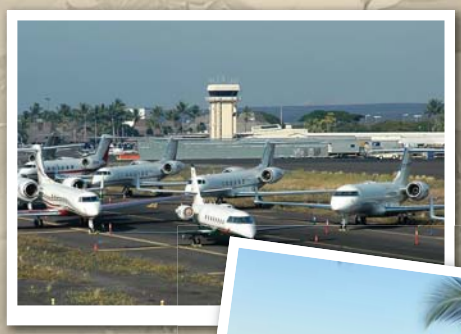
KONA

INTERNATIONAL AIRPORT AT KEAHOLE

Keahole, North Kona, Hawaii



AIRPORT MASTER PLAN

Prepared for:
State of Hawaii
Department of Transportation
Airports Division

KONA INTERNATIONAL AIRPORT AT KEAHOLE
Keahole, North Kona, Hawaii

AIRPORT MASTER PLAN

Prepared For The
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
AIRPORTS DIVISION

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TABLE OF CONTENTS

CONTENTS

KONA INTERNATIONAL AIRPORT AT KEAHOLE
Keahole, North Kona, Hawaii

Airport Master Plan

INTRODUCTION AND SUMMARY

MASTER PLAN GOALS AND OBJECTIVES ii
SENSE OF PLACE iii
MASTER PLAN ELEMENTS AND PROCESS iii
COORDINATION iv
SUMMARY AND RECOMMENDATIONS v
- Airfield vi
- Passenger Terminal vii
- Air Cargo viii
- General Aviation viii
- Other Land Uses ix
- Financial Plan x

Chapter One
INVENTORY

AIRPORT SETTING 1-1
- Locale 1-2
- Climate 1-2
- Island Transportation Network 1-3
- Airport History 1-5
- Ceded Lands 1-6
- FAA Airport Improvement Program (AIP) Projects 1-7
- Airport Administration 1-7

AVIATION ACTIVITY 1-8
- Aircraft Operations 1-9
- Passenger Activity 1-9
- Cargo Activity 1-11

AIRFIELD FACILITIES 1-11
- Runways 1-12
- Taxiways 1-13
- Airfield Lighting 1-13
- Airfield Signage 1-14
- Airport Markings 1-15
- Navigational Aids 1-15
- Weather Reporting 1-16
- Air Traffic Control Tower 1-16

LANDSIDE FACILITIES 1-16
- Passenger Terminal 1-16
- Terminal Parking and Access 1-26
- Air Cargo Facilities 1-28
- General Aviation Facilities 1-28
- Support Facilities 1-29
- Utilities 1-30

AREA AIRSPACE AND AIR TRAFFIC CONTROL 1-32
- Airspace Structure 1-32
- Airspace Control 1-35

SOCIOECONOMIC PROFILE 1-38
- Population 1-38
- Employment 1-38
- Income 1-40

REGIONAL LAND USE 1-40
- Existing Area Land Use 1-40
- Land Use Districts 1-41
- General Plan 1-41
- Community Development Plan 1-42
- Zoning 1-42

ENVIRONMENTAL INVENTORY 1-43
- Natural Resources 1-43

Chapter One (Continued)

Natural Resources 1-41
Cultural and Section 4(f) Resources 1-47

Chapter Two
FORECASTS

NATIONAL AVIATION TRENDS 2-2
Commercial Passenger Airlines 2-3
Air Cargo 2-5
General Aviation 2-7
SOCIOECONOMIC TRENDS 2-9
STATEWIDE PASSENGER FORECASTS 2-14
AIRLINE ACTIVITY FORECASTS 2-15
Air Service History 2-15
Passenger Forecasts 2-17
Airline Operations 2-21
AIR CARGO 2-24
All-Cargo Operations 2-26
GENERAL AVIATION FORECASTS 2-27
Based Aircraft 2-27
General Aviation Operations 2-31
OTHER AIR TAXI 2-35
MILITARY 2-35
ANNUAL INSTRUMENT APPROACHES (AIAs) 2-36
SUMMARY 2-37

Chapter Three
FACILITY REQUIREMENTS

PLANNING HORIZONS 3-1
ATCT Count Adjustment 3-2
Peaking Characteristics 3-3
AIRFIELD CAPACITY 3-8
Hourly Runway Capacity 3-9
Annual Service Volume 3-10
Aircraft Delay 3-10
Capacity Analysis Conclusions 3-11
CRITICAL AIRCRAFT 3-11
AIRFIELD REQUIREMENTS 3-13
Runway Configuration 3-13
Runway Dimensional Requirements 3-14

Chapter Three (Continued)

Pavement Strength 3-18
Taxiways 3-18
Helicopter Touchdown and Liftoff Area (Heliport) 3-19
Navigational Aids and Instrument Approach Procedures 3-20
Lighting and Marking 3-21
Weather Reporting 3-23
Air Traffic Control Tower 3-24
PASSENGER TERMINAL COMPLEX REQUIREMENTS 3-24
Terminal Gate Analysis 3-24
Terminal Building Capacity 3-26
Terminal Facilities Requirements 3-42
TERMINAL REQUIREMENTS SUMMARY 3-49
Terminal Access and Parking 3-50
Air Cargo Requirements 3-54
GENERAL AVIATION FACILITIES 3-57
Hangars 3-57
Aircraft Parking Apron 3-59
General Aviation Terminal Services 3-60
General Aviation Parking 3-60
AIRPORT SUPPORT REQUIREMENTS 3-61
Aircraft Rescue and Firefighting Equipment 3-61
Airport Maintenance Facilities 3-62
Aviation Fuel Storage 3-63
SUMMARY 3-63

Chapter Four
ALTERNATIVES

PREVIOUS PLANNING EFFORTS 4-2
1998 Master Plan 4-2
Previous Passenger Terminal Planning 4-4
NON-DEVELOPMENT ALTERNATIVES 4-5
No Action 4-5
TRANSFERRING AVIATION SERVICES 4-6
Transfer Services to an Existing Airport 4-6
Relocate to a New Airport Site 4-8
KEY PLANNING ISSUES 4-9
AIRFIELD IMPROVEMENT CONSIDERATIONS 4-12
Airfield Capacity Alternatives 4-12
Runway 17-35 4-16
Airfield Support Facilities 4-18
Passenger Terminal Complex 4-20

Chapter Four (Continued)

Design Basis 4-21
Development Constraints and Opportunities 4-21
Terminal Area Alternative Development Concepts 4-24
Air Cargo Development Alternatives 4-32
General Aviation Development Alternatives 4-34
General Aviation Alternative 1 4-35
General Aviation Alternative 2 4-35
General Aviation Alternative 3 4-36
General Aviation Alternative 4 4-37
ACCESS AND LAND USE 4-37
Access and Circulation 4-38
Land Use Considerations 4-39
CONCLUSIONS 4-41

Chapter Five
AIRPORT PLANS

AIRPORT DESIGN STANDARDS 5-2
RECOMMENDED MASTER PLAN CONCEPT 5-4
Airfield Recommendations 5-4
Passenger Terminal Concept 5-8
Air Cargo Concept 5-16
General Aviation Concept 5-18
Land Use Plan 5-20
DEMAND-BASED CAPITAL NEEDS PLAN 5-25
Short Term Projects 5-26
Intermediate Term Projects 5-27
Long Term Projects 5-29
SUMMARY 5-30

Chapter Six
FINANCIAL PLANS

FRAMEWORK OF CURRENT AIRPORTS SYSTEM
FINANCIAL OPERATIONS 6-1
Hawaii Revised Statutes (HRS) 6-3
The Certificate 6-3
Airport-Airline Lease Agreement 6-4
Other Agreements 6-5
AIRPORT CAPITAL NEEDS PROGRAM 6-5

Chapter Six (Continued)

FINANCIAL PLAN 6-6
Financial Analysis Assumptions 6-7
SOURCES OF FUNDING 6-7
Airport Improvement Program Grants 6-7
Passenger Facility Charges (PFCs) 6-9
Transportation Security Administrative (TSA) Grants 6-9
Customer Facility Charges (CFCs) 6-10
Special Funds (Cash) 6-10
Tenant and Third-Party Funding 6-10
Revenue Bonds 6-11
DEBT SERVICE 6-11
OPERATING EXPENSES 6-12
OPERATING REVENUES 6-13
Airline Revenues 6-14
Nonairline Revenues 6-16
SUMMARY 6-19

TABLES

A AVIATION DEMAND PLANNING HORIZONS vi
B MASTER PLAN CAPITAL NEEDS PLAN xi

1A 1971-2000 MONTHLY CLIMATE SUMMARY 1-3
1B FAA AIRPORT IMPROVEMENT PROGRAM (AIP) GRANTS 1-8
1C HISTORICAL AIRCRAFT OPERATIONS BY CATEGORY 1-9
1D ANNUAL PASSENGER AND CARGO ACTIVITY 1-10
1E AIRFIELD FACILITY DATA 1-12
1F GENERAL AVIATION SERVICES OPERATORS 1-29
1G INSTRUMENT APPROACH DATA 1-36
1H POPULATION HISTORY 1-38
1J EMPLOYMENT BY SECTOR 1-39
1K HISTORICAL UNEMPLOYMENT RATE 1-39
1L HISTORICAL PER CAPITA PERSONAL INCOME 1-40
1M AMBIENT AIR QUALITY STANDARDS 1-46

2A SOCIOECONOMIC TRENDS AND PROJECTIONS 2-10
2B POPULATION AND VISITOR TRENDS AND PROJECTIONS 2-11
2C POPULATION TRENDS AND PROJECTIONS 2-14
2D HAWAII STATEWIDE PASSENGER DEMAND FORECASTS 2-14
2E PASSENGER TRAFFIC HISTORY 2-15
2F PREVIOUS PASSENGER PROJECTIONS 2-17

TABLES (Continued)

2G PASSENGER FORECAST UPDATE 2-18
2H INTERISLAND/OVERSEAS PASSENGER FORECASTS 2-19
2J PASSENGER FORECAST SUMMARY 2-20
2K INTERNATIONAL ARRIVALS FORECAST 2-21
2L AIRLINE FLEET MIX AND OPERATIONS FORECAST 2-23
2M AIR CARGO FORECAST 2-25
2N ALL-CARGO OPERATIONS FORECAST 2-27
2P HAWAII COUNTY REGISTERED AIRCRAFT 2-28
2Q REGISTERED AIRCRAFT PROJECTIONS 2-29
2R BASED AIRCRAFT FORECASTS 2-30
2S BASED AIRCRAFT MIX FORECAST 2-32
2T GENERAL AVIATION ITINERANT OPERATIONS FORECAST 2-33
2U GENERAL AVIATION LOCAL OPERATIONS FORECAST 2-34
2V OTHER AIR TAXI OPERATIONS 2-35
2W MILITARY OPERATIONS 2-36

3A AVIATION DEMAND PLANNING HORIZONS 3-2
3B ADJUSTED AIRCRAFT OPERATIONS 3-3
3C PEAK PASSENGER ACTIVITY CHARACTERISTICS 3-5
3D AIRLINE OPERATIONS PEAK ACTIVITY FORECASTS 3-6
3E AIR TAXI AND ITINERANT GENERAL AVIATION OPERATIONAL PEAKS 3-7
3F TOTAL OPERATIONS PEAK 3-8
3G AIRCRAFT OPERATIONAL MIX – CAPACITY ANALYSIS 3-9
3H AIRFIELD DEMAND/CAPACITY SUMMARY 3-10
3J ULTIMATE TAKEOFF LENGTH REQUIREMENTS 3-15
3K GENERAL AVIATION RUNWAY LENGTH ANALYSIS 3-16
3L AIRFIELD DESIGN STANDARDS 3-17
3M AIRCRAFT GATE POSITION REQUIREMENTS 3-26
3N PASSENGER DEMAND ANALYSIS 3-28
3P PASSENGER DEMAND 3-30
3Q PEAK HOUR PASSENGER DEMAND PROFILE 3-31
3R TERMINAL FACILITIES INPUT VARIABLES 3-32
3S LEVEL OF SERVICE STANDARDS (in square feet) 3-35
3T EXISTING DEMAND CAPACITY ANALYSIS – PROCESSING FACILITIES 3-36
3U EXISTING DEMAND CAPACITY ANALYSIS BAG CLAIM AND LOBBY 3-39
3V EXISTING DEMAND CAPACITY ANALYSIS – POST-SECURITY FACILITIES 3-41
3W EXISTING DEMAND CAPACITY ANALYSIS – PUBLIC SPACES 3-42
3X DEPARTURE PROCESSING FACILITY REQUIREMENTS 3-44

TABLES (Continued)

3Y ARRIVAL PROCESSING FACILITY REQUIREMENTS 3-46
3Z HOLDROOM AND CONCOURSE FACILITY REQUIREMENTS .. 3-47
3AA PUBLIC AND SUPPORT FACILITY REQUIREMENTS 3-48
3BB TERMINAL FACILITY REQUIREMENTS SUMMARY 3-49
3CC TERMINAL CURB REQUIREMENTS 3-51
3DD TERMINAL VEHICLE PARKING 3-52
3EE AIR CARGO REQUIREMENTS 3-56
3FF GENERAL AVIATION HANGAR REQUIREMENTS 3-58
3GG GENERAL AVIATION PARKING APRON REQUIREMENTS 3-59
3HH GENERAL AVIATION TERMINAL SERVICES 3-61
3JJ FUEL STORAGE REQUIREMENTS 3-63

5A AIRFIELD DESIGN STANDARDS 5-3
5B AVIATION DEMAND PLANNING HORIZONS 5-25

6A MASTER PLAN CAPITAL NEEDS PLAN (in 2008 Dollars) ..... after page 6-6
6B MASTER PLAN SHORT-TERM FINANCIAL PLAN (with Anticipated Funding Sources) ..... after page 6-6
6C HISTORICAL REVENUES 6-14

EXHIBITS

A RECOMMENDED MASTER PLAN CONCEPT ..... after page vi
B INITIAL TERMINAL DEVELOPMENT – SHORT AND INTERMEDIATE TERM ..... after page viii
C DEMAND-BASED CAPITAL NEEDS STAGING ..... after page x

1A LOCATION MAP ..... after page 1-2
1B AIRPORT PROPERTY ..... after page 1-2
1C HAWAII DOT-A ORGANIZATION ..... after page 1-8
1D EXISTING AIRFIELD FACILITIES ..... after page 1-12
1E EXISTING TERMINAL AREA FACILITIES ..... after page 1-18
1F EXISTING TERMINAL PLAN ..... after page 1-18
1G TERMINAL SURVEY PHOTOS ..... after page 1-20
1H EXISTING CARGO AND GENERAL AVIATION FACILITIES ..... after page 1-28
1J TERMINAL AREA UTILITIES ..... after page 1-30
1K AIRSPACE CLASSIFICATION ..... after page 1-32
1L ISLAND AIRSPACE ..... after page 1-34
1M EXISTING LAND USE AND LAND USE DISTRICTS ..... after page 1-40

EXHIBITS (Continued)

1N LUPAG AND ZONING MAPS ..... after page 1-42
1P WATER RESOURCES ..... after page 1-44
1Q SECTION 4(f) PROPERTIES ..... after page 1-48

2A U.S. LARGE AIR CARRIER AND REGIONAL/ COMMUTER FORECASTS ..... after page 2-6
2B U.S. AIR CARGO FORECASTS ..... after page 2-8
2C U.S. ACTIVE GENERAL AVIATION AIRCRAFT FORECASTS ..... after page 2-8
2D SOCIOECONOMIC TRENDS AND PROJECTIONS ..... after page 2-10
2E STATEWIDE PASSENGER FORECASTS ..... after page 2-14
2F HISTORIC PASSENGER TRAFFIC ..... after page 2-16
2G KOA NON-STOP FLIGHTS ..... after page 2-16
2H PASSENGER FORECASTS ..... after page 2-18
2J AIRCRAFT SEATING FOR KOA CARRIERS ..... after page 2-22
2K AIR CARGO FORECASTS ..... after page 2-24
2L HAWAII COUNTY REGISTERED AIRCRAFT FORECASTS ..... after page 2-28
2M BASED AIRCRAFT FORECASTS ..... after page 2-30
2N ACTIVITY FORECAST SUMMARY ..... after page 2-37

3A AIRFIELD CAPACITY FACTORS ..... after page 3-8
3B AIRFIELD DEMAND VS. CAPACITY ..... after page 3-10
3C AIRPORT REFERENCE CODES ..... after page 3-12
3D WINDROSE ..... after page 3-14
3E TERMINAL GATE OCCUPANCY ..... after page 3-26
3F AIRFIELD REQUIREMENTS ..... after page 3-63
3G PASSENGER TERMINAL ..... after page 3-63
3H GA/CARGO SUMMARY ..... after page 3-63

4A 1998 AIRPORT LAYOUT PLAN ..... after page 4-2
4B PREVIOUS TERMINAL PLANNING ..... after page 4-4
4C DEVELOPMENT CONSIDERATIONS ..... after page 4-10
4D AIRFIELD ALTERNATIVE 1 ..... after page 4-14
4E AIRFIELD ALTERNATIVE 2 ..... after page 4-14
4F TERMINAL CONSTRAINTS/OPPORTUNITIES ..... after page 4-22
4G PRELIMINARY TERMINAL CONCEPTS ..... after page 4-26
4H TERMINAL ALTERNATIVE 1 ..... after page 4-26
4J TERMINAL ALTERNATIVE 2 ..... after page 4-30
4K TERMINAL ALTERNATIVE 3 ..... after page 4-32
4L AIR CARGO ALTERNATIVES ..... after page 4-32
4M GENERAL AVIATION LANDSIDE ALTERNATIVE 1 .. after page 4-36
4N GENERAL AVIATION LANDSIDE ALTERNATIVE 2 .. after page 4-36
4P GENERAL AVIATION LANDSIDE ALTERNATIVE 3 .. after page 4-36

EXHIBITS (Continued)

4Q GENERAL AVIATION LANDSIDE ALTERNATIVE 4.. after page 4-38
4R ACCESS/LAND USE ALTERNATIVE 1 ..... after page 4-38
4S ACCESS/LAND USE ALTERNATIVE 2 ..... after page 4-38

5A RECOMMENDED MASTER PLAN CONCEPT..... after page 5-4
5B RECOMMENDED PASSENGER TERMINAL PLAN .... after page 5-10
5C INITIAL TERMINAL DEVELOPMENT – SHORT AND INTERMEDIATE TERM..... after page 5-10
5D TERMINAL DEVELOPMENT PLAN – OPTION 1 ..... after page 5-12
5E TERMINAL DEVELOPMENT PLAN – OPTION 2 ..... after page 5-12
5F FULL BUILDOUT TERMINAL AREA MODEL..... after page 5-12
5G TERMINAL PERSPECTIVES..... after page 5-12
5H TERMINAL LOOP AND PARKING PLAN ..... after page 5-16
5J RECOMMENDED AIR CARGO CONCEPT..... after page 5-16
5K RECOMMENDED GENERAL AVIATION CONCEPT .. after page 5-18
5L AIRPORT LAND USE CONCEPT ..... after page 5-20
5M DEMAND-BASED CAPITAL NEEDS STAGING – SHORT TERM (5 YEAR HORIZON) ..... after page 5-26
5N DEMAND-BASED CAPITAL NEEDS STAGING -- INTERMEDIATE TERM (5-10 YEAR HORIZON)..... after page 5-28
5P DEMAND-BASED CAPITAL NEEDS STAGING -- LONG TERM (10-20 YEAR HORIZON) ..... after page 5-30

6A OPERATING EXPENSES AND REVENUES..... after page 6-14

B1 LONG RANGE NOISE EXPOSURE CONTOURS WITH LAND USE.....after page B-6

D1 NORTH KONA REGIONAL MAP.....after page D-2

Appendix A
GLOSSARY OF TERMS

Appendix B
ENVIRONMENTAL EVALUATION

Appendix C
TERMINAL ALTERNATIVES EVALUATION CRITERIA

Appendix D
AIRPORT AREA DEVELOPMENT

Appendix E
AIRPORT LAYOUT PLAN DRAWINGS

INTRODUCTION AND SUMMARY

INTRODUCTION AND SUMMARY

This update of the Kona International Airport at Keahole (KOA) Master Plan was undertaken to evaluate the airport's capabilities and role, to review forecasts of future aviation demand, and to plan for the timely development of new or expanded facilities that may be required to meet that demand. The ultimate goal of the master plan is to provide systematic guidelines for the airport's overall development, maintenance, and operation for the next 20 years.

The master plan is intended to be a proactive document which identifies and then plans for future facility needs well in advance of the actual need for the facilities. This is done to ensure that the State of Hawaii Department of Transportation Airports Division (DOT-A) can coordinate project approvals, design, financing, and construction to avoid experiencing detrimental effects due to inadequate facilities.

An important result of the master plan is reserving sufficient areas for future facility needs. This protects development areas and ensures they will be readily available when required to meet future needs. The intended result is a development concept which outlines the proposed uses for all areas of airport property.

The DOT-A recognizes the importance of air transportation to the island community and the associated challenges inherent in providing for its unique operating and improvement needs. The cost of maintaining an adequate airport is an investment which yields impressive benefits to the island as well as the entire state.

With a sound and realistic master plan, KOA can maintain its role as an important link to the national air transportation system for the island and the state of Hawaii, and maintain the existing public and private investments in its facilities.

MASTER PLAN GOALS AND OBJECTIVES

The primary objective of the master plan is to provide the community and public officials with proper guidance for future development which will address aviation demands and be wholly compatible with the environment. The accomplishment of this objective requires the evaluation of the existing airport and determination of what actions should be taken to maintain an adequate, safe, and reliable airport facility in support of those long term goals. This master plan provides an outline of necessary development and gives those responsible an advance notice of future airport funding needs so that appropriate steps can be taken to ensure that adequate funds are budgeted and planned.

Specific goals for the airport are to:

- Provide a high level of service to passengers, while maintaining the "Hawaiian sense of place."
- Stimulate and support island and state economic development.
- Enhance services for air cargo operations.
- Encourage international flights at the airport.
- Accommodate existing and future general aviation (including corporate aviation) customer needs.
- Maintain good relationships with neighborhood communities by minimizing environmental impacts such as aircraft noise.

Specific objectives of this master plan designed to help in attaining these goals include:

- Research and evaluate socio-economic factors likely to affect the air transportation demand on the island.
- Determine projected needs of airport users through the year 2030 by which to support airport development alternatives.
- Recommend improvements that will enhance the airport's safety capabilities to the maximum extent possible within affordability parameters established jointly with DOT-A.
- Produce current and accurate base maps and Airport Layout Plan drawings.
- Establish a schedule of priorities and an affordable program for the improvements proposed in the Master Plan.
- Prioritize the airport capital improvement program and develop a financial plan.

- Evaluate the potential for enhanced revenue development on the airport.

- Develop active and productive public involvement throughout the planning process.

The Master Plan provides recommendations from which DOT-A may take action to improve the airport and all associated services important to public needs, convenience, and economic growth. The plan benefits all residents of the area by providing a single, comprehensive plan which supports and balances the continued growth of aviation activity with the preservation of the surrounding environs and maintaining a "sense of place" as described below.

SENSE OF PLACE

Sense of place is that relationship between the natural and built environment with the community. In Hawaii, it's often found in the spirit of *aloha.* People often develop a relationship of place through sights, sounds, smells, tastes, temperature, and climate. These unique characteristics, qualities, and features of a place help distinguish one place from another. Kona's spirit of *aloha* can be found throughout the Kona International Airport at Keahole.

As the Kona community continues to grow, Kona International Airport at Keahole keeps its past connected to the future. Although one can't plan or design a sense of place into a building, planners and architects can create the opportunity for a sense of place. Future development and the expansion of the terminal must continue building the relationship between the community, its visitors, and the experience of *aloha.*

MASTER PLAN ELEMENTS AND PROCESS

The KOA Master Plan was prepared in a systematic fashion following FAA guidelines and industry-accepted principles and practices. The master plan has six chapters plus appendices that are intended to assist in planning for future facility needs and provide the supporting rationale for their implementation.

Chapter One - Inventory summarizes the inventory efforts. The inventory efforts focused on collecting and assembling relevant data pertaining to the airport and the area it serves. Information was collected on existing airport facilities and operations. Local economic and demographic data was collected to define the local growth trends. Planning studies which may have relevance to the master plan were also collected and reviewed.

Chapter Two - Forecasts examines the potential aviation demand for aviation activity at the airport. This analysis reviews and updates the KOA demand forecasts previously prepared for DOT-A in the *Hawaii Aviation Demand Forecasts Update.* The forecast effort takes into account local socioeconomic information, as well as national air transportation trends to quantify the levels of aviation activity

which can reasonably be expected to occur at KOA through the year 2030. The results of this effort were used to determine the types and sizes of facilities which will be required to meet the projected aviation demands on the airport through the planning period.

Chapter Three - Facility Requirements comprises the demand/ capacity and facility requirements analyses. The intent of these analyses is to compare the existing facility capacities to forecast aviation demand and determine where deficiencies in capacities (as well as excess capacities) may exist. Where deficiencies are identified, the size and type of new facilities to accommodate the demand are identified. The airfield analysis focuses on improvements needed to serve the type of aircraft expected to operate at the airport in the future, as well as navigational aids to increase the safety and efficiency of operations. This element also examines the passenger terminal complex, air cargo facilities, general aviation facilities, and support needs.

Chapter Four - Alternatives considers a variety of solutions to accommodate the projected facility needs. This element proposes various facility and site plan configurations which can meet the projected facility needs. An analysis is completed to identify the strengths and weaknesses of each proposed development alternative, with the intention of determining a conceptual direction for development.

Chapter Five – Recommended Airport Plan provides both a graphic and narrative description of the recommended plan for the use, development, and operation of the airport. From this, the airport's capital needs are outlined. An environmental overview is also provided as an appendix. The master plan also supports the official Airport Layout Plan (ALP) and detailed technical drawings depicting related airspace, land use, and property data. These drawings are used by the Federal Aviation Administration (FAA) in determining grant eligibility and funding.

Chapter Six - Financial Plan examines and refines the capital needs program, including the schedules and costs for the recommended development projects. The plan then evaluates the potential funding sources to analyze financial strategies for successful implementation of the plan.

COORDINATION

The KOA Master Plan is of interest to many within the local community. This includes local citizens, community organizations, airport users, airport tenants, local and state planning agencies, and aviation organizations. As the airport is a strategic component of the state and national aviation systems, the KOA Master Plan is of importance to both state and federal agencies responsible for overseeing air transportation.

To assist in the development of the master plan, the Hawaii DOT-A identified a group of community members and aviation interest groups to act in an advisory role in the development of the master plan. Members of the Technical Advisory Committee (TAC) met four times during the process to

review phase reports and provide comments at each step to help ensure that a realistic, viable plan was developed.

To assist in the review process, draft working papers were prepared at the various milestones in the planning process. The working paper process allowed for timely input and review during each step within the master plan to ensure that all master plan issues were addressed as the recommended program develops.

A series of four public information workshops were also held as part of the plan coordination. The public information workshops were designed to allow any and all interested persons to become informed and provide input concerning the master plan. Notices of meeting times and locations were advertised through the media as well as local neighborhood associations. The notices as well as the draft working papers were also made available to the public online.

SUMMARY AND RECOMMENDATIONS

The proper planning of a facility of any type must consider the demand that may occur in the future. For Kona International Airport at Keahole, this involved updating forecasts to identify potential future aviation demand. Because of the cyclical nature of the economy, it is virtually impossible to predict with certainty year-to-year fluctuations in activity when looking five, ten, and twenty years into the future.

Recognizing this reality, the Master Plan is keyed more to potential demand "horizon" milestones than future dates in time. These "planning horizons" were established as levels of activity that will call for consideration of implementation of the next step in the Master Plan program. By developing the airport to meet aviation demand levels instead of specific points in time, the airport will serve as a safe and efficient aviation facility which will meet the operational demands of its users while being developed in a cost-efficient manner. This program allows the DOT-A to adjust specific development in response to unanticipated needs or demand. The forecast planning horizons are summarized in **Table A**.

The recommended Master Plan Concept includes improvements to the airfield, terminal area, air cargo, and general aviation facilities to meet current and forecast needs over the long range planning horizon. It is also designed to ensure a viable aviation facility for the West Coast, the Big Island, and the State well beyond the long range horizon. The recommended concept is depicted on **Exhibit A**. The following sections further detail these plans and recommendations.

TABLE A
Aviation Demand Planning Horizons
Kona International Airport at Keahole

	Base Year (2006)	Short Term	Intermediate	Long Term
Annual Passengers	3,033,212	3,472,000	3,819,000	4,721,000
Annual Air Cargo (Tons)	32,390	39,000	45,000	62,000
Based GA Aircraft	61	102	118	160
Annual Operations				
Airline	37,436	39,800	41,400	45,800
Air Cargo	4,372	4,700	5,100	6,100
Other Air Taxi	9,116	15,500	18,000	24,000
GA Itinerant	18,340	31,000	36,000	48,000
GA Local	54,650	89,000	101,000	134,000
Military	19,304	30,000	30,000	30,000
Total Operations	143,218	210,000	231,500	287,900

AIRFIELD

The airfield is the lifeblood of any airport, as it is the direct air-to-ground interface. Of key importance is to ensure that airport design standards are adequately planned for and met. Recommendations are then provided to improve the operational efficiency, circulation, and capability of the airfield.

Runway 17-35 will remain the primary runway in the future, although it will ultimately be used in concert with a parallel runway and a helicopter touchdown and lift-off (TLOF) area. It is planned to be capable of accommodating the Boeing 747, as well as to serve as an alternate airport for the largest civilian aircraft, the Airbus A380-800.

The helicopter TLOF is planned mauka (east) of the rest of the airfield at a separation that will allow it to operate independent of the runways, thus increasing airport capacity. A facility complete with apron, small terminal, hangars, and auto parking are planned.

The parallel runway is initially planned at 5,500 feet to relieve general aviation traffic. It can be extended in the future to serve a full range of commercial activity at the airport and ensure that the airport is not shut down when its primary runway is temporarily closed for any reason.

The Kona auxiliary training runway (KATR) is included in the plans for development by the Department of Defense. It will be used by C-17 military aircraft to practice short field landings. If developed to a length of 5,000 feet and 100 feet wide, the KATR could be available for civilian use when not being used for military training until such time as the parallel runway can be developed.

Taxiway improvements are also planned to improve airfield efficiency and circulation as traffic grows. Plans also include new support facili-

06MP06-A-5/11/10

Proposed Main Entrance

Existing Entrance

Kaiminani Dr.

Queen Kaahumanu Hwy.

Proposed Parallel Rd.

REVENUE SUPPORT (LARGE TRACT)

ATCBI 1,500'

PUBLIC SAFETY TRAINING CAMPUS

AIRPORT INDUSTRIAL

Road P

AVIATION SUPPORT

MIXED USE/ COMMERCIAL

HOTEL

MIXED USE/ COMMERCIAL

Conference Center

CULTURAL/EDUCATION

GENERAL AVIATION (Helicopters)

TLOF 1,700' x 200'

2,000'

AIRPORT INDUSTRIAL

Fuel Farm

AIRPORT SUPPORT

AVIATION SUPPORT

Halalu St.

GROUND TRANSPORTATION

Keaholo St.

Proposed Museum Site

AVIATION SUPPORT

Road M

NELHA

Heat Exchanger Site

Pao'o St. (Road N)

AVIATION SUPPORT

Waste Water Treatment

Flight Kitchen

USPS

Parking

Petroglyphs

Kupipi St.

AIRPORT SUPPORT

AIRPORT SUPPORT

AIRPORT SUPPORT

Wash Rack

FLIGHT LINE RESERVE

3,000'

LARGE AIRCRAFT USES

Hapu'upu'u St.

ATCT

FAA

ARFF

U'U Street

K

L

GENERAL AVIATION

AIR CARGO

TERMINAL

TLOF Emergency Response Route

Remote Fuel Station

Taxiway A

1,000'

VOR

A

381'

P

C

A

Taxiway E

500'

M

N

G

H

D

Runway 17-35 11,000' x 150' (Future 12,000' x 150')

1,000'

700'

KATR 5,000' x 100'

Taxiway F

500'

Ultimate Runway 17R-35L 11,000' x 150'

Initial Parallel Runway 5,500' x 100'

Ultimate Perimeter Service Road

WATER RESCUE FACILITY/ BOAT LAUNCH

LEGEND

- Airport Property Line
- Object Free Area (OFA)
- Extended OFA
- Runway Safety Area (RSA)
- Lease Parcels
- Ultimate Roads/Parking
- Ultimate Airfield Pavement
- Kona Auxiliary Training Runway (KATR)
- Runway Protection Zone (RPZ)

Existing Facilities per Photograph

NORTH

0 1200 2400

SCALE IN FEET

RECOMMENDED MASTER PLAN CONCEPT

Exhibit A

ties such as a new airport traffic control tower (ATCT), a new aircraft rescue and firefighting station (ARFF), a water rescue facility with a boat launch, and relocation of the VOR (very high frequency omni-directional range) facility onto the south side of the airport.

PASSENGER TERMINAL

While the airfield is the lifeblood, the passenger terminal is the spirit of the airport. It is the facility that is frequented by the most people and serves as a gateway to the island. That is why it is important that Kona's spirit of *aloha* is carried throughout the passenger terminal and beyond.

The passenger terminal improvements are designed to modernize the existing facility while maintaining the Hawaiian "sense of place," as well as prepare to accommodate the long term planning horizon level of 4.7 million annual passengers. **Exhibit B** depicts the short and intermediate horizon plans for the terminal. Terminal development priorities were determined to be as follows:

1. Improve baggage claim areas to reduce crowding and improve circulation, ventilation, and lighting. This is addressed first through relocating the perimeter rails around the baggage claim, then with additional claim devices and general expansion of the claim area.

2. Improve the ticket lobby experience and reduce crowding. This is addressed within the plan by creating a centralized ticket lobby with adequate space for queuing and processing functions without hindering passenger wayfinding and flow. This will first require the relocation of the Ellison S. Onizuka Space Center from the terminal area. A new site for the space center has been determined opposite the Keahole Street entrance to the rental car area.

3. Improve TSA security checkpoint operations. This is addressed by consolidating the two current TSA checkpoints into one centralized screening location.

4. Implement TSA in-line baggage screening. This is addressed with plans for a centralized in-line security screening system, where baggage would be transported by belts after check-in, then redistributed to the airlines after screening. As an option, agricultural screening of checked bags could be put in-line as well.

5. Increase gate holdroom areas. This is addressed with a second level departure concourse for overseas flights that would be located between the two existing ground level departure areas. The ground level departure areas will remain for handling inter-island flights.

6. Improve CBP international arrivals experience. This is addressed with plans to replace the current structure with an expanded permanent facility in the same area.

To accommodate the terminal development, Taxiway A will be relocated

114 feet makai (west) on the other side of the terminal. The terminal loop road is also planned to be relocated mauka (west) from Kupippi Street to Pao`o Street (Road N) to contain all terminal parking within the loop system.

The proposed improvements could require the terminal curb to be relocated 30 feet Mauka (east). The need for the shift, however, will be dependent upon the final terminal design. If the design does not require additional mauka space for pre-security queuing, the roadway and the ground transportation building could be maintained.

AIR CARGO

As cargo traffic grows, it is recommended that cargo be consolidated to an area north of the passenger terminal. This will not only consolidate the use, but separate it from the general aviation activity at the south end of the terminal area. It will also provide space for full screening of all outbound freight, if necessary, in the future.

The cargo buildings are aligned parallel to the runway with apron makai (west) and truck docks and vehicle parking mauka (east).

Space is also provided at the south end of the cargo complex for a Joint Inspection Facility building. This is designed to house the Hawaii Department of Agriculture (HDOA), the United States Department of Agriculture (USDA), and other state and federal agencies with jurisdiction over cargo exports and imports.

GENERAL AVIATION

The general aviation (GA) facilities are planned to remain south of the passenger terminal, and expand with the eventual relocation of the air cargo facilities to the north. This will ultimately provide three distinct and separate functional areas for the primary aviation uses on the airport.

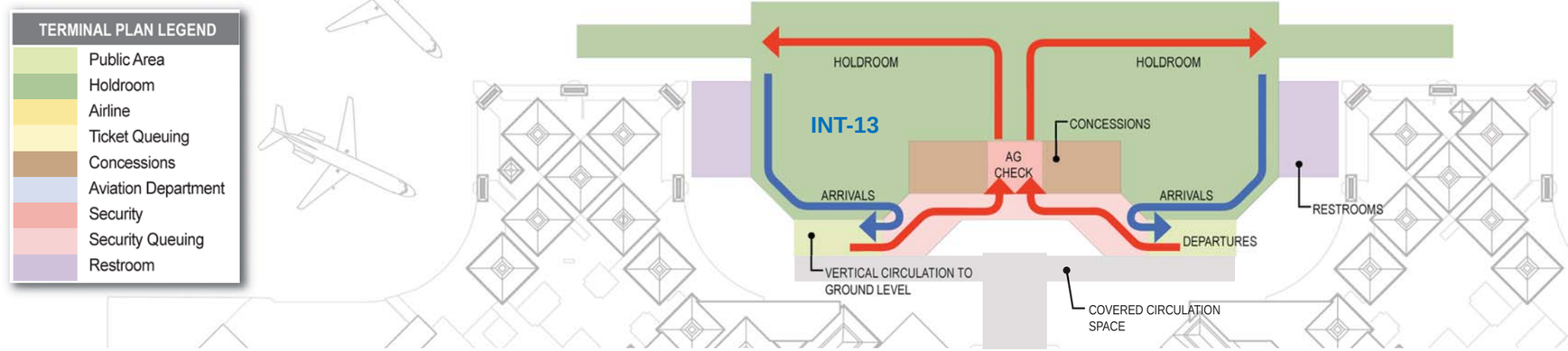
Property mauka (east) of U`u Street has been divided into four areas for lease to private developers through a request for proposal (RFP) process. The DOT-A intends these areas to have corporate/general aviation facilities constructed to assist in meeting the future demands as expressed by the general aviation community.

The ramp south of Taxilane K remains as a corporate ramp with expansion planned south of Taxilane K. The south ramp expansion also includes a location for a wash rack next to a site that would be reserved by DOT-A for future consideration as to its use.

North of Taxilane K is the site for an interim commuter air terminal (CAT) to be used until such time as a permanent location can be developed on the site now occupied by the ATCT and the ARFF. At that time, the interim terminal can be converted into a GA terminal and GA offices. Currently in the design stages, the interim CAT will be the first LEED-certified facility on the airport.

06MP06-B-1/27/09

UPPER LEVEL



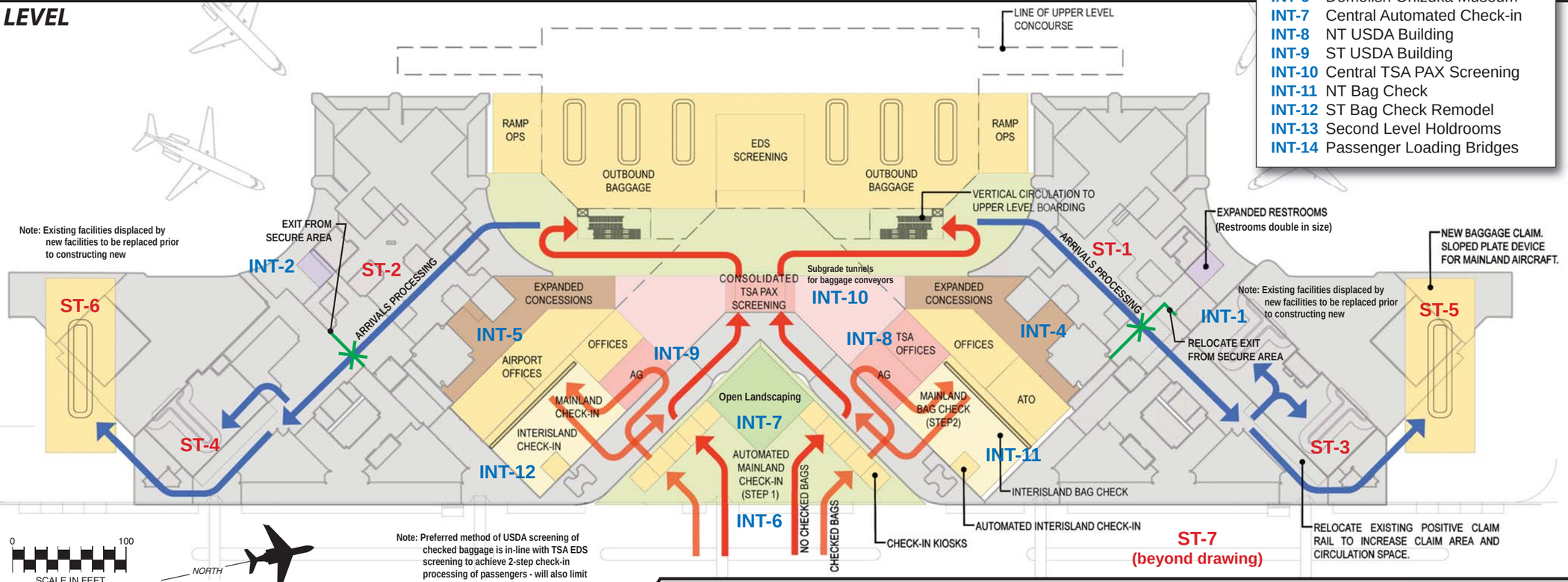
SHORT TERM

- **ST-1** NT Courtyard Canopies
- **ST-2** ST Courtyard Canopies
- **ST-3** NT Bag Claim Retrofits
- **ST-4** ST Bag Claim Retrofits
- **ST-5** NT Bag Claim / IBB
- **ST-6** ST Bag Claim / IBB
- **ST-7** Employee Parking Expansion

INTERMEDIATE TERM

- **INT-1** NT Expand Restrooms
- **INT-2** ST Expand Restrooms
- **INT-3** Central OBB / EDS / Tunnels (not shown)
- **INT-4** NT Concessions
- **INT-5** ST Concessions
- **INT-6** Demolish Onizuka Museum
- **INT-7** Central Automated Check-in
- **INT-8** NT USDA Building
- **INT-9** ST USDA Building
- **INT-10** Central TSA PAX Screening
- **INT-11** NT Bag Check
- **INT-12** ST Bag Check Remodel
- **INT-13** Second Level Holdrooms
- **INT-14** Passenger Loading Bridges

LOWER LEVEL



Note: Preferred method of USDA screening of checked baggage is in-line with TSA EDS screening to achieve 2-step check-in processing of passengers - will also limit crossing flow of passengers

The buildings on parcels immediately north of the commuter terminal are on small parcels that can continue to be used for general aviation businesses. Proceeding north along the flightline, the current cargo buildings can be converted to GA specialty suites after the cargo facilities are moved north of the passenger terminal. The specialty suites would have subdivided space in each building that can be leased to various general aviation specialty operators for flight training, small aircraft charter operators, avionics shop, etc. The ramp in front of these buildings would also be converted to general aviation parking.

OTHER LAND USES

There are two primary considerations for on-airport land use planning. First is to secure those areas essential to the safe and efficient operation of the airport. Once these uses are provided for now and into the future, other uses that are compatible with and complement the primary uses can be considered. They should provide a function that is either a complimentary service to the airport (i.e., warehousing and storage, ground transportation, public safety training, hotel/conference center, etc.), a cultural tie that enhances the "Hawaiian sense of place" at the airport, and/or enhances revenues in support of the airport operation. **Exhibit A** depicts the location of these other key uses.

The north flight line beyond the cargo area is reserved for large aircraft uses. This is envisioned to be the location for airline maintenance facilities and for hangars that could accommodate the largest corporate aircraft.

The center core area between Keahole Street and future Road P is the current and future location for ground transportation facilities. This consists primarily of rental car facilities. Additional area for ground transportation facilities has been reserved north of the existing facilities.

An area for a public safety training campus is another use that relates to airport needs, but also has the potential to serve the broader-based community. An 80-acre campus is depicted south of the helicopter facilities.

Other aviation support areas are planned and could house airport administration, FAA, TSA, airline and other airport-related offices in a campus-like setting that does not have to be at or near the flightline.

Area has also been reserved for the relocation of the Ellison S. Onizuka Space Center. Adjacent uses are planned to support a cultural education center as well as a hotel and conference center.

Other airport industrial and mixed-use commercial uses are planned to round out the land use mix. These are expected to include warehousing and businesses that can directly benefit from proximity to the airport and provide revenue support towards the airport's self-sufficiency.

Another important factor to the plan is access to the airport. Road P is planned as the future primary entrance with the capability for devel-

opment of a grade separation interchange with Queen Kaahumanu Highway. An internal road system is planned to provide access and circulation for all airport uses that does not get funneled through the passenger terminal area as it does today. The road system also allows for flexibility in serving future transit options being considered for west Hawaii.

FINANCIAL PLAN

The recommended improvements are grouped by planning horizon. The short term planning horizon contains projects of highest priority (collectively referred to as the "Early Works" projects), including, but not limited to, those already identified in the statewide CIP, and those relating to meeting safety design standards. As short term improvements are completed, DOT-A would begin programming the intermediate term projects, and finally the long term needs.

The development of the recommended master plan concept is intended to follow demand-driven indicators. For example, the plan anticipates the construction of a parallel runway to accommodate general aviation operations in the intermediate term. Increased air traffic will be the indicator for the need of the runway, and the timing of the construction will depend on meeting that demand. Some development items, such as major maintenance of existing facilities at the airport are intended to meet FAA standards and would not be considered demand-driven.

Table B presents a summary of estimated project costs (in 2008 dollars) for the capital needs program (CNP) in the planning period during which those costs are proposed to occur.

The 20-year capital needs program for KOA focuses heavily on meeting FAA design standards for safety, improving overall airfield capacity, and providing developable space for landside facilities to accommodate forecasted growth of based aircraft. **Exhibit C** depicts the proposed staging by planning horizon.

The 20-year investment total is approximately $780 million. Projects eligible for FAA grant assistance through its Airport Improvement Program (AIP) total approximately $310 million. Therefore, an estimated $470 would fall under other funding sources including private financing and Airports System Special Funds. It should be noted that although a project is eligible for federal funding, there is no guarantee that the project will receive federal funding. Nationwide, AIP-eligible airport projects typically exceed AIP funding availability by a wide margin.

The financial plan for the Kona International Airport Master Plan anticipates that project costs would be funded with a combination of federal grants-in-aid, Transportation Security Administrative funds, passenger facility charge (PFC) revenues, internally generated cash flow, and future bonds to be repaid in part from revenues of the Airports System and in part from PFC revenues. In addition, a significant share of the capital costs is anticipated to be funded through tenant and third party financing. Beyond the short-term period through FY 2012, it is assumed that DOT-A will continue

06MP06-C-5/11/10

Proposed Main Entrance

Existing Entrance

Queen Kaahumanu Hwy.

Kaiminani Dr.

RETAIL

ATC BI 1,500'

Road P

NELHA

Road M

2,000'

Pao'o St. (Road N)

Kupipi St.

3,000'

TERMINAL

GENERAL AVIATION

1,000'

VOR

381'

500'

Runway 17-35 11,000' x 150' (Future 12,000' x 150')

1,000'

700'

Kona Auxiliary Training Runway 5,000' x 100'

500'

Ultimate Runway 17R-35L 11,000' x 150'

Initial Parallel Runway 5,500' x 100'

Ultimate Perimeter Service Road

LEGEND

- Airport Property Line
- Object Free Area (OFA)
- Extended OFA
- Runway Safety Area (RSA)
- Lease Parcels
- Short Term Development
- Intermediate Term Development
- Long Term Development
- Runway Protection Zone (RPZ)

Existing Facilities per Photograph

NORTH

0 1200 2400

SCALE IN FEET

DEMAND-BASED CAPITAL NEEDS STAGING

Exhibit C

to develop the Airport as required to meet the needs of increased passenger demand, consistent with future funding sources available to the State at the time of project implementation. The financial feasibility of future projects will be determined by the provisions of existing or future tenant agreements (including Airlines), funding levels and participation rates of federal grant-in-aid programs, availability of PFC revenues (pay-as-you-go and leveraged), revenue bond capacity, and the ability to generate discretionary cash flow from Airport operations.

TABLE B
Master Plan Capital Needs Plan
(in 2008 Dollars)

	Short Term FY08-FY12	Intermediate FY13-FY17	Long Term FY18-FY30	Total FY08-FY30
Airfield				
Terminal Apron Expansion West	$9,419,000	$6,232,000	$ ---	**$15,651,000**
Runway 17-35	---	5,994,000	4,562,000	**10,556,000**
Parallel Runway 17R-35L	---	18,289,000	47,065,000	**65,354,000**
Taxiways G & F West & South of KATR	---	272,000	19,994,000	**20,266,000**
Taxiway Renovations & Improvements	---	5,141,000	30,014,000	**35,155,000**
Airfield Lighting	---	675,000	---	**675,000**
Other Airfield	---	6,511,000	---	**6,511,000**
	$9,419,000	$43,114,000	$101,635,000	**$154,168,000**
Terminal Area				
Terminal Expansion	$94,772,000	$133,328,000	$203,100,000	**$431,200,000**
Parking Lot Expansion	---	6,585,000	3,629,000	**10,214,000**
	$94,772,000	$139,913,000	$206,729,000	**$441,414,000**
Parking & Roadway				
Employee Parking Expansion	$ ---	$ ---	$ ---	**$ ---**
Roadways	---	2,430,000	5,184,000	**7,614,000**
	$ ---	$2,430,000	$5,184,000	**$7,614,000**
Cargo Area				
Phase I	$ ---	$41,731,000	$ ---	**$41,731,000**
Phase II	---	---	35,738,000	**$35,738,000**
	$ ---	$41,731,000	$35,738,000	**$77,469,000**
General Aviation				
Aircraft Wash Rack	$743,000	$ ---	$ ---	**$743,000**
Commuter Air Terminal (CAT)	3,578,000	---	11,340,000	**14,918,000**
Apron Expansion	---	5,164,000	4,050,000	**9,214,000**
GA Auto Parking	122,000	---	122,000	**244,000**
Roadway Access	491,000	491,000	---	**982,000**
	$4,934,000	$5,655,000	$15,512,000	**$26,101,000**
Heliport				
Site Preparation	$3,897,000	$ ---	$ ---	**$3,897,000**
Roadway Access	3,856,000	---	---	**3,856,000**
Phase I	6,028,000	---	5,184,000	**11,212,000**
Phase II	---	---	1,583,000	**1,583,000**
	$13,781,000	$ ---	$6,767,000	**$20,548,000**
Other				
ARFF Station Installation	$17,288,000	$ ---	$ ---	**$17,288,000**
Utilities Master Plan	500,000	---	---	**500,000**
Airport Administration Facility	---	10,000,000	---	**10,000,000**
Regional ARFF Training Facility	---	25,000,000	---	**25,000,000**
	$17,788,000	$35,000,000	$ ---	**$52,788,000**
Capital Needs Program Total	**$140,694,000**	**$267,843,000**	**$371,565,000**	**$780,102,000**

The financial projections were prepared on the basis of available information and assumptions as set forth in **Chapter Six** of this master plan. It is believed that such information and assumptions provide a reasonable basis for the projections to the level of detail appropriate for an airport master plan. Based on these assumptions, the capital improvement program could be financed in the future by the State and result in key financial indicators that are consistent with the historical results of the Statewide Airports System and industry comparables. However, some of the assumptions used to develop the projections will not be realized and unanticipated events and circumstances may occur. Therefore, the actual results may vary from those projected and such variations could be material.

Chapter One

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 76th 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. Keahole 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

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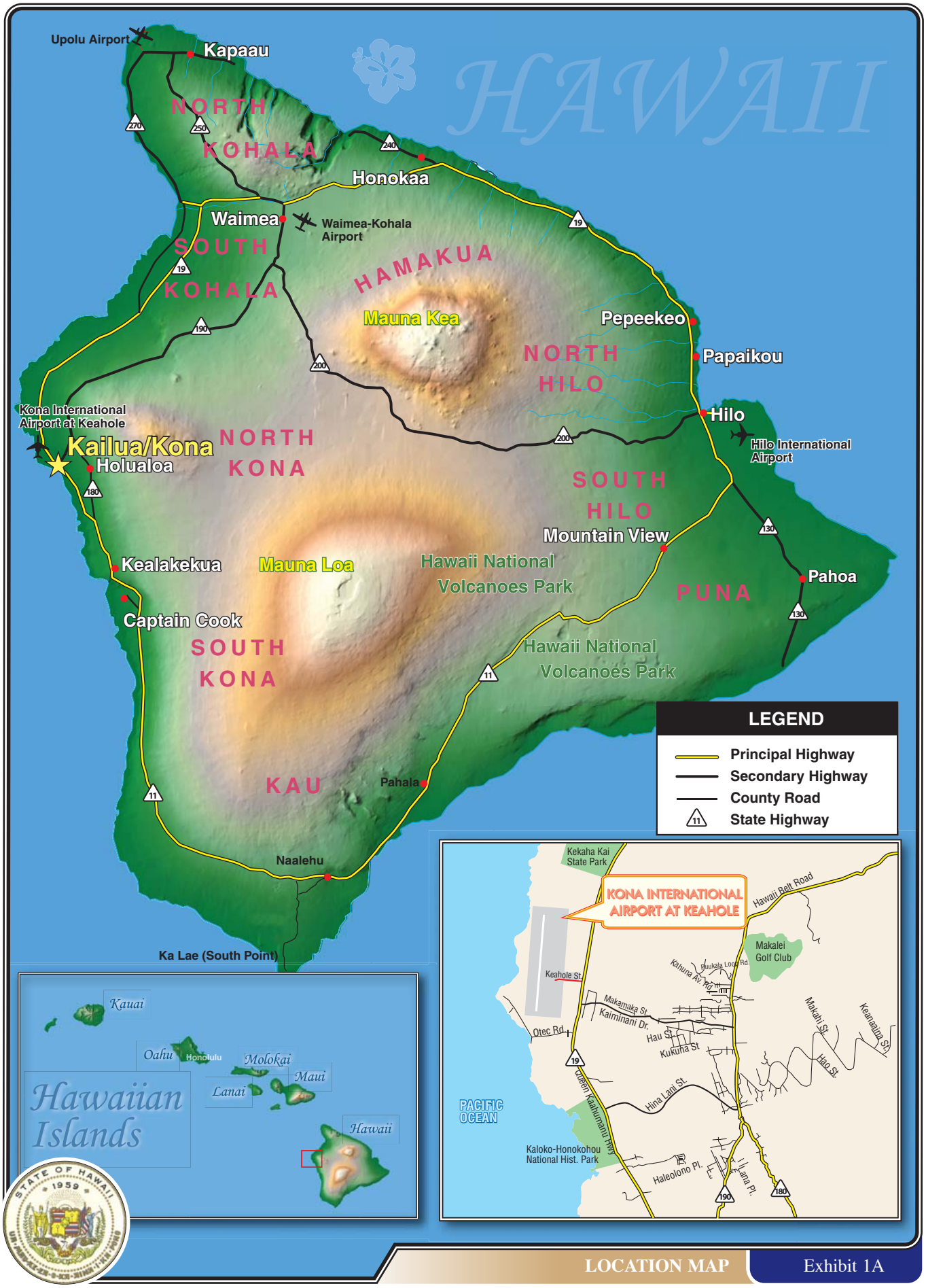


LOCATION MAP

Exhibit 1A

06MP06-1B-3/22/10

AIRPORT PROPERTY

Exhibit 1B

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, waterspouts, 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.

TABLE 1A
1971-2000 Monthly Climate Summary
Kona International Airport at Keahole

	Monthly Temperature Averages		Precipitation
Month	**Maximum (F)**	**Minimum (F)**	**Mean (inches)**
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 highways. 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.

TABLE 1B
FAA Airport Improvement Program (AIP) Grants
Kona International Airport at Keahole

Fiscal Year	AIP Grant Number	Project Description	Total Grant Funds
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
Total AIP Grant Funds			**$27,308,400**

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)
Kalaeloa 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.

TABLE 1C
Historical Aircraft Operations By Category
Kona International Airport at Keahole

	Itinerant					Local			
Year	Air Carrier	Air Taxi	General Aviation	Military	Subtotal	General Aviation	Military	Subtotal	Total
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.

TABLE 1D
Annual Passenger and Cargo Activity
Kona International Airport at Keahole

Airline Passenger Activity

Year	Interisland Passengers	Overseas Passengers	Total Passengers	International Arrivals
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

Air Cargo Activity (U.S. Tons)

Year	Air Freight	Air Mail	Total Cargo
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 activities 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	**RW 17** PAPI-4 MALSR	**RW 35** 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

06MP06-1D-3/22/10

ATCBI-5

ATCT and Airport Beacon

ASOS

Lighted Windcone

Glideslope Antenna

PAPI-4

Localizer

Queen Kaahumanu Highway
ATCBI-5
Keahole Street
RENTAL CAR FACILITIES
ARFF Training Facilities
RTR
ATCT & Airport Beacon
Terminal
Segmented Circle & Lighted Windcone
B
B
D
B
Holding Apron
75′
Taxiway A
Holding Apron
Blast Pad
A North
887′
G
E (Abandoned)
H
ARFF Service Road
C
A South
Blast Pad
MALSR
PAPI-4
Runway 17 - 35 (11,000′ x 150′)
Windcone
Glideslope Antenna
Fence Line
ASOS
PAPI-4
Windcone
Anemometer & Windvane
Localizer
Airport Property Line
Oter Road
Cyanotech Algae Farm
NELHA
NORTH
0
1200
2400
SCALE IN FEET

EXISTING AIRFIELD FACILITIES

Exhibit 1D

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-

06MP06-1E-1/26/09

1 JTB Building

2 Parking Lot

3 Airline Equipment Storage Area

4 International Federal Inspection Facility

5 Onizuka Memorial Museum

6 Airport Cafe

7 South Passsenger Terminal

8 Terminal Apron

9 ATCT

10 Kupipi Road

11 Keahole Street

NORTH

0 300 600

SCALE IN FEET

Recent Parking Additions

Recent Parking Additions

Employee Parking

Public Automobile Parking

Airport Mangement Offices

International Terminal

North Passenger Terminal

Vehicle Wash Rack

ARFF

EXISTING TERMINAL AREA FACILITIES

Exhibit 1E

06MP06-1F-3/22/10

SOUTH TERMINAL

NORTH TERMINAL

BUILDING RESTRICTION LINE

Gate 9
Gate 8
Gate 7
Gate 10
Gate 6
Gate 4
Gate 3
Gate 2
Gate 5
Gate 1

ATCT

ARFF

AIRPORT ADMINISTRATION

INTERNATIONAL ARRIVALS

Bag Claim B

Ticketing

Ticketing

Bag Claim A

ONIZUKA MEMORIAL

Kupipi Street

Parking Exit

PUBLIC PARKING

Parking Entrance

Kupipi Street

EXISTING TERMINAL PLAN	
Public Area	171,753 SF
Holdroom	17,713 SF
Airline	54,968 SF
Ticket Queuing	11,793 SF
Concessions	16,534 SF
Airport Administration/Support	12,788 SF
Security	2,674 SF
Security Queuing	2,376 SF
Restroom	5,043 SF
Baggage Tug Drive	45,129 SF
Customs/Border Protection	18,130 SF
Total	358,901 SF

NORTH

0 160

SCALE IN FEET

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. Curbside 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 bag-gage 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 midday peak was observed during the period of 11:30am to 12:30pm. During 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.

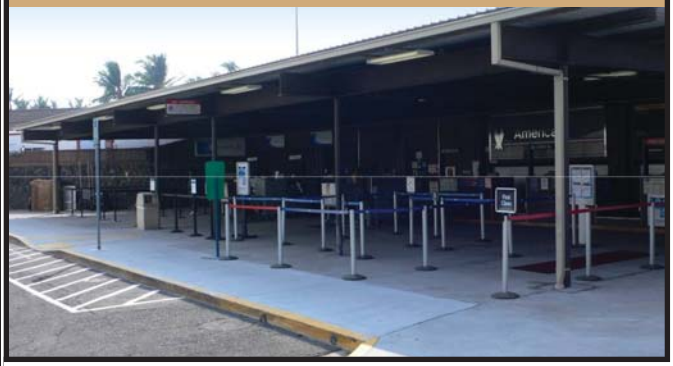
  United States Department of Agriculture Screening (Checked Baggage) – The location of the agricultural check station with regards to visibility is good in the north terminal. Passengers who are flying to the mainland at this terminal are checking in at the United Airlines counters, which are located 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).

06MP06-1G-5/7/10

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 pickup 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) – 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 court-yard, 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, includes 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.

06MP06-1H-11/10/08

1 ARFF

2 T-Hangars

3 North General Aviation Apron

4 Maintenance Facility

5 Tropicbird Flight Service

6 Air Cargo Facilities

7 Cargo Apron

Civil Air Patrol

Bradley Pacific Aviation

Uu Street

ATCT

Helipads

Blast Wall

NORTH

0 300 600

SCALE IN FEET

8 Air Service Hawaii

9 Commuter Air Terminal

10 Paradise Helicopters

11 Hawaii Flight Academy / Island Hoppers

12 Mauna Loa Helicopters

13 Fuel Farm

14 South GA Apron

EXISTING CARGO AND GENERAL AVIATION FACILITIES

Exhibit 1H

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 firefighting (ARFF), airport administration, airport maintenance, and fuel storage.

TABLE 1F
General Aviation Services Operators
Kona International Airport

	Air Tours	Charter	Flight Training	Fuel	Ground Handling	Parts/ Supplies	Rentals
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 facility 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 Aviation. 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

06MP06-1J-01/29/09

LEGEND

- Drainline
- Electrical
- Sewerline
- Waterline
- D18/S6/W8 Utility Line Size In Inches

Existing 12.47KV Airport Feeders No. 1 and No. 2

E, T & N/L

Electrical/ Telephone Manholes

NORTH

0 250

STATE OF HAWAII 1959

TERMINAL AREA UTILITIES

Exhibit 1J

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.

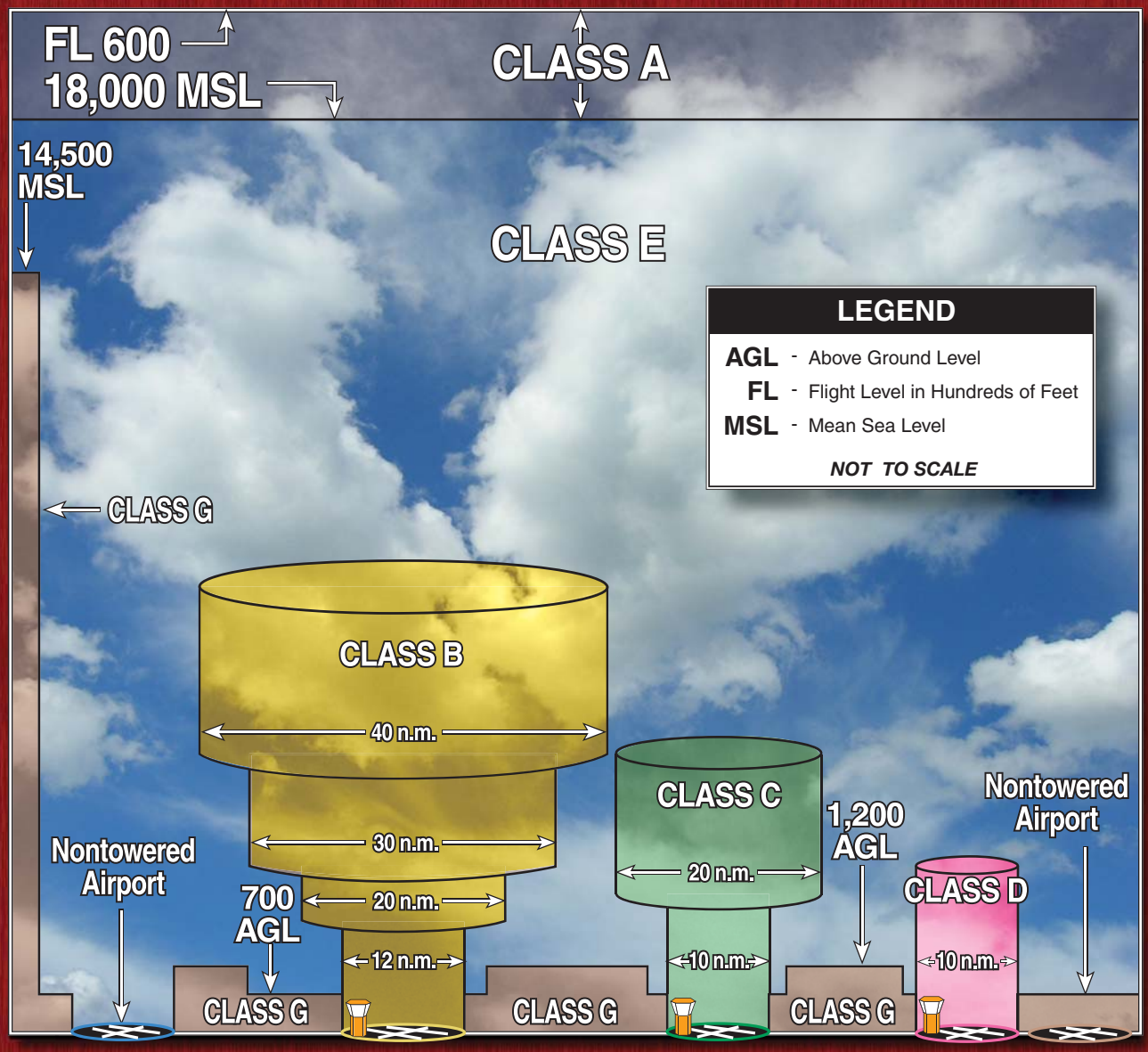
The airport is not located within a 100-year floodplain. Due to the extremely porous lava rock surrounding the airport facilities, large scale flooding is rarely a problem. During heavy downpours, short term ponding can occur on the ramp and some gate locations; however, the present drainage system is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

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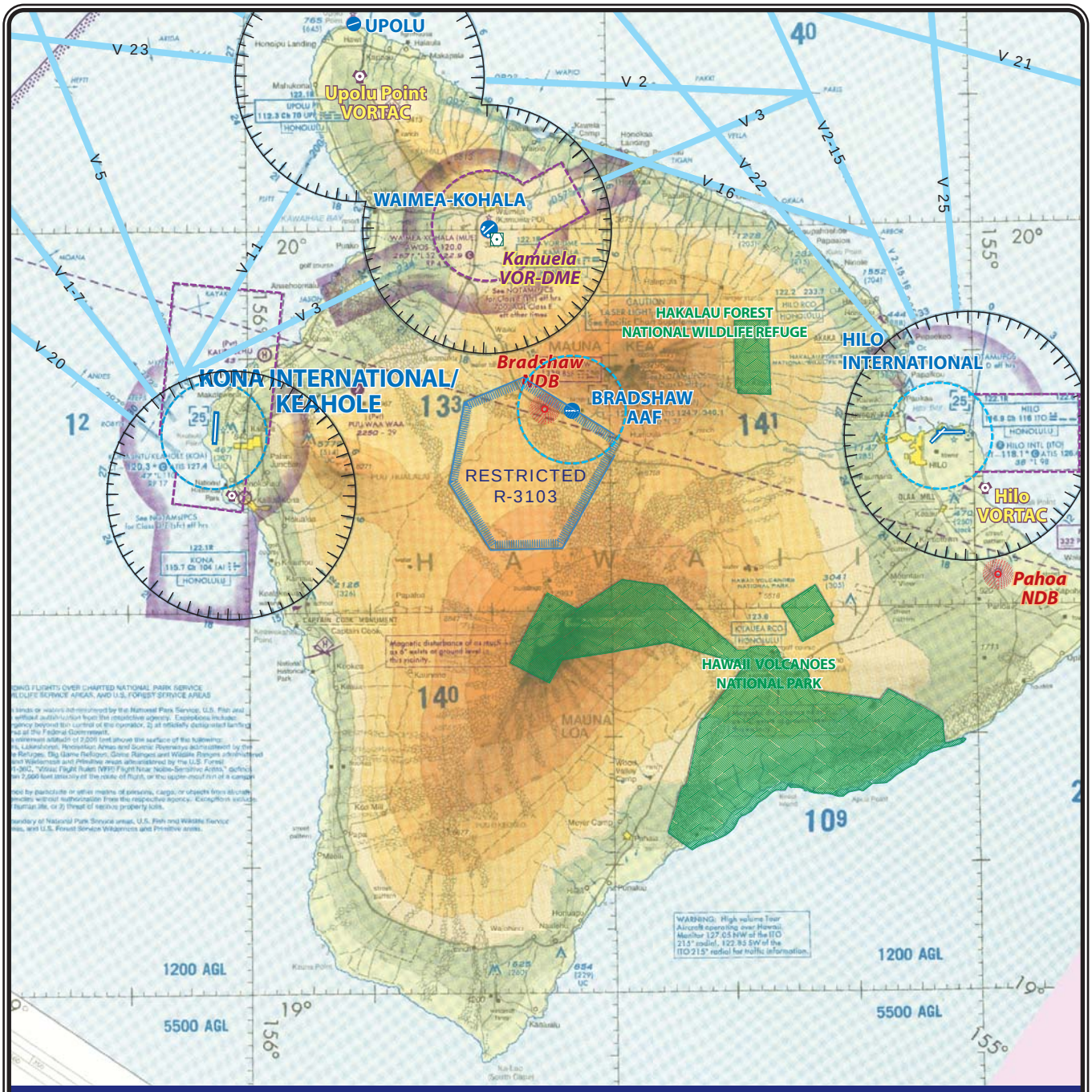


LEGEND

- 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 - 2000
- 0 - 1,000

NORTH

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.

TABLE 1G
Instrument Approach Data

	WEATHER MINIMUMS BY AIRCRAFT TYPE									
	Category A		Category B		Category C		Category D		Category E	
	CH	VIS	CH	VIS	CH	VIS	CH	VIS	CH	VIS
ILS RWY 17										
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
RNAV (GPS) RWY 17										
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
RNAV (GPS) Y RWY 35										
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
RNAV (GPS) Z RWY 35										
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
LOC RWY 17										
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
LOC BC RWY 35										
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
VOR/DME or TACAN RWY 17										
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
VOR or TACAN RWY 35										
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 socioeconomic 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.

TABLE 1H
Population History
North Kona, Hawaii County, and State of Hawaii

Year	Kona/Kohala Districts	% Change	Hawaii County	% Change	State of Hawaii	% Change
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%
Total Employment	**48,700**	**49,550**	**55,900**	**64,450**	**33.3%**	**1.9%**

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.

TABLE 1L
Historical Per Capita Personal Income
Hawaii County, State of Hawaii, United States

Year	Hawaii County	State of Hawaii	U.S.
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
Avg. Annual % Change	**3.1%**	**2.8%**	**3.8%**

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**.

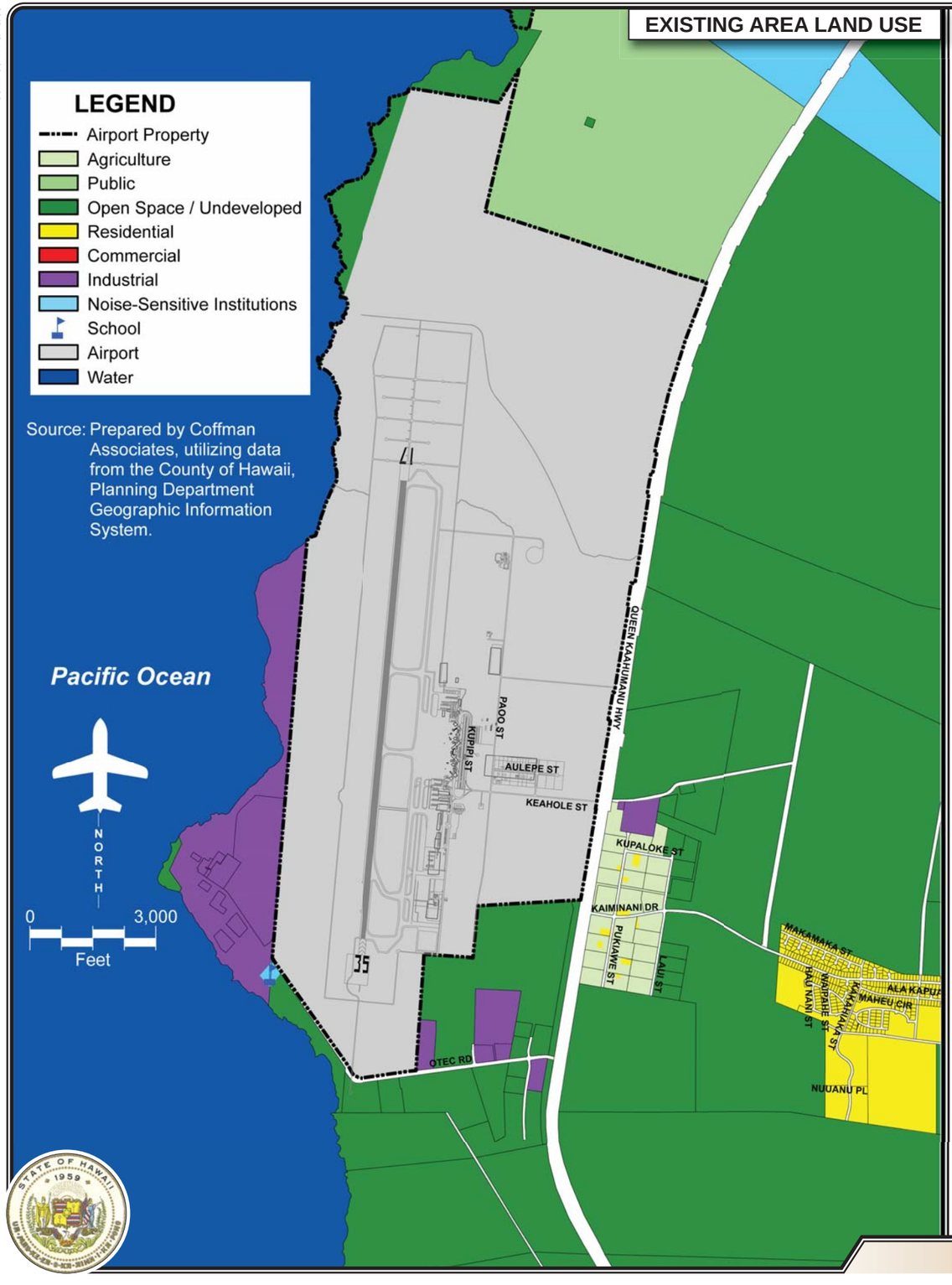
06MP06-1N-3/19/09

EXISTING AREA LAND USE

LEGEND

- Airport Property
- Agriculture
- Public
- Open Space / Undeveloped
- Residential
- Commercial
- Industrial
- Noise-Sensitive Institutions
- School
- Airport
- Water

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

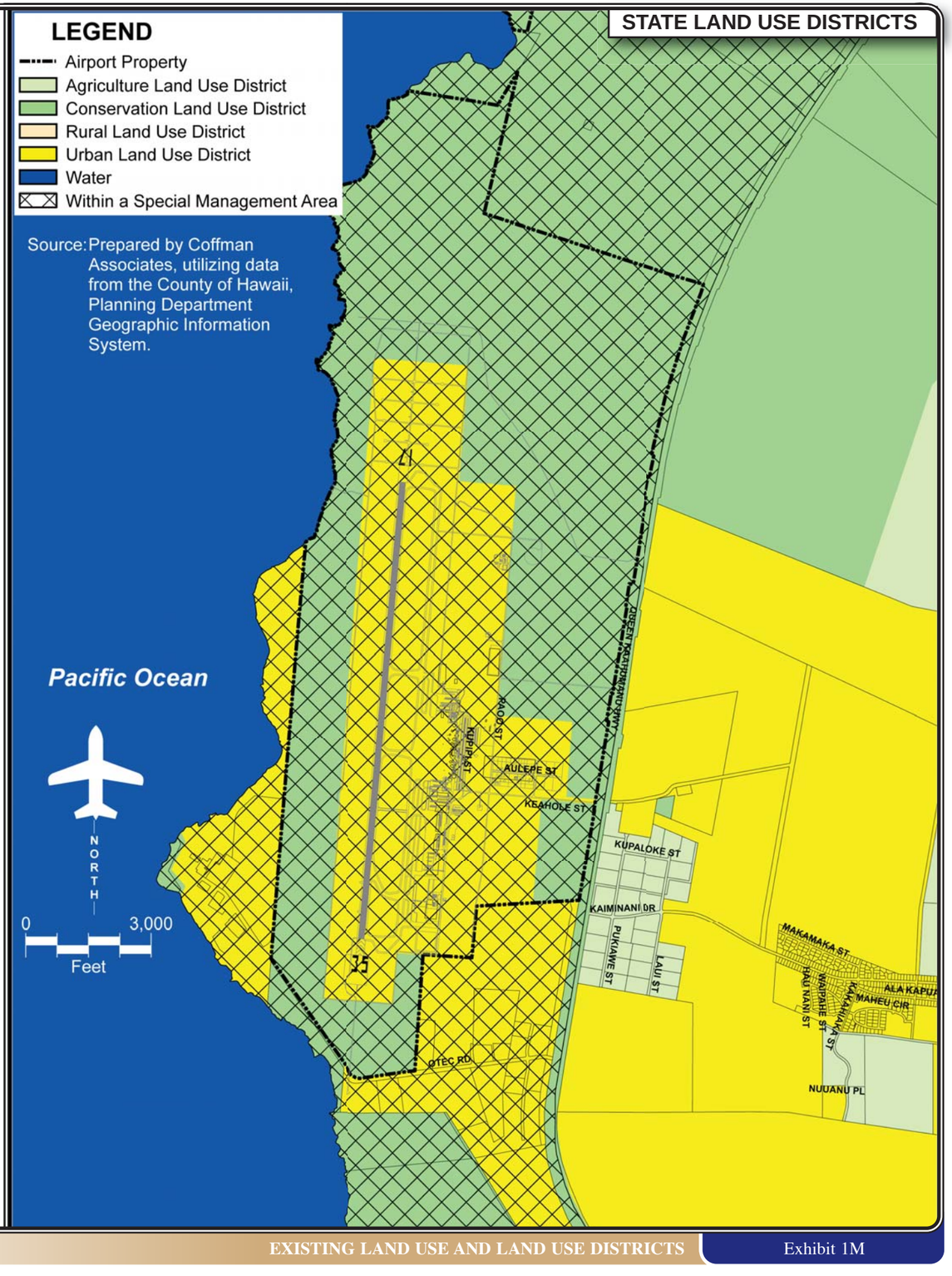


STATE LAND USE DISTRICTS

LEGEND

- Airport Property
- Agriculture Land Use District
- Conservation Land Use District
- Rural Land Use District
- Urban Land Use District
- Water
- Within a Special Management Area

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



EXISTING LAND USE AND LAND USE DISTRICTS

Exhibit 1M

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

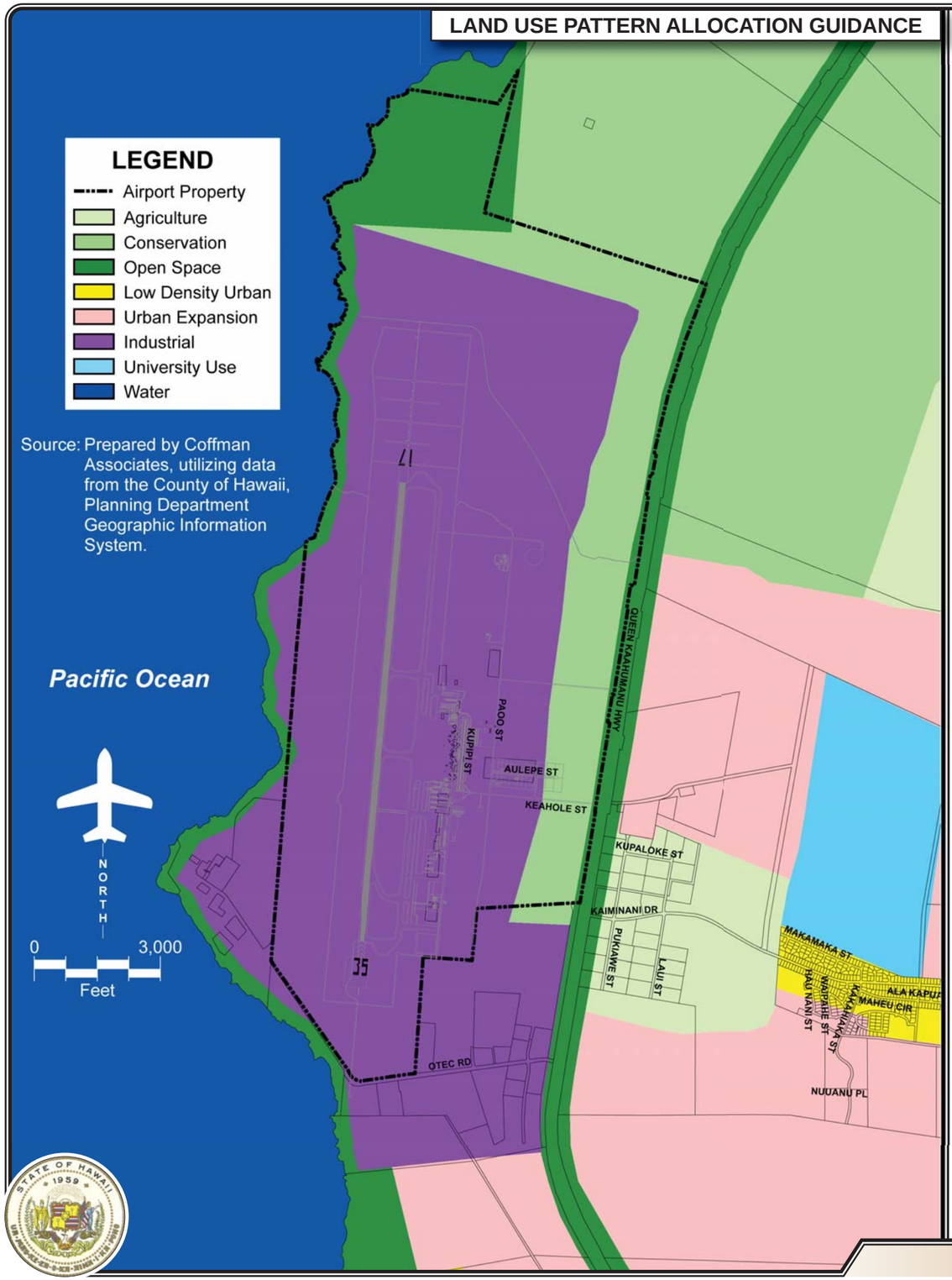
06MP06-1N-3/19/09

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.

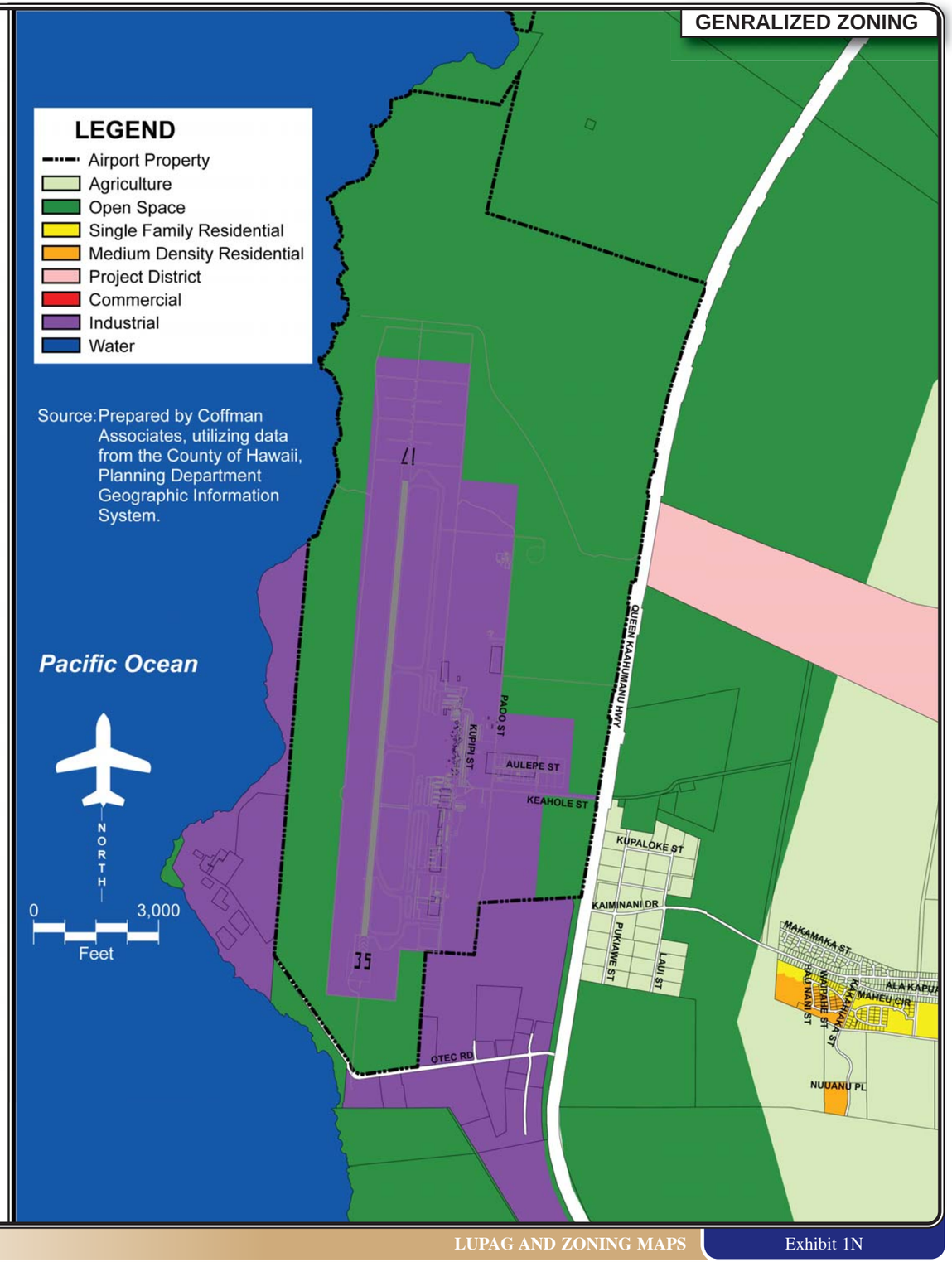


GENRALIZED ZONING

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 species 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
- Twp 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 northeast 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, potholes, wet meadows, river overflows, mud flats, natural ponds, estuarine areas, tidal overflows, and shallow

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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 ʻaʻā and pāhoehoe lava flow. ʻAʻā 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 ʻaʻā if it becomes turbulent due to meeting impediments or steep slopes.

Both ʻaʻā 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_3), Carbon Monoxide (CO), Sulfur Dioxide (SO_x), Nitrogen Oxide (NO_x), Particulate Matter (PM_{10}), 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.

TABLE 1M
Ambient Air Quality Standards

Air Pollutant	Hawaii	Federal
Carbon Monoxide		
1-hour	9 (ppm)	35 (ppm)
8-hour	4.4 (ppm)	9 (ppm)
Nitrogen Dioxide		
1-hour	-	-
24-hour	-	-
Annual	0.04 (ppm)	0.05 (ppm)
Sulfur Dioxide		
3-hour	0.5 (ppm)	-
24-hour	0.14 (ppm)	0.14 (ppm)
Annual	0.03 (ppm)	0.03 (ppm)
Ozone		
1-hour	-	0.12 (ppm [limited])
8-hour	0.08 (ppm)	0.08 (ppm)
PM_{10}		
24-hour	150 µg/m^3	150 µg/m^3
Annual	50 µg/m^3	Revoked
$PM_{2.5}$		
24-hour	-	35 µg/m^3
Annual	-	15.0 µg/m^3
Lead		
Quarterly Average	1.5 µg/m^3	1.5 µg/m^3
Hydrogen Sulfide		
1-hour	35 µg/m^3	-

Source: Environmental Protection Agency, Hawaii State Department of Health
Abbreviations: ppm = parts per million; µg/m^3= 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 review 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 consist-ing 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 ahupuaas 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.

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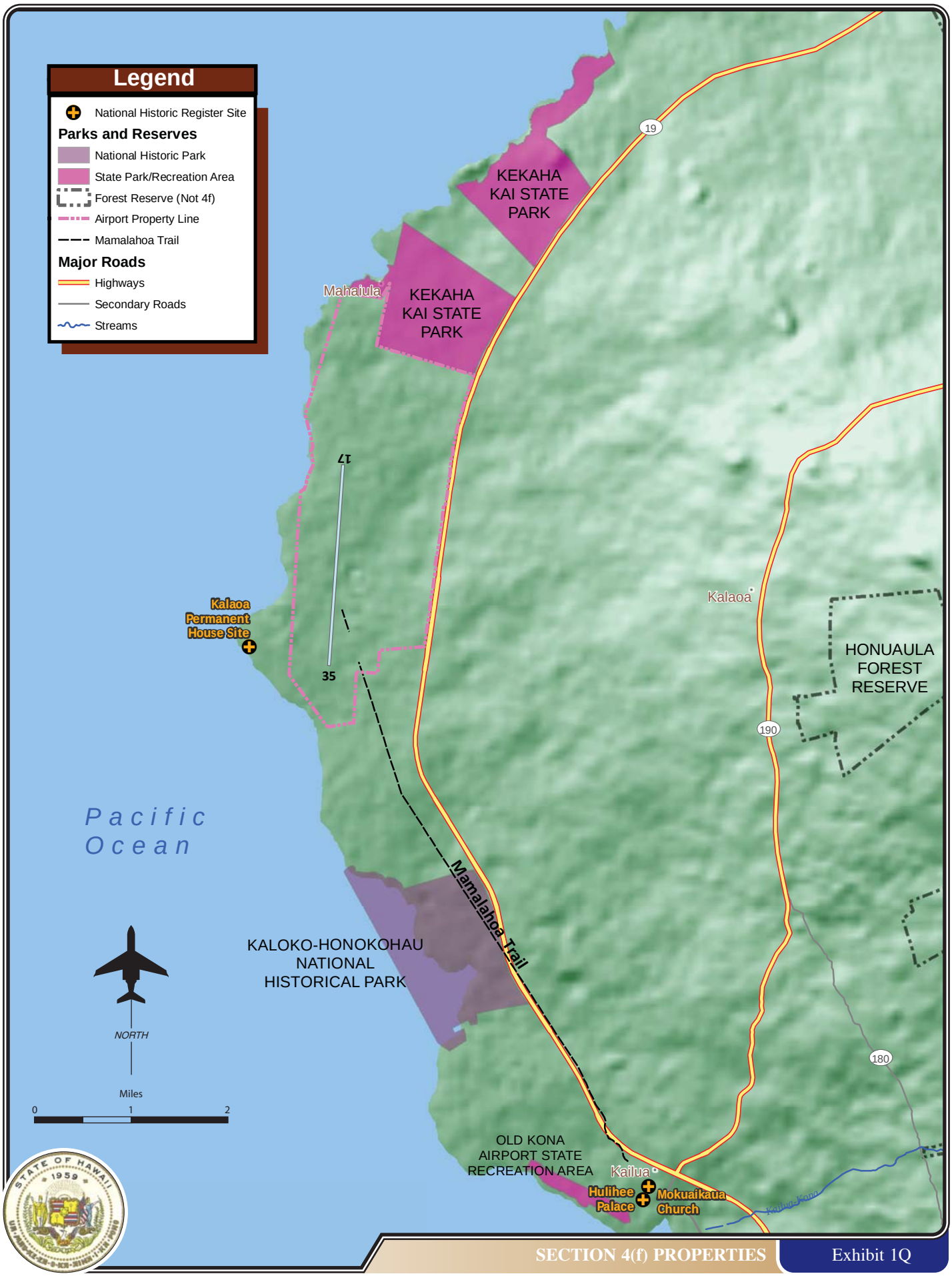


Chapter Two

FORECASTS

FORECASTS

An important factor in facility planning involves a definition of demand that may reasonably be expected to occur during the useful life of the facility's key components. In airport master planning, this involves projecting potential aviation activity over at least a twenty-year timeframe. For small-hub, primary commercial service airports such as Kona International Airport at Keahole (KOA), forecasts of passengers, cargo, based aircraft, and operations (takeoffs and landings) serve as a basis for facility planning.

The Federal Aviation Administration (FAA) has a responsibility to review aviation forecasts that are submitted to the agency in conjunction with airport planning, including master plans, CFR Part 150 Studies, and environmental studies. The FAA reviews such forecasts with the objective of including them in its *Terminal Area Forecasts* (TAF) and the

National Plan of Integrated Airport Systems (NPIAS). In addition, aviation activity forecasts are an important input to the benefit-cost analyses associated with airport development, and FAA reviews these analyses when federal funding requests are submitted.

As stated in FAA Order 5090.3C, *Field Formulation of the National Plan of Integrated Airport Systems (NPIAS)*, dated December 4, 2004, forecasts should be:

- Realistic
- Based on the latest available data
- Reflect current conditions at the airport
- Supported by information in the study

- Provide adequate justification for the airport planning and development

The forecast process for an airport master plan consists of a series of basic steps that can vary depending upon the issues to be addressed and the level of effort required to develop the forecast. The steps include a review of previous forecasts, determination of data needs, identification of data sources, collection of data, selection of forecast methods, preparation of the forecasts, and evaluation and documentation of the results.

The following forecast analysis for Kona International Airport at Keahole was produced following these basic guidelines. Other forecasts dating back to the previous master plan were examined and compared against current and historic activity. The historical aviation activity was then examined along with other factors and trends that could affect demand. The intent is to provide an updated set of aviation demand projections for KOA that will permit the Hawaii Department of Transportation Airports Division (DOT-A) to make planning adjustments as necessary to maintain a viable, efficient, and cost-effective facility.

This forecast effort was completed in mid-2007 using 2006 as its base year. This chapter reflects the conditions at that time as well as utilizes socioeconomic and aviation industry forecasts in effect at that time. Since that time, Aloha Airlines ceased operations.

The economic downturn and recession in the last half of 2008 has affected at least the short term outlook for aviation activity. History has shown that aviation activity is affected in the short term by events such as an airline's bankruptcy and economic hard times. Over the long term, however, traffic has generally recovered. That assumption is maintained for the purposes of this master plan.

NATIONAL AVIATION TRENDS

Each year, the FAA updates and publishes a national aviation forecast. Included in this publication are forecasts for the large air carriers, regional/commuter air carriers, general aviation, and FAA workload measures. The forecasts are prepared to meet budget and planning needs of the constituent units of the FAA and to provide information that can be used by state and local authorities, the aviation industry, and the general public.

The current edition when this chapter was prepared was FAA *Aerospace Forecasts - Fiscal Years 2007-2020*, published in March 2007. The forecasts used the economic performance of the United States as an indicator of future aviation industry growth. Similar economic analyses were applied to the outlook for aviation growth in international markets.

In the seven years prior to the events of September 11, 2001, the U.S. civil aviation industry experienced unprec-

edented growth in demand and profits. The impacts to the economy and aviation industry from the events of 9/11 were immediate and significant. The economic climate and aviation industry, however, has been on the recovery.

The Office of Management and Budget (OMB) expected the U.S. economy to continue to grow in terms of Gross Domestic Product (GDP) at an average annual rate of 2.9 percent through 2020. The world GDP was forecast to grow at an even faster rate of 3.1 percent over the same period. This was expected to positively influence the aviation industry, leading to passenger, air cargo, and general aviation growth throughout the forecast period (assuming there will be no new successful terrorists incidents against either U.S. or world aviation).

U.S. airline passengers (combined domestic and international) have surpassed pre-9/11 levels and were projected to grow at an average of 3.5 percent annually through 2020. Mainline air carriers were projected to grow at 3.7 percent annually, while the regional/commuter airlines were expected to maintain a pace of 3.1 percent annually. Total international traffic to and from the U.S. was forecast to grow even faster at a 4.9 percent annual rate.

U.S. airline air cargo revenue-ton-miles (RTMs) were projected to grow at 5.3 percent annually through 2020. The number of active general aviation aircraft was expected to grow at 1.4 percent annually.

COMMERCIAL PASSENGER AIRLINES

The passenger airlines in the United States are comprised of 33 mainline carriers and 81 regional carriers. The mainline carriers are airlines that primarily use passenger jets with over 90 seats, while the regional carriers are airlines that primarily use smaller propeller and jet aircraft up to 90 seats. The mainline carriers have also emerged into two other groupings: legacy network carriers and low-cost carriers.

Legacy Network Carriers - This group includes the airlines established prior to deregulation in 1978 (e.g., Alaska Airlines, Aloha Airlines, American Airlines, Continental Airlines, Delta Airlines, Hawaiian Airlines, Northwest Airlines, United Airlines, US Airways). The legacy airlines were the most impacted by 9/11, and many are now undergoing restructuring efforts to redefine themselves in the new operating environment of the industry. These airlines operate primarily in hub-and-spoke networks and generally have higher operating costs. The legacy airlines have been downsizing and cost-cutting to become competitive with the low-cost carriers. The string of negative external events, out of the control of the airlines, made it difficult for most of the legacy carriers to achieve profitability. Many have gone through bankruptcy as part of their restructuring.

Low-Cost Carriers - This group is comprised of established low-cost carriers, new entrants, and a few restruc-

tured legacy carriers (American Trans Air, AirTran, Frontier Airlines, JetBlue Airways, Southwest Airlines, and Spirit Air Lines). These carriers typically operate point-to-point and have lower operating costs than their legacy counterparts. Their post-9/11 strategy has been growth in airports and city-pairs served, aircraft fleet, and longer-haul flights. The recent sharp increases in oil prices have impacted the profits of the low-cost airlines.

Regionals/Commuters - This group's operating strategy focuses around providing feeder traffic through a code-sharing arrangement with a legacy airline. Some, like ExpressJet on the mainland and Mesa Airlines in Hawaii (Go! Airlines) have attempted point-to-point service in competition with the larger carriers. Since 9/11, the regional commuters have benefited from the route restructuring and cost-cutting of the legacy network, taking over service to thinner medium-haul and long-haul markets.

While continuing to recover from 9/11, new challenges and uncertainties unfolded. A slowed economy, the Severe Acute Respiratory Syndrome (SARS) epidemic, and the war in Iraq all added to the difficulties already facing the industry.

Jet fuel prices have affected the carriers worldwide, but the impacts to the bottom line have been greatest on the U.S. airlines. A relatively strong world economy allowed the world airlines to pass on the increased fuel costs through higher fares with minimal effect. The U.S. Airlines, however, raised fares, cut capacity, and increased international flying. In spite of this, the U.S. airline industry lost money for the sixth consecutive year in 2006, while the world airlines made an estimated $3.2 billion.

Following two years of strong growth in rebounding from 9/11, the U.S. carriers' passenger demand was flat in 2006. While demand remained healthy for the regional carriers, higher fares and capacity cuts by the legacy carriers reduced mainline carrier demand. Despite flat domestic demand, international markets experienced a five to six percent growth.

Capacity and demand growth were expected to rebound in 2007, with capacity (available seat-miles or ASMs) expected to grow 2.8 percent on the premise that the legacy carrier domestic market capacity stabilizes while capacity in their international markets and the capacity of the low-cost carriers grows. In addition, regional carrier capacity was expected to grow by 3.0 percent.

As the capacity begins to grow again in 2007, revenue passenger miles (RPMs) were also forecast to increase by 3.4 percent, while enplanements grow by 3.7 percent. In 2008, growth was expected to accelerate with capacity up 4.3 percent, RPMs up 4.2 percent, and passengers up 3.4 percent.

For the remainder of the forecast period, system capacity is expected to average 4.4 percent per year. Solid economic growth and falling real yields contribute to a projection of 4.5 percent average annual growth rate through 2020 for RPMs. System pas-

sengers are projected to increase at an average of 3.5 percent per year, with the mainline carriers growing faster (3.7 percent) than regional carriers (3.0 percent). **Exhibit 2A** depicts the history and projected growth in U.S. passenger enplanements.

Load factors are expected to continue to increase from an all-time high of 79.0 percent to 80.3 percent by 2020. Growth in longer international trips and more point-to-point service on domestic routes contributes to a projected growth in average passenger trip length of more than 130 miles to 1,198.1 miles by 2020.

Domestic Market Forecast

Capacity in the domestic markets declined in 2006 with legacy carriers cuts in aircraft and shifts of other aircraft to international markets. The cuts by Chapter 11 carriers not only affected mainline capacity, but also that of their regional carrier partners. As the airlines restructure, domestic capacity is expected to rebound and grow at an annual rate of 4.0 percent, with the mainline carrier growth slightly slower at 3.8 percent and the regional carriers averaging 5.0 percent through the planning period.

RPMs are expected to average 4.1 percent growth annually, again with mainline growth slower (4.0 percent) than regional carrier growth (5.2 percent). Domestic passenger growth is expected to average 3.4 percent annually; however, mainline traffic is expected to grow faster at 3.5 percent compared to 3.0 percent for regional carriers. While total domestic traffic exceeded pre-9/11 levels in 2005, the mainline carrier traffic is not forecast to reach pre-9/11 levels until 2009.

International Market Forecast

The FAA forecasts total international traffic (that carried by both U.S. and foreign flag carriers) for travel between the U.S. and the three world travel areas of Atlantic, Latin America, and Asia/Pacific. Total U.S. international traffic grew 2.9 percent in 2006. The 141.5 million enplanements surpassed pre-9/11 levels for the first time. World and U.S. economic growth was expected to result in a 5.2 percent passenger increase in 2007 and 5.3 percent in 2008. After that, the FAA projected an average annual increase of 4.8 percent through 2020 to a total of 274.7 million enplaned passengers.

High economic growth expected in the Asia/Pacific region lead it to the highest regional growth rate of 7.0 percent annually. U.S./Canadian transborder markets are projected to grow at 3.6 percent annually.

AIR CARGO

Air cargo traffic is comprised of freight/express and mail. Air cargo is moved either in the bellies of passenger aircraft or in dedicated all-cargo aircraft. FAA data and forecasts are presented in revenue-ton-miles (RTMs).

Air cargo activity has historically had a high correlation to Gross Domestic Product (GDP). Other factors that affect air cargo growth are real yields, improved productivity, and globalization. Ongoing trends that are and will continue to improve the air cargo market include the opportunities from open skies agreements, decreasing costs from global airline alliances, and increasing business volumes from e-commerce. At the same time, trends that could limit air cargo growth include increased use of e-mail, decreased costs of sending documents by facsimile, and increased airline costs due to environmental and security restrictions.

Before 2001, air cargo was the fastest growing sector of the aviation industry. From 1994 through 2000, total tons and RTMs grew at annual average rates of 8.0 and 8.6 percent. An economic slowdown in the U.S., combined with the collapse of the high-tech industry and a slowing of imports, resulted in declines of 5.0 percent in tons and 3.9 percent in RTMs. Traffic began to recover in 2002 and is setting new record RTMs, especially in the international market.

The FAA notes there are several structural changes that are occurring within the air cargo industry. Among them are the following:

- **Security regulations** – Security regulations put in place shortly after 9-11 shifted cargo from the passenger airlines to the all-cargo airlines. Additional regulations have been put in place since. These include requiring the carriers to conduct random inspections, codifying and strengthening the "known shipper" program, and establishing a security program specifically to all-cargo operations by aircraft over 20,000 pounds.

- **Market maturation** – The express market in the United States has matured after dramatic growth over the last two decades. This is the majority of domestic air cargo activity.

- **Modal shift** – Improved service and economics from the use of alternative modes of cargo transported by the integrated cargo carriers (e.g., FedEx, UPS, and DHL) has matured.

- **Increased USPS use of all-cargo carriers –** This initially resulted from the U.S. Postal Service's (USPS) need to improve control over delivery. The trend has continued due to security regulations.

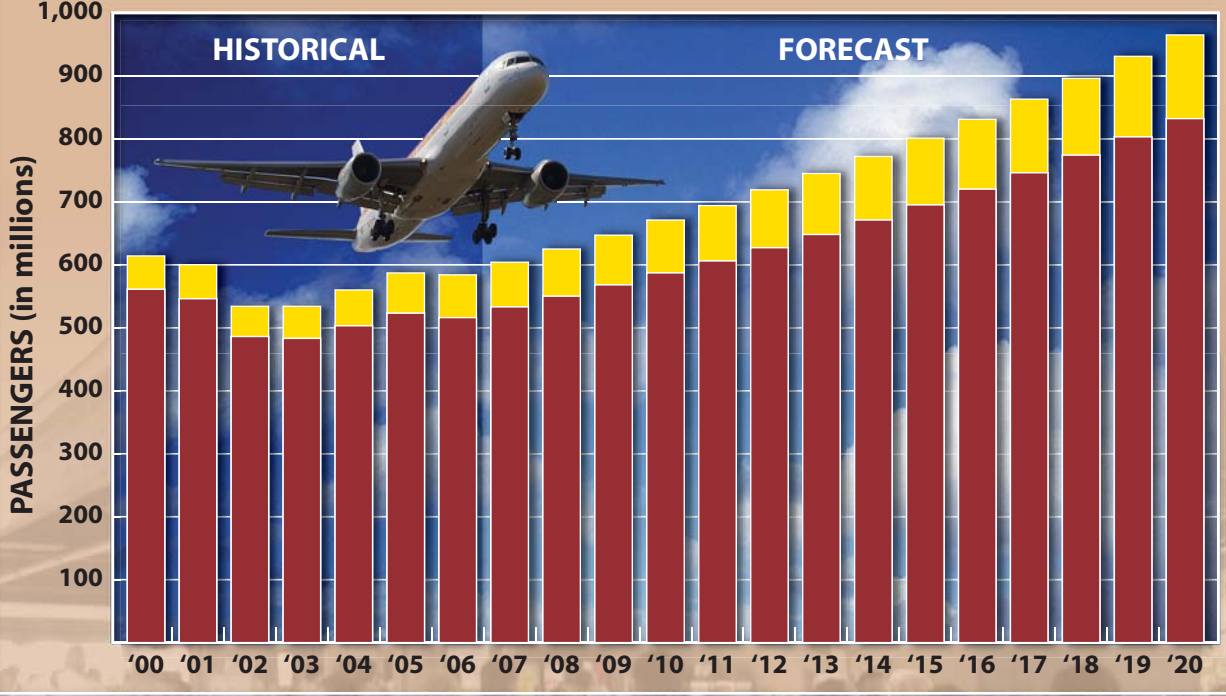
- **Increased use of mail substitutes** – Substitutes such as e-mail affect mail volume. The residual fear of mail because of terrorism has also been a factor.

FAA's forecasts of air cargo RTMs are predicated on several assumptions:

1) Security restrictions concerning air cargo transportation will stay in place;

2) There will be no additional terrorist attacks in the U.S.;

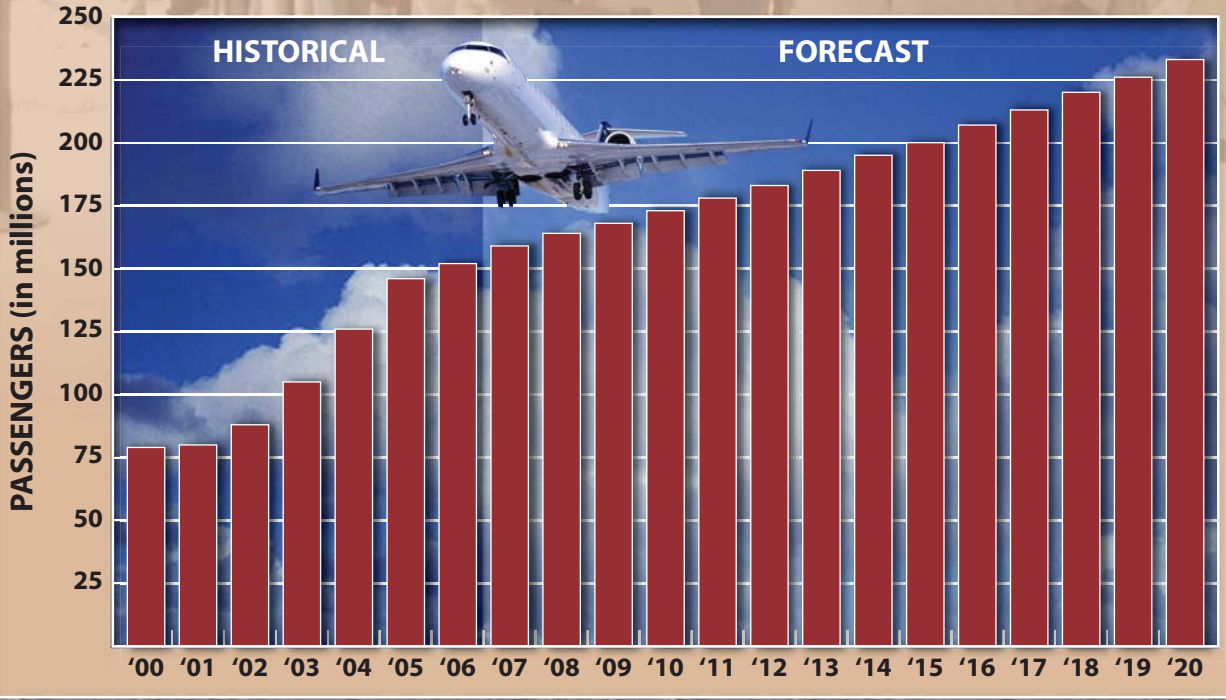
U.S. MAINLINE AIR CARRIER PASSENGER ENPLANEMENTS



Source: FAA Aerospace Forecasts, FY 2007-2020

Domestic International

U.S. REGIONAL/COMMUTER SCHEDULED PASSENGER ENPLANEMENTS



Source: FAA Aerospace Forecasts, FY 2007-2020

3) There will be continued domestic and international economic growth;

4) Most of the modal shift from air to ground has occurred; and

5) In the long term, cargo activity will be tied to economic growth.

The number of RTMs flown by U.S. carriers grew by 1.2 percent in 2006 to 39.7 billion. Total RTMs flown are forecast to increase 4.6 percent in 2007 and 6.1 percent in 2008. Over the following twelve years, total RTMs are projected to increase at an annual average rate of 5.2 percent. **Exhibit 2B** depicts the FAA forecasts for air cargo and mail.

Domestic cargo RTMs decreased 2.4 percent in 2006, to 15.7 billion. This followed a 1.6 percent decline in 2005, and was primarily due to the modal shift from air to ground and the impact of jet fuel surcharges. Domestic RTMs are projected to increase 2.7 percent in 2007 and 4.7 percent in 2008. From 2008 through 2020, growth is expected to average 3.3 percent annually, based upon projected U.S. economic growth.

Between 1997 and 2006, the all-cargo carrier percentage of U.S. domestic RTMs grew from 65.4 percent to 79.4 percent. Significant growth in express service coupled with combined higher passenger load factors leaving less room for belly cargo were key factors in this shift. The October 2001 FAA security directive that strengthened security standards for cargo on passenger flights also impacted belly freight. By 2020, this share is projected to increase to 83.6 percent based upon increases in wide-body capacity for all-cargo carriers and security considerations.

International RTMs flown by U.S. carriers grew to 24.0 billion in 2006, a 3.7 percent increase over the previous year. The FAA forecasts a 5.9 percent increase in 2007, and a 7.0 percent increase in 2008, followed by an average annual increase of 6.3 percent through 2020. The all-cargo carriers' percentage of the international market is projected to increase from 65.5 percent in 2006, to 69.7 percent by 2020, due to increased capacity.

The all-cargo large jet aircraft fleet is expected to grow from 997 in 2006, to 1,468 by 2020. Narrow-body aircraft in the fleet are projected to decline by four aircraft per year over this period. Meanwhile, wide-body aircraft are projected to increase by more than 37 aircraft annually.

GENERAL AVIATION

Following more than a decade of decline, the general aviation industry was revitalized with the passage of the *General Aviation Revitalization Act* in 1994, which limits the liability on general aviation aircraft to 18 years from the date of manufacture. This legislation sparked an interest to renew the manufacturing of general aviation aircraft due to the reduction in product liability, as well as renewed optimism for the industry. The high cost of product liability insurance had been a major factor in the decision by many American aircraft manufacturers to

slow or discontinue the production of general aviation aircraft.

The sustained growth in the general aviation industry slowed considerably in 2001, negatively impacted by the events of September 11. Thousands of general aviation aircraft were grounded for weeks due to no-fly zone restrictions imposed on operations of aircraft in security-sensitive areas. This, in addition to the economic recession that began in early 2001, had a negative impact on the general aviation industry. General aviation shipments by U.S. manufacturers declined for three straight years from 2001 through 2003.

Stimulated by an expanding U.S. economy as well as accelerated depreciation allowances for operators of new aircraft, general aviation staged a relatively strong recovery with over ten percent growth in each of the last three years.

Resilience being demonstrated in the piston aircraft market offers hope that the new aircraft models are attracting interest in the low-end market of general aviation. The introduction of new, light sport aircraft is expected to provide further stimulation in the coming years.

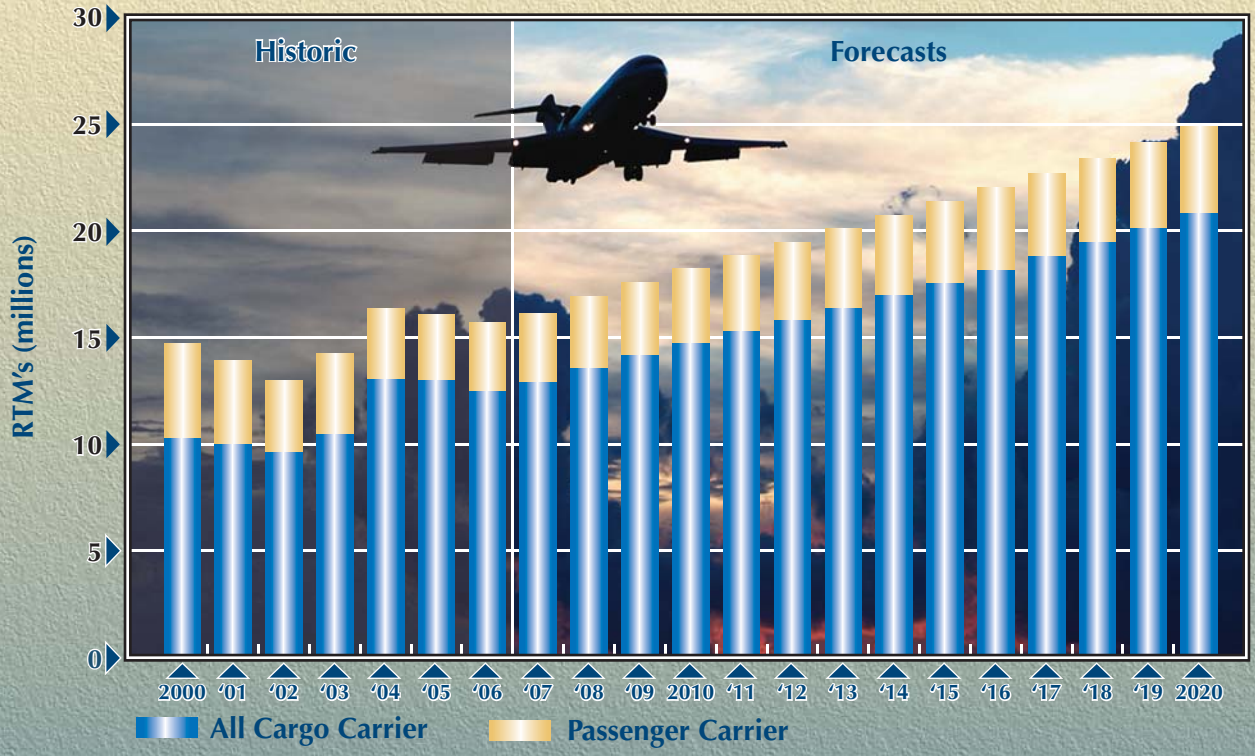
New models of business jets are also stimulating interest for the high-end of the market. The FAA still expects the business segment to expand at a faster rate than personal/sport flying. Safety and security concerns combined with increased processing time at commercial terminals make business/corporate flying an attractive alternative. In addition, the bonus depreciation provision of the President's economic stimulation package began to help business jet sales late in 2004.

In 2006, there were an estimated 226,422 active general aviation aircraft in the United States. **Exhibit 2C** depicts the FAA forecast for active general aviation aircraft. The FAA projects an average annual increase of 1.4 percent through 2020, resulting in 274,914 active aircraft. Piston-powered aircraft are expected to grow at an average annual rate of 0.4 percent. This is driven primarily by a 5.7 percent annual increase in piston-powered rotorcraft and growth in experimental and sport aircraft, as single engine fixed wing piston are projected to increase at just 0.3 percent annually, and multi-engine fixed wing piston aircraft are projected to decrease by 0.2 percent per year. This is due, in part, to declining numbers of multi-engine piston aircraft, and the attrition of approximately 1,500 older piston aircraft annually. In addition, it is expected that the new, light sport aircraft and the relatively inexpensive microjets will dilute or weaken the replacement market for piston aircraft.

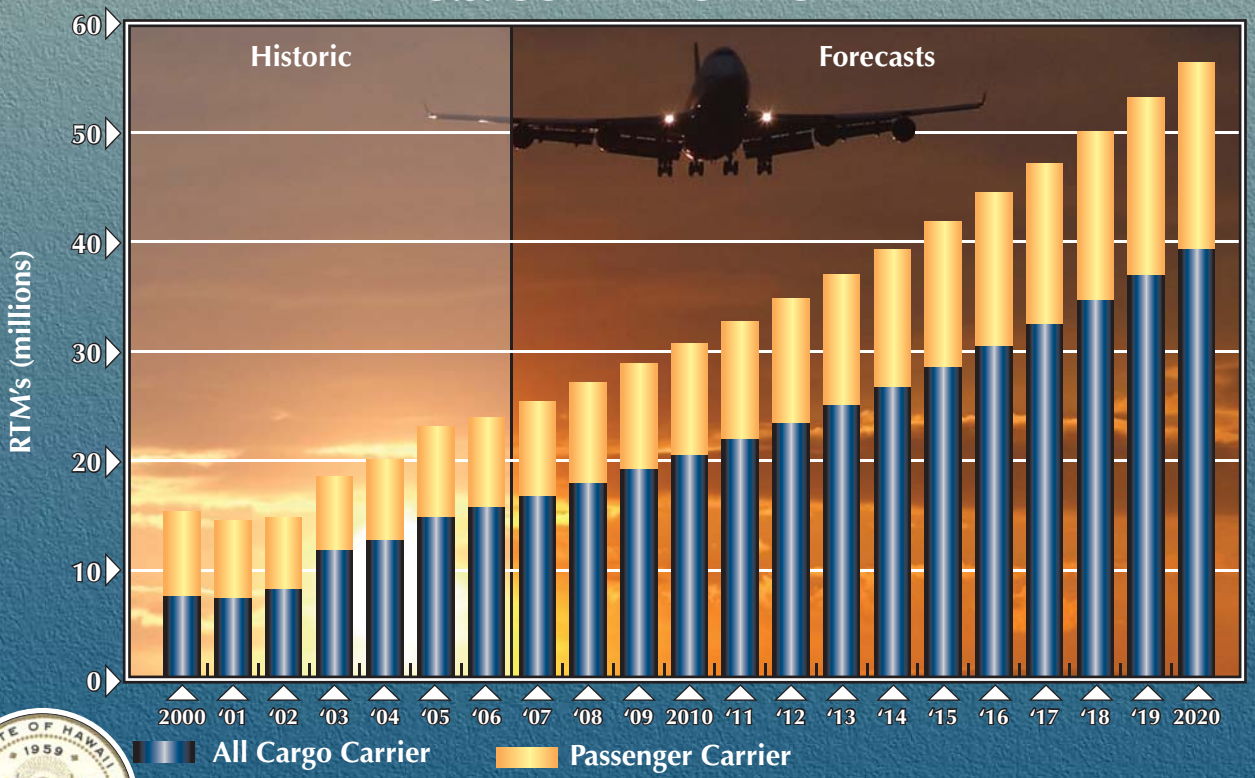
Owners of ultralight aircraft could begin registering their aircraft as "light sport" aircraft in 2005. The FAA estimates there will be a registration of 5,600 aircraft by 2010, and then grow to 13,200 aircraft by 2020.

Turbine-powered aircraft (turboprop and jet) are expected to grow at an average annual rate of 3.6 percent over the forecast period. Even more significantly, the jet portion of this fleet is expected to double in size in 12 years, with an average annual growth rate of

DOMESTIC AIR CARGO REVENUE TON MILES (RTM's)
U.S. COMMERCIAL CARRIER

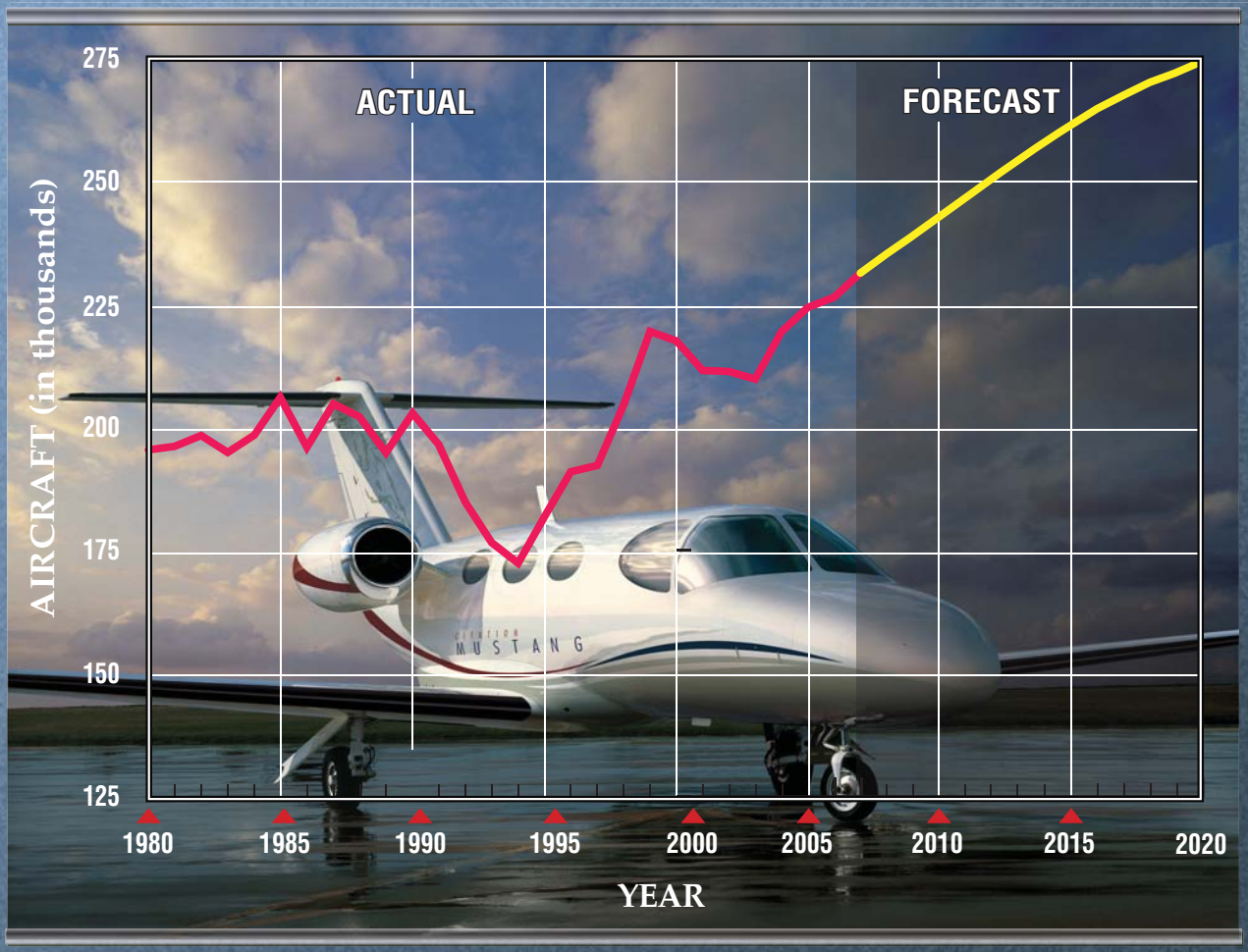


INTERNATIONAL AIR CARGO REVENUE TON MILES (RTM's)
U.S. COMMERCIAL CARRIER



Source: FAA Aerospace Forecasts, Fiscal Years 2007-2020
Domestic figures prior to 2003 exclude Airborne Express Inc.

U.S. ACTIVE GENERAL AVIATION AIRCRAFT



U.S. ACTIVE GENERAL AVIATION AIRCRAFT (in thousands)

Year	FIXED WING				ROTORCRAFT		Experimental	Sport Aircraft	Other	Total
	PISTON		TURBINE							
	Single Engine	Multi-Engine	Turboprop	Turbojet	Piston	Turbine				
2006 (Est.)	148.2	19.4	8.0	10.0	3.4	5.9	24.5	0.4	6.6	226.4
2010	150.4	19.2	8.2	13.4	4.8	6.5	27.7	5.6	6.8	242.8
2015	154.0	19.0	8.5	18.0	6.3	7.2	31.1	10.5	6.7	261.4
2020	155.6	18.8	8.8	22.8	7.4	7.9	33.9	13.2	6.6	274.9

Source: FAA Aerospace Forecasts, Fiscal Years 2007-2020.

Notes: An active aircraft is one that has a current registration and was flown at least one hour during the calendar year.

6.0 percent. The total number of jets in the general aviation fleet is projected to grow from 10,032 in 2006, to 22,797 by 2020.

At the October 2006 workshop sponsored by the FAA and the Transportation Research Board, industry experts suggested that the market for the new, very light jet (VLJ), or microjet aircraft, could add 500 more aircraft a year to the fleet by 2010. These twin-engine jets are expected to be priced between $1 million and $2 million, and are believed to have the potential to redefine business jet flying with the capability to support a true on-demand air taxi business service. The FAA forecast assumes that microjets will begin to enter the active fleet in 2007, with 350 new aircraft. After this year's introduction, they are forecast to grow by 400 to 500 aircraft per year, contributing a total of 6,300 aircraft to the jet forecast by 2020.

SOCIOECONOMIC TRENDS

Local and regional forecasts developed for key socioeconomic variables provide an indicator of the potential for creating growth in aviation activities at an airport. Typical variables used in evaluating potential for traffic growth include population and employment. This data is readily available on an annual historic basis at the state and county level.

In Hawaii, the tourism and visitor industry plays a key factor in passenger traffic as well. As a result, the Research and Economic Analysis Division of the State of Hawaii Department of Business, Economic Development, and Tourism (DBEDT) maintains data on both mainland and international visitors to the island. The DBEDT also prepares and regularly updates projections of visitors as well as population and other economic statistics. The most recent update was in August 2004 and provided projections on a state and county basis through 2030. **Tables 2A** and **2B** as well as **Exhibit 2D** depict historic and forecast numbers of key factors for the state and Hawaii County. These include civilian employment, per capita personal income, visitors by air, the average daily visitor census, population, and de facto population.

Civilian employment in Hawaii has grown at an annual average rate of 1.4 percent over the last twenty years. The DBEDT forecast that statewide civilian employment would grow at 0.8 percent annually through 2030. Hawaii County's civilian employment comprised 10.2 percent of the state employment in 1985. Averaging nearly 2.2 percent growth per year, the county now comprises 11.9 percent of the statewide civilian employment. The DBEDT forecasts employment in the county to grow at 1.2 percent in the future. This would result in 12.6 percent of the state's civilian employment in Hawaii County by 2030. As presented on **Table 2A** and **Exhibit 2D**, state and county employment appears to continue to trend along with the 2004 DBEDT forecasts.

Per capita personal income (PCPI) for the state and county is also presented on **Table 2A** and **Exhibit 2D** and are inflation-adjusted to year 2000 dollars.

Inflation-adjusted PCPI for the state has been growing at an annual average of 0.96 percent over the last twenty years. The DBEDT projects future growth at 1.6 percent annually.

TABLE 2A
Socioeconomic Trends and Projections
Hawaii County

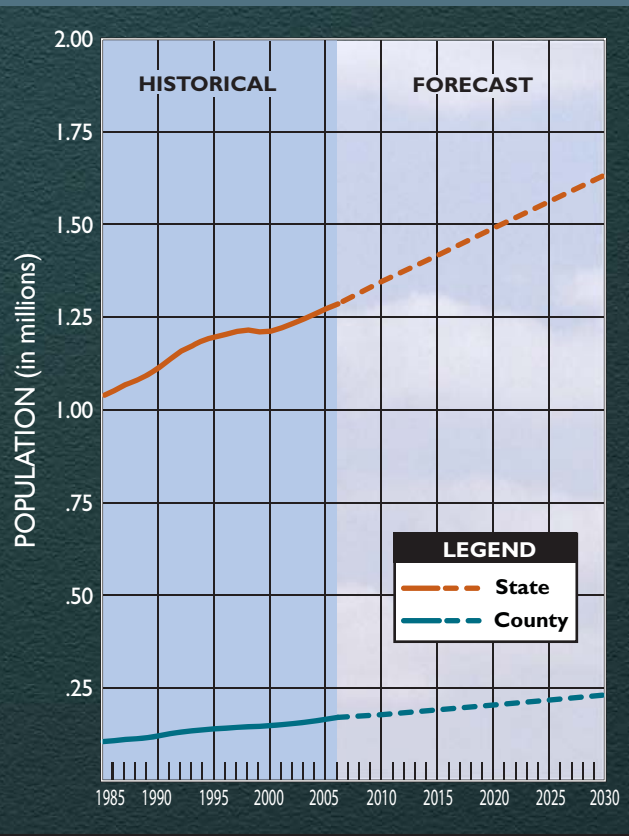
	Visitors by Air		Civilian Employment		Per Capita Income (2000$)	
	State	County	State	County	State	County
ACTUAL						
1985	4,843,414	NA	452,000	46,150	$25,107	$18,760
1986	5,569,067	NA	468,050	47,500	$25,730	$19,460
1987	5,770,585	NA	494,000	50,950	$26,098	$19,392
1988	6,101,483	NA	501,750	52,200	$27,178	$19,990
1989	6,488,422	NA	511,000	54,700	$28,498	$21,317
1990	6,723,531	1,127,373	527,000	55,200	$29,230	$21,669
1991	6,518,460	1,111,035	557,750	60,900	$28,947	$21,534
1992	6,473,669	1,139,978	557,400	60,050	$29,572	$21,456
1993	6,070,995	1,117,656	560,850	60,400	$29,262	$21,335
1994	6,364,674	1,079,535	545,000	58,300	$28,790	$21,071
1995	6,546,759	1,081,047	542,650	57,600	$28,252	$20,526
1996	6,723,141	1,163,700	555,700	60,550	$27,465	$20,310
1997	6,761,135	1,205,081	558,550	61,950	$27,453	$20,010
1998	6,595,790	1,340,767	559,750	62,050	$27,607	$20,757
1999	6,741,037	1,307,720	559,550	63,350	$27,879	$21,007
2000	6,948,594	1,267,965	566,100	65,000	$28,422	$21,410
2001	6,303,790	1,181,551	564,200	65,950	$27,963	$21,631
2002	6,389,058	1,243,313	557,400	66,150	$28,229	$22,101
2003	6,380,439	1,207,164	NA	NA	$28,427	$22,072
2004	6,912,094	1,281,156	NA	NA	$29,773	$23,111
2005	7,416,574	1,521,536	593,376	70,643	$30,410	$23,446
2006	7,414,613	1,590,495	NA	NA	NA	NA
DBEDT 2030 Series, August 2004						
2010	7,810,000	1,420,000	621,451	74,863	$33,339	$25,084
2015	8,620,000	1,570,000	647,372	78,954	$35,940	$27,382
2020	9,290,000	1,700,000	672,912	83,045	$38,780	$30,142
2025	10,010,000	1,830,000	698,967	87,275	$41,823	$32,846
2030	10,780,000	1,980,000	725,838	91,726	$44,906	$35,215

Source: Population and Economic Projections for the State of Hawaii to 2030, DBEBT 2030 Series; Research and Economic Analysis Division – Department, Department of Business, Economic Development and Tourism; August 2004

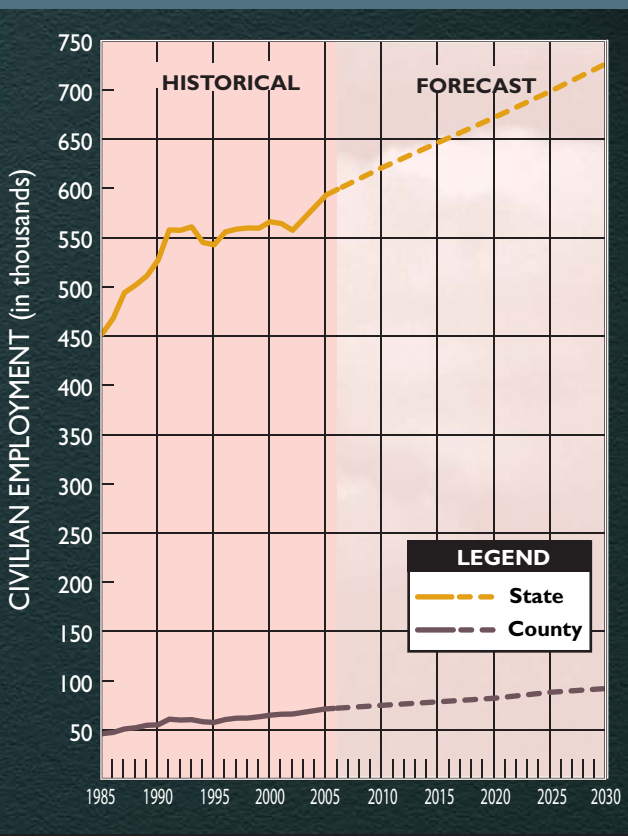
Hawaii County inflation-adjusted PCPI has grown at an average of 1.12 percent annually over the last twenty years. The DBEDT forecasts future growth at 1.7 percent annually.

Annual visitors by air to the state grew dramatically in the late 1980s from 4.84 million in 1985 to 6.72 million in 1990, for an increase of 39 percent. Since 1990, however, statewide visitor growth has totaled just over 10

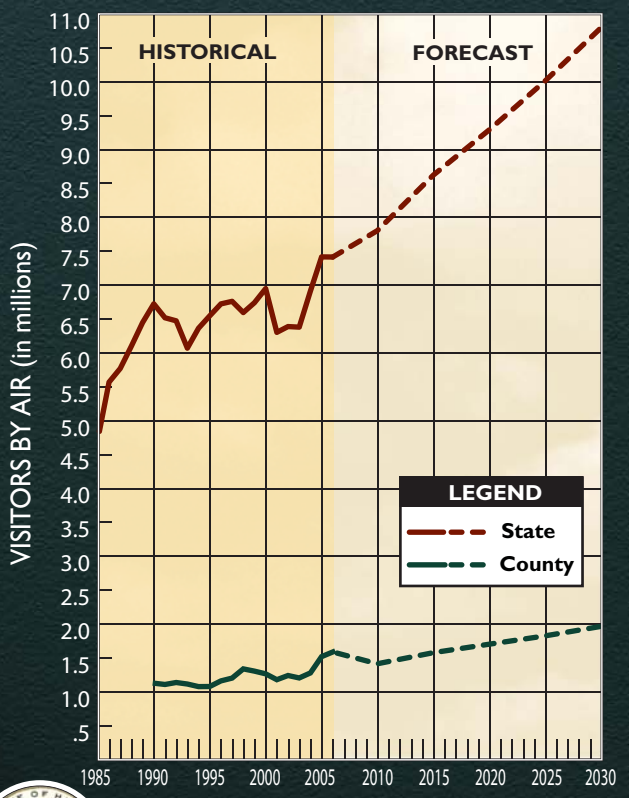
POPULATION



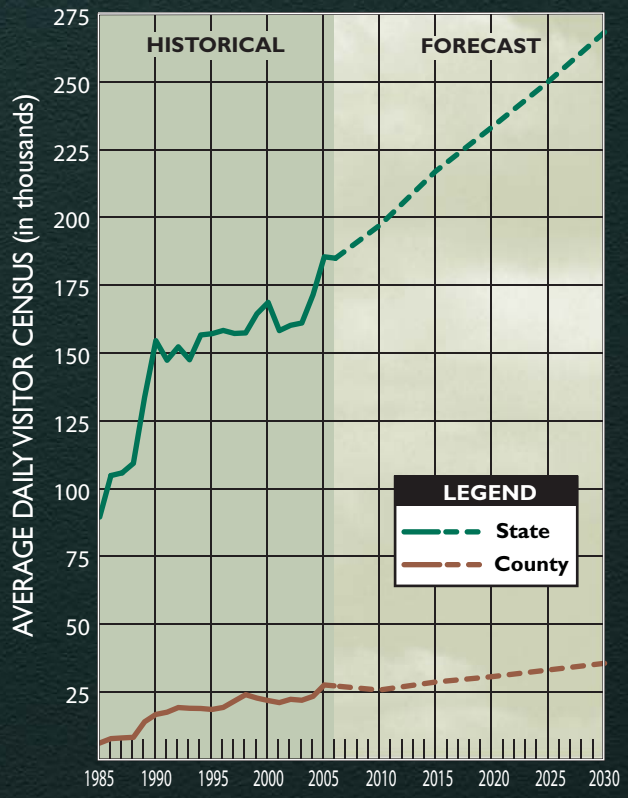
CIVILIAN EMPLOYMENT



VISITORS BY AIR



AVERAGE DAILY VISITOR CENSUS



Source: Population and Economic Projections for the State of Hawaii to 2030, DBEDT Series 2030; August 2004.

percent. The DBEDT projects a future annual growth rate of 1.5 percent for 10.78 million by 2030. After statewide air visitor growth slowed in 2006, the DBEDT forecasts appear to continue to reflect the statewide trend.

TABLE 2B
Population and Visitor Trends and Projections
Hawaii County

	Population		Average Daily Visitor Census		De Facto Population	
	State	County	State	County	State	County
ACTUAL						
1985	1,039,698	105,900	89,515	6,167	1,136,160	112,343
1986	1,051,762	108,362	104,787	7,781	1,165,826	116,451
1987	1,067,917	111,735	105,787	8,044	1,185,394	120,289
1988	1,079,827	113,439	109,290	8,262	1,198,637	122,038
1989	1,094,588	116,585	133,664	13,991	1,234,640	131,153
1990	1,113,491	121,572	154,516	16,698	1,240,013	137,103
1991	1,136,754	127,266	147,323	17,535	1,252,265	141,240
1992	1,158,613	131,630	152,249	19,245	1,271,662	146,421
1993	1,172,838	135,085	147,498	18,974	1,267,849	148,014
1994	1,187,536	137,713	156,630	18,902	1,289,804	150,311
1995	1,196,854	140,492	157,098	18,547	1,298,096	152,482
1996	1,203,755	141,935	158,297	19,285	1,303,915	154,364
1997	1,211,640	144,445	157,188	21,656	1,327,930	161,225
1998	1,215,233	145,833	157,389	23,993	1,334,125	165,205
1999	1,210,300	146,970	164,439	22,736	1,332,442	164,570
2000	1,212,113	149,243	168,637	21,831	1,334,599	166,428
2001	1,221,419	151,538	158,247	21,064	1,333,100	167,979
2002	1,233,249	154,348	160,195	22,277	1,346,687	171,556
2003	1,245,606	157,801	161,048	21,934	1,353,207	174,042
2004	1,259,299	161,798	171,481	23,376	1,373,299	179,053
2005	1,273,278	166,461	185,445	27,579	1,393,049	186,836
2006	1,285,498	171,191	184,930	28,011	1,407,616	191,733
PROJECTIONS						
DBEDT 2030 Series, August 2004						
2005	1,277,950	163,000			1,406,650	180,800
2010	1,346,600	176,750	196,849	25,479	1,490,500	196,500
2015	1,418,650	190,300	216,849	28,219	1,579,400	212,250
2020	1,489,500	203,050	233,288	30,411	1,663,450	226,800
2025	1,560,400	216,150	249,863	32,740	1,748,600	241,800
2030	1,630,450	229,700	268,082	35,479	1,834,200	257,700
Updated Time-Series County Projections, Coffman Associates, August 2006						
2010		180,736		29,117		203,421
2015		195,409		32,777		220,946
2020		210,083		36,438		238,472
2025		224,757		40,098		255,997
2030		239,430		43,759		273,523

Source: Population and Economic Projections for the State of Hawaii to 2030, DBEBT 2030 Series; Research and Economic Analysis Division – Department of Business, Economic Development and Tourism; August 2004

In contrast, visitors to the Big Island have increased 41 percent since 1990. The DBEDT forecast a 1.7 percent average annual growth rate for Hawaii County annual visitors by air. That forecast, however, used a base year prior to 2004. Since 2004 alone, visitors to the Big Island have increased by 24 percent, and the 1.59 million visitors in 2006 exceed the 1.57 million forecast for 2015. This growing disparity is graphically depicted on **Exhibit 2D**.

As with visitors by air, the average daily visitor census for the state also increased 39 percent between 1985 and 1990, but has increased a total of 20 percent since then. The statewide visitor census was forecast by DBEDT to grow at a 1.5 percent average annual rate through 2030. As shown on **Table 2B** and **Exhibit 2D**, statewide growth is still trending with the DBEDT forecast.

The Hawaii County visitor census was forecast to grow at a 1.8 percent annual rate. As with the annual visitors, the average daily visitor census on the Big Island has increased dramatically since 2003. The actual figures for 2006 have reached the level DBEDT forecast for 2015.

Since 1985, the state population has been growing at an annual average rate of 1.0 percent per year. The DBEDT projects the state population to continue to grow at a similar rate through 2030. As shown on **Table 2B** and **Exhibit 2D**, the state's population is following closely the 2004 DBEDT forecast.

By comparison, the population of Hawaii County has grown at an annual average rate of 2.3 percent over the past 21 years. Subsequently, the percentage of the state's population on the Big Island has grown from 8.3 percent in 1985 to an estimated 13.3 percent in 2006. The county's population was forecast to grow at an average annual rate of 1.3 percent through 2030. Based upon this forecast, Hawaii County would comprise 14.1 percent of the state's population by 2030.

A review of the county population since 2003 indicates that it has grown nearly 8.5 percent (13,390 residents) and is exceeding the forecast trend.

Table 2B also examines the de facto population of the state and county. De facto population is defined as the number of persons physically present in an area, regardless of military status or usual place of residence. It includes persons present, but excludes residents temporarily absent, both calculated as an average daily census.

De facto population is important in examining the socioeconomics of Hawaii and each island. Not only are there short term visitors, but there are a growing number of second homes. The second home, or nonresident housing market on the Big Island has grown significantly over the past two decades. This is illustrated in the following nonresident housing data collected by the U.S. Census Bureau.

- 1980 – 1,114 units
- 1990 – 2,045 units
- 2000 – 5,101 units

DBEDT also forecast de facto population for the state and each county in its 2030 series forecasts in 2004. As with resident population and the daily visitor census, the recent state de facto population data is still in line with the DBEDT forecasts. Hawaii County, however, is growing faster than previously forecast.

From each of the socioeconomic indicators, it is clear that economic growth on the Big Island has been and is forecast to continue to increase at a faster rate than the state as a whole.

Because of the growing disparity between the actual and projected growth in county resident and de facto population as well as visitors, an updated projection was examined for each.

Table 2B presents updated county projections for population, average daily visitor census, and de facto population based upon a time-series analysis of annual data on each category since 1970. A correlation coefficient (Pearson's "r") measures the association between changes in the dependent variable and the independent variable(s) (calendar years). An r^2 greater than 0.90 indicates good predictive reliability. A value below 0.90 may be used with the understanding that the predictive reliability is lower.

The r^2 for the population time-series was very strong at 0.996. The resulting forecast, shown at the bottom of **Table 2B**, represents an annual average growth rate of 1.4 percent.

The r^2 for the daily visitor census time-series was not as strong but also good at 0.910. This resulting updated projection of **Table 2B** would represent an average annual visitor growth rate of 1.8 percent through 2030.

For de facto population, the times series correlation was again strong at 0.974. This updated projection reflects and average annual growth rate of 1.5 percent.

While the Big Island demographics are growing faster than that of the state as a whole, the west side of the island is growing even faster. **Table 2C** presents the population data and forecasts for the west coast districts as included in the *2005 Hawaii County General Plan*. The share of the county population in the four west coast districts of North and South Kohala and North and South Kona grew from less than 30 percent in 1980 to 36 percent in 1990. The west coast share of the population grew another two percent over the next decade, and was forecast to comprise 42.3 percent of the county's population by 2020. Although specific data was not available, much of the nonresident housing that has developed on the island is on the west side as well. There are also several new developments in various stages of permitting that will contribute to the continuance of this growth in both resident and de facto population.

TABLE 2C
Population Trends and Projections
Big Island West Coast Districts

	1980	1990	2000	2010	2020
County Population	92,053	120,317	148,677	176,938	217,718
West Coast Districts					
North Kohala	3,249	4,291	6,038	7,917	11,273
South Kohala	4,607	9,140	13,131	18,184	24,426
North Kona	13,478	22,284	28,543	34,024	42,275
South Kona	5,914	7,658	8,589	11,414	14,092
West District Total	27,248	43,373	56,301	71,539	92,066
Percent of County	29.6%	36.0%	37.9%	40.4%	42.3%

Source: Hawaii County General Plan, 2005

STATEWIDE PASSENGER FORECASTS

The last statewide update of aviation demand forecasts were prepared for the DOT-A in 2004. These were based on activity statistics through 2002 as well as the previous DBEDT socioeconomic projections (2025 Series Projections) published in February 2000. In general, the 2004 DBEDT projections discussed in the previous section are more optimistic than the preceding forecasts.

The DOT-A forecasts were prepared based upon a series of regression analyses both statewide and for individual counties. A linear regression of historic passenger versus population and visitor data was found to have a good correlation and was used to prepare the passenger forecast. **Exhibit 2E** graphically presents the resulting forecast for statewide passenger growth.

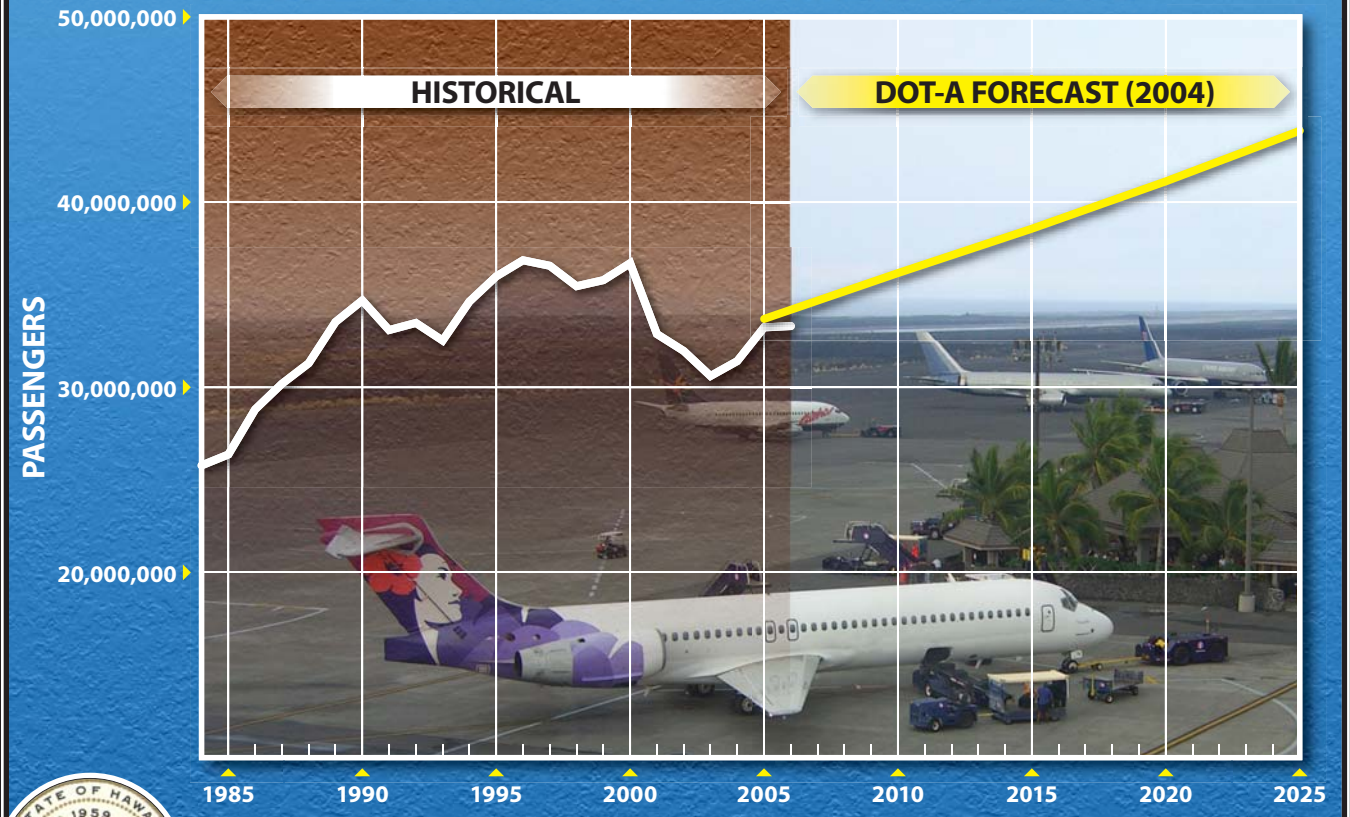
As indicated on **Table 2D**, passengers (excluding transits) were forecast to grow at an average annual rate of 1.4 percent from 32.0 million in 2002 to 43.9 million by 2025. Hawaii County passengers were forecast to grow the fastest at 1.7 percent annually, from 4.0 million in 2002 to 5.8 million in 2025. The Hawaii County share of the state's passengers was forecast to grow from 12.5 percent in 2002 to 13.2 percent by 2025.

TABLE 2D
Hawaii Statewide Passenger Demand Forecasts
DOT-A 2004

	Actual		Forecast			
	2002	2005	2005	2010	2015	2025
Total Passengers						
Statewide	31,959,439	33,230,288	33,703,500	36,166,300	38,561,300	43,848,600
Hawaii County	4,006,465	4,265,261	4,244,200	4,615,600	4,982,800	5,802,800
County Percentage of State	12.5%	12.8%	12.6%	12.8%	12.9%	13.2%
County Airport Passengers						
Kona International	2,601,739	2,959,727	2,793,400	3,064,500	3,344,400	3,974,900
Hilo International	1,401,664	1,300,736	1,447,300	1,547,300	1,634,400	1,823,400
Waimea-Kohala	3,062	4,798	3,500	3,800	4,000	4,500

Source: Hawaii Aviation Demand Forecasts Update; Hawaii DOT-A; 2004.

STATEWIDE AIRPORT SYSTEM PASSENGER FORECAST



Source: Hawaii Aviation Demand Forecasts Update; State of Hawaii Department of Transportation Airports Division, 2004.

A review of the forecasts to date reveals The DOT-A statewide passenger forecast for 2005 was 33.7 million. The actual total in 2005 of 33.2 million was slightly behind, but still compared favorably with the forecast. Passenger levels in 2006 were 33.3 million.

The table also compares Hawaii County passengers. Comprised primarily of those using KOA and Hilo International Airport (ITO), county passengers were forecast at 4.24 million for 2005. This compares very favorably with the actual total of 4.26 million in 2005. If broken down by airport, however, the 2005 figures reveal that ITO actual passengers of 1.3 million were behind the DOT-A forecast of 1.45 million. Meanwhile, the KOA 2005 passenger total of 2.96 million was ahead of the 2.79 million forecast for that year. The following section will examine the passenger activity and forecasts for Kona International Airport at Keahole in more detail.

AIRLINE ACTIVITY FORECASTS

To determine the types and sizes of facilities necessary to properly accommodate present and future airline activity at any airport, two basic elements must be forecast: annual passengers and annual aircraft operations. Annual passengers serve as the most basic indicator of demand for commercial service activity. From a forecast of annual passengers, operations and other activity descriptors can be projected based upon behavioral factors characteristic of Kona International Airport at Keahole or the airline industry as a whole.

AIR SERVICE HISTORY

Table 2E and **Exhibit 2F** provide a review of the history of passenger traffic at KOA back to its opening in 1970. Over the past 36 years, KOA has seen its passenger activity grow from 508,681 in 1970, to an all-time high of 3,033,212 in 2006. The average annual growth rate over the 36-year period has been 5.1 percent, but the table and graph show how traffic has fluctuated on an annual basis.

TABLE 2E
Passenger Traffic History
Kona International Airport at Keahole

Year	Kona Passengers	% Change
1970	508,681	NA
1971	515,378	1.3%
1972	635,914	23.4%
1973	728,200	14.5%
1974	808,970	11.1%
1975	865,961	7.0%
1976	1,294,556	49.5%
1977	1,106,257	-14.5%
1978	1,253,379	13.3%
1979	1,278,712	2.0%
1980	1,118,413	-12.5%
1981	1,057,881	-5.4%
1982	1,150,618	8.8%
1983	1,227,799	6.7%
1984	1,427,432	16.3%
1985	1,485,813	4.1%
1986	1,691,342	13.8%
1987	1,803,590	6.6%
1988	1,823,549	1.1%
1989	2,097,931	15.0%
1990	2,178,696	3.8%
1991	2,118,777	-2.8%
1992	2,161,936	2.0%
1993	2,179,062	0.8%
1994	2,238,583	2.7%
1995	2,303,455	2.9%
1996	2,524,402	9.6%
1997	2,628,157	4.1%
1998	2,652,955	0.9%
1999	2,668,182	0.6%
2000	2,842,097	6.5%
2001	2,640,318	-7.1%
2002	2,601,739	-1.5%
2003	2,542,566	-2.3%
2004	2,653,562	4.4%
2005	2,959,727	11.5%
2006	3,033,212	2.5%

Source: Hawaii Department of Transportation - Airports Division

Traffic has declined from the previous year just seven times since 1970. The only consecutive year declines were in 1980-81 following deregulation and in 2001-03 in the aftermath of 9/11.

As can be seen from the exhibit, the first several years after the airport opened comprised a period of strong growth as passenger traffic increased 150 percent. The largest single-year increase in the airport's history occurred in 1976, when traffic jumped 49.5 percent to exceed one million passengers for the first time. This was followed the next year by the largest single-year decline of 14.5 percent.

The 1970s ended with deregulation of the airline industry. The two-year period of decline immediately followed in the early 1980s as a prolonged national recession and rising fuel prices combined with the initial uncertainties of deregulation to affect traffic throughout the airline industry. As the airlines became more acclimated to their deregulated environment, traffic responded to the economic recovery and grew very strongly through the remainder of the decade. A major change at KOA resulting from deregulation was the introduction of direct mainland flights in 1983 by United Airlines. The runway was extended to 9,500 feet and the terminal expanded in 1988. The next year, passengers eclipsed the 2.0 million mark for the first time in 1989. As the 1990s began, traffic had more than doubled since 1981.

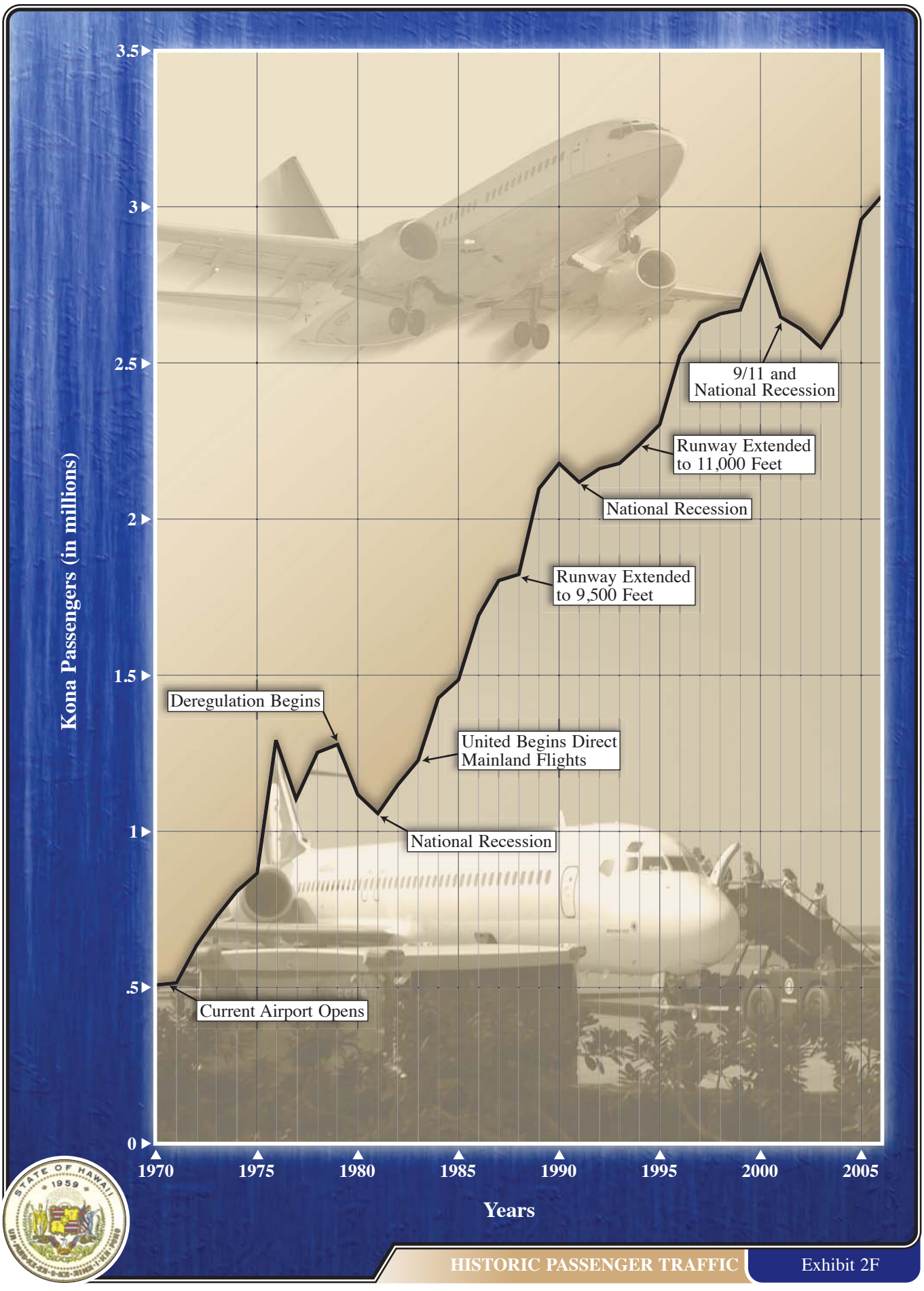
The economic recession in the early 1990s resulted in a 2.8 percent decline in passengers in 1991. Another decade of growth began the next year. Each year from 1993 through 2000, new all-time highs in passenger traffic were set at the airport, culminating in 2.84 million passengers to begin the new millennium. The extension of the runway in 1994 to its current length of 11,000 feet opened the airport to more direct overseas flights by widebody aircraft.

A national recession began in March of 2001, which on its own, likely would have slowed passenger growth for that year. The events of September 11, 2001 had an immediate impact on traffic in the last quarter of the year. The impact to air travel, however, was prolonged, and KOA passenger traffic continued to decline through 2003.

Positive growth returned in 2004, but it was not until 2005 that traffic finally exceeded the levels experienced in 2000, as traffic increased by 11.5 percent from 2004. In 2006, the airport surpassed the 3.0 million passenger level for the first time with an all-time high of 3,033,212.

Over the years, the airport has grown from supporting only interisland flights to both mainland and international flights. **Exhibit 2G** depicts the non-stop destinations served from KOA during the peak month of August 2006. There were 58 daily flights from KOA according to the August 18, 2006 schedule. In addition to three interisland destinations, seven U.S. mainland destinations were served nonstop. International service to and from Narita, Japan is available as well. During the winter months, there is also international traffic from Canada.

06MP06-2F-2/22/07



HISTORIC PASSENGER TRAFFIC

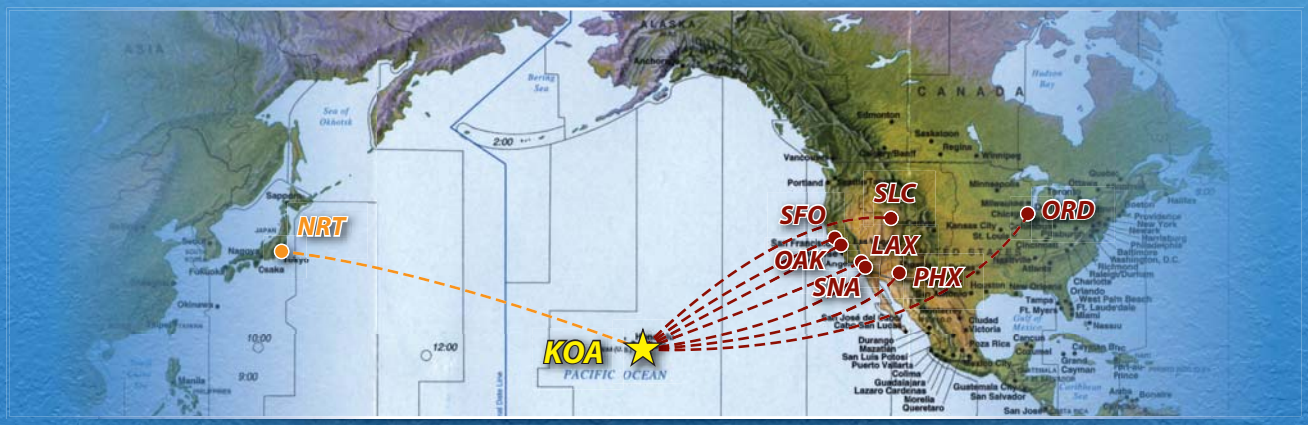
Exhibit 2F

06MP06-2G-5/29/07

KOA NON-STOP FLIGHTS BY DESTINATIONS (August 2006)

INTERISLAND DESTINATIONS

- Hilo (ITO)
- Honolulu (HNL)
- Kahului (OGG)
- Kapalua (JHM)



INTERNATIONAL DESTINATIONS

- Narita, Japan (NRT)

MAINLAND DESTINATIONS

- Chicago, Illinois (ORD)
- Los Angeles, California (LAX)
- Oakland, California (OAK)
- Phoenix, Arizona (PHX)
- Salt Lake City, Utah (SLC)
- Santa Ana, California (SNA)
- San Francisco, California (SFO)

PASSENGER FORECASTS

As discussed in this chapter's introduction, the first steps involved in updating an airport's forecasts include reviewing previous forecasts in comparison to actual activity to determine what changes, if any, may be necessary. After that comes the consideration of the effects of any potential new factors that could affect the forecasts, such as changes in the socioeconomic climate, or the potential effects of service changes at KOA or other island airports.

Previous Passenger Forecasts

The first step in this forecast update is to compare actual activity to previous forecasts prepared for KOA. Several sets of previous forecasts were reviewed and are outlined in **Table 2F**. These include projections from the previous master plan update for KOA (dated 1998), the *Hawaii Aviation Demand Forecasts Update* in 2004, prepared by Aries Consultants for DOT-A, and the FAA *Terminal Area Forecasts* (TAF), issued in December 2006. This is the FAA's most current forecast of activity for Kona International Airport at Keahole. The projections in this table are also depicted on **Exhibit 2H** for graphic comparison.

TABLE 2F
Previous Passenger Projections
Kona International Airport at Keahole

	2000	2005	2010	2015	2020	2025
Total Passengers						
Actual	2,842,097	2,959,727				
1998 Master Plan Update	2,654,000	2,923,000	3,201,000	3,489,000	3,780,000	
2004 DOT-A Forecasts		2,793,400	3,064,500	3,344,400	3,649,500	3,974,900
2006 TAF*			3,120,268	3,385,822	3,674,420	

*For comparison, the enplanement projections in the 2006 FAA Terminal Area Forecast (TAF) were doubled to reflect total passengers.

As can be seen from the exhibit, actual passenger traffic is higher than each of the earlier forecasts for the airport. As of 2005, the projections used in the 1998 Master Plan are within 1.2 percent of the actual traffic, while the 2004 DOT-A forecast is over 5.6 percent below the actual number. The more recent FAA forecasts as included in the TAF fall between the two earlier forecasts.

As indicated earlier in the discussion of statewide forecasts, the 2004 DOT-A forecast was derived from regression analyses relating passengers to population and island visitors. Also indicated earlier, the DBEDT forecasts of these variables have been updated since the 2004 forecasts were prepared. To examine the potential effect on passenger traffic at KOA, the fol-

lowing section will consider this updated information.

Analytical Projections

Two analytical techniques were re-examined for their applicability to projecting airline passengers at KOA. These included time-series extrapolation and regression analyses considering population and visitor statistics as independent variables.

A time-series analysis of airline passengers was prepared based upon the historic passengers between 1970 and 2006. The r^2 value for the 36-year time frame was very strong at 0.960. Several shorter periods beginning in later years were also tested, but all resulted in lower statistical correlations. Thus, the longer period time-series was felt to be the most representative of past trends. The time-series projection for 1970-2006 is shown for comparison with the FAA TAF and the DOT-A forecast in **Table 2G** and on **Exhibit 2H**. As can be seen from the exhibit, the updated time series projection is higher than both the DOT-A and the FAA-TAF forecasts.

Next, a correlation analyses was run to re-examine the relationship between KOA passengers and the Hawaii County population and visitor census dating back to 1970. The correlation (r^2 = 0.962) was found to be as high as the time-series correlation. The resulting projection is also shown on **Table 2G** and **Exhibit 2H**. As the exhibit shows, the updated regression projection is very similar to the time-series projection.

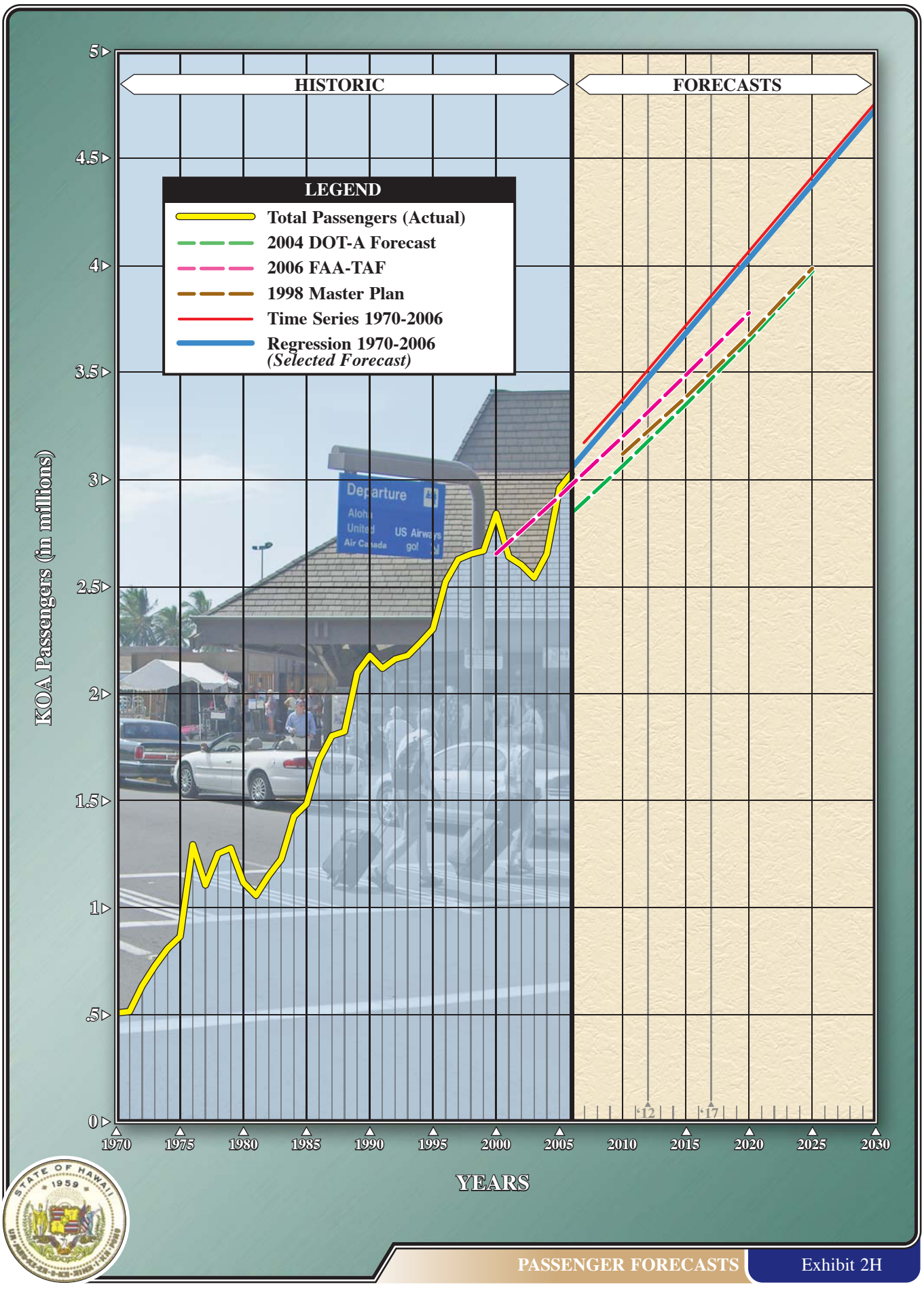
TABLE 2G
Passenger Forecast Update
Kona International Airport at Keahole

	2012	2017	2030
2004 DOT-A Forecast*	3,171,200	3,461,500	4,332,500
Time Series Analysis (1970-2006)	3,476,192	3,824,304	4,729,396
Regression Analysis vs. County Population And Visitor Census (1970-2005)	3,471,629	3,818,715	4,721,138
Master Plan Forecast Update	**3,472,000**	**3,819,000**	**4,721,000**
2006 FAA TAF*	3,223,846	3,498,388	4,328,139
Percentage Difference	7.70%	9.16%	9.08%

*2030 projection extrapolated by Coffman Associates.

Recommended Planning Forecast

The updated time-series and regression projections vary by less than two percent over the planning period. The updated population and visitor census forecasts (Table 2A) for Hawaii County were used in the regression projection to account for the fact that the DBEDT forecasts for each are already tracking well below the 2006 actual estimates. Because of the similarity in the time-series and regression projections, the regression projection was selected as the preferred forecast as it best represents an update using the DOT-A forecast methodology.


HISTORIC
FORECASTS
LEGEND
Total Passengers (Actual)
2004 DOT-A Forecast
2006 FAA-TAF
1998 Master Plan
Time Series 1970-2006
Regression 1970-2006
(Selected Forecast)
KOA Passengers (in millions)
5
4.5
4
3.5
3
2.5
2
1.5
1
.5
0
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
2025
2030
YEARS

As depicted on **Table 2G**, the recommended forecast compares favorably with the FAA TAF. For 2012, the Master Plan forecast is within 7.7 percent of the TAF. For 2017, the Master Plan forecast is within 9.2 percent of the TAF.

Table 2H outlines the breakdown of interisland and overseas passengers since 1995, the first year after the runway was extended to 11,000 feet. From this table, it is evident that the airport's passenger growth has been in passengers flying directly to and from KOA from mainland and international markets. In fact, direct overseas passenger traffic has increased nearly five times, while 2006 interisland passengers were slightly lower than in 1995.

TABLE 2H
Interisland/Overseas Passenger Forecasts
Kona International Airport at Keahole

		Interisland		Overseas	
Year	Total	Interisland Passengers	Interisland Percent	Overseas Passengers	Overseas Percent
1995	2,303,455	2,081,368	90.4%	222,087	9.6%
1996	2,524,402	2,248,511	89.1%	275,891	10.9%
1997	2,628,157	2,257,218	85.9%	370,939	14.1%
1998	2,652,955	2,241,765	84.5%	411,190	15.5%
1999	2,668,182	2,215,953	83.1%	452,229	16.9%
2000	2,842,097	2,271,216	79.9%	570,881	20.1%
2001	2,640,318	2,009,138	76.1%	631,180	23.9%
2002	2,601,739	1,940,181	74.6%	661,558	25.4%
2003	2,542,566	1,824,130	71.7%	718,436	28.3%
2004	2,653,562	1,807,289	68.1%	846,273	31.9%
2005	2,959,727	1,913,344	64.6%	1,046,383	35.4%
2006	3,033,212	1,984,319	65.4%	1,048,893	34.6%
Master Plan Forecast					
2012	3,472,000	2,153,000	62.0%	1,319,000	38.0%
2017	3,819,000	2,253,000	59.0%	1,566,000	41.0%
2030	4,721,000	2,502,000	53.0%	2,219,000	47.0%

The change represents the availability of more non-stop flights with overseas destinations on the U.S. mainland as well as Canada and Japan. The need to connect to flights in Honolulu has been reduced. Where less than 10 percent of the traffic was directly overseas in 1995, over one-third was in 2006. This percentage is expected to continue to grow, but at a slower rate, towards fifty percent.

The resulting forecast of interisland and overseas passengers is depicted at the bottom of **Table 2H**. Overseas passengers are projected to grow at an annual average rate of 3.2 percent through 2030. Interisland passengers are projected to grow at an average of 1.0 percent annually.

Table 2J provides an even more detailed breakdown of the passenger

forecasts, with enplanements (departing passengers) separated from deplanements (arriving passengers). Transit passengers are those that connect between aircraft at the airport. Currently, there are more interisland enplanements than deplanements, but more overseas deplanements than enplanements. This is, in part, because of interisland "hopping" where some overseas visitors arrive at one island, visit other islands by plane or ship, then leave the state from the last island they visit. Another factor noticed in the statistical data is that the passengers arriving on international flights from Japan are counted as overseas deplanements, but departing passengers have generally been included in the interisland statistics. Over the long range, this differential is assumed to balance out.

TABLE 2J
Passenger Forecast Summary
Kona International Airport and Keahole

	Actual	Forecast		
	2006	2012	2017	2030
Interisland Passengers				
Enplaned (Departures)	1,025,378	1,098,000	1,138,000	1,251,000
Deplaned (Arrivals)	958,941	1,055,000	1,115,000	1,251,000
Total Interisland	**1,984,319**	**2,153,000**	**2,253,000**	**2,502,000**
Overseas Passengers				
Enplaned (Departures)	497,060	628,000	753,000	1,077,000
Deplaned (Arrivals)				
Mainland Arrivals	451,319	562,000	660,000	817,000
International Arrivals	69,650	91,000	108,000	151,000
Subtotal Deplaned	520,969	653,000	768,000	1,078,000
Transits	30,864	38,000	45,000	64,000
Total Overseas	**1,048,893**	**1,319,000**	**1,566,000**	**2,219,000**
TOTAL PASSENGERS	**3,033,212**	**3,472,000**	**3,819,000**	**4,721,000**

Table 2J also includes a forecast for international arrivals. Since 1996, KOA has had a scheduled non-stop flight from Japan. The airport also has seasonal flights from Canada. The Canadian flights, however, are pre-cleared in Canada and are not included in the international arrival statistics shown in **Tables 2J** and **2K**.

The DOT-A forecast assumptions indicated that most other international markets are more likely to continue to utilize connections through Honolulu to reach the other islands in Hawaii.

Table 2K compares historic KOA international arrivals with total overseas arrivals at KOA and with statewide international arrivals. The airport's international arrivals peaked at 87,521 in 1998, but declined to 65,652 by 2003. Over the next two years, traffic recovered to 86,111 in 2005, but in 2006 was down to 69,650.

Statewide, international traffic peaked in 2000 at 2.66 million arrivals. International traffic declined after 9-11 and SARS concerns. This traffic has still not grown back to pre-9-11 levels.

The 2004 DOT-A forecasts projected the state's international traffic to grow at an average annual rate of 1.8 percent. This is much lower than the FAA's current projected growth rate of 5.9 percent for U.S international traffic.

TABLE 2K
International Arrivals Forecast
Kona International Airport at Keahole

	KOA Arrivals			Statewide International Arrivals*	KOA %
Year	Overseas	International	% International		
1996	154,187	29,371	19.0%		
1997	213,268	40,988	19.2%		
1998	251,899	87,521	34.7%		
1999	253,630	80,087	31.6%	2,610,459	3.07%
2000	316,211	78,895	25.0%	2,664,373	2.96%
2001	356,118	65,141	18.3%	2,209,722	2.95%
2002	366,760	66,871	18.2%	2,195,631	3.05%
2003	397,057	65,652	16.5%	2,031,586	3.23%
2004	461,170	78,918	17.1%	2,207,944	3.57%
2005	486,730	86,111	17.7%	2,259,386	3.81%
2006	520,969	69,650	13.4%	2,143,799	3.25%
FORECAST					
2012	653,000	91,000	14.0%	2,722,890	3.34%
2017	768,000	108,000	14.0%	3,027,830	3.57%
2030	1,077,000	151,000	14.0%	3,931,950	3.84%

* Statewide International Arrivals forecast interpolated and extrapolated from Hawaii Aviation Demand Forecasts Update, DOT-A, 2004.

For planning purposes, international arrivals at KOA were projected, at best, to grow at a rate similar to that of mainland passengers. This would essentially represent a doubling of international arrivals by 2030. The 3.3 percent annual growth rate is higher than the 1.8 percent rate projected statewide, suggesting a potential increase in market share for KOA. As depicted on **Table 2K**, however, that market share would remain within the range previously experienced at KOA.

With just one daily international flight currently serving KOA, the Master Plan forecast essentially allows planning for an eventual second international flight over the long term.

AIRLINE OPERATIONS

The commercial service fleet mix is needed to project airline operations for the airport. A projection of the fleet mix for Kona International Airport at Keahole has been developed by reviewing the equipment used by the carriers serving the airport.

Changes in equipment, airframes, and engines have always had a significant impact on airlines and airport plan-

ning. There are many ongoing programs by the manufacturers to improve performance characteristics. These programs continue to focus on improvements in fuel efficiency. Regional jets have also become a larger factor as the airlines look for ways to reduce costs. On the mainland, many airlines have replaced larger commercial jets on smaller emerging routes with regional jets. In Hawaii, go! Airlines, a subsidiary of Mesa Air Group, has introduced the 50-seat regional jet into serving interisland routes.

At the same time as these smaller aircraft have been introduced at KOA, overseas traffic has been increasing. These routes are being served primarily by aircraft like the Boeing 757 up to the Boeing 747.

Table 2L compares the airline operational fleet mix by seat capacity for the last three years at KOA. The table includes a breakdown of interisland and overseas operations as well as the combined analysis. **Exhibit 2J** depicts the aircraft fleet mix and seating capacities of the airlines serving the airport.

Overall, the average seats per departure have declined from 131.6 in 2004, to 118.7 in 2005. This is primarily due to an increase in operations by aircraft with 60 seats or less. In 2004, less than 13 percent of the total flights were by aircraft with 60 seats or less. In two years, this percentage has increased to nearly 30 percent of all airline operations.

It appears that these aircraft have added to operations rather than replace other aircraft in the fleet, as total airline operations increased from 26,768 in 2004 to 37,426 in 2006. The percentage of operations by larger aircraft with 165 or more seats has remained relatively constant over the last three years at around 19 percent. The medium-sized jet in the 105 to 134 seat range has seen its percentage decline from 68 to 51 percent. Like the regional aircraft, these aircraft are used primarily for interisland flights. While their market percentage has declined, the total number of annual operations by medium-sized jets has actually increased by approximately 800 operations in the last two years.

The boarding load factor (BLF) is defined as the ratio of passengers boarding aircraft compared to the seating capacity of the aircraft. With the increase in operations, the BLF at the Kona International Airport at Keahole has declined in recent years, from 75.3 percent in 2004, to 68.2 percent in 2005. By comparison, the BLF at most airports on the mainland has been increasing as airlines have worked to improve efficiency and reduce costs.

AIRCRAFT TYPE	American Airlines	Delta	Northwest Airlines	United Airlines	US Airways	Air Canada
B747-400			403	347		
B777-200A				**348**		
B747			310			
B767-400		**287**				
A330-300			298		286	270
A340-300						282
B777-200	245	268				
A330-200			243			
B767-300	212	250		244		**212**
B757-300			**224**			
B767-200	158				203	**207**
B757-200	**188**	184	182	**182**	**193**	

AIRCRAFT TYPE	Aloha Airlines	Hawaiian Airlines	Island Air	Mesa Airlines	Pacific Wings	JAL Japan Airlines
B747-400						**384**
B767-300		260				**240**
B737-200	**127**					
B737-200A	**127**					
B737-700	**124**					
B717		**123**				
CRJ200				**50**		
DHC Dash 8 Q400			**37**			
Cessna 208B					**14**	

Bold faced figures represent aircraft that regularly operated at KOA in 2006-2007.

TABLE 2L
Airline Fleet Mix and Operations Forecast
Kona International Airport at Keahole

	Historic			Forecast		
Seating Capacity	**2004**	**2005**	**2006**	**2012**	**2017**	**2030**
TOTAL AIRLINE OPERATIONS						
>320	1.0%	4.2%	2.3%	2.6%	2.5%	3.4%
250-320	1.6%	0.5%	1.1%	1.6%	2.2%	3.4%
200-249	5.6%	5.6%	5.7%	6.2%	6.0%	6.5%
165-199	11.0%	9.6%	10.3%	10.8%	10.8%	11.1%
135-164	0.0%	0.0%	0.0%	0.0%	0.9%	4.5%
105-134	68.2%	57.6%	50.9%	49.2%	45.6%	38.5%
75-104	0.0%	0.0%	0.0%	0.0%	3.9%	7.4%
60-79	0.0%	0.0%	0.0%	3.2%	5.5%	7.4%
40-59	0.0%	0.0%	8.4%	8.0%	6.3%	3.7%
20-39	10.6%	16.1%	16.1%	14.4%	13.3%	11.1%
<19	2.0%	6.5%	5.2%	4.0%	3.1%	3.0%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Average Seat per Op.	131.6	126.1	118.7	122.6	123.8	131.0
Boarding Load Factor	75.3%	73.9%	68.2%	69.5%	74.5%	78.7%
Passengers per Op.	99.1	93.1	81.0	85.3	92.2	103.1
Annual Passengers	2,653,562	2,959,727	3,033,212	3,472,000	3,819,000	4,721,000
Annual Operations	**26,768**	**31,776**	**37,436**	**39,800**	**41,400**	**45,800**
INTERISLAND OPERATIONS						
>320	0.0%	2.2%	2.0%	2.0%	1.0%	0.0%
250-320	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
200-249	0.0%	2.9%	2.4%	2.0%	1.0%	0.0%
165-199	0.0%	0.0%	0.6%	1.0%	1.0%	1.0%
135-164	0.0%	0.0%	0.0%	0.0%	0.0%	4.0%
105-134	83.3%	66.9%	58.8%	58.0%	56.0%	51.0%
75-104	0.0%	0.0%	0.0%	0.0%	5.0%	10.0%
60-79	0.0%	0.0%	0.0%	4.0%	7.0%	10.0%
40-59	0.0%	0.0%	10.3%	10.0%	8.0%	5.0%
20-39	14.0%	20.0%	19.6%	18.0%	17.0%	15.0%
<19	2.7%	8.1%	6.4%	5.0%	4.0%	4.0%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Average Seat per Op.	109.6	106.2	100.3	101.1	97.9	95.9
Boarding Load Factor	81.5%	70.9%	64.0%	67.0%	71.0%	77.0%
Passengers per Op.	89.3	75.2	64.3	67.7	69.5	73.8
Annual Interisland Passengers	1,812,930	1,923,503	1,970,937	2,153,000	2,253,000	2,502,000
Annual Interisland Operations	**20,296**	**25,566**	**30,666**	**31,800**	**32,400**	**33,900**
OVERSEAS OPERATIONS						
>320	4.0%	12.5%	3.6%	5.0%	8.0%	13.0%
250-320	6.4%	2.4%	6.0%	8.0%	10.0%	13.0%
200-249	24.1%	16.9%	20.9%	23.0%	24.0%	25.0%
165-199	45.0%	48.9%	54.2%	50.0%	46.0%	40.0%
135-164	0.0%	0.0%	0.0%	0.0%	4.0%	6.0%
105-134	20.5%	19.3%	15.2%	14.0%	8.0%	3.0%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Average Seat per Op.	201.2	208.1	202.1	208.0	217.3	231.0
Boarding Load Factor	63.6%	80.2%	76.7%	79.0%	80.0%	81.0%
Passengers per Op.	128.0	166.9	154.9	164.3	173.8	187.1
Annual Overseas Passengers	840,632	1,036,224	1,048,893	1,319,000	1,566,000	2,219,000
Annual Overseas Operations	**6,566**	**6,210**	**6,770**	**8,000**	**9,000**	**11,900**

The BLF decline at KOA can be attributed to the increased competition brought on by the entry of more regional aircraft flights on interisland routes. The interisland BLF at KOA has declined from 81.5 percent to 64 percent while the island airlines compete for market share. Over the same period, the overseas BLF has increased from 63.6 percent to 76.7 percent. In the future, boarding load factors can be expected to begin to return to previous levels and even grow into the upper 70s.

The decline in seating capacity as well as load factor has resulted in a net decrease in passengers per flight at KOA. The average passengers per operation fell from 99 in 2004 to 81 in 2006. Again, the influx of operations on interisland routes was the primary factor as passengers per operation on overseas routes actually increased from 128 to 155.

Kona International Airport at Keahole can expect regional aircraft to continue to affect interisland service into the future. The 50-passenger regional jet has recently been introduced to the islands, but new airline orders for regional jets (RJs) are now focused on 70- and 90-seat aircraft. While the medium-sized commercial jet will continue to have the majority of interisland flights, these larger regional jet aircraft are likely to become more of a factor in the future.

The mix of aircraft used on overseas flights is expected to continue to grow in size. This will result in a net increase in aircraft seating capacity and in passengers per operation over the long term. **Table 2L** presents the fleet mix and operations forecast for KOA.

AIR CARGO

Air cargo is comprised of air freight and air mail. Air cargo is critical to the Hawaiian Islands for timely delivery of mail as well as time-sensitive freight. Cargo is handled both in the bellies of the passenger airlines as well as by all-cargo carriers. **Table 2M** and **Exhibit 2K** depict the growth of air cargo at Kona International Airport at Keahole since it opened in 1970.

Most cargo at the airport was handled by the passenger airlines in the 1970s. Cargo grew steadily through the 1970s from 1,255 tons in 1970 to 8,812 tons in 1980. Virtually all of the cargo at that time was interisland with little overseas cargo.

The advent of express package carriers in the 1980s began to change cargo activity and handling at airports. The extension of the runway to 9,500 feet in the late 1980s brought the first significant overseas cargo to KOA. By 1990, the airport was handling 19,591 tons of freight and mail annually. Traffic continued to grow through the 1990s and the runway was extended to 11,000 feet. A new high of 29,206 tons of cargo was handled in 1999.

Cargo traffic reached its next new high in 2002 at 31,361 tons then slowed for the next three years. While air freight has actually declined each year since 2002, air mail has more than doubled. This growth in air mail

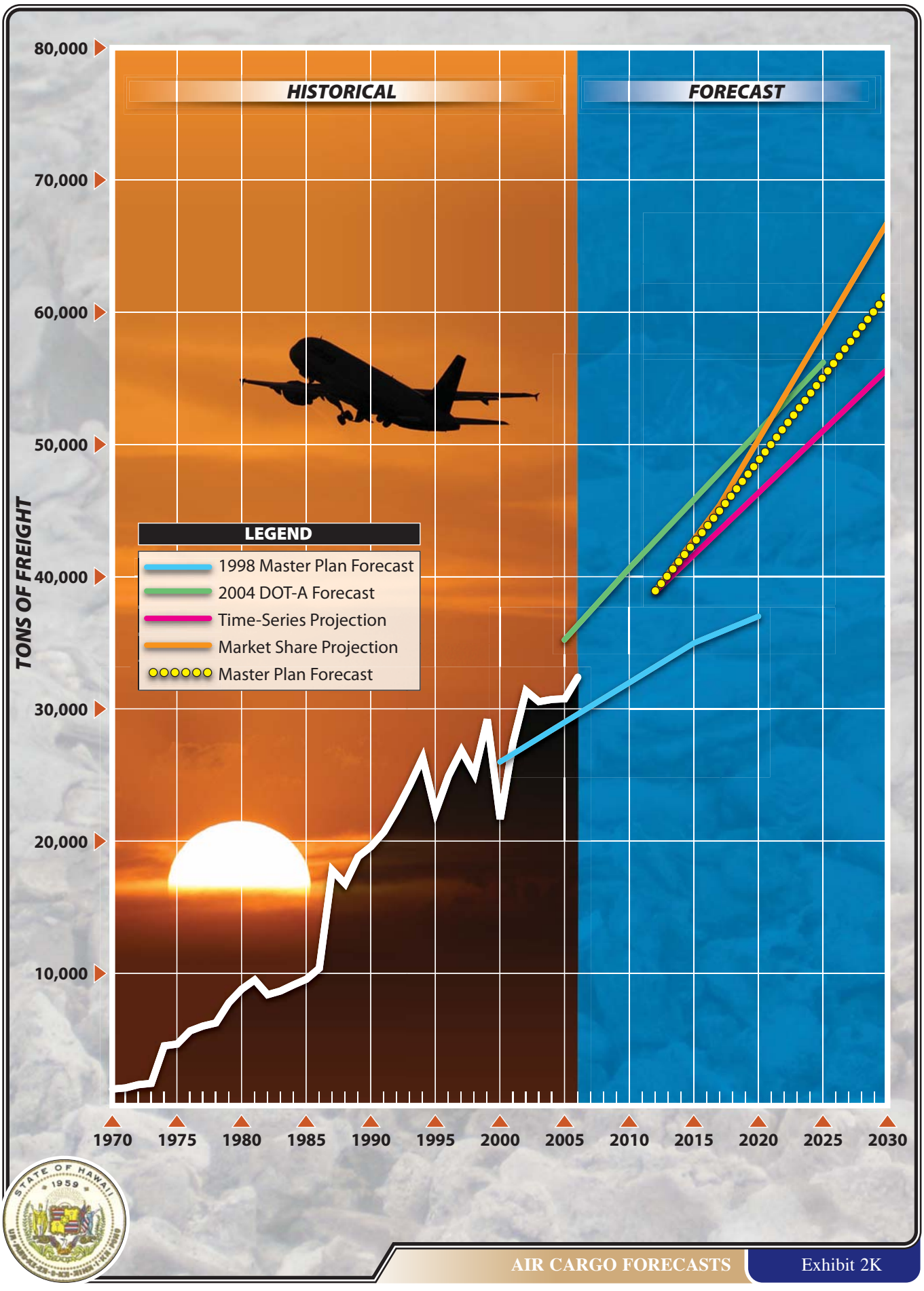

HISTORICAL
FORECAST
TONS OF FREIGHT
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
LEGEND
1998 Master Plan Forecast
2004 DOT-A Forecast
Time-Series Projection
Market Share Projection
Master Plan Forecast
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020
2025
2030

TABLE 2M
Air Cargo Forecast
Kona International Airport at Keahole

	Air Freight Annual Tons	Air Mail Annual Tons	Total Cargo Annual Tons	Domestic Cargo RTMs (millions)	KOA Market Share %
1970	686	569	1,255	NA	NA
1971	724	613	1,337	NA	NA
1972	949	637	1,586	NA	NA
1973	939	743	1,682	NA	NA
1974	3,714	806	4,520	NA	NA
1975	3,742	912	4,654	NA	NA
1976	4,664	986	5,650	NA	NA
1977	4,991	1,027	6,018	NA	NA
1978	5,155	1,095	6,250	NA	NA
1979	6,630	1,152	7,782	NA	NA
1980	7,826	986	8,812	NA	NA
1981	8,498	1,006	9,504	NA	NA
1982	7,326	1,061	8,387	NA	NA
1983	7,430	1,239	8,669	NA	NA
1984	7,730	1,401	9,131	NA	NA
1985	8,212	1,346	9,558	NA	NA
1986	8,835	1,548	10,383	NA	NA
1987	16,047	1,751	17,798	NA	NA
1988	14,912	1,863	16,775	NA	NA
1989	16,813	2,008	18,821	NA	NA
1990	17,290	2,301	19,591	NA	NA
1991	18,720	2,425	20,695	NA	NA
1992	19,766	2,579	22,345	NA	NA
1993	21,565	2,668	24,233	10,394.1	0.000233%
1994	23,482	2,821	26,303	11,323.3	0.000232%
1995	19,512	2,710	22,222	12,415.7	0.000179%
1996	22,486	2,448	24,934	12,781.7	0.000195%
1997	24,636	2,222	26,858	13,454.1	0.000200%
1998	22,085	2,994	25,079	13,828.1	0.000181%
1999	23,317	5,889	29,206	13,974.9	0.000209%
2000	15,223	6,450	21,673	14,698.8	0.000147%
2001	21,540	5,907	27,447	13,934.0	0.000197%
2002	27,323	4,038	31,361	12,967.3	0.000242%
2003	25,836	4,710	30,546	14,972.4	0.000204%
2004	25,588	5,130	30,718	16,340.9	0.000188%
2005	24,477	6,290	30,767	16,089.6	0.000191%
2006	23,878	8,512	32,390	15,710.5	0.000206%
Time Series Analysis					
2012	27,947	10,868	38,815	19,473.4	0.000199%
2017	31,316	12,179	43,495	22,701.1	0.000192%
2030	40,078	15,586	55,664	33,416.2	0.000167%
Market Share Projection					
2012	28,042	10,905	38,947	19,473.4	0.000200%
2017	32,690	12,713	45,402	22,701.1	0.000200%
2030	48,119	18,713	66,832	33,416.2	0.000200%
2004 DOT-A Forecast					
2012	38,100	4,600	42,700	19,473.4	0.000219%
2017	42,900	5,000	47,900	22,701.1	0.000211%
2030	57,000	5,400	61,400	33,416.2	0.000184%
Master Plan Forecast					
2012	28,000	11,000	39,000	19,473.4	0.000200%
2017	32,400	12,600	45,000	22,701.1	0.000198%
2030	44,500	17,500	62,000	33,416.2	0.000186%

resulted in the most cargo traffic to date at 32,390 tons for 2006.

Exhibit 2K compares the air cargo forecasts prepared for the *1998 Master Plan* and the 2004 DOT-A Forecast to the actual traffic that has occurred since. With the slowdown in cargo growth since 2002, the actual activity is still ahead of the *1998 Master Plan*, but is behind the 2004 DOT-A Forecast pace.

To update the forecasts, the enplaned cargo data was evaluated using time-series, regression, and market share analyses in a manner similar to the passenger projections. The updated time-series analysis of the past 36 years resulted in a strong correlation (r^2 = 0.962). The resulting projection is presented for comparison on **Exhibit 2K** and in **Table 2M**. This projection has a slope similar to that of the DOT-A Forecast, but would lag approximately three years behind.

Regression analyses with Hawaii County population, defacto population, and employment were examined, but all resulted in correlations below 0.90.

Table 2M presents a market share review of cargo tons at KOA versus U.S. domestic cargo revenue ton-miles (RTMs). The percentage has been fluctuating around an average of 0.0000490 percent over the past eight years. A projection of cargo based upon maintaining this percentage into the future is presented on the table and exhibit as well.

The constant market share would project the airport's cargo to grow at the industry rate for domestic air cargo. As can be seen from the exhibit, this projection is lower through at least the first ten years, then grows beyond the DOT-A forecast. For the purposes of this master plan update, a hybrid projection representing the middle range between the time-series and market share projections was selected as the recommended forecast for air cargo, and is presented on **Table 2M** as well as **Exhibit 2K.** This forecast essentially falls in line with the 2004 DOT-A forecast over the long term.

Table 2M also presents a breakdown of air mail and air freight forecasts. In the past ten years, the air mail percentage of the total air cargo has increased from 8.3 percent in 1997 to 26.3 percent in 2006. This percentage was projected to grow in the short term to 28 percent then remain relatively stable over the long term.

ALL-CARGO OPERATIONS

Kona International Airport at Keahole is served by several all-cargo carriers or their contract carriers. United Parcel Service (UPS) and Aloha Airlines operate all-cargo commercial jet aircraft to KOA. There are also several contract carriers operating commuter aircraft. UPS primarily utilizes Boeing 747 or 767 aircraft, while Aloha utilizes Boeing 737-200 cargo aircraft. The primary commuter aircraft are turboprops such as the Beech 1900 and the Shorts 360.

A combination of additional flights and more of the larger all-cargo air-

craft can be expected as cargo volumes increase. Thus, air cargo operations were projected to increase, although not as fast as the cargo tonnage.

As shown on **Table 2N**, all-cargo operations totaled 4,372 in 2006. This was down from 2005, when there were 4,842 all-cargo operations. This was due to a decline in commuter operations from 1,952 to 1,360. Cargo jet operations actually increased from 2,890 to 3,012 in the last year.

TABLE 2N
All-Cargo Operations Forecast
Kona International Airport at Keahole

	ALL-CARGO OPERATIONS		
	Total	**Commercial Jet**	**Commuter Aircraft**
ACTUAL			
2004	4,484	2,926	1,558
2005	4,842	2,890	1,952
2006	4,372	3,012	1,360
FORECAST			
2012	4,700	3,300	1,400
2017	5,100	3,700	1,400
2030	6,100	4,700	1,400

The table also presents the forecasts for all-cargo operations. The growth in operations is expected primarily in commercial jets, with commuter aircraft operations remaining fairly stable after declining in recent years.

GENERAL AVIATION FORECASTS

General aviation encompasses all portions of civil aviation except commercial operations. To determine the types and sizes of facilities that should be planned to accommodate general aviation activity, certain elements of this activity must be forecast. These indicators of general aviation demand include based aircraft, aircraft fleet mix, and annual operations.

BASED AIRCRAFT

The number of based aircraft is the most basic indicator of general aviation demand. By first developing a forecast of based aircraft, the growth of other general aviation activities and demands can be projected.

Aircraft basing at an airport is somewhat dependent upon the nature and magnitude of aircraft ownership in the local service area. As a result, aircraft registrations in the area were reviewed and forecast first.

Aircraft Registrations

Data was collected on the history of aircraft ownership in Hawaii County

over the last two decades. This information was obtained from records of the FAA's Aircraft Registry over the years and is presented in **Table 2P**, as well as on **Exhibit 2L**.

Registered aircraft in Hawaii County have grown steadily since the early 1990s. Between 1990 and 2006, registered aircraft in the county grew from 97 to 167. There are no recently prepared forecasts of registered aircraft to examine and compare. As a result, a projection of county registrations was developed.

The Hawaii County share of the U.S. general aviation (GA) active aircraft market is examined in **Table 2P**. Because of a change in how the FAA counts active aircraft, this comparison could only be extended back to 1993. From 1993 through 2006, Hawaii County's market share has grown from 0.0574 percent 0.0738 percent. A projection that would maintain a constant share of 0.738 percent into the future results in 221 registered aircraft by 2030.

TABLE 2P
Hawaii County Registered Aircraft

	Registered Aircraft	U.S. Active Aircraft	County Market Share
1990	97	NA	NA
1991	87	NA	NA
1992	96	NA	NA
1993	102	177,719	0.0574%
1994	104	172,936	0.0601%
1995	106	188,089	0.0564%
1996	104	191,129	0.0544%
1997	107	192,414	0.0556%
1998	114	204,710	0.0557%
1999	116	219,464	0.0529%
2000	117	217,533	0.0538%
2001	118	211,535	0.0558%
2002	121	211,345	0.0572%
2003	144	209,788	0.0686%
2004	155	219,426	0.0706%
2005	156	224,352	0.0695%
2006	167	226,422	0.0738%
Constant Market Share Projection			
2012	185	250,587	0.0738%
2017	197	267,470	0.0738%
2030	221	299,766	0.0738%

Next, trend line or "time-series" analysis was conducted for the period dating back to 1990. The correlation coefficient, or $r^{2,}$ was 0.857. While not as strong a correlation as preferred, the resulting projection does provide an indication if the historic growth trend continued. This would result in 255 registered aircraft by 2030. The projection is included for comparison on **Exhibit 2L** as well as in **Table 2Q**.

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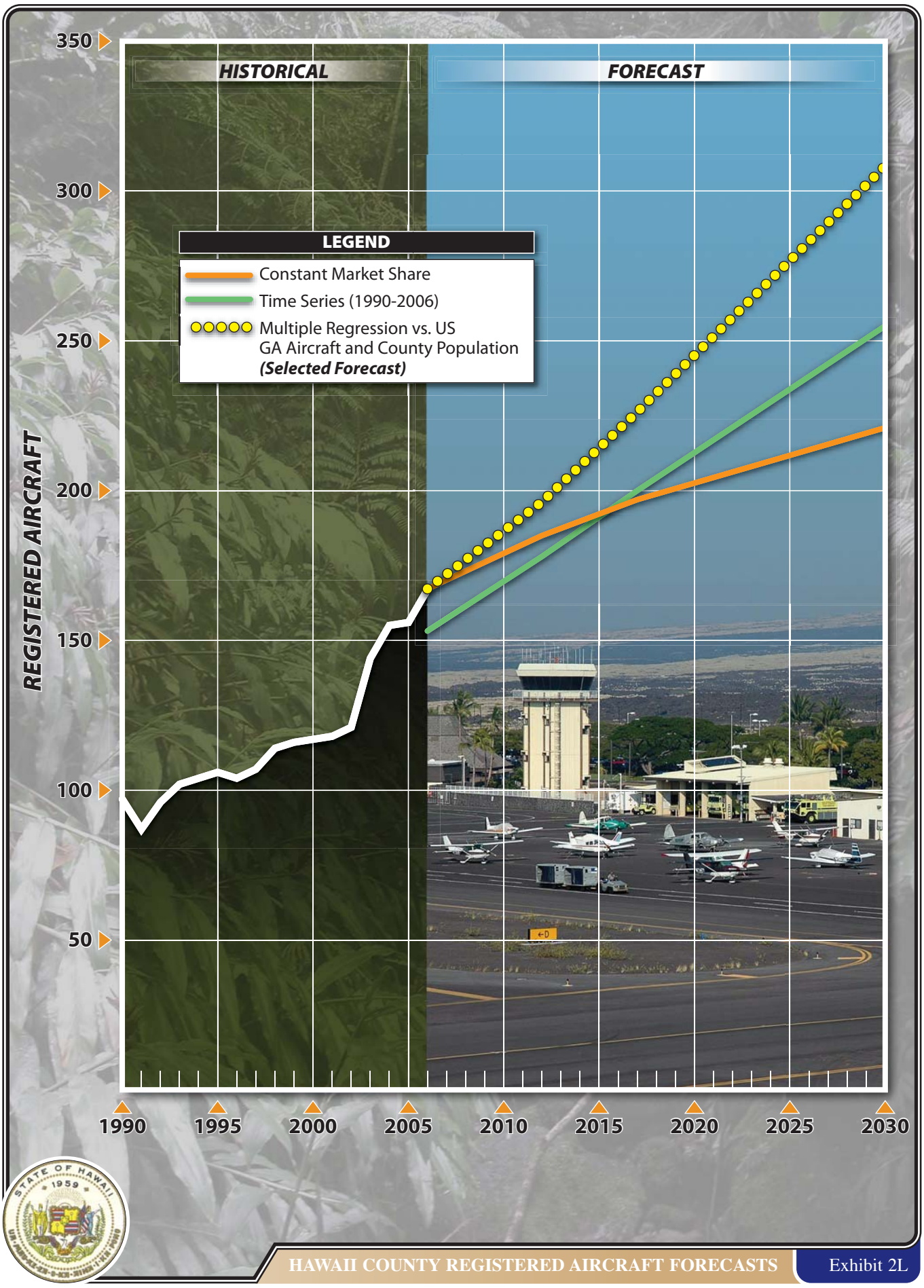


HAWAII COUNTY REGISTERED AIRCRAFT FORECASTS

Exhibit 2L

TABLE 2Q
Registered Aircraft Projections
Hawaii County

	Actual	Forecast		
	2006	**2012**	**2017**	**2030**
Constant Market Share	167	185	197	221
Time Series (1990-2006)	167	178	200	255
Multiple Regression vs. U.S. GA Aircraft & County Population	167	196	226	308
Selected Forecast	**167**	**196**	**226**	**308**

Several regression analyses comparing registered aircraft to Hawaii County's socioeconomic variables were conducted. These included population, employment, the daily visitor census, inflation-adjusted per capita personal income, and de facto population. U.S. active aircraft were also considered in combination with these variables. The best correlation involved a multiple regression of registered aircraft versus U.S. active aircraft and county population which produced an r^2 of 0.944. De facto population was specifically substituted for resident population to examine the effect of the nonresident population on registered aircraft. This resulted in a lower r^2 of 0.915.

Applying the updated population projections from **Table 2B** provided the regression projection that is presented for comparison on the exhibit and table. With 308 registered aircraft in 2030, this results in the highest projection. The regression utilizing de facto population resulted in a very similar projection of 307 by 2030.

The good correlation with U.S. active GA aircraft and population suggests that the county's aircraft ownership is likely to grow faster than the national rate. Substituting the de facto population for resident population in the regression results in essentially the same projection. As a result, the regression forecast was selected as the preferred forecast and is shown in bold on the exhibit and the table.

Based Aircraft Forecast

Having forecast the aircraft ownership demand in Hawaii County, the historic basing at Kona International Airport at Keahole was reviewed to examine the change in market share over the years. **Table 2R** examines the based aircraft at KOA as a percentage of the aircraft registered to owners' addresses on the island.

Based aircraft for 2006 were derived from survey information provided by the Hawaii County General Aviation Council (HCGAC). The historic based aircraft figures at the KOA were taken from airport records when available,

and for other years, from FAA records of counts conducted as part of an annual airport inspection by the FAA or state aviation officials.

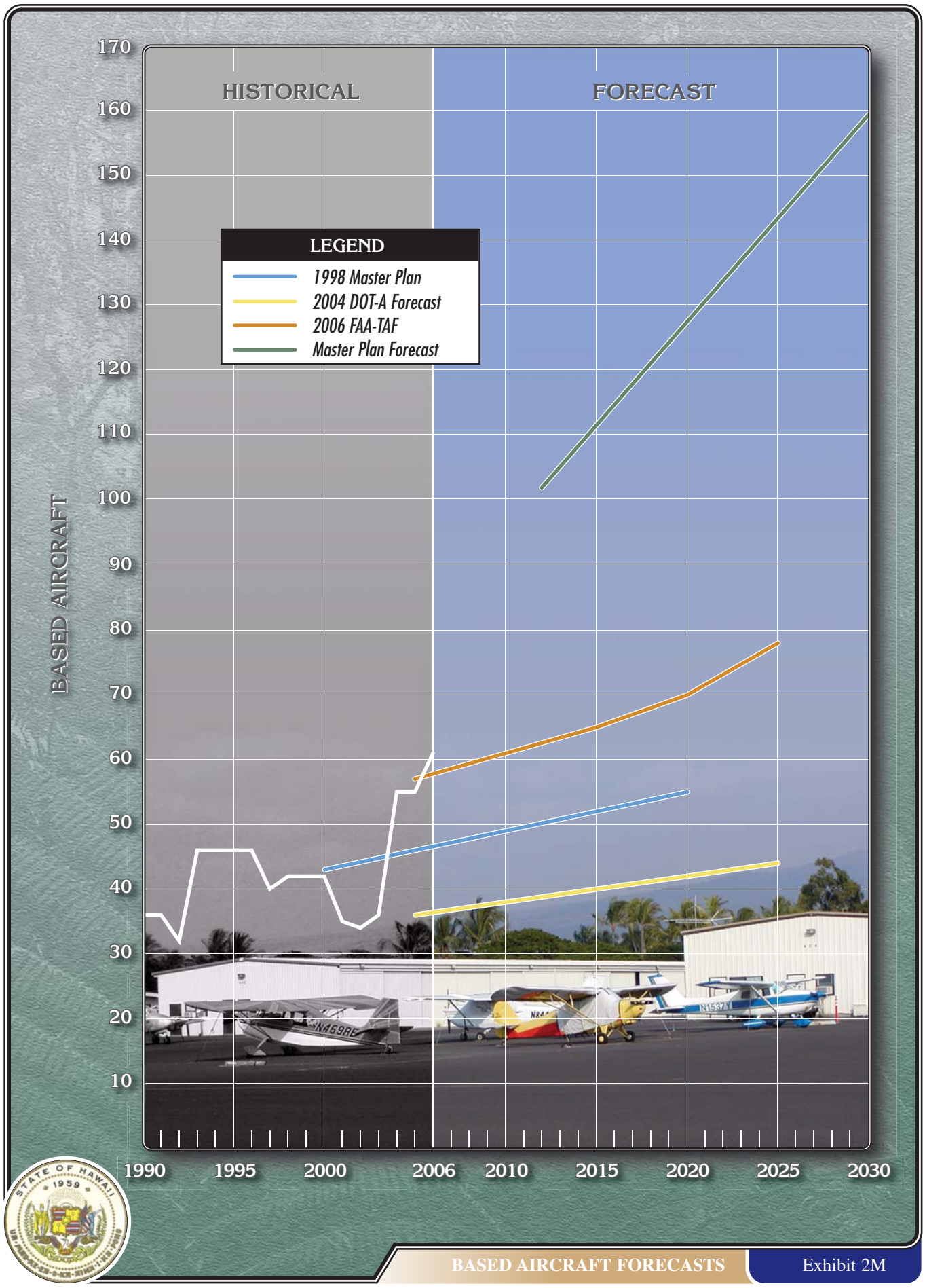
TABLE 2R
Based Aircraft Forecasts
Kona International Airport at Keahole

Year	KOA Based Aircraft	County Registered	KOA Percent
1990	36	97	37.1%
1991	36	87	41.4%
1992	32	96	33.3%
1993	46	102	45.1%
1994	46	104	44.2%
1995	46	106	43.4%
1996	46	104	44.2%
1997	40	107	37.4%
1998	42	114	36.8%
1999	42	116	36.2%
2000	42	117	35.9%
2001	35	118	29.7%
2002	34	121	28.1%
2003	36	144	25.0%
2004	55	155	35.5%
2005	55	156	35.3%
2006	61	167	36.5%
2006 Demand	79	167	47.3%
Master Plan Forecast			
2012	102	196	52.0%
2017	118	226	52.0%
2030	160	308	52.0%

Between 1990 and 2003, KOA based aircraft fluctuated between 32 and 36. More recent FAA records indicate 55 based aircraft in 2004 and 2005. According to information derived from the HCGAC survey, there were 61 based aircraft in 2006. Several operators on the airport have added aircraft in 2007, so based aircraft are anticipated to total at least 67 by the end of the year.

Exhibit 2M graphically depicts the previous forecasts for based aircraft. The current based aircraft already exceeds the 2025 projection of the 2004 DOT-A Forecast as well as those of the *1998 Master Plan* which projected 55 based aircraft by 2020. The FAA TAF forecasts are the highest of the three, and project 78 based aircraft by 2025.

In the 1990s, the based aircraft were equivalent to 35 to 45 percent of the aircraft registered aircraft in the county. Between 2000 and 2003, this percentage declined to 25 percent. The decline in percentage may have been, at least in part, due to the limited hangar space available on the airport. There are local aircraft owners who have indicated they would base an aircraft at the airport if hangars were available. The limited general aviation services available are also a factor.


HISTORICAL
FORECAST
LEGEND
1998 Master Plan
2004 DOT-A Forecast
2006 FAA-TAF
Master Plan Forecast
BASED AIRCRAFT
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
1990
1995
2000
2006
2010
2015
2020
2025
2030

Although the current based aircraft level is growing, the lack of hangars and other services is still constraining the based aircraft at KOA. The HCGAC estimates there would be at least 20 additional aircraft based at the airport if sufficient hangars were available.

In addition, there are several general aviation businesses that are expected to expand their fleets at KOA within the next few years. Flight schools at the airport are growing as are the charter and tour flights. One local operator is examining the potential for establishing an airline-oriented flight school at the airport, taking advantage of the superb climate and weather conditions. This alone could eventually result in up to 48 additional based aircraft.

For planning purposes, it is assumed that the airport's general aviation facilities can be developed in a manner that will allow it to serve its demand and maintain a larger portion of the market share based primarily upon convenience and airfield capabilities.

Table 2R depicts the forecast based upon this premise. Considering the underserved demand, KOA's based aircraft as a percentage of county registrations should currently be at least 47 percent. With the west coast of the Big Island growing at a faster rate than the rest of the County, and the planned additions of aircraft expected at KOA, this share was projected to continue to increase to 52 percent. This would result in a based aircraft forecast of 160 in 2030.

As is evident from **Exhibit 2M**, the updated forecast is significantly higher than previous forecasts, all of which did not fully take into account the affect that the lack of hangar space and general aviation services has had on aircraft basing in the past.

Based Aircraft Fleet Mix

The based aircraft fleet mix at Kona International Airport at Keahole, as shown on **Table 2S**, was compared to the existing and forecast U.S. general aviation fleet mix trends as presented in FAA *Aerospace Forecasts Fiscal Years 2007-2020*. The FAA expects business jets will continue to be the fastest growing general aviation aircraft type in the future. The number of business jets in the industry fleet is expected to double in the next twelve years.

Single-engine piston aircraft (including sport aviation and experimental aircraft), helicopter, and turboprop aircraft are expected to grow at slower rates. The number of multi-engine piston aircraft in the U.S. will actually decline slightly as older aircraft are retired, according to the FAA forecasts.

GENERAL AVIATION OPERATIONS

General aviation operations are classified by the airport traffic control tower (ATCT) as either local or itinerant. A local operation is a take-off or landing performed by an aircraft that operates

within sight of the airport, or which executes simulated approaches or touch-and-go operations at the airport. Itinerant operations are those performed by aircraft with a specific origin or destination away from the airport. Generally, local operations are characterized by training operations. Typically, itinerant operations increase with business and commercial use, since business aircraft are operated on a higher frequency.

TABLE 2S
Based Aircraft Mix Forecast
Kona International Airport at Keahole

	Current		2012		2017		2030	
	Number	%	Number	%	Number	%	Number	%
KOA Based Aircraft								
Single Engine Piston	39	63.9%	65	63.7%	74	62.7%	99	61.9%
Multi-Engine Piston	6	9.8%	7	6.9%	7	5.9%	7	4.4%
Turboprop	4	6.6%	9	8.8%	11	9.3%	14	8.8%
Jet	1	1.6%	4	3.9%	7	5.9%	14	8.8%
Rotorcraft	9	14.8%	16	15.7%	19	16.1%	26	16.3%
Other	2	3.3%	1	1.0%		0.0%	0	0.0%
Totals	**61**	**100.0%**	**102**	**100.0%**	**118**	**100.0%**	**160**	**100.0%**
U.S. Active Aircraft (from FAA Aerospace Fiscal Years [2007-2020])								
Single Engine Piston	173,177	76.5%	188,737	75.3%	199,099	74.4%	214,562	71.6%
Multi-Engine Piston	19,364	8.6%	19,101	7.6%	18,916	7.1%	18,444	6.2%
Turboprop	8,026	3.5%	8,352	3.3%	8,605	3.2%	9,301	3.1%
Jet	10,032	4.4%	15,304	6.1%	19,881	7.4%	32,393	10.8%
Rotorcraft	9,232	4.1%	12,308	4.9%	14,272	5.3%	18,551	6.2%
Other	6,592	2.9%	6,785	2.7%	6,698	2.5%	6,515	2.2%
Totals	**226,423**	**100.0%**	**250,587**	**100.0%**	**267,471**	**100.0%**	**299,766**	**100.0%**

Note: Experimental and sport aircraft are included under single engine piston.

Itinerant Operations

Table 2T depicts general aviation itinerant operations, as counted by the ATCT at Kona International Airport at Keahole since 1990. Between 1990 and 2002, itinerant GA operations more than doubled from 9,563 to 21,170. Since that time, traffic has declined to 18,340 operations in 2006.

KOA's market share as a percentage of GA itinerant operations at towered airports across the country steadily rose from 1990 (0.041 percent) through 2005 (0.102 percent). The market share declined in 2006 to 0.098 percent.

In *FAA Aerospace Forecasts Fiscal Years 2007-2020*, the FAA projects itinerant general aviation operations at towered airports. **Table 2T** presents this forecast as well as a projection for KOA based upon maintaining its recent share of the itinerant operations market.

The table also examines the relationship of annual operations to based aircraft. Operations per based aircraft grew from a low of 203 in 1993 to a high of 623 in 2002. By 2006, the ratio had declined to 301. The sharp increases in the price of fuel affected the decline in 2006. In the first half of 2007, itinerant operations were comparable to for the same period in 2006.

TABLE 2T
General Aviation Itinerant Operations Forecast
Kona International Airport at Keahole

Year	KOA Itinerant Operations	U.S. ATCT GA Itinerant (millions)	KOA Market Share %	KOA Based Aircraft	Itinerant Ops Per Aircraft
1990	9,563	23.10	0.041%	36	266
1991	9,972	22.20	0.045%	36	277
1992	8,857	22.10	0.040%	32	277
1993	9,336	21.14	0.044%	46	203
1994	9,757	21.06	0.046%	46	212
1995	9,556	20.86	0.046%	46	208
1996	9,485	20.82	0.046%	46	206
1997	13,250	21.70	0.061%	40	331
1998	13,987	22.09	0.063%	42	333
1999	14,853	23.02	0.064%	42	354
2000	18,011	22.84	0.079%	42	429
2001	19,570	21.43	0.091%	35	558
2002	21,170	21.45	0.099%	34	623
2003	19,894	20.23	0.098%	36	553
2004	20,122	20.00	0.101%	55	366
2005	19,737	19.32	0.102%	55	359
2006	18,340	18.75	0.098%	61	301
Constant Market Share Projection					
2012	21,840	21.84	0.100%	102	214
2017	24,150	24.15	0.100%	118	205
2030	29,600	29.60	0.100%	160	185
Operations Per Based Aircraft Projection					
2012	30,600	21.84	0.140%	102	300
2017	35,400	24.15	0.147%	118	300
2030	48,000	29.60	0.162%	160	300
FAA-TAF Projection					
2012	21,586	21.84	0.099%	62	348
2017	23,662	24.15	0.098%	67	353
2030	28,476	29.60	0.096%	86	331
Master Plan Forecast					
2012	31,000	21.84	0.142%	102	304
2017	36,000	24.15	0.149%	118	305
2030	48,000	29.60	0.162%	160	300

Thus, the ratio can be expected to maintain at least its current level. With the forecast increase in based aircraft, however, the operations ratio is not likely to increase back to its 2002 levels. The second projection in **Table 2T** reflects the itinerant operational levels that could be expected if the operations per based aircraft ratio were to average 300 in the future.

Based upon the historic growth, it is likely that the KOA market share will continue to grow. Thus, the constant market share would be a low range forecast. For planning purposes, a projection maintaining the current level of itinerant operations per based aircraft ratio was selected as most representative of the potential growth.

The resulting forecast is included at the bottom of **Table 2T**.

As can be seen from the table, the Master Plan forecast is significantly higher than the FAA TAF. This reflects the higher forecast for based aircraft.

Local Operations

A similar methodology was utilized to forecast local operations. **Table 2U** depicts the history of local operations at Kona International Airport at Keahole and examines its historic market share of GA local operations at towered airports in the United States. Local operations grew nearly ten-fold between 1990 (7,941) and 2005 (73,055). In 2006, traffic dropped off to 54,650, but is up nine percent in the first half of 2007.

TABLE 2U
General Aviation Local Operations Forecast
Kona International Airport at Keahole

Year	KOA Local Operations	U.S. ATCT GA Local (millions)	KOA Market Share %	KOA Based Aircraft	Local Ops Per Aircraft
1990	7,941	17.10	0.046%	36	221
1991	5,336	16.60	0.032%	36	148
1992	12,306	16.31	0.075%	32	385
1993	8,990	15.46	0.058%	46	195
1994	11,412	15.19	0.075%	46	248
1995	11,888	15.07	0.079%	46	258
1996	12,106	14.48	0.084%	46	263
1997	24,299	15.16	0.160%	40	607
1998	23,150	15.96	0.145%	42	551
1999	22,666	16.98	0.133%	42	540
2000	29,010	17.03	0.170%	42	691
2001	35,544	16.19	0.220%	35	1,016
2002	45,310	16.17	0.280%	34	1,333
2003	46,904	15.29	0.307%	36	1,303
2004	60,105	14.96	0.402%	55	1,093
2005	73,055	15.85	0.461%	55	1,328
2006	54,650	14.38	0.380%	61	896
Constant Market Share Projection					
2012	74,475	16.55	0.450%	102	730
2017	79,740	17.72	0.450%	118	676
2030	89,550	19.90	0.450%	160	560
Operations Per Based Aircraft Projection					
2012	91,800	16.55	0.555%	102	900
2017	106,200	17.72	0.599%	118	900
2030	144,000	19.90	0.720%	160	900
FAA-TAF Projection					
2012	71,849	16.55	0.434%	62	1,159
2017	83,292	17.72	0.470%	67	1,243
2030	122,316	19.90	0.615%	86	1,422
Master Plan Forecast					
2012	89,000	16.55	0.538%	102	873
2017	101,000	17.72	0.570%	118	856
2030	134,000	19.90	0.673%	160	838

The market share has grown significantly as well, from around 0.046 percent to 0.461 percent, although the share in 2006 declined to 0.380. **Table 2U** presents a market share projection based upon carrying forward a constant share of 0.450 percent.

Local operations per based aircraft have also increased over the same period from 221 in 1990 to 1,333 in 2002. The ratio in 2006 was 896. The second projection in **Table 2U** maintains a similar ratio of 900 local operations per based aircraft into the future.

As with the itinerant forecast, the local operations market share is likely to continue to increase in the future. At the same time, however, local operations per based aircraft are more likely to decline slowly as based aircraft increase. Thus, a declining ratio forecast is recommended for the purposes of this master plan and is depicted at the bottom of **Table 2U**.

The FAA TAF forecasts are also presented on **Table 2U**. As with itinerant operations, the master plan forecast is significantly higher reflecting the higher based aircraft forecast based upon the assumption of meeting currently underserved demand for hangars and other general aviation services.

OTHER AIR TAXI

Air taxi operations as reported by the ATCT include commuter passenger, commuter cargo, as well as for-hire general aviation operations. Some operations by aircraft operated under fractional ownership programs are also counted as air taxi operations. Since the airline and cargo operations have been forecast, this section reviews the growth potential for the "other air taxi" operations. At KOA this includes interisland charters and tour operators as well.

Table 2V presents the other air taxi operations for the past three years. These operations have averaged approximately 50 percent of the itinerant general aviation operations. Because of the relationship to general aviation activity, other air taxi operations were projected to increase in line with that of general aviation itinerant operations. The resulting forecast is also presented on **Table 2V**.

TABLE 2V
Other Air Taxi Operations
Kona International Airport at Keahole

Year	Other Air Taxi
Actual	
2004	11,798
2005	8,419
2006	9,116
Forecast	
2012	15,500
2017	18,000
2030	24,000

MILITARY

In spite of the fact that there are no military units based there, Kona International Airport at Keahole has a significant amount of military activity. **Table 2W** provides the history of military operations at KOA since 1990. The military operations at KOA primarily consist of training operations

by aircraft from other military bases in Hawaii and the Pacific Ocean.

Unless there is an anticipated mission change in the area, military operations are typically forecast to remain at current levels. That was the case with the previous forecasts for KOA. The *1998 Master Plan* forecast military activity at KOA to maintain a level of 12,700 annual operations through 2020. The 2004 DOT-A Forecast projected military activity at 17,600 annual operations through 2025. In 2006, there were 19,304 military operations at the airport. This is comparable to the current FAA TAF projection of 19,256 through 2025.

TABLE 2W
Military Operations
Kona International Airport at Keahole

Year	Itinerant	Local	Total
1990	1,636	2,500	4,136
1991	1,350	1,978	3,328
1992	1,564	2,642	4,206
1993	1,944	3,584	5,528
1994	1,685	4,373	6,058
1995	2,104	6,997	9,101
1996	2,368	7,315	9,683
1997	1,999	5,394	7,393
1998	2,084	5,570	7,654
1999	2,359	6,648	9,007
2000	2,856	9,069	11,925
2001	3,176	11,414	14,590
2002	4,203	13,411	17,614
2003	4,227	11,344	15,571
2004	3,070	11,571	14,641
2005	3,686	13,456	17,142
2006	3,453	15,851	19,304
FORECAST			
2012	4,000	26,000	30,000
2017	4,000	26,000	30,000
2030	4,000	26,000	30,000

A mission change that was fully implemented in the first half of 2006 was the arrival of eight C-17 Globemasters to be stationed at Hickam Air Force Base in Honolulu. The C-17s use KOA regularly as part of their training activities. This contributed to the increase in military traffic over the last three years at KOA.

There are two changes expected in the near future that will affect military activity at KOA. The airport is the preferred location for an auxiliary training runway at KOA to be used by the C-17 aircraft to practice short field landings.

Based upon information provided by the 15th Airlift Wing at Hickam Air Force Base, annual military operations can be expected to increase by approximately 10,000 after the Kona auxiliary training runway (KATR) is constructed.

In another expected change, the Hawaii Air National Guard is expected to undergo an aircraft conversion from the F-15 to the F-22. This change is not expected to significantly change operations at KOA. The forecasts presented in **Table 2W** reflect the planned mission changes.

ANNUAL INSTRUMENT APPROACHES (AIAs)

Forecasts of annual instrument approaches provide guidance in determining an airport's requirements for navigational aid facilities. An instrument approach as defined by FAA is "an approach to an airport with intent to land by an aircraft in accordance with an Instrument Flight Rule (IFR) flight plan, when visibility is less than

three miles and/or when the ceiling is at or below the minimum initial approach altitude."

Data on instrument approaches to Kona International Airport at Keahole since 1995 were examined. True instrument weather conditions are not a common occurrence at KOA, with an average of just 64 AIAs over the 12 years examined. In fact, there have been several years when no AIAs were reported. The highest AIAs reported occurred in 1996 with 302. This included 265 by commercial aircraft, 19 by general aviation, and 18 by military. For commercial operations, the AIAs in that year were just 1.2 percent of the commercial landings. The AIA percentage for military activity was 1.5 percent of itinerant military landings. The AIAs for general aviation were just 0.4 percent of itinerant landings. These percentages were applied to the forecast operations to estimate the future AIA potential at KOA. **Exhibit 2N** includes the AIA forecast for KOA.

SUMMARY

This chapter has outlined the various activity levels that might reasonably be anticipated over the planning period. **Exhibit 2N** is a summary of the aviation forecasts prepared in this chapter. Actual activity is included for 2006, which was the base year for these forecasts.

Airline passenger activity has good potential for growth, especially for overseas traffic. The increase in direct overseas traffic will have a dampening effect on interisland passenger figures. Regional jets have recently been introduced on interisland routes and can be expected to affect the future mix of aircraft on these routes.

Based aircraft at KOA are expected to see strong growth over the planning period, but the extent of that growth will be dependent upon the availability of services and facilities (especially hangars) in the future. Business and corporate jet traffic will be a contributor to that growth.

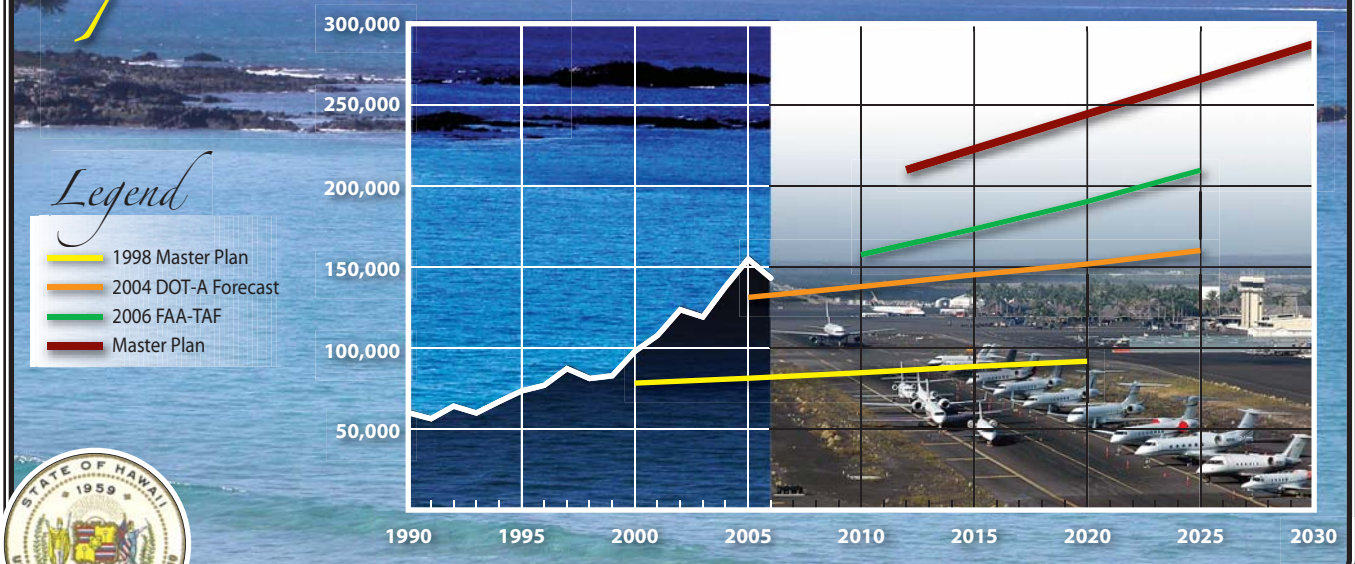
Air cargo activity can be expected to grow in volume. Other air taxi operations can be expected to continue to grow with increased interisland charter and tour flights. Military activity is expected to continue to be a factor in the mix of traffic at Kona International Airport at Keahole as well.

The next step in the planning process is to assess the capabilities of the existing facilities to determine what upgrades may be necessary to meet future demands. The forecasts developed here will be taken forward in the next chapter as planning horizon activity levels that will serve as milestones or activity benchmarks in evaluating facility requirements. Peak activity characteristics will also be determined for the various activity levels for use in determining facility needs.

Forecast Summary

	ACTUAL	FORECAST		
	2006	2012	2017	2030
ANNUAL OPERATIONS				
General Aviation				
Local	*54,650*	*89,000*	*101,000*	*134,000*
Itinerant	*18,340*	*31,000*	*36,000*	*48,000*
Total General Aviation	72,990	120,000	137,000	182,000
Airline	37,436	39,800	41,400	45,800
Air Cargo	4,372	4,700	5,100	6,100
Other Air Taxi	9,116	15,500	18,000	24,000
Military	19,304	30,000	30,000	30,000
Total Annual Operations	**143,218**	**210,000**	**231,500**	**287,900**
AIRLINE PASSENGERS				
Overseas				
U.S. Mainland	*941,260*	*1,160,000*	*1,348,000*	*1,853,000*
International	*76,769*	*121,000*	*173,000*	*302,000*
Transits	*30,864*	*38,000*	*45,000*	*64,000*
Total Overseas Passengers	1,048,893	1,319,000	1,566,000	2,219,000
Interisland	1,984,319	2,153,000	2,253,000	2,502,000
Total Airline Passengers	**3,033,212**	**3,472,000**	**3,819,000**	**4,721,000**
AIR CARGO (total tons)				
Air Freight	23,878	28,000	32,400	44,500
Air Mail	8,512	11,000	12,600	17,500
Total Air Cargo	**32,390**	**39,000**	**45,000**	**62,000**
BASED AIRCRAFT				
Single-Engine Piston	39	65	74	99
Multi-Engine Piston	6	7	7	7
Turboprop	4	9	11	14
Jet	1	4	7	14
Helicopter	9	16	19	26
Other	2	1	0	0
Total Based Aircraft	**61**	**102**	**118**	**160**
INSTRUMENT APPROACHES (AIA's)	**35**	**490**	**477**	**567**

Operations Forecast



Chapter Three

FACILITY REQUIREMENTS

FACILITY REQUIREMENTS

To properly plan for the future at Kona International Airport at Keahole (KOA), it is necessary to translate forecast aviation demand into the specific types and quantities of facilities that can adequately serve projected demand levels. This chapter uses the results of the forecasts prepared in Chapter Two, as well as established planning criteria, to determine the airfield (i.e., runways, taxiways, navigational aids, marking and lighting, and support facilities), and landside (i.e., terminal building, cargo buildings, hangars, aircraft parking apron, fueling, vehicle parking and access) facility requirements.

The objective of this effort is to identify, in general terms, the adequacy of the existing airport facilities, outline what new facilities may be needed, and when they may be needed to accommodate forecast demands. Having established these facility

requirements, alternatives for providing the facilities will be evaluated in Chapter Four to determine the most reasonable and feasible means for implementation.

PLANNING HORIZONS

Cost-effective, safe, efficient, and orderly development of an airport should rely more upon actual demand than a time-based forecast figure. In order to develop a master plan that is demand-based rather than time-based, a series of planning horizon milestones have been established that take into con-

sideration the reasonable range of aviation demand projections.

It is important to consider that over time, the actual activity at the airport may be higher or lower than what the annualized forecast portrays. By planning according to activity milestones, the resultant plan can accommodate unexpected shifts or changes in the area's aviation demand. It is important to plan for these milestones so that airport officials can respond to unexpected changes in a timely fashion. As a result, these milestones provide flexibility, while potentially extending this plan's useful life if aviation trends slow over the period.

The most important reason for utilizing milestones is to allow the airport to develop facilities according to need generated by actual demand levels. The demand-based schedule provides flexibility in development, as the schedule can be slowed or expedited according to actual demand at any given time over the planning period. The resultant plan provides airport officials with a financially responsible and need-based program. **Table 3A** presents the planning horizon milestones for each activity demand category.

TABLE 3A
Aviation Demand Planning Horizons
Kona International Airport at Keahole

	Base Year (2006)	Short Term	Intermediate Term	Long Term
Annual Passengers	3,033,212	3,472,000	3,819,000	4,721,000
Annual Air Cargo (Tons)	32,390	39,000	45,000	62,000
Based GA Aircraft	61	102	118	160
Annual Operations				
Airline	37,436	39,800	41,400	45,800
Air Cargo	4,372	4,700	5,100	6,100
Other Air Taxi	9,116	15,500	18,000	24,000
GA Itinerant	18,340	31,000	36,000	48,000
GA Local	54,650	89,000	101,000	134,000
Military	19,304	30,000	30,000	30,000
Total Operations	143,218	210,000	231,500	287,900

ATCT COUNT ADJUSTMENT

The planning horizon operational activity levels in **Table 3A** represent the airport's aircraft operations as counted by the airport traffic control tower (ATCT). They will remain the milestones for monitoring growth and activity because the tower count is readily available.

The ATCT at KOA is not a 24-hour tower, so the count is not all-inclusive of operations at the airport. Certain elements of the planning analyses, however, require that all the airport activity be considered. For these evaluations, it is necessary to estimate and adjust for operations that occur when the tower is closed.

The ATCT hours are from 6:00 a.m. to 10:00 p.m. daily. The passenger airline and air cargo operations were derived from the landing reports of the airlines and do not need to be adjusted. The other operations were adjusted by three percent to account for operations that occur overnight while the tower is closed. This is based upon estimates from ATCT personnel. **Table 3B** outlines the adjusted operations.

TABLE 3B
Adjusted Aircraft Operations
Kona International Airport at Keahole

	Base Year (2006)	Short Term	Intermediate Term	Long Term
Airline	37,436	39,800	41,400	45,800
Air Cargo	4,372	4,700	5,100	6,100
Other Air Taxi	9,424	16,000	18,500	24,700
General Aviation				
Itinerant	18,890	31,900	37,100	49,400
Local	56,290	91,700	104,000	138,000
Military	19,883	30,000	30,000	30,000
Total Adjusted Operations	146,295	214,100	236,100	294,000

Aircraft operations adjusted to account for those that occur overnight when ATCT is not in operation.

PEAKING CHARACTERISTICS

Airport capacity and facility needs analyses typically relate to the level of activity during a peak or design period. The periods used in developing the capacity analyses and facility requirements in this study are as follows:

- **Peak Month** - The calendar month in which traffic activity is highest.

- **Average Day Peak Month (ADPM)** - The average day in the peak month. This indicator is easily derived by dividing the peak month activity by the number of days in the month.

- **Design Day** - The busy day of a typical week in the peak month. This descriptor is used by the Hawaii Department of Transportation Airports Division (DOT-A) for terminal facilities planning. It is also used to determine general aviation transient ramp parking requirements.

- **Design Hour** - The busiest hour within the design day or busy day.

It is important to note that only the peak month is an absolute peak within a given year. All other peak periods will be exceeded at various times during the year. However, they do represent reasonable planning standards that can be applied without overbuilding or being too restrictive.

Airline Peak Periods

The summer months are typically the busiest time for airline activity at Hawaii airports, and Kona International Airport at Keahole is no exception. Each year, DOT-A prepares a snapshot of peaking activity for each of the five major commercial service airports in the state. Titled *Gate Utilization Survey*, the report provides a look at overseas and interisland aircraft and passenger activity on a typical busy day during the peak season. The day used in this analysis was August 18, 2006. The following discussion of peaking factors for passengers and airline operations is primarily based upon this survey.

Peak Passenger Activity

The peak month overseas passenger demand at KOA is typically 11.0 percent of the annual passengers. The peak month for interisland traffic averages 9.6 percent of the annual interisland passengers. The DOT-A has established the design day as 1.12 times the ADPM as its statistical reference for facilities planning.

Hourly passenger activity is examined as a percentage of the daily activity. This can be greatly affected by the number of flights and the aircraft seats available during the design hour. According to the *Gate Utilization Survey*, the design hour for arriving (deplaning) passengers began at 10:34 a.m. and accounted for 19.6 percent of the daily arrivals. The design hour for departing (enplaning) passengers began at 12:28 p.m. and accounted for 16.7 percent of the daily departures. **Table 3C** outlines the peak activity passengers forecast for each of the planning horizons.

Peak Airline Operations

As with passengers, airline operations also are highest during the summer months. The peak month is typically 9.7 percent of the annual airline operations.

On August 18, 2006, KOA had 58 daily flights, spread throughout the day. These included 48 interisland flights and 12 overseas flights (one of which was an international arrival). The peak for departures was eight beginning at 12:28 p.m. The peak for arrivals was seven, beginning at 10:34 a.m. The peak hour for total operations (arrivals and departures) was 12 and occurred twice in the day; the first beginning at 11:48 a.m., and the second at 4:40 p.m. **Table 3D** outlines the peak airline operations forecast for each of the planning horizons.

TABLE 3C
Peak Passenger Activity Characteristics
Kona International Airport at Keahole

	Base Year (2006)	Short Term	Intermediate Term	Long Term
ANNUAL				
Total Passengers (includes transits)	3,033,212	3,472,000	3,819,000	4,721,000
Enplaned Passengers (Departures)				
Overseas	497,060	628,000	753,000	1,077,000
Interisland	1,025,378	1,098,000	1,138,000	1,251,000
Total Enplaned	1,522,438	1,726,000	1,891,000	2,328,000
Deplaned Passengers (Arrivals)				
Overseas (includes international)	520,969	653,000	768,000	1,078,000
Interisland	958,941	1,055,000	1,115,000	1,251,000
Total Deplaned	1,479,910	1,708,000	1,883,000	2,329,000
International Arrivals	69,650	91,000	108,000	151,000
PEAK MONTH				
Enplaned Passengers (Departures)				
Overseas	59,828	69,100	82,800	118,600
Interisland	98,094	105,400	109,200	120,100
Total Enplaned	157,922	174,500	192,000	238,700
Deplaned Passengers (Arrivals)				
Overseas	61,750	71,800	84,500	118,500
Interisland	92,739	101,300	107,000	120,100
Total Deplaned	154,489	173,100	191,500	238,600
International Arrivals	7,303	9,100	10,800	15,100
DESIGN DAY				
Enplaned Passengers (Departures)				
Overseas	2,162	2,497	2,991	4,285
Interisland	3,544	3,808	3,945	4,339
Total Enplaned	5,706	6,305	6,937	8,314
Deplaned Passengers (Arrivals)				
Overseas	2,231	2,594	3,053	4,281
Interisland	3,351	3,660	3,866	4,339
Total Deplaned	5,582	6,254	6,919	8,620
International Arrivals	264	329	390	546
DESIGN HOUR				
Enplaned Passengers (Departures)				
Overseas	614	709	850	1,217
Interisland	439	472	489	538
Total Enplaned	953	1,053	1,158	1,440
Deplaned Passengers (Arrivals)				
Overseas	738	859	1,011	1,417
Interisland	486	531	561	629
Total Deplaned	1,094	1,226	1,356	1,690
International Arrivals	240	329	350	450

TABLE 3D
Airline Operations Peak Activity Forecasts
Kona International Airport at Keahole

	Base Year (2006)	Short Term	Intermediate Term	Long Term
ANNUAL				
Operations				
Overseas	6,770	8,000	9,000	11,900
Interisland	30,666	31,800	32,400	33,900
Total Operations	37,436	39,800	41,400	45,800
Departures				
Overseas	3,385	4,000	4,500	5,950
Interisland	15,333	15,900	16,200	16,950
Total Departures	18,718	19,900	20,700	22,900
PEAK MONTH				
Operations				
Overseas	704	832	936	1,238
Interisland	2,924	3,022	3,078	3,222
Total Operations	3,628	3,854	4,014	4,460
Departures				
Overseas	352	416	468	619
Interisland	1,462	1,511	1,540	1,612
Total Departures	1,814	1,888	2,008	2,231
DESIGN DAY				
Operations				
Overseas	24	30	32	44
Interisland	98	102	104	110
Total Operations	122	132	136	154
Departures				
Overseas	12	15	16	22
Interisland	49	51	52	55
Total Departures	61	66	68	77
DESIGN HOUR				
Departures				
Overseas	3	4	4	6
Interisland	5	5	5	6
Total Departures	8	9	9	10
Arrivals				
Overseas	4	5	5	7
Interisland	5	5	5	6
Total Arrivals	7	8	8	9
Combined Operations				
Arrivals/Departures	12	14	14	16

Itinerant General Aviation/ Other Air Taxi Peaks

The peak month for general aviation and other air taxi itinerant operations at KOA is typically March or August. In the five years from 2002 through 2006, the peak month averaged 9.9 percent of the annual general aviation/air taxi itinerant operations.

Daily operational counts from the ATCT were utilized to determine a design day factor for itinerant general aviation/other air taxi activity. During the peak month in 2006, the peak day of each week averaged 18.7 percent of the operations for the week. This equates to a design day factor of 1.31 times higher than the average day of the peak month.

The design hour for itinerant operations was determined from ATCT hourly counts during a week in the middle of August 2006. The design hour averages 15 percent of the daily itinerant operations. This percentage is expected to slowly decrease as operations increase and peaks spread. **Table 3E** summarizes the peak activity projections for each planning horizon.

TABLE 3E
Air Taxi and Itinerant General Aviation Operational Peaks
Kona International Airport at Keahole

	Base Year (2006)	Short Term	Intermediate Term	Long Term
AIR TAXI				
Annual	9,116	15,500	18,000	24,000
Peak Month	1,003	1,705	1,980	2,640
Design Day	42	72	84	112
Design Hour	8	14	17	22
ITINERANT GENERAL AVIATION				
Annual	18,340	31,000	36,000	48,000
Peak Month	1,816	3,069	3,564	4,752
Design Day	77	130	151	201
Design Hour	12	19	22	29

Total Operations Peak Periods

The peaking characteristics of total aircraft operations are utilized in examining the operational capacity of the airfield. The peak month for total operations averaged 9.7 percent over the five years between 2002 and 2006. The peak month is typically during the summer months.

Design hour operations were determined from the ATCT hourly data to average 13.3 percent of the daily operations. This can be expected to decline slightly as activity increases. **Table 3F** also summarizes the peak activity projections for total operations over the planning horizons.

TABLE 3F
Total Operations Peak
Kona International Airport at Keahole

	Base Year (2006)	Short Term	Intermediate Term	Long Term
Annual	143,218	210,000	231,500	287,900
Peak Month	14,379	20,400	22,500	27,900
ADPM*	464	658	726	900
Design Hour	62	86	94	115

*Average Day of the Peak Month

AIRFIELD CAPACITY

Airfield capacity is measured in a variety of different ways. The **hourly capacity** measures the maximum number of aircraft operations that can take place in an hour. The **annual service volume (ASV)** is an annual level of service that may be used to define airfield capacity needs. **Aircraft delay** is the total delay incurred by aircraft using the airfield during a given timeframe. FAA Advisory Circular 150/5060-5, *Airport Capacity and Delay*, provides a methodology for examining the operational capacity of an airfield for planning purposes. This analysis takes into account specific factors about the airfield. These various factors are depicted in **Exhibit 3A**. The following describes the input factors as they relate to Kona International Airport at Keahole:

- **Runway Configuration** – KOA operates in a single runway configuration (Runway 17-35) with a full-length parallel taxiway. The instrument landing system (ILS) on Runway 17 provides instrument approach capabilities down to a half-mile visibility. Runway 35 has minimums down to one-mile visibility.

- **Runway Use** – Runway 17 is used for 70 percent of the airport's operations.

- **Exit Taxiways** - Based upon mix, taxiways located between 3,500 and 6,500 feet from the landing threshold count in the exit rating for each runway. There are currently two exits available within this range for each runway. Therefore, the exit rating is two in each direction.

- **Weather Conditions** – Visual meteorological conditions (VMC) are defined as conditions when cloud ceilings are 1,000 feet or above and/or visibility is at least three statute miles. Instrument meteorological conditions (IMC) occur when cloud ceilings are between 500 and 1,000 feet and visibility is between one and three statute miles. Poor visibility conditions (PVC) apply for minimums below 500 feet and one mile. Weather data indicates that KOA is in VMC over 99 percent of the

AIRFIELD LAYOUT

Runway Configuration

Runway Use

Number of Exits

WEATHER CONDITIONS

VMC

IMC

PVC

AIRCRAFT MIX

A&B

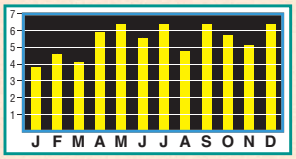
C

D

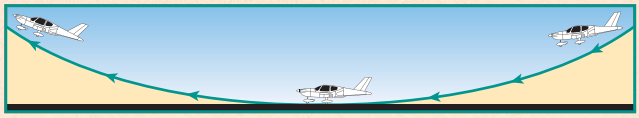
OPERATIONS

Arrivals and Departures

Total Annual Operations



Touch-and-Go Operations



time. The minimal amount of instrument weather makes it almost inconsequential to the capacity analysis.

- **Aircraft Mix** - Descriptions of the classifications and the percentage mix for each planning horizon are presented in **Table 3G**.

- **Percent Arrivals** - Generally follows the typical 50-50 percent split.

- **Touch-and-Go Activity** - Percentages of touch-and-go activity are presented in **Table 3G**.

- **Operational Levels -** Operational planning horizons were outlined in the previous section of this chapter. The peak month averages 9.7 percent of the year. The peak hour averages 13.0 percent of the operations in a day.

TABLE 3G
Aircraft Operational Mix – Capacity Analysis
Kona International Airport at Keahole

Aircraft Classification	Base Year (2006)	Short Term	Intermediate Term	Long Term
VMC				
Classes A & B	57.3%	60.5%	62.3%	61.9%
Class C	36.1%	28.4%	27.3%	27.6%
Class D	6.5%	11.2%	10.4%	10.5%
IMC				
Classes A & B	24.6%	31.0%	25.3%	35.4%
Class C	67.5%	60.3%	63.3%	54.4%
Class D	7.8%	8.7%	11.3%	10.1%
Touch-and-Go's	39.4%	44.0%	44.0%	44.6%

Definitions:
Class A: Small single-engine aircraft with gross weight of 12,500 pounds or less.
Class B: Small twin-engine aircraft with gross weight of 12,500 pounds or less.
Class C: Large aircraft with gross weights over 12,500 pounds up to 300,000 pounds.
Class D: Large aircraft with gross weights over 300,000 pounds.

HOURLY RUNWAY CAPACITY

Based upon the input factors, current and future hourly capacities for the various operational scenarios at KOA were determined. The base year and future hourly capacities are depicted in **Table 3H**. The base year hourly capacity was 71 operations. This capacity is expected to grow slightly as the mix and touch-and-go factors do not change dramatically. This will be reached before the short term planning horizon milestone. The long term design hour operations of 115 will exceed the hourly capacity by 58 percent.

TABLE 3H
Airfield Demand/Capacity Summary
Kona International Airport at Keahole

	PLANNING HORIZON			
	Base Year (2006)	Short Term	Intermediate Term	Long Term
Operational Demand				
Annual (Adjusted)	143,218	214,100	236,100	294,000
Design Hour	62	86	94	115
Capacity				
Annual Service Volume	168,000	179,000	180,000	186,000
Weighted Hourly Capacity	71	72	72	73
Delay				
Per Operation (Minutes)	1.8	9.5	12.8	19.5
Total Annual (Hours)	4,300	33,300	49,200	93,600

ANNUAL SERVICE VOLUME

The weighted hourly capacity is utilized to determine the annual service volume in the following equation:

$$ASV = C \times D \times H$$

C = weighted hourly capacity;

D = ratio of annual demand to the average daily demand during the peak month; and

H = ratio of average daily demand to the design hour demand during the peak month.

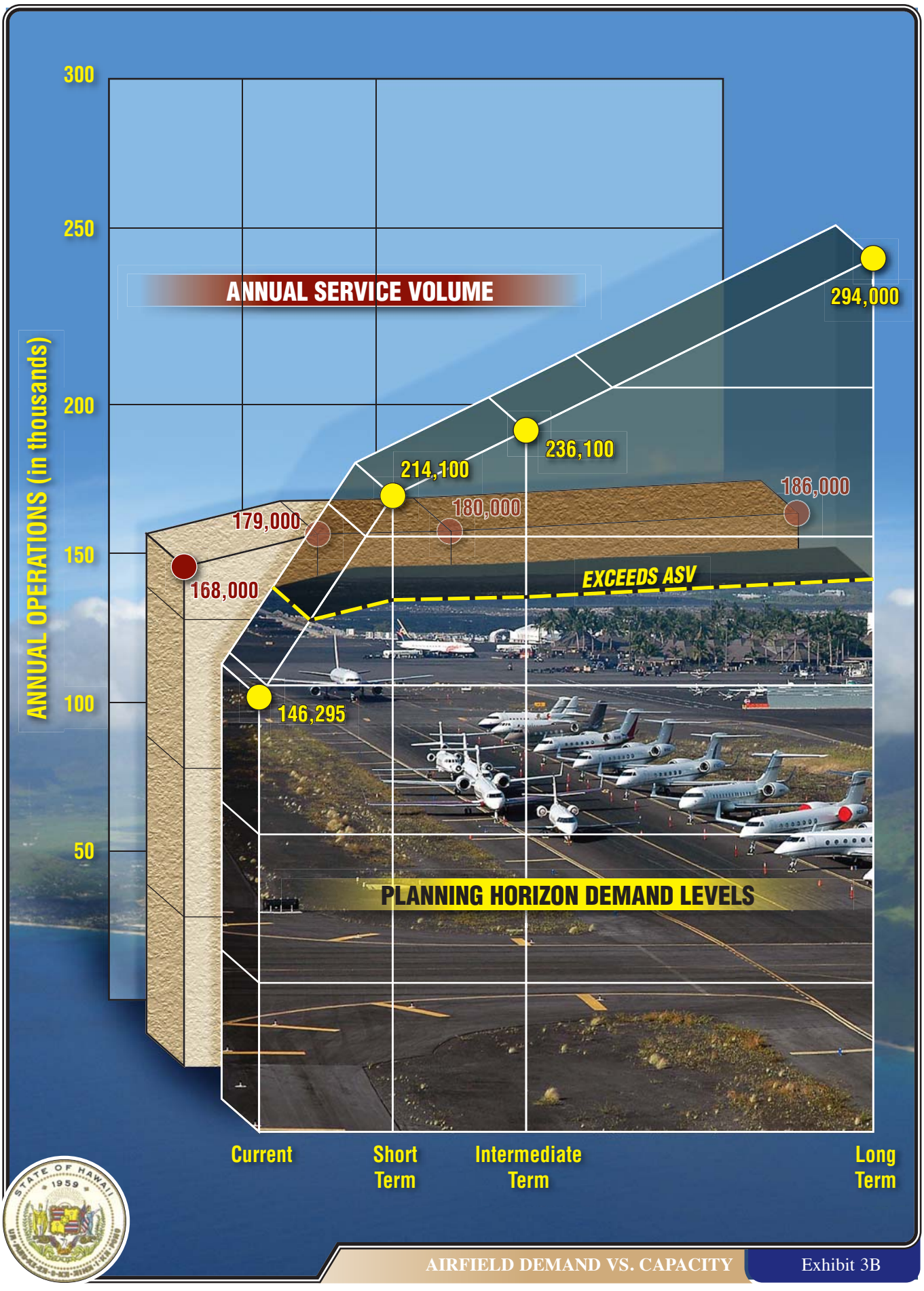
The ratio of annual demand to average daily demand (D) at KOA was determined to remain relatively constant in the future at 320. The ratio of average daily demand to average peak hour demand (H) was determined to be 7.67 in 2006. This ratio will grow to 7.99 over the long term as peaks spread slightly with increased operations.

The 2006 ASV was determined to be 168,000 operations. The changes in the daily and hourly demand ratios result in an increase in the ASV as activity increases. The ASV for the long term was calculated to be 186,000.

Annual operations for the long term planning horizon are 294,000, which would be 158 percent of the airport's ASV. **Table 3H** and **Exhibit 3B** summarize and compare the airport's ASV and projected annual operations over the planning horizons.

AIRCRAFT DELAY

As the number of annual aircraft operations approaches the airfield's capacity, increasing amounts of delay to aircraft operations begin to occur. Delays occur to arriving and departing aircraft in all weather conditions. Arriving aircraft delays result in aircraft holding outside of the airport traffic area. Departing aircraft delays result in aircraft holding at the runway end until released by air traffic control.



AIRFIELD DEMAND VS. CAPACITY

Exhibit 3B

Table 3H summarizes the aircraft delay analysis conducted for Kona International Airport at Keahole. The delay per operation represents an average delay per aircraft. It should be noted that delays of five to ten times the average could be experienced by individual aircraft during peak periods. In the base year of 2006, total annual aircraft delay was 4,300 hours. As an airport's operations increase toward the annual service volume, delay increases exponentially. Analysis of delay factors for the long term planning horizon indicates that annual delay can be expected to exceed 20,000 hours in the short term if capacity improvements are not implemented.

CAPACITY ANALYSIS CONCLUSIONS

Exhibit 3B compares annual service volume to existing and forecast operational levels at KOA. The 2006 operations level equated to 87 percent of the airfield's annual service volume. The ASV will essentially be reached by the short term planning horizon. By the long term planning horizon, total annual operations are expected to represent 158 percent of annual service volume.

FAA Order 5090.3C, *Field Formulation of the National Plan of Integrated Airport Systems* (NPIAS), indicates that improvements for airfield capacity purposes should begin to be considered once operations reach 60 to 75 percent of the annual service volume. KOA has already surpassed this range. Therefore, planning efforts should be considering airfield capacity improvements beginning in the short term.

CRITICAL AIRCRAFT

The selection of appropriate FAA design standards for the development and location of airport facilities is based primarily upon the characteristics of the aircraft which use, or are expected to use, the airport. The critical design aircraft is defined as the most demanding category of aircraft, or family of aircraft, which conducts at least 500 operations per year at the airport. Planning for future aircraft use is of particular importance since design standards are used to plan separation distances between facilities. These future standards must be considered now to ensure that short term development does not preclude the long range potential needs of the airport.

The FAA has established a coding system to relate airport design criteria to the operational and physical characteristics of aircraft expected to use the airport. This airport reference code (ARC) has two components. The first component, depicted by a letter, is the aircraft approach category and relates to aircraft approach speed (operational characteristic); the second component, depicted by a Roman numeral, is the airplane design group and relates to aircraft wingspan (physical characteristic). Generally, aircraft approach speed applies to runways and runway-related facilities, while airplane wingspan primarily relates to separation criteria involving taxiways, taxilanes, and landside facilities.

According to FAA Advisory Circular (AC) 150/5300-13, *Airport Design*, an aircraft's approach category is based upon 1.3 times its stall speed in landing configuration at that aircraft's maximum certificated weight. The five approach categories used in airport planning are as follows:

Category A: Speed less than 91 knots.

Category B: Speed 91 knots or more, but less than 121 knots.

Category C: Speed 121 knots or more, but less than 141 knots.

Category D: Speed 141 knots or more, but less than 166 knots.

Category E: Speed greater than 166 knots.

The airplane design group (ADG) is based upon the aircraft's wingspan. The six ADGs used in airport planning are as follows:

Group I: Up to but not including 49 feet.

Group II: 49 feet up to but not including 79 feet.

Group III: 79 feet up to but not including 118 feet.

Group IV: 118 feet up to but not including 171 feet.

Group V: 171 feet up to but not including 214 feet.

Group VI: 214 feet or greater.

Exhibit 3C summarizes representative aircraft by ARC.

At commercial service airports such as KOA, the critical aircraft typically come from the passenger or cargo airline fleets. While the large majority of airline operations are by narrow-body commercial jets flying interisland routes within ARC C-III, wide-body aircraft conduct well over 500 annual operations at the airport. In 2006, operations by commercial aircraft in ARC D-V conducted 1,256 operations at KOA to qualify as the current critical ARC. These included passenger operations by Boeing 747 and 777 aircraft as well as cargo operations by Boeing 747 aircraft. **Thus, the base year airport reference code for Kona International Airport at Keahole is ARC D-V.**

Larger aircraft are now entering the global commercial service fleet. The largest is the Airbus A380-800 super jumbo freighters. This aircraft has a payload capacity of 330,000 pounds and wingspan of 261.8 feet. The A380-800 and the Boeing 747-8 are both in ARC D-VI. The initial deliveries of these aircraft are now in service.

These aircraft are expected to be used primarily on international routes. Honolulu International Airport is being planned to ARC D-VI. KOA has been approved as an alternate landing site for the A380. **For planning purposes, it is recommended that the airfield continue to be planned to accommodate at least ARC D-V, but consider the design ramifications necessary to accommodate ARC D-VI aircraft in the future.**

A-I

- Beech Baron 55
- Beech Bonanza
- Cessna 150
- Cessna 172
- Cessna Citation Mustang
- **Eclipse 500**
- Piper Archer
- Piper Seneca

B-I *less than 12,500 lbs.*

- Beech Baron 58
- Beech King Air 100
- Cessna 402
- **Cessna 421**
- Piper Navajo
- Piper Cheyenne
- Swearingen Metroliner
- Cessna Citation I

B-II *less than 12,500 lbs.*

- **Super King Air 200**
- Cessna 441
- DHC Twin Otter

B-I, B-II *over 12,500 lbs*

- Super King Air 300
- Beech 1900
- Jetstream 31
- Falcon 10, 20, 50
- Falcon 200, 900
- **Citation II**, III, IV, V
- Saab 340
- Embraer 120

A-III, B-III

- DHC Dash 7
- **DHC Dash 8**
- DC-3
- Convair 580
- Fairchild F-27
- ATR 72
- ATP

C-I, D-I

- Beech 400
- **Lear** 25, 31, **35**, 45, 55, 60
- Israeli Westwind
- HS 125-400, 700

C-II, D-II

- Cessna Citation III, VI, VIII, X
- **Gulfstream** II, III, **IV**
- Canadair 600
- ERJ-135, 140, 145
- CRJ-200, 700, 900
- Embraer Regional Jet
- Lockheed JetStar
- Super King Air 350

C-III, D-III

- ERJ-170, 190
- Boeing Business Jet
- B727-200
- **B737-300 Series**
- MD-80, DC-9
- Fokker 70, 100
- A319, A320
- Gulfstream V
- Global Express

C-IV, D-IV

- **B757**
- B767
- B787
- C-130
- DC-8-70
- DC-10
- MD-11

D-V, D-VI

- **B747** Series
- B777
- A380-800

Note: Aircraft pictured is identified in bold type.

AIRFIELD REQUIREMENTS

The analyses of the operational capacity and the critical design aircraft are used to determine airfield needs. This includes runway configuration, dimensional standards, pavement strength, as well as navigational aids, lighting, and marking.

RUNWAY CONFIGURATION

Key considerations in the runway configuration of an airport involve the orientation for wind coverage and the operational capacity of the runway system. FAA Advisory Circular 150/5300-13, Change 1, *Airport Design*, recommends that a crosswind runway should be made available when the primary runway orientation provides less than 95 percent wind coverage for any aircraft forecast to use the airport on a regular basis.

The 95 percent wind coverage is computed on the basis of the crosswind component not exceeding 10.5 knots (12 mph) for ARC A-I and B-I; 13 knots (15 mph) for ARC A-II and B-II; and 16 knots (18 mph) for ARC A-III, B-III, and C-I through D-II; and 20 knots (23 mph) for ARC C-III through D-IV.

A wind rose is a tool used to calculate the wind coverage of an airport. The all-weather wind rose for Kona International Airport at Keahole is presented on **Exhibit 3D**. The orientation of Runway 17-35 provides 97.3 percent coverage for 10.5 knot crosswinds, and 98.8 percent coverage for 13 knot crosswinds. Coverage for the higher design crosswinds is over 99.9 percent. Thus, the single runway orientation available at KOA provides adequate wind coverage for all aircraft types.

According to FAA Order 5090.3C, *Field Formulation of the National Plan of Integrated Airport Systems* (NPIAS), capacity development should be recommended when activity approaches the 60 percent level. This is an approximate level to begin the detailed planning of capacity improvements. Actual implementation may be deferred until such time that the improvement is considered timely and cost-beneficial. The earlier airfield capacity analysis indicated that, in 2006, the airfield was already operating at 88 percent of its annual service volume and will reach its ASV by the short term planning horizon. Consideration for capacity improvements should be considered in the near term.

Examples of potential capacity improvements that may be considered in the alternatives analysis include additional taxiway exits and/or a parallel runway. The high number of helicopter operations suggests that an independently operational helicopter touchdown and lift-off (TLOF) area should also be considered.

While a parallel runway is a means to increase capacity, a second runway to provide back-up capability is an important factor to the DOT-A and commercial service on the islands. KOA is the only one of Hawaii's five small hub or larger airports that does not have a second runway available.

Kona International Airport at Keahole is being considered as a site for a new

C-17 Globemaster II pilot proficiency training runway. Such a runway would allow the current fleet of C-17s based at Hickam Air Force Base (AFB) to certify pilots locally rather than incur high expenses of flying to and training at facilities on the U.S. mainland.

A new Kona Auxiliary Training Runway (KATR) would be utilized to certify air crews of C-17s (and potentially other USAF aircraft) operating military cargo aircraft into short or austere landing strips.

RUNWAY DIMENSIONAL REQUIREMENTS

Runway dimensional standards include the length and width of the runway, as well as the dimensions associated with runway safety areas and other clearances. These requirements are based upon the design aircraft, or group of aircraft. The runway length must consider the performance characteristics of individual aircraft types, while the other dimensional standards are generally based upon the most critical airport reference code expected to use the runway. The dimensional standards are outlined for the planning period for the primary runway, as well as for a potential parallel runway, to meet future capacity demand.

Runway Length

The aircraft performance capability is a key factor in determining the runway length needed for takeoff and landing. The performance capability and, subsequently, the runway length requirement of a given aircraft type can be affected by the elevation of the airport, the air temperature, the gradient of the runway, and the operating weight of the aircraft. Aircraft performance declines as each of these factors increase.

The airport elevation at Kona International Airport at Keahole is 47.1 feet above mean sea level (MSL). The temperature commonly used for design is the mean maximum daily temperature during the hottest month. According to the National Climatic Data Center, that is 86.9 degrees Fahrenheit (F) at KOA during the month of August. The change in elevation (gradient) varies by 10 feet along the runway (0.09 percent gradient). This information is utilized in the following runway length analyses.

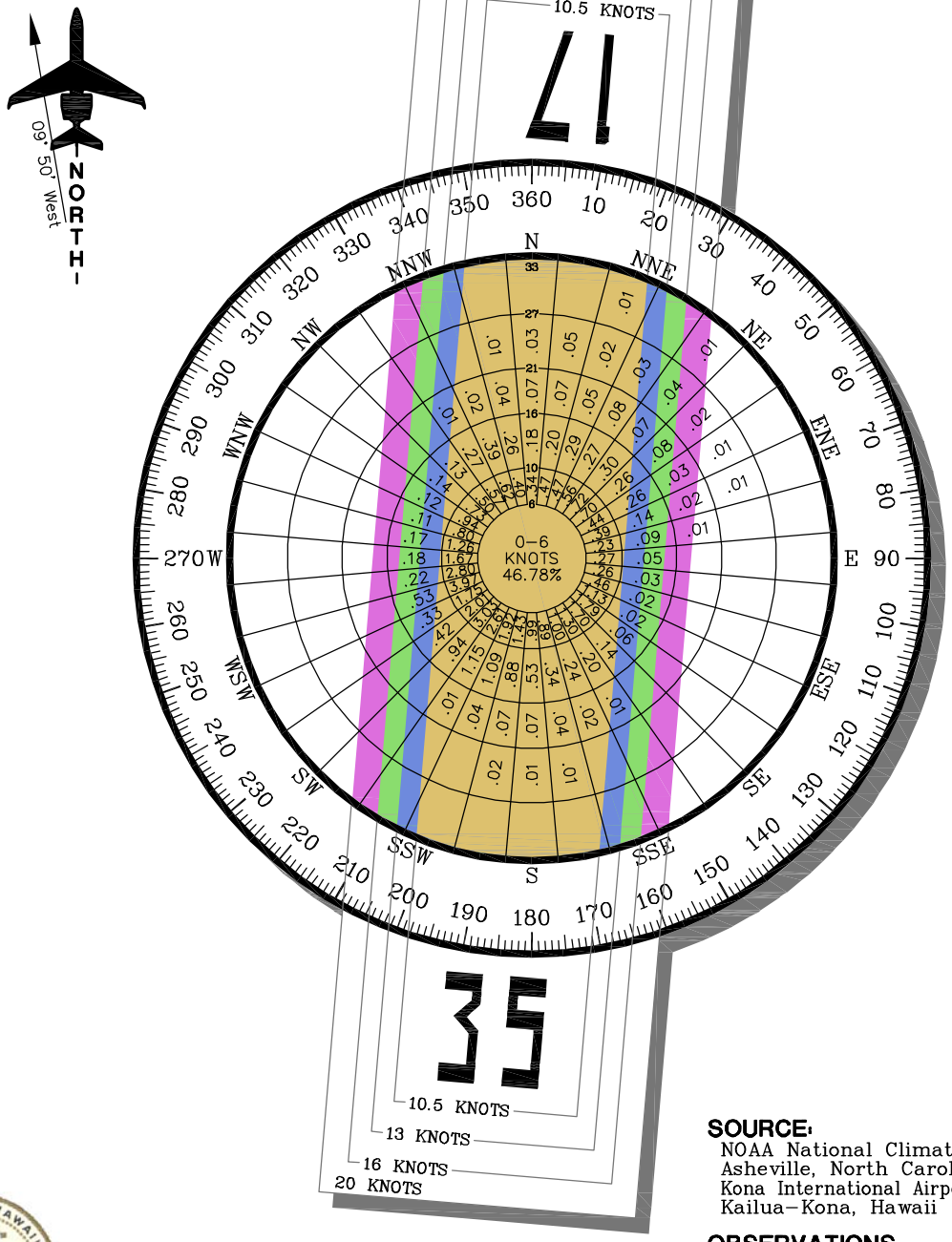
The airport should have the capability to handle the most demanding aircraft with regards to runway length. Thus, the following discussion considers the most demanding runway length requirements now and in the future.

The aircraft load is dependent upon the payload of passengers and/or cargo, plus the amount of fuel it has on board. For departures, the amount of fuel varies depending upon the length of non-stop flight or trip length. As of June 2007, the longest daily non-stop commercial flights were to Chicago (4,208 miles) and Narita, Japan (3,976 miles). The Chicago flight is by a Boeing 777-200 aircraft. The Narita flight is listed as a Boeing 767, but landing reports over the past year indicate

ALL WEATHER WIND COVERAGE

Runway	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 17–35	*97.30%*	*98.81%*	*99.94%*	*99.97%*

Magnetic Variance
09° 50' West (June 2007)
Annual Rate of Change
00° 00' West (June 2007)



SOURCE:
NOAA National Climatic Center
Asheville, North Carolina
Kona International Airport at Keahole (KOA)
Kailua–Kona, Hawaii

OBSERVATIONS:
74,064 All Weather Observations
1998–2006

that a Boeing 747 is sometimes substituted on this flight.

Table 3J outlines the runway length requirements at maximum takeoff weight (MTOW) for key passenger and cargo commercial jets at KOA's design temperature and airport elevation. The still air (zero wind) range in nautical miles is also given for each aircraft listed. The available runway length of 11,000 feet meets the existing needs of the commercial passenger and cargo aircraft. The present length of 11,000 feet would be adequate for the newer A380-800 and B747-8 jumbo jets.

TABLE 3J
Ultimate Takeoff Length Requirements
Kona International Airport at Keahole

Aircraft	MTOW Length (ft.)	Still Air Range (nm)
B767-300	8,800	4,675
B767-300ER	10,300	6,105
B767-400ER	12,500	5,645
B777-200	9,800	5,210
B777-200ER	11,500	7,730
B777-300ER	12,400	8,258
B747-400	11,500	4,260
B747-400ER	12,600	7,670
B747-400F	11,700	4,445
B747-8	11,200	8,000
B747-8F	11,200	4,475
A380-800	10,800	8,000
A380-800F	10,800	6,500

MTOW –Maximum Takeoff Weight
Design Criteria: Elevation – 47.1 ft. MSL; Temperature – 86.9F; Gradient – 0.09%

As is evident from the table, however, additional runway length would be necessary to accommodate the maximum range of several of the long range wide body aircraft. The maximum length required would be 12,600 feet for the B747-400ER to fly its maximum range of 7,670 miles. A future need for this range by this particular aircraft is not foreseen. To ensure viability for the future, however, an ultimate runway length of 12,000 feet could be planned. Such an extension would not be developed until such time it could be justified as expressly seeded on a regular basis by one or more operators.

Table 3K outlines the runway length requirements for various groupings of general aviation aircraft. It is evident that the current runway length is more than adequate to accommodate 100 percent of the business jet fleet at 90 percent useful load. Business jet aircraft weighing over 60,000 pounds have a range of more than 5,000 nautical miles from the current runway.

The capacity analysis earlier in this chapter suggests planning for a future parallel runway. To serve a sufficient back-up to the existing runway, the parallel runway should ultimately be planned to at least the 11,000-foot length. This would maintain uninterrupted service whenever the primary runway is temporarily shut down for any reason. An interim length sufficient for at least a portion of the general aviation aircraft would provide capacity relief. While the parallel runway has been and should continue to be planned for an ultimate length of 11,000 feet, an initial length of 4,200 feet would accommodate small general aviation and air taxi aircraft weighing 12,500 pounds or less. A minimum length of 5,000 feet is required for interisland cargo aviation. An interim length of 7,000 feet would accommodate most interisland commercial and general aviation flights.

TABLE 3K
General Aviation Runway Length Analysis
Kona International Airport at Keahole

AIRPORT AND RUNWAY DATA	
Airport elevation	47.1 feet
Mean daily maximum temperature	86.9 F
Maximum different in runway centerline elevation	10 feet
Length of haul for airplanes of more than 60,000 pounds	5,000 miles
Wet and slippery runways	
RUNWAY LENGTHS RECOMMENDED FOR AIRPORT DESIGN	
Small airplanes with less than 10 passenger seats	
75 percent of these small airplanes	2,500 feet
95 percent of these small airplanes	3,100 feet
100 percent of these small airplanes	3,600 feet
Small airplanes with 10 or more passenger seats	4,200 feet
Large airplanes of 60,000 pounds or less	
75 percent of these large airplanes at 60 percent useful load	5,400 feet
75 percent of these large airplanes at 90 percent useful load	7,000 feet
100 percent of these large airplanes at 60 percent useful load	5,500 feet
100 percent of these large airplanes at 90 percent useful load	8,100 feet
Airplanes of more than 60,000 pounds	Approximately 10,800 feet

Reference: Chapter 2 of AC 150/5325-4A, Runway Length Requirements for Airport Design, no Changes included.

According to the Environmental Assessment prepared for the Department of Defense in 2004, the KATR for the C-17 is be planned to be 4,250 feet in length with 300-foot paved overruns at each end.

Runway Design Standards

Runway design standards define the widths and clearances required to optimize safe operations in the landing and takeoff area. These dimensional standards can vary depending upon the ARC for each runway. **Table 3L** outlines key design standards for the airport reference codes most applicable to Kona International Airport at Keahole presently and in the future. As indicated earlier, the ARC for the airport is currently D-V. An initial parallel general aviation runway should consider ARC B-II standards. As evidenced from the table, KOA meets or exceeds all D-V design stan-

dards with the exception of the parallel taxiway to taxilane separation. These are currently adequate because of the limited operations by D-V aircraft. Adequate D-V separation, however, should be considered in future terminal and apron planning.

While D-V is expected to remain as the ARC for KOA in the future, ARC D-VI standards are also listed in the table for comparison. These design standards would need to be addressed if the airport were to ever accommodate the A380-800 and the B747-8. Critical standards that would need to be addressed for the A380 are widening the runway to 200 feet and the taxiways to 100 feet. If use is occasional as an alternate service location, the runway would not need to be widened. A taxiway route for the large aircraft, however, would still need to be addressed. In addition, taxiway fillets would have to be addressed to accommodate the wheel track of a turning aircraft. The taxiway/taxilane separation and the taxilane separation from fixed or movable objects would also have to be addressed.

TABLE 3L
Airfield Design Standards
Kona International Airport at Keahole

Design Standard	Existing	Airport Reference Code		
		Current D-V (ft.)	Ultimate D-VI (ft.)	Initial Parallel B-II (ft.)
RUNWAYS				
Runway Length	11,000	11,000	12,000	4,200
Runway Width	150	150	200	75
Runway Shoulder Width	35	35	40	10
Runway Safety Area				
Width	500	500	500	150
Length Beyond End	1,000	1,000	1,000	300
Runway Object Free Area				
Width	800	800	800	500
Length Beyond End	1,000	1,000	1,000	300
Runway Blast Pad				
Width	200	220	280	95
Length	200	400	400	150
Runway Centerline to:				
Holding Position	280	280	280	200
Parallel Taxiway	881	400	500	240
Parallel Runway	NA	1,200	1,200	700
TAXIWAYS				
Taxiway Width	75	75	100	35
Taxiway Centerline to:				
Fixed or Movable Object	193	160	193	66
Parallel Taxilane	215	267	324	105
Taxilane Centerline to:				
Fixed or Movable Object	112	138	167	57.5
Parallel Taxilane	220	245	298	97
RUNWAY PROTECTION ZONES				
Category I				
Inner Width	1,000	1,000	1,000	NA
Length	2,500	2,500	2,500	NA
Outer Width	1,750	1,750	1,750	NA
One mile visibility				
Inner Width	500	500	500	500
Length	1,700	1,700	1,700	1,000
Outer Width	1,010	1,010	1,010	700

PAVEMENT STRENGTH

The most important feature of airfield pavement is its ability to withstand repeated use by aircraft of significant weight. At Kona International Airport at Keahole, pavement must be able to support multiple operations of large commercial and military jet aircraft on a daily basis.

The current strength rating of the runway is 750,000 pounds single wheel loading (SWL), 200,000 dual wheel loading (DWL), 400,000 pounds dual tandem wheel loading (DTL), and 850,000 pounds double dual tandem wheel loading (DDTL). The existing pavement strengths of the runway are adequate to accommodate these aircraft.

A pavement design analysis will be necessary to determine if additional pavement strengthening will be required for regular operations by this aircraft. The A380-800 has a maximum weight of up to 1.3 million pounds on DDT gear. A pavement design analysis will be necessary to determine if additional pavement strengthening would be required for regular operations by this aircraft.

An initial parallel general aviation runway would need to be designed to at least 12,500 pounds single wheel gear. Pavement strength would increase depending upon the design aircraft for further development of the parallel runway.

TAXIWAYS

Taxiways are primarily constructed to facilitate aircraft movements to and from the runway system. Parallel taxiways greatly enhance airfield capacity and are essential to aircraft movement on the ground. Some taxiways are necessary simply to provide access to apron and terminal areas, while others are designed to facilitate the movement of aircraft to and from the runways. As activity increases, additional taxiways become necessary to provide for safe and efficient use of the airfield. The taxiway system at KOA consists of a full-length parallel taxiway long the east side of the runway, exit taxiways, and access taxiways connecting the airfield to the various terminal and general aviation ramps. A partial parallel taxilane also aids with circulation near the ramps.

Parallel Taxiway A maintains an 881-foot centerline separation from Runway 17-35 along the entire length of the runway. Besides the exits at each end, there are two right-angle exits (Taxiways G and H) and one angled exit (Taxiway C) along the length of the runway. The angled exit is most suitable for use by aircraft arriving on Runway 17.

Ideally, each runway should be planned with full-length parallel taxiways on the same side as the landside interface facilities. Since the landside facilities are all located on the east side of the airfield, the current loca-

tion is adequate. If a parallel runway is developed, a second parallel taxiway should be considered to provide circulation and access along it.

As the landside facilities develop and traffic increases, a dual parallel taxiway system may need to be considered along the east side of Runway 17-35 to enhance circulation.

Exit taxiways provide a means to enter and exit the runways at various points on the airfield. The type and number of exit taxiways can have a direct impact on the capacity and efficiency of the airport as a whole. As indicated earlier in the capacity analysis, the runway's exit rating is two in both directions of traffic flow, with four being the optimum. For example, the first exit taxiway is approximately 4,700 feet from the runway threshold in both directions. An additional exit approximately 1,000 feet closer to the threshold would permit many landing propeller aircraft to exit the runway sooner.

High speed exits provide a means for aircraft to clear the runway at higher speeds, thus reducing runway occupancy time. This is especially advantageous for higher performance aircraft that approach at greater speeds, and then must slow to 10 to 15 miles per hour to exit at a right angle exit. Depending upon its design, a high speed exit can allow the aircraft to exit the runway at speeds as high as 60 miles per hour.

Locations for high speed exits to accommodate Categories C and D aircraft were calculated for KOA's average temperature and elevation. Based upon the ICAO standard deceleration rate of 4.1 feet per second per second, the optimum exit locations were determined to be at 5,700 feet for Approach Category C aircraft and 7,600 feet for Approach Category D. Currently, the only high speed exit available is Taxiway C, which is located approximately 9,000 feet from the Runway 17 threshold. The potential locations and efficiency of additional exits will be considered in **Chapter Four - Alternatives**.

Holding aprons and bypass taxiways can also improve the efficiency of the taxiway system. Each runway end has a holding apron available. They are only large enough to store no more than two aircraft larger than Group IV due to insufficient wingtip clearances. The same should be considered with the development of a parallel runway.

HELICOPTER TOUCHDOWN AND LIFTOFF AREA (HELIPORT)

The airport does not have a designated heliport. There are designated helicopter parking areas on the south general aviation ramp. Itinerant helicopters utilize the same runway procedures as fixed-wing aircraft. Helicopter training operations use areas at the north and south ends of the parallel taxiway, but these are not specifically marked or truly independent from other airfield operations. Helicopter and fixed-wing aircraft should be segregated to the greatest extent possible.

Facility planning should include establishing a designated helicopter

landing and takeoff area or heliport on the airport. The heliport facilities should be planned with up to three independent touchdown and lift-off areas (TLOFs), each with access to helicopter parking, hangars, and a passenger terminal facility. These landside needs are discussed later in the chapter.

At a minimum, an area for segregation of training touch-and-go's and autorotations is needed. A training strip 1,500 feet long and between 50 and 300 feet wide should be planned.

NAVIGATIONAL AIDS AND INSTRUMENT APPROACH PROCEDURES

Navigational Aids

Navigational aids are electronic devices that transmit radio frequencies which properly equipped aircraft and pilots translate into point-to-point guidance and position information. The types of electronic navigational aids available for aircraft flying to or from Kona International Airport at Keahole include the very high frequency omnidirectional range/distance measuring equipment (VOR/DME) facility, global positioning system (GPS), area navigation (RNAV), and for the military, tactical air navigation (TACAN). These systems are sufficient for navigation to and from the airport; therefore, no other navigational aids are needed at the airport.

The VOR and TACAN are FAA and DOD facilities that are currently colocated off-site south of the airport. For security reasons, the FAA is considering relocating the facility to airport property. This is being coordinated with this Master Plan.

GPS was developed and deployed by the United States Department of Defense as a dual-use (civil and military) radio navigation system. GPS initially provided two levels of service: the GPS standard positioning system (SPS), which supported civil GPS uses; and the GPS precise positioning system (PPS), which was restricted to U.S. Armed Forces, U.S. federal agencies and selected allied armed forces, and government use.

The differences in GPS signals have been eliminated and civil users now access the same signal integrity as federal agencies. A GPS modernization effort is underway by the FAA and focuses on augmenting the GPS signal to satisfy requirements for accuracy, coverage, availability, and integrity.

For civil aviation use, this includes the continued development of the Wide Area Augmentation System (WAAS), which was initially launched in 2003. The WAAS uses a system of reference stations to correct signals from the GPS satellites for improved navigation and approach capabilities. Where the present GPS provides for enroute navigation and limited instrument approach (nonprecision) capabilities, WAAS provides for approaches with both course and vertical navigation. This capability was historically only provided by an instrument landing system (ILS), which requires extensive on-airport facilities.

The WAAS upgrades are expected to allow for the development of ap-

proaches to most airports with cloud ceilings as low as 200 feet above the ground and visibilities restricted to ½ mile, after 2015. KOA should plan for this potential at least in the long term.

Instrument Approach Procedures

Instrument approach procedures have been established for the airport using GPS, RNAV, VOR/DME, TACAN, as well as the instrument landing system (ILS). The ability to access the airport using different navigational aids allows the most flexibility for aircraft operators, by not requiring that they have a specific navigational aid on board to access the airport. This also provides significant levels of redundancy should a primary navigational aid fail.

A Category I ILS approach is available to Runway 17. The Category I approach provides for landing when the cloud ceilings are as low as 200 feet above the ground and visibility is restricted to ½-mile.

An RNAV approach with a GPS overlay is available to each runway end. GPS approaches are currently categorized as to whether they provide only lateral (course) guidance or a combination of lateral and vertical (descent) guidance. An approach procedure with vertical navigation guidance (VNAV) GPS approach provides both course and descent guidance. A lateral navigation approach (LNAV) approach only provides course guidance. Both runways have VNAV and LNAV available.

In the future as WAAS is upgraded, precision approaches similar in capability to the existing ILS will become available. These approaches are currently categorized as the Global Navigation Satellite System (GNSS) Landing System (GLS). A GLS approach may be able to provide for approaches with ½ mile visibility and 200-foot cloud ceilings. A GLS would supplement the existing ILS approach to the Runway 17. A GLS should be planned for Runway 35 as well. A GLS approach requires an approach lighting system that is already available for the Runway 17 end, and would be needed for Runway 35.

The initial parallel runway can be developed as a visual runway. The parallel runway should ultimately have at least non-precision GPS instrument capability to serve as a back-up to the primary runway.

LIGHTING AND MARKING

Currently, there are a number of lighting and pavement marking aids serving pilots using KOA. These lighting systems and marking aids assist pilots in locating the airport at night or in poor weather conditions, and assist in the ground movement of aircraft.

Identification Lighting

The airport is equipped with a rotating beacon to assist pilots in locating the airport at night. The existing rotating beacon is located on top of the airport traffic control tower. The

rotating beacon is sufficient and should be maintained through the planning. It is required for the airport to maintain its certification for scheduled airline activity. The FAA is relocating the control tower in 2012, and the rotating beacon will be relocated to the top of the new tower.

Runway and Taxiway Lighting

Runway 17-35 is equipped with high intensity runway lights (HIRL). The runway is also equipped with threshold lights, which indicate the location of the runway threshold at night. These lighting aids are required to maintain the ILS approach to Runway 17.

Any future parallel runway should be equipped with medium intensity runway lights (MIRL) to allow nighttime and instrument operations.

Effective ground movement of aircraft at night and during instrument conditions can be enhanced by taxiway lighting. Currently, all airfield taxiways are equipped with medium intensity taxiway lights (MITL). An upgrade to an LED system could be considered to reduce maintenance and energy costs.

KOA is equipped with pilot-controlled lighting (PCL). PCL allows pilots to activate the HIRL and MITL from dusk to dawn using the radio transmitter in the aircraft. This system should be maintained through the planning period.

Airfield Signs

Lighted airfield signage currently conforms with FAR Part 139 standards. Lighted directional and hold signs are installed at the airport. This signage identifies runways, taxiways, and apron areas. These aid pilots in determining their position on the airport and provide directions to their desired location on the airport.

The runway is also equipped with distance remaining signs. These lighted signs are placed in 1,000-foot increments along the runway to notify pilots of the length of runway remaining and should be maintained in the future.

This airfield signage is sufficient and should be maintained through the planning period, and included with any future parallel runway development.

Visual Approach Lighting

The landing phase of most flights to the airport must be conducted visually. Visual glide slope indicators provide visual descent guidance information during approach. There are two forms of these aids that have been regularly installed by the FAA at airports. They include precision approach path indicators (PAPI) and visual approach path indicators (VASI). PAPI-4's are in use at KOA, and should be planned for the parallel runway as well.

Approach Lighting

Approach lighting systems consist of a configuration of signal lights extending into the approach area from the runway threshold to aid pilots transitioning from instrument flight to visual flight and landing. A medium intensity approach lighting system with runway alignment indicator lights (MALSR) is installed on the Runway 17 end to assist pilots in landing during inclement weather conditions. A similar lighting system would be needed on Runway 35 to support a future GLS approach.

Runway End Identification Lighting

Runway end identification lighting provides the pilot with rapid and positive identification of the runway end. The most basic system involves runway end identifier lights (REILs). As REILs provide pilots with the ability to identify the runway ends and distinguish the runway end lighting from other lighting on the airport and in the approach areas. There are currently no REILs in service at KOA. REILs are typically not needed when another approach lighting system is in operation. REILs may be considered for any future parallel runway.

Pavement Markings

Pavement markings are designed according to the type of instrument approach available on the runway. FAA AC 150/5340-1H, *Markings of Paved Areas on Airports*, provides the guidance necessary to design an airport's markings. The Runway 17 and 35 ends are equipped with precision runway markings. A future parallel runway should be equipped with nonprecision runway markings.

Taxiway and apron areas also require marking to assure that aircraft remain on the pavement. Yellow centerline stripes and taxiway edge markings are currently painted on all taxiway and apron surfaces at the airport to provide this guidance to pilots. Besides routine maintenance, these markings will be sufficient through the planning period.

WEATHER REPORTING

Kona International Airport at Keahole is equipped with an Automated Surface Observation System (ASOS). The ASOS provides automated aviation weather observations 24 hours-a-day. The system updates weather observations every minute, continuously reporting significant weather changes as they occur. The ASOS reports cloud ceiling, visibility, temperature, dew point, wind direction, wind speed, altimeter setting (barometric pressure), and density altitude (airfield elevation corrected for temperature). This system is essential for aircraft operations and should be maintained through the planning period.

The airport is equipped with three lighted wind cones providing visual wind direction and speed information to pilots. The wind cones are near each runway end as well as with the segmented circle near midfield. These

wind cones are required for the airport's certification and should be maintained through the planning period.

A segmented circle identifies the proper landing pattern for each runway. This segmented circle is required for the airport's certification and should be maintained through the planning period.

AIRPORT TRAFFIC CONTROL TOWER

The existing airport traffic control tower (ATCT) is located on the east side of the airfield, south of the terminal building and north of the aircraft rescue and firefighting facility. The current wood structure is old and out of date. The cab height is not sufficient to provide line-of-sight for all airfield operating areas. A northern section of Taxiway A, a small portion of Taxiway G, and much of the terminal apron are not visible from the tower. The FAA began construction of a new ATCT at KOA in 2010. Completion and commissioning is scheduled for 2012. This has been coordinated with this Master Plan.

An airport traffic control beacon interrogator (ATCBI-5) is located on the airport. The FAA owned and operated ATCBI-5 is a long-range radar used in enroute air traffic control. The radar will be maintained by the FAA through the planning period. Upgrades to this system will be the responsibility of the FAA.

The ATCBI-5 has a critical area encompassing a 1,500-foot radius around the facility. Objects within this radius should be at or below the elevation of the radar, or 159 feet above mean sea level (MSL).

PASSENGER TERMINAL COMPLEX REQUIREMENTS

Requirements for the passenger terminal complex include aircraft gate positions, terminal building facilities, access and parking. This section identifies the facilities required to meet the airport's terminal complex needs through the planning horizons. The review of the capacity and requirements for various terminal complex functional areas was performed with the guidance of FAA Advisory Circular 150/5360-13, *Planning and Design Guidelines for Airport Terminal Facilities*, the *TSA Recommended Security Guidelines for Airport Planning, Design and Construction*, and *IATA Level of Service Standards*.

TERMINAL GATE ANALYSIS

Gate Capacity and Utilization

Currently, the airport is divided into two separate air terminals: North and South. Both have five gates for a total of 10 gates at the airport. In the base year of 2006, the North Terminal was served by United Airlines, Aloha Airlines, US Airways, Delta Airlines, Go!, and Japan Airlines (JAL). There is an aircraft mix of wide-body, narrow-

body, and regional jets serving this concourse. The South Terminal was served by American Airlines, Hawaiian Airlines, Northwest Airlines, Delta, and Island Air.

In comparison, the South Terminal served fewer wide-body flights. This accounts for the higher passenger traffic levels at the North Terminal. According to the August 18, 2006, flight schedule, there were a total of seven wide-body flights at the North Terminal and four at the South Terminal. **Exhibit 3E** presents the gate occupancy based upon the August 18, 2006 flight schedule.

In order to calculate the average gate utilization at the airport, dwell times were averaged for the four major aircraft types from the design day flight schedule: large wide-body, wide-body, narrow-body, and regional jets. Applying these dwell times to the number of aircraft types per gate and dividing by the airport operating hours provides the average utilization per gate.

The average gate utilization for both North and South Terminals was 30 percent. It is important to note that the total gate usage was 32 hours for the North Terminal and 21 hours for the South Terminal. This further indicates that one terminal has been used more heavily than the other, resulting in the disproportionate demands. When a new carrier enters the airport or an existing airline increases flights, a rebalancing of gate utilization should be considered.

Aircraft Gate Position Requirements

According to the airline operations forecast in the previous chapter, the airport can expect a gradual decline in service from narrow-body aircraft and growth in regional jets and wide-body aircraft. The aircraft gates requirements are calculated based on the current and forecast design day peak hour operations. The average dwell times as determined from the 2006 design day flight schedule were 30 minutes for regional jets, 30 minutes for narrow-body, 150 minutes for wide-body, and 90 minutes for large wide-body. Gate requirements are based on peak hour operations, so dwell times greater than 60 minutes were assumed to require one gate for the full hour.

Industry standard dwell times were used for future gate requirements in order to optimize the use of existing facilities. The requirements are also based on peak hour operations and fleet mix forecasts. Finally, the base year gate utilization factor of 30 percent was applied to determine the number of gates required to accommodate the projected operations at the same activity level as in the current base schedule. There are 10 aircraft gates available, with five at each terminal.

Based on this utilization factor, the resulting base year requirements were 12 gates, short term is 12 gates, intermediate is 12 gates, and long range is 14 gates. There has been joint usage on some, but not all, gates. If

joint usage continues, utilization can be increased, thereby requiring fewer gates. **Table 3M** presents the aircraft gate position requirements.

TABLE 3M
Aircraft Gate Position Requirements
Kona International Airport at Keahole

Demand Level	Dwell Minutes	2006	Optimized Dwell Time	Short Term	Inter. Term	Long Term
Annual Aircraft Operations		37,436		38,986	40,554	44,824
Peak Month Operations		3,628		3,776	3,932	4,364
Design Day Operations		122		128	134	148
Aircraft Gates						
Peak Hour Operations		12		13	14	16
Average Gate Utilization		30%		30%	30%	30%
Large Wide-body (B747,B777)	60	0	60	1	1	1
Wide-body (B757,B767)	60	3	45	3	3	4
Narrow-body (B717,B737)	30	5	30	5	5	6
Regional Jets (CRJ)	30	3	25	3	3	4
Total Gates		**12**		**12**	**12**	**14**

TERMINAL BUILDING CAPACITY

The facility requirements determination for the passenger terminal begins with a demand-capacity analysis of existing facilities. This analyzes the current capacity of key processing areas and compares that to the passenger demand at the airport. The purpose of the analysis is to quantify and qualify the level that the existing terminal facilities satisfy the current demand of the traveling public at Kona International Airport at Keahole. The objectives of this analysis are as follows:

- Quantify the levels of activity related to the combined capacity of the individual passenger processing elements of the terminal.

- Determine what additional facilities would be required to optimize passenger processing by balancing the flow of the processing with the efficiency of space utilization.

- Analyze the terminal building to identify physical conditions that may currently exist, or are likely to develop with increased demand, that will compromise functional efficiency. In addition, existing vacant space and area for expansion are identified.

- Provide the planning team with a comprehensive understanding of the existing terminal facilities as the basis to optimize the facilities and to develop alternatives for meeting future needs at KOA.

With the demand capacity analysis serving as a basis, the terminal facilities requirements quantify and qualify the facilities that would be required to accommodate the forecast demand. The terminal facilities requirements also serve as a base for the development of alternatives.

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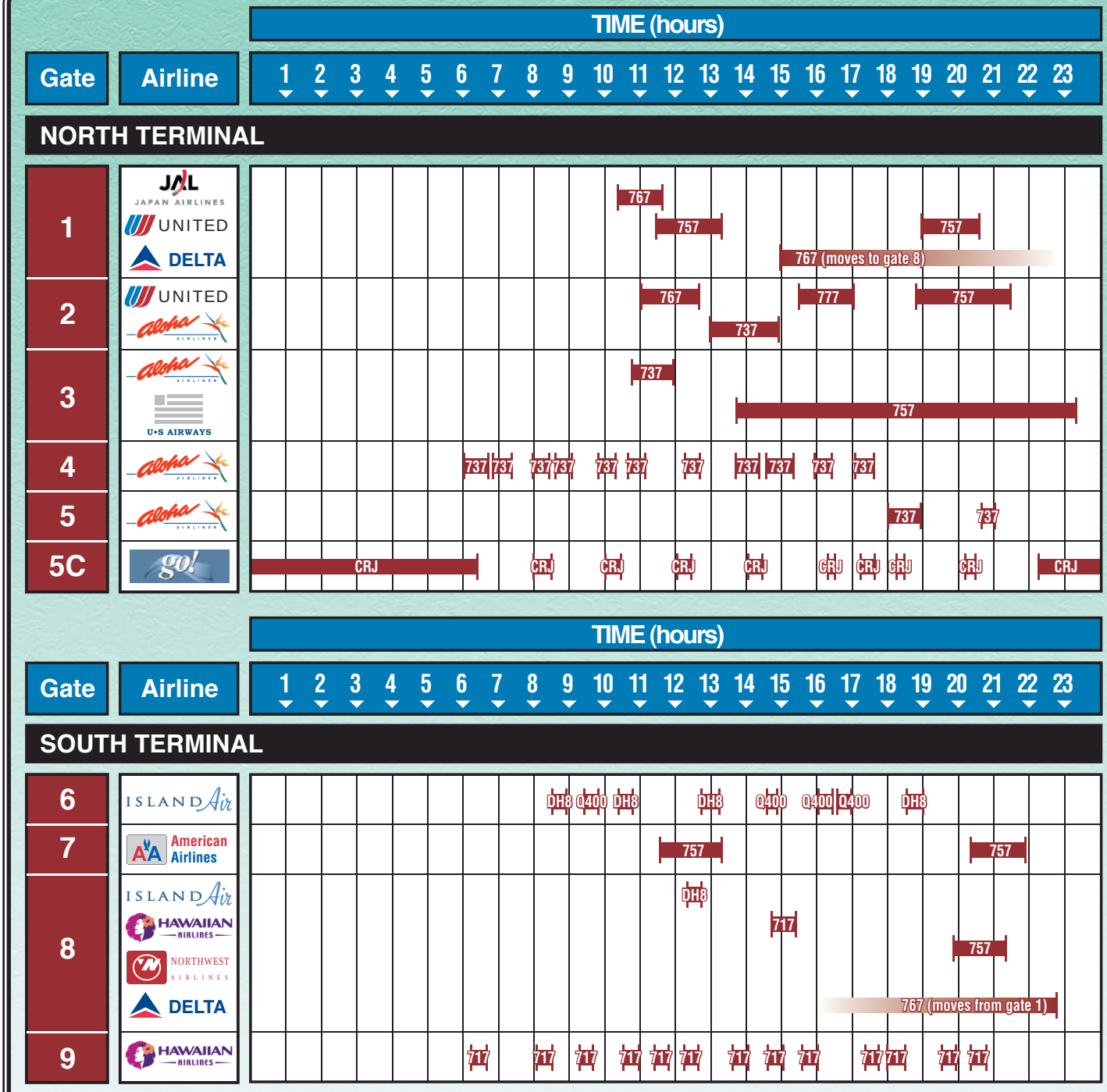


AIRCRAFT KEY

717 - Boeing 717

737 - Boeing 737

747 - Boeing 747

757 - Boeing 757

767 - Boeing 767

777 - Boeing 777

CRJ - Canadair Regional Jet

DH8/Q400 - De Havilland Dash-8

LEGEND

Aircraft Departure | Aircraft Arrival | Aircraft at Gate

Source: Gate Utilization Survey, August 18, 2006; Hawaii DOT-Airports Division

Note: Aloha Airlines ceased all operations March 31, 2008

Methodology

A spreadsheet model is the tool used for accomplishing the terminal demand-capacity analysis. The model is based on industry standards and is calibrated specifically to represent this terminal and its operations. The physical aspects of the terminal, including numbers of processing units and function areas for all processing and support spaces, were derived from Chapter One - Inventory.

The demand input used for the model is based on the peak hour of the August 18, 2006 flight schedule. The operational input for processing of passengers is derived from observations, airport staff, and other tenants. Calculations are based on the standard queuing theory, which simply stated is: passengers arriving minus passengers processed equals passengers in queue.

The evaluation of individual processing elements is based on industry standards and formulas. Computer simulations are not employed in these evaluations. Building information modeling (BIM), however, has been integrated as a planning tool into this master plan methodology.

The existing airport terminal and its individual facilities have been modeled in a 3D virtual model. Each facility (such as ticket lobbies, security checkpoints, etc.) has been modeled as a separate object with attributes attached that contain information relevant to this study, such as area, volume, cost estimates, passenger demand, and applicable facility processing information. In this chapter, the model is linked to the spreadsheets to provide the necessary information for the demand capacity evaluation. In the next chapter, alternatives that fulfill the facility requirements will be evaluated utilizing the BIM.

The spreadsheet model used to determine the terminal facilities requirements is an extension of the demand-capacity analysis model. The former utilizes the same industry standards that include service goals, functional space standards, and operational parameters.

The terminal facilities requirements are based on the forecasts that have been developed for three future planning horizon activity levels. Calibrations for operational processing utilize on-site observed and measured rates for the base year demand-capacity analysis. However, industry standards and anticipated calibrations due to industry changes have been included in the facility requirements calculations in order to arrive at an optimized facility condition.

Passenger Demand and Peak Hour

The current passenger demand was derived from the August 2006 consolidated flight schedule for the average day of the peak month. August is considered part of the peak period of the year and the flight schedule provides a reasonable basis for design demand. When this demand is coupled with a level of service that is supportive, effi-

cient, and economical to functions of the airport, appropriate requirements for future facilities can be forecast. The flight schedule is used to estimate the total daily departing and arriving passengers and to determine the daily traffic pattern and peaking conditions that produce the largest demands on the facilities.

As indicated earlier, Kona International Airport at Keahole is essentially comprised of two independently functioning terminals. The North and South Terminal each have their own processing facilities, including a ticket lobby, security checkpoint, concourse, and baggage claim. Since the aircraft and airlines serving each terminal are different, the passenger demand on each side will also be different. Thus, to effectively evaluate the capacity of the facilities, it was necessary to determine the passenger demand on each terminal separately.

Based on the flight schedule for departing flights, the North Terminal has experienced more aircraft operations and more passenger demand than the South Terminal. From the 2006 flight schedule, it was determined that the North Terminal serviced the majority of the larger widebody aircraft for overseas flights operated by United, US Airways, Delta and JAL. The total passenger demand, including departures and arrivals on the design day, was 6,366 at the North Terminal.

In contrast, the South Terminal handled 4,517 on the design day. Since Japan Airlines arriving passengers are processed in the separate Customs Border Protection (CBP) facility (formerly U.S. Immigrations and Customs), that arrivals demand has been separated from the above figures. The passenger arrival demand for this daily flight was 237 passengers. **Table 3N** outlines the passenger demand by terminal.

TABLE 3N
Passenger Demand Analysis
Kona International Airport at Keahole

	North Terminal	%	South Terminal	%	CBP Facility	%	Totals
Departing Passengers							
Design Day	3,283	58%	2,419	42%	N/A	N/A	**5,702**
Arriving Passengers							
Design Day	3,083	57%	2,098	39%	237	4%	**5,418**
Total Passengers	**6,366**	57%	**4,517**	41%	**237**	2%	**11,120**

**Based on August 2006 flight schedule*

As shown in the table, there was a significant difference in the passenger demand handled by the two terminals. The North Terminal handled 58 percent of the departing passenger demand compared to 42 percent in the South Terminal. While four percent of the arriving passengers were processed through the Customs and Border Protection (CBP) facility, 57

percent were handled in the North Terminal, and 39 percent in the South Terminal. Overall, the North Terminal processed 57 percent and the South Terminal 41 percent of the total passenger demand.

These proportions were applied to the passenger peak hour demand forecasts in order to establish a baseline for evaluating the requirements of individual facilities within the North and South Terminals. As explained later in this chapter, the facility requirements were determined based on the scenario that the airport will continue to operate as two separate terminals throughout the future planning horizons as established by the forecasts. This assumption serves as a baseline to allow for further analysis and evaluation of the need to merge whole or specific facility components of the airport.

The peaking conditions that are important to the evaluation of the terminal are: arrivals peak hour, departures peak hour, and the combined peak hour. The peak hour demand is derived from the flight schedule and is basically defined as the number of passengers utilizing the airport within a one-hour period. Each peak places demands on the various functions and different areas within the terminal. The peaks are also expressed as numbers of passengers as well as aircraft operations.

Departures Peak Hour - The departures peak hour occurred from 12:30 p.m. to 1:30 p.m. and consisted of eight total flights. The flights were split evenly between the two terminals. The flights that occurred in the North Terminal were serviced by United, Aloha, and Go! Airlines. The two United flights during this peak hour were wide-body aircraft with overseas destinations. The flights that occurred in the South Terminal were serviced by American, Hawaiian, and Island Air. The one American flight was a wide-body aircraft with an overseas destination. By applying the terminal demand proportions as explained above, the departures peak hour for the North Terminal was 553 passengers, and 400 passengers for the South Terminal.

Arrivals Peak Hour - The arrivals peak hour occurred from 10:30 a.m. to 11:30 a.m. and consisted of seven flights. Four of those flights occurred in the North Terminal and were operated by United and Aloha. Two of the United flights were by wide-body aircraft. The other three flights occurred in the South Terminal and were operated by American and Hawaiian. The American flight was a wide-body aircraft. By applying the terminal demand proportions as explained above, the arrivals peak hour for the North Terminal was 656 passengers, and 438 passengers for the South Terminal.

Combined Peak Hour - The combined peak hour occurred from 2:30 p.m. to 3:30 p.m. and consisted of 13 departing flights. These flights were operated by United, Delta, Island Air, Go!, Aloha, and Hawaiian. The combined departures and arrivals peak hour demand was 1,247 passengers.

Table 3P presents the base year passenger demand as well as the demand

for the three planning horizons. The demand and forecast have been determined for both the North and South Terminals individually according to the proportions shown above.

Demand-Capacity Factors

Passenger Profiles - The passenger demand is accommodated in various ways. For example, the departing passengers may or may not have baggage and may check in for a flight in the ticketing lobby or remotely with e-tickets. As such, the number of options for processing passengers and the percentage of passengers exercising each option are determined by the passenger profiles. A basic profile that considers all possible inputs was developed to represent departing and arriving passengers at the airport. The profiles also include the ratio of well-wishers and greeters who accompany the passengers. **Table 3Q** presents the passenger profiles for KOA.

TABLE 3P
Passenger Demand
Kona International Airport at Keahole

	Base Year (2006)	Short Term	Intermediate Term	Long Term
NORTH TERMINAL				
Departing				
Annual	883,014	1,001,080	1,096,780	1,350,820
Design Hour (Ticket Lobby)	553	611	672	835
Design Hour (Hold room)	553	611	672	835
Design Hour (Mainland)	356	411	493	706
Design Hour (Interisland)	255	274	284	312
Arriving				
Annual	887,946	1,024,800	1,129,800	1,396,800
Design Hour	656	736	814	1,013
Total Passengers				
Annual	1,770,960	2,025,880	2,226,580	2,747,620
Design Hour (Ticket Lobby)	1,209	1,347	1,486	1,848
Design Hour (Hold room)	1,209	1,347	1,486	1,848
Peak 20 Min.	617	660	730	900
SOUTH TERMINAL				
Departing				
Annual	639,424	724,920	794,220	978,180
Design Hour (South Ticket Lobby)	338	373	411	511
Design Hour (Central Ticket Lobby)	62	69	76	94
Design Hour (Hold room)	400	442	487	605
Design Hour (Mainland)	258	298	357	511
Design Hour (Interisland)	184	198	205	226
Arriving				
Annual	591,964	683,200	753,200	931,200
Design Hour	438	490	542	676
Total Passengers				
Annual	1,231,388	1,408,120	1,547,420	1,909,380
Design Day	4,441	4,830	5,300	6,540
Design Hour	838	932	1,029	1,281
CUSTOMS & BORDER PROTECTION				
Arriving				
Design Hour (International)	237	329	350	450

TABLE 3Q
Peak Hour Passenger Demand Profile
Kona International Airport at Keahole

	Factor %	2006	Factor %	Short Term	Factor %	Inter. Term	Factor %	Long Term
NORTH TERMINAL								
Departing Passengers								
Curbside	0	0	0	0	0	0	0	0
Counter/Kiosk Check-in	90	498	80	489	75	504	70	585
Remote Check-in	10	55	20	122	25	168	30	251
Subtotal	100	553	100	611	100	672	100	835
Arriving Passengers								
Claiming	90	590	90	662	90	733	90	912
Bypass Claim	10	66	10	74	10	81	10	101
Subtotal	100	656	100	736	100	814	100	1,013
Well-wishers	20	111	20	122	20	134	20	167
Greeters	20	131	20	147	20	163	20	203
SOUTH TERMINAL								
Departing Passengers								
Curbside	0	0	0	0	0	0	0	0
Counter/Kiosk Check-in	90	360	80	298	75	308	70	358
Remote Check-in	10	40	20	75	25	103	30	153
Subtotal	100	400	100	373	100	411	100	511
Arriving Passengers								
Claiming	90	394	90	441	90	488	90	608
Bypass Claim	10	44	10	49	10	54	10	68
Subtotal	100	438	100	490	100	542	100	676
Well-wishers	20	80	20	75	20	82	20	102
Greeters	20	88	20	98	20	108	20	135

Processing Parameters - The processing parameters consist mostly of transaction times for the processing of passengers for departing or arriving flights. Some of these functions, like baggage claim, are dependent on the time it takes to process an entire aircraft load of passengers. **Table 3R** provides a list of the parameters that determine the number of processing facilities required for the peak conditions of the design day.

Space Standards - The space standards are a dimensional requirement that represent the elements of the terminal or are determined to be desirable alternatives to existing dimensions. For example, the depth of the baggage claim lobby may be inadequate and a larger depth may be specified as optimal to be added in the future. **Table 3R** outlines the facilities input variables used in the analysis.

TABLE 3R
Terminal Facilities Input Variables
(Service Levels, Space Standards, and Processing Rates)
Kona International Airport at Keahole

Function/Facility	Standard Units	Space Project Factor		Optimized Future Factor	Description/Comments
		North	South		
Terminal Design Activity Level		85%		85%	The processing level established for balanced operations for the peak hour average day peak month (% of total capacity)
Departures Processing					
Agricultural Check					
Inspection Rate Pax/Hour	Pax/ Hr	**200**	**200**		Pax checked through Agricultural check per hour per x-ray unit.
% of Mainland People checking bags	%	**0.80**	**0.80**		
Ticket Counters					
Ticketing Utilization Level (TUF)	%	**0.85**	**0.66**	**1.00**	Percentage of Counter positions used during the peak hour peak period.
% of Peak Hour Demand	% Pk.Hr.	**50**	**50**		% of total Peak Hour Passengers demand in Peak Period
Domestic/Mainland Ticketing rate	Min/ Pax	**1.3**	**1.3**		Average agent ck-in or ticketing rate for transaction
International Ticketing rate	Min/ Pax	**n/a**	**1.3**		Average agent ck-in or ticketing rate for transaction
Frontage / Agent Position	Ft.	**5.3**	**5.3**		3'-6" Desk Positions with half of 3'-6" bag well
Depth Ticket Counter	Ft.	**11**	**11**		Includes counter depth, standing work area and circulation behind
North/South Ticket Lobby (Queueing)					
Domestic/Mainland Service Goal Min.	Min	**15.0**	**15.0**		Maximum average waiting time for passenger in queue.
International Service Goal Min.	Min	**n/a**	**15.0**		Maximum average waiting time for passenger in queue.
Outbound Baggage Depth	Ft.	**68**	**107**		Average Depth of baggage handling space
Queuing Area / Person	Ft^2	**16.1**	**16.1**		Level Of Service C+
Queuing Area Depth	Ft.	**24.3**	**24.3**		
Airline Ticket Office Depth	Ft.	**43**	**29**		Average Depth of ATO space
Ticket Lobby circulation	Ft.	**22.0**	**20.5**		
Central Ticket Lobby (Queueing)					
Domestic/Mainland Service Goal Min.	Min	**n/a**	**15.0**		Maximum average waiting time for passenger in queue.
Outbound Baggage Depth	Ft.	**n/a**	**0**		Average Depth of baggage handling space
Queuing Area / Person	Ft^2	**n/a**	**16.1**		Level Of Service C+
Queuing Area Depth	Ft.	**n/a**	**18.1**		
Airline Ticket Office Depth	Ft.	**n/a**	**15**		Average Depth of ATO space
Ticket Lobby circulation	Ft.	**n/a**	**4.5**		

TABLE 3R (Continued)
Terminal Facilities Input Variables
(Service Levels, Space Standards, and Processing Rates)
Kona International Airport at Keahole

Function/Facility	Standard Units	Space Project Factor		Optimized Future Factor	Description/Comments
		North	South		
Public Area					
Circulation area per person	Ft^2	**116**	**349**		Calculated from drawings
Security					
Inspection Rate Pax/Hour	Pax/ Hr	**104**	**104**	**200**	Pax checked through security per hour per x-ray unit.
Security Service Goal Minutes	Min	**7**	**7**	**10**	Maximum wait in queue
Security Station Width	Ft.	**11.5**	**11.5**	**12.5**	Width of x-ray plus passing lane with magnetometer
Security Station Length	Ft.	**24**	**24**		Length of x-ray station input to reclaim
Area/Station	Ft^2	**277**	**277**		
Queuing Area / Pax	Ft^2	**16.1**	**16.1**		Level Of Service C+
ARRIVAL FACILITIES					
Baggage Claim					
Device Utilization Factor (DUF)	%	**50%**	**100%**		Percentage of the peak hour that all devices are in use.
Checked Bags per passenger	#	**1.8**	**1.8**		Average number of Checked bags per Passenger.
Frontage/Bag	Ft.	**2.5**	**2.5**	**1.5**	Average frontage for bags on claim device.
% Total Bags Displayed	% Pk.Hr.	**30%**	**30%**		% of total Hourly bags displayed.
Flat Bed Device Length	Ft.	**52**	**53**		Average for existing space from drawings
Claim device Area	Ft^2	**1,701**	**797**		Calculated
Device frontage per Flat Bed Device	Ft.	**133**	**133**	**185**	Existing = flat plate; Optimized = sloped plate 185 lf
Claim Lobby					
Claim Area	Ft^2/ Pax	**18.3**	**18.3**		IATA service level C+
Service Goal Minutes	Minutes	**20**	**20**		Delivery cycle of single flight bags to device
Public Area					
Ticket Lobby Circulation Length	Ft.	**204.9**	**194.0**		Calculated from drawings
Concourses					
Passenger Holdrooms					
Area S.F./ Occupant	Ft^2	**14**	**14**		Based on 60% seating @15sf, 40% standing @10sf + 10% for circ.
Airline Operations	Ft^2	**500**	**500**		Per peak hour departure (AC150-5360-13)
Area allowance for podiums & AC exit	Ft^2	**350**	**350**		Per gate
Airline Clubrooms					
Clubroom % of total holdroom area	%	**6**	**10**		Percentage of total passengers using clubs
Holdrooms / Clubroom	#	**5**	**5**		Ratio of gate to Club rooms
Average Clubroom area	Ft^2	**525**	**825**		Clubroom size

TABLE 3R (Continued)
Terminal Facilities Input Variables
(Service Levels, Space Standards, and Processing Rates)
Kona International Airport at Keahole

Function/Facility	Standard Units	Space Project Factor		Optimized Future Factor	Description/Comments
		North	South		
Concourse Circulation					
Circulation length	Ft^2	**132.2**	**132.0**		Calculated from drawings
Public Spaces					
Rest Rooms					
Area per peak hour passenger	Ft^2	**2,400**	**2,400**		Area/ 500 peak hour pax (AC150-5360-13 =1800, add for current standard)
Distance between restrooms	Ft.	**312**	**312**		To farthest restroom
Concessions		**8.40**	**8.40**		Area per 1,000 annual enplaned passenger (inc, 15% support area)
Food and Beverage	Ft^2/K ann.	**5.46**	**5.46**		Area per 1,000 annual enplaned passenger (inc, 15% support area)
Retail	Ft^2/K ann.	**2.94**	**2.94**		Area per 1,000 annual enplaned passenger (inc, 15% support area)

Level of Service - Table 3S presents the level of service standards used in the capacity analysis. Levels of service designations are of relevance to the comfort and quality of the passenger experience. One measurement of level of service is the desired personal space to be provided at peak passenger occupancy during a queuing situation, such as ticketing, baggage claim, or a gathering place such as the hold room and circulation areas.

Because of the large proportion of tourist passengers with a high number of checked and carry-on baggage, a level of service C+ was selected as appropriate for projections of the facilities at Kona International Airport at Keahole. This is slightly higher criteria for determining demand than standard planning practice, but is considered appropriate due to the nature of the tourism and visitor industry served by KOA.

Capacity Evaluation

Each of the processing functions was evaluated using the inputs and demand described above. Related processing functions were evaluated in the sequential experience by passengers. Only those functions for which user demand can be determined were evaluated. Secondary facilities that support processing were sized either in proportion to the existing ratio, or the ratio was altered to correct imbalances. The demand-capacity evaluations of related sequential functions were averaged to indicate the overall performance of the facilities. All facilities were adjusted to process a balanced capacity for the entire terminal.

A level of 85 percent of capacity was set up as the design utilization factor (DUF). This design level of activity is chosen as a "trigger" to initiate design

and construction of new facilities. The excess of 15 percent capacity allows for continuing growth during the design and construction period until new expanded facilities come on line.

TABLE 3S
Level of Service Standards (in square feet)
Kona International Airport at Keahole

	Area per Occupant							
Level of Service Standards	**A**	**B**	**C+**	**C**	**C-**	**D**	**E**	**F**
Check-in Queue Area	19.4	17.2	16.1	15.1	14.0	12.9	10.8	
Wait/Circulate	29.1	24.8	22.6	20.4	18.3	16.1	12.8	
Hold Room	15.1	13.5	12.8	12.0	11.3	10.5	8.0	
Bag Claim Area (excludes claim device)	21.5	19.4	18.3	17.2	16.1	15.1	12.9	System Failure
Federal Inspection Services	15.1	12.9	11.8	10.8	9.7	8.6	6.5	

Legend
A. Excellent level of service; conditions of free flow; excellent level of comfort.
B. High level of service; condition of stable flow; very few delays; high level of comfort.
C. Good level of service; condition of stable flow; acceptable delays; good level of comfort.
D. Adequate level of service; condition of unstable flow; acceptable delays for short periods of time; adequate level of comfort
E. Inadequate level of service; condition of unstable flow; unacceptable delays; inadequate levels of comfort
F. Unacceptable levels service; conditions of cross flows, system breakdown and unacceptable delays; unacceptable levels of comfort

Departure Processing Evaluation

Table 3T summarizes the demand capacity analysis for departure processing at the North and South Terminals. The following paragraphs discuss each of the components of departure processing.

USDA Agricultural Check – All passengers departing to the mainland are required to have bags inspected by the United States Department of Agriculture (USDA) prior to checking them to their destination. The ratio of departing mainland passengers during peak hour demand that would check their bags is 80 percent. Floor area calculations and agent positions are based on existing facilities. The capacity of the current facility was based on the existing number of stations and the passenger processing rate for a one hour period.

The USDA agricultural check stations at the North Terminal were found to be operating at 142 percent capacity in 2006. The South Terminal stations were operating at 52 percent capacity. The extreme difference is due to the fact that there are two USDA agricultural check stations at the South Terminal, but only one at the North Terminal even though passenger demand is higher.

Ticket Counters – The percentage of the departing passenger peak hour demand that would check in at the ticket lobby is 90 percent. The remaining 10 percent account for passengers that would have checked in on the web prior to arriving at the airport. Active ticket agent positions, frontage, workspace floor area, and vacant counters are based on existing facilities.

TABLE 3T
Existing Demand Capacity Analysis – Processing Facilities
Kona International Airport at Keahole

Facility Title	Units	Existing 2006	Existing Processing Capacity	Existing % of Capacity	Cap. Inc. (Dec.)	2006 Required Facilities	Required Facilities at 85% DUF
NORTH TERMINAL							
Planning Activity Level		**1,770,960**					
Departures Processing (peak hour demand)							
Agricultural Check (pre-security)	Pax	**285**	**200**	**142%**	**85**	**285**	**170**
Number of Stations	**#**	1			1	1	1
Area of Queuing	Ft^2	317			216	535	319
Ticket Counters	Pax	**498**	**667**	**75%**		**498**	**567**
Agent Positions (Active)	#	17			(2)	13	14
Frontage	Ft.	110			(9)	67	76
Area	Ft^2	1,269			(99)	713	812
Vacant Counter	#	3					
Ticket Lobby	Pax	**553**	**551**	**100%**		**553**	**469**
Queuing Area	Ft^2	2,219			340	2,226	1,886
Outbound Baggage	Ft^2	12,389			947	6,206	5,259
Airline Ticket Office	Ft^2	4,419			601	3,939	3,338
Ticket Lobby Circulation	Ft^2	2,111			307	2,015	1,708
Public Area	Pax.	**664**	**821**	**81%**		**664**	**698**
Ticket Lobby Public Circ.	Ft^2	3,058			(128)	2,472	2,600
Security Station	Pax	**553**	**208**	**266%**		**553**	**177**
Number of Stations	#	2			4	5	2
Area of Queuing	Ft^2	1,256			707	1,039	332
Average Utilization (% of Capacity)	%			**133%**			
Area Total	Ft^2	**27,040**				**19,143**	**16,254**
SOUTH TERMINAL							
Planning Activity Level		**1,231,388**					
Departures Processing (peak hour demand)							
Agricultural Check (pre-security)	Pax	**206**	**400**	**52%**	**85%**	**206**	**340**
Number of Stations	**#**	2			(1)	1	2
Area of Queuing	Ft^2	415			(251)	388	639
Ticket Counters	Pax	**360**	**777**	**46%**		**360**	**660**
Agent Positions (Active)	#	26			(10)	12	22
Frontage	Ft.	189			(52)	62	114
Area	Ft^2	2,939			(554)	664	1,218
Vacant Counter	#	4					
South Ticket Lobby	Pax	**338**	**544**	**62%**		**333**	**463**
Queuing Area	Ft^2	2,191			(502)	1,360	1,863
Outbound Baggage	Ft^2	15,212			(2211)	5,990	8,202
Airline Ticket Office	Ft^2	3,597			(599)	1,624	2,223
Ticket Lobby Circulation	Ft^2	1,750			(424)	1,148	1,571
Central Ticket Lobby	Pax	**62**	**355**	**17%**		**62**	**302**
Queuing Area	Ft^2	1,429			(965)	250	1,214
Outbound Baggage	Ft^2	0			0	0	0
Airline Ticket Office	Ft^2	375			(800)	207	1,006
Ticket Lobby Circulation	Ft^2	361			(240)	62	302
Public Area	Pax.	**418**	**654**	**64%**		**418**	**556**
Ticket Lobby Public Circ.	Ft^2	9,634			(2033)	6,155	8,189
Security Station	Pax	**394**	**208**	**189%**		**394**	**177**
Number of Stations	#	2			2	4	2
Area of Queuing	Ft^2	1,119			419	751	332
Average Utilization (% of Capacity)	%			**72%**			
Area Total	Ft^2	**39,023**				**18,599**	**26,758**

The capacity of the ticket counters was calculated using the passenger processing rate derived from observation averages. The capacity was also based on the ticketing utilization factor which represents the percentage of counter positions used during the peak period. The ticket counters were operating at 75 percent of capacity at the North Terminal and 46 percent of capacity at the South Terminal.

Ticket Lobby – The adequacy of the ticket lobby floor area was evaluated to determine whether base year demands result in an acceptable level of service. The ticket lobby demand included a percentage of well-wishers in addition to the passengers. Industry standards assume that some passengers enter the queuing area with their family or friends for assistance. The evaluation was based on a service goal of a 15-minute maximum wait in queue, and a Level of Service C+ of 16 square feet per person in queue with baggage.

There are three separate locations of ticket lobbies at KOA: one at the North Terminal, one at the South Terminal, and another central location behind the Onizuka Space Center. The peak hour demand on each of the ticket lobbies was determined and the ticket lobby space was evaluated. The North Terminal ticket lobby was operating at 100 percent capacity, the South Terminal ticket lobby at 62 percent, and the central ticket lobby was operating at 17 percent.

Baggage Security Screening – The current state of the outbound baggage screening system includes explosive detection systems that are located within the ticket lobby at the North and South Terminals and adjacent to the ticket lobby at the North Terminal. Baggage screening at the American Airlines counters is accomplished by electronic trace detection (ETD) screening. Locating baggage screening within the ticket lobbies poses problems of passenger congestion since there are already queues associated with agricultural check for overseas baggage and ticketing.

Public Areas – The public areas are the spaces in front of ticketing, the security checkpoint, and the baggage claim area that are utilized by departing and arriving passengers for circulation space, as well as by meeters/greeters and well-wishers. This area also includes seating space around the planters. Therefore, the demand is based on the combined peak hour passenger numbers, and the capacity is based on the level of service standard for circulation space and the rate of passengers leaving the space.

It was determined that the public area at the North Terminal was operating at 81 percent of capacity and the South Terminal at 64 percent. This is consistent with observations of the space, confirming that during combined peak times there is sufficient space relative to the level of service.

Passenger Security Screening – Based upon on-site observations, the average processing rate at the security checkpoint is 104 passengers per hour. With two stations at each terminal, the capacity is 208 passengers per hour at both the North and South Terminals. It was calculated that the

security checkpoints at both the North and South Terminals were operating at 266 percent and 192 percent capacity respectively. The required queuing area for the checkpoint was determined based on 10 minutes as the TSA standard waiting time service goal and an area of 16 square feet per person at a level of service C+. This is in keeping with observations of the space, validating that the areas for queuing at both terminals are insufficient for the current demand level during peak times.

Arrival Processing Evaluation

Table 3U summarizes the demand-capacity analysis for arrivals processing at the North and South Terminals.

Baggage Claim – Because the majority of passengers are tourists at this airport, it is estimated that 90 percent of the arriving peak hour passengers claim their checked baggage. The remaining 10 percent of the passengers bypass the baggage claim areas and go directly to the curb or other ground transportation facilities. In order to determine the peak hour number of bags, it was estimated that each passenger checks an average of 1.8 bags. The bag claim capacity was based on the device frontage, frontage per bag, percentage of total bag displayed, and the design utilization factor (DUF).

The capacity based on the current available devices at the North Terminal is 355 peak hour bags and was operating at 300 percent of capacity in 2006. At the South Terminal, the capacity is 177 peak hour bags and was operating at 400 percent of capacity. The current number of bag claim devices as well as the claim frontage were both deficient for the base year demand at both terminals.

This claim device evaluation was based on characteristics of the existing flat plate baggage claim devices. Sloped plate devices would provide greater capacity due to their ability to display baggage vertically and to stack baggage. In calculating the claim device and claim frontage requirements, sloped plate device characteristics were used to present an optimized condition for evaluation.

Claim Lobby – The lobby area surrounding the flat bed claim devices is 9,604 square feet for the North Terminal and 5,334 square feet for the South Terminal. This area excludes the area of the device, but includes the active claim area and circulation space from the edge of the device to the low partition walls defining the baggage claim area. With the level of service C+ area of 18 square feet per person, the capacity for the claim device lobby space is 525 persons at the North Terminal and 291 persons at the South Terminal. As a result, the North Terminal claim lobby was operating at 137 percent capacity and at the South Terminal at 165 percent capacity in 2006.

TABLE 3U
Existing Demand Capacity Analysis Bag Claim and Lobby
Kona International Airport at Keahole

Facility Title	Units	2006	Existing Processing Capacity	Existing % of Capacity	Cap. Incr. (Decr.)	2006 Re-quired Facilities	Required Facilities at 85% DUF
NORTH TERMINAL							
Planning Activity Level		1,770,960					
Baggage Claim	Bags	1,063	355	300%		1,063	301
Devices	#	2			2	4	2
Device Frontage	Ft.	266			571	797	226
Inbound Baggage	Ft^2	17,738			35,475	52,213	17,738
Baggage Services Office	Ft^2	549			1,098	1,646	549
Claim Lobby	Pax+Gr.	722	525	137%		722	446
Area Excluding Devices	Ft^2	9,604			5,042	13,205	8,164
(inc. active claim & circ.)							
Public Area	Pax.	**722**	**570**	**127%**		**722**	**485**
Claim Lobby Public Circulation	$Ft.^2$	6,509				8,240	5,533
Average utilization (% of Capacity)	%			188%			
Area Total	Ft^2	34,400				76,304	31,893
SOUTH TERMINAL							
Planning Activity Level		1,231,388					
Baggage Claim	Bags	710	177	400%		710	151
Devices	#	1			3	4	1
Device Frontage	Ft.	133			419	532	113
Inbound Baggage	Ft^2	16,956			33,912	50,868	16,956
Baggage Services Office	Ft^2	157			313	470	157
Claim Lobby	Pax+Gr.	482	291	165%		482	248
Area Excluding Devices	Ft^2	5,334			4,283	8,817	4,534
(inc. active claim & circ.)							
Public Area	Pax.	**482**	**955**	**50%**		**482**	**812**
Claim Lobby Public Circulation	$Ft.^2$	9,782				4,935	8,314
Average utilization (% of Capacity)	%			170%			
Area Total	Ft^2	32,229				65,090	29,961
CUSTOMS AND BORDER PROTECTION							
CBP Facility	Pax.	**237**	**418**	**57%**	**85%**	**237**	**355**
Area	$Ft.^2$	18,130			(5,124)	10,287	15,411

Customs and Border Protection (CBP) – The current CBP facility is located at the north end of the terminal area in a white fabric strung structure. This facility processes international arriving passengers including the primary functions of passport control, baggage claim, and customs/agricultural check. The facility currently encompasses 18,130 square feet.

In assessing the capacity of the CBP facility, the "Airport Technical Design Standards" published by the CBP was consulted. The design standards indicated that an area of 8,362 square feet is necessary to handle 400 peak hour

passenger arrivals. This does not include baggage claim, so an additional 9,000 square feet was assumed for this function. This resulted in a CBP space requirement of 17,362 square feet. It was determined that the existing facility was operating at 57 percent of capacity in 2006. It should be recognized, however, that the facility was constructed as a temporary solution and a permanent state-of-the-art CBP facility should be planned.

Post-Security Facilities

Table 3V summarizes the demand capacity analysis for post-security facilities at the North and South Terminals.

Holdrooms – The holdroom capacity is based on the area required for seating 60 percent of the passengers, plus an additional 10 percent of the area for general circulation. Using the aggregate area of all holdroom space in each terminal, the base year capacity was 711 peak hour passengers in each terminal. This results in the total holdroom area operating at 78 percent and 56 percent capacity at the North and South Terminals, respectively.

The holdroom evaluation excludes the space necessary for podium functions and aircraft exit space. This space is required per the functionality of each gate and is not related to passenger demand. The capacity of the holdroom space was based on the assumption that the entire holdroom area is shared by all gates and can be occupied by any outbound passenger. However, the current operation of the space segregates holdroom areas to confine mainland-bound passengers after their carry-on baggage has been processed through the agricultural check. This makes the holdroom space inadequate during peak hours. Consideration should be given to relocating the agricultural check function to better optimize the space available.

Circulation – The departures holdroom areas at KOA are not configured like those typically found in rectilinear corridor concourses. The five gates at each terminal surround a central hold room area that is partitioned into smaller areas defined by the edge of the roof lines and sometimes by low or full height partitioning. Because of the centralized holdroom space, the circulation area is defined as the space that allows passengers to travel from the end of the security checkpoint to the holdroom area and vice versa.

In evaluating the capacity of the current public circulation space, the guide "Pedestrian Planning and Design" by John J. Fruin was referenced for levels of service areas. This data was used in calculating the number of passengers that could circulate through the space within a one-hour period. As a result, the capacity of the North Terminal holdroom circulation area is 3,638 passengers and 3,577 for the South Terminal. The circulation area was operating at 15 percent of capacity at the North Terminal and 11 percent of capacity at the South Terminal in 2006.

TABLE 3V
Existing Demand Capacity Analysis – Post-Security Facilities
Kona International Airport at Keahole

Facility Title	Units	Existing 2006	Existing Processing Capacity	Existing % of Capacity	Inc. (Dec.)	2006 Required Facilities	Required Facilities at 85% DUF
NORTH TERMINAL							
Planning Activity Level		**1,770,960**					
Passenger Holdrooms	Pax.	**553**	**711**	**78%**		**553**	**604**
Passenger Holdroom Area	Ft^2	10,163			(731)	7,908	8,639
Airline Operations	Ft^2	682			1,697	2,500	803
Clubrooms	Ft^2	525					
Public Area (post-security)	Pax.	**553**	**3,638**	**15%**		**553**	**3,093**
Circulation Area	Ft^2	17,462			(12,188)	2,654	14,842
Average Utilization (% of Capacity)	%			**40%**			
Area Total	Ft^2	**28,832**				**13,062**	**24,284**
SOUTH TERMINAL							
Planning Activity Level		**1,231,388**					
Passenger Holdrooms	Pax.	**400**	**711**	**56%**		**400**	**604**
Passenger Holdroom Area	Ft^2	10,163			(2,919)	5,720	8,639
Airline Operations	Ft^2	222			1,239	1,500	261
Clubrooms	Ft^2	825					
Public Area (post-security)	Pax.	**400**	**3,577**	**11%**		**400**	**3,041**
Circulation Area	Ft^2	17,125				1,915	14,556
Average Utilization (% of Capacity)	%			**34%**			
Area Total	Ft^2	**28,335**				**9,135**	**23,456**

Public Space

Table 3W outlines the demand capacity analysis for public spaces at the North and South Terminals.

Restrooms - Restrooms are located near the baggage claim in the non-secure area of both terminals. On the secure side, there are restrooms adjacent to the restaurants in both terminals. Because of the configuration of the terminal, the distance between the two sets of restrooms is not significant and was measured at 312 feet.

Restroom capacity was calculated based on a square-foot per peak hour passenger. The number has been adjusted to current standards that include wider and deeper stalls to accommodate baggage and stall doors that swing out. The restroom capacity was determined to be sufficient to accommodate a peak hour passenger level of just 393 in each terminal. The restrooms were operating at 307 percent of capacity at the North Terminal and 213 percent of capacity at the South Terminal. The evaluation confirms the spatial deficiency for current demand at both terminal areas.

TABLE 3W
Existing Demand Capacity Analysis - Public Spaces
Kona International Airport at Keahole

Facility Title	Units	Existing 2006	Existing Processing Capacity	Existing % of Capacity	Inc. (Dec.)	2006 Required Facilities	Required Facilities at 85% DUF
NORTH TERMINAL							
Planning Activity Level		**1,770,960**					
Restrooms	Pax.	**1,209**	**393**	**307%**		**1,209**	**334**
Restrooms area	Ft^2	1,889			4,198	5,803	1,605
Concessions	Pax.	**883,014**	**378,679**	**233%**		**883,014**	**321,878**
Food & Beverage	Ft^2	2,068			**3,064**	4,821	1,757
Concessions	Pax.	**883,014**	**529,762**	**167%**		**883,014**	**450,298**
Retail	Ft^2	1,558			**1,272**	2,596	1,324
Average Utilization (% of Capacity)				**236%**			
Area Total	Ft^2	**23,923**				**13,221**	**4,687**
SOUTH TERMINAL							
Planning Activity Level		**1,231,388**					
Restrooms	Pax.	**838**	**393**	**213%**		**838**	**334**
Restrooms area	Ft^2	1,888			2,418	4,022	1,604
Concessions	Pax.	**639,424**	**543,271**	**118%**		**639,424**	**461,780**
Food & Beverage	Ft^2	2,966			970	3,491	2,521
Concessions	Pax.	**639,424**	**551,340**	**116%**		**639,424**	**468,639**
Retail	Ft^2	1,621			(502)	1,880	1,378
Average Utilization (% of Capacity)				**149%**			
Area Total	Ft^2	**6,475**				**9,394**	**5,504**

Concessions and Retail - There are concessions and retail on both the secure and non-secure sides of the terminals. The total aggregate area of concessions at the North Terminal is 2,068 and 1,558 square feet respectively for retail areas. The South Terminal has concessions and retail areas of 2,966 and 1,621 square feet, respectively. Based on industry standards, the North Terminal was at 233 percent capacity for concessions and 167 percent capacity for retail in 2006. The South Terminal was at 118 percent capacity for concessions and 116 percent capacity for retail.

TERMINAL FACILITIES REQUIREMENTS

Departure Processing Facilities

The facility requirements projected here are based on the assumption that the passenger profiles will change over time. It takes into consideration the industry changes in passenger processing in the ticketing lobbies. As a result of technology, the percentage of passengers that are checking-in and printing boarding passes at home or at the hotel is increasing. Consequently, the future will see a lower proportion of passengers checking in for their flight in the airport ticket lobby.

The requirements are also based upon the premise that the airport will continue to operate two separate terminals. This assumption serves only to establish a baseline from which to evaluate the alternatives against the facility requirements. Therefore, the proportion of passengers between the two terminals derived from the August 2006 flight schedule was applied to the facility requirements throughout the planning horizon activity levels. The assumption was also based upon the airlines or similar replacement airlines continuing to serve the same terminals and the aircraft mix at each terminal remaining the same.

During the peak hour there has been an imbalance of originating passengers between the North and South Terminals ticket lobbies. The North Terminal has served a greater passenger demand, and on-site observations confirmed its ticket lobby was more crowded.

The facility requirements show the spaces associated with queuing for both agricultural check and ticket counter check-in, and airline ticket offices at the North Terminal would require additions to accommodate the future demand. The calculation shows, however, the space for ticket lobby at the South Terminal will be underutilized. Future requirements can be achieved by either physical space additions at the North Terminal, or by re-balancing airline operations between the two terminals.

Due to the configuration of the facilities within the departures processing facility, passenger disorientation and crowding easily occur. The location of the agricultural check station within the ticket lobby entrance and its proximity to the security checkpoint create a queuing convergence. It has been observed during peak hours that passengers often find themselves in the wrong queue.

There are many ways to relieve this issue in the near term without expansion of facilities. The agricultural check can be relocated or the planter immediately in front of ticketing could be relocated to provide more space for organized queuing. These solutions will be investigated in more detail in the Alternatives chapter.

Table 3X summarizes the facility requirements for departing processing at the North and South Terminals.

Passenger Security Screening - The on-site measured security checkpoint processing rate was 104 passengers per hour and was used in the existing demand capacity analysis. By comparison, the checkpoint processing rate was 160-180 passengers per hour at Honolulu International Airport and 220 at the Kahului International Airport.

The TSA standard rate of 200 passengers per hour was used for the facility requirements calculations to arrive at an optimized facility condition. The current passenger security screening positions and queuing areas do not have adequate processing capacity at either terminal. The projection assumes that the two main security screening positions will remain with additional stations and queuing spaces to satisfy the future demand.

TABLE 3X
Departure Processing Facility Requirements
Kona International Airport at Keahole

Facility Title	Standard Units	Existing 2006	2006 Required Facilities	Required Facilities at 85% DUF	Short Term	Inter. Term	Long Term
NORTH TERMINAL							
Planning Activity Level		**1,770,960**			**2,025,880**	**2,226,580**	**2,747,620**
Agricultural Check (pre-security)	Pax	**285**	**285**	**170**	**329**	**394**	**565**
Number of Stations	**#**	1	1	1	2	2	3
Area of Queuing	Ft^2	317	535	319	618	741	1,061
Ticket Counters	Pax	**498**	**498**	**567**	**489**	**504**	**585**
Agent Positions (Active)	#	17	13	14	11	11	13
Frontage	Ft.	110	67	76	56	57	66
Area	Ft^2	1,269	713	812	595	613	711
Vacant Counter	#	3					
Ticket Lobby	Pax	**553**	**553**	**469**	**550**	**571**	**668**
Queuing Area	Ft^2	2,219	2,226	1,886	2,213	2,299	2,689
Outbound Baggage	Ft^2	12,389	6,206	5,259	6,171	6,410	7,496
Airline Ticket Office	Ft^2	4,419	3,939	3,338	3,917	4,068	4,758
Ticket Lobby Circulation	Ft^2	2,111	2,015	1,708	2,004	2,081	2,434
Public Area	Pax.	**664**	**664**	**698**	**733**	**806**	**1,002**
Circulation Area	Ft^2	3,058	2,472	2,600	2,731	3,004	3,732
Security Station	Pax	**553**	**553**	**177**	**611**	**672**	**835**
Number of Stations	#	2	5	2	3	3	4
Area of Queuing	Ft^2	1,256	1,039	332	1,640	1,803	2,241
Area Total	Ft^2	**27,040**	**19,143**	**16254**	**19,888**	**21,020**	**25,122**
SOUTH TERMINAL							
Planning Activity Level		**1,231,388**			**1,408,120**	**1,547,420**	**1,909,380**
Agricultural Check (pre-security)	Pax	**206**	**206**	**340**	**238**	**286**	**409**
Number of Stations	**#**	2	1	2	1	1	2
Area of Queuing	Ft^2	415	388	639	448	536	768
Ticket Counters	Pax	**360**	**360**	**660**	**298**	**308**	**358**
Agent Positions (Active)	#	26	12	22	6	7	8
Frontage	Ft.	189	62	114	34	35	41
Area	Ft^2	2,939	664	1,218	363	375	435
Vacant Counter	#	4					
South Ticket Lobby	Pax	**338**	**338**	**463**	**373**	**411**	**511**
Queuing Area	Ft^2	2,191	1,360	1,863	1,501	1,654	2,057
Outbound Baggage	Ft^2	15,212	5,990	8,202	6,611	7,284	9,057
Airline Ticket Office	Ft^2	3,597	1,624	2,223	1,792	1,974	2,455
Ticket Lobby Circulation	Ft^2	1,750	1,148	1,571	1,267	1,396	1,735
Central Ticket Lobby	Pax	**62**	**62**	**302**	**69**	**76**	**94**
Queuing Area	Ft^2	1,429	250	1,214	278	306	378
Outbound Baggage	Ft^2	0	0	0	0	0	0
Airline Ticket Office	Ft^2	375	207	1,006	230	254	314
Ticket Lobby Circulation	Ft^2	361	62	302	69	76	94
Public Area	Pax.	**418**	**418**	**556**	**448**	**493**	**613**
Circulation Area	Ft^2	9,634	6,155	8,189	6,591	7,263	9,030
Security Station	Pax	**400**	**400**	**177**	**373**	**411**	**511**
Number of Stations	#	2	4	2	2	2	3
Area of Queuing	Ft^2	1,119	751	332	1,001	1,103	1,371
Area Total	Ft^2	**39,023**	**18,599**	**26,758**	**20,150**	**22,221**	**27,693**

Baggage Security Screening - The amount of space required for outbound baggage operations is largely dependent on the processing characteristic of the system. Since this information is not available, the facility requirement for this area has been related to the capacity of the ticket lobby.

Arrival Processing Facilities

The passenger arrivals process consists primarily of those facilities and functions that provide means to reunite the arriving passenger with the items that were checked in at the origin of the flight. The current terminal was originally designed to accommodate 130-seat interisland aircraft. The existing claim devices and claiming area around the devices at both terminals are insufficient to serve the current wide-body aircraft. There will be an increase in this type of aircraft in the future due to forecasted mainland passenger demand.

The low walls surrounding the claim lobby and their proximity to the device create crowding at the end of the devices. This can be relieved by some modifications such as removing or relocating the walls surrounding the claim lobby. Additional new claim devices should be designed to accommodate the future demand at both the North and South Terminals.

According to the passenger demand forecast, the peak hour international arriving passengers will increase to 329 in the short term, 350 in the intermediate term, and 450 in the long range. CBP design standards indicate 17,362 square feet are needed to process a peak hour demand of 400 passengers. The current facility will satisfy the short and intermediate term demand, but 19,532 square feet will be necessary to meet the long term planning horizon.

All passengers and baggage that arrive from Overseas (non-inter island passengers) aircraft are subject to inspection by the Hawaii Department of Agriculture (HDOA). Other inspections that are conducted are done by the United States Department of Agriculture (USDA) and their Animal and Plant Health Inspection Service, Plant Protection and Quarantine Division (APHIS-PPQ). Much of their inspection deals with outgoing overseas passengers. In certain conditions, HDOA and USDA share or overlap their inspection duties.

Currently, HDOA has one inspection counter in the north terminal baggage claim area and an office located in the administrative building. HDOA also does agriculture cargo inspection and uses a temporary cooling facility (note: this has been displaced and HDOA is currently using the triturator) that is undersized for their requirements. HDOA operational needs include inspection counters and each baggage claim area. Several small inspection/holding/quarantine facilities that allow for plant and animal inspection should be located in the terminal, general aviation and commuter areas. A dog holding area should be centrally located to the main terminal baggage claim areas as well as the general aviation and commuter terminals.

There will also be a need to have offices for both HDOA and USDA staff and inspectors with quick access to staff vehicles. The detailed program requirements for these facilities will be developed with both the HDOA and USDA during the design phase.

Table 3Y summarizes the facility requirements for arrivals processing at the North and South Terminals.

Holdroom and Concourse Circulation

The holdroom capacity requirements are based on the mix of aircraft during the peak hour and the number of gates required serving the combined peak hour operations. The size for holdrooms at both terminals is adequate for base year and future demand, except that the holdroom area will need to increase at the North Terminal in the long-term.

TABLE 3Y
Arrival Processing Facility Requirements
Kona International Airport at Keahole

Facility Title	Standard Units	Existing 2006	2006 Required Facilities	Required Facilities at 85% DUF	Short Term	Inter. Term	Long Term
NORTH TERMINAL							
Planning Activity Level		**1,770,960**			**2,025,880**	**2,226,580**	**2,747,620**
Baggage Claim	Bags	**1,063**	**1,063**	**301**	**1,192**	**1,319**	**1,641**
Devices	#	2	6	2	3	3	4
Device Frontage	Ft.	266	797	226	537	593	738
Inbound Baggage	Ft^2	17,738	53,213	17,738	26,606	26,606	35,475
Baggage Services Office	Ft^2	549	1,646	549	823	823	1,098
Claim Lobby	Pax+Gr.	**722**	**722**	**446**	**810**	**895**	**1,114**
Area Excluding Devices	Ft^2	9,604	13,205	8,164	14,816	16,386	20,392
Public Area	Pax.	**722**	**722**	**485**	**810**	**895**	**1,114**
Claim Lobby Public Circulation	$Ft.^2$	6,509	8,240	5,533	9,245	10,224	12,724
Area Total	Ft^2	**34,400**	**76,304**	**31,983**	**51,490**	**54,040**	**69,688**
SOUTH TERMINAL							
Planning Activity Level		**1,231,388**			**1,408,120**	**1,547,420**	**1,909,380**
Baggage Claim	Bags	**710**	**710**	**151**	**794**	**878**	**1,095**
Devices	#	1	4	1	2	2	3
Device Frontage	Ft.	133	532	113	357	395	493
Inbound Baggage	Ft^2	16,956	50,868	16,956	33,912	50,868	50,868
Baggage Services Office	Ft^2	157	470	157	313	470	470
Claim Lobby	Pax+Gr.	**482**	**482**	**248**	**539**	**596**	**744**
Area Excluding Devices	Ft^2	5,334	8,817	4,534	9,864	10,910	13,608
Public Area	Pax.	**482**	**482**	**812**	**539**	**596**	**744**
Claim Lobby Public Circulation	$Ft.^2$	9,782	4,935	8,314	5,521	6,107	7,617
Area Total	Ft^2	**32,229**	**65,090**	**29,961**	**49,610**	**68,356**	**72,563**
CUSTOMS AND BORDER PROTECTION							
CBP Facility	Pax.	**237**	**237**	**355**	**329**	**350**	**450**
Area	$Ft.^2$	18,130	10,287	15,411	14,280	15,192	19,532

Within the holding areas at both terminals, there are spaces where mainland and international passengers are required to be contained by security barriers after agricultural inspection. These barriers prevent passengers from having the advantage of flexible use of holdrooms jointly as common holding area. The passengers who need access to concessions and restrooms are required to either use them before agricultural inspection or leave the holdroom area and then reprocess through inspection. **Table 3Z** presents the facilities requirements for the holdrooms.

TABLE 3Z
Holdroom and Concourse Facility Requirements
Kona International Airport at Keahole

Facility Title	Standard Units	Existing 2006	2006 Required Facilities	Required Facilities at 85% DUF	Short Term	Inter. Term	Long Term
NORTH TERMINAL							
Planning Activity Level		**1,770,960**			**2,025,880**	**2,226,580**	**2,226,580**
Passenger Holdrooms	Pax.	**553**	**553**	**604**	**611**	**672**	**835**
Passenger Holdroom Area	Ft^2	10,163	7,908	8,639	8,737	9,610	11,941
Airline Operations	Ft^2	682	2,500	803	794	722	581
Clubrooms	Ft^2	525					
Public Area (post-security)	Pax.	**553**	**553**	**3,093**	**611**	**672**	**835**
Circulation Area	Ft^2	17,462	2,654	14,842	17,462	17,462	17,462
Area Total	Ft^2	**28,832**	**13,062**	**24,284**	**26,993**	**27,793**	**29,983**
SOUTH TERMINAL							
Planning Activity Level		**1,231,388**			**1,408,120**	**1,547,420**	**1,909,380**
Passenger Holdrooms	Pax.	**400**	**400**	**604**	**442**	**487**	**605**
Passenger Holdroom Area	Ft^2	10,163	5,720	8,639	6,321	6,964	8,652
Airline Operations	Ft^2	222	1,500	261	357	324	261
Clubrooms	Ft^2	825					
Public Area (post-security)	Pax.	**400**	**400**	**3,041**	**442**	**487**	**605**
Circulation Area	Ft^2	17,125	1,915	14,556	17,125	17,125	17,125
Area Total	Ft^2	**28,335**	**9,135**	**23,456**	**23,803**	**24,413**	**26,038**

Public Spaces

Table 3AA summarizes the facilities requirements for public spaces.

Restrooms – The restroom area is not adequate at either terminal and will require substantial space increases to serve the existing and future demand. In addition to increasing capacity, the current restrooms need to be modernized and new restrooms will need to be designed to meet current airport restroom standards. To accommodate passenger roller bags, new standards include wider circulation spaces, larger stalls, and doors that swing out.

Concessions – The projections indicate that the space for concessions at the South Terminal is adequate for base year and future demand, while the concessions at the North Terminal will require additional space to accommodate future demand. Observations indicate that larger floor area and variety would improve passenger experience at post-security concessions. There is also a lack of concessions to serve passengers departing or arriving on evening flights as most concessions are closed during the evening hours.

TABLE 3AA
Public and Support Facility Requirements
Kona International Airport at Keahole

Facility Title	Standard Units	Existing 2006	2006 Required Facilities	Required Facilities at 85% DUF	Short Term	Inter. Term	Long Term
NORTH TERMINAL							
Planning Activity Level		**1,770,960**			**2,025,880**	**2,226,580**	**2,747,620**
Restrooms	Pax.	**1,209**	**1,209**	**334**	**1,347**	**1,486**	**1,848**
Restrooms area	Ft^2	1,889	5,803	1,605	6,466	7,133	8,870
Concessions	Pax.	**883,014**	**883,014**	**321,878**	**1,001,080**	**1,096,780**	**1,350,820**
Food & Beverage	Ft^2	2,068	4,821	1,757	5,466	5,988	7,375
Concessions	Pax.	**883,014**	**883,014**	**848,638**	**1,001,080**	**1,096,780**	**1,350,820**
Retail	Ft^2	1,558	2,596	1,324	2,943	3,225	3,971
Public Area (pre-security)	Pax.	**1,451**			**1,616**	**1,783**	**2,218**
Ancillary Circulation Area	$Ft.^2$	18,409			21,059	23,913	28,539
Area Total	Ft^2	**23,923**	**13,221**	**4,687**	**35,934**	**40,259**	**48,756**
Aviation Department							
Administrative/ Operations Space (16%)	Ft^2	23,128	24,654	15,637	27,201	28,985	35,149
Building Systems/Support Space							
Building Systems/ Support Space (5%)	Ft^2	723	770	489	850	906	1,098
SOUTH TERMINAL							
Planning Activity Level		**1,231,388**			**1,408,120**	**1,547,420**	**1,909,380**
Restrooms	Pax.	**838**	**838**	**334**	**932**	**1,029**	**1,281**
Restrooms area	Ft^2	1,888	4,022	1,604	4,474	4,939	6,149
Concessions	Pax.	**639,424**	**639,424**	**461,780**	**724,920**	**794,220**	**978,180**
Food & Beverage	Ft^2	2,966	3,491	2,521	3,958	4,336	5,341
Concessions	Pax.	**639,424**	**639,424**	**468,639**	**724,920**	**794,220**	**978,180**
Retail	Ft^2	1,621	1,880	1,378	2,131	2,335	2,876
Public Area (pre-security)	Pax.	**1,006**			**1,105**	**1,220**	**1,518**
Ancillary Circulation Area	$Ft.^2$	15,004			15,306	15,994	20,536
Area Total	Ft^2	**6,475**	**9,394**	**5,504**	**10,563**	**11,611**	**14,366**
Aviation Department							
Administrative/ Operations Space (16%)	Ft^2	21,481	20,702	17,353	21,089	25,641	28,488
Building Systems/Support Space							
Building Systems/ Support Space (5%)	Ft^2	671	647	542	659	801	890

TERMINAL REQUIREMENTS SUMMARY

Table 3BB presents a summary of the terminal requirements. The total combined occupiable space of the existing terminal is 296,935 square feet. The demand-capacity analysis indicated that the terminal would require 221,597 square feet at 85 percent utilization. This represents when the level of service during peak periods is beginning to drop below the desired C+ level. It is also an indicator to initiate a design and construction of new facilities.

TABLE 3BB
Terminal Facility Requirements Summary
Kona International Airport at Keahole

	Available		Planning Horizons by Terminal (million passengers)					
			Short Term		Inter. Term		Long Term	
Category	North	South	North 2.0	South 1.4	North 2.1	South 1.6	North 2.5	South 2.0
Agricultural Check Processing								
Number of Stations	1	2	2	1	2	1	3	2
Area of Queuing (Ft.^{2})	317	415	618	448	741	536	1,061	768
Airline Counter/Office								
Ticket Counter Frontage (Ft.)	110	189	56	34	57	35	66	41
Counter Area (Ft.^{2})	1,269	2,939	595	351	613	356	711	417
Queuing Area (Ft.^{2})	2,219	3,620	2,213	1,779	2,299	1,960	2,689	2,435
Outbound Baggage (Ft.^{2})	12,389	15,212	6,171	6,611	6,410	7,284	7,496	9,057
Airline Ticket Office (Ft.^{2})	4,419	3,972	3, 917	2,022	4,068	2,228	4,758	2,769
Ticket Lobby Circulation (Ft.^{2})	2,111	2,111	2,004	1,336	2,081	1,472	2,434	1,829
Public Circulation	3,058	9,634	2,731	6,591	3,004	7,263	3,732	9,030
Security Processing								
Number of Stations	2	2	3	2	3	2	4	3
Area of Queuing (Ft.^{2})	1,256	1,119	1,640	1,001	1,803	1,103	2,241	1,371
Baggage Claim								
Devices	2	1	3	2	3	2	4	3
Device Frontage (Ft.)	266	133	537	357	593	395	738	493
Inbound Baggage (Ft.^{2})	17,738	16,956	26,606	33,912	26,606	50,868	35,475	50,868
Baggage Services Office (Ft.^{2})	549	157	823	313	823	470	1,098	470
Area Excluding Device (including active claim) (Ft.^{2})	9,604	5,334	14,816	9,864	16,386	10,910	20,392	13,608
Public Circulation (Ft.^{2})	6,509	9,782	9,245	5,521	10,224	6,107	12,724	7,617
Concourses								
Passenger Holdroom Area (Ft.^{2})	10,163	10,163	8,737	6,321	9,610	6,964	11,941	8,652
Airline Operations (Ft.^{2})	682	222	794	357	722	324	581	261
Public Spaces								
Restrooms Area (Ft.^{2})	1,889	1,888	6,466	4,474	7,133	4,939	8,870	6,149
Food & Beverage (Ft.^{2})	2,068	2,966	5,466	3,958	5,988	4,336	7,375	5,341
Retail (Ft.^{2})	1,558	1,621	2,943	2,131	3,225	2,335	3,971	2,876
International Arrivals Processing								
Customs and Border Protection (Ft.^{2})	18,130		14,280		15,192		19,532	

Although the total terminal area required at 85 percent utilization is less than the currently available facilities, several areas of the terminal were found deficient for the 2006 base year levels of demand. They included ticket lobby queuing, airline ticket offices, queuing space for pre-security agricultural check, baggage claim area, holdroom areas, restrooms, and concessions spaces.

At 3.4 million total annual passengers in the short-term, a total of 317,003 square feet will be required. This is six percent more than the currently available facilities. At 3.7 million total annual passengers in the intermediate term, a total of 340,580 square feet will be required. This requirement is 15 percent more than currently available facilities. At 4.5 million total annual passengers in the long-term, a total of 423,342 square feet will be required, or an increase of 126,407 square feet to the existing terminal.

TERMINAL ACCESS AND PARKING

Since the terminal building serves primarily as the interface between air and ground transportation, terminal access and vehicle parking are important components of the terminal complex. The components to be examined here are:

- Terminal Curb Frontage
- Vehicle Parking
- Terminal Access Road

Terminal Curb Frontage

The terminal curb element is the direct interface between the terminal building and the ground transportation system. The length of the curb available for loading and unloading passengers and baggage is determined by the type and volume of ground vehicles anticipated during the peak period on the design day. The airport presently has approximately 690 feet of curb frontage directly in front of each terminal (1,380 feet total) available for enplaning (departing) and deplaning (arriving) passengers from private vehicles. Three sections of median curb provide an additional 850 feet of frontage available for passenger loading and unloading from commercial vehicles.

A common problem for terminal curb capacity in the past has been the length of dwell time for vehicles utilizing the curb. At airports where the curb front has not been strictly patrolled, vehicles have been known to be parked at the curb while the driver and/or riders are at the terminal checking in, greeting arriving passengers, or awaiting baggage pick-up. Since most curbs are not designed for vehicles to remain curbside for more than two to three minutes, capacity problems can ensue. Since the events of September 11, 2001, most airports police the curb front much more strictly for security reasons. This alone has eliminated, or at least significantly reduced, the curb front capacity problems at most airports.

KOA has a staff of traffic personnel that strictly polices the curb during

busy periods of the day. The curbside staff assists with traffic flow and pedestrian crossing, as well as maintaining vigilance for unattended vehicles and extended parking at the curb.

A terminal curb survey was conducted during peak traffic periods at the North and South Terminals on November 14 and 15, 2006. This included a survey of the vehicle dwell times at the arrival and departure curbs at both terminals. The average dwell times varied between terminals and between the arrival and departure curbs. The dwell times at the North Terminal were higher, averaging 2.3 minutes per vehicle at the arrival curb and 2.2 minutes per vehicle at the departure curb. At the South Terminal, the average dwell times were 1.4 minutes at the arrival curb and 2.0 minutes at the departure curb. Thus, it is apparent that the curb enforcement is maintaining reasonable curb dwell times at both terminals.

Table 3CC outlines the terminal curb requirements based upon the curb surveys. The existing curb front as well as the commercial median curb should be adequate through the long term planning horizon.

TABLE 3CC
Terminal Curb Requirements
Kona International Airport at Keahole

		Planning Horizons			
	Available	Base Year (2006)	Short Term	Inter. Term	Long Term
Annual Passengers		3,033,212	3,472,000	3,819,000	4,721,000
Public Curb					
Departure Curb (ft.)	690	440	490	540	670
Arrival Curb (ft.)	690	400	440	490	610
Total Public Curb (ft.)	1,380	840	930	1,030	1,280
Commercial Median (ft.)	850	490	550	610	760
Total Terminal Curb (ft.)	2,230	1,330	1,480	1,640	2,040

Terminal Vehicle Parking

Vehicle parking in the airline passenger terminal area of the airport includes those spaces utilized by passengers, visitors, and employees of the airline terminal facilities. Parking spaces are classified as public and employee.

Public parking is located in the area enclosed by the terminal loop road and is directly east of the North and South Terminals. There are a total of 706 spaces in the public lot. The employee lot is currently being expanded. When all phases are complete there will be 758 spaces in this area for employee and long term (monthly pass) parking. In addition, there will be 432 spaces available in the Pao`o Street (Road N) lot.

As an airport serving primarily visitors and tourists, the ratio of public parking spaces per enplaned passenger is lower than that experienced at mainland airports. Peak parking lot usage tends to be highest on holiday weekends.

The ratio of parking to enplaned passengers utilized in the previous master plan was 521 spaces per 1.0 million enplanements. Since 9/11, however, stricter enforcement at the curb for security purposes has helped to alleviate extended curb parking and increased the use of the parking lot.

In 2006, the airport was providing just 471 public spaces per million enplanements. Based upon observations and interviews of parking lot usage in 2006-07, the available public parking is undersized during peak periods nearly every month. It was estimated that public parking was approximately 30 percent undersized for peak month demand levels. Thus, a more reasonable parking ratio for KOA would be 620 spaces per million enplanements. Monthly parking passes are issued to long term or frequent parking. These passes allow for parking in the employee lot or the Pao`o Street lot. The passes average approximately 80 spaces per million enplanements, for a combined public parking requirement of 700 spaces per million annual enplanements.

Table 3DD presents the parking requirements for the planning horizons. As indicated above, the main public lot is undersized. Assuming the Pao`o Street lot is used for overflow, parking will be marginally sufficient through the short term. By the long term, nearly over 1,650 public parking spaces will be needed.

TABLE 3DD
Terminal Vehicle Parking
Kona International Airport at Keahole

		Planning Horizons			
	Available	Base Year (2006)	Short Term	Inter. Term	Long Term
Annual Enplanement Level (millions)		1.52	1.74	1.91	2.36
Public Parking Requirements					
Public Lot	706	944	1,076	1,184	1,464
Monthly Parking*	432	122	139	153	189
Total Public Parking	1,138	1,066	1,215	1,337	1,652
Employee Parking	758	457	521	573	708
Rental Car Facilities (ac.)	14.0	12.2	13.9	15.3	18.9

* Assumes Pao`o Street Lot as Monthly Parking and Overflow Lot

The recently expanded employee parking lot provides 758 spaces. Future needs were based upon a ratio of 300 spaces per million annual enplaned passengers. Based upon this ratio, the expanded employee parking lot should be adequate through the planning horizons.

Rental Cars

The rental car operations are located at the remote rental car facilities along the airport access road. Each rental car maintains its own ready/return, service and storage on its individual lease hold. Each com-

pany shuttles customers to and from the terminal. Based upon observations and interviews with the rental car operators, rental car facility needs at KOA were estimated at 8.0 acres per million annual enplanements. Maintaining this ratio, and assuming no additional on-site rental car agencies, additional space will be needed after the short term planning horizon. The DOT-A is currently undertaking planning studies for consolidated rental car facilities at each of its major airports.

Airport Access

In terminal facility planning, both on- and off-airport vehicle access is important. For the convenience of the traveler (and to provide maximum capacity), access to the terminal should include (to the extent practical) connections to the major arterial roadways near the airport. The primary access to Kona International Airport at Keahole is Queen Ka`ahumanu Highway. This road extends north and south along the airport's eastern property line. The intersection of the highway and the airport access road is signalized with a left turn lane into the airport.

The highway is integral to the commuting pattern in North and South Kona. Traffic on the highway backs up most in the morning and late afternoon rush hours.

As tourism and population in West Hawaii grow, so does traffic on Queen Ka`ahumanu Highway. The road is presently being widened to four lanes from Henry Street to Kealakehe Parkway. Phase II of the project is planned to extend the four-lane widening project to Kona International Airport at Keahole.

While the widening project will improve highway capacity in the short term, traffic is expected to continue to grow. While the airport's vehicle traffic will be part of this growth, it is certainly not the only contributing factor. Development all along the highway is a contributor, as are the other employment centers that rely on employees to traverse the highway to and from work.

Keahole Street is currently the only public entrance to the airport. The two-lane rural design roadway carries over 900 vehicles per hour during peak periods. The rental car facilities are located along this road. As a result, there are several left turns both out of the facilities to the west and into the facility east from the terminal.

According to FAA AC 150/5360-13, *Design Guidelines for Airport Terminal Facilities*, a rural two-lane access road would have a capacity of approximately 1,500 vehicles per hour both ways for at-grade interrupted flow conditions. While capacity is marginally adequate for base year traffic levels, additional capacity will need to be considered by the intermediate planning horizon.

As traffic increases along the entrance road, left turn lanes should be considered for the major traffic movements into the rental car facility and other side roads that may have significant traffic levels in the future. A secondary access road to separate general

aviation traffic from commercial service traffic entering the airport would assist in relieving capacity and enhancing safety in the earlier planning horizons. Ultimately, however, the commercial service entrance roadway should be planned as a four-lane facility with turning lanes.

The terminal frontage road is often a section of the terminal road system that creates bottlenecks. With vehicles stopping for enplaning and deplaning passengers at the terminal curb, this portion of the terminal roadway has a high potential for congestion and reduced levels of capacity. Therefore, the capacity of the terminal loop is most commonly measured in this area.

Using guidance provided in FAA AC 150/5360-13, *Design Guidelines for Airport Terminal Facilities*, the capacity of the terminal loop road at the terminal curb was estimated.

Directly in front of the terminal, the roadway includes two through lanes, a maneuvering lane, plus a curb lane. On the opposite side of the median curb, there is a second curb lane and another through lane. The lanes closest to the curb lanes are affected by the maneuvering at the curb front, and provide a limited service volume of 300 vehicles per hour. The outside lanes can accommodate up to 600 vehicles per hour. By combining the capacity of these three available through lanes, there is an effective capacity of 1,800 vehicles per hour along the front of the terminal. During peak periods, however, the outside lane between the terminal and the median curb is typically cordoned off for the safety of passengers on the median curb awaiting the rental car shuttles. This reduces the effective capacity to 1,200 vehicles per hour.

The terminal curb study also included an updated count of the traffic passing in front of the terminal. During the peak periods counted on November 14 and 15, 2006, traffic averaged 366 vehicles per hour. Since November traffic was 40 percent lower than during the peak month in 2006, the design hour traffic for the average day of the peak month was estimated at 502 vehicles per hour. By the long term planning horizon, this can be expected to reach 741 vehicles per hour. Therefore, the current terminal frontage configuration should be adequate for the planning horizons.

The highest traffic levels are currently experienced at the south end of the loop. At this point, all of the traffic that has passed by the terminal plus traffic exiting the public parking and traffic leaving U`u Road are merging into an area where the number of available lanes is reduced to two. Because of the weaving and merging in this area, the capacity is estimated at 900 vehicles per hour. Design hour traffic in this area is currently 580 vehicles per hour. By the long term planning horizon, the southern end of the loop will be carrying 850 vehicles per hour and nearing its capacity.

AIR CARGO REQUIREMENTS

The primary cargo-related facilities requiring analysis include the cargo apron, building space, and truck/automobile parking area. Air cargo facilities at KOA currently con-

sist of two cargo buildings and associated parking located south of the passenger terminal and the existing T-hangars. The two buildings total 40,310 square feet with 104,400 square feet on the landside for parking, truck docks, and circulation. Some of the cargo building space is currently used for general aviation purposes.

Ground support equipment (GSE) storage and staging is located in two areas totaling 51,500 square feet. This includes the area between the cargo buildings, and an area located immediately north of the buildings. There is approximately 19,300 square yards of apron area on the airside of the cargo buildings. The depth of this ramp is only 200 feet, which limits its use to smaller cargo aircraft. Subsequently, some of the apron area is used for GSE staging and general aviation and air taxi parking. All-cargo commercial jet aircraft currently park on the terminal ramp.

Cargo Building Requirements

The annual tons of air freight and air mail handled in 2006 at the airport (32,390 tons) was compared to the combined total square footage of dedicated air cargo building space (40,300 square feet) to determine existing utilization rates for comparison to other facility utilization in the U.S. Surveys of the top 50 cargo airports in the U.S. have determined that the current utilization rate is approximately 1.75 square feet per ton. The range of adequacy for an airport on average is between 1.00 and 2.50 square feet per ton. KOA's current utilization rate of 1.25 falls in the low range of the spectrum. Portions of the buildings are currently in other uses, so the true ratio is actually even lower. Since the ratio tends to be lower at the busier airports, the available space at KOA appears to be undersized.

The cargo operators have adapted with some transfer occurring outside either directly on the ramp or in the GSE areas. This has allowed the cargo operators to handle more air cargo with smaller buildings. It still suggests a need for additional building space both now and in the future.

The Hawaii Department of Agriculture (HDOA) has been mandated by Hawaii State law [Act 236 (08) (Senate Bill 2850) to provide joint-use inspection facilities at all Hawaii ports-of-entry. KOA has become a key port-of-entry for cargo so space needs to be planned for this type of facility.

The joint use facility should be located to minimize the impact on air cargo operations as well as to reduce the movement of cargo from one agency to the other for various inspections and compliance documentation. All cargo should be inspected at the joint inspection facility before it is released to the importer or before leaving the airline's possession. The joint agencies expected to participate include HDOA, USDA, CBP, U.S. Food and Drug Administration, and the U.S. Fish and Wildlife Service.

The inspection facilities should provide an area to prevent potential pest release as well as treatment capacity to seize and/or destroy cargo and/or contraband. A joint facility centralizes plant quarantine expertise and agen-

cies for information sharing and rapid response and mobilization in an emergency. Large scale treatment facilities such as an irradiation facility should also be planned.

The facility should house offices of the various inspection agencies as well as inspection bays, inspection counters and treatment areas. The inspection of outbound cargo should be centralized for efficient clearance and documentation for the exporters.

Contamination and spoilage has become an issue at ports in Hawaii, the mainland, and internationally. Cargo marshalling with refrigeration and weather protections should also be included to alleviate food safety and quality concerns. Based upon information provided by HDOA and USDA representatives to the planning advisory committee, the space requirements for the joint inspection facility are estimated at 20,000 square feet.

In providing future cargo building requirements, it is important to consider the goals of individual operators. Some operators may want to limit space for cargo sorting activities for cost savings, while others may need more square-footage to accommodate their specific sorting methods. Taking this need into consideration, as well as accounting for agriculture inspection and marshalling needs future requirements have been based upon a utilization factor of 1.90. Cargo building requirements have been summarized on **Table 3EE**.

TABLE 3EE
Air Cargo Requirements
Kona International Airport at Keahole

		Planning Horizons			
	Available	Base Year (2006)	Short Term	Inter. Term	Long Term
Annual Cargo Tons		32,390	39,000	45,000	62,000
Annual Operations		4,372	4,700	5,100	6,100
Cargo Apron Area (s.y.)	19,300	21,500	29,600	37,700	51,100
GSE Storage (s.f.)	51,100	68,000	82,000	94,000	130,000
Building Space (s.f.)	40,310	62,000	74,000	86,000	118,000
Truck Docks (ea.)	12	18	22	26	35
Truck Staging/Vehicle Parking (ac.)	2.4	4.2	5.1	5.9	8.1

Truck dock requirements are based upon a planning factor of 0.3 trucks per 1,000 square feet of building space. In addition to truck docks, area must be provided adjacent to the building for staging activities and employee parking. An area approximately three times the building area is provided for these activities. These requirements are also outlined in the table.

Cargo Apron Requirements

Apron space requirements vary with the size of the aircraft and the manner in which aircraft are handled on the

ground. The space requirements of aircraft commonly used for air cargo operations at the airport were reviewed to examine future ramp requirements. United Parcel Service (UPS) serves KOA with Boeing 747 and Boeing 767 aircraft. Aloha Air Cargo operates several daily Boeing 737 cargo flights. Commuter aircraft operating on a regular basis include the Beech 1900, Beech 99, and Shorts 330 and 360 aircraft.

The cargo forecast anticipates additional operations by the wide-body aircraft. The cargo ramp requirements outlined on **Table 3EE** take into account the operational mix changes expected over the planning horizons.

Space is also needed within the secure area for ground service equipment (GSE). This includes cargo pallets, tugs, and other equipment necessary to service and process freight from aircraft. Space requirements equivalent to the building space plus ten percent were estimated and included on the table.

GENERAL AVIATION FACILITIES

General aviation (GA) facilities are those necessary for handling general aviation aircraft, passengers, and cargo while on the ground. This section is devoted to identifying future GA facility needs during the planning period for the following types of facilities normally associated with general aviation terminal areas:

- Hangars
- Aircraft Parking Apron
- Commuter Terminal Services

HANGARS

The demand for hangar facilities typically depends on the number and type of aircraft expected to be based at the airport. Hangar facilities are generally classified as T-hangars and conventional hangars. Conventional hangars can include individual executive/box hangars, large corporate hangars, or multi-aircraft clear-span hangars. These different types of hangars offer varying levels of privacy, security, and protection from the elements.

Demand for hangars varies with the number of aircraft based at the airport. Another important factor is the type of based aircraft. Smaller single engine aircraft usually prefer T-hangars, while larger business jets will prefer conventional hangars. The tropical climate and rental costs will also be factors in the choice for based aircraft owners at KOA. Input from the Hawaii County General Aviation Council indicated a strong unserved demand for hangars at KOA.

In fact, based upon the information provided, if adequate hangar facilities were currently available, it is estimated that the current based aircraft would immediately increase from 61 to 79.

Another factor to be considered with regards to hangar development is ex-

ecutives with second homes on the island. Some own or have access to corporate aircraft and visit the island for periods of time. While these aircraft may not be considered based aircraft, it can be desirable to some to hangar the aircraft out of the elements during the frequent visits. Additional hangar capabilities should be considered to meet the needs of these types of corporate aviation users.

The airport currently has two T-hangar storage facilities, providing 18 storage units. T-hangar space available at the airport totals approximately 23,100 square feet for aircraft storage. Analysis of future hangar requirements, as depicted on **Table 3FF**, indicates that an additional 54 hangar storage spaces could be filled immediately today if available. In the long term, the T-hangar demand could increase nearly five times from the spaces currently available.

TABLE 3FF
General Aviation Hangar Requirements
Kona International Airport at Keahole

		Planning Horizons			
	Available	Base Year (2006)	Short Term	Inter. Term	Long Term
Based Aircraft					
Single Engine Piston		50	65	74	99
Multi-Engine Piston		6	7	7	7
Turboprop		6	9	11	14
Jet		2	4	7	14
Helicopter		13	16	19	26
Other		2	1	0	0
Total Based Aircraft		79	102	118	160
Hangar Positions					
T-Hangars	18	47	59	66	86
Conventional Box Hangars	0	25	34	44	64
Total Hangar Positions	18	72	93	110	150
Hangar Space Requirements					
T-Hangars (s.f.)	23,100	59,900	75,200	84,200	109,700
Conventional Hangar Space (s.f.)	--	53,100	82,400	115,900	189,400
Service Hangar Space (s.f.)	--	17,000	23,600	30,000	44,900
Total Hangar Space	23,100	130,000	181,200	230,100	344,000

KOA does not currently have any conventional hangars for general aviation aircraft storage. These hangars are used primarily to store corporate aircraft and helicopters, although some fixed-wing piston aircraft may be stored in multi-aircraft hangars. Conventional hangar space will need to be planned to accommodate a growing number of corporate jets forecast to base at KOA. As was discussed above, there is also potential demand for conventional hangar storage for non-based corporate aircraft.

KOA is also lacking hangar facilities for aircraft maintenance and other services. Requirements for the main-

tenance and fixed base operator (FBO) hangar area were estimated at 15 percent of the total hangar storage requirements. It should be noted that FBO hangars are often cross-utilized for storage and aircraft maintenance. They are also sometimes used to store transient aircraft overnight.

Table 3FF compares the available hangar space to the future hangar requirements. It is evident from the table that the airport is extremely deficient in both storage and service hangars. This demand can be expected to grow over the planning horizons.

AIRCRAFT PARKING APRON

A parking apron should be provided for at least the number of locally based aircraft that are not stored in hangars, as well as transient aircraft. The airport currently has approximately 64,500 square yards of general aviation apron parking on the south side of the airport. The breakdown of spaces by type is presented in **Table 3GG**.

TABLE 3GG
General Aviation Parking Apron Requirements
Kona International Airport and Keahole

		Planning Horizons			
	Available	Base Year (2006)	Short Term	Inter. Term	Long Term
Aircraft Parking Positions					
Based Aircraft Tie-downs	36	8	10	11	15
Charter/Tour Operator Ramp	15	14	18	21	28
Helicopter Parking	3	8	10	12	16
Transient GA Parking	7	35	45	53	70
Corporate Jet Parking	15	28	40	50	69
Total Parking Positions	76	93	123	147	198
Total Apron Area (s.y.)	64,500	92,700	126,800	154,900	211,000

For planning purposes, the ramp requirements were divided into five types. Based aircraft tie-downs are located immediately east of the T-hangars. These are used for parking non-hangared based aircraft. Apron requirements were based upon 350 square yards per aircraft.

Air taxi (charter and commuter) or tour operator parking positions were considered as the drive-through positions located in front of the commuter terminal. The parking positions required were based upon accommodating 25 percent of the design day operations. Apron requirements were estimated at 600 square yards per aircraft.

The helicopter positions are located at the south end of the commuter terminal ramp. Requirements were based upon accommodating the equivalent of 65 percent of the based helicopters.

Transient general aviation parking comprises the remainder of the ramp parking in front of the commuter ter-

minal and the air cargo buildings. The corporate jet ramp is the newer, large ramp located at the south end of the general aviation area. The spaces required were based upon accommodating the equivalent of three times the number of corporate jet flights during the design day. The holiday season of Christmas and New Year's is the busiest corporate aircraft period at the airport. At its peak during the 2006-07 holiday season, the airport had more than 65 corporate jets on the ground. To accommodate this peak period, allowances for overflow parking in addition to that outlined in **Table 3GG** will need to be considered. This unique situation will be further addressed in the alternatives analysis of the next chapter.

Another consideration for the general aviation apron area is an aircraft wash rack. The constant salt spray from the Airport's ocean-side location creates a demand for washing down all types of general aviation aircraft. A wash rack equipped to meet Environmental Protection Agency (EPA) would provide a designated location for washing aircraft.

GENERAL AVIATION TERMINAL SERVICES

General aviation terminal services at KOA are currently provided from several buildings in the general aviation area. The highest profile is the commuter terminal located adjacent to the ramp that is utilized by air taxi and air tour operators. Other buildings provide facilities related to terminal services, including passenger waiting, pilots' lounge and flight planning, concessions, management offices, storage, and various other needs.

The methodology used in estimating general aviation terminal facility needs was based upon the number of passengers expected to utilize general aviation facilities during the design hour, as well as FAA guidelines. Space requirements for terminal facilities were based on providing 120 square feet per design hour air taxi and general aviation itinerant passenger.

Table 3HH outlines the general space requirements for air taxi and general aviation terminal services at KOA through the long term planning horizon. In 2006, the terminal services space is currently at least 35 percent undersized. In addition, it is scattered through many different buildings, making the available space less efficient than the table suggests. In the long term, the space will need to nearly triple.

GENERAL AVIATION PARKING

Vehicle parking requirements for general aviation were also examined. Space determinations were based on an evaluation of the existing airport use, as well as industry standards. General aviation auto parking spaces were calculated at 50 percent of based aircraft, plus an industry standard of 1.8 spaces per design hour passenger.

Automobile parking requirements are summarized in **Table 3HH**. The general aviation parking around the

commuter terminal and the other GA facilities at the south end of the airport is sufficient for approximately 130 vehicles. This is inadequate during peak periods. During these periods, vehicles park along U`u Street and in other overflow areas. As shown on the table, at least 254 spaces are currently needed and over 500 spaces will be needed for the long term planning horizon.

TABLE 3HH
General Aviation Terminal Services
Kona International Airport at Keahole

		Planning Horizons			
	Available	Base Year (2006)	Short Term	Inter. Term	Long Term
Air Taxi Design Hour Passengers					
Design Hour Operations		11	14	17	22
Passengers per Operation		7.0	7.0	7.0	7.0
Design Hour Passengers		77	98	119	154
GA Design Hour Passengers					
Design Hour Itinerant Operations		15	19	22	29
Passengers per Operation		2.8	2.9	3.0	3.1
Design Hour Passengers		42	55	66	90
Total Design Hour Passengers		119	153	185	244
Terminal Services Area (s.f.)	10,600	14,300	18,400	22,200	29,300
General Aviation Parking Spaces	130	254	327	392	519

AIRPORT SUPPORT REQUIREMENTS

Various facilities that do not logically fall within classifications of airfield, terminal building, or general aviation facilities have been identified for inclusion in this Master Plan. Facility requirements have been identified for these remaining facilities:

- Aircraft Rescue and Firefighting Equipment
- Airport Maintenance-Baseyard
- Aviation Fuel Facilities

AIRCRAFT RESCUE AND FIREFIGHTING EQUIPMENT

Requirements for aircraft rescue and firefighting (ARFF) services at an airport are established under 14 Code of Regulations (CFR) Part 139. 14 CFR Part 139 applies to the certification and operation of land airports served by any scheduled or unscheduled passenger operation of an air carrier using aircraft with more than 10 seats. Paragraph 139.315 establishes ARFF index ratings based on the length of the largest aircraft with an average of five or more daily departures. The following defines each index:

- Index A - aircraft less than 90 feet in length.
- Index B - aircraft less than 126 feet in length.
- Index C - aircraft less than 159 feet in length.
- Index D - aircraft less than 200 feet in length.
- Index E - aircraft at least 200 feet in length.

If there are not five daily departures by the largest aircraft, then the next lower index will apply.

The airport currently maintains at least an Index "D" ARFF facility. Index D is adequate for aircraft such as the Boeing 767-200, Airbus 300, and Dec-10. The Index D requirements include the following:

- One vehicle carrying at least 500 pounds of sodium-based dry chemical of halon 1211; or 450 pounds of potassium-based dry chemical and water with a commensurate quantity of aqueous film-forming foam (AFFF) to total 100 gallons for simultaneous dry chemical and AFFF application.

- Two vehicles carrying an amount of water and the commensurate quantity of AFFF so that the total quantity of water for foam production carried by all three vehicles is at least 4,000 gallons.

The airport's equipment includes one 3,000 gallon vehicle and two 1,500 gallon vehicles. There is also a reserve 1,500 gallon vehicle. In addition, there is a chief's vehicle, a captain's truck, and a quad agent rapid intervention vehicle (RIV).

The airport is currently serving scheduled passenger flights by Boeing 777-200 and Boeing 747 aircraft. Both of these aircraft are over 200 feet in length, qualifying the airport for Index "E." Index E requirements are the same as Index D with the exception that all three vehicles carry the water and AFFF so that the total quantity of foam production is 6,000 gallons. The current equipment can meet this requirement.

The current four-bay ARFF facility houses the three trucks plus the captain's truck. The chief's vehicle is parked in a lean-to shadeport with the reserve truck directly adjacent. While the facility meets the current need, consideration should be given to an updated ARFF facility with wider bays at some point in the future.

AIRPORT MAINTENANCE FACILITIES

The airport maintenance facilities are located south of the terminal loop road and east of U`u Street. The three-acre site includes a 15,000 square-foot maintenance building and a 7,800 square-foot shadeport for equipment storage.

Future expansion of these facilities will be a function of airfield development and airport management needs. This U`u Street location is outside of the secure airport operations area. To access the airfield, all vehicles must

cross a public street (U`u), and then enter the airside through a security gate. The alternatives analysis should consider airport maintenance facilities in a consolidated location with direct and secure access to the airfield.

AVIATION FUEL STORAGE

Aviation fuel at KOA is stored on the south side of the airport. There are currently 90,000 gallons of Jet A storage and 12,000 gallons of Avgas.

Fuel sales are handled through the commercial general aviation operators. One FBO is contracted by a consortium of the airlines to manage the fuel storage and fueling of their aircraft. While Avgas storage is currently adequate, Jet A is not. According to the FBO, Bradley Pacific Aviation, the Jet A usage at KOA in 2006 was 110,000 gallons daily. Thus, on-airport storage has been less than a single day's usage.

Besides the limited storage, fuel must be delivered to the airport from the harbor terminal in Hilo. This requires as many as 15 daily round trips by 8,000-gallon over-the-road tankers between Hilo and Kona. An interruption in delivery of more than a few hours will interrupt flights into and out of the airport. On-airport fuel storage needs to be increased to at least five days supply. Volumes are sufficient that a fuel terminal on the west side of the island should also be considered.

Storage requirements were based upon maintaining a five-day supply. **Table 3JJ** outlines the analysis for both airline and general aviation fuel storage.

TABLE 3JJ
Fuel Storage Requirements
Kona International Airport at Keahole

		Planning Horizons			
	Available	Base Year (2006)	Short Term	Inter. Term	Long Term
Jet A Requirements					
Daily Usage (gal.)		110,000	126,000	138,000	171,000
Five Day Storage (gal.)	90,000	550,000	630,000	690,000	855,000
Avgas Requirements					
Daily Usage (gal.)		1,200	1,900	2,200	2,900
Five Day Storage (gal.)	10,000	6,000	10,000	11,000	15,000

SUMMARY

The intent of this chapter has been to outline the facilities required to meet aviation demands projected for Kona International Airport at Keahole through the long term planning horizon. A summary of the airfield, airline terminal, and general aviation facility requirements are presented on **Exhibits 3F**, **3G**, and **3H**.

Following the facility requirements determination, the next step is to develop a direction for development to best address these potential needs. The remainder of the Master Plan will be devoted to conceiving a direction, its schedule, and its costs.

	AVAILABLE	SHORT TERM	INTERMEDIATE TERM	LONG TERM
RUNWAYS	ARC D-V **Runway 17-35** 11,000' x 150' 200,000# DWL 850,000# DTL	ARC D-V **Runway 17-35** 11,000' x 150' 200,000# DWL 850,000# DTL **Military KATR** 4,250' x 90' 340,000# DTL **Helicopter TLOF** Heliport Training Pads	ARC D-V **Runway 17-35** Same **Parallel Runway** 4,200' x 75' 12,500# SWL **Military KATR** 4,250' x 90' 340,000# DTL **Helicopter TLOF** Same	ARC D-V **Runway 17-35** (Ultimate 12,000' x 150') 200,000# DWL 850,000# DTL **Parallel Runway** 7,000' x 150' (Ultimate 11,000' x 150') 200,000# DWL 850,000# DTL **Helicopter TLOF** Same
TAXIWAYS	**Runway 17-35** 75' wide Full Length Parallel Partial Dual Parallel Five Exits Holding Aprons	**Runway 17-35** 75' wide Full Length Parallel Partial Dual Parallel Seven Exits **Military KATR** 75' wide Two Exits	**Runway 17-35** 75' wide Full Length Parallel Partial Dual Parallel Seven Exits **Parallel Runway** 35' wide Three Exits Holding Aprons **Military KATR** 75' Wide Two Exits	**Runway 17-35** 75' wide Full Length Dual Parallel Nine Exits **Parallel Runway** 75' wide Full Length Parallel Seven Exits Holding Aprons
NAVIGATIONAL AIDS	ATCT, ASR, ASOS, RTR **Runway 17-35** RNAV, GPS ILS (17) DME (17) LOC BC 35	ATCT, ASR, ASOS ASOS, RTR **Runway 17-35** VOR, TACAN, RNAV, GPS ILS (17) DME (17) LOC BC 35 **Military KATR** None	ATCT, ASR, ASOS ASOS, RTR **Runway 17-35** VOR, TACAN, RNAV, GPS ILS, DME (17) LOC BC 35 **Parallel Runway** GPS **Helicopter TLOF** None **Military KATR** None	ATCT, ASR, ASOS, ASOS, RTR **Runway 17-35** CAT I GPS **Parallel Runway** GPS **Helicopter TLOF** GPS
LIGHTING AND MARKING	Airport Beacon, MITL Segmented Circle, Lighted Wind Cones **Runway 17-35** HIRL, PAPI-4 MALSR (17) Precision Marking	Airport Beacon, MITL Segmented Circle, Wind Cones **Runway 17-35** HIRL, PAPI-4 MALSR (17) Precision Marking **Military KATR** Visual Marking	Airport Beacon, MITL Segmented Circle, Wind Cones **Runway 17-35** HIRL, PAPI-4 MALSR (17) Precision Marking **Parallel Runway** Nonprecision Marking **Helicopter TLOF** Heliport Markings **Military KATR** Visual Marking	Airport Beacon, MITL Segmented Circle, Wind Cones **Runway 17-35** HIRL, PAPI-4 MALSR (17) Precision Marking **Parallel Runway** Nonprecision Marking **Helicopter TLOF** Heliport Markings

	AVAILABLE SUPPLY	ANNUAL PASSENGER THRESHOLDS (MILLIONS) 3.47	3.82	4.72
AIRLINE COUNTER / OFFICE				
Agricultural Check Stations	3	3	3	5
Ag Station Queue Area (s.f.)	732	1,066	1,277	1,829
Counter Length (l.f.)	299	90	92	107
Ticket Queue/Lobby (s.f.)	10,062	7,332	7,812	9,387
Outbound Baggage (s.f.)	27,601	12,782	13,694	16,553
Airline Ticket Office (s.f.)	8,391	5,939	6,296	7,527
SECURITY PROCESSING / CONCOURSES				
Security Stations	4	5	5	7
Security Queue Area (s.f.)	2,375	2,641	2,906	3,612
Aircraft Gates	12	13	14	16
Holdroom Area (s.f.)	20,326	15,058	16,574	20,593
Airline Operations	904	842	1,046	1,151
International Arrivals Processing (s.f.)	18,130	14,280	15,192	19,532
BAGGAGE CLAIM				
Inbound Baggage (s.f.)	34,694	60,518	69,387	95,212
Bag Claim Devices	3	5	5	7
Bag Claim Display (l.f.)	544	894	988	1,231
Bag Claim Lobby (s.f.)	14,938	24,680	27,296	34,000
Bag Services Office (s.f.)	706	1,136	1,293	1,568
PUBLIC / SUPPORT SPACE				
Restrooms (s.f.)	3,777	10,940	12,072	15,019
Food & Beverage (s.f.)	5,034	9,424	10,324	12,716
Retail Concessions (s.f.)	3,179	5,074	5,560	6,847
CURB AND PARKING				
Terminal Curb (l.f.)	1,380	930	1,030	1,280
Commercial Median (l.f.)	850	550	610	760
Parking Spaces				
Public	1,138	1,215	1,337	1,652
Employee	758	521	573	708
Rental Car Facilities	14.0	13.9	15.3	18.9
GROSS TERMINAL AREA	323,740	351,500	377,300	447,200

AIR CARGO FACILITIES

	AVAILABLE SUPPLY	DEMAND PLANNING HORIZONS			
		BASE YEAR	SHORT	INTERMEDIATE	LONG
Cargo Apron Area (s.y.)	19,300	21,500	29,600	37,700	51,100
GSE Storage (s.f.)	51,100	68,000	82,000	94,000	130,000
Building Space (s.f.)	40,310	62,000	74,000	86,000	118,000
Truck Docks (ea.)	12	18	22	26	35
Truck Staging/Vehicle Parking (ac.)	2.4	4.2	5.1	5.9	8.1

GA AIRCRAFT HANGARS

	AVAILABLE SUPPLY	DEMAND PLANNING HORIZONS			
		BASE YEAR	SHORT	INTERMEDIATE	LONG
T-Hangars					
Positions	18	47	59	66	86
Hangar Area (s.f.)	23,100	59,900	75,200	84,200	109,700
Conventional Hangars					
Storage Positions	0	25	34	44	64
Hangar Area (s.f.)	0	53,100	82,400	115,900	189,400

GA TERMINAL SERVICES

	AVAILABLE SUPPLY	DEMAND PLANNING HORIZONS			
		BASE YEAR	SHORT	INTERMEDIATE	LONG
Apron Parking					
Positions	76	93	123	147	198
Area (s.y.)	64,500	92,700	126,800	154,900	211,000
Maintenance Hangar (s.f.)	0	17,000	23,600	30,000	44,900
Services Building (s.f.)	10,600	14,300	18,400	22,200	29,300
Auto Parking (spaces)	130	254	327	392	519

AVIATION FUEL STORAGE

	AVAILABLE SUPPLY	DEMAND PLANNING HORIZONS			
		BASE YEAR	SHORT	INTERMEDIATE	LONG
Jet A (gal)	90,000	550,000	630,000	690,000	855,000
Avgas (gal)	10,000	6,000	10,000	11,000	15,000

Chapter Four

ALTERNATIVES

ALTERNATIVES

In the process of updating the master plan for Kona International Airport at Keahole (KOA), it is important to review development potential and constraints at the airport. The purpose of this chapter is to develop a series of airport development scenarios by considering the actual physical facilities which are needed to accommodate projected demand and meet the program requirements as defined in **Chapter Three - Facility Requirements.**

In each of these scenarios, different physical facility layouts are presented for the purpose of discussion and evaluation. The ultimate goal is to develop the underlying rationale which supports the final master plan recommendations. Through this process, an evaluation of the highest and best uses of airport property is made while considering local goals, physical constraints, and federal airport design standards, where appropriate.

Any development proposed by a master plan evolves from an analysis of projected needs. Though the needs were determined by the best methodology available, it cannot be assumed that future events will not change these needs. The master planning process attempts to develop a viable concept for meeting the needs caused by projected demands through the planning period.

The number of potential alternatives which can be considered is endless. Therefore, some judgment must be applied to identify the alternatives which have the greatest potential for implementation. The alternatives presented in the chapter were developed to meet the overall program ob-

jectives for the airport in a balanced manner. Through coordination with the Technical Advisory Committees (TAC), the public, and the Hawaii Department of Transportation – Airports Division (DOT-A), the alternatives (or a combination thereof) were refined and modified as necessary to shape the recommended development program. Therefore, the alternatives presented in this chapter could be considered a beginning point for formulating the updated master plan development program.

PREVIOUS PLANNING EFFORTS

Prior to presenting airport development alternatives, it is helpful to review some of the previous planning efforts and the subsequent development now in place. The last airport master plan for KOA was completed in 1998. Along with the previous master plan, there have also been three terminal-specific studies completed since 1997. The following briefly discusses each of these plans as they relate to what has taken place with regard to airport facility development.

1998 MASTER PLAN

The previous master plan was based primarily on the projected aviation demands through 2015, but also factored in some flexibility for demand to 2020 and beyond. Long-range facilities were designated on the airport layout plan (ALP) for land reservation purposes.

The runway had just been extended to 11,000 feet in 1993 and was viewed by the Master Plan as adequate for the future. In fact, the only airfield-related improvements recommended through 2015 were the development of a new airport traffic control tower (ATCT) mauka (east) of U`u Street and a heliport. To date, neither has been developed.

The demand forecast by the 1998 Master Plan suggested that the single runway would be adequate through 2020. The plan, however, did include a future parallel runway 1,400 feet makai (west) of the existing runway to ensure that adequate space was reserved beyond the planning period. As shown on **Exhibit 4A**, a parallel taxiway was also planned between the two runways. Category I instrument approach capability was also reserved for each runway end.

On the landside, the proposed terminal complex development was planned to maintain its linear pattern. The major expansion of the passenger terminal was to the north of the existing complex with expansion of general aviation, air tour facilities, and air cargo to the south.

The 1998 Master Plan proposed an airline terminal development plan that followed the projected growth of an estimated 3.8 million passengers in the year 2020, and confirmed the overseas passenger growth of the 1997 Overseas Terminal Study.

At the time, remedial improvements were in progress to serve overseas flights from the existing terminal.

PACIFIC OCEAN

KEAHOLE POINT

U.S. COAST GUARD

CI BM KEAHOLE 2

NATURAL ENERGY LABORATORY OF HAWAII

PACIFIC OCEAN

UNUALOHA POINT

PACIFIC OCEAN

PUUKALA POINT

MAKOLEA POINT

2500' (762.00)

FUTURE RUNWAY PROTECTION ZONE

1750' (533.40)

EL 30' (est.)

WIND CONE (EXIST'G)

FUTURE GLIDE SLOPE FACILITY

ANEMOMETER & WIND VANE

LOCALIZER FACILITY (EXIST'G)

FUTURE MARKER

LOC. ANT.

FUTURE MIDDLE MARKER

RUNWAY PROTECTION ZONE

RSA

1000' (304.80)

50:1 APPROACH SURFACE

SERVICE ROAD

700' (213.36)

ARP (FUTURE)

ANEMOMETER AND WIND VANE

EL 25' (est.)

FUTURE RUNWAY PROTECTION ZONE

FUTURE

LOW POINT (EL. 5.00)

1300' (396.24)

EL 43.3', ARP (EXIST'G)

GLIDE SLOPE

EL 47.22'

EL 37.75'

FUEL STORAGE

CARGO BUILDINGS

ATCT-RTR SITE

EXISTING ATCT

RUNWAY 17-35 (11,000' x 150')

SEGMENTED CIRCLE

AZIMUTH 185° (TRUE)

EL 43.93'

141' (42.98)

PAPI

LIGHTED WIND CONE

FUTURE LOCALIZER ANT.

ARFF ROAD

MIDDLE MARKER

10' ROAD

HOLDING BAY

2500' (762.00)

(FORMER TAXIWAY)

HOST PARK BOUNDARY AIRPORT BOUNDARY/FENCE

SERVICE ROAD

MAHALAHOA TRAIL

EXISTING ARFF STATION

INTERISLAND TERMINAL

DOTA

OVERSEAS TERMINAL

FUTURE LOCALIZER FACILITY

SERVICE ROAD

ITINERANT AIRCRAFT PARKING

FBO LOTS

RAMP K

RAMP L

GENERAL AVIATION

RAMP M

MARRIOTT

PUBLIC PARKING

PETROGLYPHS

EMPLOYEE PARKING

PUBLIC PARKING

PD

288' (87.78)

FUTURE RD. 'N' CONNECTOR

WASTEWATER TREATMENT PLANT

2500' (762.00)

NEUHI ACCESS ROAD

ROAD 'W'

ROAD 'N'

EQUIPMENT STORAGE

B-3 HELICOPTER APPROACH SURFACE

AIR TOURS TERM.

HELIPORT LEASE LOTS

EXISTING FAA-RFF FACILITY

GROUND TRANSPORTATION

B-1 HELICOPTER APPROACH SURFACE

FUEL FARM

SERVICE RD. 'N'

SHORELINE ACCESS ROAD

EXIT-OFF AREA & FATO

LANDING AREA & FATO

ROAD 'T'

LONG TERM PARKING

KITCHEN

SUPPORT USES

ARFF TRAINING FACILITY

FUTURE DEVELOPMENT

TO KAILUA-KONA

COMMERCIAL/INDUSTRIAL USE

AIRPORT ACCESS ROAD

COMMERCIAL/INDUSTRIAL USE

SERVICE ROAD 'P'

RADAR TOWER

FAA RADAR RESTRICTED ZONE

TERMINAL AREA PLAN

LIGHTED INTERSECTION

ELECTRIC SUB STATION

WATER TANK EL. 280' OVERFLOW EL. 262' BOTTOM

QUEEN KAAHUMANU HIGHWAY

AIRPORT BOUNDARY

DEPARTMENT OF LAND AND NATURAL RESOURCES (DLNR)

TO KAWAIHAE

AIRPORT BOUNDARY

50:1 APPROACH SURFACE

40:1 APPROACH SURFACE

KAWILA POINT

MAHAILUA BAY

TRUE NORTH

MAG. DEC. 10°16' E (1997)

0 1000' 2000' 3000'

GRAPHIC SCALE IN FEET

(0) (500) (1000)

GRAPHIC SCALE IN METERS

NOTES

1. FACILITIES FOR FUTURE DEVELOPMENT SHOWN AS — · — · —
2. ALL ELEVATIONS REFERRED TO MEAN SEA LEVEL (MSL).
3. RUNWAY AZIMUTH AND COORDINATES BASED ON WGS 84, UNLESS NOTED OTHERWISE.
4. ELEVATIONS OF PROPOSED AND FUTURE (LONG RANGE) FACILITIES ARE ESTIMATED (DENOTED AS est.)
5. PAVEMENT CLASSIFICATION NUMBER (PCN) BASED ON: INTERNATIONAL CIVIL AVIATION ORGANIZATION (ICAO), AERODROME DESIGN MANUAL, PART 3, PAVEMENTS, SECOND EDITION 1983; AND, ICAO, VOLUME I, AERODROME DESIGN AND OPERATIONS, SECOND EDITION, JULY 1995.
6. THIS DRAWING IS FOR PLANNING PURPOSES ONLY AND IS NOT INTENDED FOR CONSTRUCTION AND NAVIGATIONAL PURPOSES.

The master plan recommended that ultimately the existing terminals would return strictly to interisland use and incorporated the 1997 study's concept of a new overseas terminal planned to the north.

Recommended improvements included additional airline operating spaces, expanded baggage facilities, and additional covered space in the waiting areas near the gates. The parking lot and terminal loop would be expanded to the north to Pao`o Street (Road N) to provide for additional parking, terminal curb, and circulation.

Moderate growth in air cargo was projected and the master plan called for accommodating this growth by expanding the current cargo area to the south with an additional cargo building in line with the two existing buildings.

The master plan projected a doubling of based aircraft so doubling of hangar space was planned. The existing general aviation facilities were split on either side of the cargo area. The area to the south had already been graded for future development. The master plan recommended the development of ramp and fixed base operator (FBO) facilities to the south to anchor a new general aviation area. The existing general aviation hangars were planned to be relocated to the south to consolidate all general aviation in one area. This would include the relocation of the existing air tour facilities to a permanent site adjacent to the rest of the general aviation facilities.

The itinerant aircraft parking that was planned to the south along Taxiway A has been developed. This includes taxiway stubs on either side that were intended to provide depth into the general aviation area as it was developed.

Finally, the heliport was planned for an area mauka (east) of Pao`o Street. This area would include two heliports as well as lease lots, helicopter parking, and vehicle parking.

Support uses were generally planned to the north of the passenger terminal. This included areas for a fuel farm, wastewater treatment, flight kitchen, postal facilities, and administrative uses. Ground transportation service and storage was planned to remain and expand in its current location just north of the airport access road. The plan also included the relocation of the rental car counters and ready return area in the parking lot to the service and storage areas. This has occurred since the master plan was completed.

Besides expansion of the terminal loop road described earlier, on-airport circulation included the development of a pattern of roads in support of not only the flight line development but other areas within the airport property. The airport access road was planned to be expanded to four lanes. A second access to Queen Kaahumanu Highway was planned for a service road (Road P) to the north of the access road. Roads "L," "M," and "N" were planned as internal circulation routes as shown within **Exhibit 4A**.

PREVIOUS PASSENGER TERMINAL PLANNING

The plans recommended from the previous terminal planning studies are all depicted on **Exhibit 4B** for review and comparison. Each is discussed below.

1997 Overseas Terminal Study

This study was conducted shortly after the interim FIS (Federal Inspection Services) facility was completed to service flights arriving from Japan. Forecasts at the time of the study showed an increase in wide body service from Asia, thereby requiring the development of an overseas terminal with an appropriate level of service. The recommended terminal would be located north of the existing main terminal and would require a new peripheral roadway, infrastructure, and parking. The terminal building itself would be built for international and domestic overseas flights with a two-level pier concourse. The concept was phased for an initial two-gate concourse with a later five-gate expansion planned. This preferred concept was never realized and the interim tent structure is still in operation today as the CBP (Customs and Border Protection) facility for international arriving flights.

2001 Terminal Facilities Study

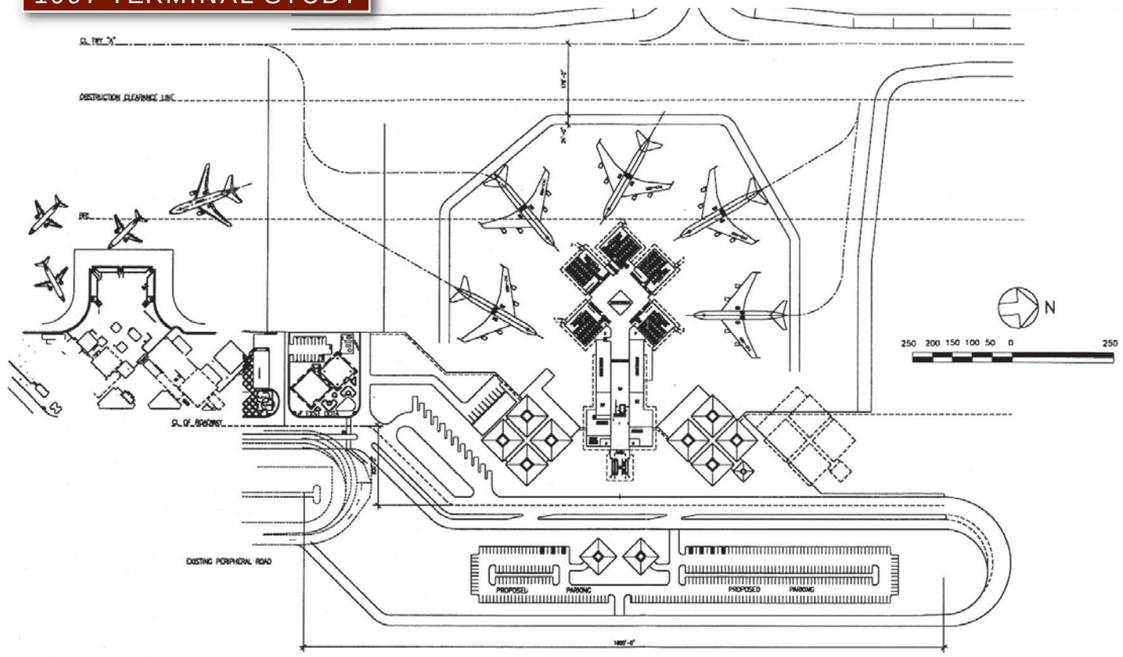
This study followed the Master Plan Update of 1998 and provided a more detailed evaluation of the development opportunities for the terminal area. These opportunities include the aircraft apron, passenger processing facilities, airport and airline operations facilities, passenger service concessions, and the terminal curbs, parking, and roadways. The preferred plan would improve and expand facilities in the existing terminal area for the purpose of elevating passenger levels of service, and increasing capacity, efficiency, and flexibility of operations. The preferred concept included an elevated passenger boarding corridor that would provide a connection to all holdrooms and to the FIS facility. It would function as a covered walkway for inter-island passengers as well as a sterile corridor for international arriving passengers. The main terminal area functions such as Ticketing (centralized to one zone) and Baggage Claim (two separate zones) are grouped for clearer understanding of overall airport functions. The current "two-unit terminal" airport layout transitioned toward a more centralized terminal by connecting south and north terminal areas with airside improvements. The Ellison S. Onizuka Space Center was planned to remain in its existing location. Additional holdroom and baggage handling facilities were also included in the recommended plan as well as an increase in long term parking capacity.

2005 Terminal Safety and Security Study

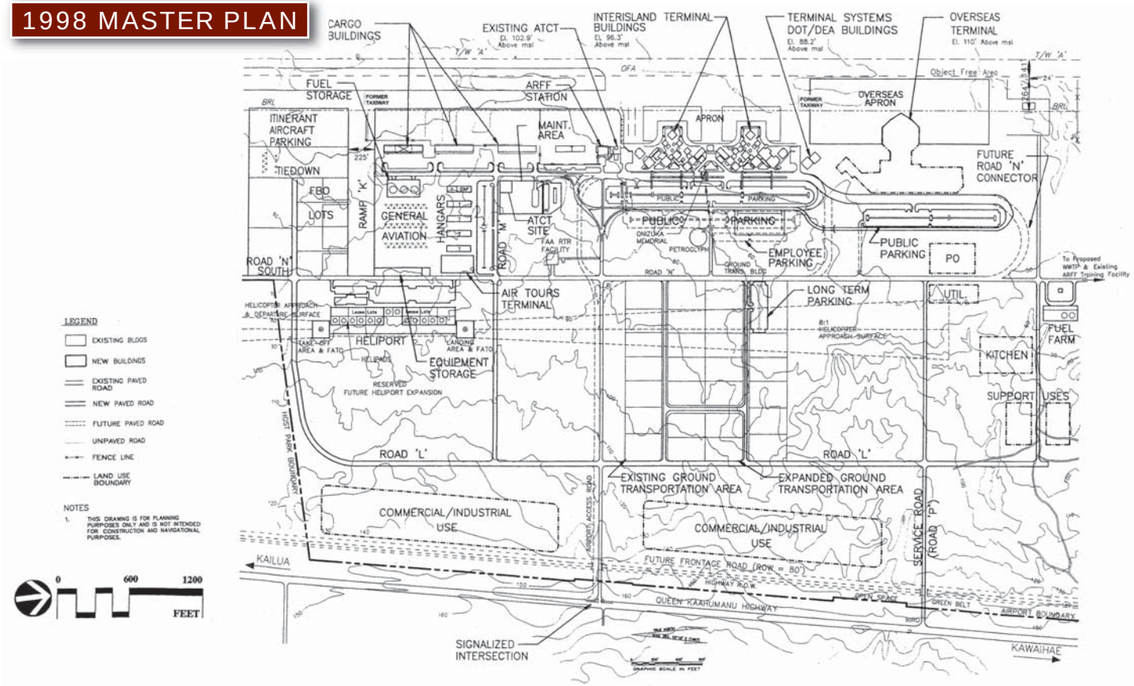
This terminal study evaluates the current terminal facilities for safety and security requirements and makes recommendations for terminal devel-

06MP06-4B-11/20/07

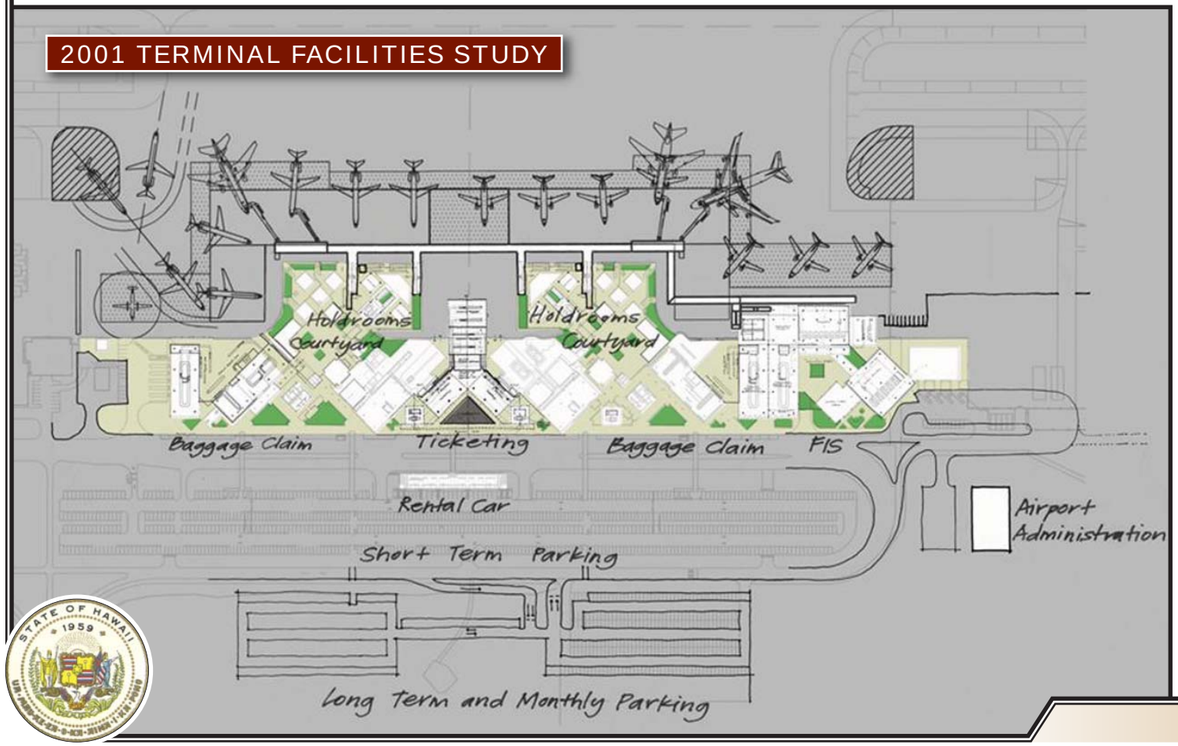
1997 TERMINAL STUDY



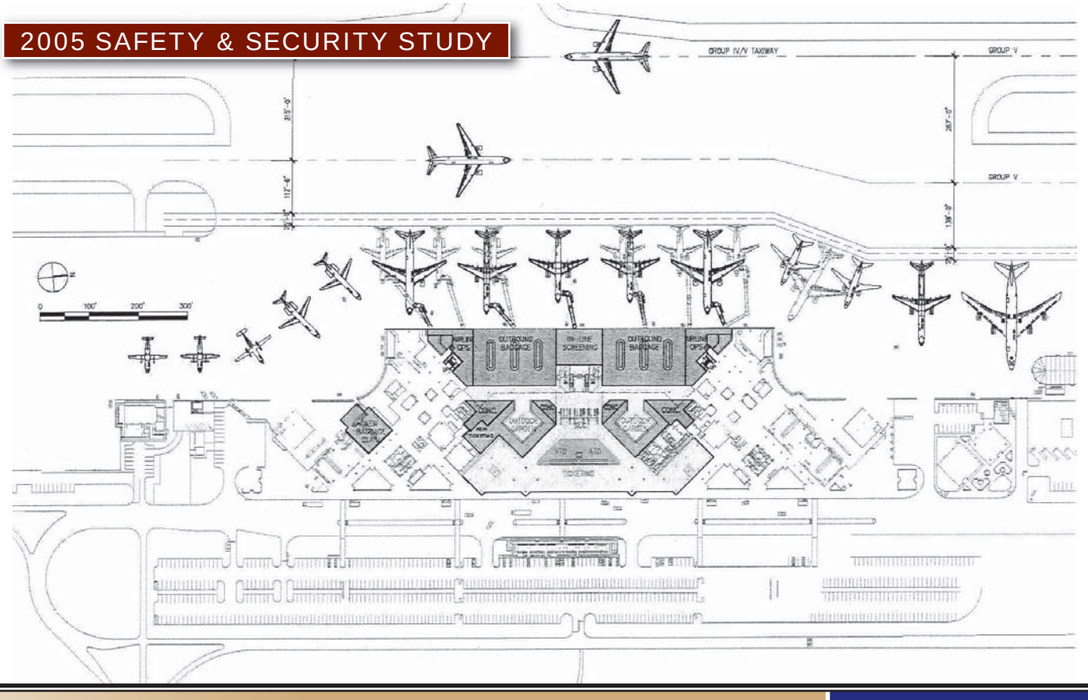
1998 MASTER PLAN



2001 TERMINAL FACILITIES STUDY



2005 SAFETY & SECURITY STUDY



opment to accommodate forecast growth through 2025. The study focused on six key areas which included holdrooms, security screening checkpoints, FIS facility, ticket lobby, baggage claim, and baggage screening. Recommendations were phased for short term, mid-term, and long-term projects. Improvements included centralizing ticketing and security screening as well as additional baggage claim and a centralized and larger outbound bound baggage facility in the space between the north and south holdrooms. Above this baggage facility would be an enclosed second level concourse level that would include loading bridges. The recommended concept assumed the relocation of the Ellison S. Onizuka Space Center. Long term phase recommendations include expanding the facility to the north, incorporating a new FIS international arrivals facility.

NON-DEVELOPMENT ALTERNATIVES

Non-development alternatives include the "No Action" or "Do Nothing" alternative, transferring service to an existing airport, or developing an airport at a new location. Several previous planning efforts have also considered these alternatives. All have resulted in the same conclusion: continue to develop the existing airport site to meet the needs of Hawaii County and its western coast.

NO ACTION

The "No Action" alternative essentially considers keeping the airport in its existing condition, with no additional improvements. As the island of Hawaii continues to develop and grow, the transportation system must also adjust to meet the changing needs. Air transportation is a part of this system and, in many ways, the most dynamic and key element of the system. Travel by air is the fastest means to cover long distances, and it provides businesses the capability to expand their markets nationally and globally. It provides tourists the means to maximize their vacation experience within the time available. It can be argued that the airlines provide the most successful form of mass transportation in the world today.

Today's technological advancements have made the internet the most dynamic form of communication. While the capabilities of the internet may have reduced the need for some transportation for communications (i.e., certain meetings and letter deliveries), it has also increased the demand for short turnarounds, both in business and household purchases. Air transportation is critical to providing the "just-in-time deliveries" for an industry that has dramatically reduced overhead related to inventory storage. Even individual households can have virtually any consumer product delivered to the doorstep within 24 hours because of the capabilities of the internet and air transportation.

Activity statistics for Kona International Airport at Keahole indicate that it has evolved into the most important interface to the air transportation system on the Big Island. The airport's forecasts and facility requirements analysis indicate future needs for improvements throughout the facility. The passenger terminal building, which is often the first and last memory of the area for visitors, will need to be able to adapt and grow to accommodate changing security and inspection requirements as well as a growing nonstop overseas market.

A simple review of history indicates that today's airport is handling nearly two million more passengers than it did in the early 1980s. Growth in air cargo has been just as dramatic. General aviation needs continue to evolve and change as the use of corporate aircraft become more commonplace. The use of general aviation for sightseeing and interisland travel is also increasing, and the Big Island is also being discovered as an excellent location for pilot training.

Even though the old airport had experienced some jet activity, the opening of the airport in 1970 truly brought the west coast of the island into the jet age. Runway extensions since that time have provided direct links to the mainland and to the world.

Landside improvements have allowed the airport to adjust to the increasing volumes of passengers as well.

If KOA had not been able to respond to the growth in demand and the changing marketplace, the island's and the state's ability to participate and compete in the national and global economy would have been compromised. If facilities are not maintained and improved so that the airport remains a pleasant experience to the visitor or business traveler, or if delays and queues become unacceptable, then these groups or individuals may consider doing business elsewhere or choose not to frequent the area.

Thus, a "No Action" alternative remains inconsistent with the goals of the State of Hawaii, as well as those of the Federal Aviation Administration (FAA), which include enhancing local and interstate commerce. A policy of no action would be considered an irresponsible approach affecting the long term economic growth of the island and the state.

TRANSFERRING AVIATION SERVICES

Transferring services to another airport, existing or new, is one that may typically be favored by many residing close to an existing airport. Relocating an airport, however, is very complex and expensive, especially when commercial service is involved.

TRANSFER SERVICES TO AN EXISTING AIRPORT

A master plan for an existing airport typically looks at the needs over a 20- to 25-year period. In this manner, any short term investment in improvements at the airport will be ensured of being amortized over a useful period of time. The same would be true of

transferring services to another existing airport, provided that the transfer airport could absorb much of the current and 20-year demand without major investment beyond what would be required at the present airport.

Examples of how this could occur would be if services could be effectively consolidated at another nearby commercial service airport, a large general aviation airport, or at a nearby military air base. In most cases, an existing general aviation airport will require such an extensive upgrade that it would essentially be the same as starting over with a new airport on the same site.

The military air base is viable only if there is one available that is either planned to be or recently was decommissioned, or a base that is willing to operate as a joint-use facility. This most recently occurred in Austin, Texas, where Bergstrom AFB was converted to Austin-Bergstrom International Airport. Of course, Honolulu International Airport is currently a joint-use facility with Hickam Air Force Base. There are, however, no air bases on the Big Island to even be considered.

The other commercial service airport on the Big Island is Hilo International Airport (ITO). Like all public airports in Hawaii, ITO is owned by the state and operated by the Hawaii Department of Transportation Airports Division (DOT-A). The airport has two intersecting runways, the longest of which is 9,800 feet long. ITO currently handles approximately half the passenger level of KOA. Annual operations have been around 100,000 for the last several years.

The level of facilities available at ITO would need to upgrade significantly to accommodate the traffic at KOA. The primary runway is 1,200 feet shorter than the 11,000-foot runway at KOA. The facility requirements indicated that additional airfield capacity will be needed at KOA in the short term. The same would be required immediately at Hilo International Airport if services were to be transferred. This would likely include a parallel runway. The passenger facility would be required to nearly triple in size along with an expansion of cargo facilities just to handle current levels of traffic at one airport. Access roads would also require upgrading.

Hilo International Airport is surrounded by established urban development on its north, west, and southwest sides. Adding the traffic levels of KOA to this airport would more than double operations and increase the potential for impacts on the established neighborhoods nearby.

Perhaps the largest drawback, however, is the travel distance from the west side of the island to Hilo. It is approximately a 96-mile drive between the two airports with a drive time estimated at over two hours one-way. Most of the trip would be on two-lane highways. This would be a significant cost in time and travel to the large majority of KOA passengers. The additional travel distance would have a major impact not only on residents but also on the tourism industry on the west coast. As the state's largest is-

land, the distance between the two major economic centers on the island is the primary reason there are two existing airports. To transfer services to one commercial service airport would have a major economic impact on the island and the state.

Waimea-Kohala Airport and Upolu Airport are the two general aviation airports on the Big Island. Both are in the northern reaches of the island. Waimea-Kohala Airport has a 5,197-foot runway while Upolu Airport has a 3,800-foot runway. Each of these airports would need to basically be redeveloped like a new site if either were to serve as a replacement commercial service airport for KOA. This would also require major property acquisitions and have potentially major environmental impacts.

One of the advantages of Kona International Airport at Keahole is that it is relatively centrally located for the four districts on the west side of the island. Waimea-Kohala Airport is the closer of the two airports to KOA, and it is over 36 miles northeast and approximately 47 minutes drive time. This distance would be even further from the South Kona district.

Kona International Airport was designed and planned in the late 1960s with room to develop. Its current location best serves the population and tourism industry of the west side of the island. As long as this facility remains viable with room to meet the long term aviation needs, transferring services to another site would not be prudent or feasible.

The two airports do serve a purpose of providing convenient general aviation access to the north side of the island. Waimea-Kohala Airport does have some small commuter activity as well. In addition, both airports can be valuable for supporting training activity that is generated by flight schools based at KOA. Continuing to support the development and improvement of general aviation facilities at these two airports can help to accommodate some of the growing general aviation demand on the west coast.

RELOCATE TO A NEW AIRPORT SITE

In addition to the major financial investment, the development of a new commercial airport also takes a commitment of extensive land area. The location for a new site is usually undeveloped. As a result, the potential for impacts to wildlife habitat, wetlands, prime farmland, and cultural resources is higher than at an existing site which still has development capability.

That is why in the past 30 years, there have been only two completely new "green field" airports constructed in the United States to replace existing airports serving over one million annual enplanements. Those airports were in Ft. Myers, Florida and Denver, Colorado. Southwest Florida International Airport was constructed because the existing airport was severely limited in runway length and room for airfield or terminal development. Denver International Airport

was constructed primarily to replace an airport with some of the highest operational delays in the nation and with no feasible means to increase the airfield's capacity on-site.

Kona International Airport at Keahole does not experience any of these constraints, nor is it expected to experience severe constraints. The airport was developed in the late 1960s with the foresight to acquire and protect sufficient acreage to be able to develop and grow in the future. As presented in the 1998 Master Plan, the airport has adequate room to grow and develop to carry the facility well into the future. Given the investment in the existing facilities and the ability to meet future needs, complete relocation to another site would be neither prudent nor feasible.

A less demanding alternative could be the development of a new general aviation airport or heliport. The previous chapter indicated a need for capacity improvements such as a parallel runway and/or a heliport. In essence, this capacity could be provided at a new general aviation "reliever" airport or stand-alone heliport. If developed in a location convenient to general aviation users, such an airport could serve to relieve operational level demand at the existing airport.

FAA regulations and the airport's grant assurances prohibit the restriction of a class of aircraft from using the airport. So forcing general aviation to move to a different airport is not an alternative. A new general aviation airport would have to be convenient and offer advantages to attract general aviation users. Such advantages could include less congested and less restricted airspace, as well as shorter taxis and more advantageous locations for general aviation services.

A new general aviation airport will require less property and will likely have fewer environmental impacts than a new commercial service airport. A site as convenient as the existing airport and without significant environmental impacts may be difficult to find. As long as there are economically feasible and environmentally reasonable alternatives for providing adequate capacity at the existing airport site, development of a new general aviation airport cannot be considered as prudent or feasible at this time.

KEY PLANNING ISSUES

Analysis in the previous chapters of this master plan indicates that several improvements will be necessary to enhance the capability of the airport to serve its users well into the 21st century. The key airfield issue facing the airport in the coming years is expected to be operational capacity. In the terminal area, early public input has indicated that maintaining a "sense of place" will be critical as issues are addressed in the organization, optimization, and ultimate expansion of the passenger terminal. Opportunities for general aviation of all types to develop and grow are a key concern. Adequate space to accommodate air cargo needs in a consolidated manner must be considered. Support facilities to complement these primary components must also be incorporated. Finally, the

acreage associated with Kona International Airport at Keahole offers opportunities to further enhance aviation on the Big Island as well as provide avenues to generate revenue towards maintaining a self-sufficient airport and state aviation system.

Exhibit 4C outlines key considerations for this alternatives analysis. The facility requirements analysis from the previous chapter identified several needs over the planning period. Carrying over from the previous master plan is the development of a parallel runway. Added to the airfield mix, however, is the Kona auxiliary training runway (KATR) proposed by the United States Air Force. This is essentially a landing strip 4,250 feet long intended for the purpose of practicing short field landings by C-17 Cargomaster aircraft.

The previous master plan also recommended an independent touch-down and lift-off (TLOF) area for helicopters. This heliport concept still needs to be considered as it can improve the capacity of the airfield. As the airport has a large amount of existing and potential helicopter training, consideration should also be given to a separate training area for practicing landings and takeoffs, auto-rotations, etc. for capacity relief.

In addition to operational capacity, the airfield planning must also consider safety and efficiency enhancements. The airfield's taxiway system will be reviewed to ensure that runway incursion potential is minimized, and that the available taxiways provide efficient access and egress to the runway system. Circulation is also a key to the overall efficiency of the system. The locations of future taxiway exits will be reviewed, as will the parallel and connecting taxiway system.

As indicated in the previous chapter, the Airbus 380-800 and the Boeing 747-800 aircraft requires ARC D-VI airfield standards. The potential for ultimately accommodating these standards at KOA as at least an alternate airport to Honolulu International Airport will be considered.

The facility requirements indicated that the runway length is currently adequate. While there is no specific need at this time, to ensure viability for the future, the opportunity for reserving an ultimate runway length up to 12,000 feet will be considered.

Other airfield issues include the aircraft rescue and firefighting (ARFF) station, and the airport maintenance facilities which need to allow for space for potential expansion with growth of the airfield.

The passenger terminal at KOA is unique among the world's airports, being completely open air and preserving the indigenous architecture of the island. Passengers walk under hut roof structures, through open courtyards and alongside tropical landscaping on their way to and from the aircraft. While the terminal was originally designed to service small aircraft flying interisland routes, the terminal has seen increasing passenger traffic from the U.S. mainland and Asia. With the continued popularity for Kona as a tourist destination, the challenge in

AIRFIELD CONSIDERATIONS

- **Airfield capacity**
  - KATR for C-17
  - Parallel runway
  - Independent helicopter operations
- **ARC D-V vs. D-VI design**
- **Ultimate runway length**
- **Future south CAT I approach**
- **Taxiway system**
  - Parallels
  - Exit locations
- **Support facilities**
  - ATCT location
  - Relocate VOR on-airport
  - ARFF
  - Maintenance facilities

TERMINAL CONSIDERATIONS

- **Maintaining sense of place and character**
- **Passenger comfort**
  - Shade and cooling
  - Protection from inclement weather
- **Terminal layout and organization**
  - Future north terminal option
  - Commuter terminal vs. Integrated operations
- **Optimization of the existing terminals**
  - Balance utilization of terminals
  - Common use vs. exclusive leases
  - Combine terminals
- **Departures processing**
  - Electronic and off-site check-in and bag drop-off
  - Security checkpoint (split vs. consolidated)
  - Agricultural check combined with TSA bag screening
  - In-line baggage screening
  - Passenger circulation and wayfinding
- **Baggage claim**
  - Claim device capacity
  - Circulation/greeter space requirements
- **Concourse development**
  - Second level boarding/enhanced boarding
  - Agricultural check-in line with Security checkpoint
  - Retail/concessions requirements
  - Restroom expansion/modernization
  - Adequate seating and amenities
- **International operations/CBP requirements**
  - Integrate CBP within terminal vs. separate facility
  - Improve international passenger experience
- **Phased construction**
  - Maintaining operations and passenger safety

OTHER CONSIDERATIONS

- **Air cargo development**
  - Future cargo site requirements
  - HDOA site requirements
  - Post office site location
- **General aviation development**
  - Commuter terminal and parking requirements
  - Underserved hangar needs
  - FBO development sites
  - Apron and overflow parking requirements
  - Helicopter facilities
- **Expanded fuel storage/distribution**
- **Land use development revenue generation**
  - Onizuka Space Center relocation
  - Regional ARFF/public safety training facility
  - Shared government office complex
  - Commercial development opportunities
- **Access and circulation**
  - Future airport access points
  - Loop road/internal road circulation
  - Public parking needs
  - Cell phone lot
- **Infrastructure**
  - Utility upgrade and development
  - Wastewater treatment plant
  - Sustainability opportunities

this master plan will be to expand the terminal to meet the forecast demand while maintaining the character and ambience that is strongly desired by the community and passengers. This will be balanced, however, by considering an adequate level of passenger security and comfort such as shade, cooling, and protection from inclement weather.

Originally designed to operate as two separate terminals for interisland aircraft, the airport's capacity is now challenged by larger overseas aircraft and an unbalanced demand between the two terminals. Concepts that optimize current facilities through operational improvements such as common use systems and combining two terminals into one will be considered. This will be followed by efficient, flexible, and expandable alternatives that meet the forecast demands. Maintaining airport operations and passenger security and safety will be requirements for the alternatives. Improving the passenger experience through the departures and arrivals processing will be another important consideration. This will include good passenger circulation and wayfinding throughout the terminal, consolidating processing functions, improving passenger amenities, and providing protection for passenger boarding of aircraft.

As overseas flights increase as forecasted, there will be a need to provide facilities that are appropriate to multiple larger size aircraft. This facility could also include international arrivals processing which is currently contained in a temporary tent structure.

Air cargo continues to be an industry that shows dynamic potential worldwide. On the Big Island, however, it is also an essential part of the modern economy. Protecting the potential for increased cargo capability will be important for the island's west coast. In addition, cargo development has the potential to work in concert with a foreign trade zone to further enhance regional economic development and airport revenue generation.

Currently, cargo is handled in two separate parts of the airport. As demand grows, consolidation of cargo facilities will become more of a necessity for safety and functional efficiency. Other considerations are the needs of the U.S. Postal Service for a facility on site, as well as the needs of the Hawaii Department of Agriculture for refrigeration storage, enclosed holding space, and inspection areas.

General aviation is once again a growing industry. This is being reflected at KOA as corporate activity increases, pilot training grows, and the demand for small aircraft storage is on the rise. The rise in second homes, high end resorts, and convention opportunities are contributing to the increased corporate demand. Flight schools on the airport have found a large demand for training in the excellent weather conditions of the west coast. In addition to the growth, there is a large underserved demand for hangars on the airport.

Maintaining areas for corporate aviation development, FBO and specialty operator growth, and individual air-

craft storage are essential for serving this sector of the aviation industry. More defined areas for helicopter activity will also be considered.

The on-site fuel storage capabilities at KOA are dangerously low, especially considering the fact that fuel must currently be trucked around the island from the port in Hilo. This chapter will consider potential locations for increased fuel storage.

Another planning consideration on the airport includes the potential use of remaining landside property on the airport. While it is important to maintain these areas on-airport for operational safety and land use compatibility purposes, putting them to use in a manner that will generate revenue to support airport operational costs, as well as provide economic opportunities for the community, should be considered.

AIRFIELD IMPROVEMENT CONSIDERATIONS

Airfield facilities are, by nature, a focal point of the airport complex. Because of their primary role and the fact that they physically dominate airport land use, airfield facility needs are often the critical factor in the determination of viable airport development. Analysis in the previous chapter indicated the need to plan for additional airfield, as well as examine options that could provide additional runway length if ever needed for longer haul overseas flights. Other factors to be considered include the airfield taxiway system and the potential to accommodate airport reference code (ARC) D-VI at least as an alternate airport. The relocation of the ATCT is being evaluated by the FAA and is discussed here. Options for relocating the very high frequency omnidirectional range (VOR) onto the airport are also examined.

AIRFIELD CAPACITY ALTERNATIVES

Physical improvements that can increase airfield capacity include additional taxiway exits, a parallel runway, and independent helicopter landing areas. There is an opportunity to increase airfield capacity by up to 10 percent at KOA with the proper placement of two additional taxiway exits. These will be addressed later in the taxiway subsection. A more significant increase in capacity, however, can be attained with the development of a parallel runway. A helicopter landing and takeoff area that can support operations independent of the runway activity can also increase capacity due to the level of helicopter activity at the airport. The following subsections examine parallel runway and helicopter TLOF alternatives. The discussion begins, however, with a description of the KATR programmed for KOA by the Department of Defense.

Kona Auxiliary Training Runway (KATR)

The United States Air Force (USAF) utilizes the C-17 aircraft in its role of supporting security response, provid-

ing civil defense, and supplying humanitarian aid. The C-17 is used to furnish supplies, equipment, food, clothing, and military assistance throughout the world and within the Pacific Asian Theater of Operations. In 2006, a squadron of C-17 aircraft was established at Hickam Air Force Base (AFB) as part of this mission.

One of the critical elements of the training curriculum for the C-17 air crews is the use of an auxiliary training runway to gain experience in operating into and out of short runways. By military design criteria, the training facility can be as small as 3,000 feet by 90 feet or as large as 5,000 feet by 100 feet.

The USAF proposed the KATR at 4,250 feet long and 90 feet wide. The USAF searched and evaluated alternative locations for an auxiliary training runway in the Hawaiian Islands, ultimately selecting an alternative at Kona International Airport at Keahole. An environmental assessment was prepared on the proposed KATR in 2004.

Exhibit 4D includes a depiction of the KATR as proposed by the Air Force. The proposed KATR is planned along the alignment of the ultimate parallel taxiway between the proposed parallel runway and Runway 17-35 in the 1998 Master Plan. This would place the centerline of the KATR 700 feet makai (west) of the centerline of Runway 17-35. The 4,250-foot KATR would also have 300-foot paved overruns within a 500-foot extended safety area off each end. Exit taxiways are planned to align with Taxiway A North and with Taxiway G. Training aircraft will land on the KATR, then use the taxiways to return to Runway 17-35 for departure. This layout is included in each of the proposed airfield alternative layouts to be discussed.

It should be noted, however, that the proposed location could allow the KATR to be readily developed to the maximum size of 5,000 feet by 100 feet. In fact, this size would have the potential for joint interisland GA and cargo use.

Parallel Runway

When possible, the best means for improving runway capacity is the development of a parallel runway. The optimum capacity is attained by a parallel runway that matches the design of the primary runway. A runway that can accommodate a majority of the airport's operational mix, however, can still significantly improve capacity. Since instrument meteorological conditions (IMC) exist a small percentage of the time at KOA, there is not a need for simultaneous instrument approaches. For simultaneous operations in visual conditions, a runway separation of 1,200 feet is the minimum FAA standard for aircraft in airport reference code (ARC) D-V and D-VI.

Exhibit 4D presents the parallel runway in the location proposed in the 1998 Master Plan. The runway separation is 1,400 feet. Besides the physical runway there are several minimum standards that are designed to allow for safe operation of the runway.

As discussed in the previous chapter, these vary with the operating characteristics of the design aircraft. While the parallel runway may initially start out with a lesser design, it is prudent to plan and protect the area expected to be needed over the long term.

The runway safety area (RSA) is the most critical standard. As can be seen on the exhibit, this would be graded and maintained within the current property. At the north end of the runway, however, there is minimal clearance between the RSA and the property boundary. Next is the runway object free area (ROFA), also depicted on the exhibit. While this area does not necessarily need to be graded, the ROFA should still be kept clear of all objects not fixed by airfield function, and those objects must be on frangible mounts. Airport fencing and perimeter service roads should be located outside of the ROFA. The ROFA on the north end of the ultimate parallel runway in this alternative would extend beyond the airport property and over the water. This would require that the perimeter fencing and service road be placed within the standard ROFA in this area. To accommodate the fence and road, the FAA would need to issue a Modification to Design Standard for this alignment to be feasible.

Another runway design standard is the runway protection zone (RPZ). While it is desirable to keep this trapezoidal area off each of the runway clear of all objects, uses such as parking and roadways are permissible outside the central core (extended ROFA) of the RPZ. It is also preferred that the airport maintain fee simple control of the area if at all possible.

As shown on **Exhibit 4D**, the south RPZ of the parallel runway would extend over a public road and into property leased by the National Energy Laboratories of Hawaii (NELHA). This would require FAA approval of the public road within the RPZ as well as easements over the property currently outside the airport boundary.

Exhibit 4E presents an alternative where the parallel runway would be located at the minimum standard separation of 1,200 feet from Runway 17-35. In addition, the ultimate runway would be shifted 1,000 feet to the north. This would keep the ROFA entirely within the existing makai (west) boundary of the airport and allow for the perimeter fencing and service road to remain outside the ROFA. This also would allow the potential to ultimately develop airport landside uses makai (west) of the runways.

Alternative 2 would place the runway closer to the planned KATR. This would be an operational problem only if the KATR and parallel runway were intended to have simultaneous operations.

As indicated earlier, the parallel runway can be expected to be developed in stages. A length of 3,600 feet would be capable of accommodating aircraft weighing less than 12,500 pounds with less than 10 seats. To accommodate small aircraft with 10 or more passenger seats, a 4,200-foot runway would be needed.

06MP06-4D-5/11/10

ASR 1,500'

2,000'

Shoreline Access Rd.

#3

3,300'

VOR #4J

1,000'

Road P (Proposed Future Airport Access Rd.)

Keahole St. (Airport Access Road)

Kaiminani Dr.

Queen Kaahumanu Hwy.

#1

Pao'o St. (Road N)

ATCT #8

#2

Kupipi St.

ATCT #10

Alternative ARFF Site

Existing ARFF Site

VOR #11

1,000'

VOR #12

1,000'

324'

Runway 17-35 11,000' x 150' (Future 12,000' x 150')

1,000'

700'

KATR 4,250' x 90'

700'

1,000'

VOR #8

1,000'

VOR #9

1,000'

VOR #10

Initial GA Parallel Runway 4,500' x 75'

Ultimate Runway 17R-35L 11,000' x 150'

ATCT #9

Ultimate Perimeter Service Road

LEGEND

- Airport Property Line
- Object Free Area (OFA)
- Extended OFA
- Runway Safety Area (RSA)
- Short Term Airfield Pavement
- Ultimate Airfield Pavement
- Kona Auxiliary Training Runway (KATR)
- Runway Protection Zone (RPZ)
- Airport Traffic Control Tower (ATCT) Site Alternatives
- Heliport Site Alternatives
- Helicopter Training Pad

NORTH

0 1200 2400

SCALE IN FEET

AIRFIELD ALTERNATIVE 1

Exhibit 4D

06MP06-4E-5/11/10

ASR 1,500'

Road P (Proposed Future Airport Access Rd.)

Keahole St. (Airport Access Road)

Kaiminani Dr.

Queen Kaahumanu Hwy.

#3

Shoreline Access Rd.

1,800'

#1

Pao'o St. (Road N)

ATCT #8

#2

Kupipi St.

2,500'

ATCT #10

Alternative ARFF Site

Existing ARFF Site

VOR #4J

1,000'

VOR #11

1,000'

381'

500'

Runway 17-35 11,000' x 150' (Future 12,000' x 150')

VOR #12

1,000'

1,000'

700'

KATR 4,250' x 90'

1,000'

VOR #8

1,000'

VOR #9

VOR #10

1,000'

500'

Ultimate Runway 17R-35L 11,000' x 150'

Initial GA Parallel Runway 3,600' x 75'

Ultimate Perimeter Service Road

ATCT #9

LEGEND

- Airport Property Line
- Object Free Area (OFA)
- Extended OFA
- Runway Safety Area (RSA)
- Short Term Airfield Pavement
- Ultimate Airfield Pavement
- Kona Auxiliary Training Runway (KATR)
- Runway Protection Zone (RPZ)
- Airport Traffic Control Tower (ATCT) Site Alternatives
- Heliport Site Alternatives
- Helicopter Training Pad

NORTH

0 1200 2400

SCALE IN FEET

AIRFIELD ALTERNATIVE 2

Exhibit 4E

Exhibits 4D and **4E** depict two options for this initial development. Alternative 1 shows the initial parallel runway developed at the north end of the airfield. This would be aligned with the north end of existing Runway 17-35 and the planned KATR. The initial length would be 4,500 feet with taxiway access at each end of the runway.

Alternative 2 shows the initial parallel runway developed at the south end of the shifted runway. Starting the runway development at the south end would maintain the runway closer to the airport's general aviation facilities. This would reduce taxi times and likely increase the propensity of general aviation operators to regularly use the parallel runway. As depicted, the runway could initially be developed at a length of 3,600 feet and with taxiway exits at both ends. This would not only be staggered south of the KATR, but would also be clear of the RPZ for the KATR. A 4,500-foot long runway would require the north exit taxiway to cross the RPZ for the KATR. If the ultimate runway alignment were planned similar to Alternative 1, a length of 4,600 feet could be attained before the KATR's RPZ became a factor.

Independent Helicopter TLOF

To better accommodate the growing helicopter traffic as well as increase the airfield's capacity, helipads for independent operations by helicopters should be considered. For completely independent operations, the helicopter TLOF should be separated at least 2,500 feet from the runway. A base heliport for operators should be considered as well as a separate landing area for helicopter training. Ideally, the heliport should be in reasonable proximity to the general aviation facilities for potential cross-utilization of services and facilities. The training TLOF can be located in a separate area away from other activities.

The previous master plan recommended a separate heliport location mauka (east) of the general aviation area across Pao`o Street (Road N). This location is generally depicted by Heliport Site #1 on **Exhibit 4D**. In this location the heliport would be at least 2,500 feet from the runway. There is some concern for the line-of-sight between the heliport ATCT Site #10.

Alternate Site #2 is also shown on the exhibit. This site is closer to the general aviation facilities, for even greater cross-utilization of services and facilities. A helipad in this area, however, would be as close as 2,200 feet from the runway. Traffic at this site would directly overfly ATCT Site #8. There is also concern for potential line-of-sight problems with ATCT Site #10.

Site #3 would co-locate the heliport with the heliport facilities adjacent to the helicopter training pad. This would maintain essentially all helicopter activity in one general location. Line-of-sight for ATCT Site #10 would be better, but this location could create potential problems for viewing from ATCT Site #9.

Heliport layouts for these two locations will be examined later with the general aviation landside alternatives.

The airport's large acreage offers opportunities for establishing a helicopter training area away from other airside and landside facilities. The optimum location appears to be at the north end of the airport away from the general aviation area, and at least 2,500 feet from the runway. For compatibility with developing off-airport land uses, locations in close proximity to Queen Kaahumanu Highway were avoided.

The Hawaii County General Aviation Council (HCGAC) has recommended a training area/runway 1,500 feet long and 300 feet wide. The area would be paved and marked to accommodate multiple training aircraft. While this would be ideal, funding and other development factors could limit the paved width of the facility, although the 1,500-foot length should be maintained.

Exhibit 4D depicts an alternate training location approximately one-half mile makai (west) of Queen Kaahumanu highway. This location maintains a 3,300-foot separation from Runway 17-35. The separation from the heliport in the general aviation area should be sufficient to establish separate traffic routes for the two landing areas.

Exhibit 4E presents an alternate location at 2,500 feet mauka (east) of Runway 17-35. This location is generally along an extension of the Road N (Pao`o Street) alignment. This alignment would provide a general flight path between the training area and the heliport terminal.

RUNWAY 17-35

Runway 17-35 is currently the only runway on the airport. While parallel runway alternatives to improve airfield capacity are being considered, Runway 17-35 will likely remain as the primary runway because of its current length, instrument capability, and proximity to the terminal area.

One consideration for Runway 17-35 as traffic increases is a CAT I approach to the south end of the runway. While this may not be a short term priority, the capability for CAT I minimums should be protected for future viability. The primary planning consideration is to ensure that the approach is protected. This would include planning for an RPZ for CAT I standards. **Exhibits 4D** and **4E** depict this RPZ off the south end of the runway. All but the southwest corner of the RPZ would remain within the current airport boundaries. The Natural Energy Laboratory of Hawaii Authority (NELHA) has a roadway that is within this corner off-property. According to FAA design criteria, roadways are acceptable within the RPZ as long as they are outside an extended ROFA to the back of the RPZ. The NELHA roadway would remain outside the extended ROFA, suggesting that a future CAT I approach can be accommodated on Runway 35.

While there is not a pending need for additional runway length, the facility requirements indicated that reserving the capability for a runway up to 12,000 feet in length should be considered in long range planning. **Exhibit 4D** depicts adding 1,000 feet to the north end of the runway. This can be accommodated well within the airport property. The existing approach light lane as well as the glide slope would have to be relocated. A southern extension would require not only relocation of the localizer, but would also place a larger portion of the future runway protection zone over NELHA and its roadway. As a result, any future runway extension is recommended to be planned at the north end of Runway 17-35.

The runway and its taxiway system currently meet FAA design standards for up to ARC D-IV. This includes aircraft such as the B-767 and DC-10. The runway itself meets ARC D-V standards to accommodate aircraft such as most B-747 and B-777 aircraft. If the runway were to regularly accommodate ARC D-VI aircraft such as the A380-800 and the B747-800, it should be planned for a 200-foot width with taxiways 100 feet wide. While this can be accommodated, it is not anticipated to be necessary. The current runway and taxiway widths will be adequate to accommodate these large aircraft on an infrequent basis, such as a special charter or to serve as a diversion airport for Honolulu International Airport.

Most important in the short term is to provide adequate separation distances on the taxiway system. The 225-foot separation between Taxiway A and the partial parallel taxiway in the terminal area meets Group IV standards, but is not adequate for Group V aircraft (267-foot standard). In fact, the push-backs from some aircraft parking positions are also affected by Group V taxiway standards.

To provide such separation mauka (east) of the existing Taxiway A would require moving terminal facilities farther back from the runway. Since the taxiway is currently located 881 feet from the runway, there is adequate space between the runway and taxiway to consider improving circulation makai (west) of Taxiway A.

Exhibit 4D depicts establishing a second parallel taxiway alignment 324 feet makai (west) of the current parallel taxiway. This is the taxiway separation standard for Group VI aircraft. The clearances in the terminal area, however, would remain tight, thus limiting aircraft parking flexibility at the terminal gates.

Exhibit 4E examines locating the inside taxiway closer to the runway. A 500-foot runway-taxiway separation would still meet Group V design standards. This would also allow a 114-foot "bump-out" of Taxiway A in front of the terminal, thereby increasing the terminal apron for parking and circulation. The resulting parallel taxiway separation of 267 feet meets the Group V standard. As will be demonstrated in the discussion of terminal alternatives, this also enhances terminal development options.

The dual parallel taxiway can also provide flexibility for adding taxiway exits. **Exhibits 4D** and **4E** depict recommendations for the placement of additional taxiway exits to enhance runway efficiency. The grade differential between the runway and Taxiway A in front of the current cargo area, however, currently prohibits an exit in this area. This leaves a 3,000-foot gap between exits for aircraft that cannot slow sufficiently to exit within 6,400 feet of the runway threshold. The grade of the inside parallel taxiway could be designed to allow an exit in this area.

The exit plan as proposed on these exhibits would ultimately maintain exits from the runway at least every 2,000 feet, with a higher concentration near midfield.

AIRFIELD SUPPORT FACILITIES

Airport Traffic Control Tower

As indicated in the previous chapter, the existing ATCT is old and out-of-date. In addition, the cab height is not sufficient to provide full line-of-sight of all airfield movement areas. In particular, a northern section of Taxiway A and portions of the terminal apron are shadowed from the tower by large aircraft parked on the terminal ramp.

A site selection study conducted by the FAA identified and evaluated 10 potential sites, including the current location. From this preliminary evaluation, the sites were narrowed down to three alternate locations for further analysis. Those three sites are identified on both **Exhibits 4D** and **4E**.

Site #8 is located mauka (east) of the terminal loop and parking lot, between Kupipi Street and Pao`o Street. This would place this alternative in a location that could include future terminal parking. While the basic footprint of the terminal would have a minimal impact, the potential requirement for a 300-foot secure radius around the tower could require shifting future parking farther north.

Site #9 is located makai (west) of the current airfield, near the west boundary of the airport. A concern with this site is its proximity to the parallel runways as proposed by Airfield Alternatives 1 and 2.

Site #10 is located north of the current terminal along the flightline. While this area is currently undeveloped, it does have access and can be maintained within the security. The location is sufficiently north of the terminal so that it should not impede northward development of the terminal for well beyond the planning period.

The FAA completed final evaluations and determined Site #10 to be the most viable site. This recommendation is included in the final master plan concept.

VOR Relocation

The Kona VOR is currently located 4.3 nautical miles south of the airport.

Development pressures around this site require that the FAA find a new location for the VOR, preferably within the airport boundaries. As with the ATCT, the FAA conducted a site study to determine its future location. After considering a multitude of sites, the primary candidate locations considered for additional review and evaluation are depicted on **Exhibits 4D** and **4E**.

General siting requirements recommend that the VOR be located a minimum of 500 feet from any runway centerline and at least 250 feet from taxiway centerlines. The VOR should also be at least 500 feet from metal fences and overhead transmission lines. A single tree can be tolerated at 500 feet, but groupings of trees should be maintained at least 1,000 feet away. Structures should be kept at least 1,000 feet away. In addition, metal structures beyond 1,000 feet should not penetrate a 1.2 degree angle from the base of antenna, and non-metal structures should not penetrate a 2.5 degree angle.

One of the primary candidate locations was on the north end of the airfield, while the rest were on the southern portion of the field. **VOR Site 4J** is located within the secured airfield perimeter, approximately 200 feet makai (west) of the service road, and 1,100 feet mauka (east) of the runway centerline. This site could be readily serviced from the power to the approach light system. Access could be extended from the service road. There was a concern that this location could affect the developable flight line at the north end.

VOR Site 8 is located approximately 600 feet makai (west) of Runway 17-35 and approximately 2,000 feet north of the Runway 35 threshold. While this area is within the secured airfield perimeter, it would affect the ability to develop a full length parallel taxiway between the existing and future parallel runway.

VOR Site 9 is also located approximately 600 feet makai of Runway 17-35, but is approximately 700 feet north of the Runway 35 threshold. It is also within the secure airport operations area (AOA), and would affect the development of the southern portion of the parallel taxiway between the runways in Airfield Alternative I. Airfield Alternative II shifts the parallel runway and taxiway north so they do not affect Site 9. The elevation of the VOR, however, was a concern to be evaluated to determine its potential impact on the ultimate parallel runway approach.

VOR Sites 10, **11**, and **12** are each located beyond the south runway thresholds. Site 10 is makai of the runway centerline, and Sites 11 and 12 are mauka the centerline. All are within the AOA, and appear to be out of the way of airport development. A Site 11 concern was its potential affect on future general aviation apron development. Sites 11 and 12 would need to be coordinated with NELHA to ensure its potential development would not derogate the VOR signal.

Airport Rescue and Firefighting Facility

The current ARFF is located south of the terminal area next to the ATCT. This location is suitable for future needs provided the ATCT is relocated as planned and/or the T-hangar to the south can be relocated to allow for expansion and improvements to the ARFF building.

According to an environmental assessment prepared for the military for construction and operation of a KATR, the current ARFF at KOA would not meet the military response time. If the ARFF remains in its current location, a second facility with one vehicle would need to be constructed.

If a passenger terminal alternative is selected that requires development to the south, the ARFF building would need to be relocated. The key consideration for siting an ARFF facility is the response time requirements under FAR Part 139. Proximity to the terminal is also advantageous for emergency medical response.

Exhibits 4D and **4E** depict an alternate location for the ARFF if it becomes necessary to be relocated. The location south of ATCT Site #10 will still meet required airfield response times for both Part 139 and for the KATR, as well as be relatively close to the terminal building without impacting future terminal growth. It is also adjacent to an existing service road.

PASSENGER TERMINAL COMPLEX

The alternatives analysis for the passenger terminal complex at Kona International Airport at Keahole includes the terminal, roads and parking, and adjacent facilities. The analysis of the terminal building on the airside will be limited by the constraints imposed by the runway and taxiway systems and the utilization of the aircraft apron. Airfield alternatives that alter the constraints and allow for terminal growth opportunities will be coordinated with the terminal alternatives.

Both initial and long term strategies that are considered will be developed. These include the optimization of existing terminal facilities, and identifying potential modest incremental expansion to meet near term demand. A critical factor in the implementation of the incremental expansion will be based on the appropriate availability of funding.

For the airside analysis, the focus is on the efficient utilization of the aircraft apron as it relates to the terminal, size, and type of aircraft it serves, and the needs of the airlines operating the aircraft. In addition, aircraft movement in and out of the gates, servicing of the aircraft, and passenger boarding methods are considered.

The focus of the landside analysis is the level of service afforded to passen-

gers, efficiency of airport operations, passenger safety and security, efficient use of capital resources, and operational flexibility. Together these optimize the utilization of terminal building facilities. The landside analysis also considers how development strategies relate to operations sectors (interisland, overseas U.S. mainland, and international) of the airport and the terminal facilities needs of the airline.

DESIGN BASIS

The existing terminal facilities at KOA can be very crowded at peak times. There is already concern about the level of service provided to passengers at the airport. Seating space is limited at peak departure times for mainland passengers, restrooms are not well placed for convenient access, and concessions are limited in their space and offering. Ticketing and bag claim are each congested during their respective peak periods, as is passenger security screening. With all of this in mind, launching into a remodel and expansion of these facilities while keeping them in full public use requires careful attention to a number of factors.
These include the following Basis of Design factors:

1. Create a unique environment for people: their travel experience; level of service and convenience; reduce stress.

2. Continue the focus on the natural environment: responsive to climate; efficient use of site; sustainable.

3. Retain and reinforce community values, culture and vision.

4. Create an efficient, flexible, expandable facility responding to forecast demands as they occur and meeting all safety and security requirements.

5. Create alternatives responsive to funding availability: prioritized "shopping list" of improvements; upgrade existing facilities; optimize operations and maintenance; maximize revenue generation opportunities.

DEVELOPMENT CONSTRAINTS AND OPPORTUNITIES

(Strategies to Expand the Terminal Area)

The alternative analysis begins with a thorough understanding of the terminal building constraints that are influenced by runway and taxiway setback and clearance regulations, the terminal building's unique location as it relates to existing buildings, and development within the terminal area. Knowledge of these constraints then reveals the opportunities available for terminal growth as outlined by the Constraints/Opportunities diagram on **Exhibit 4F**.

The size and shape of the existing terminal area limits opportunities for facilities development to meet the future needs of aviation demand. Thus, determining strategies to expand the footprint of the terminal area are appropriate.

The existing terminal area includes the aircraft parking apron, the terminal buildings and the terminal drives, roadways, and parking. The terminal area envelope is defined as the footprint boundary of these facilities – from the ground plane up to the vertical height limit determined by the lower of two imaginary surfaces. The first imaginary surface is a horizontal plane 165 feet above grade. The second has both a horizontal and sloped surface where the horizontal component projects 500 feet from the centerline of Runway 17-35 at grade. The sloped component begins where the horizontal ends and projects upward at a slope of one vertical to seven horizontal until it intersects the 165-foot height limit. Other horizontal controls that affect the boundary of the terminal area mainly occur along the makai (west) and mauka (east) edges of the existing terminal area. On the airside, it is the layout of the airfield – runway, parallel taxiway, and taxilanes. On the landside, it is the layout of the terminal drives, roadways, and parking.

The terminal area envelope can be expanded to the north into the former fuel facilities (recently removed) and developing vacant land. Expanding to the south would require the relocation of the ATCT and ARFF facility and consolidating general aviation and air cargo facilities. Expanding to the makai (west) requires relocating the parallel taxiway, and to the mauka (east) relocating roadways and parking.

Alternatives were developed for planning horizons that can be implemented on an as needed basis according to aviation demand. Generally, they incrementally increase in magnitude from limited operational changes to major facilities relocation and additions.

Short Term

This strategy results in a very limited footprint increase along the west edge of the aircraft apron. The operational change requires downsizing Taxiway A from Group V capability to Group IV, striping an aircraft push-back zone designed for B767-300 ER aircraft size, and striping for a vehicle service road (VSR). The resulting depth of the aircraft parking apron would be approximately 200 feet.

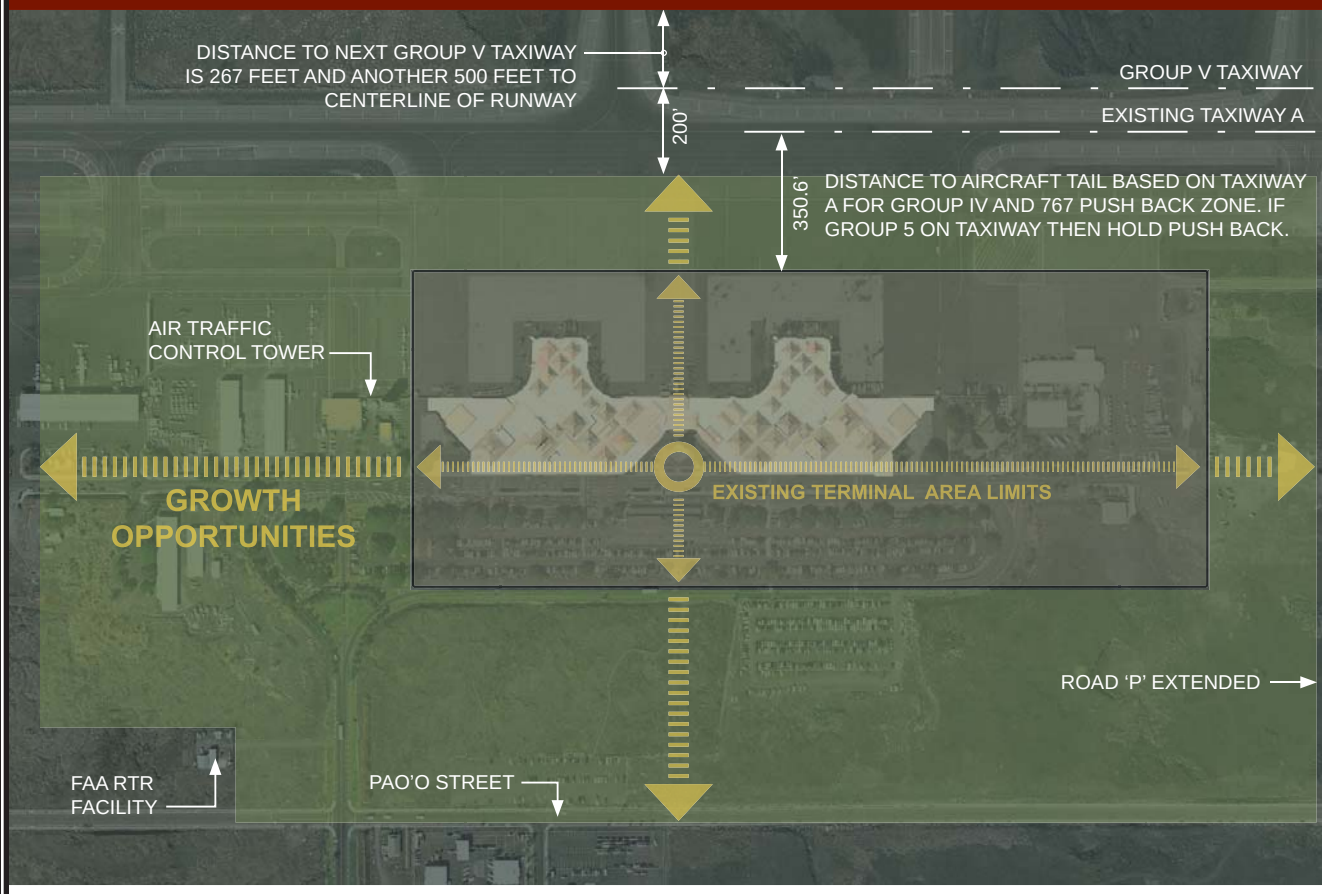
The impact of this strategy on the airfield operations is that if a Group V aircraft is taxiing on Taxiway A, then aircraft ready to push back would have to hold until that aircraft passes.

Terminal facilities improvements would be limited to those that would provide the most immediate improvement to the passenger level of service.

Intermediate

This strategy results in a reasonable footprint increase along the makai (west) edge of the aircraft apron and along the terminal landside. The improvements include relocating the Taxiway A centerline to a position 767 feet east of the centerline of Runway 17-35 for the length between the ARFF service road and Taxiway G. Relocating this distance from the runway allows the addition of a new

CONSTRAINTS/OPPORTUNITIES



ST-1/2/3

parallel taxiway between the runway and Taxiway A in the future. Both the new taxiway and Taxiway A would be Group V capable. A new Group IV taxilane would be placed east of Taxiway A with a vehicle service road (VSR) adjacent. The resulting depth of the aircraft apron would be approximately 285 feet. Alternatively, if the new Group IV taxilane were designed specifically for B767-300 ER aircraft or smaller, then the resulting aircraft apron depth would be approximately 310 feet. If the taxilane would be further reduced to Group III capability, the resulting apron depth would be approximately 367 feet.

A further strategy results in a reasonable footprint increase along the mauka (east) edge of the terminal buildings. The improvements include relocating the terminal drive to the first row of parking. Short term parking would remain within the loop with a new long term parking lot constructed mauka (east) of the terminal roadway.

The terminal area footprint can be expanded to the north by removing the fuel farm facilities which are no longer in use and to the south by relocating the ATCT, ARFF, and consolidating general aviation facilities.

The impact of this strategy on the airfield operations is limited to aircraft movement flexibility lost as the taxilane is downsized from Group IV, though frequency of large aircraft movements is not high at this airport and the future configuration of the airfield for maximum flexibility is not affected. The impact on the landside is that the long term parking location requires pedestrian crossing of the terminal loop roadway and terminal drives to reach the terminal buildings through the intermediate phase.

Long Range

This strategy results in a very large footprint increase along the west edge of the aircraft apron, along the terminal landside, and to the north or south. The improvements include relocating the Taxiway A centerline to a position 767 feet east of the centerline of Runway 17-35 for the length between the ARFF service road and Taxiway G if not accomplished in the intermediate phase and constructing a new full-length taxiway 500 feet east of the runway centerline. Both taxiways would be capable of Group V aircraft movement. After reserving space for a VSR, the resulting depth of the aircraft apron would be approximately 450 feet. This configuration allows for total flexibility of aircraft parking and movement adjacent to the terminal.

The long range plan also provides a very large footprint increase along the mauka (east) edge of the terminal buildings. The improvements include relocating the terminal drive to the first row of parking if not already implemented in the intermediate phase and relocating the terminal roadway to the existing Road N.

The north turn of the new roadway and drives would align with the future terminal area entrance roadway from Queen Kaahumanu Highway at approximately existing Road P. The south turn of the new roadway would

continue its connection to the existing airport access road. The interior of the roadway system would be large enough to include all types of parking, short term, long term, employee, other ground transport, as well as a park area which would include the petroglyph site and a potential cultural heritage development between the terminal area to the rental car site.

The terminal area footprint can be expanded to the north by removing the fuel farm facilities no longer in use and improving undeveloped land. Expansion to the south requires relocating the ATCT, the ARFF facility, consolidating general aviation and air cargo facilities, each of which are considered for relocation as a part of this master plan.

The impact of this strategy on operations is minimal since it generally expands the terminal area footprint without changing the relationship adjacencies of the aircraft parking area, terminal buildings, and the roadway system and vehicle parking. Further, each component can be expanded to meet its individual demand without requiring changes to the other components. The long range capability of this strategy to meet future aviation demand beyond the 20-year time frame is excellent.

TERMINAL AREA ALTERNATIVE DEVELOPMENT CONCEPTS

The strategies to expand the terminal area are identified and can be incrementally implemented as demand for additional air terminal facilities requires. Alternative development concepts for using the expanded terminal area footprint are associated with the Short Term, Intermediate, and Long Range opportunities. The alternative concepts to add terminal facility capacity focus on aircraft gates, passenger terminal processing facilities, terminal roadways, and parking. They depict potential means to add capacity to the terminal area for each of the strategies that expand land area.

The terminal area at KOA has an existing capacity to meet current passenger demand, and the facility requirements also project future need for facilities. Generally, there is a current need to add capacity for departure queuing areas and gate holdrooms, baggage claim, baggage and passenger security screening, concessions, improving restrooms, and adding capacity to public parking. The short term need includes more facilities for these areas and the relocation of baggage security screening to the baggage make-up area. Beyond the short term planning horizon, the need for capacity improvements to all departures and arrivals facilities would logically follow growth in passenger processing demand. Notably, intermediate and long range passenger processing need is for agricultural check, security checkpoint, gate holdroom space, baggage make-up and claim, concessions and restrooms, public parking, rental car facilities, and one to three additional aircraft gates. The expansion of facilities for processing arriving international passengers will also be required.

Current need for airport terminal improvement is incorporated within the

short term alternative concept depicted on **Exhibit 4F** and is common to all three alternatives. Alternatives for future development have a broader range as the terminal area footprint is enlarged. Some of the near term concepts evolve into longer range opportunities by the nature of their configuration to flexibly grow into other layouts. This increases their viability for incremental expansion.

Three alternatives were developed associated with the forecast facilities demand growth and opportunities to increase the size and shape of the terminal area footprint. Further studies were developed for Long Range Alternative 1 (LR-1) to explore the different configurations of an expanded concourse from the existing terminal and are labeled LR-1A to LR-1D. After evaluating all concepts, the Master Plan team determined that these configurations did not offer any additional flexibility in terms of aircraft parking. If the airport decides to transition to common-use in the future, this flexibility will be required and the other concourse options would limit the choice of aircraft at the gates. These concepts are shown on **Exhibit 4G**. As noted, they can be implemented on an as-needed basis according to aviation demand. Further, each component can be expanded to meet its individual demand without requiring changes to the other components. The long range capability of this strategy to meet future aviation demand beyond the 20-year time frame is excellent. The concepts are identified by ST (Short Term), INT (Intermediate) and LR (Long Range).

The short term expansion, as noted previously, is a "Do Minimal Work" alternative and assumes only limited funding is available. As presented on **Exhibit 4F**, this alternative allows the Ellison S. Onizuka Space Center to remain in its current location for a period of time, continues the two separate passenger screening checkpoints, and generally retains the existing separate North and South Terminal configuration. An additional lane would be added to the passenger security screening lanes, baggage security screening would be relocated into the present bag make-up areas, and new bag claim devices would be added to the north and south claim areas.

The flow at ticketing would be improved by reorganizing the processing between agriculture screening, kiosks and ticket counter, and a change to common use kiosks and check-in. These kiosks could also be placed in the rental car area as well as in the old rental car pavilion adjacent to parking to further expedite the flow. Restrooms would be upgraded and expanded as would flight information and signage. This alternative does not address the passenger boarding process or aircraft parking. If sufficient budget is available for a more aggressive development program, parts of this short term development could be incorporated with implementation of one of the three intermediate alternatives.

The three basic terminal area development alternatives will be described in detail below. They are coordinated with exhibits that show the overall

growth in relation to the terminal area as well as the operational detail of the facility. The discussion and appropriate exhibits focus on intermediate and long range development.

Alternative 1 focuses all development on continued use and expansion of the existing terminal area facilities.

Alternative 2 creates a new terminal for overseas and international passengers north of the existing terminal area, retaining the existing terminal facilities for interisland passengers. The improvements incorporated into the existing facilities are limited to those which will continue the existing passenger experience and upgrade facilities to current standards. Temporary facilities for Customs and Border Protection (CBP) are required for this alternative.

Alternative 3 creates a new terminal for overseas and international passengers to the south while retaining the existing terminal for interisland passengers as in Alternative 2.

All three alternatives assume a basic upgrade to the existing terminal buildings and systems as required for preventive maintenance and code compliance.

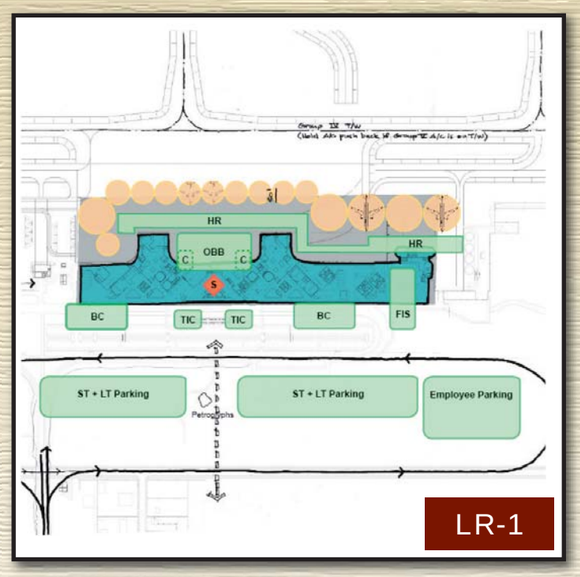
Terminal Alternative 1 (Exhibit 4H)

Intermediate Horizon (INT-1)

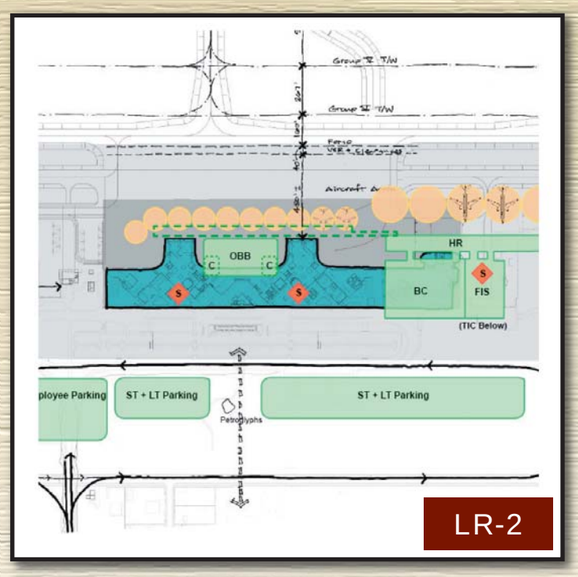
This stage of development addresses the need to improve the existing aircraft boarding procedure as well as increase terminal capacity. A second level concourse with passenger loading bridges would be connected to the existing gate holdrooms by ramps or mechanical means such as escalators or elevators. The second level concourse would primarily serve four larger aircraft for overseas flights while the existing hold rooms would serve the ground-loaded interisland flights.

Taking full advantage of the elevated concourse, large glazed windows on the airside would provide views across the apron to the ocean. To the mauka side, views of the unique terminal structures, palm trees and courtyards and the mountains welcome arriving passengers and continue the Aloha experience for departing passengers. The roof of the baggage make-up area would include various arrangements of local natural materials to further enhance the views. While air conditioning of the concourse is an option, it may also be able to be served by natural ventilation.

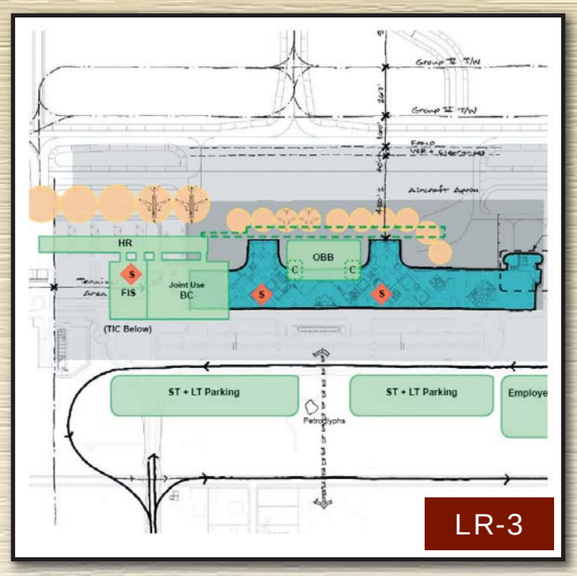
During periods when the larger aircraft are not present, the apron can be used for multiple interisland aircraft parking and the loading bridges would be configured to serve both the widebody and interisland aircraft. Other interisland aircraft would continue to be ground-loaded. Taxiway A would remain in its current location. When a Group V aircraft is taxiing on Taxiway A, however, aircraft ready to push back would have to hold in the gate until the aircraft passes. Given the low-level frequency of large aircraft movements, both now and anticipated in the future, the loss of flexibility is minor and can be alleviated at a later stage if necessary.



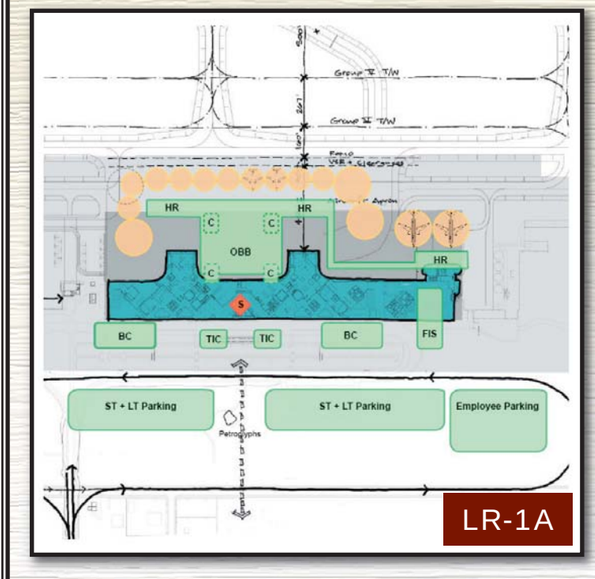
LR-1



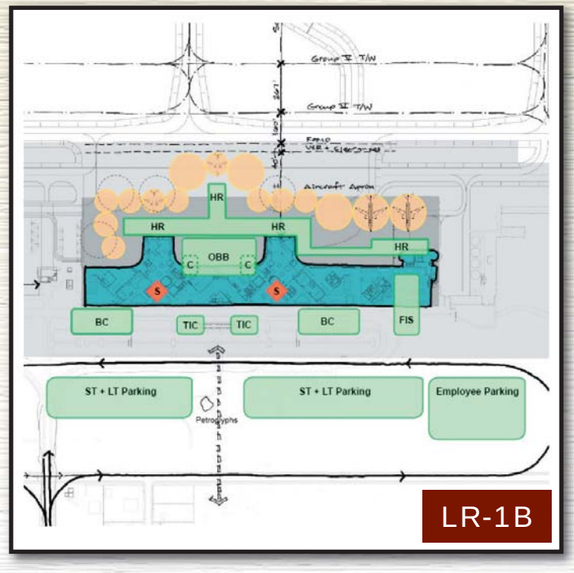
LR-2



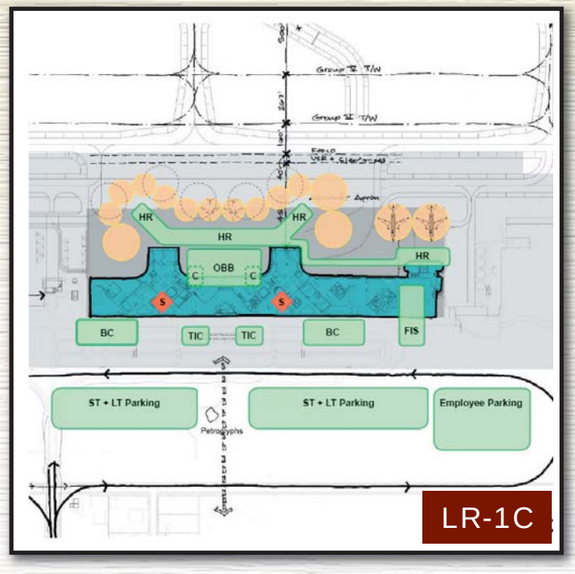
LR-3



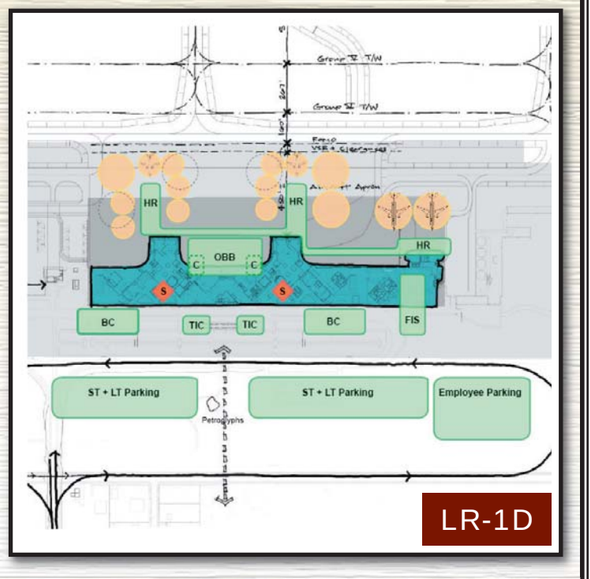
LR-1A



LR-1B



LR-1C



LR-1D

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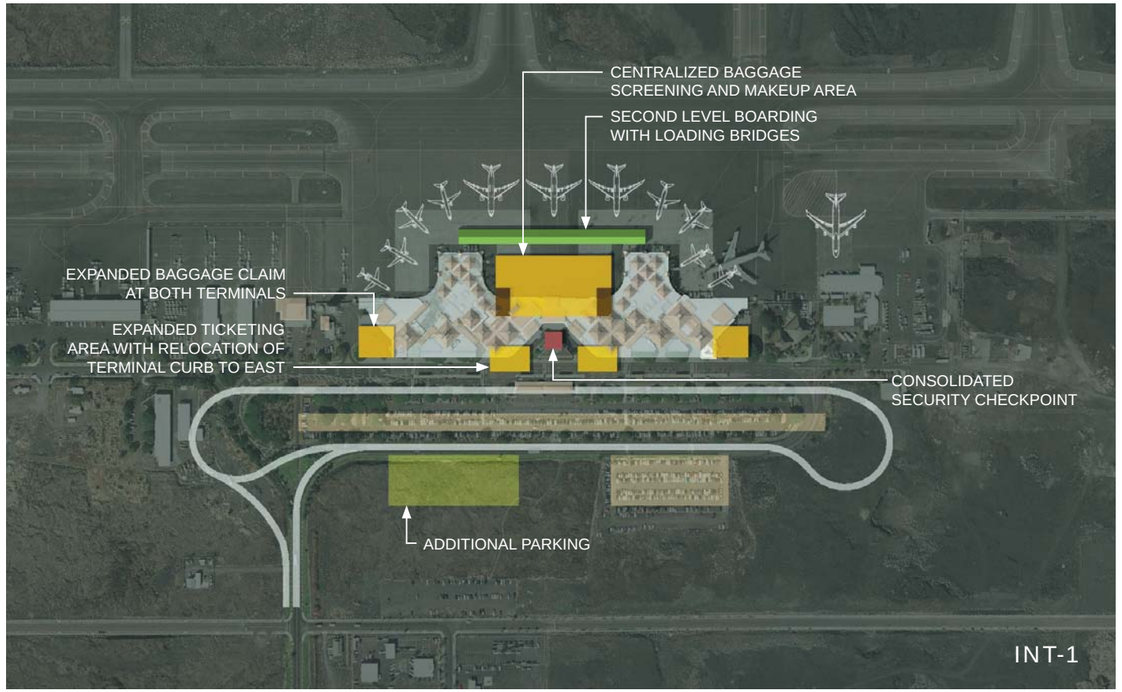
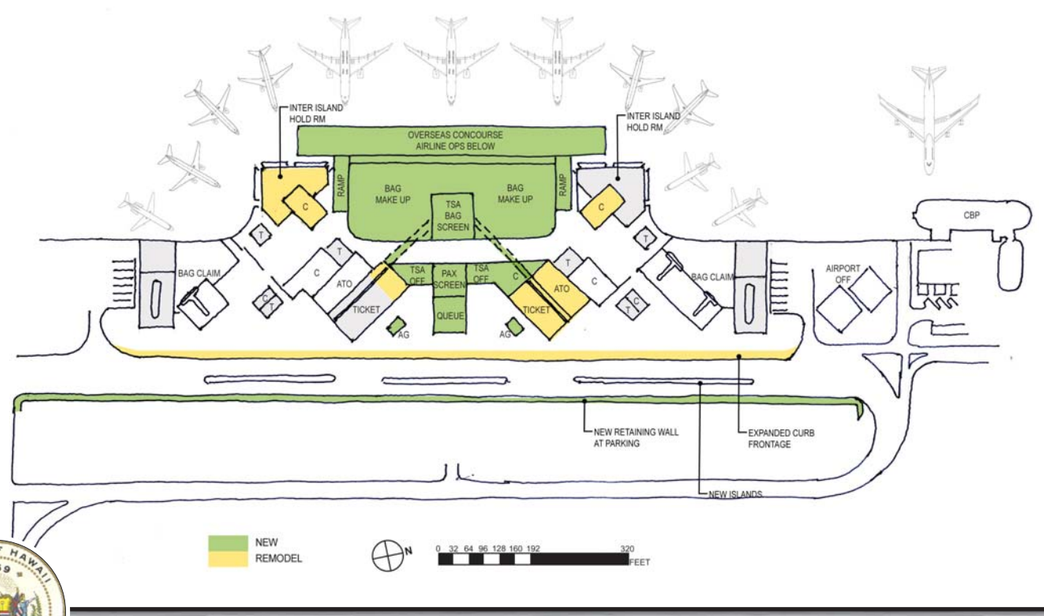
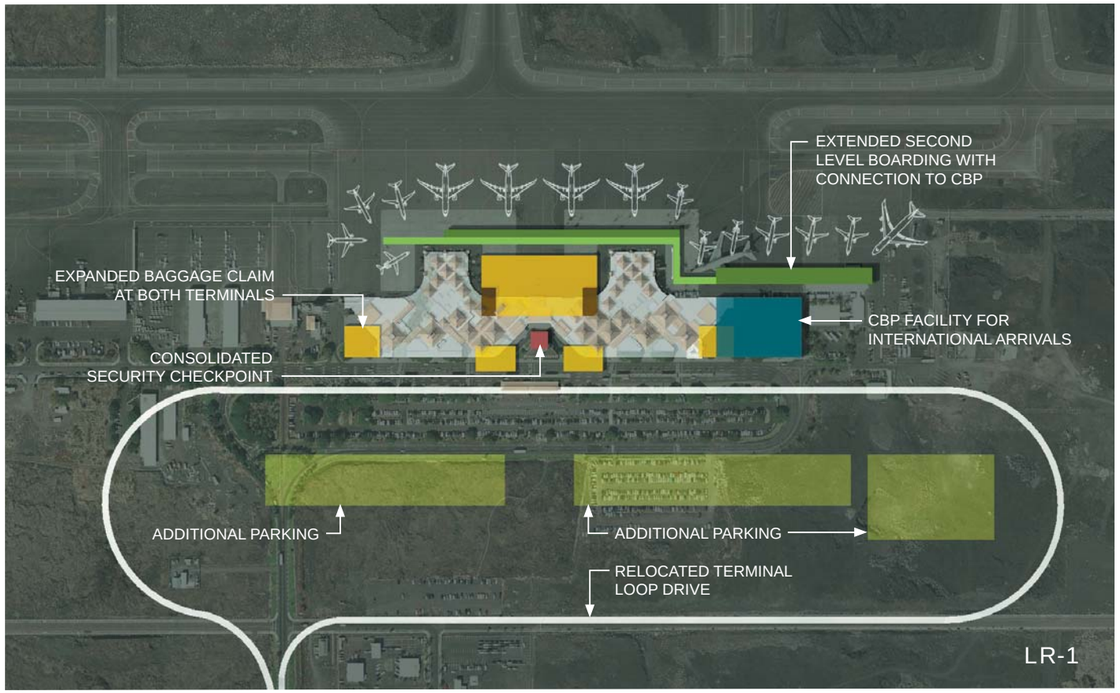
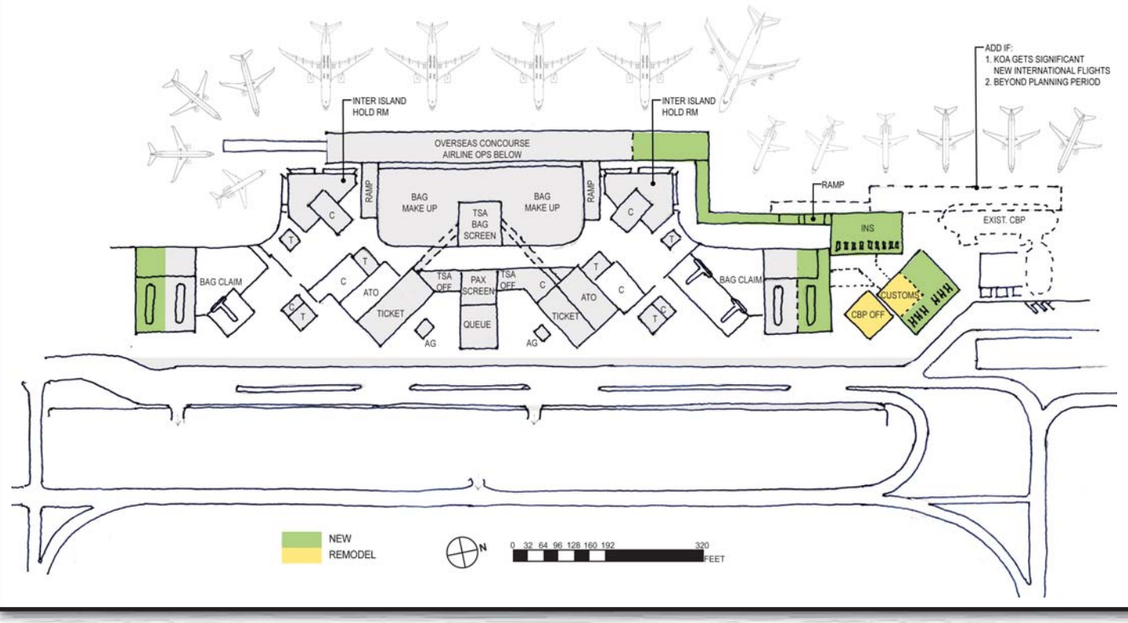
ALTERNATIVE 1 - INTERMEDIATE TERM





ALTERNATIVE 1 - LONG RANGE





This alternative includes relocation of the Ellison S. Onizuka Space Center from the center of the terminal complex. This opens the opportunity for a single, centralized passenger security screening process with adequate queuing area. TSA search rooms and office space would be located adjacent to the screening area. Upon clearing security, passengers can go directly to either the north or the south secure waiting areas.

With the relocation of the overseas passenger holdrooms to the second level concourse, some of the existing holdrooms adjacent to the central courtyards can be converted to concessions to improve the offering and revenue generation, as well as the addition of cultural and regional displays. The courtyards would continue to provide places for enjoyment of the natural environment and reinforce the Aloha spirit. All passengers, both departing and arriving, would be exposed to these concession areas, displays, and courtyard plantings as arriving overseas and interisland passengers will still flow through the courtyards on their way to bag claim. Consolidated bag make-up with TSA bag screening would be developed between the north and south terminals served by tunnels from ticketing. Additional capacity for baggage claim can be provided adjacent to existing claim devices if not already provided by the short term improvements.

Some additional ticketing will be provided adjacent to the existing area on the south. The ticket counter within the north ticketing lobby could be turned 90 degrees and placed against the makai wall of the lobby. This would create a single "departures courtyard" serving both ticket lobbies as well as the consolidated passenger screening entrance. USDA inspection would be placed to be found more easily by passengers, prior to check-in.

Additional queuing for departure processing areas will be provided by relocating the terminal curbfront to the east so that the terminal drives are immediately adjacent to the edge of the existing short term parking area. This will also provide opportunity for additional covered queuing and waiting areas as well as additional planting and local and cultural displays. Some additional concessions may be provided as well. Additional public long term parking will be provided east (mauka) of the entry loop road.

Individual improvements can be implemented in a phased manner according to priorities and budget availability. If there is sufficient budget and demand, a new Customs and Border Protection (CBP) facility can be developed to replace the existing prefabricated international arrivals facility. Initially, passengers would deplane to the apron and walk to the new facility as they do today. International aircraft parking would be coordinated with interisland aircraft parking so as to maximize the latter while not compromising the required security separation of the former.

The initial phase of the CBP would include a new immigration hall, a new baggage claim area which may be used for domestic bag claim when not needed for international passengers, and customs offices and inspection fa-

cilities in remodeled and expanded existing airport management offices. These replacement facilities can be built without interrupting use of the existing clearance facilities. The existing greeters area, bus parking, and other facilities will continue to serve the new CBP facility.

Long Range (LR-1):

The Alternative 1 Long Range expansion builds upon the terminal framework created in the intermediate phase. If warranted due to unacceptable delays of departing aircraft pushback due to Group V aircraft on Taxiway A, the apron could be expanded to the west (makai) and the taxiway rerouted between Taxiway "G" and the ARFF Service Road as noted above. This taxiway alignment was depicted on Airfield Alternative 2 (**Exhibit 4E**).

The second level concourse would be extended to the north to provide for a holdroom for one additional widebody aircraft. An elevated and enclosed secure corridor would extend to the CBP facility with a ramp to grade connecting to the Immigration Area for arriving international passengers. Views from the corridor to the ocean and the mountains would introduce passengers to the beauty of Hawaii. Access to ground-loaded interisland aircraft would be under this raised corridor. If not provided as part of the Intermediate expansion phase, the Customs and Border Protection facilities (described earlier in the Intermediate phase) would be developed at this time. If already in place, the CBP would be expanded as needed to respond to international arriving passenger demand. A second large capacity claim device would be added, as before, with the ability to be cross-utilized for domestic passengers when not needed for secure international bag claim. The claim device provided earlier in the Intermediate phase would become exclusively for domestic passengers.

An additional large capacity claim device would also be provided adjacent to the south claim area. The passenger screening checkpoint can be expanded to six lanes as required to meet demand. It is not anticipated that additional ticketing will be required due to further enhancements to the common use system and improvements to passenger self check-in.

The entrance roadway from Queen Kaahumanu Highway may be relocated to the north to the general location of the existing Road "P." This alignment would extend to the terminal area providing an extended curb frontage at the CBP area. The recirculation road would be relocated to existing Pao`o Street (Road "N"). Long term parking would be further expanded in the area adjacent to the petroglyphs with an open park setting from the terminal to the rental car area further enhancing this cultural heritage site. The existing rental car area will be expanded to the north with access and egress from the new airport entrance road at Road "L."

Alternative 2 (Exhibit 4J)

Intermediate (INT-2)

Alternative 2 creates a new terminal facility to the north of the existing terminal. The new terminal would include facilities to process international arriving passengers as well as arriving and departing overseas mainland passengers. Customs and Border Protection facilities must be continuously available to process arriving international passengers. This can be achieved by phasing the construction of the new terminal such that the new CBP facilities are constructed first, the existing CBP demolished, then the remainder of the new terminal constructed on its site. The existing terminal would be used for interisland flights and receive upgrades appropriate to meet the needs of this aviation sector.

In order to locate the new terminal close to the existing facilities and avoid extensive construction in the existing lava field to the north, it may be appropriate to first construct the CBP facilities as shown in Alternative 1, using the existing DOT-A office buildings, demolish the temporary CBP structure, and build the initial phase of the new north terminal immediately north of the DOT-A / CBP facility. When the new north terminal CBP functions are in place and operational, the existing facilities can be removed and the terminal completed on that site.

The concept organizes the new terminal with departures processing, passenger and bag security screening, baggage make-up, domestic and international bag claim, and Customs clearance facilities on the ground level with international arrivals immigration processing on the third level above the concourse and passenger support facilities at the second level. The holdrooms on the concourse would be at the second level as would concessions, restrooms, airline club rooms, and other passenger amenities. The concourse would provide loading bridges for four aircraft positions. By locating the new terminal close to the existing terminal, there would be apron available for ground-loading/ deplaning of flights that arrive off-schedule should no second level gate be available.

International arriving passengers would proceed from the aircraft up across the sterile concourse to the immigration processing areas at the third level, then down to ground level for bag claim, customs clearance, and exit. Arriving domestic passengers would proceed down the concourse to a separate escalator/elevator/stair to domestic bag claim at ground level. The international claim device would be used for domestic claim when not in use for international passengers.

With the relocation of all overseas passengers to the new terminal, the existing terminal facilities would be more than adequate to serve the interisland passengers through the full planning period. Baggage screening would be located in the existing bag make-up areas, and passenger screening would remain in its current location. There may be a need for additional bag claim facilities both north

and south due to the existing congestion in these areas and the length of time required to design and build the new north terminal. Ground loading of aircraft would continue. Restrooms would be upgraded and concession and display areas would be expanded somewhat. The Ellison S. Onizuka Space Center would not need to be relocated. Maximum use would be made of the existing facilities with improvements to the structures and systems to respond to preventive maintenance and code requirements.

The terminal loop drive would be extended to the north to provide curb frontage for the new terminal, and public parking would be provided within the loop.

The northern portion of the new terminal site and aircraft apron is currently an undeveloped lava field. Extensive site development and new infrastructure to serve the terminal will be required. Views to the ocean and the mountains will be provided from the second level of the terminal, as well as development of planting and other amenities at grade. There would be the potential for natural ventilation in the concourse, as well as in the new terminal. Air-conditioning as a back-up option during certain times would be an option for further study.

Long Range (LR-2):

The long range expansion of the new north terminal would include those areas required to meet the demand levels. CBP functions would only require significant expansion if a second international flight were to arrive at approximately the same time as the current flight. Departures processing is not anticipated to require significant expansion due to further enhancements to the common use systems and self check-in. Baggage security screening and baggage make-up will require significant expansion as will domestic bag claim.

The facility requirements forecast a need for five, second level gates for the long range planning horizon. Should a sixth plane position be required, it would be added on the south end of the concourse as the existing CBP facilities will have been removed. This will also avoid further incursion into the lava field to the north.

With sufficient budget, the existing terminal facilities may be developed to provide second level boarding with loading bridges, a centralized bag screening and makeup area, and a single passenger screening and queuing area after the Ellison S. Onizuka Space Center is relocated away from the terminal area.

Road access to the terminal area in the long range may be relocated to the north at the Queen Kaahumanu Highway to approximately the existing service Road P. It would extend west directly to the terminal area turning to the north at Pao`o Street and looping to align with the existing terminal curb. The extension to the north will be sufficient to provide adequate curb frontage for the new terminal. Additional short and long term parking would be provided within the new loop drive, having to be developed

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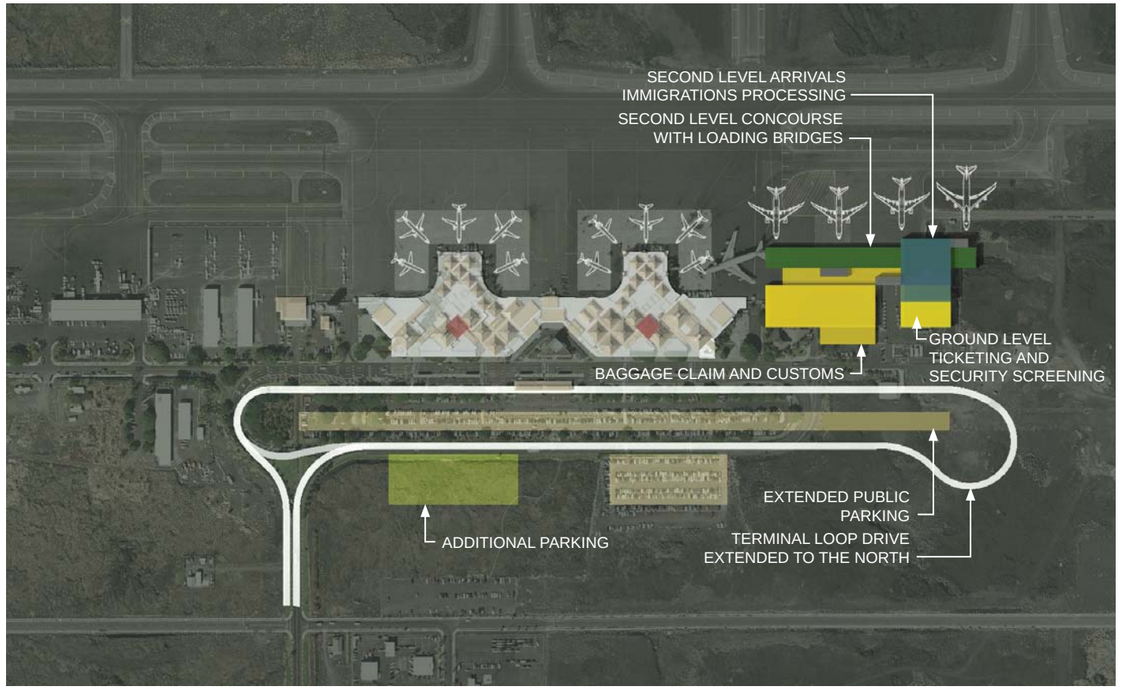
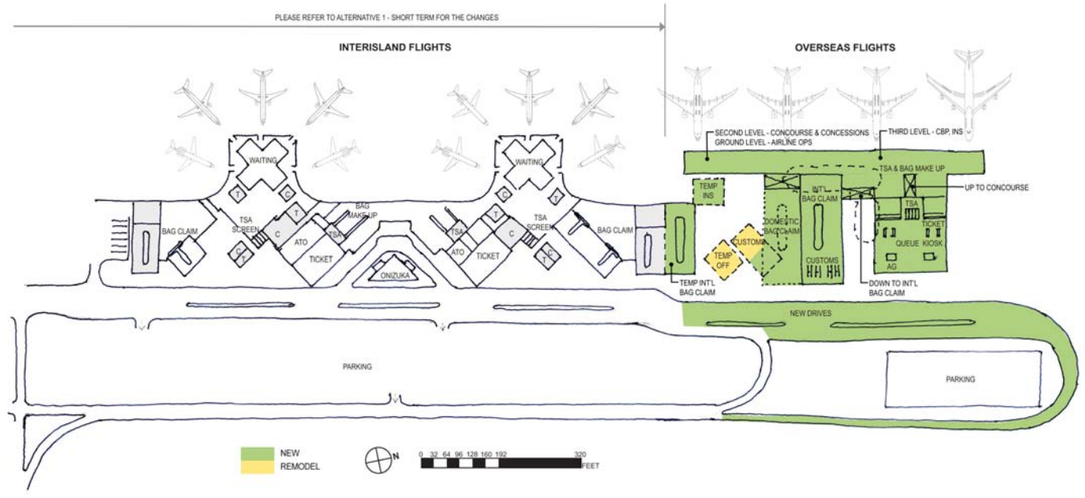
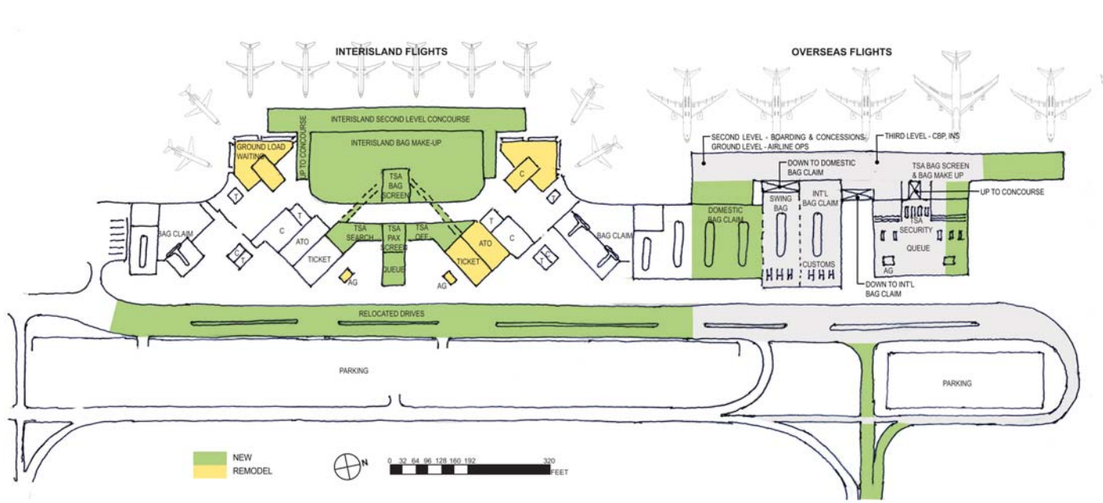
ALTERNATIVE 2 - INTERMEDIATE TERM





ALTERNATIVE 2 - LONG RANGE



upon the existing lava field. Rental car areas can be extended to the north from their current location with access and egress provided to the new airport road at Road L.

Alternative 3 (Exhibit 4K)

Intermediate (INT-3)

Alternative 3 is similar to Alternative 2 except that the new terminal is developed immediately south of the existing terminal area. This location requires the relocation of the ATCT, the ARFF facility and the general aviation aircraft parking and tie-down areas. The ATCT is already planned for relocation, and there are alternatives for relocating the other uses if necessary. The new south terminal and its CBP facilities can be built adjacent to the existing terminal area while the existing CBP facility continues in operation.

The site has already been developed for its current uses; thus, a certain amount of infrastructure is already in place compared to the north terminal development in Alternative 2. To limit the difference in size and scale between the new terminal and the existing structures, the new terminal will be largely on grade with only the second level concourse and its support functions of concessions, restrooms, airline clubs, and other passenger amenities at the second level. Views of the airfield and the ocean would be provided, as would views to the mountains on the east. Natural ventilation may be able to be used in the concourse as well as the rest of the new terminal while air conditioning may be provided as a backup system, but this issue will require further analysis. The need to build gates beyond the forecast demand can be eliminated by cross-utilizing interisland apron area and ground boarding aircraft when there is a need for an additional gate due to flight delays or other circumstances.

As with Alternative 2, the existing terminal facilities will continue to be used for ground-loaded interisland flights. The baggage security screening would be located in the existing make-up areas. The two passenger screening areas would be maintained, and the relocation of the Ellison S. Onizuka Space Center could be delayed until the long range planning horizon, if necessary.

If required, an additional bag claim device would be added adjacent to the existing bag claim area on the north and south. This may be required in the interim due to current demand and the length of time it will take to design and build the new terminal. If a new bag claim device is required in the short term for the existing south terminal, it may be incorporated into the new terminal when it is built. Unlike the new north terminal which would have the capability of shared bag claim between international and domestic operations, the new south terminal would require two separate claim areas. The existing terminal structures and systems would be upgraded to meet current codes and preventive maintenance. Some additional concessions, improved restrooms, and other passenger amenities would be provided.

The existing terminal curb will be extended to the south to serve the new terminal. The loop road back to the entrance road will require the relocation of the airport maintenance facilities but would not affect the existing FAA RTR facility.

Long Range (LR-3):

In the long range, the second level concourse of the new south terminal would be extended to the north to provide one additional gate for overseas flights. Baggage claim, baggage security screening, and baggage make-up areas would require expansion, as would passenger security screening. Expansion of the passenger processing is not anticipated to be needed due to improvements in common use functions and self check-in.

If there is sufficient budget available, the existing terminal facilities may be expanded to include second level boarding, improved concessions and passenger amenities, a central passenger security screening location, and centralized baggage screening and make-up once the Ellison S Onizuka Space Center is relocated away from the terminal area.

As with each of the other alternatives, the airport entrance and egress location may be moved north on Queen Kaahumanu Highway providing a new entrance at approximately Road P directly to the terminal area. Recirculation and exiting traffic would use Pao`o Street to return to the new entry road. Substantial additional short and long range parking would be required within the loop roadway proximate to the new south terminal.

Long Range Flexibility

It should be noted that Alternative 1 can be developed through the intermediate development phase and still allow the development of any of the three long range alternatives without altering any of the investment made to that point in the terminal, apron, roadways, or parking.

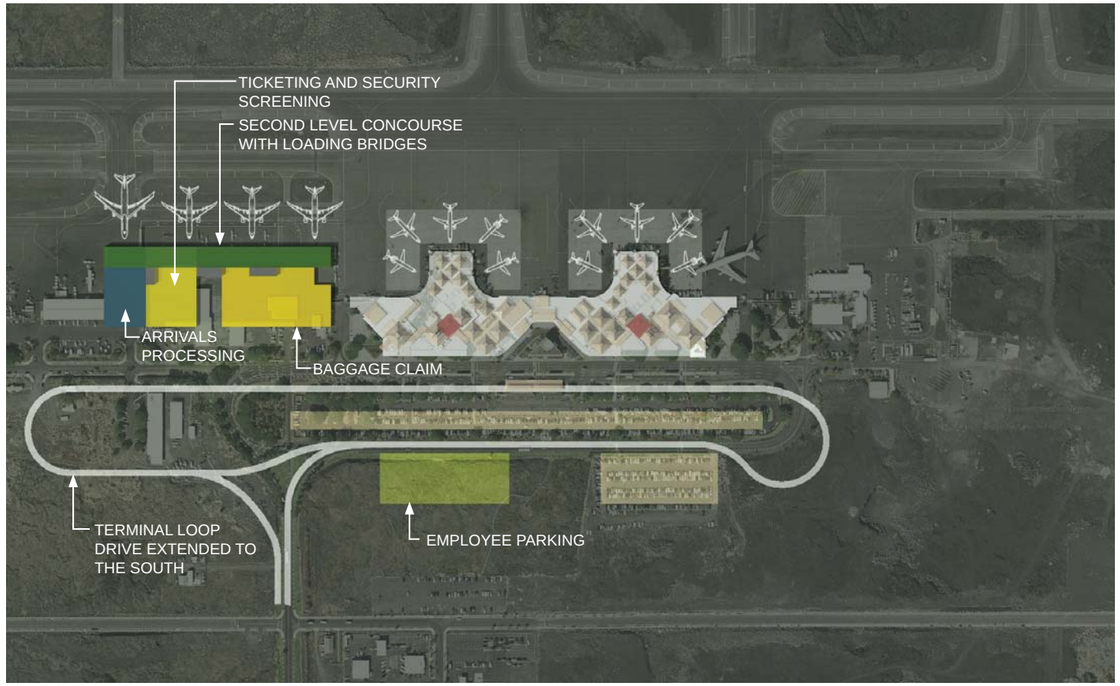
AIR CARGO DEVELOPMENT ALTERNATIVES

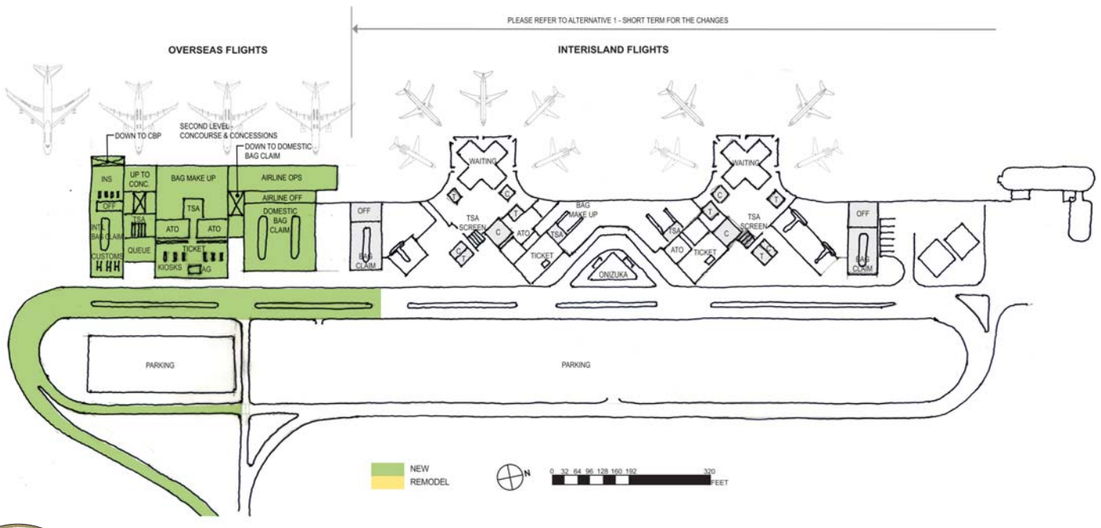
Currently, air cargo operations are conducted from two different locations on the airport. The cargo area to the south of the terminal includes an apron and two cargo buildings. This is used primarily by Aloha Air Cargo for its cargo flights with B-737 aircraft. There is not adequate space in the cargo area to handle the daily UPS B-747 aircraft. That aircraft is currently handled on the ramp immediately west of the International Arrivals facility.

To accommodate all of the cargo activity in the current cargo area would require redevelopment of the current facility. Alternative 1 on **Exhibit 4L** depicts a layout for the area that could accommodate the forecast air cargo needs at the current location. As proposed in this alternative, the current air cargo buildings would be replaced mauka (east) of their present location to provide the apron depth necessary to accommodate larger aircraft. The

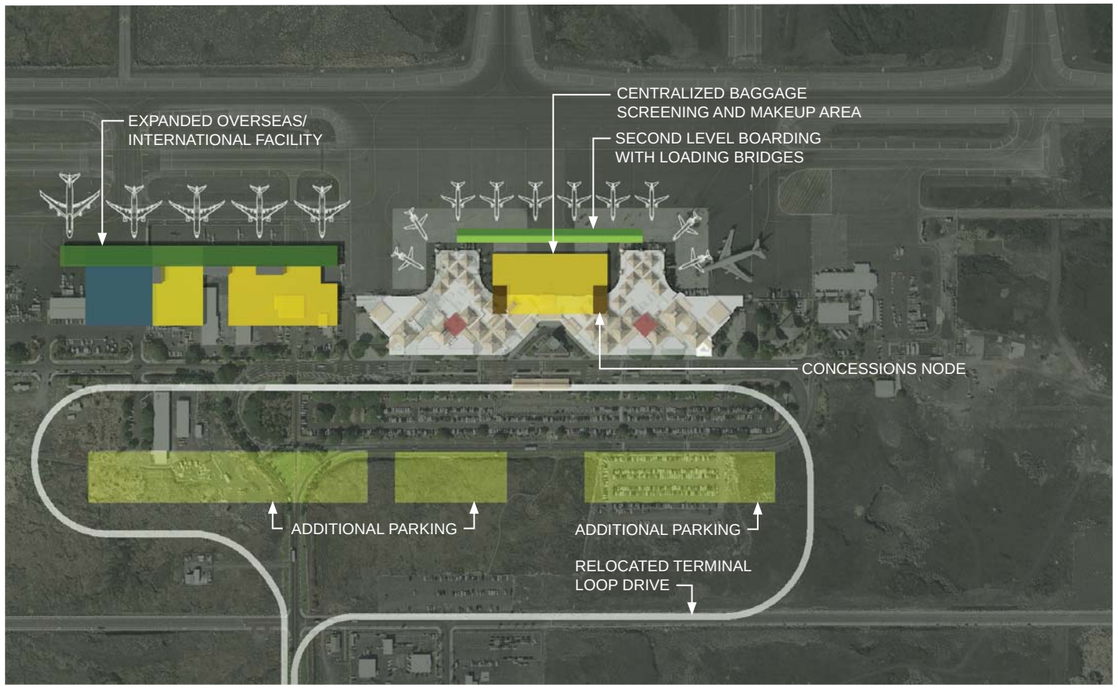
06MP06-4K-11/20/07

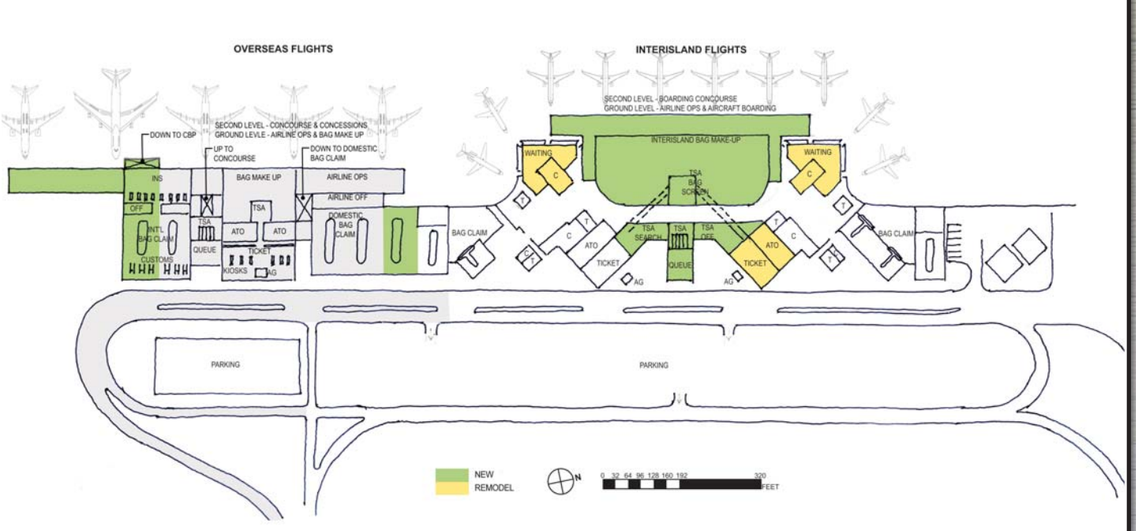
ALTERNATIVE 3 - INTERMEDIATE TERM





ALTERNATIVE 3 - LONG RANGE





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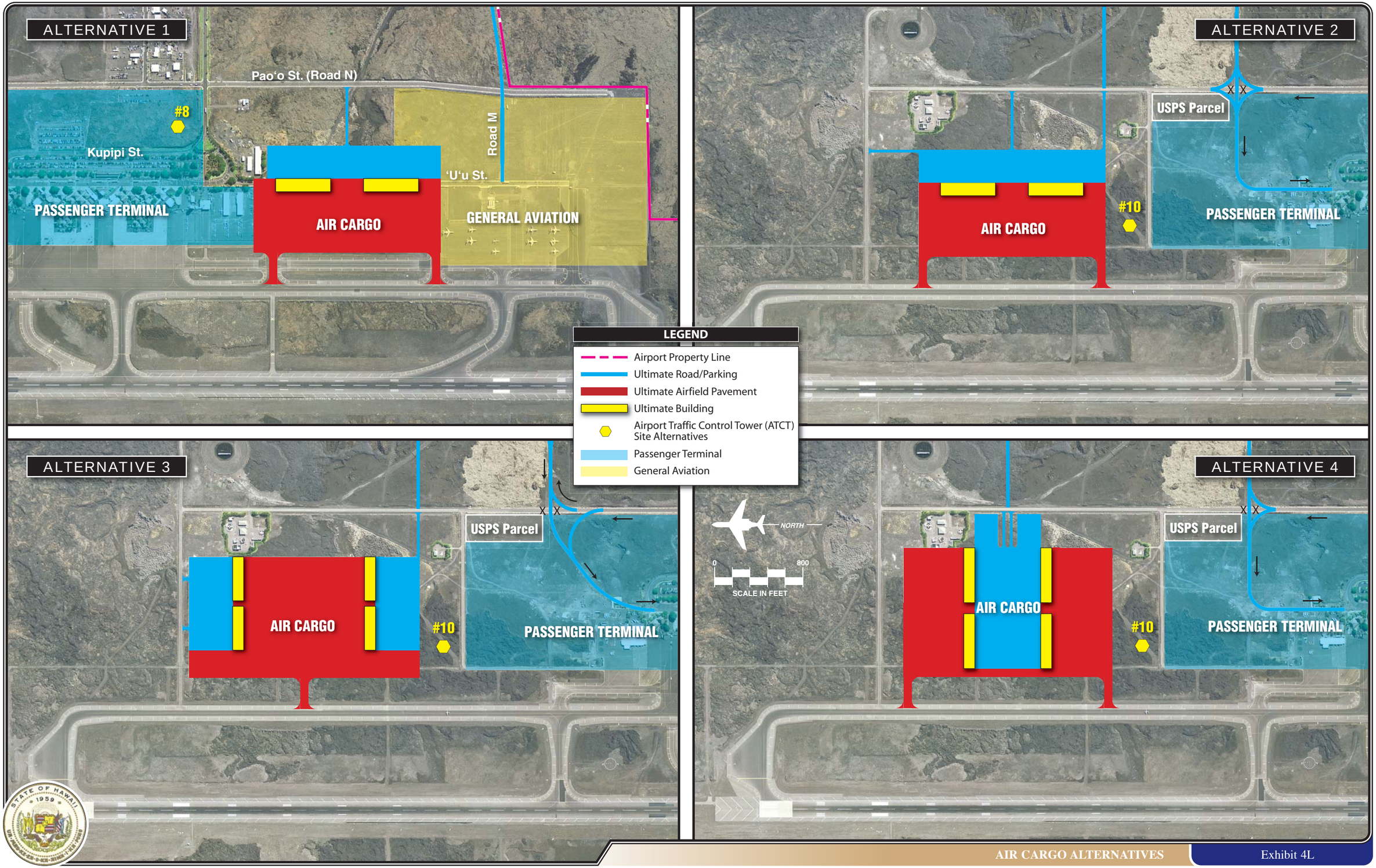


AIR CARGO ALTERNATIVES

Exhibit 4L

ramp would also need to be expanded south to provide for adequate parking positions for the long term planning horizon. This would displace the commuter terminal and adjacent facilities.

U`u Street would need to be abandoned at the cargo area as well with access developed off Pao`o Street. The new access would feed into a larger landside area developed to include loading docks and vehicle parking.

The United States Postal Service (USPS) has maintained ownership rights to a 4.0 acre parcel on the airport with the intent to serve as a regional distribution center. To date they have not developed any facilities on the parcel. While the USPS does not require direct airfield access, proximity to aircraft carrying mail under contract would be advantageous. Their site is located makai (west) of Pao`o Street, north of the passenger terminal. When obtained several years ago, most mail was transported by the passenger airlines. Today, most mail is handled by contract carrier. The current carrier is FedEx, which subcontracts with Aloha Air Cargo for interisland mail to and from KOA.

Thus, proximity to the air cargo facilities is now more desirable. **Cargo Alternative 1** would leave the cargo area far removed from the current USPS property. Under this alternative, air mail from the cargo operators would need to be transported across the terminal ramp to the future USPS facility. The other option would be to swap property to place the USPS facility closer to the cargo area in this alternative.

While it appears that the site could be redeveloped to accommodate the needs for the planning horizon, air cargo is very dynamic and perhaps has the greatest potential to exceed the forecasts. As is evidenced by the exhibit, the site is very constrained for further cargo development. Expansion into the terminal or general aviation areas would be necessary for further growth. As a result, an undeveloped area along the flightline north of the terminal area was examined as an alternative.

Cargo Alternative 2 on **Exhibit 4L** depicts the similar layout on the north site. The location is north of ATCT Site #10, so it would not impede future terminal development to the north. It has ready access to the airfield, as well as landside access and utilities from Road N.

This cargo area could be developed beyond the planning horizon activity levels by continuing the linear pattern to the north.

While the general topography of the airport slopes towards the ocean, on the north cargo alternative site, elevations range from 50 feet above mean sea level (MSL) on the south side to as much as 80 feet in the northwest corner near the wastewater treatment facility. The southern half of the site would require much less grading than the northern half of the site for Cargo Alternative 2 due to the layout of the ramp.

Cargo Alternative 3 organizes the cargo area into a "pod" with the cargo buildings perpendicular to the airfield and on both sides of a cargo ramp that extends deeper into the site. Under this alternative, the southern half of the pod could be developed in stages to meet the needs of the planning horizon, while taking the best advantage of the site topography. The northern half would provide expansion flexibility beyond the long term horizon activity level.

The two previous concepts maintain a single, continuous ramp that requires a large graded area with minimum slope. **Cargo Alternative 4** maintains the perpendicular concept of the previous alternative, but places the cargo building and landside docks and parking in a center core with separate ramps both north and south of the core. This provides some flexibility for reducing the grading requirements for the site. The south ramp could be at a lower grade than the north ramp.

Each of the north cargo alternatives indicates the location of the USPS parcel just makai (west) of Pao`o Street. Trucks would have easy accessibility from the cargo area. In fact, trailers could be transferred directly from the ramp to the USPS facility via the service road.

GENERAL AVIATION DEVELOPMENT ALTERNATIVES

Since the last master plan, general aviation has been focused on the south side of the airport. In fact, several grading and ramp improvements have been undertaken to establish this area for future general aviation development. A series of development alternatives have been formulated for the general aviation area on the south side of the airport. Each of the four alternatives presented have the following in common:

- All are designed to accommodate at least the general aviation facility requirements as outlined in **Chapter Three – Facility Requirements**.

- Each assumes that the existing general aviation T-hangars would eventually either be relocated or replaced by new hangars farther south in the expanded general aviation area.

- The two taxilane stubs (K and L) located in the south general aviation area can be extended to the mauka (east) from their current terminus at U`u Street.

- The future core of the general aviation area can be made accessible from Pao`o Street (Road N) by a connector road (Road M).

- Road M subdivides the developable area mauka (east) of U`u Street into two areas described here as "mauka north" and "mauka south."

- Two fixed base operator (FBO) pads are already established fronting the apron in this core. A fuel farm has also been established.

- The south end of the general aviation area can be made accessible from the landside by an extension

of Pao`o Street (Road N) and a connector road to the makai (west) from Road N.

- Heliport facilities will be planned in one of the two areas (makai and mauka of Road N) depicted on the alternative exhibits. A third heliport option is to co-locate with the helicopter training pad on the north side of the airport.

During the preparation of the master plan, the Hawaii DOT-A has been in the process of requesting proposals for development of a 10-acre parcel at the south end of the general aviation area. The parcel is outlined on each alternative exhibit. The alternatives included in this master plan provide examples of the types of general aviation facilities that can readily be developed within the proposed 10-acre parcel, but are not meant to restrict or limit the general aviation development opportunities and options for the parcel.

GENERAL AVIATION ALTERNATIVE 1

General Aviation Alternative 1, as depicted on **Exhibit 4M**, would establish two FBO sites in the center core at the end of the new Road M. Expansion of the flight line apron would be reserved south of Taxilane K to front the 10-acre parcel.

This alternative assumes that the current air cargo facilities would be relocated to another area of the flight line, opening up the ramp and adjacent flight line for general aviation uses. This would include a new commuter terminal in the location of the current south cargo building. The north cargo building would be subdivided or replaced with a multi-tenant facility to house specialty operators. Locating the heliport facilities directly to the east of this area would provide for a common use parking lot for the various tour operators. It should be noted, however, this heliport location is closer than the 2,500-foot separation from the runway desired to accommodate helicopter operations independent from the runway. It would also have visibility issues from the ATCT site #10.

The existing commuter terminal area would be subdivided into several smaller lease parcels that could accommodate buildings for various specialty operators. Farther north, the existing T-hangars would be relocated and replaced with a wash rack. The wash rack area would be designed to not only be used to wash aircraft, but also ground service equipment (GSE) and airport maintenance equipment.

The mauka north area would be reserved for T-hangar development. The mauka south area would be reserved primarily for large parcel development intended for large conventional and corporate hangars.

GENERAL AVIATION ALTERNATIVE 2

The remaining three alternatives focus new general aviation development from the current terminal area south. All still assume that the existing T-hangars would be relocated or replaced to the south. Re-development north of the current commuter ter-

minal would be dependent upon future air cargo and passenger terminal alternatives in this area.

Alternative 2 (**Exhibit 4N**) would develop a new commuter terminal immediately south of the existing terminal. The terminal would be placed in the corner with ramp access to the south as well as the current ramp. This would minimize disruption to current operations while the new terminal was constructed.

As with the previous alternative, two FBO sites would be developed in the core area at the end of Road M. The flight line apron would be expanded to the south of Taxilane L with two development parcels fronting it. These parcels could be developed with large hangars for general aviation business use or corporate aircraft storage.

Like in Alternative 1, the mauka north area is planned primarily for small general aviation aircraft storage, just not all in T-hangars. While half of the area is planned for the standard T-hangars, the other half is planned for executive box hangars of 5,000 square feet or less.

Also like Alternative 1, the mauka south area is planned for large corporate parcels designed primarily for corporate aircraft users. A "hammerhead" taxilane at the end of Taxilane L would subdivide and provide access to several parcels ranging from one to two acres in size.

The helipads and helicopter parking would be developed mauka (east) of Pao`o Street. This would provide the 2,500-foot separation desired for operations independent from the runway. This layout is similar to that proposed in the previous master plan. Parcels are provided adjacent to the helipads for lease by helicopter operators on the airport. This site could have visibility issues from the ATCT Site #10.

GENERAL AVIATION ALTERNATIVE 3

General Aviation Alternative 3, as presented on **Exhibit 4P,** would redevelop an expanded commuter terminal in its current location. It would also maintain the two FBO locations within the core at the end of new Road M. As with the other alternatives, the flightline apron would expand to the south, but the wash rack would be located in the southeast corner of the apron.

The mauka areas would develop with basic hangar storage on either side of Road M and larger parcel development on the north and south ends. The mauka north area would have T-hangars adjacent to Road M with the corporate parcels on the opposite side of the extended Taxilane K. The mauka south area would have conventional hangars (up to 10,000 square feet) as well as executive box hangars. The 10-acre parcel could be subdivided for several corporate-type users with landside access extended around the south side.

As with the previous alternative, the heliport would be developed mauka (east) of Pao`o Street. The layout shown is a variation with staggered

06MP06-4M-11/19/07

Pao'o St. - Road N

CONVENTIONAL HANGAR

AIRPORT MAINTENANCE EXPANSION

HELICOPTER TERMINAL

T-HANGARS

Road M

CONVENTIONAL HANGARS

'U'u Street

WASH RACK

ARFF

PARKING

SPECIALTY OPERATORS

COMMUTER TERMINAL

FBO

FUEL STORAGE

FBO

APRON EXPANSION

Taxilane K

Taxilane L

Taxiway A

LEGEND

- Airport Property Line
- Ultimate Airfield Pavement
- Ultimate Building
- Ultimate Road/Parking
- Building to be Removed
- Lease Parcels
- 10 Acre Lease Site
- Touchdown & Liftoff Area (TLOF)
- Final Approach & Takeoff Area (FATO)
- Helipad Safety Area
- Protection Zone

NORTH

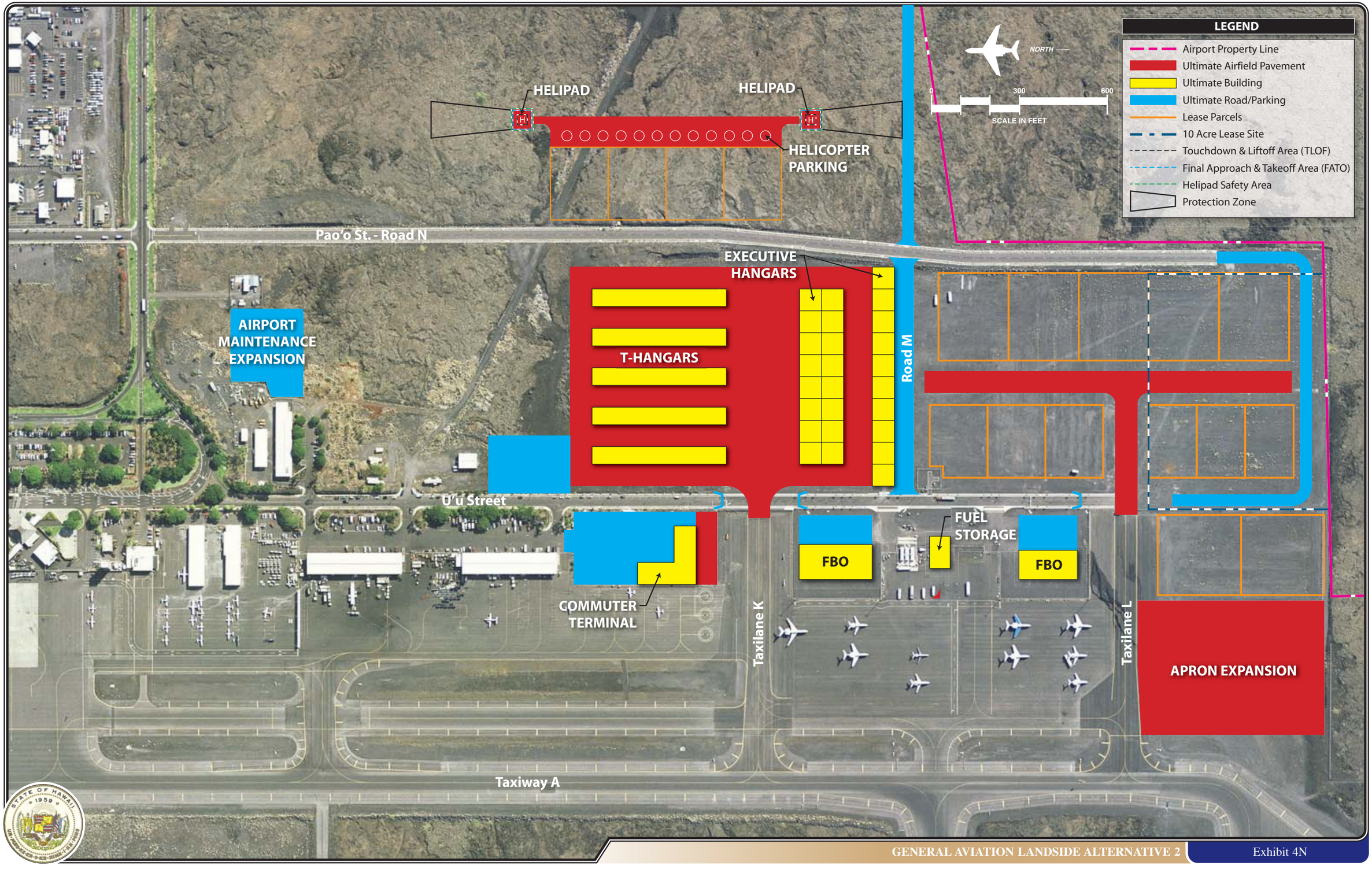
0 300 600

SCALE IN FEET

GENERAL AVIATION LANDSIDE ALTERNATIVE 1

Exhibit 4M

06MP06-4N-12/21/07



GENERAL AVIATION LANDSIDE ALTERNATIVE 2

Exhibit 4N

06MP06-4P-11/19/07

LEGEND

- Airport Property Line
- Ultimate Airfield Pavement
- Ultimate Building
- Ultimate Road/Parking
- Lease Parcels
- 10 Acre Lease Site
- Touchdown & Liftoff Area (TLOF)
- Final Approach & Takeoff Area (FATO)
- Helipad Safety Area
- Protection Zone

NORTH

0 300 600

SCALE IN FEET

CONVENTIONAL HANGARS

CONVENTIONAL HANGARS

HELICOPTER TERMINAL

Pao'o St. - Road N

EXECUTIVE BOX HANGARS

Road M

T-HANGARS

CONVENTIONAL HANGARS

RELOCATED AIRPORT MAINTENANCE

U'u Street

WASH RACK

FBO

FBO

FUEL STORAGE

COMMUTER TERMINAL

Taxilane K

Taxilane L

APRON EXPANSION

ALTERNATIVE 3 TERMINAL PLAN

GENERAL AVIATION LANDSIDE ALTERNATIVE 3

Exhibit 4P

helipads and four rows of parking for up to 12 helicopters. In addition, a helicopter terminal and conventional hangar pads are provided around three sides of the parking stands. As with the previous alternative, however, there could be visibility issues from ATCT Site #10.

The exhibit also shows this alternative could be developed in concert with Terminal Alternative 3. For the terminal to develop southward, the T-hangars and general aviation parking apron would first need to be relocated into the expanded general aviation area. Air cargo would then need to be relocated to the north side of the airfield as presented in three of the four air cargo alternatives. This would open up space for the airport maintenance facilities to be relocated and provide separation between the general aviation area and passenger terminal complex.

GENERAL AVIATION ALTERNATIVE 4

The last general alternative is shown on **Exhibit 4Q** and locates an expanded commuter alternative adjacent to U`u Street to allow an expansion of the ramp in front of the terminal. Parking for the terminal would be relocated and expanded mauka (east) of U`u Street.

The helicopter facilities are depicted makai (west) of Pao`o Street, again allowing for some cross-utilization of landside access and parking with the commuter terminal. As with Alternative 1, however, independent operation may be sacrificed with the location because the separation from the runway is less than 2,500 feet. In addition, there would be visibility issues with ATCT Site #10.

As with each of the other alternatives, two FBO's would be located in the center core off Road M. With this alternative, however, a third FBO location is included at the southeast corner of the expanded flightline ramp. This would allow additional ramp development and a wash rack.

This alternative would locate the larger three to five acre development parcels in the mauka north area off an extended Taxilane K. The mauka south area would include the T-hangar development next to Road M and conventional hangar development area within the 10-acre parcel.

ACCESS AND LAND USE

After the major functional elements intrinsic to the airport are accommodated, other areas can be considered for uses that provide additional support to the airport function, generate revenue to help the airport maintain self-sufficiency, or promote economic development for the community. Key to the land use considerations, however, is access and circulation. This section begins with a discussion of alternatives related for off-airport access and circulation within the airport boundaries.

ACCESS AND CIRCULATION

Queen Kaahumanu Highway will remain the primary off-airport access. There is currently only one point of access to the airport from the highway. That is at the intersection with Keahole Street. The previous master plan proposed a second access point to the north along a new road named Road P. This has been carried forward in areawide planning to date.

Queen Kaahumanu Highway is planned as a limited access highway. The planned widening north from Kealakehe Parkway to the airport will restrict the number of full intersections with the highway. The Kona Community Development Plan (CDP) supports a frontage road makai of Queen Kaahumanu Highway from the airport south to Honokohau Harbor to consolidate access points along the highway. The frontage road is envisioned with its own 60-foot right-of-way, but it must be outside the 300-foot right-of-way of the highway. It will cross the NELHA property as well as the O`oma development south of the airport.

Original consideration was for a frontage road alignment connecting to Pao`o Street (Road N) on the airport. While this would take advantage of an existing roadway on the airport, it could ultimately create larger circulation problems as airport traffic grows. As the terminal expands, the section of Pao`o Street between Road P and Keahole Road is expected to become part of the one-way terminal loop road system. Use of this street as the frontage road would add unnecessary through traffic and truck traffic to not only the airport's primary access road, but also the terminal loop.

A better alternative would appear to be a more traditional frontage road closer to the highway, as depicted on **Exhibit 4R**. This would stay near the mauka side of the airport, but well outside of the highway right-of-way. It would also better serve access for future development opportunities along the highway.

Alternative 1 also shows the potential for an additional access point connecting to the airport. In this alternative, Keahole Street would remain as the primary access point. A secondary access point would be available at Road P to the north. The frontage road would also provide access to other access points south of the airport.

Road P could provide access to the cargo area and other support uses at the north end of the flight line. It is not likely that the DOT Highways Division will accept two full access points so close together. Two access points are more likely with one of them at the existing Kaiminani Drive to the south. Road P would provide better separation between the full intersections than Keahole Street.

Alternative 2 on **Exhibit 4S** presents this option. Keahole Street would be restricted to right-in, right-out traffic. As shown, Road P would ultimately be developed with a full interchange; the interchange would provide access not only to the terminal area, but to planned off-airport devel-

06MP06-4Q-1/27/09

Pao'o St. - Road N

HELICOPTER PARKING

AIRPORT MAINTENANCE EXPANSION

CONVENTIONAL HANGARS

'U'u Street

COMMUTER TERMINAL

EXECUTIVE BOX HANGARS

Road M

T-HANGARS

CONVENTIONAL HANGARS

WASH RACK

FBO

FBO

FBO

FUEL STORAGE

Taxilane K

Taxilane L

Taxiway A

LEGEND

- Airport Property Line
- Ultimate Airfield Pavement
- Ultimate Building
- Ultimate Road/Parking
- Lease Parcels
- 10 Acre Lease Site
- Touchdown & Liftoff Area (TLOF)
- Final Approach & Takeoff Area (FATO)
- Helipad Safety Area
- Protection Zone

NORTH

0 300 600

SCALE IN FEET

STATE OF HAWAII 1959

GENERAL AVIATION LANDSIDE ALTERNATIVE 4

Exhibit 4Q

06MP06-4E-5/11/10

SECONDARY ACCESS

PRIMARY ACCESS

Kaiminani Dr.

Queen Kaahumanu Hwy.

RETAIL

Proposed Museum Site

Proposed Frontage Road

ASR 1,500'

MIXED USE/ COMMERCIAL

Flight Kitchen

INDUSTRIAL/WAREHOUSE/ AVIATION SUPPORT

Keahole St.

HOTEL/ CONFERENCE CENTER

NELHA

Halalu St.

Road P

Helicopter Training Pad

Airport-Related Offices

PUBLIC SAFETY TRAINING CAMPUS

USPS

AIRPORT RESERVE

GROUND TRANSPORTATION

MIXED USE/COMMERCIAL

Pao'o St. (Road N)

Waste Water Treatment

Fuel Farm

LARGE AIRCRAFT USES

CARGO

Kupipi St.

AIRPORT SUPPORT

'U'U Street

Road M

TERMINAL

GENERAL AVIATION

AIRPORT SUPPORT

Runway 17-35 11,000' x 150' (Future 12,000' x 150')

KATR 4,250' x 90'

Initial GA Parallel Runway 4,500' x 75'

Ultimate Runway 17R-35L 11,000' x 150'

Airport Property Line

Ultimate Perimeter Service Road

NORTH

0 1200 2400

SCALE IN FEET

ACCESS/LAND USE ALTERNATIVE 1

Exhibit 4R

06MP06-4S-5/11/10

ASR 1,500'

PUBLIC SAFETY TRAINING CAMPUS

Helicopter Training Pad

Waste Water Treatment

LARGE AIRCRAFT USES

CARGO

AIRPORT SUPPORT

INDUSTRIAL/ WAREHOUSE/ AVIATION SUPPORT

Road P

Fuel Farm

USPS

Flight Kitchen

HOTEL/ CONFERENCE CENTER

Halalu St.

MIXED USE/ COMMERCIAL

AIRPORT RESERVE

GROUND TRANSPORTATION

Airport-Related Offices

Kupipi St.

TERMINAL

Proposed Museum Site

MIXED USE/ COMMERCIAL

RETAIL

Kaiminani Dr.

Queen Kaahumanu Hwy.

Keahole St.

MIXED USE/ COMMERCIAL

Proposed Frontage Road

NELHA

INDUSTRIAL/ WAREHOUSE/ AVIATION SUPPORT

Pao'o St. (Road N)

AIRPORT SUPPORT

Road M

'U'U Street

GENERAL AVIATION

Runway 17-35 11,000' x 150' (Future 12,000' x 150')

KATR 4,250' x 90'

Ultimate Runway 17R-35L 11,000' x 150'

Initial GA Parallel Runway 3,600' x 75'

Ultimate Perimeter Service Road

Airport Property Line

NORTH

0 1200 2400

SCALE IN FEET

ACCESS/LAND USE ALTERNATIVE 2

Exhibit 4S

opment mauka of Queen Kaahumanu Highway.

Road P would tie into the terminal loop at the north end of the terminal. Access to the cargo area would be developed from a Road P intersection with Halalu Street. As shown, the roadways could ultimately be grade-separated. If it is desirable for the Queen Kaahumanu Highway frontage road to extend to Road P in this scenario, Halalu Street might be considered for the alignment as shown on the exhibit.

In this alternative, the road extending makai from the Kaiminani intersection would run along the airport property boundary and tie directly into Road M. This would ultimately become the primary access for general aviation users. Other roadways within the property can be developed for circulation in support of the proposed land use development. The following section discusses the alternatives for land use outlined on **Exhibits 4R** and **4S**.

LAND USE CONSIDERATIONS

Flight line uses are outlined on each of the alternatives. From earlier in this chapter, general aviation will generally be along the south portion of the flight line. The airport passenger terminal is planned for the center of the airfield with air cargo to the north of it. Airport support corridors are located between the three key aviation uses to meet the needs for ATCT, ARFF, airport maintenance, etc.

The flight line north of the cargo area could be developed for large aircraft uses such as hangars for large commercial jet storage and/or maintenance. This could include not only commercial service needs, but also needs for the private corporate users of large commercial aircraft.

This leaves a large expanse of airport property for aviation-related support uses as well as for revenue support uses.

Land Use Alternative 1

Land Use Alternative 1 is based upon Keahole Street remaining as the primary access to the passenger terminal. Road P would be a secondary access for air cargo, and the Kaiminani extension would serve general aviation.

Land uses immediately mauka of the terminal loop and parking and north of the access road would remain primarily in ground transportation uses. A flight kitchen location is also shown in this area. Other property along the access road would be recommended for mixed use/ commercial, while retail uses are planned mauka of the frontage road to take advantage of the visibility from the highway. The preferred site for the relocation of the Ellison S. Onizuka Space Center is shown near the airport entrance. It too would have high visibility from Queen Kaahumanu Highway. A location for a hotel/conference center is shown just south of Keahole Street in this alternative. The hotel/conference

center would be a focal point along the airport's main entryway and would be surrounded by retail and commercial uses, as well as across the street from the transportation center and the Ellison S. Onizuka Space Center.

A natural extension mauka of the cargo area are uses related to the support of cargo and the terminal. The USPS parcel would be highly compatible with the cargo area. This would allow access to the cargo ramp and to the terminal area via the service road makai of the USPS site. Alternative 1 also depicts a fuel farm location along Pao`o Street that could service the cargo and terminal areas.

Another specific aviation support use shown is a location for an airport related office. This could be a building or campus of buildings to house airport administration, TSA offices, and other offices directly related to airport functions, but that do not need to be directly on the flight line.

If Road P is planned primarily for air cargo access, the area along this roadway would be planned for industrial and warehouse uses that can take advantage of the proximity to the air cargo facilities. This alignment provides greater separation from the Queen Kaahumanu Highway entrance to allow for the ultimate grade separations.

Another potential use that is well suited for the airport environment is a public safety training center. The primary focus of the regional training center would be for training the airport's emergency and security personnel. An ARFF training facility could become an anchor for the training center, which would also be expanded to include multi-disciplinary training for first responders and support agencies, many of which would be involved in an airfield incident. A 60-acre site is depicted on **Exhibit 4R** for this use. The location encompasses the present ARFF training facility and extends northward along an extended Pao`o Street. As shown on the exhibit, the proximity of the proposed north side heliport and helicopter training area could allow them to be used in training programs as well.

This alternative provides room for expansion of the wastewater treatment facility to the north of the current site. The proposed road circulation system can serve as the basic grid for utility line distribution. Pao`o Street has been considered as the alignment for a potential chilled water distribution line from NELHA for energy conservation in cooling the terminal and potentially other buildings on the airport.

Land Use Alternative 2

Exhibit 4S presents a land use alternative based upon the primary airport entrance moving north to Road P. In this scenario, Keahole Street will likely become a secondary access with right-in/right-out traffic. As proposed, Halalu Street would become the primary airport frontage.

With the primary entryway moved north, the hotel/conference center use is also positioned along Road P between the Queen Kaahumanu Highway interchange and Halalu Street.

Mixed use commercial and ground transportation uses would surround it to the south and mauka (east). Retail remains proposed along the Queen Kaahumanu frontage south of Keahole Street, along with mixed use commercial behind it.

As with the previous alternative, industrial/warehouse and airport support uses are recommended mauka of the cargo area north of Road P. This area would include the USPS facility and fuel farm, as shown on the exhibit. This is also an alternative location for a flight kitchen.

Another option for airport related office space is shown immediately mauka of the terminal loop road. This location would have a direct view of the terminal area across the parking lot.

On this alternative, additional industrial/warehouse use is shown to the south of Keahole Street between Pao`o Street and Halalu Street. This would be in the approach to the heliport.

Sixty acres at the north end of the area is also set aside for the public safety training campus. The area shows the flexibility in space design that is available to design a facility that can best serve the training needs of the airport, the island, and the state in a single, consolidated location.

Finally, an alternative site for an expanded wastewater treatment facility is depicted farther north of the current site. As with the previous alternative, the circulation system forms the grid for utility planning for the site.

CONCLUSIONS

The process used in formulating and evaluating airside and landside development alternatives involves an analysis of short and long range requirements, as well as future growth potential. Compliance with airport design standards was considered in every scenario. Safety, both air and ground, were given high priority in the analyses, as were potential effects on the environment.

The updated development plan for the airport must represent a means by which the facility can be improved in a balanced manner, both airside as well as landside. In addition, it should consider flexibility to meet activity growth beyond the planning horizons.

The remaining chapters will be dedicated to refining the proposed concept into a final plan with recommendations to ensure proper implementation as a demand-based program.

Chapter Five

AIRPORT PLANS

AIRPORT PLANS

The planning process for the Kona International Airport at Keahole (KOA) Master Plan has included several analytical efforts in the previous chapters intended to project potential aviation demand, establish airside and landside facility requirements, and evaluate options for improving the airport to meet the identified airport facility needs. The purpose of this chapter is to describe, in narrative and graphic form, the recommended plan for the future of Kona International Airport at Keahole.

As stated in the Introduction section, the primary objective of the master plan is to provide the community and public officials with proper guidance for future development which will address aviation demands and be wholly compatible with the environment.

Specific goals outlined at the outset were to:

- Provide a high level of service to passengers while maintaining a "Hawaiian sense of place that represents the unique culture and physical environment of Kona."
- Stimulate and support island and state economic development.
- Enhance services for air cargo operations.
- Encourage international flights at the airport.
- Accommodate existing and future general aviation (including corporate aviation) customer needs.

- Maintain good relationships with neighborhood communities by minimizing environmental impacts such as noise.

From the outset of the Master Plan process, it has been clear that the people of West Hawaii highly value the unique, open air, Polynesian atmosphere of Kona International Airport at Keahole. For this community, reflection of the Hawaiian culture and island lifestyle is more than a design element: it goes to the relationship people have with their airport – a sense of connection, pride and ownership.

Accordingly, preservation and enhancement of the unique aesthetic elements of the airport has been a main priority for this Master Plan. In every recommendation made, specific attention has been paid to this aspect. It will be of utmost importance that this focus be sustained throughout the process of design and implementation of the Master Plan.

AIRPORT DESIGN STANDARDS

As a Part 139 certificated commercial service airport, Kona International Airport at Keahole must comply with FAA design and safety standards. Advisory Circular 150/ 5300-13, *Airport Design*, is the key reference used to ensure compliance with these standards. These design and safety standards are based primarily upon the characteristics of aircraft expected to use the airport on a regular basis.

As previously discussed in Chapter Three, the design codes are based upon the approach speeds and wingspans of these "critical" aircraft. This is comprised of the most demanding aircraft or "family" of aircraft conducting at least 500 annual operations at the airport.

The critical design aircraft for Kona International Airport at Keahole is driven by the transport category aircraft used in the scheduled airline and air cargo service at the airport. Analysis in Chapter Three – Facility Requirements indicated that KOA's current airport reference code (ARC) is D-V. This includes aircraft in Aircraft Design Group V such as the Boeing 747 and 777 aircraft that already operate at the airport.

Recognizing the airport's importance to air cargo on the island, and the importance of the international passenger market to the island as well, the master plan recommends the airport continue to maintain the capability to accommodate the larger civilian aircraft in the future. This would include aircraft in ARC D-V and potentially D-VI. The B747-series and B777 aircraft would be the critical aircraft in D-V. At a minimum, the airport should plan to regularly accommodate these aircraft.

Larger aircraft are now entering the civilian fleet. The Airbus A380-800 and the Boeing 747-800 are in ARC D-VI and are the largest civilian aircraft in the commercial fleet. They are expected to be used on international routes. Honolulu International Airport is being planned for A380 service to Hawaii, but KOA has been approved as an alternate airport. While ARC D-V is recommended as the critical ARC for future design at KOA, it is recommended that D-VI separation

design standards be maintained on at least one runway for future viability.

Runway 17-35 is currently designed to the ARC D-V design standards with Category (CAT) I instrument approach capability. The current runway is positioned to maintain adequate separations and clearances to support ARC D-VI at least as an alternate airport. The current runway-to-parallel taxiway separation of 881 feet provides adequate space to add a dual parallel taxiway at Group D-VI standard separations.

Ultimately, parallel Runway 17R-35L is planned to be the same length and ARC as the primary runway, but without Category (CAT) I approach minimums. The parallel runway separation standard for this runway is 400 feet. While this runway is ultimately planned for ARC D-V, its initial development will be to serve commuter, corporate, and general aviation aircraft which are in D-II or below.

Table 5A summarizes the various airfield design standards for Kona International Airport at Keahole. These standards were considered in the planned improvements for the airport site, to be discussed further within this chapter.

TABLE 5A
Airfield Design Standards
Kona International Airport at Keahole

	Runway 17-35	Initial Runway 17R-35L	Ult. Runway 17R-35L
Critical Aircraft	B 747-400	Gulfstream V	B 747-400
Airport Reference Code	D-V[1]	D-II	D-V
Instrumentation	CAT I	One-mile visibility	One-mile Visibility
RUNWAYS			
Length (ft)	12,000[2]	5,500	11,000
Width (ft.)	150	100	150
Shoulder Width (ft.)	35	20	40
Safety Area			
Width (ft.)	500	500	500
Length Beyond End (ft.)	1,000	1,000	1,000
OBJECT FREE AREA			
Width (ft.)	800	800	800
Length Beyond End (ft.)	1,000	1,000	1,000
CENTERLINE TO:			
Holding Position (ft.)	280	250	280
Parallel Taxiway (Centerline)	400 (500)	400	400
TAXIWAYS			
Width (ft.)	75	35	75
Centerline to:			
Fixed or Movable Object (ft.)	160 (193)	65.5	160
Taxiway Centerline (ft.)	267 (324)	105	267
Taxilane Centerline to:			
Fixed or Moveable Object (ft.)	138 (167)	57.5	138
RUNWAY PROTECTION ZONES			
Inner Width (ft.)	1,000	500	500
Length (ft.)	2,500	1,700	1,700
Outer Width (ft.)	1,750	1,010	1,010

Notes:
[1] Runway will be D-V, but consider ability to serve ARC D-VI aircraft as an alternate airport. Where applicable, separations for D-VI are shown in parentheses.
[2] Existing Runway 17-35 length of 11,000 feet is adequate for the foreseeable future. A 12,000-foot length is reserved on the ALP for future capability should demand dictate.

RECOMMENDED MASTER PLAN CONCEPT

The Master Plan Concept includes improvements to the airfield, terminal area, air cargo, and general aviation facilities to meet current and forecast needs over the long range planning horizon. It is also designed to ensure a viable aviation facility for the West Coast, the Big Island, and the State well beyond the long range horizon. The recommended concept is depicted on **Exhibit 5A**. The following sections further detail these plans and recommendations.

AIRFIELD RECOMMENDATIONS

The principal airfield recommendations should always focus first upon safety and security. Of key importance is to ensure that airport design standards are adequately planned for and met. Recommendations are then provided to improve the operational efficiency, circulation, and capability of the airfield. **Exhibit 5A** depicts the principal airfield recommendations.

The following subsections discuss the recommendations as they pertain to each runway, the taxiway system, and the airfield support facilities.

Runway 17-35

Runway 17-35 will remain the primary runway in the future, although it will ultimately be used in concert with a parallel runway and a helicopter touchdown and lift-off (TLOF) area. The primary runway is currently 11,000 feet, but the plan reserves the capability to extend the runway to 12,000 feet should demand dictate. The 1,000-foot extension would occur to the north, but only if and when an airline or group of airlines would commit scheduled daily flights that would require the additional length to reach long haul international destinations.

Runway 17 currently supports the airport's only CAT I instrument approach. A CAT I approach from the south on Runway 35 is reserved. This would likely be through a lateral precision performance with vertical guidance (LPV) approach utilizing satellite-based GPS (global positioning system). The only ground-based investment would be in the approach lighting necessary to obtain the lower minimums.

The other key improvements recommended for Runway 17-35 involve the taxiway access system. Parallel Taxiway A currently provides circulation and access along the mauka (east) side of the runway. The section of Taxiway A in front of the passenger terminal is planned to be relocated 114 feet makai (west). This will provide for adequate circulation for Group V aircraft in and around the passenger terminal area.

A second parallel taxiway is planned between Taxiway A and the runway to provide for flexibility with future aircraft circulation. All landside aviation facilities are located and will continue to be planned for the mauka (east) side of the airfield. As a result, aviation uses will eventually stretch along

06MP06-5A-5/11/10

REVENUE SUPPORT (LARGE TRACT)
ATCBI 1,500'
PUBLIC SAFETY TRAINING CAMPUS
GENERAL AVIATION (Helicopters)
TLOF 1,700' x 200'
2,000'
AIRPORT INDUSTRIAL
Road P
AVIATION SUPPORT
Proposed Main Entrance
Existing Entrance
MIXED USE/ COMMERCIAL
HOTEL
MIXED USE/ COMMERCIAL
Kaiminani Dr.
Queen Kaahumanu Hwy.
Proposed Parallel Rd.
Conference Center
CULTURAL/EDUCATION
Halalu St.
Keaholo St.
Proposed Museum Site
NELHA
AIRPORT INDUSTRIAL
Fuel Farm
AIRPORT SUPPORT
AVIATION SUPPORT
GROUND TRANSPORTATION
AVIATION SUPPORT
Road M
Heat Exchanger Site
Pao'o St. (Road N)
AVIATION SUPPORT
Waste Water Treatment
Flight Kitchen
USPS
AIRPORT SUPPORT
AIRPORT SUPPORT
Parking
Petroglyphs
Kupipi St.
AIRPORT SUPPORT
Wash Rack
FLIGHT LINE RESERVE
3,000'
LARGE AIRCRAFT USES
Hapu'upu'u St.
AIR CARGO
FAA
ATCT
ARFF
TERMINAL
U'U Street
K
L
GENERAL AVIATION
TLOF Emergency Response Route
Remote Fuel Station
381'
500'
700'
500'
A
P
M
N
G
H
D
C
A
Taxiway A
Taxiway E
Runway 17-35 11,000' x 150' (Future 12,000' x 150')
1,000'
KATR 5,000' x 100'
Taxiway F
1,000'
VOR
Ultimate Runway 17R-35L 11,000' x 150'
Initial Parallel Runway 5,500' x 100'
Ultimate Perimeter Service Road
WATER RESCUE FACILITY/ BOAT LAUNCH

LEGEND

- Airport Property Line
- Object Free Area (OFA)
- Extended OFA
- Runway Safety Area (RSA)
- Lease Parcels
- Runway Protection Zone (RPZ)
- Ultimate Roads/Parking
- Ultimate Airfield Pavement
- Short Austere Airfield (SAAF)

Existing Facilities per Photograph

NORTH

0 1200 2400

SCALE IN FEET

RECOMMENDED MASTER PLAN CONCEPT

Exhibit 5A

the entire length of the runway in the future. The dual parallel taxiway will ultimately provide for two-way circulation, and are planned at airport design group (ADG) VI separation standards. The dual taxiway system can be developed in sections as needed to address specific circulation needs as they arise. For example, the section between taxiway exits G and H can assist with circulation in front of the terminal.

The construction of the second parallel section south of Taxiway G would permit the installation of an additional taxiway exit from Runway 17-35. The separation between taxiway exits in this area is currently 2,700 feet. An exit in this area is not currently possible due to the grade change between the runway and Taxiway A. The grade of the second parallel taxiway would be designed to allow for the exit and would result in reduced taxi times for airline and air cargo aircraft.

Additional exit taxiways have been planned to provide more efficient egress from the primary runway. This includes a high speed exit near midfield for both landing directions, as well as supplemental right-angle exits that reduce the maximum spacing between exits to 2,000 feet.

Kona Auxiliary Training Runway (KATR)

The plans depict the proposed location for the Kona auxiliary training runway (KATR) for use in military pilot-proficiency training by C-17s for landing on short field conditions. This location at KOA was selected by the Department of Defense (DOD) after evaluating a range of alternative locations throughout the Hawaiian Islands. The KATR as originally proposed by the DOD would be 4,250 feet long and 90 feet wide with taxi access to Runway 17-35 for departure after executing the short landing.

The master plan recommends that a parallel runway be developed not only for capacity, but to provide a second runway to keep the airport open when the primary runway must be temporarily closed for any reason. KOA is currently the only small hub or larger commercial service airport in Hawaii that does not have a second runway.

The following subsection outlines ultimate plans for that parallel runway development. The DOT-A, however, has been negotiating with the DOD for the potential use of the KATR as an interim solution for providing a second runway at KOA. For this to be practicable, the KATR would need to be a minimum length of 5,000 feet, a width of 100 feet, and be available for civilian use when not being used for military training. As a result, the **Exhibit 5A** and the airport layout plan depict the potential interim 5,000-foot length for the KATR. The proposed location is 700 feet makai (west) of Runway 17-35.

The KATR would be constructed by the Department of Defense and could be used until such time that a full-length parallel taxiway becomes necessary between the parallel runways. At that time, it could be incorporated into the proposed taxiway as depicted on the exhibit.

Parallel Runway 17R-35L

Parallel Runway 17R-35L is ultimately planned as a full-service runway 1,200 feet makai (west) of the primary runway. The 1,200-foot separation is recommended as it meets the FAA standard separation for parallel runways serving D-V and larger aircraft, and it also ensures that the perimeter fencing and service road can be maintained outside of the runway's object free area on the makai (west) side.

The ultimate length is planned to be 11,000 feet and would have the same design standards (D-V) and pavement strength as the primary runway. It is planned for one-mile visibility instrument approaches to each end. A full-length parallel taxiway is ultimately planned between the parallel runways along the same alignment as the proposed KATR. This would place the centerline of the taxiway at 500 feet from the centerline of the parallel runway.

It is anticipated that the runway would initially be developed at a length to accommodate at least small general aviation aircraft and corporate and commuter aircraft. An initial runway length of 5,500 feet is shown on **Exhibit 5A**. If maintained at D-II design standards and at least 60,000 pound pavement strength, this runway would be capable of accommodating approximately 60 percent of the airport's operational mix.

The initial parallel runway would be developed from the south threshold of the ultimate runway. This will make it readily accessible to the general aviation facilities already located at the south end of the airport's flight line. Future extensions of the runway would make it more usable by the commercial service and cargo aircraft. The ultimate goal is to maximize the airfield capacity of the parallel runways and ensure there is always a runway available in service when a runway must be temporarily closed in emergencies or for maintenance or construction.

Helicopter Touchdown and Lift-Off Area (TLOF)

The plan includes a separate area to accommodate helicopter operations virtually independent of fixed wing operations. The facility is focused on a touchdown and lift-off area (TLOF) to be developed approximately 3,000 feet mauka (east) of the north end of the existing runway. This will allow air traffic control to permit helicopter operations independent of operations from the main runway system. This site was chosen for its separation from the runway environment as well as its visibility from the programmed airport traffic control tower (ATCT).

The TLOF is designed to serve helicopter training and function as a base for other helicopter operations on the airport. The ultimate paved TLOF is planned to 1,700 feet long and 200 feet wide, but can be developed in stages. The TLOF is also planned with 280 feet clearance on three sides from any publicly occupied areas to provide for protection zones.

Helicopter terminal area facilities are planned mauka (east) of the TLOF to

ensure that line-of-sight is maintained to the programmed ATCT.

Support Facilities

Airfield support facilities include facilities necessary for the maintenance and operation of the airfield. These include the airport traffic control tower (ATCT), other on-site FAA facilities, an airport rescue and firefighting (ARFF) facility, airport maintenance facilities, and perimeter service roads.

The current ATCT is old and outdated. It also does not have sufficient visibility of all airfield operations areas. As this master plan was being prepared, the FAA conducted a siting study for a new ATCT. The recommended location was Site #10 from the previous chapter, and is shown on **Exhibit 5A**. The new ATCT has been programmed for design and construction by 2012.

The FAA has also evaluated potential sites for relocating the very-high omnidirectional range with tactical air navigation (VORTAC) to the airport from its current site south of KOA. Chapter Four outlined the six primary candidate sites located within the airfield operations area (AOA) that were being considered. After considering input from the DOT-A and its consultants regarding the master plan, the FAA selected a location between candidate Sites 11 and 12.

As depicted on **Exhibit 5A**, the selected site is located 900 feet makai (west) of the runway centerline, and 2,270 feet from the runway end. This location should not affect existing buildings and remain out of areas anticipated to be developed in the next 20 years. It is also located just outside the ultimate RPZ for Runway 35 and will not pose a hazard to aircraft operations.

The ARFF building equipment is currently housed in a structure next to the existing ATCT on the south side of the airport. The facility is also located behind the general aviation transient and tie-down ramps. As depicted on **Exhibit 5A**, a location for a new, modern facility has been planned to the north of the passenger terminal and just south of the proposed ATCT site. The proposed location will have more direct access to the airfield, is closer to the helicopter TLOF area, and is still close to the passenger terminal. A direct emergency access route from the ARFF to the runways and the KATR will also serve to reduce response times and eliminate the need for an auxiliary response station to meet military response times to the KATR.

Training for ARFF personnel as well as other regional first responder facilities is being planned for a 60-acre public safety training campus on the airport. In addition, a boat launch for water rescue facilities and training should be considered as part of the ARFF and regional training facilities. The proposed location is indicated on **Exhibit 5A** on the coast line near the north end of the airfield.

The airport maintenance facilities are mauka (east) of U`u Street and south

of the terminal loop road. Area to expand the airport maintenance yard has been reserved immediately south of the current location.

The plan includes relocations and an addition to the perimeter service road as necessary to maintain secure access that will essentially circumvent the entire airfield. The perimeter service road on the makai (west) side of the airfield will need to be relocated for the KATR and parallel runway development. In addition, an emergency response route is planned to extend from the north end of Taxiway A then mauka (east) to the proposed helicopter TLOF. This will provide emergency access to the helicopter facility for ARFF equipment. Similarly, service road access to the water rescue facility is also planned.

PASSENGER TERMINAL CONCEPT

The previous chapter examined potential terminal alternatives that would accommodate the needs determined for the passenger terminal area in Chapter 3 - Facility Requirements. Those alternatives considered the short-, intermediate-, and long-term planning horizon needs of the airport as well as the functional, environmental, and financial factors involved. While the planning horizons are established to be demand-driven, they have been keyed to demand levels anticipated in the five-, ten-, and twenty-year time frames.

In order for the Master Plan team and the stakeholders of the airport to better evaluate the alternatives, these factors were developed into evaluation criteria and listed in a matrix for the purposes of scoring the three alternatives. An example of this form is found in **Appendix C**. Further, a cost benefit analysis was performed for all three alternatives. This analysis can also be viewed in **Appendix C**.

From the cost benefit analysis, Alternative 1 was the least expensive option and the primary benefits include the following:

1. Maintains the current architectural character – "Hawaiian Sense of Place."

2. Increases airport operational efficiency.

3. Optimizes current facilities.

4. Increases passenger level of service.

5. Allows for expandability.

6. Constructability and minimizes impacts to airport operations.

7. Minimal expenditure.

Alternative 2 prioritizes the building of a new north terminal for overseas operations before focusing on the expansion of the existing terminal. The benefits of the new north terminal for overseas passengers include:

1. Increases passenger level of service.

2. Flexibility of facilities – baggage claim use for both international and domestic travelers.

3. Minimizes disruption of airport operations during implementation.

Alternative 3 proposes the building of a new overseas facility at the south end of the terminal area, and the benefits are similar to Alternative 2.

The recommended concept strategy for future terminal development is based on Alternatives 1 and 2. More specifically, the preferred concept includes the short and intermediate plans from Alternative 1 with the option of moving forward with either the long range plan of Alternatives 1 or 2. With either option, the Customs and Border Protection (CBP) facilities would be relocated from the existing location, thereby allowing for the construction of the North Terminal if desired at some point in the future.

The full build out of the recommended plan is illustrated in **Exhibit 5B**. It is color coded by facility operations as consistent with other diagrams in this study. The recommended terminal plan by phase will be described below. They are coordinated with exhibits that show the overall growth in relation to the terminal area as well as the operational detail of the facility.

Terminal Development Priorities

Input and comments from the public workshop, the TAC, and other stakeholders were reviewed and taken into consideration as the concept was refined and priorities established. Through further analysis and discussion of the alternatives evaluation with the Master Plan team, terminal development priorities were determined to be as follows:

1. Improve baggage claim areas to reduce crowding and improve circulation.

2. Improve ticket lobby experience and reduce crowding.

3. Improve TSA security checkpoint operations.

4. Implement TSA in-line baggage screening.

5. Increase gate holdroom areas.

6. Improve CBP international arrivals experience.

The recommended development plan for the passenger terminal follows the Short Term, Intermediate, and Long Range time frames of the aviation forecast and its requisite requirements for facilities. Generally, though the master plan requirements identify need for expanded facilities in respective 5, 10, and 20 years time frames, the master plan is "demand driven" and as such facilities should be developed to address growth or operational change at the airport. For KOA the Short Term and Intermediate plans of the terminal area, in addition to increasing capacity to meet future needs, address current need to improve passenger level of service and safety noted above. This led to the decision by DOT-A to identify an "Initial Development Phase" that combines

the Short Term and Intermediate phases for terminal area development.

Therefore, initial development of the passenger terminal will focus on improvements within the existing terminal as described below and depicted on **Exhibit 5C**.

Initial Development Phase (Short Term plus Intermediate Term)

Baggage Claim (Short Term)

The perimeter rails at baggage claim can be relocated in order to provide more space for circulation at the ends of the claim device. Currently, the space between the ends of the baggage claim devices and the perimeter rail create a pinch point. An additional baggage claim device will be added to each end of the terminal. The added claim devices will need to be sloped plate devices able to handle the baggage demand from large aircraft flying overseas.

Ticketing (Intermediate Term)

Crowding and lack of wayfinding clarity result in an inadequate level of service within the two current ticket lobbies. The best solution to resolving these issues would be to create a centralized ticket lobby with adequate space for queuing and processing functions without hindering passenger wayfinding and flow. This can be achieved first by a relocation of the Ellison S. Onizuka Space Center, which would allow space for an automated kiosk check-in area. These self-service kiosks would be the first step of a two-step process that would organize queuing and streamline passenger flow.

A centralized ticket lobby would also require the remodeling of the north ticket lobby so that the counters face the center of the terminal as do the current south ticket lobby counters. These ticket counters would be designated bag check counters for both mainland and interisland passengers. Mainland passengers at this second step of a two-step process would require processing through USDA Agricultural screening before advancing to the bag check counters. The current two locations of the TSA security checkpoints would be consolidated into one checkpoint and would be located makai (west) of the self-service kiosks where the ticket counters converge.

Airside (Intermediate Term)

On the airside, between the two departure areas, new covered centralized in-line EDS outbound baggage areas would be constructed. Tunnels would also have to be built so that the bags can be moved from the ticketing area to the EDS baggage system. The tunnels would include baggage conveyance systems, utilities, and be of a size to maintain the systems. In order to maintain the level of passenger service for the short term, restrooms and concessions would be upgraded and expanded.

Above the new outbound baggage system is a second-level concourse from

06MP06-5B-11/13/08

Kupipi St.

SHORT TERM PARKING

ULTIMATE TERMINAL EXPANSION

NORTH

0 150

SCALE IN FEET

LEGEND

- Ultimate Roads/Parking
- Ultimate Airfield Pavement
- Public Area
- Holdroom
- Airline
- Ticket Queuing
- Concessions
- Aviation Department
- Security
- Security Queuing
- Restroom

Existing Facilities per Photograph

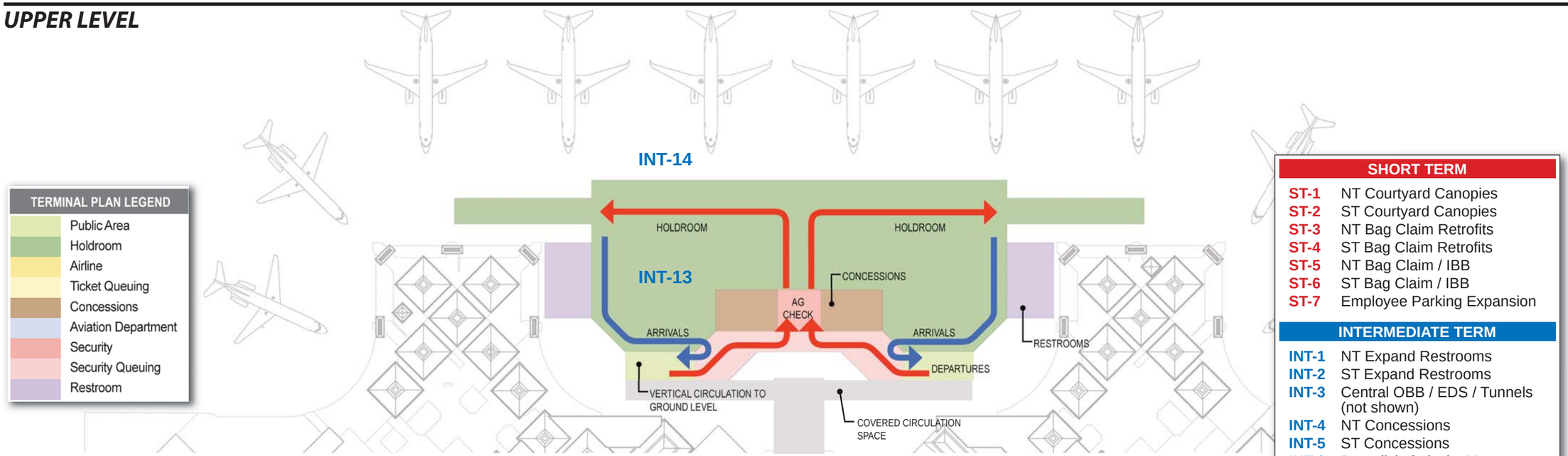
STATE OF HAWAII 1959

RECOMMENDED PASSENGER TERMINAL PLAN

Exhibit 5B

06MP06-5C-1/27/09

UPPER LEVEL



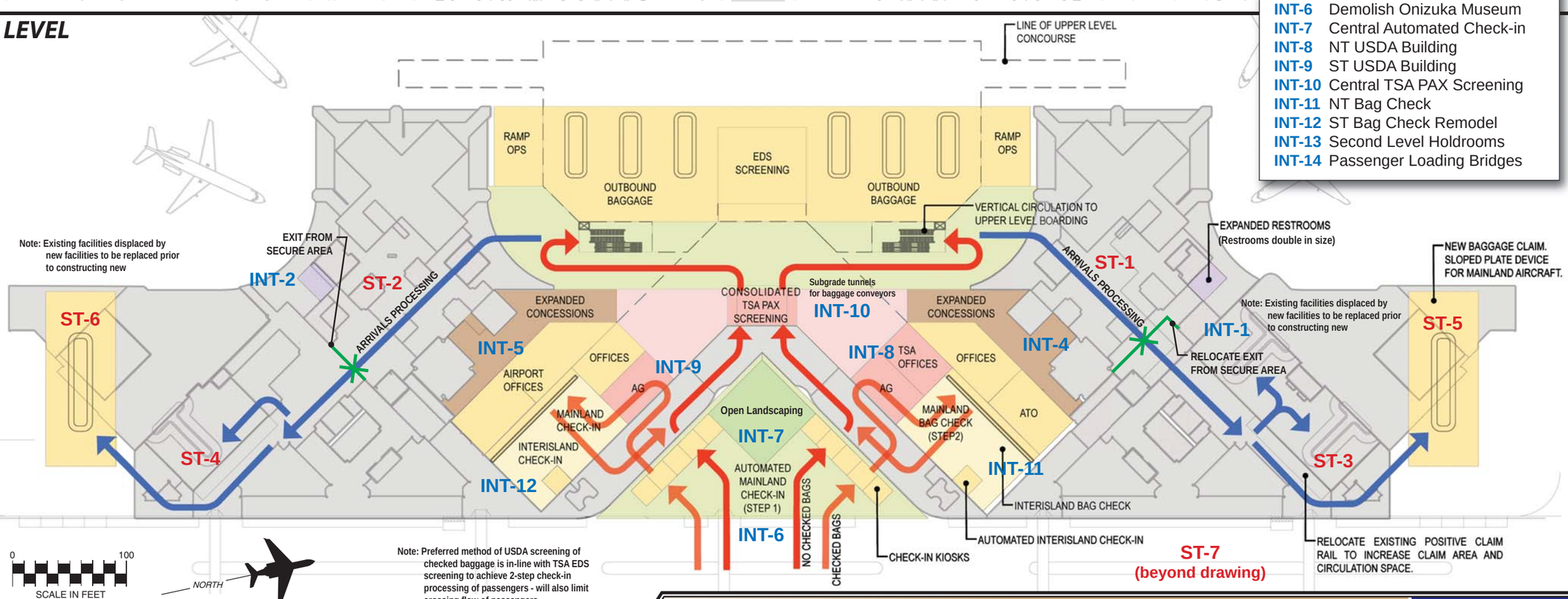
SHORT TERM

- **ST-1** NT Courtyard Canopies
- **ST-2** ST Courtyard Canopies
- **ST-3** NT Bag Claim Retrofits
- **ST-4** ST Bag Claim Retrofits
- **ST-5** NT Bag Claim / IBB
- **ST-6** ST Bag Claim / IBB
- **ST-7** Employee Parking Expansion

INTERMEDIATE TERM

- **INT-1** NT Expand Restrooms
- **INT-2** ST Expand Restrooms
- **INT-3** Central OBB / EDS / Tunnels (not shown)
- **INT-4** NT Concessions
- **INT-5** ST Concessions
- **INT-6** Demolish Onizuka Museum
- **INT-7** Central Automated Check-in
- **INT-8** NT USDA Building
- **INT-9** ST USDA Building
- **INT-10** Central TSA PAX Screening
- **INT-11** NT Bag Check
- **INT-12** ST Bag Check Remodel
- **INT-13** Second Level Holdrooms
- **INT-14** Passenger Loading Bridges

LOWER LEVEL



Note: Preferred method of USDA screening of checked baggage is in-line with TSA EDS screening to achieve 2-step check-in processing of passengers - will also limit crossing flow of passengers

which larger overseas aircraft can be accessed via passenger loading bridges. Ground boarding for narrow body aircraft on interisland routes would be maintained from the existing holdrooms. The second level concourse would be accessed via escalators and stairs at either side upon exiting the security checkpoint. Once above, passengers pass through agricultural screening of hand baggage prior to entering the main holdroom area. The second-level departures area would have restrooms and concessions.

Long Range Options

The long range plan focuses on improving the international arrivals operations. As indicated earlier, the initial plan preserves the flexibility to choose either Alternative 1 or Alternative 2 for long range terminal development. With each option, a "Beyond Plan" addresses needs if and when the long range planning horizon forecasts are exceeded.

Long Range - Option 1

Exhibit 5D presents the long range Option 1. A new immigrations facility would be built south of the existing tent structure and would be connected to the main terminal upper level concourse via a corridor and ramp. This would increase the level of service for the international arriving passengers by allowing them to deplane from loading bridges.

A new sloped plate baggage claim device would be added next to the one added in the previous phase. This new claim device would be swing use and could operate either as domestic or international depending on schedule. The current administrative buildings would be converted for use as the CBP offices and the Customs facility.

An increase in international flights is anticipated beyond the long range horizon. This option would address the need by adding an upper level concourse with loading bridges. The concourse would be directly connected to the immigrations facility via a ramp and vertical transport. The long range would also see the expansion of the CBP processing facility.

In this phase, the terminal drive would be relocated to the east in order to expand the curb and allow for more capacity at the terminal front.

Long Range – Option 2

The long range alternate plan depicted on **Exhibit 5E** addresses the needs of the airport if international demand increases significantly in the future. A new north terminal would be built for departures and arrivals processing of international passengers as well as overseas mainland passengers. Ticketing and security screening would be located on the ground floor with holdrooms, concessions, and restrooms on the second level concourse. International arriving passengers would deplane onto a sterile third level, process through immigrations, and then proceed to ground level for baggage claim and customs processing.

Once the new international facility is built and operational, the interim CBP facility built in the intermediate phase can be demolished to clear the area for increased baggage claim capacity. Three new sloped plate devices will be added between the international bag claim and the domestic bag claim device. Two of these will be for domestic use and the other will be swing use domestic or international depending on the schedule.

Airport Terminal Vision

Throughout the Master Planning process for Kona International Airport at Keahole, it has been emphasized by all involved that any future development should consider maintaining the existing unique character and ambience of the airport as a top priority. The recommended terminal plan identifies the facilities needed to be improved and built to meet the future growing demand. The final concept and all previous alternatives, however, have been studied and developed with the requirements as a base and with the vision as identified above.

The human scale of the buildings, open air structures, integration of landscape, and use of indigenous architectural style are principles that contribute to the unique experience at this airport. The terminal portion of this master plan has been developed throughout with building information modeling (BIM) as the integration tool of facility requirements and vision.

Exhibit 5F illustrates three alternatives for roof designs that can shape the future development with the principles as stated above. Roof Option 1 uses a similar roof type as the existing roof and is adapted in size to the facility function below. Roof Option 2 utilizes the language and scale of the existing hut roofs; however, they are constructed of fabric on tensile structure much like the existing CBP structure. Roof Option 3 uses a modified version of the traditional hut roof and can possibly be perforated at the top for natural air flow and have solar panels on the south facing slope. **Exhibit 5G** further illustrates the various views of these roof options.

Special Considerations

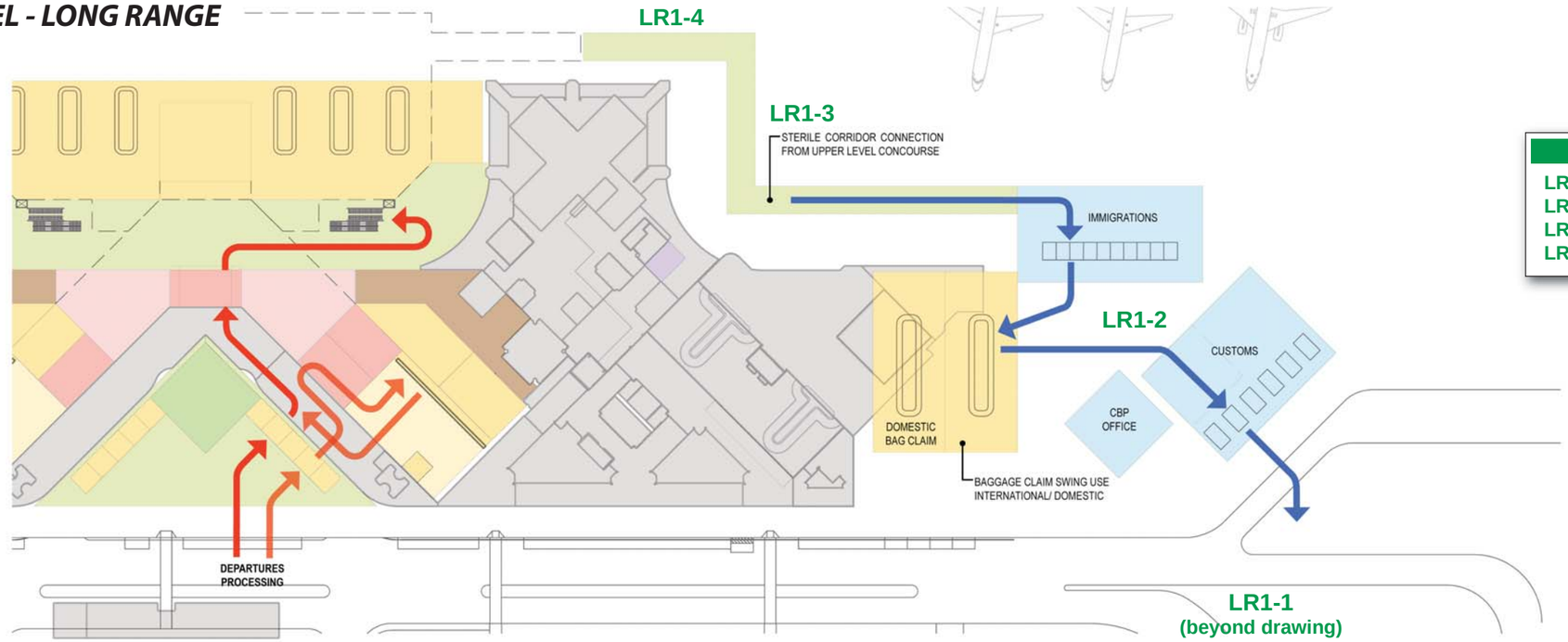
- AGRICULTURAL INSPECTIONS

Different than most airports within the US, Hawaii airports require inspection of passengers and both hand-carried and checked baggage for items not allowed into or out of the state. This requirement adds to the departures and arrivals processing of passengers and baggage. The recommended plan considers this unique condition and acknowledges the need for facilities and their detailed requirements to ensure proper inspections by both United States Department of Agriculture (USDA) and the Hawaii Department of Agriculture (HDOA).

Generally for this master plan level of detail within the terminal – for departing passengers, baggage must be inspected either prior to checking it as "aircraft checked baggage" or carrying it on board aircraft as "hand carry"

06MP06-5D-11/13/08

LOWER LEVEL - LONG RANGE



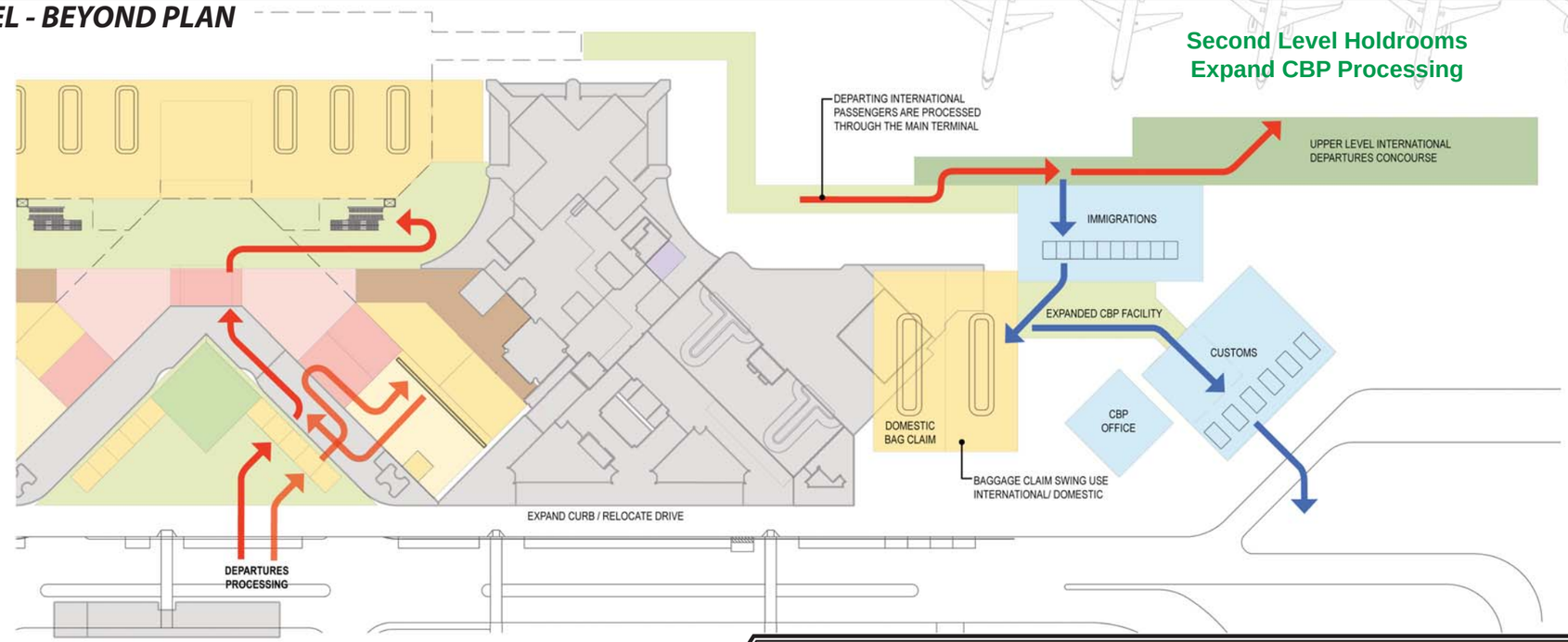
LONG RANGE

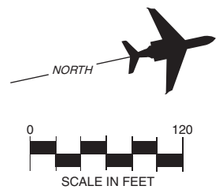
- **LR1-1** Airport Administration
- **LR1-2** CBP Facility
- **LR1-3** Arrivals Cooridor
- **LR1-4** Passenger Loading Bridges

TERMINAL PLAN LEGEND

- Public Area
- Holdroom
- Airline
- Ticket Queuing
- Concessions
- Aviation Department
- Security
- Security Queuing
- Restroom

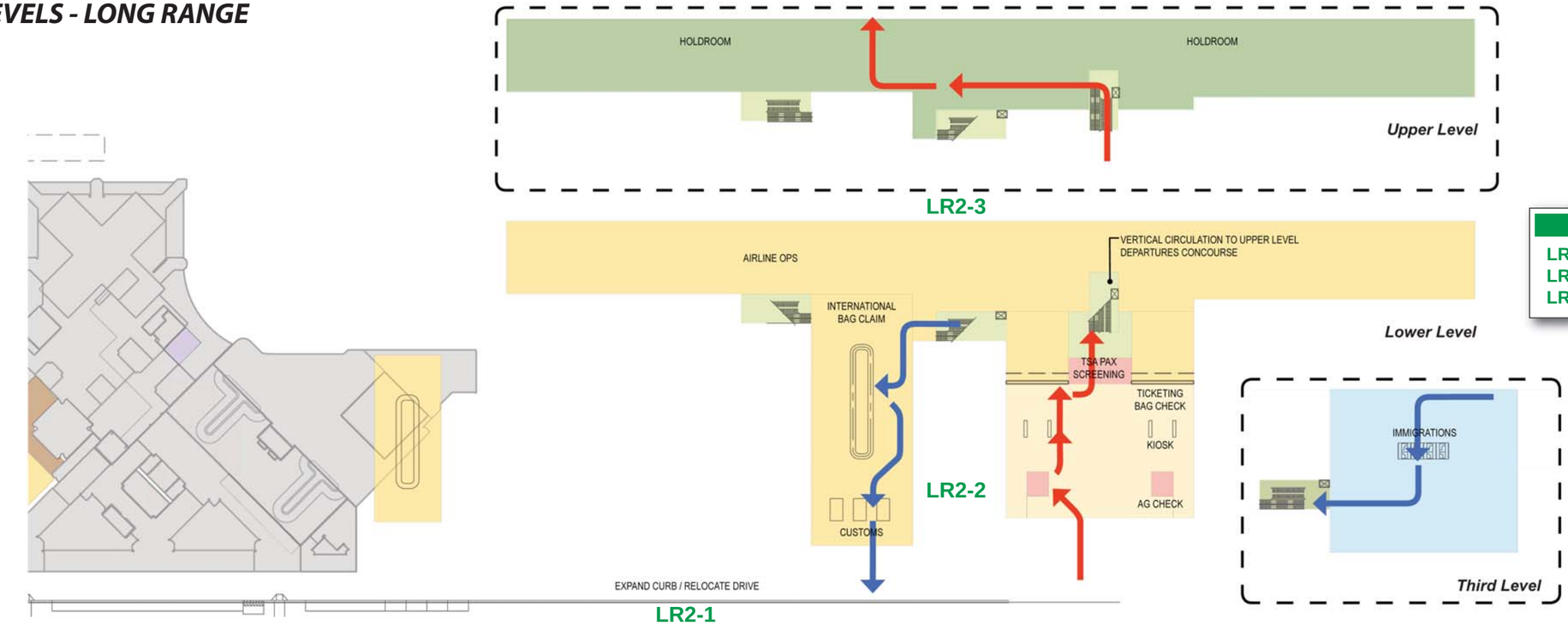
LOWER LEVEL - BEYOND PLAN





06MP06-5E-5/19/08

ALL LEVELS - LONG RANGE



LONG RANGE

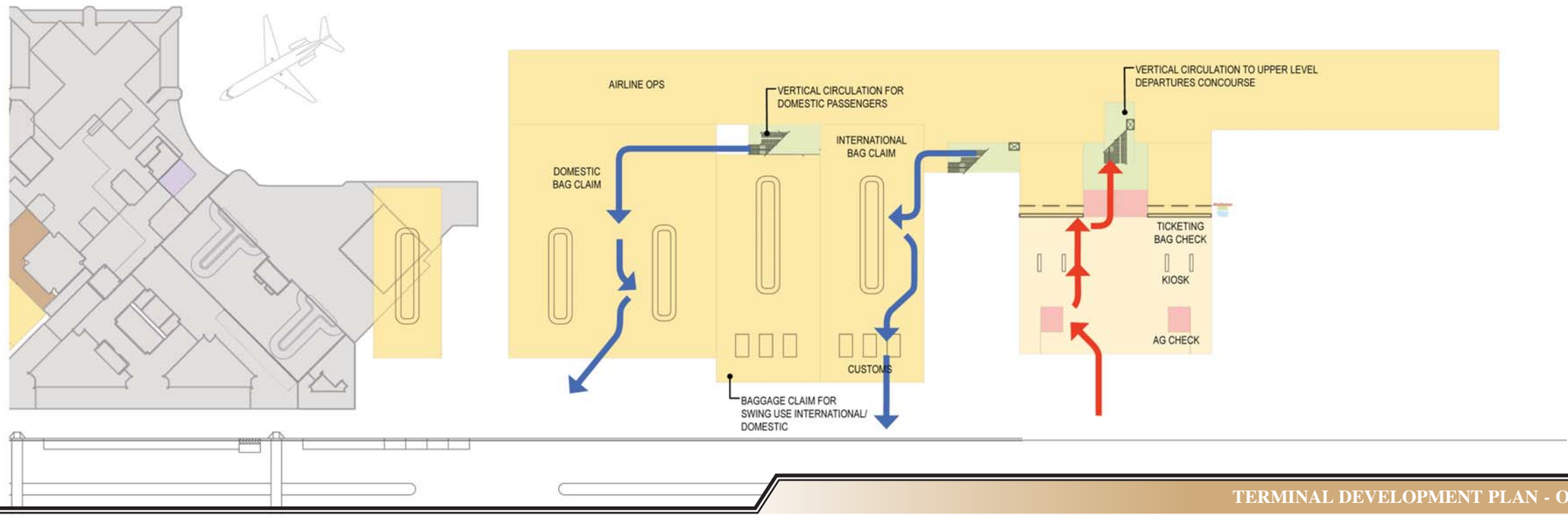
- **LR2-1** Expand Curb / Relocate Drive
- **LR2-2** North Terminal
- **LR2-3** Passenger Loading Bridges

TERMINAL PLAN LEGEND

- Public Area
- Holdroom
- Airline
- Ticket Queuing
- Concessions
- Aviation Department
- Security
- Security Queuing
- Restroom

LOWER LEVEL - BEYOND PLAN

Expand North Terminal Gates
Expand North Terminal CBP Processing

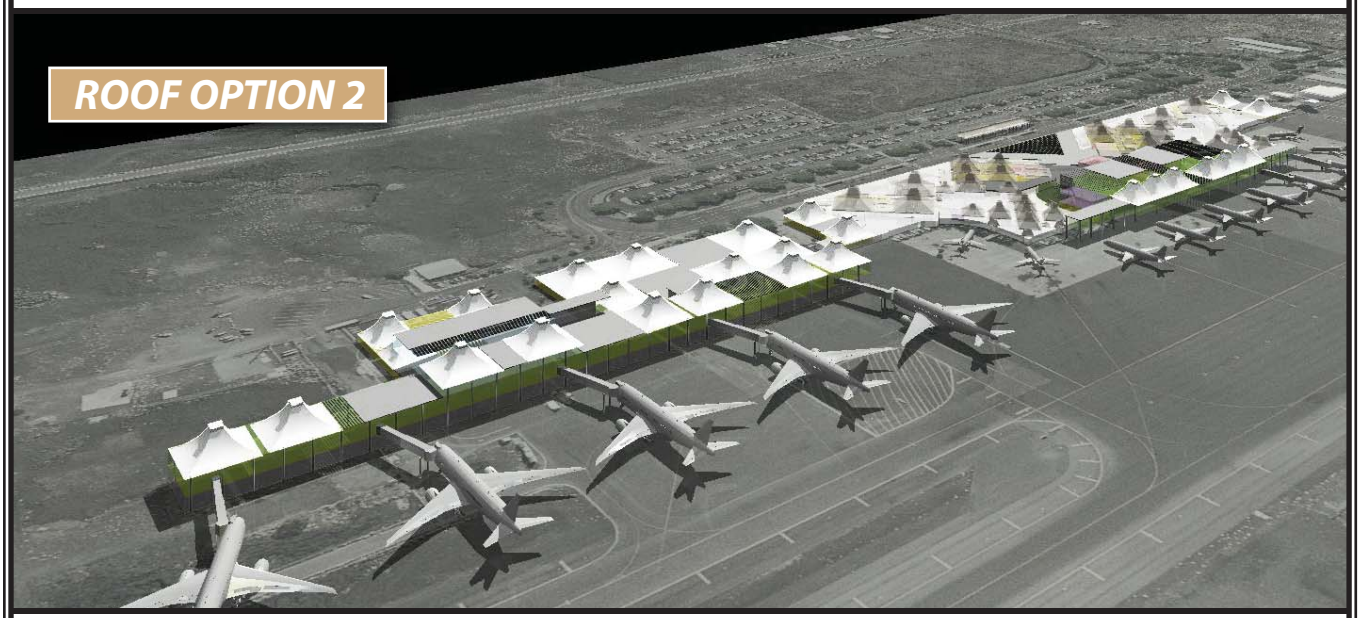


NORTH

0 120

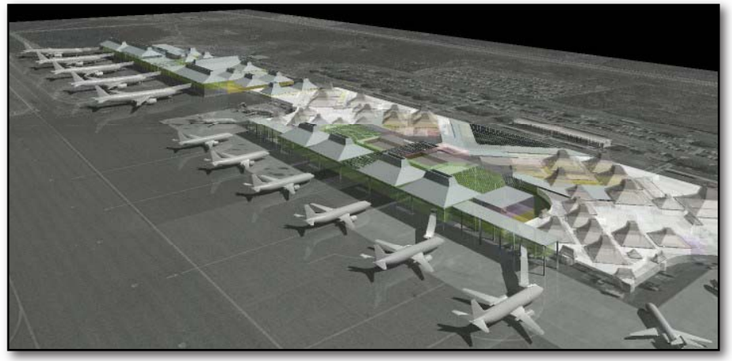
SCALE IN FEET

06MP06-5F-5/19/08

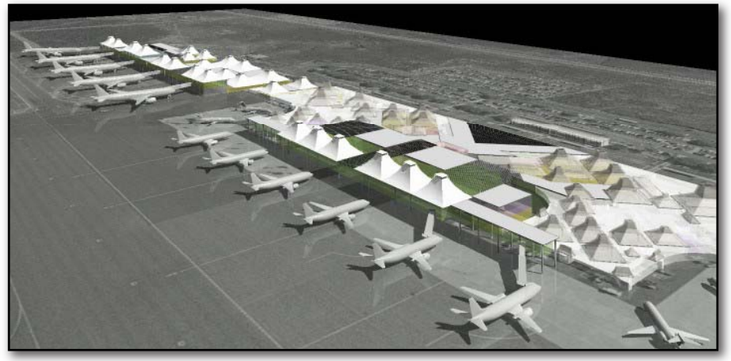


FULL BUILDOUT TERMINAL AREA MODEL

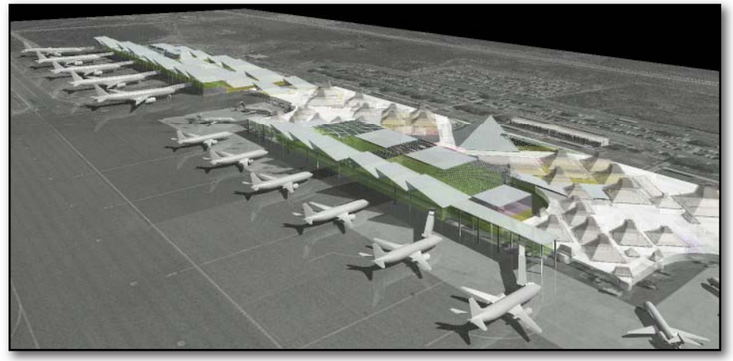
Exhibit 5F



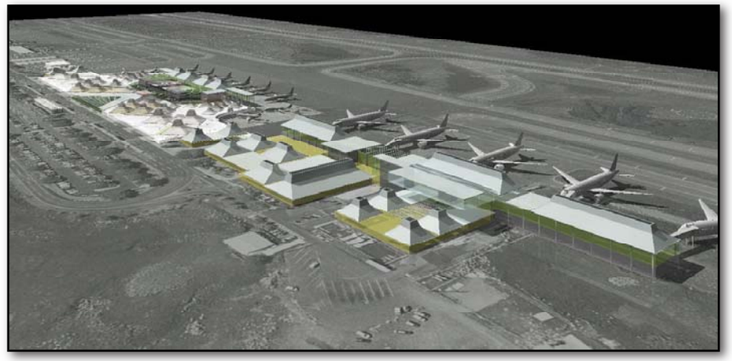
View of Initial Development From SW-Roof Option 1



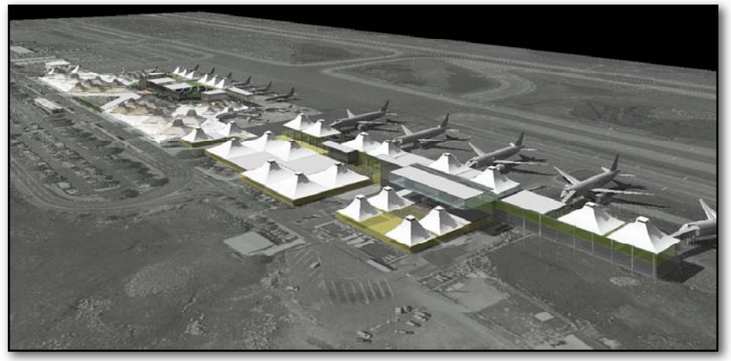
View of Terminal Area From SW - Roof Option 2



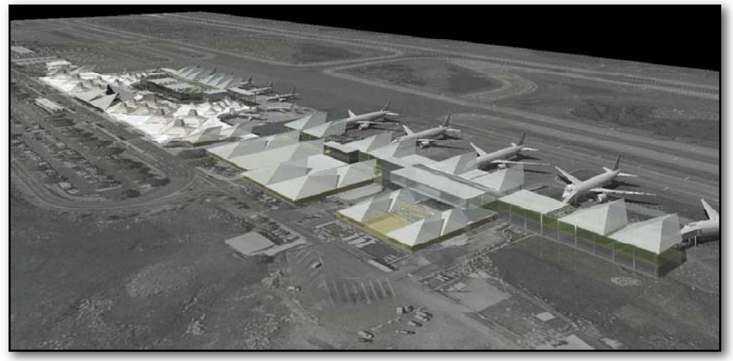
View of Terminal Area From SW - Roof Option 3



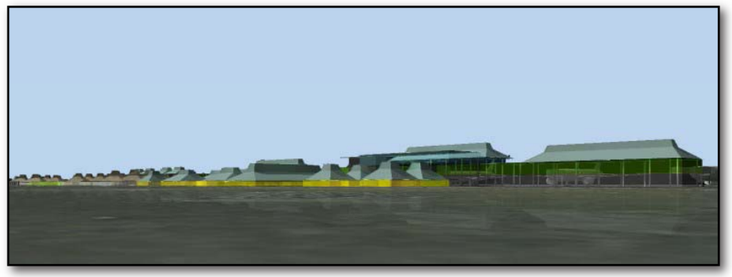
View of Terminal Area From NE - Roof Option 1



View of Terminal Area From NE - Roof Option 2

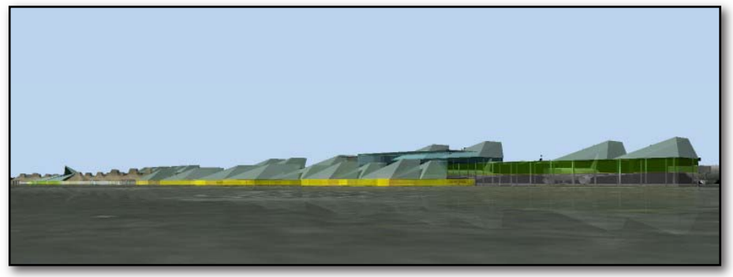


View of Terminal Area From NE - Roof Option 3



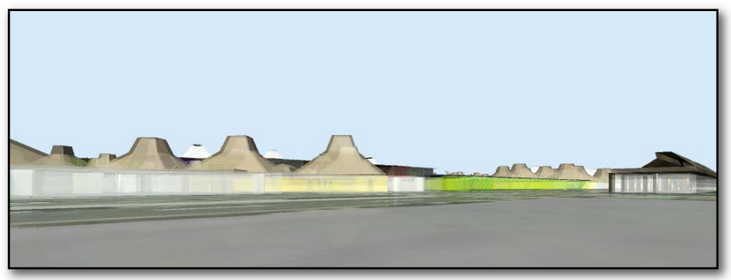
View of Terminal Area From NE - Roof Option 1

View of Terminal Area From NE - Roof Option 2

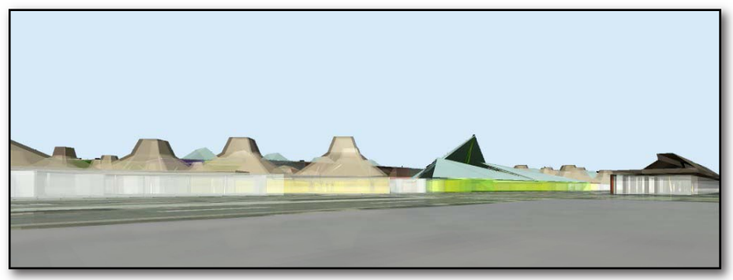


View of Terminal Area From NE - Roof Option 3

View of Terminal Area From SE - Roof Option 1



View of Terminal Area From SE - Roof Option 2



View of Terminal Area From SE - Roof Option 3

baggage. For arriving passengers, a declaration of contents not allowed into the state is required, and inspection of checked or hand carry baggage must be conducted prior to departing the airport.

Space must be allocated in the master plan to support these inspection functions as well as for agency offices to support operations and staff. The recommended plan includes spaces allocated to the inspection of checked baggage either prior to checking the bag with the airlines (as it occurs now) or after if it is in-line within the outbound baggage system, but prior to TSA screening of checked baggage.

The plan also includes an area to screen hand-carried baggage prior to passengers entering the holdroom area for mainland and international departures. The plan includes baggage claim additions of new buildings and claim devices mainly to serve larger aircraft. These buildings would include adequate space for inspection areas prior to their controlled exit points. Space is also provided in the plan for processing live domestic animals that arrive as checked baggage.

The plan includes office space within the terminal buildings adjacent to departures processing for both agencies, as well as a centralized joint-use USDA/HDOA marshalling area with direct airside access for aircraft belly freight cargo. If interim facilities are needed due to vacation of existing space in order to build new facilities, they will accommodate that agency's requirements for operations. Detailed programming for both agencies should be conducted prior to the design phase of future projects.

- AIRPORT REVENUE – CONCESSIONS

Airport concessions are important to the level of service provided passengers, visitors, and employees at the airport as well as for generating airport revenue. The airport currently has approximately 8,200 s.f. of concessions space that will be increased to approximately 15,800 s.f. in the Initial Development Phase and to 19,500 s.f. in the Long Range.

The majority of concessions are planned to be located beyond the TSA security checkpoint as that is where passengers tend to spend most of their time waiting before boarding flights. These concessions can also serve employees at the airport.

Concessions are also planned to be available to visitors prior to the security checkpoint. The type will be determined by market conditions.

The concessions post-security are located in three areas. Immediately after the TSA security checkpoint and upon turning to the north or south depending on gate location, passengers will encounter concessions opportunities laid out in a "shopping street" type arrangement. Immediately after the shopping street arrangement, is a second area for concessions that will front the existing departures courtyards. This area is accessible to all passengers, though it is directly adjacent to gates for interisland travel. A

centralized concessions area is also located in the second level departure area serving mainland flights.

In support of the concessions and departures process, the restrooms adjacent to the two interisland departures courtyards are anticipated to more than double in size. The second level departure area will have restrooms in two locations adequate to support the mainland flight activities.

- DESIGN AND CONSTRUCTION PHASES

The terminal development plan is a strategy that offers guidance for the development of the airport over time to address capacity, operational requirements, safety, and necessary services for all users of the airport.

This plan also recommends maintaining and enhancing the unique architectural character of the air terminal complex and a course of action describing a facilities development sequence to make improvements.

The next phase of study, definition of the projects in further detail, prior to detailed design and construction is a necessary step. This phase of study should be conducted with the participation of user groups that will occupy the new facilities. In addition to detailed programming and concepts this definition phase should include definition of administrative systems to implement the projects, financial strategies to support their costs, detailed scheduling for phasing and staging of construction, identification of agency requirements and reviews for permitting development (such as for broader concerns like shoreline management and detail concerns like storm water management during construction), and other design standards necessary to management of development at a major institution as an airport.

- AIRPORT SECURITY BLAST MITIGATION

The US Department of Homeland Security (US DHS) has requirements, guidelines and recommendations for air terminal buildings related to their ability to withstand forces generated by vehicle transported explosives detonated within the terminal area of airports. DOT-A conducted a separate study of the main passenger airports in the state with recommendations for physical improvements of the air terminal buildings or operational procedures for controlling vehicle access to the terminal and/or prox-imity of parking based on size categories of vehicles – or a combination of both. This master plan identifies expansion of terminal parking, relocation of the terminal curbs (though not to the 300' distance to terminal structures required by the US DHS), and relocation of the main entrance roadway systems in phases. As such, this master plan allows for layout of interim vehicle access control for the airport terminal area to enforce operational procedures that meet the various "state of alert" US DHS requirements.

- INTERIM AND TEMPORARY FACILITIES

Implementation of new facilities within the existing operating terminal area will, in some instances, require relocating airport related operations to temporary facilities. Phasing, staging, and sequencing of improvements and their construction will prioritize completion of new facilities before necessity to relocate existing operations. When temporary facilities are necessary, consideration should be given to locating those facilities in proximity to the functions they will serve. Additionally, detailed requirements for the relocated operations should be identified prior to detailed design of the temporary facilities for airlines, agencies, airport operations, concessionaires and others. This will insure that operational needs (space requirements as well as specialized information technology and communications) are met.

Terminal Parking and Access Loop

The facility requirements indicated that even with the recent additions to terminal area lots, the parking facilities will be marginally undersized by the short term planning horizon. More than 800 additional spaces will be needed by the long range planning horizon level.

With the parking area within the existing terminal loop essentially fully developed, recent additions have been located mauka (east) of the terminal loop road. This is less than desirable as pedestrians from these lots must cross terminal traffic twice. The mauka side of the loop is the area of concern as traffic tends to move faster in this area and drivers are not as prepared to encounter pedestrian traffic here as they are at the terminal curb front.

As parking needs increase, it is recommended that the terminal loop be expanded mauka to Pao`o Street (Road N). This will place all of the terminal parking lots inside the loop road. **Exhibit 5H** depicts the plan for the terminal parking and loop road system.

Pao`o Street between Keahole Street and the proposed new airport access road (Road P) to the north would be converted to a northbound one-way road to become the backside of the terminal loop system. The proposed intermediate terminal improvements could require the curb in front of the terminal to be moved 30 feet mauka (east). If the roadway shift is made, it is recommended that a wider median island and an additional outside lane be planned. The shift and additional width would extend at least to the edge of the parking lot.

This would also require the removal of the building known as the Ground Transportation Building. The building was previously used for rental car counters. It has not been needed for this use since all rental car operations were relocated to their lease areas off Keahole Street and away from the parking lot. The building currently houses a local style eatery, the only restaurant concession outside of secu-

rity on the airport. Since new restaurant facilities will be provided within the terminal modernization, the building will become disposable.

The need for the shift will depend upon the final terminal design. If the design does not require additional mauka space for pre-security queuing, the roadway and the ground transportation building could be maintained.

The parking lot would be divided into short and long term parking. Kupipi Street would bisect the lot with short term parking makai and long term parking mauka. It would also be converted to an internal one-way access spine for entering and exiting parking lots. The main entrance would be at the north end of the loop. Vehicles could enter long or short term parking from this entrance. Exits from the lots would be located farther south with the toll plaza located south of the lots. The toll plaza would exit to the mauka side of the terminal loop. An additional entrance to the long term parking lot could be made available from Pao`o Street. A second entrance to the short term lot could also be developed at the south end of the terminal frontage road.

The short term parking lot would have a higher percentage of spaces than typical. It could be priced to accommodate not just hourly parkers, but also all-day parking by island commuters, as well as overnight users willing to pay a higher rate for close-in parking. The parking as depicted on the plan will accommodate both public and employee parking needs through the long term planning horizon. Additional space is available for expansion beyond the planning horizons. It should be noted that the petroglyphs in the area would be avoided by the parking lot development plan.

The proposed parking plan is purposely designed around preserving the petroglyphs that are located mauka of Kupipi Street. This is a unique historic cultural setting that can be tied into the overall plan for maintaining the Hawaiian sense of place. As will be shown in later discussions of the overall airport land use plan, the petroglyphs are part of the link between the terminal plans, the new site for the Ellison S. Onizuka Space Center, and other areas designed to maintain and honor the Aloha Spirit.

AIR CARGO CONCEPT

The air cargo facilities are currently located south of the passenger terminal and are surrounded by general aviation facilities. The ramp can only accommodate aircraft up to Aircraft Design Group (ADG) III. Larger cargo aircraft must be parked on the ramp north of the passenger terminal. As cargo traffic grows it is recommended that cargo be consolidated to an area north of the passenger terminal and the ATCT. This will not only consolidate the use, but separate it from the general aviation activity at the south end of the terminal area.

Exhibit 5J depicts the recommended plan for the cargo area. The plan is a refinement of Cargo Alternative 2 in the previous chapter. The cargo buildings are aligned parallel to the run-

06MP06-5H-3/23/10

USPS

LONG TERM PARKING

CELL PHONE LOT

Keahole St.

Pao'o St. (Road N)

TOLL PLAZA

Petroglyphs

Kupipi St.

SHORT TERM PARKING

AIRPORT MAINTENANCE EXPANSION

PASSENGER TERMINAL EXPANSION

COMMUTER AIR TERMINAL

LEGEND

- Airport Property Line
- Ultimate Road/Parking
- Ultimate Airfield Pavement
- Ultimate Building

NORTH

0 300

SCALE IN FEET

STATE OF HAWAII 1959

TERMINAL LOOP AND PARKING PLAN

Exhibit 5H

06MP06-5J-3/23/10

LEGEND

- Airport Property Line
- Ultimate Road/Parking
- Ultimate Airfield Pavement
- Ultimate Building
- Airport Traffic Control Tower (ATCT) Site Alternatives
- Passenger Terminal

NORTH

0 300

SCALE IN FEET

Halalu Street Extension

FUEL FARM (ORIGINAL SITE)

Pao'o St. - Road N

WASTEWATER TREATMENT EXPANSION AREA

RESERVE FOR TRUCK STAGING

FLIGHT KITCHEN

USPS

TERMINAL PARKING

RESERVE FOR AIRPORT SUPPORT

RESERVE FOR FUTURE TERMINAL EXPANSION

JOINT INSPECTION FACILITY

Hapu'upu'u Street

FAA

ATCT

ARFF

PASSENGER TERMINAL EXPANSION

Current BRL

AIR CARGO

Service Road

REMOTE FUEL STATION

Group VI Taxiway Clearance/Ultimate BRL

RECOMMENDED AIR CARGO CONCEPT

Exhibit 5J

way with apron makai and truck docks and vehicle parking mauka.

Space is also provided at the south end of the cargo complex for a Joint Inspection Facility building. This is designed to house the Hawaii Department of Agriculture (HDOA), the United States Department of Agriculture (USDA), and other state and federal agencies with jurisdiction over cargo exports and imports. The facility is expected to include inspection areas, treatment areas, office space, and cargo consolidation and deconsolidation areas. The facility is expected to meet all food quality and food safety requirements.

As depicted on the exhibit, the apron is sized to accommodate Group V aircraft, but could also accommodate Group VI on an infrequent basis. The apron is set back from Taxiway A to Group VI design standards as well. Space is provided on the ends as well as on the ramp side of the buildings for storage of ground support equipment (GSE).

Access to the cargo area would be extended from Pao`o Street. Secondary access points are depicted at the north and south ends of the cargo parking lot.

For the terminal loop road to be relocated to Pao`o Street as planned, the primary access for the new cargo area will need to be relocated mauka of Pao`o Street. As shown on **Exhibit 5A**, the cargo access road would then tie into an extension of Halalu Street. Halalu Street would intersect with the future airport access Road P. There will be more discussion on the access system later in this chapter.

Exhibit 5J also depicts the locations reserved for several other support uses that would be developed by others. The new FAA ATCT and the ARFF relocation sites were discussed earlier. While the flightline areas used by the ATCT and the ARFF provide the sightlines and airfield access those uses require, areas just mauka of the flightline are ideal for other uses that support both the passenger and cargo functions. Such support uses planned for this area include a United States Postal Service (USPS) facility, a flight kitchen, and a consolidated airline fuel farm.

The four-acre site owned by the Postal Service is shown on the northwest corner of the intersection of Pao`o Street and future Road P. Although consideration had been given to a potential land swap with the USPS if this site was determined to affect the Master Plan concept, the site actually works well with the recommended concept. The site has good access to Pao`o Street and the utility corridor along it. The site is also in good proximity to the cargo area to aid in the transfer of air mail between the facilities. At the same time, it stays outside the potential long term path of terminal expansion.

Just to the north across the service road from the USPS site is a parcel reserved for a flight kitchen. Mauka of the flight kitchen and across Pao`o Street is the site recommended for the consolidated fuel farm. These locations provide both of these uses with

the landside access necessary for ground deliveries as well as being a short distance from the aircraft they are intended to service.

The new setting for the cargo area and other support facilities provides another opportunity to incorporate the Hawaiian sense of place into what may ordinarily be considered one of the more drab components of the airport. Sufficient space is available to incorporate native landscaping into the area. The façades of the new cargo buildings can be designed in a manner to blend with that of the terminal, ATCT and other new structures on the airport

GENERAL AVIATION CONCEPT

The general aviation (GA) facilities are presently located south of the passenger terminal and on both sides of the air cargo area. As discussed previously, the cargo facilities are recommended to eventually be relocated to the north of the passenger terminal, providing three distinct and separate functional areas for the primary aviation uses on the airport.

Exhibit 5K outlines the recommended concept for the general aviation area. This concept is based upon the input and comment received from the TAC and the public through the alternatives review. The basic premise to the concept is derived primarily from GA Alternative 3. Aspects of the redevelopment of the northern portions of the area, however, are from Alternatives 1 and 2.

The concept essentially maintains the subdivision of function within the general aviation area that exists today. The areas south of Taxilane K would continue to primarily serve business jets and other corporate aircraft. The areas north of Taxilane K would continue to serve uses related to smaller general aviation aircraft.

Property mauka (east) of U`u Street has been divided into four areas for possible lease to private developers through a request for proposal (RFP) process. The DOT-A intends these areas to have corporate/general aviation facilities constructed to assist in meeting the future demands as expressed by the general aviation community. The areas are to be developed in accordance with the DOT-A's *Development Standards for Leased Property,* and can include, but are not limited to, storage hangars, maintenance facilities, aircraft parking, and associated infrastructure.

The four areas are essentially defined by the area between U`u Street and Pao`o Street (Road N). They are divided by extensions of Taxilane L and the future roads as shown on **Exhibit 5K**. The parcels range in size from 11 to 17 acres for a combined total of 58.59 acres. The following discussion and the layouts within these parcels as depicted on **Exhibit 5K** are intended to demonstrate the general recommended concept based upon input obtained from the general aviation community, the TAC, and the general public. It is not meant to restrict or limit the general development opportunities and options for the parcels.

06MP06-5K-3/23/10

LEGEND

- Airport Property Line
- Ultimate Airfield Pavement
- Ultimate Building
- Ultimate Road/Parking
- Lease Parcels
- General Aviation Development Areas

NORTH

0 300 600

SCALE IN FEET

HEAT EXCHANGER SITE

Pao'o St. - Road N

AREA D

AREA C

AREA B

AREA A

TOLL BOOTH

AIRPORT MAINTENANCE EXPANSION

PARKING

T-HANGARS

Road M

EXECUTIVE BOX HANGARS

CONVENTIONAL HANGARS

WASH RACK

U'u Street

COMMUTER AIR TERMINAL

GA SPECIALTY SUITES

GA RAMP

INTERIM COMMUTER AIR TERMINAL

Taxilane K

FBO

FUEL STORAGE

FBO

Taxilane L

APRON EXPANSION

RECOMMENDED GENERAL AVIATION CONCEPT

Exhibit 5K

The two northern areas (Areas C and D) are recommended to primarily serve typical general aviation uses. T-hangars and other facilities that can store and serve small general aviation aircraft (primarily in ADG I but up through ADG II) are recommended for this area.

The two southern areas (Areas A and B) are recommended to primarily serve cabin-class and corporate aircraft through at least ADG III. This could include conventional hangars to store larger aircraft and "corporate parcels" for developing corporate hangars and/or maintenance hangars.

Increased traffic and proposed revisions to the terminal loop road will make it imperative to provide access to the general aviation area that avoids the terminal loop. Therefore, the general aviation area will need to be made accessible from Pao`o Street via Road M and other roads extending makai from U`u Street.

Road M will not only provide access to two of the parcels, but will also become the access point for the two fixed base operator (FBO) sites already established fronting the apron in this core area. This road will need to be developed before U`u Street can be cut off to extend taxilane access into the parcels. The fuel storage facilities will remain between the two FBO sites and will be used to supply fuel for general aviation and corporate aircraft even after the airline fuel farm is developed north of the passenger terminal.

The ramp south of Taxilane K remains as a corporate ramp with expansion planned south of Taxilane K. If necessary, this ramp could be extended farther south of that shown on **Exhibit 5K** to meet jet parking needs. The south ramp expansion also includes a location for a wash rack next to a site that would be reserved by DOT-A for future consideration as to its use.

North of Taxilane K is the site of the interim commuter air terminal (CAT). The interim CAT will be the first LEED-certified facility on the airport. It will provide commuter terminal services until such time as a permanent location can be developed on the site now occupied by the ATCT and the ARFF. At that time, the interim terminal can be converted into a GA terminal and GA offices.

As with other new structures throughout the airport, the interim commuter terminal is being designed to carry forward the Hawaiian sense of place. The architecture fits with the terminal design, with an open air plaza available for awaiting aircraft and watching the activity in the general aviation area. First as the interim commuter terminal and later as a GA terminal, this facility can remind the user and visitor of the early days of flight around the islands.

The buildings on parcels immediately north of the commuter terminal are on small parcels that can continue to be used for general aviation businesses. Proceeding north along the flightline, the current cargo buildings can be

converted to GA specialty suites after the cargo facilities are moved north of the passenger terminal. The specialty suites would have subdivided space in each building that can be leased to various general aviation specialty operators for flight training, small aircraft charter operators, avionics shop, etc. The ramp in front of these buildings would also be converted to general aviation parking.

Under this concept, the current T-hangars and tie-downs will be able to stay in their location between the existing ARFF and cargo buildings. The transient general aviation parking currently located in front of the existing ATCT, however, would ultimately trade locations with the existing commuter parking when the permanent commuter terminal is developed just south of the passenger terminal at the location of the current ATCT and ARFF.

As depicted on **Exhibit 5K**, the commuter terminal's planned permanent location at the south end of the passenger terminal becomes the transition area between general aviation and airline activity. The commuter terminal is used by passengers flying on smaller aircraft between other airports within the Hawaiian Islands. Some passengers do transfer to commercial airline flights in the main terminal. This location will make such transfers within walking distance. In addition, day commuters will be able to use the terminal loop road to be dropped off at the commuter terminal or they can park at the south end of the short-term parking lot just across Kupipi Street.

As shown, the new permanent commuter terminal could be designed to match with the architectural style of the main terminal.

As mentioned earlier and depicted on **Exhibit 5A**, helicopter facilities are planned for the area immediately mauka (east) of the helicopter TLOF. The plan includes an access road extended from Pao`o Street to parking on the south and east sides of the helicopter terminal area. A terminal facility and vehicle parking is planned along the south edge of the parking ramp to serve helicopter tours and other operations.

Hangars are planned on the east side of the parking ramp for maintenance and storage of helicopters. Additional parcels for helicopter operators are planned for lease north of these facilities as the need arises.

LAND USE PLAN

The objective of airport land use planning is to coordinate uses of the airport property in a manner that is both functional with the design of the airport and compatible with the airport environs. There are two primary considerations for on-airport land use planning. First is to secure those areas essential to the safe and efficient operation of the airport. Second is to determine compatible land uses for the balance of the property which would be most advantageous to the airport and the community.

Exhibit 5L depicts the recommendations for the ultimate land

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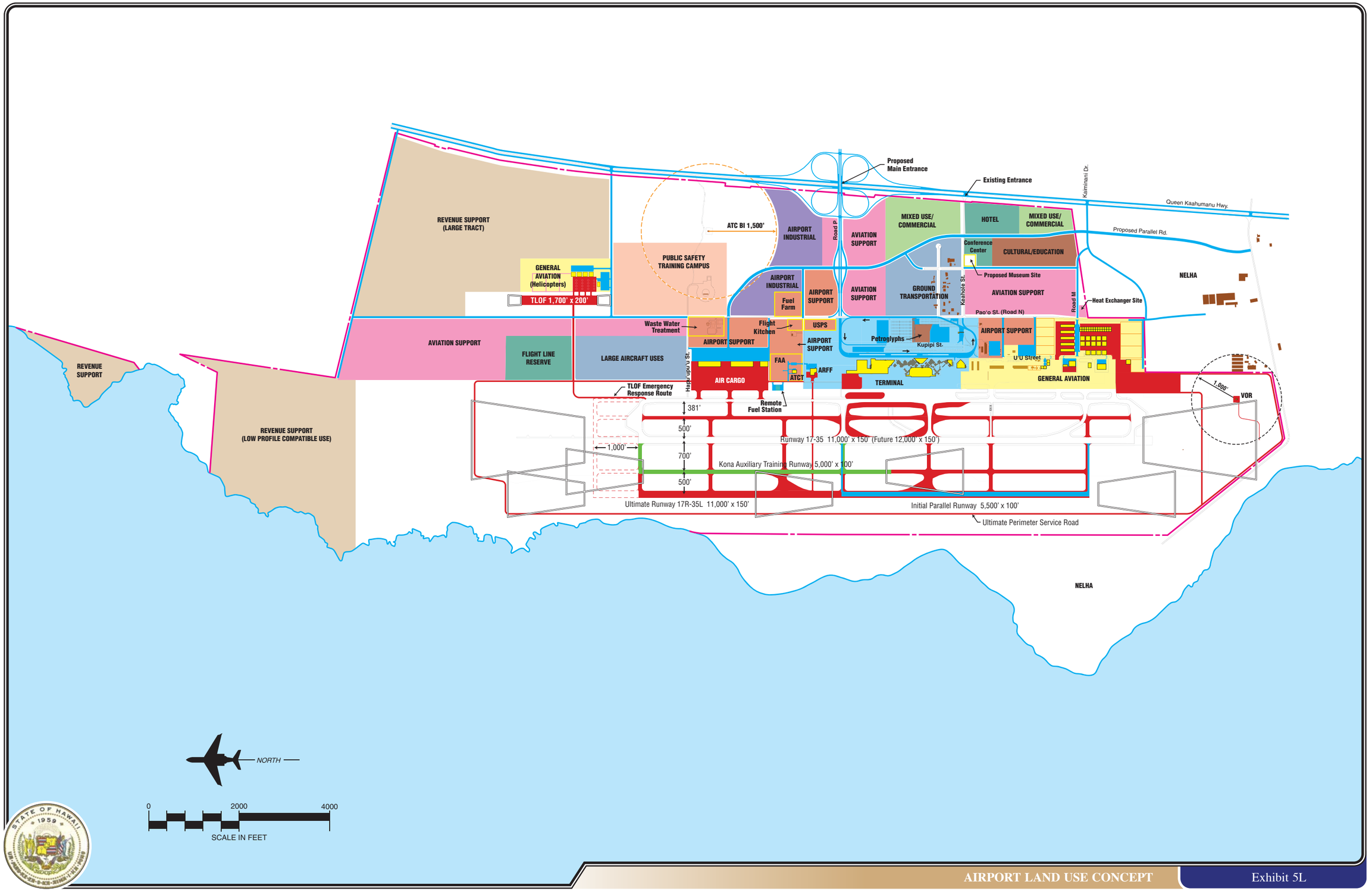

AIRPORT LAND USE CONCEPT

Exhibit 5L

use development on the airport. The long range future for an area may differ from the current use of the property. In these areas, major expansion or improvements of the existing use should be discouraged. If expansion is needed, it should be directed to the appropriate use areas depicted on the land use plan.

Several airport land use categories have been identified. The primary uses such as passenger terminal, air cargo, general aviation, and airport support have all been discussed in detail in the previous sections. These are the uses that should occupy the flightline and must be completely accommodated before other uses are considered.

Once these uses are provided for now and into the future, other uses that are compatible with and complement the primary uses can be considered. They should provide a function that is either a complimentary service to the airport (i.e., warehousing and storage, ground transportation, emergency training, hotel/conference center, etc.), a cultural tie that enhances the "Hawaiian sense of place" at the airport, and/or enhances revenues in support of the airport operation.

Flight Line Land Uses

Next to the airfield itself, the flightline is the most valuable commodity of an airport. It is the interface between air and ground transportation. For this reason, the plan calls for the area from the parallel Taxiway A to Pao`o Street to be reserved for uses directly relating to the primary functions of the airport.

Starting at the south end of the flight line is the area planned for general aviation uses. Centered on the flightline are the passenger terminal function and the terminal loop road and parking lot. As with GA, space is reserved to the north that can accommodate the passenger terminal needs through the planning horizon activity levels and beyond. To the north of the passenger terminal is the area reserved to be developed for air cargo in the future. This plan provides a separation of the three functions, yet allows interaction between the functions because of their proximity.

Areas for airport support uses are designated between the three functions. The area mauka (east) of U`u Street between the GA and terminal uses currently supports the airport maintenance facilities as well as some airport-related transmitter equipment. Space is allowed for the expansion of the maintenance facilities as well as other airport support uses in the future. Between the terminal and air cargo areas is a corridor that will accommodate the ATCT and other FAA-related functions, the ARFF, a flight kitchen, and a Postal Service facility that will handle the air mail going in and out of the airport. The support corridor will actually extend mauka west of Pao`o Street in this area to include the airline fuel farm site.

There still remains an area of flightline north of the cargo area. A portion of this area has been designated for large aircraft uses. This is

envisioned to be the location for airline maintenance facilities and for hangars that could accommodate the largest of corporate aircraft (ADG III and larger). Because these hangars will be of significant height, the area does not extend completely back to the extended Pao`o Street. There will be some restrictions on the height of buildings in the area marked for aviation support to ensure that line-of-sight can be maintained between the new ATCT and the helicopter facilities.

An additional area farther north along the flightline is simply placed in Flightline Reserve at this time. The need for this space will be long term, and there may be pressure to put it into other uses. Other temporary uses might be examined on a case-by-case basis, but they should be allowed only with the stipulation that this area could ultimately be needed for uses requiring airfield access.

Second Tier Land Uses

The second tier encompasses the airport property mauka of Pao`o Street (Road N) or beyond the runway protection zones. Priority in this area is given to access routes to the flightline (to be discussed in the next section) and to uses that directly support the airport function.

Helicopter Facilities - The helicopter facilities are actually a flightline function, but their flightline is the helicopter TLOF located 3,000 feet mauka of the north end of Runway 17-35. This allows for independent operation of helicopter activity at the airport, thereby increasing the capacity of the runway system. Thus, space is reserved for general aviation facilities related to helicopters, including a small terminal, hangars, and development parcels.

Ground Transportation Facilities - The center core area between Keahole Street and future Road P is the current and future location for ground transportation facilities. This consists primarily of rental car facilities. Additional area for ground transportation facilities has been reserved north of the existing facilities.

Aviation Support - The area immediately mauka (east) of the future terminal loop, north of the ground transportation facilities, and along Road P is reserved for aviation-related uses. This is anticipated to be an area that could host government and/or commercial uses that support the terminal and ground transportation functions. It could also host overflow parking areas. The area located mauka (east) of the general aviation area is also depicted as aviation support uses. The northern portions of this area nearest Keahole Street could house airport administration, FAA, TSA, airline and other airport-related offices that do not have to be at the flightline in a campus-like setting. Further to the south, the area would support uses more likely to be attractive to businesses that rely on general aviation for travel and small cargo shipments between islands, or for access to corporate jets and airline travel overseas. A parcel immediately south of the proposed extension of Road M is indicated

as a potential location for an airport heat exchanger site in cooperation with NELHA.

Airport Industrial - The area mauka of air cargo is specifically envisioned for industrial/warehousing uses that compliment the air cargo function. This would be an ideal location for freight forwarders and for industries that can take advantage of the proximity to the air cargo facilities for just-in-time deliveries of raw goods and supplies and for similar shipments of finished products.

Public Safety Training - An area for a public safety training campus is another use that relates to airport needs, but also has the potential to serve the broader-based community. An 80-acre campus is depicted south of the helicopter facilities. The location encompasses the current fire training pit, which could be developed into a regional ARFF training facility. The campus is envisioned to include classrooms, meeting rooms, and field areas for emergency training. The proximity to the helicopter facilities could allow it to support the public safety training function as well.

Hotel/Conference Center - An area south of Keahole Street and near the future Ellison S. Onizuka Space Center site is designated for a hotel/conference center. Many airports support hotels on-site in support of flight crews and overnight stays for passengers traveling early the next day. The conference or meeting center further supports the airport and hotel functions.

Cultural Education Center - In support of the modernization of the passenger terminal, the Ellison S. Onizuka Space Center must be relocated from its current location between the north and south passenger terminals. A location along the south side of Keahole Street and mauka (east) of Halalu Street that is closer to Queen Kaahumanu Highway is the preferred new site.

It is important to not only the Onizuka family, but also the DOT-A, the citizens of the West Coast, and all of Hawaii, that the Ellison S. Onizuka Space Center maintains a place of prominence and respect. While it would no longer be situated within the core of the terminal area for security and functional reasons, the Space Center would still anchor a spine through the airport that ties the historic aspects of Hawaiian culture with air transportation and the future.

The Space Center will anchor an area designated as a cultural education center. This is envisioned as an area that can host museums, displays, and shops in a park-like setting that captures the Hawaiian sense of place by showcasing the history and culture of the is-land.

This area would extend to the airport boundary with the Natural Energy Laboratory of Hawaii Authority (NELHA). The airport is already planning to share technology and resources with its neighbor, such as utilizing deep sea water cooling for airport buildings. Depending upon NELHA plans for educational facilities near

the entrance to their facilities, there may be an opportunity for the educational themes to be linked as well.

Mixed Use Commercial - Other areas of property are designated for uses that can further enhance revenue in support of airport operations. Mixed use commercial is planned along the frontage of Queen Kaahumanu Highway with access from the proposed Parallel Road. All would be required to fit into the architectural style reflective of the rest of the airport.

Other Revenue Support – There are large tracts to the north that could further support the revenue stream of the airport. As depicted on **Exhibit 5L**, these include a single large tract in the northeast corner of the property and a tract north of the runway system. Because of its location on the approach to the runways, this tract is recommended for a low profile use that would be compatible with aircraft noise levels of 60 to 70 DNL.

Airport Access and Circulation System

Exhibit 5L also depicts the access and circulation concept for the airport. The current access is via Keahole Street from Queen Kaahumanu Highway. The future Road P alignment offers opportunities not only to develop an expandable new access point to the highway, but also to connect to an arterial roadway system as it develops mauka (east) of the airport and Queen Kaahumanu Highway. This new access point can be developed first as a signalized intersection, but could ultimately become a grade-separated intersection as the main entrance to the airport from all three directions.

A road system is planned to develop makai (east) of Queen Kaahumanu Highway in support of a limited access plan. The Keahole Street intersection and any other interim access points that might be considered would be restricted to right in-right out only after the development of Road P.

Road P also provides better than a mile separation from the current highway intersection at Kaiminani Drive. Kaiminani Drive currently extends only mauka from the highway, but could be extended makai to provide access for both NELHA and the airport. As depicted, this roadway would become Road M on the airport and would provide access along the southern boundary and into the general aviation area.

The interior access system as shown provides the framework of arterials and connectors to serve the airport and its land use plan. Road P is planned to become a boulevard-type entrance into the airport. The roadway would terminate at Pao`o Street into the terminal loop road.

The current section of Pao`o Street between Road P and Keahole Street will become part of the terminal loop system. North and south of the terminal, however, Pao`o Street will still provide access just mauka (east) the north and south flightlines. To the north, Pao`o Street will continue to run by the entrance to the future cargo area, and the new entrance route to the future

helicopter facilities. It can ultimately be extended further north as needed to serve future development of airport properties. To the south, it will continue to extend mauka (east) the general aviation area.

A proposed parallel road located closest to the highway will ultimately relieve Pao`o Street of the north-south circulation. This road is planned to ultimately run from its southern intersection at Kaiminani Drive, north across Keahole Street before curving slightly west to an intersection with Road P. The proposed road would then continue north before turning makai (west) to intersect with Pao`o Street at the entrance to the air cargo area.

Other north-south routes of shorter lengths providing access will continue to include U`u Street serving a portion of the general aviation area, and Halalu Street providing access through the rental car area and south of Keahole Street to the Road M extension.

The Kona Community Development Plan (CDP) proposes a transit line that links the airport to a system that will run through the Kona Districts. As a major transportation center for the island, it is important for the airport to be included on this line. The route that the line takes on the airport, however, will need to be coordinated closely with DOT-A. The preferred routes would appear to be along Road P, the terminal loop, Keahole Street, and the proposed parallel road. This would focus on providing access to the core of the airport, including the terminal, the hotel/convention center, the Ellison S. Onizuka Space Center, and the cultural education center.

DEMAND-BASED CAPITAL NEEDS PLAN

With the airport development concept established, this section identifies the capital projects expected to be needed within each planning horizon. The overall cost of each project will be examined and presented in a demand-based schedule. The scheduling is based upon the key milestones for each planning horizon established earlier in the master plan and summarized in **Table 5B**.

TABLE 5B
Aviation Demand Planning Horizons
Kona International Airport at Keahole

	Base Year (2006)	Short Term	Intermediate Term	Long Term
Annual Passengers	3,033,212	3,472,000	3,819,000	4,721,000
Annual Air Cargo (Tons)	32,390	39,000	45,000	62,000
Based GA Aircraft	61	102	118	160
Annual Operations				
Airline	37,436	39,800	41,400	45,800
Air Cargo	4,372	4,700	5,100	6,100
Other Air Taxi	9,116	15,500	18,000	24,000
GA Itinerant	18,340	31,000	36,000	48,000
GA Local	54,650	89,000	101,000	134,000
Military	19,304	30,000	30,000	30,000
Total Operations	143,218	210,000	231,500	287,900

Many of the development items included in the recommended concept will need to follow demand indicators. For example, the plan anticipates the growth in operations to require the additional runway capacity. This is premised, in part, upon the anticipated growth of general aviation traffic at the airport.

The DOT-A is attempting a request for proposal (RFQ) for third party development of general aviation hangar facilities on the airport. This is a demand that is currently underserved, and is likely to serve to increase general aviation operations. If this occurs as anticipated, the DOT-A will need to move forward with airfield capacity enhancements to relieve airfield delays.

If the growth does not transpire as anticipated, airfield capacity development can and should be delayed. As a result, the earliest capital expenditures should be undertaken as needed which leads to a responsible use of capital assets. Some development, however, does not necessarily depend on growth in demand, such as pavement maintenance and projects related to safety. These types of projects are associated with day-to-day operations and should continue to be monitored and identified by airport management.

The cost estimates presented in this chapter included costs for design, engineering, construction inspection, and program management. The capital costs presented here should be viewed only as estimates subject to further refinement during design. Nevertheless, these estimates are considered reasonable for planning purposes. Cost estimates for each of the development projects are listed in 2008 dollars.

The following subsections and exhibits depict the demand-based capital needs plan for KOA. The next step in **Chapter Six – Financial Plan** will be to relate the needs to the funding sources anticipated to be available. Subsequently, the Financial Plan may prioritize projects further based upon funding capabilities. The following is a discussion of projects in each planning horizon.

SHORT TERM PROJECTS

The short term planning horizon places its major emphasis on projects with the highest priority. Terminal modernization is the key focus, but projects to satisfy the currently underserved general aviation demand are also included, along with a new ARFF station and a utilities master plan. Total costs of short term projects presented on **Exhibit 5M** are estimated at $140.7 million.

Airfield - Short term airfield improvements are limited to the expansion of the terminal apron to the west. The expansion essentially pushes Taxiway A 114 feet makai (west) where it passes by the terminal. This is needed in conjunction with the terminal modernization to maintain aircraft circulation during construction and provide adequate clearances for Group V air-

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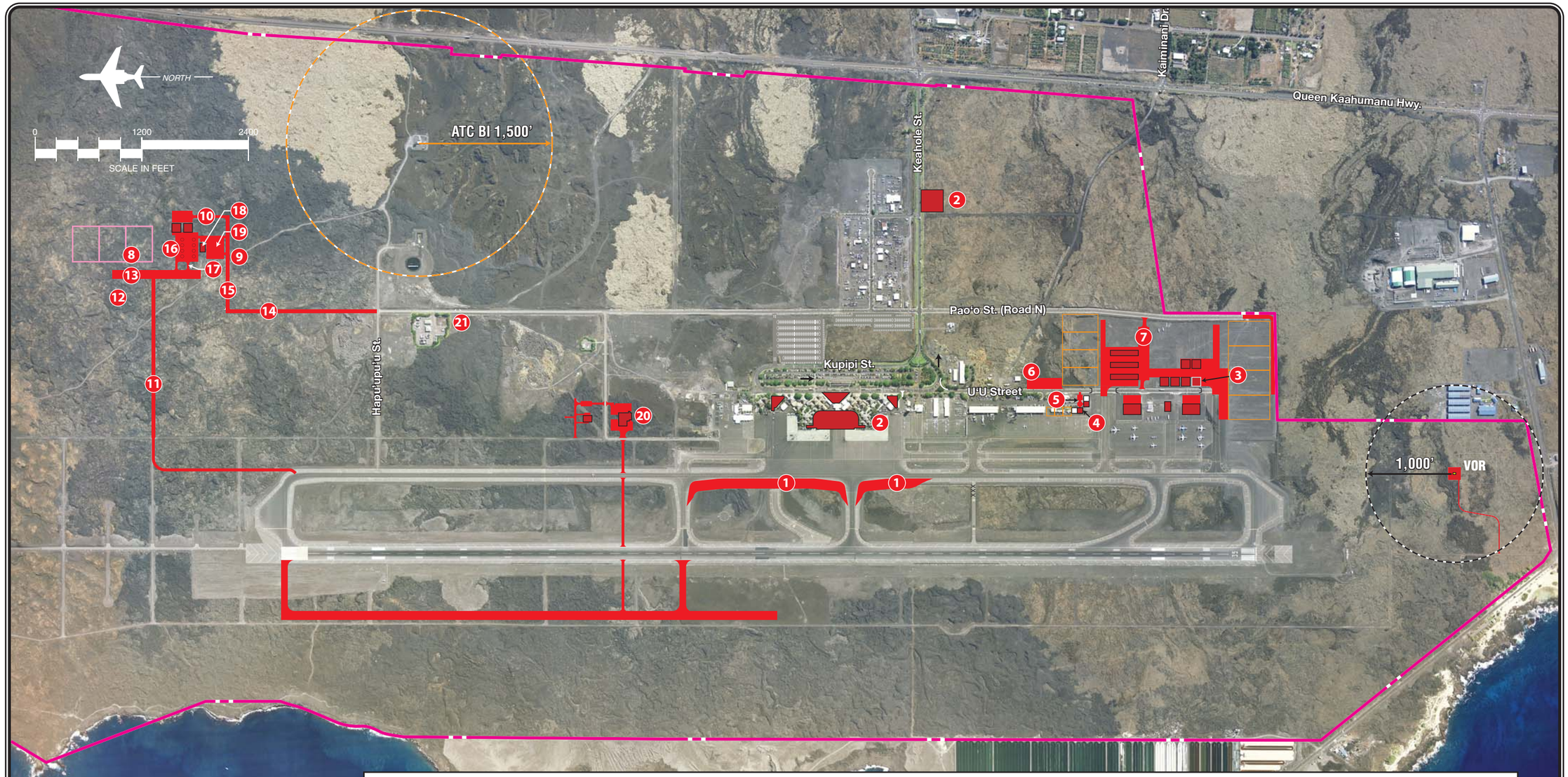

LEGEND

- Airport Property Line
- Lease Parcels
- Short Term Development

Existing Facilities per Photograph

SHORT TERM PLANNING HORIZON

	Airfield	
1	Terminal Apron Expansion West	$9,419,000
	Passenger Terminal	
2	Phase I Terminal Modernization/Expansion	$94,772,000
	General Aviation	
3	Aircraft Wash Rack	$743,000
4	Interim Commuter Air Terminal (CAT)	$3,240,000
5	Interim CAT Parking/Drop-off	$338,000
6	GA Auto Parking (Phase I)	$122,000
7	Road M from Road N	$491,000

	Heliport	
8	Heliport Area Site Preparation/Drainage	$631,000
9	Extend Utilities to Heliport Site	$675,000
10	Heliport Mauka Access Road (800 lf)	$605,000
11	Emergency Service Road (20'Wide)	$1,361,000
12	Heliport Area Perimeter Fencing (5,800 lf with 3 gates)	$431,000
13	Initial TLOF 1,000' x 100'	$2,160,000
14	Road N Extension 1,700' North	$1,285,000
15	Access Road East from Road N 800'	$605,000
16	Phase I Helicopter Parking Apron (325' x 332')	$1,748,000
17	Phase I Helicopter Taxiways (2 at 90' x 20')	$58,000
18	Heliport Terminal (100'x 60')	$3,645,000
19	Phase I Auto Parking/Access (5,700 sy)	$577,000

	Support	
20	New ARFF Station	$17,288,000
21	Utilities Master Plan	$500,000
	SHORT TERM HORIZON TOTAL	**$140,694,000**

craft upon completion of the modernization improvements.

Another short term airfield project is included on the exhibit but not in the table. The KATR planned makai of Runway 17-35 is expected to be constructed and used solely by the Department of Defense.

Phase I Terminal Modernization - The staging of the terminal modernization was discussed earlier in the chapter. The size and scope of the program suggests that it will extend beyond the first five years and into the intermediate term planning horizon. Initial projects expected in the short term include baggage claim expansion and upgrades, and other passenger amenities such as upgraded and expanded restrooms and concessions. There is also a major project for upgrading flight information displays (FIDS) the public address system, as well as the installation of fiber optic cable throughout the terminal. In addition, the Ellison S. Onizuka Space Cener will be relocated from the terminal area to its new and permanent location along Keahole Street.

General Aviation Area – The initial projects in the general aviation area are designed to address underserved demand. The Road M project will be a key component for the third party development of the general aviation areas. The development of these areas is expected to start to meet the hangar needs at the airport. An interim commuter terminal is scheduled to be developed to provide additional space for the commuter airlines operating out of the general aviation area. An aircraft wash rack is planned at the south end of the GA area. Additional vehicle parking in the general aviation area is also a key need to be met in the short term.

Heliport – The capacity analysis in **Chapter 3** indicated the airport would exceed its annual service volume (ASV) by the short term activity horizon. The first project planned to relieve capacity is the development of the helicopter takeoff area (TLOF) and associated heliport terminal facilities. The initial TLOF is planned at 1,000 feet by 100 feet with capability to expand in the future. This will allow helicopters to operate independently from the Runway 17-35 environment, thus providing some capacity relief. The other projects are designed to establish a fully functioning and independent helicopter facility.

Support – A new ARFF station is scheduled for the short term to replace the existing facility. The new ATCT is also planned to be operational by the end of the short term (2012). It is anticipated to be developed and funded solely by the FAA.

In addition, a utilities master plan is programmed to address in detail the utility needs for the airport's development.

INTERMEDIATE TERM PROJECTS

As indicated earlier, the terminal modernization program will likely extend into the intermediate term. Other intermediate term improvements

relate primarily to growth in demand. These include the establishment of the parallel general aviation runway, new cargo facilities, and additional growth in the general aviation area. Total cost of the listed intermediate term projects as depicted on **Exhibit 5N** is $267.8 million.

Airfield – While the heliport will provide initial capacity relief for the airfield, the parallel Runway 17R-35L is programmed for the intermediate term to provide additional operational capacity. The initial development is planned at 5,500 feet across the existing runway from the general aviation area. To accommodate the development, the perimeter fence and service road will need to be relocated makai (west) outside the object free area of the parallel runway.

Taxiways extending mauka (east) from the runway end will be developed to provide the initial access for aircraft. Taxiway C will need to be realigned then extended makai across Runway 17-35 to access the south end of the parallel runway. Taxiway G will need to be extended makai across the KATR to access the initial north threshold of the parallel runway.

The partial development of parallel Taxiway E is planned in the intermediate term to provide additional circulation capability as operations increase above 214,000 annually. This includes the section between Taxiways H and D. The new partial parallel taxiway will also permit the development of another exit (Taxiway D) from Runway 17-35. This exit will reduce runway occupancy times as well as reduce taxi distances for larger passenger and cargo aircraft that can't turn off by Taxiway G.

Phase II Terminal Modernization – The second phase of the terminal modernization will complete the expansion and modernization program necessary to meet the airport's needs through the intermediate term planning horizon. Projects are expected to include the consolidation of the ticketing area, in-line bag screening and agricultural inspection, and centralized TSA security screening. A second level departure area for overseas flights will also be completed in this phase.

To accommodate the ticketing area improvements, the front of the terminal will be moved mauka (east), and will require a slight relocation of the road in front of the terminal. The road will also be widened at that time and the terminal loop extended out to the Pao`o Street alignment. This will allow the parking lot to be expanded and reorganized to centralize the toll booth plaza.

Air Cargo – Phase I of the new air cargo facility is planned for the intermediate term. The facility would be developed to include approximately 60,000 square yards (540,000 square feet) of ramp for aircraft and ground equipment, a 60,000 square-foot cargo building, and a 21,000 square-foot joint agency inspection facility, as well as sufficient truck and vehicle parking through at least the intermediate term planning horizon.

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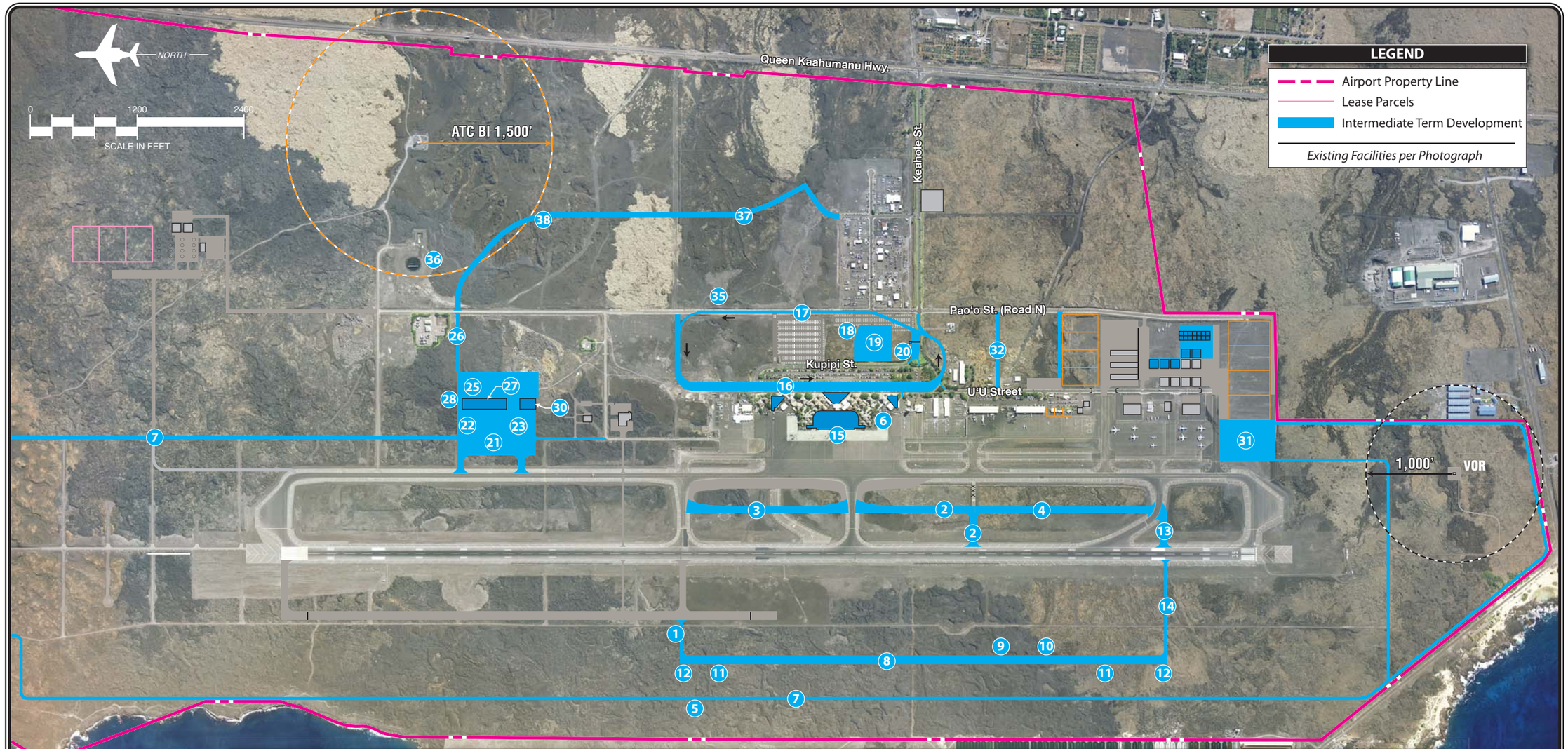

INTERMEDIATE TERM PLANNING HORIZON

	Airfield	
1	Taxiway G West of SAAF (35' wide 75,000# DWL)	$272,000
2	Taxiway D Upgrade and Parallel Taxiway E Segment	$4,212,000
3	Parallel Taxiway E Between Taxiway G and Taxiway H	$5,994,000
4	Parallel Taxiway E Between Taxiway C and D	$6,232,000
5	Relocate West Perimeter Fence	$1,128,000
6	Airfield Light Vault Upgrade	$675,000
7	Relocate West Perimeter Service Road	$5,383,000
8	Parallel Runway 17R-35L 5,500' x 100' (75,000# DWL)	$16,706,000
9	MIRL Runway 17R-35L	$371,000
10	Runway 17R-25L With Non-Precision Markings	$81,000
11	Runway 17R-35L PAPI-4's	$135,000
12	Runway 17R REIL's	$108,000
13	Taxiway C Realignment	$929,000
14	Taxiway C West to Parallel Runway (35' wide 75,000# DWL)	$888,000

	Passenger Terminal	
15	Phase II Terminal Expansion	$133,328,000
16	Terminal Frontage Road Relocation/Widening	$2,257,000
17	Terminal Loop Road Relocation	$1,411,000
18	Reconfigure Parking Lot Access/Circulation	$487,000
19	Phase I Parking Expansion (400 spaces)	$2,268,000
20	Parking Lot Toll Booth Plaza	$162,000
	Air Cargo	
21	Phase I Cargo Ramp with Taxiway Access (51,000 sy)	$9,983,000
22	Phase I Apron/Taxiway Edge Lighting (1,900 lf)	$308,000
23	Phase I Ramp Floodlighting	$338,000
24	Phase I Ground Equipment Ramp (10,000 sy)	$1,958,000
25	Phase I Cargo Building (60,000 sf)	$17,820,000
26	Phase I Access Road (650 lf x 30' wide)	$395,000
27	Phase I Truck Loading and Vehicle Parking (300' x 850')	$4,303,000

28	Phase I Cargo Security Fencing (1,600 lf with two gates)	$119,000
29	Phase I Cargo Area Utilities	$270,000
30	Joint Agency Inspection Facility	$6,237,000
	General Aviation	
31	Phase I South Apron Expansion (51,000 sy)	$5,164,000
32	General Aviation Access from Road N	$491,000
	Support	
33	Halalu Street (North to Road P)	$1,458,000
34	Halalu Street (Road P North/West to Road N)	$972,000
35	Airport Administration Facility	$10,000,000
36	Regional ARFF Facility	$25,000,000
	INTERMEDIATE TERM HORIZON TOTAL	**$267,843,000**

General Aviation – The general aviation area is expected to continue to develop hangars and other space to accommodate aircraft and general aviation business in response to demand. To accommodate growing parking needs for transient aircraft, a 51,000 square yard ramp expansion is also planned for the intermediate term.

Support – With the extended terminal loop road, Pao`o Street will no longer provide two-way access to Keahole Street from the north. Halalu Street is planned to be extended north to the new cargo area to provide this access. The extension will also serve other airport-related uses along its route, including ground transportation expansion, aviation support areas, and airport industrial uses. In addition, a new regional ARFF training facility is scheduled within the area designated as the public safety training campus.

LONG TERM PROJECTS

Long term improvements are related to extended growth in activity. These projects should only be considered if demand continues to grow as projected past the intermediate planning milestones as there is presently not enough justification to be considered earlier. Long term planning horizon capital needs are also presented on **Exhibit 5P** and are estimated at $371.6 million.

Airfield – Long term airfield improvements relate to improving efficiency, circulation, and capacity. High speed exits are planned for Taxiways G (south flow) and H (north flow) to provide more efficient exit capability for the majority of commercial and corporate jet operations. In addition, parallel Taxiway E would be extended in each direction to provide a full length second parallel along the east side of the airfield. This will be needed only when it is evident that the amount of activity along the east flight line requires two-way circulation to reduce taxiing delays and enhance safety.

As passenger and cargo traffic continues to grow, it will become more important to have back-up capability to maintain operations should Runway 17-35 be shut down for maintenance, disabled aircraft, or any other reason. Extending the parallel runway up to 11,000 feet would allow it to serve over 90 percent of the airport's operations. As the mix of commercial aircraft grows, it would also increase the capacity of the airfield.

With the extension of the parallel runway, the completion of a full length parallel taxiway system between the runways is also planned for the long term.

Long Range Terminal – As discussed earlier in the chapter, the long range improvements in the terminal area focus improvements to international operations and additional capacity, particularly in baggage claim and in gates. As activity grows beyond the 3.8 million annual passenger level, additional parking will be required. The plan calls for additional longer term parking as well as the extension of short term parking to the

north to serve the northward expansion of the terminal.

Air Cargo – As demand dictates, Phase II of the cargo development can be undertaken. This has the capability to virtually double the capacity of the air cargo facilities.

General Aviation – General aviation will also continue to develop to the south of the terminal in the long term. Besides filling in additional hangar space as needed, up to 40,000 square yards of additional parking apron is planned as well as additional auto parking. With the ARFF and the ATCT now relocated, a permanent commuter terminal is planned in their old location to be capable of interfacing with both the passenger terminal and the general aviation area.

Heliport – When demand dictates the need, the helicopter TLOF can be expanded to 1,700 feet by 200 feet for additional capacity. Additional parking apron and auto parking can be developed as well.

Support – The development of Road P as the primary terminal access is planned for the long term. While it is shown as an at grade intersection in the table, it is ultimately planned to have an interchange at Queen Kaahumanu highway. The timing of the inter-change will be dependent upon DOT-Highways and developments mauka (east) of Queen Kaahumanu.

SUMMARY

In Hawaii, a sense of place is attributed to the unique relationship between the community, the built environment and the natural surroundings. The Hawaiian culture places a high value on respect for nature and the landscape, and honoring the people of the community. This is part of the spirit of *aloha*.

Throughout the course of this master plan, the spirit of *aloha* and maintaining the Hawaiian sense of place remained the touchstone for developing future growth concepts at the airport on all levels. These principles guided the study's approach to airport land use by focusing on alternatives that considered community business growth and development along with cultural sustainability and the impact on the environment.

As the key transportation interface for persons going to and from the island, it is vital that the airport terminal area also reflect a Hawaiian sense of place. As the first place experienced upon arrival, the airport should present welcoming surroundings that foster ho`okipa (hospitality). It should encourage interaction between the kama`aina (those that have long lived in Hawaii) and the malihini (newcomers). It should embody the spirit of *aloha* as an important value and a way of life.

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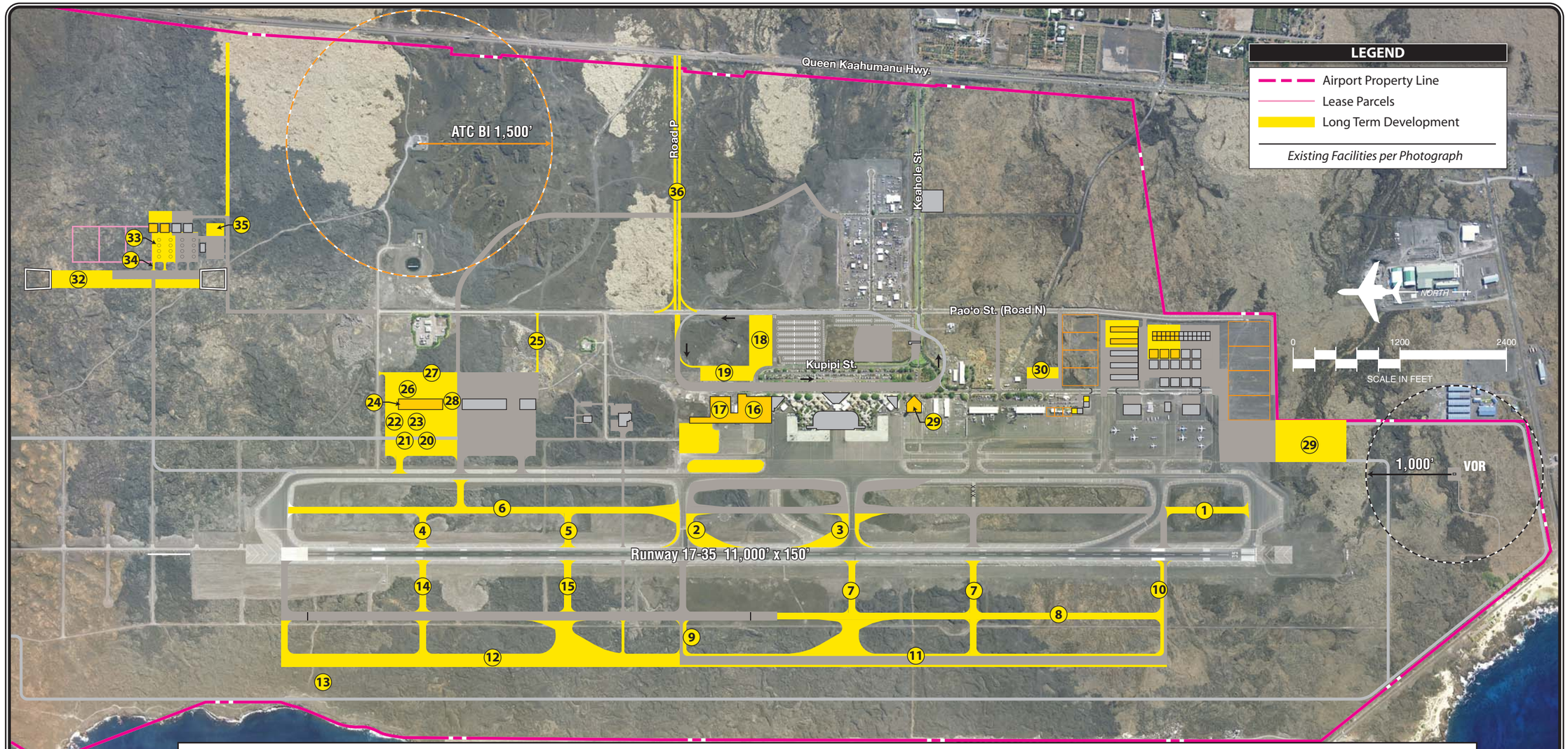


LONG TERM PLANNING HORIZON

	Airfield	
1	Parallel Taxiway E from Taxiway C South	$4,562,000
2	Taxiway G High Speed Exit	$2,592,000
3	Taxiway H High Speed Exit	$2,592,000
4	Taxiway M	$2,765,000
5	Taxiway N	$2,765,000
6	Parallel Taxiway E North from Taxiway G	$15,066,000
7	Taxiways H and D West	$4,234,000
8	Parallel Taxiway F South from SAAF	$18,900,000
9	Taxiway G West of SAAF Upgrade (full strength/width)	$1,094,000
10	Taxiway C West to Parallel Runway Upgrade (full strength/width)	$2,418,000
11	Parallel Runway 17R-35L Upgrade to Full Strength/Width	$7,425,000
12	Parallel Runway 17R-35L 4,500' Extension (include lighting & marking)	$27,338,000
13	Runway 17R PAPI-4 & REIL Relocation	$34,000
14	Taxiway M West to Parallel Runway	$5,288,000
15	Taxiway N West to Parallel Runway	$4,562,000

	Passenger Terminal	
16	Long Range Terminal Expansion	$160,728,000
17	Customs and Border Protection (CBP) Facility	$42,372,000
18	Phase II Parking Expansion (400 spaces)	$2,268,000
19	Short Term Parking North Expansion (240 spaces)	$1,361,000
	Air Cargo	
20	Phase II Cargo Ramp with Taxiway Access (44,000 sy)	$8,613,000
21	Phase II Apron/Taxiway Edge Lighting (1,300 lf)	$2,106,000
22	Phase II Ramp Floodlighting	$338,000
23	Phase II Ground Equipment Ramp (8,500 sy)	$1,664,000
24	Phase II Cargo Building (60,000 sf)	$17,820,000
25	Phase II Access Road (650 lf x 40' wide)	$527,000
26	Phase II Truck Loading and Vehicle Parking (300' x 850')	$4,303,000
27	Phase II cargo Area Utilities	$270,000
28	Phase II Cargo Security Fencing (1,300 lf with two gates)	$97,000

	General Aviation	
29	Phase II South Apron Expansion (40,000 sy)	$4,050,000
30	General Aviation Auto Parking (Phase II)	$122,000
31	Commuter Terminal (20,000 sf)	$11,340,000
	Heliport	
32	Expanded TLOF to 1,700' x 200'	$5,184,000
33	Phase II Helicopter Parking Apron (195' x 332')	$1,049,000
34	Phase II Helicopter Taxiways (2 at 90' x 20')	$58,000
35	Phase II Auto Parking (4,700 sy)	$476,000
	Support	
36	Road P (At grade, boulevard design)	$5,184,000
	LONG TERM HORIZON TOTAL	**$371,565,000**
	CAPITAL NEEDS PROGRAM TOTAL	***$780,102,000***

As a gathering place for persons brought together by transportation needs, the airport setting is a unique opportunity to promote and celebrate the cultural, historical, and ecological amenities of the island. This should include architecture that values open space and natural air flow, native landscaping, and views that exemplify this sense of place.

The spirit of *aloha* has also permeated this airport master plan process by involving the community for suggestions and support at each development stage. It is important that the community has an influence on the future growth of the airport – with a connection to the past and knowledge of the customs and traditions, they can help maintain a sense of place.

The Master Plan has strived to address the goals established at the outset of the study as follows:

- **Provide a high level of service to passengers while maintaining a "sense of place."**

  This has been the top priority of the Master Plan. The passenger terminal plan addresses the needs for the passengers for today and the long range, while maintaining the Hawaiian sense of place through its layout and architecture.

- **Stimulate and support island and state economic development**.

  This is reflected throughout the plan from providing the flexibility for passenger, cargo, and general aviation activity to grow as demand dictates, to enhance revenues of the airport and providing an employment center for the community.

- **Enhance services for air cargo operations.**

  This is reflected in the plans for the north cargo area that will provide adequate space to meet the growing cargo needs of the island. These facilities also incorporate a joint inspection facility for performing the agricultural inspection functions of the HDOA and USDA.

- **Encourage international flights at the airport.**

  The terminal plan provides the flexibility to expand the international terminal and incorporate the CBP facilities into the main terminal in the future.

- **Accommodate existing and future general aviation (including corporate aviation) customer needs**.

  Perhaps the most underserved component of the airport, the plan provides guidelines for the orderly development of the general aviation area to serve all aspects of general aviation on the West Coast.

- **Maintain good relationships with neighborhood communities by minimizing environmental impacts such as noise**.

The airfield plan provides for additional capacity in a manner that will actually reduce noise impacts on neighboring communities. The helicopter facilities will place activity farther north, away from new developments south of the airport. The parallel runway will also shift some over-flights makai of their existing routes, farther from neighborhood developments. As the plan is implemented, the airport is incorporating design considerations for sustainability and energy efficiency.

The recommended master plan is designed to assist the Hawaii Department of Transportation and the FAA in making decisions relative to future development and growth at Kona International Airport at Keahole. The plan provides for development to satisfy expected airport needs over the next 20 years and beyond.

Flexibility will be a key to future development since activity may not occur exactly as forecast. The plan has considered demands that could be placed upon the airport even beyond the normal 20-year planning period, to ensure that the facility is capable of accommodating a variety of circumstances. The recommended master plan concept provides the DOT-A with options to pursue in marketing the assets of the airport for revenue support and community development. Following the general recommendations of the plan, the airport can maintain its long-term viability and continue to provide air transportation services to the region.

In support of the Master Plan, an updated airport layout plan (ALP) for KOA has been prepared as well. A reduced-size copy of the ALP is included in **Appendix E**. Once approved by the FAA, eligible projects included on this drawing can be considered for federal funding. The next chapter will discuss the financial plan in support of the master plan concept. This will consider the development costs, scheduling, and revenue sources for funding the development plan.

Chapter Six

FINANCIAL PLAN

FINANCIAL PLAN

This chapter of the Master Plan report describes the financial plan for implementing the recommended master plan concept for Kona International Airport at Keahole (KOA) as described in Chapter Five. It provides discussion of (1) the 20-plus year capital needs program (CNP), (2) the Financial Plan for the five year capital improvement program (KOA CIP) that identifies priority projects, by year from 2008 to 2012, (3) the funding sources available for airport improvements, and (4) impact of the Financial Plan on factors such as revenues and expenses.

This chapter begins with a review of the statewide financial structure.

FRAMEWORK OF CURRENT AIRPORTS SYSTEM FINANCIAL OPERATIONS

Under the provisions of the Hawaii State Government Reorganization Act of 1959, the State of Hawaii Department of Transportation, Airports Division (DOT-A) was established on July 1, 1961, to succeed the Hawaii Aeronautics Commission. DOT-A is one of three divisions within the State's Department of Transportation, and has jurisdiction over and control of all State of Hawaii airports and air navigation facilities, as well as general supervision of aeronautics within the State. The Hawaii Airports System is operated as an enterprise fund of the State.

The Airports Division operates all 15 State airports as a single integrated system for management and financial purposes. As such, DOT-A establishes policies, rules and regulations; approves contracts and expenditures; and develops its annual operating and capital budgets for the statewide system. In addition, DOT-A is responsible for certain strategic business arrangements and other administrative and managerial functions, such as negotiation of airline agreements, regulation of aeronautical rates and charges, compliance with grant assurances, development of marketing and development policies, and preparation of long-range plans.

The financial operations of the Airports System are governed by the following documents:

- Hawaii Revised Statutes, as amended, and as related to Airports;
- The Certificate of the Director of Transportation of the State of Hawaii, dated May 1, 1969, as amended and supplemented (the Certificate);
- Agreements with the airlines providing for use of the Airports System and the payment of terminal rentals, landing fees, and certain other charges;
- Concession agreements and leases with other tenants located on Airport (including those associated with food and beverage, merchandise, rental cars, automobile parking, ground transportation, and other services);
- FAA approvals to collect Passenger Facility Charges (PFC) and use PFC revenues for Airport improvements for the 5 primary State airports;
- Federal statutory and constitutional provisions, including but not limited to the Aviation and Transportation Security Act, the Anti-Head Tax Act of 1973, the Airport and Airways Improvement Act of 1982, the Interstate Commerce Clause of the United States Constitution, the PFC Act of 1990, and Vision 100 – Century of Aviation Reauthorization Act of 2003 (Vision 100) as extended;
- U.S. Department of Transportation policies mandated by the FAA Authorization Act of 1994 related to airport rates and charges, rules for resolving disputes and revenue diversion;
- Generally accepted accounting principles;
- Various policies adopted by the State.

Certain of the governing documents mentioned above, with most relevance to this Master Plan project, are discussed in more detail below.

HAWAII REVISED STATUTES (HRS)

As provided in Section 261-5(a), Hawaii Revised Statutes, Airports Division (DOT-A) is required to generate revenues sufficient to meet all of the expenditures of the Statewide Airports System. Hawaii's airports are thus developed, operated, and maintained on a self-sustaining basis.

State Capital Budget and Project Approval Process

Pursuant to Section 226-52, capital expenditures are approved through the capital improvement project appropriations process. The appropriation of funds for major plans and projects are prepared every Fiscal Year in a statewide Capital Improvement Program (CIP) for the ensuing 6 Fiscal Years, setting out the capital projects that it proposes to undertake during those 6 years. The CIP is reviewed with the State's Department of Transportation and Department of Budget and Finance before being presented by the Department of Transportation to the Governor. Following the Governor's review, the first 2-year component of the 6-year program (known as the Biennium Budget) is submitted to the State Legislature for approval. The Legislature reviews the Biennium Budget and authorizes all or a portion of the budget by project. This authorization of a project (or component of a project) includes identification of the "means of financing," that is, the sources of funds that will be made available for the project. For the Hawaii Airports System, four sources of financing are used: Airports System Revenue Bonds (ASR Bonds), federal funds (from FAA and TSA), PFC revenues, and special funds (internally generated funds from the operation of the Airports System). The Legislature's appropriation of bond funds for a project serves as authorization for the State to issue those bonds when required in the future.

It should be noted that the capital projects in this financial analysis for KOA reflect projects with appropriations in the Biennium Budget, and the approved 6-year CIP. In addition, this analysis encompasses additional projects proposed in the comprehensive Capital Needs Program prepared for the Airport's Master Plan. Those additional projects are to be considered by the Airports Division for future development based on realization of demand, and would need authorization and appropriation by the Governor and Legislature. As of the date of this report, such authorizations and appropriations have neither been sought nor received. Any long-term capital program is subject to change based on changing demand and circumstances.

THE CERTIFICATE

The Certificate requires that airline rates and charges collected for the Hawaii Airports System be established each Fiscal Year to generate Revenues that, together with the proceeds of the Aviation Fuel Taxes (currently two cents per gallon of avia-

tion fuel), will be sufficient to pay all operating and maintenance expenses, pay all indebtedness payable from Revenues and Aviation Fuel Taxes, and make deposits required to the funds and accounts established in the Certificate. Additionally, the State pledges to establish sufficient rates, rentals, fees and charges to yield Revenues and Taxes at least equal to 125% of the Debt Service Requirements for said Fiscal Year. These provisions are referred to collectively as the Rate Covenant. Passenger Facility Charge (PFC) revenues are not defined as part of Revenues for purposes of calculating the Rate Covenant unless they are specifically pledged for that purpose.

AIRPORT-AIRLINE LEASE AGREEMENT

In 1962, DOT-A entered into an airport-airline lease agreement with the Signatory Airlines to provide those airlines the nonexclusive right to use Airports System facilities, equipment improvements, and services in addition to occupying certain premises and facilities. The Signatory Airlines operated under the terms of the lease agreement through June 30, 1994.

In June 1994, DOT-A and the Signatory Airlines executed an agreement to extend the airport-airline lease agreement to June 30, 1997 (the Three-Year Extension). Under the Three-Year Extension, the Signatory Airlines continued to operate under the terms of the lease agreement with certain modifications, including a cost-center residual landing fee calculation, appraisal-based terminal rental rates, and a systemwide residual rate-setting methodology in the form of an Airports System Support Charge (ASSC) calculated to recover any remaining residual costs of the Airports System necessary to meet the requirements of the Rate Covenant. From July 1, 1997, through December 31, 2007, DOT-A and the Signatory Airlines mutually agreed that the airlines would continue to operate under the terms of the Three-Year Extension, which provided for an automatic extension on a quarterly basis unless either party provides 60 days written notice of termination to the other party.

In October 2007, DOT-A and 30 airlines serving Hawaii executed the First Amended Lease Extension Agreement (the Amended Lease Extension), effective January 1, 2008.[1] The Amended Lease Extension amended the methodology for calculating Signatory Airline rates and charges by (1) retaining the cost-center residual landing fee calculation, (2) changing the calculation of terminal rental rates for the five primary airports in the Airports System from appraisal-based to cost-center residual, with discounted Neighbor Island terminal rental rates increasing by 5% every year from 60% of full cost-recovery rates in FY 2008 to 100% for FY 2016 and beyond to make the Neighbor Island airports increasingly self-sufficient, and (3) retaining the systemwide residual ASSC to recover

[1] There are currently a total of 27 Signatory Airlines – ATA and Aloha Airlines subsequently ceased service, and Island Air has since terminated its signatory lease.

any remaining residual costs of the Airports System necessary to meet the requirements of the Rate Covenant. Neighbor Islands include each of the primary airports except Honolulu International.

For purposes of this Master Plan, the Airport-Airline Lease Agreement, the Three-Year Extension, and the Amended Lease Extension are collectively referred to as the Airline Agreements.

OTHER AGREEMENTS

In addition, DOT-A has operating agreements with other, nonsignatory passenger airlines providing for the use of the Airport and for the payment of landing fees and other charges. DOT-A has also entered into numerous agreements with concessionaires and other tenants for the operation of concessions and other services at the Airport, including car rentals and ground transportation services.

AIRPORT CAPITAL NEEDS PROGRAM

The recommended improvements are grouped by planning horizon: short term (FY2008 – FY2012), intermediate term (FY2013 – FY2017), and long term (FY2018-FY2030). The short term planning horizon contains projects of highest priority (collectively referred to as the "Early Works" projects), including but not limited to those already identified in the statewide CIP, and those relating to meeting safety design standards. As short term improvements are completed, DOT-A would begin programming the intermediate term projects, and finally the long term needs.

The development of the recommended master plan concept is intended to follow demand driven indicators. For example, the plan anticipates the construction of a parallel runway to accommodate general aviation operations in the intermediate term. Increased air traffic will be the indicator for the need of the runway and the timing of the construction will depend on meeting that demand. Some development items, such as major maintenance of existing facilities at the Airport are intended to meet FAA standards and would not be considered demand driven.

Rough order-of-magnitude cost estimates were prepared for the recommended master plan concept projects based on assumptions specific to the islands. The project costs include allowances for design, construction and program management fees, and contingencies. Capital costs presented here are reasonable for planning purposes and would require further refinement during the design phase of implementation.

Table 6A presents a summary of estimated project costs (in 2008 dollars) for the capital needs program (CNP) in the planning period during which those costs are proposed to occur. A brief description of the projects was included in the Demand-Based Capital Needs Plan section of Chapter Five.

The 20-year capital needs program for KOA focuses heavily on meeting FAA design standards for safety, improving overall airfield capacity, and providing developable space for landside facilities to accommodate forecasted growth of based aircraft.

The 20-year investment total is approximately $745 million. Projects eligible for FAA grant assistance total approximately $310 million. Therefore, an estimated $435 million would fall under other funding sources including private financing and Airports System Special Funds. It should be noted that although a project is eligible for federal funding, there is no guarantee that the project will receive federal funding. Nationwide, AIP eligible airport projects typically exceed AIP funding availability by a wide margin.

FINANCIAL PLAN

Financial projections were prepared to emphasize projects to be implemented over the short-term planning period. The projections have been prepared incorporating projects from (1) the statewide capital improvement program, (2) terminal and landside development under the Recommended Master Plan Concept, and (3) ongoing renewal and replacement and major maintenance of the Airport. This section presents a summary of those project costs incorporated in the financial projections. An inflation assumption of 2.5% per year has been added to master plan cost estimates through the anticipated year of project implementation.

For purposes of funding the Financial Plan, it was assumed that the rate-making formulas of the current Airline Agreements will remain in effect through the planning period.

Table 6B presents the projects in the Financial Plan and their estimated funding sources by year through the planning horizon described in Section 2 of this report.

The actual timing of construction, or implementation of the individual projects included in the Financial Plan are contingent on the receipt of all required environmental or other regulatory approvals. In addition, the availability of funds is based on (1) the capacity of funding within the statewide CIP and (2) the amount of funds the Airport could expect to receive from these sources based on the eligibility of such projects. It was also assumed that DOT-A will be able to issue bonds in accordance with the Certificate and the Amended Lease Extension Agreement as needed.

It should be noted that the level of capital spending for KOA in the short-term period (through 2012) described herein would most likely not be financially viable based on the underlying economics of KOA as a stand-alone airport. The level of debt issuance needed to complete all the projects likely could not be supported by the revenues that would be generated solely from the operation of the Airport. The 15-airport Hawaii Airports System would need to support the initial development as activity and revenue opportunity grow at KOA.

TABLE 6A
Master Plan Capital Needs Plan
(in 2008 Dollars)

	Capital Needs Plan				Eligible Funding Sources		
	Short Term FY08 - FY12	Intermediate FY13-FY17	Long Term FY18-FY30	**Total FY08-30**	PFC Eligible Amount	AIP Eligible Amount	TSA Eligible Amount
Airfield							
Terminal Apron Expansion West	$ 9,419,000	$ 6,232,000	$ -	**$ 15,651,000**	$ 15,651,000	$ 14,868,450	$ -
Runway 17-35 - Taxiway E improvements	-	5,994,000	4,562,000	**10,556,000**	10,556,000	10,028,200	-
Parallel Runway 17R-35L	-	18,289,000	47,065,000	**65,354,000**	65,354,000	62,086,300	-
Taxiways G & F West & South of KATR	-	272,000	19,994,000	**20,266,000**	20,266,000	19,252,700	-
Taxiway Renovations & Improvements	-	5,141,000	30,014,000	**35,155,000**	35,155,000	33,397,250	-
Airfield Lighting	-	675,000	-	**675,000**	675,000	641,250	-
Other Airfield	-	6,511,000	-	**6,511,000**	6,511,000	6,185,450	-
	$ 9,419,000	$ 43,114,000	$ 101,635,000	**$ 154,168,000**	$ 154,168,000	$ 146,459,600	$ -
Terminal Area							
Terminal Expansion	$ 94,772,000	$ 133,328,000	$ 203,100,000	**$ 431,200,000**	$ 301,840,000	$ 142,296,000	$ 2,120,400
Parking Lot Expansion	-	6,585,000	3,629,000	**10,214,000**	-	-	-
	$ 94,772,000	$ 139,913,000	$ 206,729,000	**$ 441,414,000**	$ 301,840,000	$ 142,296,000	$ 2,120,400
Parking & Roadway							
Employee Parking Expansion	$ -	$ -	$ -	**$ -**	$ -	$ -	$ -
Roadways	-	2,430,000	5,184,000	**7,614,000**	7,614,000	7,233,300	-
	$ -	$ 2,430,000	$ 5,184,000	**$ 7,614,000**	$ 7,614,000	$ 7,233,300	$ -
Cargo Area							
Phase I	$ -	$ 41,731,000	$ -	**$ 41,731,000**	$ -	$ -	$ -
Phase II	-	-	35,738,000	**35,738,000**	-	-	-
	$ -	$ 41,731,000	$ 35,738,000	**$ 77,469,000**	$ -	$ -	$ -
General Aviation							
Aircraft Wash Rack	$ 743,000	$ -	$ -	**$ 743,000**	$ -	$ -	$ -
Commuter Terminal (CAT)	3,578,000	-	11,340,000	**14,918,000**	-	-	-
Apron Expansion	-	5,164,000	4,050,000	**9,214,000**	-	-	-
GA Auto Parking	122,000	-	122,000	**244,000**	-	-	-
Roadway Access	491,000	491,000	-	**982,000**	-	-	-
	$ 4,934,000	$ 5,655,000	$ 15,512,000	**$ 26,101,000**	$ -	$ -	$ -
Heliport							
Site Preparation	$ 3,897,000	$ -	$ -	**$ 3,897,000**	$ -	$ -	$ -
Roadway Access	3,856,000	-	-	**3,856,000**	-	-	-
Phase I	6,028,000	-	5,184,000	**11,212,000**	-	-	-
Phase II	-	-	1,583,000	**1,583,000**	-	-	-
	$ 13,781,000	$ -	$ 6,767,000	**$ 20,548,000**	$ -	$ -	$ -
Other							
ARFF Station Installation	$ 17,288,000	$ -	$ -	**$ 17,288,000**	$ -	$ 16,423,600	$ -
Utilities Master Plan	$ 500,000	$ -	$ -	**$ 500,000**	-	-	-
Airport Administration Facility	-	10,000,000	$ -	**10,000,000**	-	-	-
Regional ARFF Training Facility	$ -	$ 25,000,000	$ -	**$ 25,000,000**	-	-	-
	$ 17,788,000	$ 35,000,000	$ -	**$ 52,788,000**	$ -	$ 16,423,600	$ -
Capital Needs Program Total	$ 140,694,000	$ 267,843,000	$ 371,565,000	**$ 780,102,000**	$ 463,622,000	$ 312,412,500	$ 2,120,400

TABLE 6B
Master Plan Short-Term Financial Plan (with Anticipated Funding Sources)
(in 2.5%/year Escalated Dollars)

	2008	2009	2010	2011	2012	**Short Term FY08 - FY12**	AIP	PFC Pay-go	Special Funds	ASRB	PFC Bond	TSA	Third Party	**Total**
Airfield														
Terminal Apron Expansion West	$ -	$ -	$ -	$ 9,895,837	$ -	**$ 9,895,837**	$ -	$ -	$ -	$ 9,895,837	$ -	$ -	$ -	**$ 9,895,837**
Runway 17-35 - Taxiway E improvements	-	-	-	-	-	**-**	-	-	-			-	-	**-**
Parallel Runway 17R-35L	-	-	-	-	-	**-**	-	-	-			-	-	**-**
Taxiways G & F West & South of KATR	-	-	-	-	-	**-**	-	-	-			-	-	**-**
Taxiway Renovations & Improvements	-	-	-	-	-	**-**	-	-	-	-	-	-	-	**-**
Airfield Lighting	-	-	-	-	-	**-**	-	-	-			-	-	**-**
Other Airfield	-	-	-	-	-	**-**	-	-	-			-	-	**-**
	$ -	$ -	$ -	$ 9,895,837	$ -	**$ 9,895,837**	$ -	$ -	$ -	$ 9,895,837	$ -	$ -	$ -	**$ 9,895,837**
Terminal Area														
Terminal Expansion	$ -	$ -	$ 8,661,250	$ 65,138,750	$ 26,191,918	**$ 99,991,918**	$ -	$ 3,900,000	$ 19,632,347	$ 54,402,956	$ 22,056,615	$ -	$ -	**$ 99,991,918**
Parking Lot Expansion	-	-	-	-	-	**-**	-	-	-			-	-	**-**
	$ -	$ -	$ 8,661,250	$ 65,138,750	$ 26,191,918	**$ 99,991,918**	$ -	$ 3,900,000	$ 19,632,347	$ 54,402,956	$ 22,056,615	$ -	$ -	**$ 99,991,918**
Parking & Roadway														
Employee Parking Expansion	$ -	$ -	$ -	$ -	$ -	**$ -**	$ -	$ -	$ -			$ -	$ -	**$ -**
Roadways	-	-	-	-	-	**-**	-	-	-			-	-	**-**
	$ -	$ -	$ -	$ -	$ -	**$ -**	$ -	$ -	$ -			$ -	$ -	**$ -**
Cargo Area														
Phase I	$ -	$ -	$ -	$ -	$ -	**$ -**								**$ -**
Phase II	-	-	-	-	-	**-**								**-**
	$ -	$ -	$ -	$ -	$ -	**$ -**	$ -	$ -	$ -			$ -	$ -	**$ -**
General Aviation														
Aircraft Wash Rack	$ 743,000	$ -	$ -	$ -	$ -	**$ 743,000**	$ -	$ -	$ -			$ -	$ 743,000	**$ 743,000**
Commuter Terminal (CAT)	3,578,000	-	-	-	-	**3,578,000**	-	-	-	-		-	3,578,000	**3,578,000**
Apron Expansion	-	-	-	-	-	**-**	-	-	-			-	-	**-**
GA Auto Parking	-	-	125,050	-	-	**125,050**	-	-	-			-	125,050	**125,050**
Roadway Access	-	-	-	-	528,753	**528,753**	-	-	-			-	528,753	**528,753**
	$ 4,321,000	$ -	$ 125,050	$ -	$ 528,753	**$ 4,974,803**	$ -	$ -	$ -			$ -	$ 4,974,803	**$ 4,974,803**
Heliport														
Site Preparation	$ -	$ -	$ -	$ -	$ 4,196,643	**$ 4,196,643**	$ -	$ -	$ -			$ -	$ 4,196,643	**$ 4,196,643**
Roadway Access	-	-	-	-	4,152,490	**$ 4,152,490**	-	-	-			-	$ 4,152,490	**$ 4,152,490**
Phase I	-	-	-	-	6,491,497	**$ 6,491,497**	-	-	-			-	$ 6,491,497	**$ 6,491,497**
Phase II	-	-	-	-	-	**-**	-	-	-			-	-	**-**
	$ -	$ -	$ -	$ -	$ 14,840,630	**$ 14,840,630**	$ -	$ -	$ -			$ -	$ 14,840,630	**$ 14,840,630**
Other														
ARFF Station Installation	$ -	$ -	$ 17,720,200	$ -	$ -	**$ 17,720,200**	$ 15,271,250	$ -	$ 803,750	$ 1,645,200	$ -	$ -	$ -	**$ 17,720,200**
Utilities Master Plan	-	-	-	525,312	-	**525,312**	-	-	525,312			-	-	**525,312**
	$ -	$ -	$ 17,720,200	$ -	$ -	**$ 18,245,512**	$ 15,271,250	$ -	$ 1,329,062	$ 1,645,200	$ -	$ -	$ -	**$ 18,245,512**
Financial Plan Total	$ 4,321,000	$ -	$ 26,506,500	$ 75,559,899	$ 41,561,301	**$ 147,948,700**	$ 15,271,250	$ 3,900,000	$ 20,961,409	$ 65,943,993	$ 22,056,615	$ -	$ 19,815,433	**$ 147,948,700**

The capital program described herein could be undertaken by the State in a manner consistent with the funding sources and amounts noted in the next section below, whilst maintaining the overall financial viability of the Statewide airport system. Proceeding in this manner could, however, necessitate the need to reduce capital spending (and associated future bond issuance) at other airports in the system, so as to limit overall bond issuance for the system at a level equivalent to that described in the draft Preliminary Official Statement for the Series 2008 bonds, and as discussed with the Bond Rating Agencies in September 2008.

FINANCIAL ANALYSIS ASSUMPTIONS

The Financial Plan was developed using information and assumptions that provide a reasonable basis for analysis at a level of detail appropriate for an airport master plan. Some of the assumptions used to develop project funding and estimated costs may not be realized, and unanticipated events and circumstances may occur. Therefore, the actual results will vary from those projected, and such variations could be material. This Financial Plan is preliminary in nature and is not intended to be used to support the sale of bonds or to obtain any other forms of financing. More detailed cost estimates and financial analysis will be required if and when DOT-A decides to pursue the sale of bonds or to obtain any other forms of financing. Some projects included in the recommended master plan concept will be postponed or eliminated if forecast aviation demand is not achieved, construction costs rise significantly, or if project funding is not available. Similarly, projects may be undertaken earlier if indicated demand dictates earlier implementation, and funding is available.

SOURCES OF FUNDING

The major sources of funds that could be applied to projects in the recommended master plan concept are discussed below. The amount of funding available from these sources will depend primarily on (1) future levels of aviation activity at KOA, (2) availability of funds based on the statewide CIP, (3) future PFC approvals and grant authorizations, and (4) changes resulting from the reauthorization of federal funding programs.

AIRPORT IMPROVEMENT PROGRAM GRANTS

FAA grants from the Airport Improvement Program (AIP) are funded through the Airport and Airway Trust Fund with revenues from federal aviation user fees and taxes. Capital projects that are eligible for funding include those improvements related to enhancing airport safety, capacity, security, and environmental concerns. In general, AIP funds can be used for most airfield capital improvements or repairs except those for terminals, hangars, and nonaviation development. Any professional services that

are necessary for eligible projects - such as planning, surveying, and design - are eligible as is runway, taxiway, and apron pavement maintenance. Aviation demand at the airport must justify the projects, which must also meet Federal environmental and procurement requirements. KOA is a small-hub airport, and the AIP grants cover up to 95% of eligible costs under existing procedures (which may be amended based on future AIP reauthorizations).

- AIP primary entitlement grants are apportioned by the FAA on the number of passenger enplanements (boardings) at an airport. Based on the forecast described in chapter 2, as a stand-alone airport, KOA is eligible to receive approximately $4.5 million per year from this funding source.

- AIP cargo entitlement grants are provided to qualified cargo service airports and share the 3.5 percent of AIP apportionment made available to them for AIP eligible projects. Cargo entitlement funds are apportioned in the same proportion as its proportion of landed weight of cargo aircraft to the total landed weight of cargo aircraft at all qualifying airports. Based on historical trends, it is assumed that KOA will be eligible to receive approximately $200,000 per year based on landed weight generated at the airport.

- AIP discretionary grants are selectively distributed based on the competitiveness of proposed projects within the FAA Western Region pursuant to the national priority system established by the FAA, and designations by Congress.

Since the expiration of the Century of Aviation Reauthorization Act (Vision 100) on September 30, 2007, the FAA has continued to operate under a series of short term resolutions. On September 30, 2008, President Bush signed into law a short term extension to March 6, 2009. The continuing resolution will fund the aviation program at current levels for more than five months, or until Congress passes the fiscal year 2009 appropriations bill. The next multi-year reauthorization legislation has not yet been enacted. For purposes of analysis, it is assumed that the FAA multi-year programs would provide funding similar to the programs in the past. As noted earlier, on a nationwide basis AIP eligible project costs typically exceed AIP funding availability by a wide margin.

During the short term analysis, AIP funds are assumed to be available to fund approximately $15.3 million of the project costs for the ARFF Station Installation anticipated to occur in FY 2010. AIP funds are not assumed to provide funding for any other projects during this planning period.

DOT-A receives federal funding as a statewide Airports System and distributes funds based on priority and at the discretion of Airports System management. The availability of AIP funds during the intermediate and long term planning periods are contingent on the priority of the project in the statewide CIP and the funding capacity of the federal program.

PASSENGER FACILITY CHARGES (PFCs)

PFCs are approved by the FAA and are collected by the airlines from qualified enplaned passengers to fund eligible projects. A PFC of up to $4.50 per eligible enplaned passenger can be imposed by an airport operator. Projects that are eligible for PFC funding are those that (1) preserve or enhance the capacity, safety, or security of the air transportation system, (2) reduce noise or mitigate noise effects, or (3) furnish opportunities for enhanced competition between or among air carriers. PFCs cannot be used for commercial facilities such as restaurants and other concession space, rental car facilities, public parking facilities, or construction of exclusively leased space or facilities at airports.

The State has been authorized by the FAA to impose a $4.50 PFC on eligible passengers enplaned at KOA. The State does not charge PFCs to: (1) Interisland passengers, or (2) Nonrevenue passengers, as similarly defined and implemented at other U.S. Airports.

DOT-A has collected $2.5 million in PFC revenues at KOA through FY 2008. Approximately $3.9 million is assumed to be made available on a pay-as-you-go basis throughout the short-term forecast period. In FY 2009 and beyond, it was assumed that DOT-A would (a) submit PFC applications for Terminal Expansion projects, and (b) issue PFC-supported bonds to finance costs associated with the project.

TRANSPORTATION SECURITY ADMINISTRATION (TSA) GRANTS

After the terrorist attacks of September 11, 2001, Congress passed the Aviation and Transportation Security Act (ATSA), creating the Transportation Security Administration (TSA) and mandating the implementation of explosive detection systems (EDS) at U.S. Airports.

For the airport to receive consideration of TSA funding for the EDS System, the project design must be at least 30% complete. Upon approval, DOT-A must begin the project within three years, and must complete construction within six years from the date of application submittal. Funding for the project would be provided through (1) a negotiated TSA Other Transaction Agreement (OTA) or (2) a multi-year letter of intent (LOI). Through 2004, TSA entered into multi-year LOIs with eight (8) airport operators for in-line EDS at nine airports, Atlanta, Boston, Dallas/Fort Worth, Denver, Las Vegas, Los Angeles/Ontario, Phoenix and Seattle. The Office of Management and Budget has since prevented issuance of additional LOIs but recently indicated two-year LOIs may be entered into. Any future OTA or LOI for EDS project(s) at KOA would specify the agreed upon cost-sharing for facility modifications to accommodate optimal in-line EDS. Project costs include planning and design.

In FY 2005, TSA provided DOT-A with an OTA for up to $9.5 million in TSA

funding associated with the infrastructure costs to accommodate in-line EDS at the Lihue Airport on the island of Kauai. In conjunction with the expansion of the terminal, the Access Control and Closed-Circuit Televisions System at KOA are assumed for a smaller amount of $500,000 in funding from the TSA.

CUSTOMER FACILITY CHARGES (CFCs)

In July 2008, the State Legislature passed a bill (SB 2365-HD1) authorizing the Airports Division to establish and collect a $1 CFC per transaction day for travelers who rent cars at the State's primary airports.

The CFC was implemented beginning September 1, 2008, for all rental car transactions on airport. Moneys collected through the CFC are to be deposited into a restricted fund that can only be used to fund the construction of new consolidated rental car facilities and other improvements needed for on-airport rental car operators and associated operating costs.

The CFC is expected to be adjusted as necessary to generate sufficient funds to construct consolidated rental car facilities or make other improvements at certain airports including KOA. DOT-A has begun preliminary discussions with the rental car agencies on what modifications are needed at KOA. For purposes of analysis, no Airports System Revenues are expected from this revenue source, and no capital project costs have been estimated.

SPECIAL FUNDS (CASH)

In the past, DOT-A has used internally generated funds from Airport operations to fund projects in the Airport System. Under the Certificate, internally generated funds are deposited in the Revenue Fund at the end of each Fiscal Year (after all other uses of those funds) and can be used for any lawful Airport System purpose.

It was assumed that the projected internally generated funds from the future operations of KOA would be available to fund certain portions of the project costs. For purposes of financing the KOA CIP, Special Funds are assumed to pay the matching local share of AIP eligible projects as well as a portion of the costs associated with the Terminal Expansion.

TENANT AND THIRD-PARTY FUNDING

In recent months, DOT-A has begun initiatives to fund capital costs at KOA through tenant and third-party funding. For purposes of this analysis, capital costs associated with the following projects are assumed to be funded through such initiatives:

- General Aviation Land Development. DOT-A could seek a Request For Proposals (RFP) inviting submissions of proposals for development of corporate/general aviation support facilities at KOA, including, but not limited to, storage hangars, maintenance facilities and/or aircraft parking, and associated infrastructure. For purposes

of this analysis, capital funding provided by a third-party developer was assumed as a result of this effort.

- Cargo Redevelopment. Similarly, DOT-A could seek interest from third parties to fund capital costs associated with the Cargo Redevelopment. For purposes of analysis, it was assumed that DOT-A would continue to receive land lease payments, included in nonairline rental revenues that are discussed later in this chapter, consistent with current State policies and practices.

- Heliport touchdown and lift-off area. DOT-A could seek interest from third party developers to provide private funding to construct a new heliport area.

- Astronaut Ellison S. Onizuka Space Center. The relocation of the Ellison S. Onizuka Space Center is an element of the terminal expansion program. As a result, DOT-A has entered into discussions with the Onizuka Board to construct a new space center on a two-acre site located on the south side of the airport access road. The relocation of the facility (as necessitated by the terminal expansion project) could be funded, in part, by PFC-supported bonds. Funding through other means—such as special grant funding provided by Boeing, the Smithsonian, or NASA could be considered for final build-out costs.

REVENUE BONDS

The Airports System's financial operations are governed by the provisions of the 1969 Certificate, as described at the beginning of this chapter. Under the provisions of the Certificate, Airport Revenue Bonds are secured by and payable from Project Revenues (i.e., Revenues generated from the operations of the Airports System in aggregate, not any of the airports individually) and other pledged Amounts Available for Debt Service. In addition, PFC revenues can be used to offset the payment of Bond debt service for eligible projects.

Any project costs not funded through AIP or TSA grants, PFC revenues, private financing or internally generated funds would be financed with the proceeds from the issuance of Airports System Revenue Bonds (ASRB).

The issuance of additional bonds is limited to DOT-A's ability to meet the requirements of the Additional Bonds Test and the Rate Covenant of the Certificate, as described earlier. Bond financing capacity is constrained by these requirements and the intention of DOT-A to meet desired airline payment levels. Bond financing capacity and actual airport revenues and expenses may influence project timing.

DEBT SERVICE

As reflected in **Table 6B**, Airport Service Revenue Bonds may be issued by DOT-A in the future to fund capital

costs associated with the short term financial plan. Currently, the statewide CIP dated October 16, 2008 anticipates a total of approximately $88 million in future bond sales (including PFC-backed bonds) for the terminal expansion projects, ARFF Training Facility, and other KOA Terminal/Airfield projects during the short term. Estimated Debt Service Requirements on the Bonds were based on the following allowances and assumptions:

- 30-year maturities (which is consistent with past practices of the State)
- Assumed bond interest rates of 6%
- Allowances for capitalized interest, assuming 2-year capitalized interest periods
- Funded Debt Service Reserve Account
- Allowances for costs of issuance

The statewide CIP does not anticipate future bond sales for the Terminal Apron West Expansion. The development of this project would be demand-driven as discussed previously. Implementation of the project would require an additional $145 million in bond sales. It is anticipated the incremental debt service would result in incremental annual debt service payments of over $10.5 million starting FY 2015 for KOA. This could potentially raise the KOA terminal rental rate to over $80 per sq. ft., as well as materially increase the landing fee for the entire Hawaii Airports System.

Consistent with the Certificate, PFC revenues may be used to reduce the amount of Debt Service Requirements funded from Net Revenues. Debt Service Requirements on Outstanding and Future bonds are allocated to Airport cost centers on the basis of the project costs financed with such Bonds.

OPERATING EXPENSES

DOT-A provides most of the maintenance, operating functions, and utilities at KOA, using a combination of DOT-A staff and contract personnel. Operating expenses include salaries and wages, other personal services, utilities, special and major maintenance expenses, materials and supplies, the costs of equipment and motor vehicles purchased with cash, and Airports Division and State administrative charges. Direct operating expenses are those expenses that can be charged to one of the direct cost centers used for rate-setting purposes—i.e., to the KOA Terminal Cost Center, or to the system-wide Airfield Area Cost Center. Indirect operating expenses, including expenses associated with administration, are allocated to cost centers in proportion to the allocation of direct operating expenses.

In FY 2008, KOA incurred approximately $15.2 million in operating costs and an additional $144,111 for equipment and motor vehicle capital costs. Of this amount, $9.8 million was spent

on salaries and benefits, $2.3 million for utility costs, $1.6 million on special maintenance costs, and $1.5 on other operating costs.

Figure 1 on **Exhibit 6A** presents projected annual Operating Expenses by cost center for FY 2008 through FY 2012, FY 2017, and FY 2030. Based on historical trends, operating expenses for FY 2009 are expected to be approximately 90% of the approved budget for the year. Thereafter, it was forecast that operating expenses will increase by 2.5% per year as a result of inflation, forecast activity levels, planned facility expansions, and other assumptions regarding Airports System operations. It was assumed that the State will continue to assess a surcharge of 5% for central services expenses on all receipts of DOT-A after deducting any amounts pledged, charged, or encumbered for the payment of Bonds in each Fiscal Year.

DOT-A continues to seek cost-saving measures in daily operations. While actual savings have not been considered in the analysis, the following initiatives may reduce cost of operations at KOA, and/or enable increased activity without increased operating expenses:

- **Photovoltaic (PV) System**. Installation of a photovoltaic system is planned over the parking lot and the existing cargo buildings to provide electrical power to support the existing airport and proposed expansions.
- **Natural Energy Laboratory of Hawaii Authority (NELHA) Partnership.** To reduce operating expenses for electrical and water discussions between NELHA and the State are taking place. Some of the partnership opportunities might include the following:
-
    1. Deep Sea Water Cooling (SWAC) (Sea Water Air Conditioning)
    2. Research and Development Alternative Fuel Vehicles for use at Hotel / Conference Facilities and Consolidated Car Rental – Fleet Mix and Shuttle Buses
    3. Bio-Fuel Plant and Fueling Station
    4. Hawaii Electric Light Company (HELCO) Approved PV System
    5. Roadway Circulation / Frontage Road
    6. Algae-Based Aviation Fuel

OPERATING REVENUES

Table 6C presents historical audited operating revenues for KOA for FY 2005 through FY 2007 and unaudited operating revenues for FY 2008.

TABLE 6C
Historical Revenues
Airport Master Plan
Kona International Airport at Keahole

	Historical (a)			Unaudited (b)
	FY 2005	**FY 2006**	**FY 2007**	**FY 2008**
AIRLINE RENTALS AND FEES				
Passenger Airline Landing Fees	$2,592,244	$2,772,600	$2,818,594	$2,782,874
Less: Aviation Fuel Credit	(85,654)	(123,101)	(40,714)	(137,634)
Net Landing Fees	$2,506,590	$2,649,559	$2,777,881	$2,645,240
Terminal Rents	$796,586	$773,819	$775,716	$1,618,454
International Arrivals Building (IAB)	346,820	345,732	294,334	325,664
Airport Support Services Charge (ASSC)	41,055	43,658	39,005	47,406
Total Airline Revenue (b) (a)	$3,691,050	$3,812,768	$3,886,936	$4,636,764
Enplaned Passengers (b)	$1,481,368	$1,476,414	$1,573,799	$1,564,292
Airline Cost Per Enplaned Passenger (a/b)	$2.49	$2.58	$2.47	$2.96
NON-AIRLINE REVENUE				
Terminal Area Concessions				
Food and Beverage	$181,228	$231,134	$238,386	$663,653
News and Vending	44,021	51,420	76,745	76,762
Gift Shop/Apparel & Baggage	410,236	896,985	868,875	738,544
Lei Vendors	34,097	37,869	34,643	30,673
Total Terminal Area Concessions	$669,581	$1,217,408	$1,218,649	$1,509,632
Other Concessions (Parking, Ground Transportation, etc.)				
Parking	$806,023	$901,614	$999,672	$1,086,282
Rental Cars	6,081,747	5,990,804	6,358,589	6,115,605
Ground Transportation & Shuttle	151,650	171,492	168,639	183,252
Other Terminal Concessions	(5,618,538)	191,599	186,729	184,073
Total Other Concessions	$1,420,882	$7,255,509	$7,713,630	$7,569,212
Other				
Other Rentals	$957,119	$962,000	$981,000	$981,651
Miscellaneous Revenue	254,953	322,706	310,291	405,122
Operating Interest Income	251,198	879,243	819,283	---
Total Other Rentals	$1,463,269	$2,163,949	$2,110,574	$1,386,773
Total Non-airline Revenue	$3,553,732	$10,636,866	$11,042,853	$10,465,617
Total Airport Revenues	$7,244,783	$14,449,634	$14,929,789	$15,102,381

(a) Source: Airport management records, August 2008
(b) Source: Airport unaudited financials, November 2008

AIRLINE REVENUES

Historically, airline revenues as a percentage of total revenues at the Airport have been about 31%. Industry benchmarking suggests airline revenues at similar sized airports closer to 42%. As shown on Figure 2 of **Exhibit 6A**, airline revenues are anticipated to increase as a result of the new rate setting methodologies defined in the First Amended Lease Agreement for Signatory Airlines which went into effect January 1, 2008.

In general, Airline terminal rental rates and landing fees are calculated as a function of forecast O&M expenses, debt service, and certain non-airline revenues anticipated for the Terminal and Airfield cost centers. As presented in Figure 3 of **Exhibit 6A**, it is anticipated that Landing Fees (which, as previously noted, are calculated on a Statewide basis for all five primary airports) will grow in proportion with costs allocated to the Airfield Cost Center (a common cost center across all 5 primary airports' airfields), while terminal rents would be

FIGURE 1

OPERATING EXPENSES
Airport Master Plan
Kona International Airport at Keahole

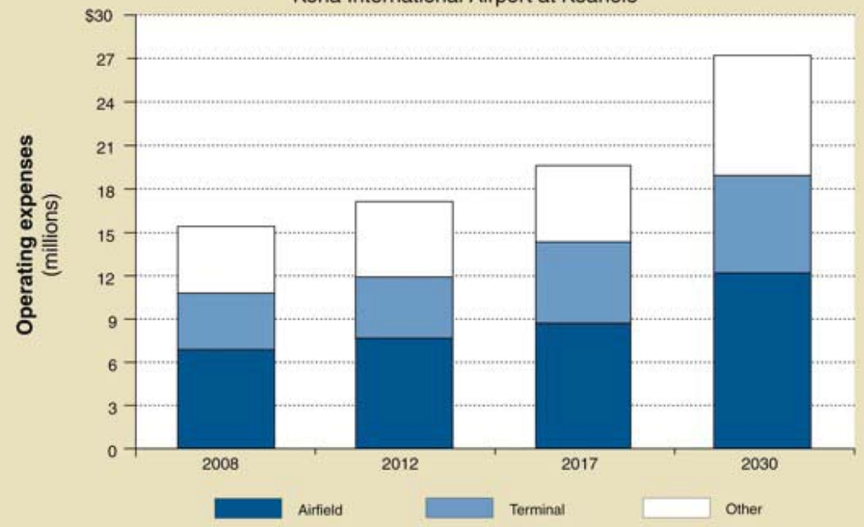


FIGURE 2

AIRLINE AND NONAIRLINE REVENUES
Airport Master Plan
Kona International Airport at Keahole

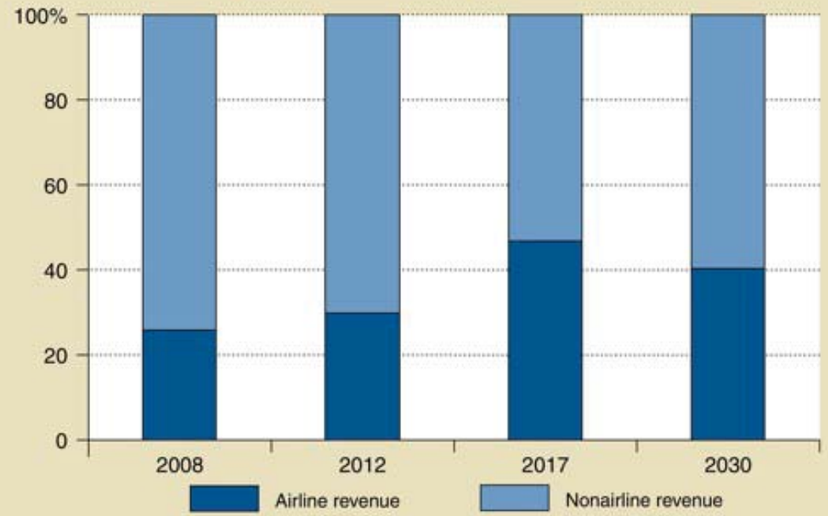


FIGURE 3

COMPONENTS OF SIGNATORY PASSENGER AIRLINE REVENUE
Airport Master Plan
Kona International Airport at Keahole

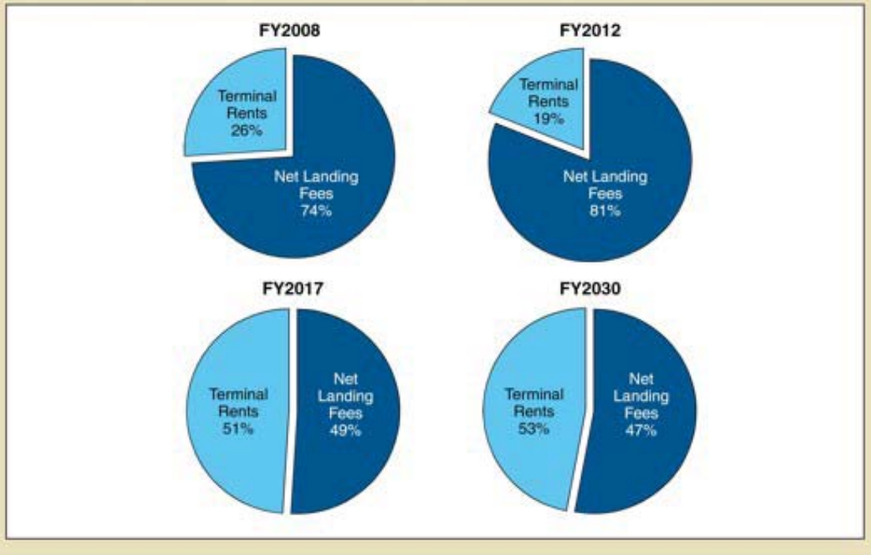
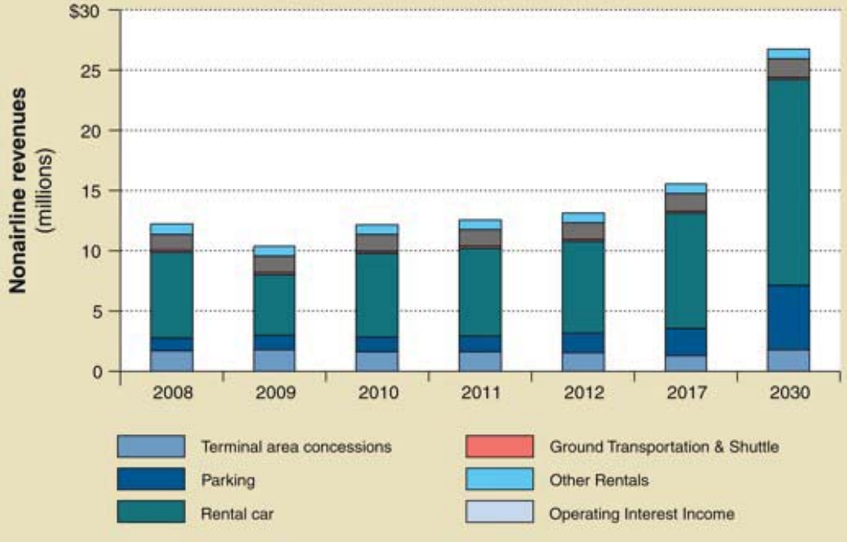


FIGURE 4

NONAIRLINE REVENUES
Airport Master Plan
Kona International Airport at Keahole



limited to methodologies defined in the First Amended Lease Agreement.

The methodologies for calculating Signatory Airline rates are defined below:

Landing Fee Revenues

Under the terms of the Amended Lease Extension, the Signatory Airlines pay landing fees per 1,000 pounds of certificated gross aircraft landed weight to allow DOT-A to recover certain operating, maintenance, and capital costs of runways, taxiways, and other airfield facilities, after crediting nonsignatory landing fee payments, PFC revenues used to pay debt service, and any federal operating grants. Nonsignatory airlines pay landing fees as described in the Hawaii Administrative Rules (see below).

The overseas landing fees for the Signatory Airlines are calculated for the statewide Airports System according to a residual rate-setting methodology. Operators of interisland flights pay an agreed-upon discounted rate that was initially set at 36% of the overseas landing fee in FY 2008, increasing 1% each subsequent Fiscal Year until it reaches 100% of the overseas rate when the discount would be eliminated.

Terminal Rents

Under the terms of the Amended Lease Extension, the Signatory Airlines pay the net requirement for the Airport's Terminal Cost Center, after being credited for terminal concession revenues, PFC revenues used to pay debt service, and any federal operating grants. Terminal rental rates are adjusted by multiplying the rates by 60% in FY 2008, which increases 5% per year until FY 2016, when the adjustment would be eliminated.

In addition, separate rental rates apply for joint use areas, including (1) holdrooms, (2) baggage systems and (3) common use ticketing positions. Charges for the international arrivals area are also assessed for use of customs and immigration facilities.

Airports System Support Charge Revenue

The ASSC is set to recover any residual costs of the Airports System and to meet requirements of the Rate Covenant. The overseas ASSC is set by dividing the Net ASSC Requirement (difference between statewide expenses and revenues less any applicable credits) by total Airports System landed weight. The interisland ASSC rate is the product of the overseas landing fee rate and the interisland rate for the Fiscal Year (initially set at 36% of the overseas rate in FY 2008, increasing 1% each subsequent Fiscal Year until such time as it equals 100% of the overseas rate).

Applicable ASSC credits for any Fiscal Year include (1) PFC revenues to pay debt service, (2) nonairline revenues, (3) interest earned on operating funds, (4) terminal rentals, (5) aeronautical rentals, and (6) landing fee revenues. When Airports System Revenues are sufficient to recover Airports System

Costs, no ASSC is to be assessed on overseas or interisland activity. Otherwise, the overseas ASSC rate is to be computed by dividing the Net ASSC Requirement by total landed weight. Forecast revenues are expected to recover the costs of the Airports System and no ASSC is forecast to be required.

Nonsignatory Airline Rates and Charges Revenues

Nonsignatory airline fixed rates that are established by H.A.R. Chapter 19-16.1, were last adjusted in November, 2000, pursuant to the Administrative Rules Process. DOT-A is in the process of amending the methodology contained in H.A.R. Chapter 19-16.1 such that nonsignatory airline rates and charges would be 125% of Signatory Airline rates and charges.

NONAIRLINE REVENUES

Ongoing efforts to maximize revenues from other sources would reduce the requirement imposed on the airlines, given that terminal concession revenues are netted against terminal costs for purposes of the terminal rental calculation. As presented in Figure 4 of **Exhibit 6A**, revenues from sources related to numbers of passengers, such as terminal concessions, rental car percentage fees, and parking revenues, were forecast to change as a function of forecast activity. Unless noted otherwise, forecast revenues reflect 2.5% annual inflation.

Terminal Area Concessions

Various terminal concessionaires lease terminal space at KOA. Under the terms of the concession agreements, concession fees payable to DOT-A are the greater of a percentage of gross sales or minimum annual guarantee (MAG) that has been specified in each concessions agreement. Unless noted otherwise, forecast revenues are based on a combination of: (1) forecasts of enplaned passengers, (2) recent historical trends in the concession revenues paid to DOT-A, (3) allowances for inflation of 2.5% per year, (4) the terms and conditions of agreements with the State, and (5) assumptions regarding ongoing improvements.

In FY 2008, terminal area concession revenues in excess of $1.5 million account for 12.4% of total nonairline revenues. A brief description of the revenue sources included in this category is provided below.

- RETAIL

The retail concession agreement includes retail concessions, such as (1) gifts, apparel, and luggage; (2) packaged foods; (3) sundries and toys; and (4) jewelry and shells. In the Intermediate planning period, construction of a second level concourse will provide opportunity for additional space for retail concessions. It was assumed that DOT-A will see an increase in the average sale per enplaned passenger of up to 15% upon 100% occupancy of the new space. For forecasting pur-

poses, the new space is assumed to be occupied in FY 2018.

- FOOD AND BEVERAGE

Historically, food and beverage concessions have accounted for approximately 3.1% of nonairline revenues. In FY 2008, food and beverage revenues increased significantly as a result of the re-bid concessions agreement. Upon completion of construction of the second level concourse, and full occupancy of the new food and beverage space, an increase of up to 25% on the average sale per enplaned passenger can be expected. For purposes of forecasting it is assumed this will happen in FY 2018.

- NEWS AND VENDING

Hawaii Revised Statutes (HRS) §102-14 requires the news and vending machine services be contracted in an effort to provide economic opportunities to persons with blind or visually impaired disabilities. Revenues to DOT-A are based on a "tiered" rate structure ranging from 2% to 10%. In FY 2008, gross sales in excess of $1.7 million resulted in revenues to the State of approximately $77,000.

- LEI STANDS

Two separate lei stands are located in each of the terminal areas. DOT-A collects approximately $35,000 a year from the floral operations.

- OTHER CONCESSIONS

Concession revenues received by DOT-A in connection with parking, rental car and ground transportation are expected to total $7.1 million, or 66% of total Revenues in FY 2008. Details of each revenue source and revenue forecast assumptions are as follows:

- PARKING

AMPCO System Parking operates the public and employee automobile parking facilities under a month-to-month management contract at KOA. Under this agreement, DOT-A retains all rights to implement, among other things, parking rate increases. Projected public parking revenues are based on (1) historical annual trends in parking revenues per enplaned passenger, (2) moderate increases in the parking rates beginning in FY 2009 and anticipated every 3 years following, and (3) forecast numbers of passengers. It is expected that with the completion of each parking expansion project a 5% increase in parking revenues can be anticipated. For forecasting purposes, the increases are anticipated in FY 2009 and FY 2020.

- RENTAL CAR REVENUES

DOT-A collects rental car concession revenues from on-Airport rental car operations. The on-Airport rental car companies operate under the terms of competitively bid Concession Agreements. In August, 2008, DOT-A advertised for new bids increasing the

percentage fee for on-airport operations from 7.5% to 10%. Currently, eight rental car companies are on-Airport property.

Revenues identified in this category are forecast to increase in proportion to (1) forecast increases in overseas originating passengers, (2) 2.5% inflation, and (3) percentage fees of 10%. The annual percentage fee is subject to a set minimum annual guarantee specified in the agreement.

On September 1, 2008, DOT-A began charging a customer facility charge (CFC) at KOA. CFC moneys collected through the rental car companies are to be deposited into a restricted fund that can only be used to fund construction of new consolidated rental car facilities and other improvements needed for on-airport rental car operators. No Airports System Revenues are expected from this revenue source, and no Airports System funds are anticipated to be used for rental car capital projects.

- GROUND TRANSPORTATION REVENUES

In FY 2008, ground transportation revenues at the Airport represented 1.4% of nonairline revenues and 1.0% of total Airport Revenues.

The components of ground transportation revenues are discussed below.

- Motor Coach (Airport Shuttle) Services

Under the terms of these contracts, the Airports Division receives 5% of gross receipts. Forecast revenues are anticipated to grow at 2.5% annually.

- Taxicab Management

Taxi service is provided on-demand. Forecast revenues are expected to grow by 2.5% annually for inflation.

Other terminal concessions

In addition to the primary concession agreements described above, off-Airport rental car companies pay fees according to the Hawaii Administrative Rule. 19-20.1-56 under Subchapter 9.

Other Rentals

Other rental revenues include revenues from certain facility and ground leases, as well as, utility costs that are recovered from the respective tenants. The details of this revenue source are described below:

- AERONAUTICAL RENTALS

Revenues from aeronautical rentals are associated with ground rentals of paved and unpaved property, and include ramp space and tie-downs that are located adjacent to the cargo and general aviation facilities. Aeronautical rentals also include facility rents and utility reimbursements associated with the cargo facilities, the commuter terminal and the general aviation T-hangars.

- NONAERONAUTICAL RENTALS

Revenues from nonaeronautical rentals include revenues associated with commercial tenants such as rental car baseyard lots, the fixed base operator (FBO) fueling facilities and other commercial leases. The terms of these leases range from 4 to 15 years for concessionaires and up to 65 years for other Airport users. Under the terms of the agreements, rental increases are adjusted in proportion with the Consumer Price Index (CPI).

The CIP includes a substantial investment in tenant support facilities at the Airport. For planning purposes, no incremental revenues were considered for these improvements that include the cargo, general aviation and heliport projects.

Other Airport Revenues

Other revenues include (1) the sale of certain utilities and other services, (2) miscellaneous income recognized through daily operations, and (3) interest income.

SUMMARY

The financial plan for the Kona International Airport Master Plan anticipates that project costs would be funded with a combination of federal grants-in-aid, Transportation Security Administrative funds, PFC revenues, internally generated cash flow, and future Bonds to be repaid in part from Revenues of the Airports System and in part from PFC revenues. In addition, a significant share of the capital costs is anticipated to be funded through tenant and third party financing. Beyond the short-term period through FY 2012, it is assumed that DOT-A will continue to develop the Airport as required to meet the needs of increased passenger demand, consistent with future funding sources available to the State at the time of project implementation. The financial feasibility of future projects will be determined by the provisions of existing or future tenant agreements (including Airlines), funding levels and participation rates of federal grant-in-aid programs, availability of PFC revenues (pay-as-you-go and leveraged), revenue bond capacity, and the ability to generate discretionary cash flow from Airport operations based on the priority of the projects in relation to the other 14 airports in the Statewide CIP.

The financial projections were prepared on the basis of available information and assumptions as set forth in this section. It is believed that such information and assumptions provide a reasonable basis for the projections to the level of detail appropriate for an airport master plan. Based on these assumptions, the capital improvement program could be financed in the future by the State and result in key financial indicators that are consistent with the historical results of the Statewide Airports System and industry comparables. However, some of the assumptions used to develop the projections will not be realized and unanticipated events and circumstances may occur. Therefore, the actual results may vary from those projected and such variations could be material.

Appendix A

GLOSSARY OF TERMS

Glossary of Terms

A

ABOVE GROUND LEVEL: The elevation of a point or surface above the ground.

ACCELERATE-STOP DISTANCE AVAILABLE (ASDA): See declared distances.

ADVISORY CIRCULAR: External publications issued by the FAA consisting of nonregulatory material providing for the recommendations relative to a policy, guidance and information relative to a specific aviation subject.

AIR CARRIER: An operator which: (1) performs at least five round trips per week between two or more points and publishes flight schedules which specify the times, days of the week, and places between which such flights are performed; or (2) transports mail by air pursuant to a current contract with the U.S. Postal Service. Certified in accordance with Federal Aviation Regulation (FAR) Parts 121 and 127.

AIRCRAFT: A transportation vehicle that is used or intended for use for flight.

AIRCRAFT APPROACH CATEGORY: A grouping of aircraft based on 1.3 times the stall speed in their landing configuration at their maximum certificated landing weight. The categories are as follows:

- Category A: Speed less than 91 knots.
- Category B: Speed 91 knots or more, but less than 121 knots.
- Category C: Speed 121 knots or more, but less than 141 knots.
- Category D: Speed 141 knots or more, but less than 166 knots.
- Category E: Speed greater than 166 knots.

AIRCRAFT OPERATION: The landing, takeoff, or touch-and-go procedure by an aircraft on a runway at an airport.

AIRCRAFT OPERATIONS AREA (AOA): A restricted and secure area on the airport property designed to protect all aspects related to aircraft operations.

AIRCRAFT OWNERS AND PILOTS ASSOCIATION: A private organization serving the interests and needs of general aviation pilots and aircraft owners.

AIRCRAFT RESCUE AND FIRE FIGHTING: A facility located at an airport that provides emergency vehicles, extinguishing agents, and personnel responsible for minimizing the impacts of an aircraft accident or incident.

AIRFIELD: The portion of an airport which contains the facilities necessary for the operation of aircraft.

AIRLINE HUB: An airport at which an airline concentrates a significant portion of its activity and which often has a significant amount of connecting traffic.

AIRPLANE DESIGN GROUP (ADG): A grouping of aircraft based upon wingspan. The groups are as follows:

- Group I: Up to but not including 49 feet.
- Group II: 49 feet up to but not including 79 feet.
- Group III: 79 feet up to but not including 118 feet.
- Group IV: 118 feet up to but not including 171 feet.
- Group V: 171 feet up to but not including 214 feet.
- Group VI: 214 feet or greater.

AIRPORT AUTHORITY: A quasi-governmental public organization responsible for setting the policies governing the management and operation of an airport or system of airports under its jurisdiction.

AIRPORT BEACON: A navigational aid located at an airport which displays a rotating light beam to identify whether an airport is lighted.

AIRPORT CAPITAL IMPROVEMENT PLAN: The planning program used by the Federal Aviation Administration to identify, prioritize, and distribute funds for airport development and the needs of the National Airspace System to meet specified national goals and objectives.

AIRPORT ELEVATION: The highest point on the runway system at an airport expressed in feet above mean sea level (MSL).

AIRPORT IMPROVEMENT PROGRAM: A program authorized by the Airport and Airway

Improvement Act of 1982 that provides funding for airport planning and development.

AIRPORT LAYOUT DRAWING (ALD): The drawing of the airport showing the layout of existing and proposed airport facilities.

AIRPORT LAYOUT PLAN (ALP): A scaled drawing of the existing and planned land and facilities necessary for the operation and development of the airport.

AIRPORT LAYOUT PLAN DRAWING SET: A set of technical drawings depicting the current and future airport conditions. The individual sheets comprising the set can vary with the complexities of the airport, but the FAA-required drawings include the Airport Layout Plan (sometimes referred to as the Airport Layout Drawing (ALD), the Airport Airspace Drawing, and the Inner Portion of the Approach Surface Drawing, On-Airport Land Use Drawing, and Property Map.

AIRPORT MASTER PLAN: The planner's concept of the long-term development of an airport.

AIRPORT MOVEMENT AREA SAFETY SYSTEM: A system that provides automated alerts and warnings of potential runway incursions or other hazardous aircraft movement events.

AIRPORT OBSTRUCTION CHART: A scaled drawing depicting the Federal Aviation Regulation (FAR) Part 77 surfaces, a representation of objects that penetrate these surfaces, runway, taxiway, and ramp areas, navigational aids, buildings, roads and other detail in the vicinity of an airport.

AIRPORT REFERENCE CODE (ARC): A coding system used to relate airport design criteria to the operational (Aircraft Approach Category) to the physical characteristics (Airplane Design Group) of the airplanes intended to operate at the airport.

AIRPORT REFERENCE POINT (ARP): The latitude and longitude of the approximate center of the airport.

AIRPORT SPONSOR: The entity that is legally responsible for the management and operation of an airport, including the fulfillment of the requirements of laws and regulations related thereto.

AIRPORT SURFACE DETECTION EQUIPMENT: A radar system that provides air traffic controllers with a visual representation of the movement of aircraft and other vehicles on the ground on the airfield at an airport.

AIRPORT SURVEILLANCE RADAR: The primary radar located at an airport or in an air traffic control terminal area that receives a signal at an antenna and transmits the signal to air traffic control display equipment defining the location of aircraft in the air. The signal provides only the azimuth and range of aircraft from the location of the antenna.

AIRPORT TRAFFIC CONTROL TOWER (ATCT): A central operations facility in the terminal air traffic control system, consisting of a tower, including an associated instrument flight rule (IFR) room if radar equipped, using air/ground communications and/or radar, visual signaling and other devices to provide safe and expeditious movement of terminal air traffic.

AIR ROUTE TRAFFIC CONTROL CENTER: A facility which provides en route air traffic control service to aircraft operating on an IFR flight plan within controlled airspace over a large, multi-state region.

AIRSIDE: The portion of an airport that contains the facilities necessary for the operation of aircraft.

AIRSPACE: The volume of space above the surface of the ground that is provided for the operation of aircraft.

AIR TAXI: An air carrier certificated in accordance with FAR Part 121 and FAR Part 135 and authorized to provide, on demand, public transportation of persons and property by aircraft. Generally operates small aircraft "for hire" for specific trips.

AIR TRAFFIC CONTROL: A service operated by an appropriate organization for the purpose of providing for the safe, orderly, and expeditious flow of air traffic.

AIR ROUTE TRAFFIC CONTROL CENTER (ARTCC): A facility established to provide air traffic control service to aircraft operating on an IFR flight plan within controlled airspace and principally during the en route phase of flight.

AIR TRAFFIC CONTROL SYSTEM COMMAND CENTER: A facility operated by the FAA which is responsible for the central flow control, the central altitude reservation system, the airport reservation position system, and the air traffic service contingency command for the air traffic control system.

AIR TRAFFIC HUB: A categorization of commercial service airports or group of commercial service airports in a metropolitan or urban area based upon the proportion of annual national enplanements existing at the airport or airports. The categories are large hub, medium hub, small hub, or non-hub. It forms the basis for the apportionment of entitlement funds.

AIR TRANSPORT ASSOCIATION OF AMERICA: An organization consisting of the principal U.S. airlines that represents the interests of the airline industry on major aviation issues before federal, state, and local government bodies. It promotes air transportation safety by coordinating industry and governmental safety programs and it serves as a focal point for industry efforts to standardize practices and enhance the efficiency of the air transportation system.

ALERT AREA: See special-use airspace.

ALTITUDE: The vertical distance measured in feet above mean sea level.

ANNUAL INSTRUMENT APPROACH (AIA): An approach to an airport with the intent to land by an aircraft in accordance with an IFR flight plan when visibility is less than three miles and/or when the ceiling is at or below the minimum initial approach altitude.

APPROACH LIGHTING SYSTEM (ALS): An airport lighting facility which provides visual guidance to landing aircraft by radiating light beams by which the pilot aligns the aircraft with the extended centerline of the runway on his final approach and landing.

APPROACH MINIMUMS: The altitude below which an aircraft may not descend while on an IFR approach unless the pilot has the runway in sight.

APPROACH SURFACE: An imaginary obstruction limiting surface defined in FAR Part 77 which is longitudinally centered on an extended runway centerline and extends outward and upward from the primary surface at each end of a runway at a designated slope and distance based upon the type of available or planned approach by aircraft to a runway.

APRON: A specified portion of the airfield used for passenger, cargo or freight loading and unloading, aircraft parking, and the refueling, maintenance and servicing of aircraft.

AREA NAVIGATION: The air navigation procedure that provides the capability to establish and maintain a flight path on an arbitrary course that remains within the coverage area of navigational sources being used.

AUTOMATED TERMINAL INFORMATION SERVICE (ATIS): The continuous broadcast of recorded non-control information at towered airports. Information typically includes wind speed, direction, and runway in use.

AUTOMATED SURFACE OBSERVATION SYSTEM (ASOS): A reporting system that provides frequent airport ground surface weather observation data through digitized voice broadcasts and printed reports.

AUTOMATED WEATHER OBSERVATION STATION (AWOS): Equipment used to automatically record weather conditions (i.e. cloud height, visibility, wind speed and direction, temperature, dew point, etc.)

AUTOMATIC DIRECTION FINDER (ADF): An aircraft radio navigation system which senses and indicates the direction to a non-directional radio beacon (NDB) ground transmitter.

AVIGATION EASEMENT: A contractual right or a property interest in land over which a right of unobstructed flight in the airspace is established.

AZIMUTH: Horizontal direction expressed as the angular distance between true north and the direction of a fixed point (as the observer's heading).

B

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. See "traffic pattern."

BASED AIRCRAFT: The general aviation aircraft that use a specific airport as a home base.

BEARING: The horizontal direction to or from any point, usually measured clockwise from true north or magnetic north.

BLAST FENCE: A barrier used to divert or dissipate jet blast or propeller wash.

BLAST PAD: A prepared surface adjacent to the end of a runway for the purpose of eliminating the erosion of the ground surface by the wind forces produced by airplanes at the initiation of takeoff operations.

BUILDING RESTRICTION LINE (BRL): A line which identifies suitable building area locations on the airport.

C

CAPITAL IMPROVEMENT PLAN: The planning program used by the Federal Aviation Administration to identify, prioritize, and distribute Airport Improvement Program funds for airport development and the needs of the National Airspace System to meet specified national goals and objectives.

CARGO SERVICE AIRPORT: An airport served by aircraft providing air transportation of property only, including mail, with an annual aggregate landed weight of at least 100,000,000 pounds.

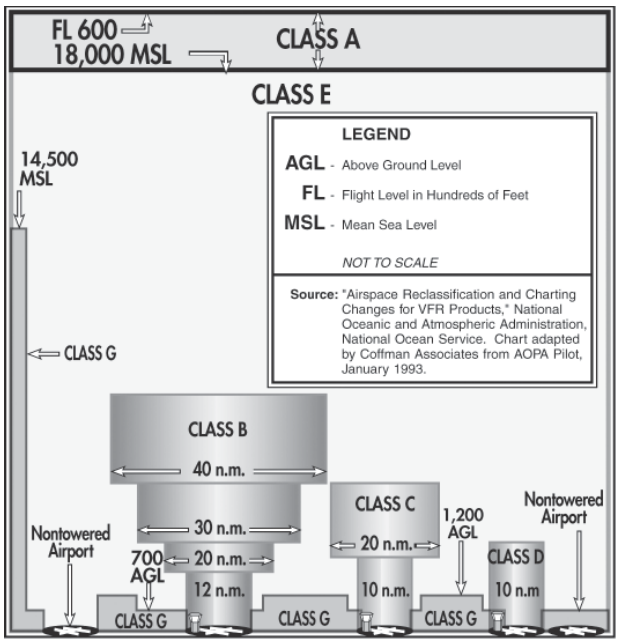
CATEGORY I: An Instrument Landing System (ILS) that provides acceptable guidance information to an aircraft from the coverage limits of the ILS to the point at which the localizer course line intersects the glide path at a decision height of 100 feet above the horizontal plane containing the runway threshold.

CATEGORY II: An ILS that provides acceptable guidance information to an aircraft from the coverage limits of the ILS to the point at which the localizer course line intersects the glide path at a decision height of 50 feet above the horizontal plane containing the runway threshold.

CATEGORY III: An ILS that provides acceptable guidance information to a pilot from the coverage limits of the ILS with no decision height specified above the horizontal plane containing the runway threshold.

CEILING: The height above the ground surface to the location of the lowest layer of clouds which is reported as either broken or overcast.

CIRCLING APPROACH: A maneuver initiated by the pilot to align the aircraft with the runway for landing when flying a predetermined circling instrument approach under IFR.



CLASS A AIRSPACE: See Controlled Airspace.

CLASS B AIRSPACE: See Controlled Airspace.

CLASS C AIRSPACE: See Controlled Airspace.

CLASS D AIRSPACE: See Controlled Airspace.

CLASS E AIRSPACE: See Controlled Airspace.

CLASS G AIRSPACE: See Controlled Airspace.

CLEAR ZONE: See Runway Protection Zone.

COMMERCIAL SERVICE AIRPORT: A public airport providing scheduled passenger service that enplanes at least 2,500 annual passengers.

COMMON TRAFFIC ADVISORY FREQUENCY: A radio frequency identified in the appropriate aeronautical chart which is designated for the purpose of transmitting airport advisory information and procedures while operating to or from an uncontrolled airport.

COMPASS LOCATOR (LOM): A low power, low/medium frequency radio-beacon installed in conjunction with the instrument landing system at one or two of the marker sites.

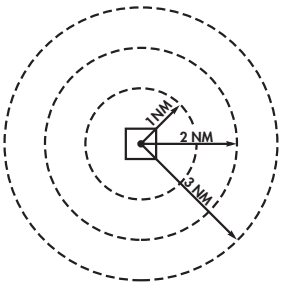
CONICAL SURFACE: An imaginary obstruction-limiting surface defined in FAR Part 77 that extends from the edge of the horizontal surface outward and upward at a slope of 20 to 1 for a horizontal distance of 4,000 feet.

CONTROLLED AIRPORT: An airport that has an operating airport traffic control tower.

CONTROLLED AIRSPACE: Airspace of defined dimensions within which air traffic control services are provided to instrument flight rules (IFR) and visual flight rules (VFR) flights in accordance with the airspace classification. Controlled airspace in the United States is designated as follows:

- **CLASS A**: Generally, the airspace from 18,000 feet mean sea level (MSL) up to but not including flight level FL600. All persons must operate their aircraft under IFR.

- **CLASS B**: Generally, the airspace from the surface to 10,000 feet MSL surrounding the nation's busiest airports. The configuration of Class B airspace is unique to each airport, but typically consists of two or more layers of air space and is designed to contain all published instrument approach procedures to the airport. An air traffic control clearance is required for all aircraft to operate in the area.



- **CLASS C**: Generally, the airspace from the surface to 4,000 feet above the airport elevation (charted as MSL) surrounding those airports that have an operational control tower and radar approach control and are served by a qualifying number of IFR operations or passenger enplanements. Although individually tailored for each airport, Class C airspace typically consists of a surface area with a five nautical mile (nm) radius and an outer area with a 10 nautical mile radius that extends from 1,200 feet to 4,000 feet above the airport elevation. Two-way radio communication is required for all aircraft.

- **CLASS D**: Generally, that airspace from the surface to 2,500 feet above the air port elevation (charted as MSL) surrounding those airports that have an operational control tower. Class D airspace is individually tailored and configured to encompass published instrument approach procedure . Unless otherwise authorized, all persons must establish two-way radio communication.

- **CLASS E**: Generally, controlled airspace that is not classified as Class A, B, C, or D. Class E airspace extends upward from either the surface or a designated altitude to the overlying or adjacent controlled airspace. When designated as a surface area, the airspace will be configured to contain all instrument procedures. Class E airspace encompasses all Victor Airways. Only aircraft following instrument flight rules are required to establish two-way radio communication with air traffic control.

- **CLASS G**: Generally, that airspace not classified as Class A, B, C, D, or E. Class G airspace is uncontrolled for all aircraft. Class G airspace extends from the surface to the overlying Class E airspace.

CONTROLLED FIRING AREA: See special-use airspace.

CROSSWIND: A wind that is not parallel to a runway centerline or to the intended flight path of an aircraft.

CROSSWIND COMPONENT: The component of wind that is at a right angle to the runway centerline or the intended flight path of an aircraft.

CROSSWIND LEG: A flight path at right angles to the landing runway off its upwind end. See "traffic pattern."

D

DECIBEL: A unit of noise representing a level relative to a reference of a sound pressure 20 micro newtons per square meter.

DECISION HEIGHT: The height above the end of the runway surface at which a decision must be made by a pilot during the ILS or Precision Approach Radar approach to either continue the approach or to execute a missed approach.

DECLARED DISTANCES: The distances declared available for the airplane's takeoff runway, takeoff distance, accelerate-stop distance, and landing distance requirements. The distances are:

- **TAKEOFF RUNWAY AVAILABLE (TORA)**: The runway length declared available and suitable for the ground run of an airplane taking off.
- **TAKEOFF DISTANCE AVAILABLE (TODA)**: The TORA plus the length of any remaining runway and/or clear way beyond the far end of the TORA.
- **ACCELERATE-STOP DISTANCE AVAILABLE (ASDA)**: The runway plus stopway length declared available for the acceleration and deceleration of an aircraft aborting a takeoff.
- **LANDING DISTANCE AVAILABLE (LDA)**: The runway length declared available and suitable for landing.

DEPARTMENT OF TRANSPORTATION: The cabinet level federal government organization consisting of modal operating agencies, such as the Federal Aviation Administration, which was established to promote the coordination of federal transportation programs and to act as a focal point for research and development efforts in transportation.

DISCRETIONARY FUNDS: Federal grant funds that may be appropriated to an airport based upon designation by the Secretary of Transportation or Congress to meet a specified national priority such as enhancing capacity, safety, and security, or mitigating noise.

DISPLACED THRESHOLD: A threshold that is located at a point on the runway other than the designated beginning of the runway.

DISTANCE MEASURING EQUIPMENT (DME): Equipment (airborne and ground) used to measure, in nautical miles, the slant range distance of an aircraft from the DME navigational aid.

DNL: The 24-hour average sound level, in Aweighted decibels, obtained after the addition of ten decibels to sound levels for the periods between 10 p.m. and 7 a.m. as averaged over a span of one year. It is the FAA standard metric for determining the cumulative exposure of individuals to noise.

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. Also see "traffic pattern."

E

EASEMENT: The legal right of one party to use a portion of the total rights in real estate owned by another party. This may include the right of passage over, on, or below the property; certain air rights above the property, including view rights; and the rights to any specified form of development or activity, as well as any other legal rights in the property that may be specified in the easement document.

ELEVATION: The vertical distance measured in feet above mean sea level.

ENPLANED PASSENGERS: The total number of revenue passengers boarding aircraft, including originating, stop-over, and transfer passengers, in scheduled and nonscheduled services.

ENPLANEMENT: The boarding of a passenger, cargo, freight, or mail on an aircraft at an airport.

ENTITLEMENT: Federal funds for which a commercial service airport may be eligible based upon its annual passenger enplanements.

ENVIRONMENTAL ASSESSMENT (EA): An environmental analysis performed pursuant to the National Environmental Policy Act to determine whether an action would significantly affect the environment and thus require a more detailed environmental impact statement.

ENVIRONMENTAL AUDIT: An assessment of the current status of a party's compliance with applicable

environmental requirements of a party's environmental compliance policies, practices, and controls.

ENVIRONMENTAL IMPACT STATEMENT (EIS): A document required of federal agencies by the National Environmental Policy Act for major projects are legislative proposals affecting the environment. It is a tool for decision-making describing the positive and negative effects of a proposed action and citing alternative actions.

ESSENTIAL AIR SERVICE: A federal program which guarantees air carrier service to selected small cities by providing subsidies as needed to prevent these cities from such service.

F

FEDERAL AVIATION REGULATIONS: The general and permanent rules established by the executive departments and agencies of the Federal Government for aviation, which are published in the Federal Register. These are the aviation subset of the Code of Federal Regulations.

FEDERAL INSPECTION SERVICES: The provision of customs and immigration services including passport inspection, inspection of baggage, the collection of duties on certain imported items, and the inspections for agricultural products, illegal drugs, or other restricted items.

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. See "traffic pattern."

FINAL APPROACH AND TAKEOFF AREA (FATO). A defined area over which the final phase of the helicopter approach to a hover, or a landing is completed and from which the takeoff is initiated.

FINAL APPROACH FIX: The designated point at which the final approach segment for an aircraft landing on a runway begins for a non-precision approach.

FINDING OF NO SIGNIFICANT IMPACT (FONSI): A public document prepared by a Federal agency that presents the rationale why a proposed action will not have a significant effect on the environment and for which an environmental impact statement will not be prepared.

FIXED BASE OPERATOR (FBO): A provider of services to users of an airport. Such services include, but are not limited to, hangaring, fueling, flight training, repair, and maintenance.

FLIGHT LEVEL: A designation for altitude within controlled airspace.

FLIGHT SERVICE STATION: An operations facility in the national flight advisory system which utilizes data interchange facilities for the collection and dissemination of Notices to Airmen, weather, and administrative data and which provides pre-flight and in-flight advisory services to pilots through air and ground based communication facilities.

FRANGIBLE NAVAID: A navigational aid which retains its structural integrity and stiffness up to a designated maximum load, but on impact from a greater load, breaks, distorts, or yields in such a manner as to present the minimum hazard to aircraft.

G

GENERAL AVIATION: That portion of civil aviation which encompasses all facets of aviation except air carriers holding a certificate of convenience and necessity, and large aircraft commercial operators.

GENERAL AVIATION AIRPORT: An airport that provides air service to only general aviation.

GLIDESLOPE (GS): Provides vertical guidance for aircraft during approach and landing. The glideslope consists of the following:

1. Electronic components emitting signals which provide vertical guidance by reference to airborne instruments during instrument approaches such as ILS; or

2. Visual ground aids, such as VASI, which provide vertical guidance for VFR approach or for the visual portion of an instrument approach and landing.

GLOBAL POSITIONING SYSTEM (GPS): A system of 24 satellites used as reference points to enable navigators equipped with GPS receivers to determine their latitude, longitude, and altitude.

GROUND ACCESS: The transportation system on and around the airport that provides access to and

from the airport by ground transportation vehicles for passengers, employees, cargo, freight, and airport services.

H

HELIPAD: A designated area for the takeoff, landing, and parking of helicopters.

HIGH INTENSITY RUNWAY LIGHTS: The highest classification in terms of intensity or brightness for lights designated for use in delineating the sides of a runway.

HIGH-SPEED EXIT TAXIWAY: A long radius taxiway designed to expedite aircraft turning off the runway after landing (at speeds to 60 knots), thus reducing runway occupancy time.

HORIZONTAL SURFACE: An imaginary obstruction- limiting surface defined in FAR Part 77 that is specified as a portion of a horizontal plane surrounding a runway located 150 feet above the established airport elevation. The specific horizontal dimensions of this surface are a function of the types of approaches existing or planned for the runway.

I

INITIAL APPROACH FIX: The designated point at which the initial approach segment begins for an instrument approach to a runway.

INSTRUMENT APPROACH PROCEDURE: A series of predetermined maneuvers for the orderly transfer of an aircraft under instrument flight conditions from the beginning of the initial approach to a landing, or to a point from which a landing may be made visually.

INSTRUMENT FLIGHT RULES (IFR): Procedures for the conduct of flight in weather conditions below Visual Flight Rules weather minimums. The term IFR is often also used to define weather conditions and the type of flight plan under which an aircraft is operating.

INSTRUMENT LANDING SYSTEM (ILS): A precision instrument approach system which normally consists of the following electronic components and visual aids:

1. Localizer.
2. Glide Slope.
3. Outer Marker.
4. Middle Marker.
5. Approach Lights.

INSTRUMENT METEOROLOGICAL CONDITIONS: Meteorological conditions expressed in terms of specific visibility and ceiling conditions that are less than the minimums specified for visual meteorological conditions.

ITINERANT OPERATIONS: Operations by aircraft that are not based at a specified airport.

K

KNOTS: A unit of speed length used in navigation that is equivalent to the number of nautical miles traveled in one hour.

L

LANDSIDE: The portion of an airport that provides the facilities necessary for the processing of passengers, cargo, freight, and ground transportation vehicles.

LANDING DISTANCE AVAILABLE (LDA): See declared distances.

LARGE AIRPLANE: An airplane that has a maximum certified takeoff weight in excess of 12,500 pounds.

LOCAL AREA AUGMENTATION SYSTEM: A differential GPS system that provides localized measurement correction signals to the basic GPS signals to improve navigational accuracy integrity, continuity, and availability.

LOCAL OPERATIONS: Aircraft operations performed by aircraft that are based at the airport and that operate in the local traffic pattern or within sight of the airport, that are known to be departing for or arriving from flights in local practice areas within a prescribed distance from the airport, or that execute simulated instrument approaches at the airport.

LOCAL TRAFFIC: Aircraft operating in the traffic pattern or within sight of the tower, or aircraft known to be departing or arriving from the local practice areas, or aircraft executing practice instrument

approach procedures. Typically, this includes touch and-go training operations.

LOCALIZER: The component of an ILS which provides course guidance to the runway.

LOCALIZER TYPE DIRECTIONAL AID (LDA): A facility of comparable utility and accuracy to a localizer, but is not part of a complete ILS and is not aligned with the runway.

LONG RANGE NAVIGATION SYSTEM (LORAN): Long range navigation is an electronic navigational aid which determines aircraft position and speed by measuring the difference in the time of reception of synchronized pulse signals from two fixed transmitters. Loran is used for en route navigation.

LOW INTENSITY RUNWAY LIGHTS: The lowest clas- sification in terms of intensity or brightness for lights designated for use in delineating the sides of a runway.

M

MEDIUM INTENSITY RUNWAY LIGHTS: The middle classification in terms of intensity or brightness for lights designated for use in delineating the sides of a runway.

MICROWAVE LANDING SYSTEM (MLS): An instrument approach and landing system that provides precision guidance in azimuth, elevation, and distance measurement.

MILITARY OPERATIONS: Aircraft operations that are performed in military aircraft.

MILITARY OPERATIONS AREA (MOA): See special-use airspace

MILITARY TRAINING ROUTE: An air route depicted on aeronautical charts for the conduct of military flight training at speeds above 250 knots.

MISSED APPROACH COURSE (MAC): The flight route to be followed if, after an instrument approach, a landing is not affected, and occurring normally:

1. When the aircraft has descended to the decision height and has not established visual contact; or

2. When directed by air traffic control to pull up or to go around again.

MOVEMENT AREA: The runways, taxiways, and other areas of an airport which are utilized for taxiing/hover taxiing, air taxiing, takeoff, and landing of aircraft, exclusive of loading ramps and parking areas. At those airports with a tower, air traffic control clearance is required for entry onto the movement area.

N

NATIONAL AIRSPACE SYSTEM: The network of air traffic control facilities, air traffic control areas, and navigational facilities through the U.S.

NATIONAL PLAN OF INTEGRATED AIRPORT SYSTEMS: The national airport system plan developed by the Secretary of Transportation on a biannual basis for the development of public use airports to meet national air transportation needs.

NATIONAL TRANSPORTATION SAFETY BOARD: A federal government organization established to investigate and determine the probable cause of transportation accidents, to recommend equipment and procedures to enhance transportation safety, and to review on appeal the suspension or revocation of any certificates or licenses issued by the Secretary of Transportation.

NAUTICAL MILE: A unit of length used in navigation which is equivalent to the distance spanned by one minute of arc in latitude, that is, 1,852 meters or 6,076 feet. It is equivalent to approximately 1.15 statute mile.

NAVAID: A term used to describe any electrical or visual air navigational aids, lights, signs, and associated supporting equipment (i.e. PAPI, VASI, ILS, etc.)

NAVIGATIONAL AID: A facility used as, available for use as, or designed for use as an aid to air navigation.

NOISE CONTOUR: A continuous line on a map of the airport vicinity connecting all points of the same noise exposure level.

NON-DIRECTIONAL BEACON (NDB): A beacon transmitting nondirectional signals whereby the pilot of an aircraft equipped with direction finding equipment can determine his or her bearing to and from the radio beacon and home on, or track to, the station. When the radio beacon is installed in conjunction with the Instrument Landing System marker, it is normally called a Compass Locator.

NON-PRECISION APPROACH PROCEDURE: A standard instrument approach procedure in which no electronic glide slope is provided, such as VOR, TACAN, NDB, or LOC.

NOTICE TO AIRMEN: A notice containing information concerning the establishment, condition, or change in any component of or hazard in the National Airspace System, the
timely knowledge of which is considered essential to personnel concerned with flight operations.

O

OBJECT FREE AREA (OFA): An area on the ground centered on a runway, taxiway, or taxilane centerline provided to enhance the safety of aircraft operations by having the area free of objects, except for objects that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes.

OBSTACLE FREE ZONE (OFZ): The airspace below 150 feet above the established airport elevation and along the runway and extended runway centerline that is required to be kept clear of all objects, except for frangible visual NAVAIDs that need to be located in the OFZ because of their function, in order to provide clearance for aircraft landing or taking off from the runway, and for missed approaches.

ONE-ENGINE INOPERABLE SURFACE: A surface emanating from the runway end at a slope ratio of 62.5:1. Air carrier airports are required to maintain a technical drawing of this surface depicting any object penetrations by January 1, 2010.

OPERATION: The take-off, landing, or touch-and-go procedure by an aircraft on a runway at an airport.

OUTER MARKER (OM): An ILS navigation facility in the terminal area navigation system located four to seven miles from the runway edge on the extended centerline, indicating to the pilot that he/she is passing over the facility and can begin final approach.

P

PILOT CONTROLLED LIGHTING: Runway lighting systems at an airport that are controlled by activating the microphone of a pilot on a specified radio frequency.

PRECISION APPROACH: A standard instrument approach procedure which provides runway alignment and glide slope (descent) information. It is categorized as follows:

- **CATEGORY I (CAT I)**: A precision approach which provides for approaches with a decision height of not less than 200 feet and visibility not less than 1/2 mile or Runway Visual Range (RVR) 2400 (RVR 1800) with operative touchdown zone and runway centerline lights.

- **CATEGORY II (CAT II)**: A precision approach which provides for approaches with a decision height of not less than 100 feet and visibility not less than 1200 feet RVR.

- **CATEGORY III (CAT III)**: A precision approach which provides for approaches with minima less than Category II.

PRECISION APPROACH PATH INDICATOR (PAPI): A lighting system providing visual approach slope guidance to aircraft during a landing approach. It is similar to a VASI but provides a sharper transition between the colored indicator lights.

PRECISION APPROACH RADAR: A radar facility in the terminal air traffic control system used to detect and display with a high degree of accuracy the direction, range, and elevation of an aircraft on the final approach to a runway.

PRECISION OBJECT FREE AREA (POFA): An area centered on the extended runway centerline, beginning at the runway threshold and extending behind the runway threshold that is 200 feet long by 800 feet wide. The POFA is a clearing standard which requires the POFA to be kept clear of above ground objects protruding above the runway safety

area edge elevation (except for frangible NAVAIDS). The POFA applies to all new authorized instrument approach procedures with less than 3/4 mile visibility.

PRIMARY AIRPORT: A commercial service airport that enplanes at least 10,000 annual passengers.

PRIMARY SURFACE: An imaginary obstruction limiting surface defined in FAR Part 77 that is specified as a rectangular surface longitudinally centered about a runway. The specific dimensions of this surface are a function of the types of approaches existing or planned for the runway.

PROHIBITED AREA: See special-use airspace.

PVC: Poor visibility and ceiling. Used in determining Annual Service Volume. PVC conditions exist when the cloud ceiling is less than 500 feet and visibility is less than one mile.

R

RADIAL: A navigational signal generated by a Very High Frequency Omni-directional Range or VORTAC station that is measured as an azimuth from the station.

REGRESSION ANALYSIS: A statistical technique that seeks to identify and quantify the relationships between factors associated with a forecast.

REMOTE COMMUNICATIONS OUTLET (RCO): An unstaffed transmitter receiver/facility remotely controlled by air traffic personnel. RCOs serve flight service stations (FSSs). RCOs were established to provide ground-to-ground communications between air traffic control specialists and pilots at satellite airports for delivering en route clearances, issuing departure authorizations, and acknowledging instrument flight rules cancellations or departure/landing times.

REMOTE TRANSMITTER/RECEIVER (RTR): See remote communications outlet. RTRs serve ARTCCs.

RELIEVER AIRPORT: An airport to serve general aviation aircraft which might otherwise use a congested air-carrier served airport.

RESTRICTED AREA: See special-use airspace.

RNAV: Area navigation - airborne equipment which permits flights over determined tracks within prescribed accuracy tolerances without the need to overfly ground-based navigation facilities. Used en route and for approaches to an airport.

RUNWAY: A defined rectangular area on an airport prepared for aircraft landing and takeoff. Runways are normally numbered in relation to their magnetic direction, rounded off to the nearest 10 degrees. For example, a runway with a magnetic heading of 180 would be designated Runway 18. The runway heading on the opposite end of the runway is 180 degrees from that runway end. For example, the opposite runway heading for Runway 18 would be Runway 36 (magnetic heading of 360). Aircraft can takeoff or land from either end of a runway, depending upon wind direction.

RUNWAY ALIGNMENT INDICATOR LIGHT: A series of high intensity sequentially flashing lights installed on the extended centerline of the runway usually in conjunction with an approach lighting system.

RUNWAY END IDENTIFIER LIGHTS (REIL): Two synchronized flashing lights, one on each side of the runway threshold, which provide rapid and positive identification of the approach end of a particular runway.

RUNWAY GRADIENT: The average slope, measured in percent, between the two ends of a runway.

RUNWAY PROTECTION ZONE (RPZ): An area off the runway end to enhance the protection of people and property on the ground. The RPZ is trapezoidal in shape. Its dimensions are determined by the aircraft approach speed and runway approach type and minima.

RUNWAY SAFETY AREA (RSA): A defined surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway.

RUNWAY VISIBILITY ZONE (RVZ): An area on the airport to be kept clear of permanent objects so that there is an unobstructed line of- site from any point five feet above the runway centerline to

any point five feet above an intersecting runway centerline.

RUNWAY VISUAL RANGE (RVR): An instrumentally derived value, in feet, representing the horizontal distance a pilot can see down the runway from the runway end.

S

SCOPE: The document that identifies and defines the tasks, emphasis, and level of effort associated with a project or study.

SEGMENTED CIRCLE: A system of visual indicators designed to provide traffic pattern information at airports without operating control towers.

SHOULDER: An area adjacent to the edge of paved runways, taxiways, or aprons providing a transition between the pavement and the adjacent surface; support for aircraft running off the pavement; enhanced drainage; and blast protection. The shoulder does not necessarily need to be paved.

SLANT-RANGE DISTANCE: The straight line distance between an aircraft and a point on the ground.

SMALL AIRPLANE: An airplane that has a maximum certified takeoff weight of up to 12,500 pounds.

SPECIAL-USE AIRSPACE: Airspace of defined dimensions identified by a surface area wherein activities must be confined because of their nature and/or wherein limitations may be imposed upon aircraft operations that are not a part of those activities. Special-use airspace classifications include:

- **ALERT AREA**: Airspace which may contain a high volume of pilot training activities or an unusual type of aerial activity, neither of which is hazardous to aircraft.

- **CONTROLLED FIRING AREA**: Airspace wherein activities are conducted under conditions so controlled as to eliminate hazards to nonparticipating aircraft and to ensure the safety of persons or property on the ground.

- **MILITARY OPERATIONS AREA (MOA)**: Designated airspace with defined vertical and lateral dimensions established outside Class A airspace to separate/segregate certain military activities from instrument flight rule (IFR) traffic and to identify for visual flight rule (VFR) traffic where these activities are conducted.

- **PROHIBITED AREA**: Designated airspace within which the flight of aircraft is prohibited.

- **RESTRICTED AREA**: Airspace designated under Federal Aviation Regulation (FAR) 73, within which the flight of aircraft, while not wholly prohibited, is subject to restriction. Most restricted areas are designated joint use. When not in use by the using agency, IFR/VFR operations can be authorized by the controlling air traffic control facility.

- **WARNING AREA**: Airspace which may contain hazards to nonparticipating aircraft.

STANDARD INSTRUMENT DEPARTURE (SID): A preplanned coded air traffic control IFR departure routing, preprinted for pilot use in graphic and textual form only.

STANDARD INSTRUMENT DEPARTURE PROCEDURES: A published standard flight procedure to be utilized following takeoff to provide a transition between the airport and the terminal area or en route airspace.

STANDARD TERMINAL ARRIVAL ROUTE (STAR): A preplanned coded air traffic control IFR arrival routing, preprinted for pilot use in graphic and textual or textual form only.

STOP-AND-GO: A procedure wherein an aircraft will land, make a complete stop on the runway, and then commence a takeoff from that point. A stop-and-go is recorded as two operations: one operation for the landing and one operation for the takeoff.

STOPWAY: An area beyond the end of a takeoff runway that is designed to support an aircraft during an aborted takeoff without causing structural damage to the aircraft. It is not to be used for takeoff, landing, or taxiing by aircraft.

STRAIGHT-IN LANDING/APPROACH: A landing made on a runway aligned within 30 degrees

of the final approach course following completion of an instrument approach.

T

TACTICAL AIR NAVIGATION (TACAN): An ultrahigh frequency electronic air navigation system which provides suitably-equipped aircraft a continuous indication of bearing and distance to the TACAN station.

TAKEOFF RUNWAY AVAILABLE (TORA): See declared distances.

TAKEOFF DISTANCE AVAILABLE (TODA): See declared distances.

TAXILANE: The portion of the aircraft parking area used for access between taxiways and aircraft parking positions.

TAXIWAY: A defined path established for the taxiing of aircraft from one part of an airport to another.

TAXIWAY SAFETY AREA (TSA): A defined surface alongside the taxiway prepared or suitable for reducing the risk of damage to an airplane unintentionally departing the taxiway.

TERMINAL INSTRUMENT PROCEDURES: Published flight procedures for conducting instrument approaches to runways under instrument meteorological conditions.

TERMINAL RADAR APPROACH CONTROL: An element of the air traffic control system responsible for monitoring the en-route and terminal segment of air traffic in the airspace surrounding airports with moderate to high levels of air traffic.

TETRAHEDRON: A device used as a landing direction indicator. The small end of the tetrahedron points in the direction of landing.

THRESHOLD: The beginning of that portion of the runway available for landing. In some instances the landing threshold may be displaced.

TOUCH-AND-GO: An operation by an aircraft that lands and departs on a runway without stopping or exiting the runway. A touch-and go is recorded as two operations: one operation for the landing and one operation for the takeoff.

TOUCHDOWN: The point at which a landing aircraft makes contact with the runway surface.

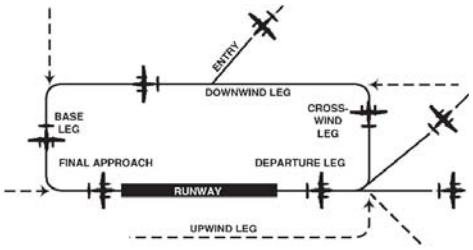
TOUCHDOWN AND LIFT-OFF AREA (TLOF): A load bearing, generally paved area, normally centered in the FATO, on which the helicopter lands or takes off.

TOUCHDOWN ZONE (TDZ): The first 3,000 feet of the runway beginning at the threshold.

TOUCHDOWN ZONE ELEVATION (TDZE): The highest elevation in the touchdown zone.

TOUCHDOWN ZONE (TDZ) LIGHTING: Two rows of transverse light bars located symmetrically about the runway centerline normally at 100- foot intervals. The basic system extends 3,000 feet along the runway.

TRAFFIC PATTERN: The traffic flow that is prescribed for aircraft landing at or taking off from an airport. The components of a typical traffic pattern are the upwind leg, crosswind leg, downwind leg, base leg, and final approach.



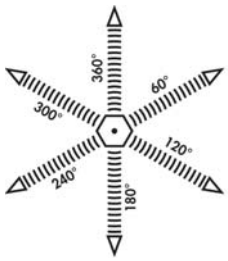
U

UNCONTROLLED AIRPORT: An airport without an air traffic control tower at which the control of Visual Flight Rules traffic is not exercised.

UNCONTROLLED AIRSPACE: Airspace within which aircraft are not subject to air traffic control.

UNIVERSAL COMMUNICATION (UNICOM): A nongovernment communication facility which may provide airport information at certain airports. Locations and frequencies of UNICOM's are shown on aeronautical charts and publications.

UPWIND LEG: A flight path parallel to the landing runway in the direction of landing. See "traffic pattern."



V

VECTOR: A heading issued to an aircraft to provide navigational guidance by radar.

VERY HIGH FREQUENCY/ OMNIDIRECTIONAL RANGE (VOR): A ground-based electronic navigation aid transmitting very high frequency navigation signals, 360 degrees in azimuth, oriented from magnetic north. Used as the basis for navigation in the national airspace system. The VOR periodically identifies itself by Morse Code and may have an additional voice identification feature.

VERY HIGH FREQUENCY OMNI-DIRECTIONAL RANGE/ TACTICAL AIR NAVIGATION (VORTAC): A navigation aid providing VOR azimuth, TACAN azimuth, and TACAN distance-measuring equipment (DME) at one site.

VICTOR AIRWAY: A control area or portion thereof established in the form of a corridor, the centerline of which is defined by radio navigational aids.

VISUAL APPROACH: An approach wherein an aircraft on an IFR flight plan, operating in VFR conditions under the control of an air traffic control facility and having an air traffic control authorization, may proceed to the airport of destination in VFR conditions.

VISUAL APPROACH SLOPE INDICATOR (VASI): An airport lighting facility providing vertical visual approach slope guidance to aircraft during approach to landing by radiating a directional pattern of high intensity red and white focused light beams which indicate to the pilot that he is on path if he sees red/white, above path if white/white, and below path if red/red. Some airports serving large aircraft have three-bar VASI's which provide two visual guide paths to the same runway.

VISUAL FLIGHT RULES (VFR): Rules that govern the procedures for conducting flight under visual conditions. The term VFR is also used in the United States to indicate weather conditions that are equal to or greater than minimum VFR requirements. In addition, it is used by pilots and controllers to indicate type of flight plan.

VISUAL METEOROLOGICAL CONDITIONS: Meteorological conditions expressed in terms of specific visibility and ceiling conditions which are equal to or greater than the threshold values for instrument meteorological conditions.

VOR: See "Very High Frequency Omnidirectional Range Station."

VORTAC: See "Very High Frequency Omnidirectional Range Station/Tactical Air Navigation."

W

WARNING AREA: See special-use airspace.

WIDE AREA AUGMENTATION SYSTEM: An enhancement of the Global Positioning System that includes integrity broadcasts, differential corrections, and additional ranging signals for the purpose of providing the accuracy, integrity, availability, and continuity required to support all phases of flight.

Abbreviations

AC: advisory circular

ADF: automatic direction finder

ADG: airplane design group

AFSS: automated flight service station

AGL: above ground level

AIA: annual instrument approach

AIP: Airport Improvement Program

AIR-21: Wendell H. Ford Aviation Investment and Reform Act for the 21st Century

ALS: approach lighting system

ALSF-1: standard 2,400-foot high intensity approach lighting system with sequenced flashers (CAT I configuration)

ALSF-2: standard 2,400-foot high intensity approach lighting system with sequenced flashers (CAT II configuration)

AOA: Aircraft Operation Area

APV: instrument approach procedure with vertical guidance

ARC: airport reference code

ARFF: aircraft rescue and fire fighting

ARP: airport reference point

ARTCC: air route traffic control center

ASDA: accelerate-stop distance available

ASR: airport surveillance radar

ASOS: automated surface observation station

ATCT: airport traffic control tower

ATIS: automated terminal information service

AVGAS: aviation gasoline - typically 100 low lead (100L)

AWOS: automated weather observation station

BRL: building restriction line

CFR: Code of Federal Regulation

CIP: capital improvement program

DME: distance measuring equipment

DNL: day-night noise level

DWL: runway weight bearing capacity of aircraft with dual-wheel type landing gear

DTWL: runway weight bearing capacity of aircraft with dual-tandem type landing gear

FAA: Federal Aviation Administration

FAR: Federal Aviation Regulation

FBO: fixed base operator

FY: fiscal year

GPS: global positioning system

GS: glide slope

HIRL: high intensity runway edge lighting

IFR: instrument flight rules (FAR Part 91)

ILS: instrument landing system

IM: inner marker

LDA: localizer type directional aid

LDA: landing distance available

LIRL: low intensity runway edge lighting

LMM: compass locator at ILS outer marker

LORAN: long range navigation

MALS: midium intensity approach lighting system with indicator lights

MIRL: medium intensity runway edge lighting

MITL: medium intensity taxiway edge lighting

MLS: microwave landing system

MM: middle marker

MOA: military operations area

MSL: mean sea level

NAVAID: navigational aid

NDB: nondirectional radio beacon

NM: nautical mile (6,076.1 feet)

NPES: National Pollutant Discharge Elimination System

NPIAS: National Plan of Integrated Airport Systems

NPRM: notice of proposed rule making

ODALS: omnidirectional approach lighting system

OFA: object free area

OFZ: obstacle free zone

OM: outer marker

PAC: planning advisory committee

PAPI: precision approach path indicator

PFC: porous friction course

PFC: passenger facility charge

PCL: pilot-controlled lighting

PIW public information workshop

PLASI: pulsating visual approach slope indicator

POFA: precision object free area

PVASI: pulsating/steady visual approach slope indicator

PVC: poor visibility and ceiling

RCO: remote communications outlet

REIL: runway end identifier lighting

RNAV: area navigation

RPZ: runway protection zone

RSA: runway safety area

RTR: remote transmitter/receiver

RVR: runway visibility range

RVZ: runway visibility zone

SALS: short approach lighting system

SASP: state aviation system plan

SEL: sound exposure level

SID: standard instrument departure

SM: statute mile (5,280 feet)

SRE: snow removal equipment

SSALF: simplified short approach lighting system with runway alignment indicator lights

STAR: standard terminal arrival route

SWL: runway weight bearing capacity for aircraft with single-wheel tandem type landing gear

TACAN: tactical air navigational aid

TAF: Federal Aviation Administration (FAA) Terminal Area Forecast

TLOF: Touchdown and lift-off

TDZ: touchdown zone

TDZE: touchdown zone elevation

TODA: takeoff distance available

TORA: takeoff runway available

TRACON: terminal radar approach control

VASI: visual approach slope indicator

VFR: visual flight rules (FAR Part 91)

VHF: very high frequency

VOR: very high frequency omni-directional range

VORTAC: VOR and TACAN collocated

Appendix B

ENVIRONMENTAL EVALUATION

Appendix B
ENVIRONMENTAL EVALUATION

A review of the potential environmental impacts associated with proposed airport projects is an essential consideration in the airport master planning process. The primary purpose of this evaluation is to review the planned improvement program for Kona International Airport at Keahole (KOA) to determine whether the planned actions could, individually or collectively, have the potential to significantly affect the quality of the environment.

Construction of the improvements depicted on the Airport Layout Plan, developed as part of this master plan, will require compliance with the *National Environmental Policy Act* (NEPA) *of 1969*, as amended, to receive federal financial assistance. For projects not categorically excluded under Federal Aviation Administration (FAA) Order 1050.1E, *Environmental Impacts: Policies and Procedures*, compliance with NEPA is generally satisfied through the preparation of an Environmental Assessment (EA). In instances where significant environmental impacts are expected, an Environmental Impact Statement (EIS) may be required. Projects that normally require an Environmental Assessment include helicopter facilities, land acquisition, major runway strengthening or extension, the conversion of prime or unique farmland to non-agricultural use, any airport project that is not normally categorically excluded that involves the dredging or filling of any waterway or wetland. Additionally, any normally categorically excluded action involving extraordinary circum-

stances as determined by the FAA requires an Environmental Assessment. A list of these actions is presented in **Table B1**.

TABLE B1
Normally Categorically Excluded Actions That May Involve Extraordinary Circumstances

Airfield barriers	On-airport obstruction treatment
Airfield improvements	Ownership change by purchase or transfer
Aircraft parking areas	Parking areas
Roads	Passenger handling building
Runways	Radar installation
Storage areas	Releasing airport land
Airfield lighting	Relocation
Cargo building	Repair and maintenance
Conveying federally owned land	Replacement structures
Deicing/anti-icing facility	Restrictions, aircraft access
Fill activity	Runway threshold
General landscaping	Security
Heliport at an existing airport	Transfer land by long term lease
Low emission technology equipment	U.S. Waters in which categorically excluded actions are proposed
Non-radar facilities	Utility line construction, temporary
Noise barriers	Wildlife Hazard Management Plan implementation
Noise compatibility programs	
Non-U.S. waters	

Source: FAA Order 5050.4B, *National Environmental Policy Act Implementing Instructions for Airports*

In addition to federal requirements regarding environmental documentation, the State of Hawaii has adopted laws concerning the evaluation of a project's impact on the environment. Hawaii Revised Statutes require that an Environmental Assessment must be prepared for any proposed action that triggers the EIS process. There are nine types of actions which can trigger the environmental review process. Airport development projects will be subject to the review process. The State of Hawaii process is similar to the federal process and requires that all affected agencies, individuals, and organizations are consulted. Like the federal process, there is also a provision for an Environmental Impact Statement to be prepared when the lead agency determines that the project will have a significant impact. It is recommended that if state and federal environmental documentation is necessary, the public consultation component of each document should be conducted at the same time.

While this appendix to the master plan is not designed to satisfy the state or NEPA requirements for a categorical exclusion, EA, or EIS, it is intended to supply a preliminary review of environmental issues that would need to be analyzed in more detail within the NEPA process. This evaluation considers all environmental

categories required for the NEPA process as outlined in FAA Order 1050.1E, *Environmental Impacts: Policies and Procedures,* and FAA Order 5050.4B, *National Environmental Policy Act* (NEPA) *Implementing Instructions for Airport Actions.*

The following sections describe potential impacts to the environmental resources (as outlined within Appendix A of FAA Order 1050.1E) as development at the airport is undertaken. Exhibit 5A in Chapter Five depicts the proposed future development of the airport. Further, Exhibit 5L depicts the ultimate land use plan for the airport property.

AIR QUALITY

The U.S. Environmental Protection Agency (EPA) has adopted air quality standards that specify the maximum permissible near-term and long-term concentrations of various air contaminants. Primary air quality standards are established at levels to protect the public health from harm with an adequate margin of safety. Secondary standards are set at levels necessary 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 the National Ambient Air Quality Standards (NAAQS). The federal air quality standards focus on limiting the quantity of six criteria pollutants:

- Ozone (O_3)
- Carbon Monoxide (CO)
- Sulfur Dioxide (SO_x)
- Nitrogen Dioxide (NO_x)
- Particulate Matter (PM_{10} and $PM_{2.5}$)
- Lead (Pb)

The Hawaii Department of Health has adopted more stringent ambient air quality standards than the federal standards. The standards for each pollutant are presented in **Table B2**. The Hawaii standards include an additional category, Hydrogen Sulfide (H_2S). Hydrogen Sulphide is a by-product of geothermal energy production processes used on the Hawaiian Islands.

Air contaminants can aggravate existing respiratory and cardiopulmonary diseases. The standards establish the level of air quality which is necessary to protect the public health and welfare including, among other things, effects on crops, vegetation, wildlife, visibility, and climate, as well as effects on materials, economic values, and on personal comfort and well-being.

Potentially significant air quality impacts associated with an FAA project or action would occur if the project or action exceeds one or more of the NAAQS for any of the time periods analyzed.

TABLE B2
Ambient Air Quality Standards

Pollutant	Hawaii	Federal
Carbon Monoxide (CO)		
1-hour	9 ppm	35 ppm
8-hour	4.4 ppm	9 ppm
Nitrogen Dioxide (NO_x)		
Annual	0.04 ppm	0.053 ppm
Ozone (O_3)		
8-hour	0.08 ppm	0.08 ppm*
Lead (Pb) in micrograms per cubic meter	1.5 µg/m^3	1.5 µg/m^3
Particulate Matter (PM_{10})		
24-hour	150 µg/m^3	150 µg/m^3
Annual	50 µg/m^3	-
Particulate Matter ($PM_{2.5}$)		
24-hour	-	35 µg/m^3
Annual	-	15 µg/m^3
Sulfur Dioxide (SO_x)		
3-hour	0.5 ppm	-
24-hour	0.14 ppm	0.14 ppm
Annual	0.03 ppm	0.03 ppm
Hydrogen Sulfide (H_2S)		
1-hour	0.025 µg/m^3	-

Source: U.S. Environmental Protection Agency; Hawaii Department of Health
µg/m^3 - micrograms per cubic meter of air
ppm – parts per million
* - effective 5/27/08

According to the EPA Green Book, published on March 12, 2008, Hawaii County is in attainment for all criteria pollutants. In regards to state requirements, the Hawaii Department of Health has issued a notice that Hawaii County has recorded increased levels of $PM_{2.5}$ and SO_2 on multiple days since April 1, 2008. Within the Kona area, $PM_{2.5}$ levels have exceeded the 24-hour threshold on four occasions as of May 2, 2008.

Additional air quality analysis is needed to determine potential impacts to air quality that may result from implementation of the various planned development projects at the airport, including demolition in preparation for airport improvements, construction of new runway and apron pavement, and the helipad facility north of the existing terminal. A number of projects planned at the airport could have temporary air quality impacts during construction. Emissions from the operation of construction vehicles and fugitive dust from pavement removal are common air pollutants during construction. However, with the use of best management practices (BMPs) during construction, these air quality impacts can be significantly lessened.

COMPATIBLE LAND USE AND NOISE

An airport's compatibility with surrounding land uses is usually associated with the extent of the airport's noise impacts. Airport projects such as those needed to accommodate fleet mix changes, an increase in operations at the airport, or air traffic changes are examples of activities which can alter noise impacts and affect surrounding land uses. Typically, if the noise analysis concludes that there is no significant impact, a similar conclusion usually can be made with respect to compatible land use. FAA Orders 1050.1E and 5050.4B define a significant noise impact as one which would occur if proposed airport development would cause noise-sensitive areas to experience an increase in noise of 1.5 DNL or more, at or above the 65 DNL noise exposure level when compared to the no action alternative for the same timeframe. The FAA's Integrated Noise Model describes aircraft noise in the *Yearly Day-Night Average Sound Level* (DNL). DNL accounts for the increased sensitivity to noise at night (10:00 p.m. to 7:00 a.m.) and is the metric preferred by the FAA, the Environmental Protection Agency (EPA), and Department of Housing and Urban Development (HUD), among others, as an appropriate measure of cumulative noise exposure.

Exhibit B1 depicts the long range contours for KOA. The noise exposure contours, developed under the airport's 2008 Part 150 Noise Compatibility Study, are based on the planned ultimate runway configuration and long range aviation forecasts developed as part of this airport master plan. As indicated on the exhibit, the long range 65 DNL noise contour would extend off airport property to the north and south. As depicted on the exhibit, no noise-sensitive development, such as homes, religious institutions, or schools, is currently located within this 65 DNL significant noise impact area. Planned development within the vicinity of the airport includes residential development south of the airport. An avigation easement has been issued for the proposed development areas within the 60 DNL noise contour. Any further development within the noise exposure contour areas is subject to the State of Hawaii fair disclosure requirements which state that any residential property that lies within the boundaries of the noise exposure are shown on the Part 150 noise exposure maps for any public airport and must require a fair disclosure notice. Further information regarding the preparation of the noise exposure contours and their impacts can be found in the KOA Part 150 Noise Compatibility Study.

CONSTRUCTION IMPACTS

Construction impacts typically relate to the effects on specific impact categories, such as air quality or noise, during construction. The use of best management practices (BMPs) during construction is typically a requirement of construction-related permits such as a National Pollutant Discharge Elimination System (NPDES) permit. Use of these measures typically alleviates potential resource impacts.

Short-term construction-related noise impacts could occur with implementation of the proposed project as there are scattered residences in the vicinity of the airport. However, these impacts typically do not arise unless construction is being undertaken during early morning, evening, or nighttime hours. Furthermore, the proposed projects will be undertaken on a demand basis and will not be constructed simultaneously.

Construction-related air quality impacts can be expected during airport improvement projects. Air emissions related to construction activities will be short-term in nature and will be included in the air emission inventory, if one is requested.

FARMLAND

Under the *Farmland Protection Policy Act* (FPPA), federal agencies are directed to identify and take into account the adverse effects of federal programs on the preservation of farmland, to consider appropriate alternative actions which could lessen adverse effects, and to assure that such federal programs are, to the extent practicable, compatible with state or local government programs and policies to protect farmland. The FPPA guidelines apply to farmland classified as prime or unique, or of state or local importance as determined by the appropriate government agency, with concurrence by the Secretary of Agriculture.

Impacts under the FPPA will not occur as a result of the planned developments at the airport. The State of Hawaii Land Study Bureau, Detailed Land Classification Report for the Island of Hawaii indicates that the undeveloped portions of the airport are designated at Class E, which is very poor and least suited for agriculture. According to the United States Department of Agriculture, National Resources Conservation Service, the soils within the vicinity of the airport are classified as `a`a lava flows (rLW) and pahoehoe lava flows (rLV), neither of which is considered supporting, prime, or unique farmlands.

FISH, WILDLIFE, AND PLANTS

A number of acts and executive orders have been put into place to protect threatened or endangered species and their habitat. Following is a brief description of these various levels of protection:

- Section 7 of the *Endangered Species Act* (ESA), as amended, applies to federal agency actions and sets forth requirements for consultation to determine if the proposed action "may affect" a federally endangered or threatened species. If an agency determines that an action "may affect" a federally protected species, then Section 7(a)(2) requires each agency to consult with the U.S. Fish and Wildlife Service (FWS) or the National Marine Fisheries Service (NMFS), as

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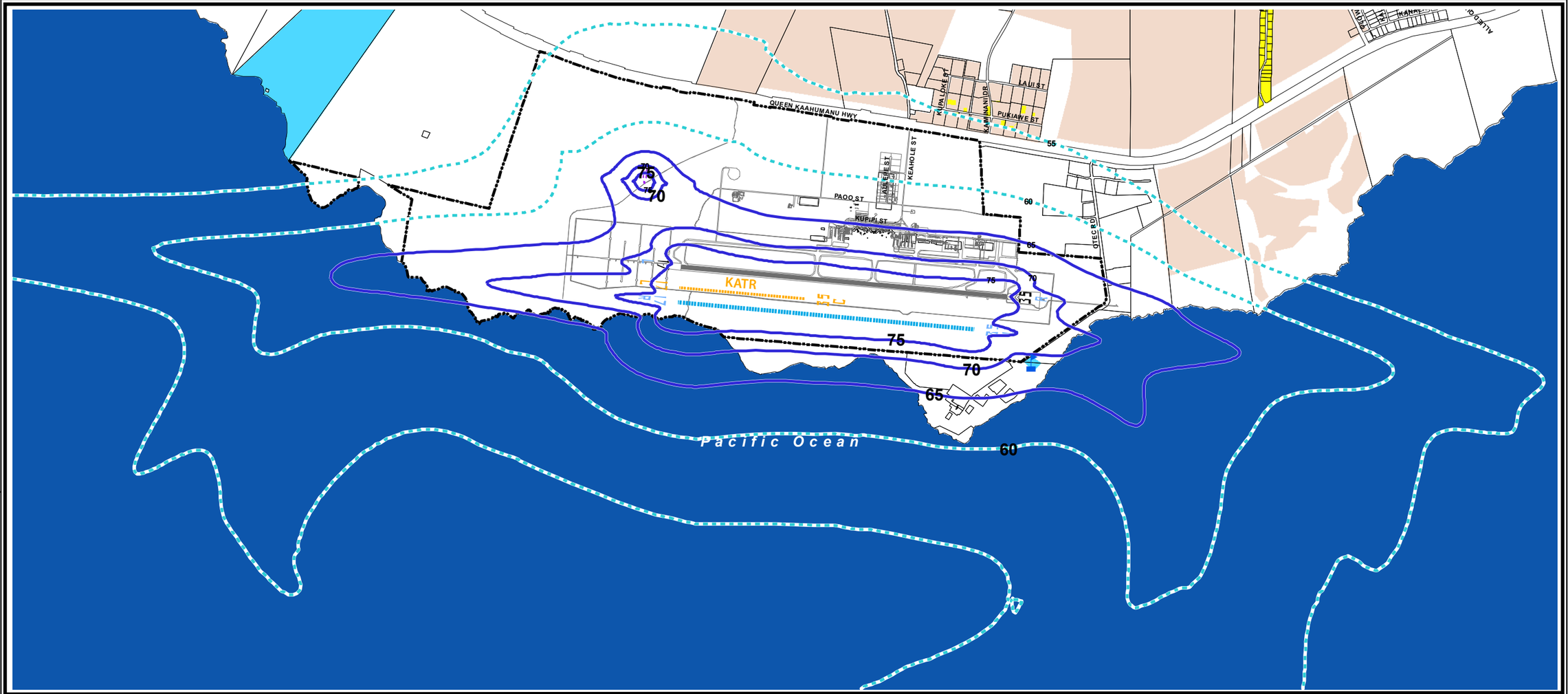


LEGEND

- Airport Property
- Kona Auxiliary Training Runway (KATR)
- Ultimate Runways
- Long Range Noise Exposure Contour, (55 to 60 DNL)
- Long Range Noise Exposure Contour, (65 to 75 DNL)
- Residential
- Noise-Sensitive Instituitons
- School
- Water
- Growth Risk Areas
- Non Noise-Sensitive Land Use

Source: County of Hawaii, Planning Department Geographic Information System. Coffman Associates Analysis.

NORTH

0 3,500

Feet

Exhibit B1
LONG RANGE NOISE EXPOSURE CONTOURS WITH LAND USE

appropriate, to ensure that any action the agency authorizes, funds, or carries out is not likely to jeopardize the continued existence of any federally listed endangered or threatened species, or result in the destruction or adverse modification of critical habitat. If a species has been listed as a candidate species, Section 7 (a)(4) states that each agency must confer with the FWS and/or NMFS.

- The *Sikes Act* and various amendments authorize states to prepare statewide wildlife conservation plans, and the Department of Defense (DOD) to prepare similar plans, for resources under their jurisdiction. Airport improvement projects should be checked for consistency with the State or DOD Wildlife Conservation Plans where such plans exist.

- The *Fish and Wildlife Coordination Act* requires that agencies consult with the state wildlife agencies and the Department of the Interior concerning the conservation of wildlife resources where the water of any stream or other water body is proposed to be controlled or modified by a federal agency or any public or private agency operating under a federal permit.

- The *Migratory Bird Treaty Act* (MBTA) prohibits private parties and federal agencies in certain judicial circuits from intentionally taking a migratory bird, their eggs, or nests. The MBTA prohibits activities which would harm migratory birds, their eggs, or nests unless the Secretary of the Interior authorizes such activities under a special permit.

- Executive Order 13112, *Invasive Species*, directs federal agencies to use relevant programs and authorities to the extent practicable and subject to available resources to prevent the introduction of invasive species and provide for restoration of native species and habitat conditions in ecosystems that have been invaded. The FAA is to identify proposed actions that may involve risks of introducing invasive species on native habitat and populations. "Introduction" is the intentional or unintentional escape, release, dissemination, or placement of a species into an ecosystem as a result of human activity. "Invasive species" are alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health.

According to FAA Order 1050.1E, a significant impact to listed threatened or endangered species would occur when the FWS or NMFS determines that the proposed action would likely jeopardize the continued existence of the species in question or would result in the destruction or adverse modification of critical habitat for the species. However, an action need not involve a threat to extinction to federally listed species to result in a significant impact. Lesser impacts, including impacts on non-listed species, could also constitute a significant impact.

As discussed in Chapter One, the State of Hawaii has the largest number of federally listed endangered and threatened species. A total of 394 species are listed for the State of Hawaii, 294 of which are plants. Of the remaining 100 species, 26 are known to be present on the Big Island. **Table B3** lists the known threatened and endangered animal species for Hawaii County. According to maps prepared by the Hawaii Department of Fish and Wildlife, the airport environs are classified as an area with low concentration of threatened and endangered plant species.

TABLE B3
Hawaii County Threatened and Endangered Animals

Species	Status
Mammals	
Bat, Hawaiian hoary; Ōpe`ape`a	Endangered
Whale, humpback; Koholā	Endangered
Hawaiian monk seal; Īlio-holo-i-ka-uaua	Endangered
Birds	
Duck, Hawaiian; Koloa maoli	Endangered
Goose, Hawaiian; Nēnē	Endangered
Hawk, Hawaiian; `Io	Endangered
Crow, Hawaiian; `Alalā	Endangered
Coot, Hawaiian; `Alae ke`oke`o	Endangered
Moorhen, Common; Hawaiian gallinule; `Alae `ula	Endangered
Akia pōlā`au	Endangered
Stilt, Black-necked; Hawaiian stilt; Ae`o	Endangered
Palila	Endangered
Ākepa, Hawai`i	Endangered
Creeper, Hawai`i	Endangered
Ō`ū	Endangered
Petrel, Dark-rumped; Hawaiian Petrel; `Ua`u	Endangered
Shearwater, Newell's	Threatened
Reptiles	
Turtle, Loggerhead sea; (incidental in Hawai`i)	Threatened
Turtle, Green sea; Honu	Threatened
Turtle, Leatherback sea; (incidental in Hawai`i)	Endangered
Turtle, Hawksbill; `Ea	Endangered
Turtle, Olive ridley sea; (incidental in Hawai`i)	Threatened
Anthropods	
Moth, Blackburn's sphinx	Endangered
Picture-wing fly, Hawaii (*Drosophila heteroneura)*	Endangered
Picture-wing fly, Hawaii (*Drosophila mulli)*	Threatened
Picture-wing fly, Hawaii (*Drosophila ochrobasis)*	Endangered

Source: U.S. Fish and Wildlife Service – Pacific Islands Endangered Species

As previously stated, land cover near the airport consists primarily of `a`a and pahoehoe lava flows. The resulting vegetation is characterized as Lowland Vegetation Community. The habitat is dominated by fountain grass, an alien African grass. There is minimal vegetation found on the lava flows, especially along the western

and northern portions of the northeast side of the airport. This habitat is not identified as a critical habitat within the State of Hawaii.

According to the *Final Environmental Assessment for Construction and Operation of a C-17 Short Austere Airfield Within the State of Hawaii, October 2004,* a faunal survey was completed for the airport environs in December 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 survey indicated a lack of habitat for any federally listed species. During the field survey, one mammalian species, an Indian mongoose was observed. This species is not a federally listed species. Additionally, 14 avian species were observed, 13 of which are alien species to the Hawaiian Islands. The Pacific Golden Plover, a native Hawaiian species, was observed, but is not a federally listed species. The Hawaiian Stilt, an endangered species, has been observed within the airport boundaries, but was not observed during the 1999 field study. A field survey was conducted by the United States Department of Agriculture, Wildlife Services as part of a Wildlife Hazard Assessment for KOA. Survey findings indicate the presence of Hawaiian Stilts on and near the airport. During the field observations, which occurred periodically between August 2000 and September 2001, there were three Hawaiian Stilt sightings within the airport boundary. Over 200 sightings were noted at the Cyanotech facility adjacent to the airport. Cyanotech has an artificial breeding area for the Hawaiian Stilt which consists of a small pond constructed to attract the birds. Additionally, a Hawaiian Stilt nest was observed approximately 200 feet from the runway. Due to wildlife hazard concerns, this nest was removed with permission from the site.

The State of Hawaii has prepared a Comprehensive Wildlife Conservation Strategy (CWCS) as its statewide wildlife conservation plan which identifies the State's species of greatest conservation need. Prior to proceeding with airport development projects, the CWCS should be consulted to ensure consistency with the state's conservation goals.

Prior to project implementation in previously undisturbed areas, including the planned helipad facility north of the terminal complex and the planned parallel runway, further coordination with the FWS and Hawaii Department of Fish and Wildlife is required. It is likely that field surveys will be required to determine the presence of listed species. Projects planned to occur in previously disturbed areas, such as the planned apron expansion and the connecting taxiways, may not require field surveys.

HAZARDOUS MATERIALS, POLLUTION PREVENTION, AND SOLID WASTE

The airport will need to continue to comply with a National Pollution Discharge Elimination System (NPDES) permit, which will ensure that pollution control measures are in place at the airport. As development occurs at the airport, the permit will need to be modified to reflect the additional impervious surfaces and stormwater retention facilities. The addition and removal of impervious surfaces may require modifications to this permit should drainage patterns be modified. Net increases in impervious surfaces are minimized by the removal of old pavement.

The airport must comply with applicable pollution control statutes and requirements. Impacts may occur when changes to the quantity or type of solid waste generated, or type of disposal, differ greatly from existing conditions.

Solid waste disposal facilities, such as landfills, can cause a hazard to aircraft by attracting wildlife and, most importantly, birds. A bird hazard exists if the landfill is located approximately 5,000 feet from runways used by piston aircraft and 10,000 feet from runways used by turbojet aircraft. There are no landfills within the vicinity of the airport.

As a result of increased operations at the airport, solid waste output may slightly increase; however, these increases are not anticipated to be significant. No impacts related to hazardous materials are anticipated as a result of the planned airport improvements.

HISTORICAL, ARCHITECTURAL, AND CULTURAL RESOURCES

Determination of a project's environmental impact to historic and cultural resources is made under guidance in the *National Historic Preservation Act* (NHPA) *of 1966*, as amended, the *Archaeological and Historic Preservation Act* (AHPA) *of 1974*, the *Archaeological Resources Protection Act* (ARPA), and the *Native American Graves Protection and Repatriation Act* (NAGPRA) *of 1990*. In addition, the *Antiquities Act of 1906*, the *Historic Sites Act of 1935*, and the *American Indian Religious Freedom Act of 1978* also protect historical, architectural, archaeological, and cultural resources.

Section 106 of the NHPA of 1966, as amended, requires federal agencies to take into account the effects of their undertakings on historic properties and determine if any properties in or eligible for inclusion in the National Register of Historic Places (NRHP) are present in the area. In addition, it affords the Advisory Council on Historic Preservation a reasonable opportunity to comment. The historic preservation review process mandated by Section 106 is outlined in regulations issued by the council.

The ARPA is triggered by the presence of archaeological resources on federal or Indian lands. The AHPA describes the process when consultation with resource agencies indicates that there may be an impact on significant scientific, prehistoric, historic, archaeological, or paleontological resources. The process provides for the preparation of a professional resource survey of the area. Should the survey identify significant resources, the National Register process described above will be followed. Should the survey be inconclusive, a determination is made whether it is appropriate to provide a commitment to halt construction if resources are recovered, in order for a qualified professional to evaluate their importance and provide for data recovery as necessary.

The NAGPRA is triggered by the possession of human remains or cultural items by a federally funded repository or by the discovery of human remains or cultural items on federal or tribal lands and provides for the inventory, protection, and return of cultural items to affiliated Native American Groups. The Act includes provisions that, upon inadvertent discovery of remains, the action will cease in the area where the remains were discovered and the appropriate agency will be notified.

The *Antiquities Act of 1906* was the first general law providing protection for archaeological resources. It protects all historic and prehistoric sites on federal lands and prohibits excavation or destruction of such antiquities without the permission of the Secretary of the department having jurisdiction.

The *Historic Sites Act of 1935* declares as national policy the preservation for public use of historic sites, buildings, objects, and properties of national significance. It gives the Secretary of the Interior authority to make historic surveys, to secure and preserve data on historic sites, and to acquire and preserve archaeological and historic sites. This Act also establishes the National Historic Landmarks program for designating properties having exceptional value in commemorating or illustrating the history of the United States.

The *American Indian Religious Freedom Act of 1978* requires consultation with Native American groups concerning proposed actions on sacred sites, on federal land, or affecting access to sacred sites. It establishes federal policy to protect and preserve for American Indians, Eskimos, Aleuts, and Native Hawaiians their right to free exercise of their religion. It allows these peoples to access sites, use and possess sacred objects, and freedom to worship through ceremonial and traditional rites. The Act requires federal agencies to consider the impacts of their actions on religious sites and objects that are important to Native Americans regardless of the eligibility for the NRHP. Executive Order 13175, *Consultation and Coordination with Indian Tribal Governments*, and the Presidential Memorandum of April 29, 1994, *Government to Government Relations with Native American Tribal Governments,* outline the government-to-government consultation process between the federal agency and the potentially affected tribe.

A project would affect a property that is on or eligible for inclusion in the NRHP if it has the potential to alter the characteristics of the property which make it eligible for listing. Federal agencies can make one of three types of "effects findings" for an action: "no properties affected," "no adverse effect," and "adverse effect." The level of finding depends upon how severely a project would alter the characteristics of a property that make it eligible for the NRHP. Although the FAA works closely with the State Historic Preservation Officer (SHPO) and/or the Tribal Historic Preservation Officer (THPO), the FAA is ultimately responsible for the effect decision, not the SHPO or THPO.

The Section 106 consultation process includes consideration of alternatives to avoid adverse effects on National Register listed or eligible properties, of mitigation measures, and of accepting adverse effects. The FAA makes the final determination on the level of effect, and advice from the SHPO/THPO may assist the FAA in making that determination.

According to the November 2000 EA, archaeological surveys were conducted in April 2000 for all of the airport environs to determine the presence of historical or cultural sites. This survey was undertaken to validate prior findings, identify new sites, and to collect information on traditional Hawaiian uses of the airport property. During the survey, nine previously recorded sites were re-evaluated and it was confirmed that these sites are not considered eligible for listing on the National Register of Historic Places.

As the planned projects include disturbance of land that was not included as part of previous coordination, further coordination with the SHPO is required regarding potential impacts to cultural or archaeological resources in these areas. It is anticipated that a cultural resource survey will be requested as portions of the proposed development areas have not been surveyed for cultural resources.

PUBLIC ACCESS SHORELINE HAWAII RIGHTS

This master plan provides for the development of facilities necessary to meet the facility needs of existing users as well as the continued safety of both the traveling public and airport tenants. It is expected that with continued development of the airport, there will be an ongoing need to maintain public shoreline access rights. The current provision of public shoreline access will continue to be provided in accordance with State Law. Concerns regarding future development will likely be addressed on a case-by-case basis as required. In the past, concerns have been raised regarding limited access, potential impacts to archaeological and historical sites, access to prime fishing grounds, loss of native plants, and potential impacts to aquifers and seabeds.

DEPARTMENT OF TRANSPORTATION ACT: SECTION 4(f)

The Department of Transportation (DOT) Act, Section 4(f) provisions state that the Secretary of Transportation will not approve any program or project that requires the use of any publicly owned land from a public park, recreation area, wildlife and waterfowl refuge or historic site of local, state, or national significance as determined by the officials trusted with the oversight of the subject property. Project approval may be granted if there is no feasible and prudent alternative to the use of such land, and the project includes all possible planning to minimize harm resulting from the use.

A significant impact would occur when a proposed action involves more than a minimal physical use of a Section 4(f) property, or is deemed a "constructive use," substantially impairing the Section 4(f) property where mitigation measures do not reduce or eliminate the impacts. Substantial impairment would occur when impacts to Section 4(f) lands are sufficiently serious that the value of the site, in terms of its prior significance and enjoyment, is substantially reduced or lost.

As discussed in Chapter One, a portion of the Mamalahoa Trail is located on airport property. The Mamalohoa Trail was built by conscripted labor forces to transport goods and food along the western side of the big island. A disconnected segment of the Mamalahoa Trail was created during the initial construction of KOA. The remaining portion of the trail is located between the runway and parallel taxiway. The master plan proposes to construct an additional parallel taxiway that would require further disturbance to the trail. Coordination with the SHPO and field investigation will be required to determine the significance of this site.

Additionally, there are several park sites within the vicinity of the airport, including the Kaloko-Honokōhau National Historic Park, located 3.5 miles to the south; the Makaulu-O`oma Mauka Tract Forest Reserve, located 5.5 miles to the east; and Kekaha Kai State Park, located 2 miles to the north. As the planned airport improvements are intended to accommodate the existing airport users, impacts to these resources are not anticipated.

LIGHT EMISSIONS AND VISUAL EFFECTS

Airport lighting is characterized as either airfield lighting (i.e., runway, taxiway, approach and landing lights) or landside lighting (i.e., security lights, building interior lighting, parking lights, and signage). Generally, airport lighting does not result in significant impacts unless a high intensity strobe light, such as a Runway End Identifier Light (REIL), would produce glare on any adjoining site, particularly residential uses.

Visual impacts relate to the extent that the proposed development contrasts with the existing environment and whether a jurisdictional agency considers this contrast objectionable. The visual sight of aircraft, aircraft contrails, or aircraft lights at night, particularly at a distance that is not normally intrusive, should not be assumed to constitute an adverse impact.

It is not anticipated that the planned airport development will result in significant lighting or visual impacts. If the potential for lighting or visual impacts is determined to be associated with the planned development, consultation with local residents and the owners of light-sensitive sites may be needed to determine possible alternatives to minimize these effects without risking aviation safety or efficiency.

Lighting at the airport will be shielded to reduce interaction both with the nocturnally flying dark-rumped petrel and Newell's Shearwater as well as to reduce off-airport lighting impacts.

NATURAL RESOURCES AND ENERGY SUPPLY

In instances of major proposed actions, power companies or other suppliers of energy will need to be contacted to determine if the proposed project demands can be met by existing or planned facilities.

There are no existing powerlines near the airport that would need to be relocated as a result of the planned development at the airport. On-site, the relocation of the airport traffic control tower (ATCT) will require new duct banks to connect to the remote transmitter/receiver (RTR), which will remain at its present site. The master plan calls for the utility building currently located near the existing ATCT to be relocated to a new site at the corner of Keahole Street and Pao`o Street.

The airport has been in discussions with the Natural Energy Laboratory of Hawaii Authority (NELHA) on the use of deep sea water air conditioning (SWAC) through a heat exchanger that would be located on a site at the south end of the airport near Road M and Pao`o Street. Additionally, the airport plans to implement a 1.0 megawatt photovoltaic solar energy system to sustain the airport's current energy demand with capability for additional phases to accommodate future increases in consumption.

Increased use of energy and natural resources are anticipated as the operations at the airport grow. None of the planned development projects outlined on the airport layout plan are anticipated to result in significant increases in energy consumption. The Master Plan recommends that a utility audit along with a utility master plan be prepared for the airport.

SOCIOECONOMIC, ENVIRONMENTAL JUSTICE, AND CHILDREN'S HEALTH AND SAFETY RISKS

Socioeconomic impacts known to result from airport improvements are often associated with relocation activities or other community disruptions, including alterations to surface transportation patterns, division or disruption of existing communities, interferences with orderly planned development, or an appreciable change in employment related to the project. Social impacts are generally evaluated based on areas of acquisition and/or areas of significant project impact, such as areas encompassed by noise levels in excess of 65 DNL.

Executive Order 12898, *Federal Action to Address Environmental Justice in Minority Populations and Low-Income Populations,* and the accompanying Presidential Memorandum, and Order DOT 5610.2, *Environmental Justice*, require the FAA to provide for meaningful public involvement by minority and low-income populations, as well as analysis that identifies and addresses potential impacts on these populations that may be disproportionately high and adverse.

Pursuant to Executive Order 13045, *Protection of Children from Environmental Health Risks and Safety Risks,* federal agencies are directed to identify and assess environmental health and safety risks that may disproportionately affect children. These risks include those that are attributable to products or substances that a child is likely to come in contact with or ingest, such as air, food, drinking water, recreational waters, soil, or products they may be exposed to.

The thresholds of significance for this impact category are reached if the project negatively affects a disproportionately high number of minority or low-income populations or if children would be exposed to a disproportionate number of health and safety risks. Significant socioeconomic impacts would result if an extensive number of residents need to be relocated and sufficient replacement housing is unavailable; if extensive relocation of businesses is required and this relocation would create a severe economic hardship for the affected communities; if disruptions of local traffic patterns would substantially reduce the level of service of the roads serving the airport and the surrounding community; or if there would be a substantial loss in the community tax base.

It is not anticipated that the proposed airport development projects would result in significant impacts within this impact category. The airport is not located within an area which would be considered an "environmental justice" area and the project area does not have high percentages of populations that are considered below poverty level or minority.

Potential risks to children from the development of the airport will be minimized through the use of standard security measures such as fencing and locks on cabinets or structures which contain hazardous materials.

WATER QUALITY

The *Clean Water Act* provides the authority to establish water quality standards, control discharges, develop waste treatment management plans and practices, prevent or minimize the loss of wetlands, and regulate other issues concerning water quality. Water quality concerns related to airport development most often relate to the potential for surface runoff and soil erosion, as well as the storage and handling of fuel, petroleum products, solvents, etc.

According to the *Water Quality Standards Map of the Island of Hawaii*, coastal nearshore waters within the airport environs are classified as "AA." Further analysis will likely be needed for large scale future projects to assess measures needed to maintain the protection of these waters.

Water quality regulations and issuance of permits will normally identify any deficiencies in the proposed development with regard to water quality or any additional information necessary to make judgments on the significance of impacts. Difficulties in obtaining needed permits for the project, such as National Pollutant Discharge Elimination System (NPDES) or Section 404 permits, typically indicate a potential for significant water quality impacts.

With regard to construction activities, the airport and all applicable contractors will need to obtain and comply with the requirements of the construction-related NPDES General Permit and a Stormwater Pollution Prevention Plan prior to the initiation of project construction activities.

WETLANDS

The U.S. Army Corps of Engineers (COE) 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 by 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 seasonally saturated soil conditions for growth and reproduction. Categories of wetlands include swamps, marshes, bogs, sloughs, potholes, 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.

As outlined within FAA Orders 1050.1E and 5050.4B, a significant impact to wetlands would occur when the proposed action causes any of the following:

- The action would adversely affect the function of a wetland to protect the quality or quantity of municipal water supplies, including sole source, potable water aquifers.
- The action would substantially alter the hydrology needed to sustain the functions and values of the affected wetland or any wetlands to which it is connected.

- The action would substantially reduce the affected wetland's ability to retain floodwaters or storm-associated runoff, thereby threatening public health, safety, or welfare.

- The action would adversely affect the maintenance of natural systems that support wildlife and fish habitat or economically important timber, food, or fiber resources in the area or surrounding wetlands.

- The action would be inconsistent with applicable state wetland strategies.

According to National Wetland Inventory Maps prepared by the United States Fish and Wildlife Service, there are no wetlands within the vicinity of the airport. During a site survey completed in December 1999, a small anchialine wetland system (approximately 58 feet by 62 feet), located at the southern end of the runway was identified. Anchialine ponds exist in lava depressions near the ocean and are fed by water table fluctuations. These ponds are not considered jurisdictional wetlands. The airport is located in an area of previously disturbed soils. The planned development at the airport does not involve disturbing the water table or areas in which wetlands are located.

COASTAL ZONE MANAGEMENT

Coastal zones are those waters and their bordering areas in states along the coastlines of the Atlantic and Pacific Oceans and the Gulf of Mexico and the shorelines of the Great Lakes. These zones include islands, beaches, transitional and intertidal areas and salt marshes. Under most conditions, airport actions that would occur in or would affect a coastal zone within a state having an approved coastal zone management program must comply with the requirements of the *Coastal Zone Management Act* (CZMA) *of 1972*, as amended. The CZMA requires that direct federal activities and development projects must be consistent with approved state coastal programs to the maximum extent practicable.

The State of Hawaii has an approved Coastal Zone Management Program in accordance with the provisions of the CZMA. The coastal areas identified within the plan, identified as Special Management Areas (SMAs), receive additional scrutiny when considering development proposals. All projects within the SMA must be consistent with the Hawaii Coastal Management Zone program, including those initiated by the government and will require a permit prior to construction. The entire airport property is located within an SMA; therefore, any airport project consid-

ered “development” will require an SMA permit from the Hawaii County Planning Department.

FLOODPLAINS

Executive Order 11988 directs Federal agencies, including the FAA, to take action to reduce the risk of flood loss, minimize the impact of floods on human safety, health, and welfare, and restore and preserve the natural and beneficial values served by floodplains. A floodplain is defined 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 a given year” (i.e., an area that would be inundated by a 100-year flood).

A proposed project would be considered significant if it results in notable adverse impacts on natural and beneficial floodplain values. Typical mitigation measures for floodplain encroachments may include special flood-related design criteria, elevating facilities above base flood level, locating nonconforming structures and facilities out of the floodplain, or minimizing fill placed in floodplains.

According to the Federal Emergency Management Agency (FEMA) Federal Insurance Rate Map (FIRM) panel number 155166 0681C, airport facilities are not located within a 100-year floodplain or floodway. A 100-year floodplain is located west of the airport along the coast, but does not include any of the planned development areas.

Appendix C

TERMINAL ALTERNATIVES EVALUATION CRITERIA

EXHIBIT C-1
Kona International Airport Master Plan
Terminal Area Development Alternatives
Development Concept Evaluation

EVALUATION CRITERIA	**Alternative 1** Expand Existing	**Alternative 2** New OST - North	**Alternative 3** New OST – South
PEOPLE			
Environment for People			
Architecture			
Experience – Concepts Enhance Design Opportunity			
Level of Service – User Convenience/Adequate Services			
Stress Reduction – Intuitive, Simple, Clear Wayfinding			
PLACE			
Natural Environment			
Context – Sustainable Approach			
Climate – Responsive and Adequate			
Resources – Efficient Site, Open Space, Minimize Stormwater			
Recycle – Maintain Use or Optimize Adaptive Re-use of Facilities			
Community Values			
Culture – Responsive and Relative			
Past – Addresses Current Shortfalls in Expectations			
Present – Maintains Current Valued KOA Characteristics			
Future – Aligns with Community Vision			
PURPOSE			
Function			
Performance			
Efficiency – PAX Processing, Walking Distance, Vertical Movement, Operations			
Flexibility – Adaptable			
Expandibility – Space Between and Beyond Functions to Grow			
Facilities Program			
Facility Requirements – Meets Projected			
Passenger Processing – Timely, Meets Goals			
Development Strategy			
Implementation and Constructability – Reasonable Complexity			
Current Phase of Development Considers Future Phases – Grows Into			
Replace Function Before Removing Function – Avoid Temporary Facilities			
Airport Operations – Maintain Safe and Secure			
Airfield – Requires Change in Configuration			
Landside – Requires Change in Configuration			
Cost			
Finance			
Initial Magnitude of Cost and Benefit – Bang for Buck/Value			
Phased Program – Demand Based, Funding Based			
Modernization – Existing Facilities Upgraded/Maintained			
Operational – Optimizes			
Maintenance – Optimizes			
Revenue – Maximize Concessions/Improve Exposure			

Exhibit C-2
Terminal Alternative Benefit Analysis
Alternatives 1/2/3 – Expand Existing

Short Term	**Cost $64,180,000**	
	Advantages	
Main Architectural Character	1	Continues locally preferred ground loading and open air "Aloha Spirit."
Flexibility for Future Changes	2	The Short Term is the same for all three alternatives. Maintains flexibility to respond to changing demands and financial capability in the future.
	3	Allows common-use processing, check-in kiosks, etc. to be implemented when and if the airlines desire them.
Optimize Current Facilities	4	Onizuka Space Center need not move in the near term. Allows time for proper program development, future needs determination, fund raising, site preparation, design and construction.
Incremental Growth	5	Parking can be added as needed.
Demand Based	6	Allows minimal expenditure to address only the most critical needs: bag claim, passenger security, bag screening, passenger shelter, etc.
	7	No changes to the apron, t/w, roads and drives.
	Disadvantages	
Passenger Level of Service	1	Defers improvements to concessions, displays, toilets, TSA offices, tenant spaces, etc.
Maintenance Costs	2	Delays significant upgrades needed for building maintenance and systems.
Operational Efficiency	3	Continues current 2 terminal functions; lack of airport operational flexibility.
		Moving bag screening to existing bag make-up areas will result in cramped space; duplications of equipment and staffing continues.

Exhibit C-3
Terminal Alternative Benefit Analysis
Alternative 1 – Expand Existing

Intermediate Term Cost $141,320,000		
Advantages		
Maintain Architectural Character	1	Maintains present "Aloha Spirit" with courtyards, open air, shared by both interisland and mainland passengers.
Passenger Level of Service	2	Provides second-level loading w/ bridges for mainland flights. Expand concessions, toilets, airlines club rooms if desired. May use natural ventilation or AC.
	3	When drives moves mauka this provides space for non-secure concessions expansion, displays, waiting.
	4	Provides space for more concessions, displays around courtyards; more seating for interisland passengers.
Operational Efficiency	5	Interisland flights continue to ground load but flexibility to use loading bridges when available.
	6	Avoids split operation for airlines.
	7	Unifies terminals into single operationally flexible complex.
	8	Single central passenger screening with adequate queue area, TSA offices and exam rooms and space for expansion in future as needed.
	9	Centralizes bag make-up with single TSA screening operations. Efficient use of staff and equipment.
	10	Turn North Ticketing to face south – straight conveyor run to bag make-up; provides a single ticketing court with flexibility to balance program requirements within space available.
	11	More convenient and clear location for USDA and HDOA.
Expandability	12	Space available under concourse for ramp operations.
	13	Bag claim can expand as needed to meet demand.
Constructability	14	CBP can expand as needed, not required as a part of Intermediate Term.
Minimize Impacts	15	When terminal drives move mauka to edge of existing parking, the parking area is not impacted – provides space for non-secure concessions expansion, displays, waiting.
	16	No change to airside aircraft circulation or new paving.
Phased Program	17	This alternative can be achieved in stages as demand and financial capability dictate. In most cases, expansion of one function need not impact adjacent functions.
Disadvantages		
Passenger Level of Service	1	Arriving international passengers continue to walk across apron and use sprung structure for CBP clearance until demand, financial capability or failure of existing structure requires change.
Optimize Current Facilities	2	Requires relocation of the Onizuka Space Center.
Minimize Impacts	3	Requires major changes and upgrades to facilities, buildings and systems while they remain in operation.
	4	Careful phasing and staging of construction required to minimize public inconvenience and coordinate operations during construction.
Costs	5	Tunnels required for bag conveyors from ticketing to bag make-up/TSA screening – need to cut and cover through lava.
Long Term Cost $102,920,000		
Advantages		
Passenger Level of Service	1	Raised covered walkway to CBP for arriving international passengers improves security and passenger convenience. Can be expanded in future for second level interisland gates and international arrivals sterile gate.
Flexibility for Future Changes	2	Option remains to go to Alternative 2 or 3 throughout development of Alternative 1.
Minimize Impacts	3	Each area and function can be expanded to respond to demand without affecting other areas.
	4	New CBP facilities can be built while existing continues in full operation with no operational conflicts.
	5	Continue use of tour passenger assembly area and bus parking during and after construction of new CBP.
	6	No additional aircraft paving required. May relocate T/W A closer to runway if group V Traffic frequency requires it.
Disadvantages		
Minimize Impacts	1	Requires provision of new offices for Airport Management and staff before CBP can expand into their current areas.
Alternative 1 Total Cost = $308,420,000		

Exhibit C-4
Terminal Alternative Benefit Analysis
Alternative 2 – New North Terminal

Intermediate Term	**Cost $209,850,000**	
	Advantages	
Maintain Architectural Character	1	Terminal can be designed to continue the atmosphere of Aloha, use natural ventilation in some areas, planting, etc.
Passenger Level of Service	2	Provides a new terminal with all amenities for mainland and international passengers.
Flexibility	3	Interim international bag claim available for domestic use when not secured.
Optimize Current Facilities	4	Onizuka Space Center need not be relocated in near term.
	Disadvantages	
Passenger Level of Service	1	Interisland passengers gain only most pressing facilities and systems improvements to prevent failures.
Flexibility	2	Will lose flexibility of interisland aircraft using bridged gates when available.
Operational Efficiency	3	Requires split interisland and overseas operations for some airlines.
Constructability	4	Some construction and infrastructure required in the lava field for roads, parking, terminal, and apron.
Minimize Impacts	5	Temporary CBP facilities using existing Airport Management and staff facilities is required as new terminal requires removal of existing "sprung structure."
	6	Requires construction of new offices for Airport Management and staff before existing remodeled for temporary CBP use.
	7	When T/W A is relocated to the west in this phase or Long Term responding to Group V aircraft frequency, it will require extending T/W A beyond existing T/W G and probable replacement of T/W G to the north.
Incremental Growth	8	Expensive first step as new terminal initial phase of development is extensive in order to be operationally complete.
Demand Based	9	Existing terminal capacity without mainland overseas traffic is way in excess of demand for only interisland passengers.
Long Term	**Cost $247,660,000**	
*Advantages and Disadvantages from Alternative 1 Intermediate Term apply to the phase		
	Advantages	
Incremental Growth	1	New terminal can expand incrementally to respond to demand.
	2	Expansion and upgrade to existing terminal facilities for interisland use per Alternative 1, can be achieved incrementally as demand and financial capability dictate.
	Disadvantages	
Constructability	1	Expansion to the north for terminal, concourse and apron will require construction in the lava field.
	2	Limited area available for construction of close in public parking.
Alternative 2 Total Cost = $521,690,000		

Exhibit C-5
Terminal Alternative Benefit Analysis
Alternative 3 – New South Terminal

Intermediate Term	**Cost $201,740,000**	
	Advantages	
Maintain Architectural Character	1	Terminal can be designed to continue the atmosphere of Aloha, use natural vegetation in some areas, planting, etc.
Passenger Level of Service	2	Provides a new terminal with all amenities for mainland and international passengers.
Optimize Current Facilities	3	Onizuka Space Center need not be relocated in near term.
	4	Preliminary site development and some utilities are in place from current uses of the site.
	Disadvantages	
Passenger Level of Service	1	Interisland passengers gain only most pressing facilities and systems improvements to prevent failures.
Flexibility	2	Will lose flexibility of interisland aircraft using bridges gates when available.
Operational Efficiency	3	Requires split interisland and overseas operations for some airlines.
Incremental Growth	4	Expensive first step as new terminal initial phase of development is extensive in order to be operationally complete.
Demand Based	5	Existing terminal capacity without mainland overseas traffic is way in excess of demand for only interisland passengers.
Minimize Impacts	6	Requires the relocation of the ATCT and ARFF and limited GA activity.
Long Term	**Cost $225,430,000**	
*Advantages and Disadvantages from Alternative 1 Intermediate Term apply to this phase		
	Advantages	
Incremental Growth	1	New terminal can expand incrementally to respond to demand.
	2	Expansion and upgrade to existing terminal facilities for interisland use per Alternative 1, can be achieved incrementally as demand and financial capability dictate.
	Disadvantages	
Constructability	1	Limited area available for construction of close in public parking.
Alternative 3 Total Cost = $491,350,000		

Appendix D

AIRPORT AREA DEVELOPMENT

Appendix D
AIRPORT AREA DEVELOPMENT

The following is a brief summary of the land developments, both existing and planned, for the area of North Kona in the vicinity of Kona International Airport at Keahole, as prepared by PBR Hawaii Associates, Inc. **Exhibit D1** is keyed to the number preceding each description.

1) **Hualālai Resort (8,851 acres)**
   Located on 8,851 acres on the Kohala Coast, the **Hualālai** Resort is a residential planned residential/resort community. In 2007, MSD Development, owner of Hualälai Resort purchased the neighboring 86 acre Kona Village Resorts. Across Queen Kaahumanu Highway **Hualālai** Resorts is currently discussing with Kamehameha Schools to develop 7,800 acres of land mauka of the existing resort.

2) **WB Kūki'o (957 acres)**
   Directly adjacent to the Hualälai Resort is the Kūki'o Beach Club. Kūki'o is a planned residential community with an 18-hole golf course. Archaeological sites and the historic Ala Kahakai Trail are integrated into the residential community.

3) **State of Hawaii (54,112 acres)**
   By far the State is the single largest landholder within the immediate area of the Kona International Airport. While a majority of the lands are unencumbered and not in current active use by the state, there are several properties in

the immediate vicinity of the Kona International Airport that are actively utilized.

a) Keahole Agricultural Park (179 acres)
This 179 acre agricultural park is subdivided into 34 individual lots where tenants are allowed to grow various crops and other agricultural products. The majority of existing tenants grow plumeria and other native plants for the landscaping industry. Approximately half of all agricultural park tenants have also built homes on their lots.

b) Honua'ula Forest Reserve (2,504 acres)
The Honua'ula Forest Reserve is located mauka of the Kona International Airport. The forest reserve is home to many indigenous plants species such as yohiya and koa. Cattle were finally removed from the reserve in 2003 to prevent the further destruction of reserve lands. Replanting of koa and other indigenous plants are currently underway.

c) Kekaha Kai (Kona Coast) State Park (1,154 acres)
Split in half by a parcel of land owned Bishop Estate, Kekaha Kai State Park can be accessed from Queen Kaahumanu Highway via an unpaved road. The southern portion, Mahaiula has a sandy beach while access to Maniniowali (Kua Bay) is accessible via the ancient Ala Kahakai Trail.

d) West Hawaii Community College (500 acres)
The proposed 500 acre lot has been earmarked for a West Hawaii Community College. Currently, students are allowed to work with the University of Hawaii Center: West Hawaii as a remote learning center. Students are currently allowed to complete online coursework.

e) Old Kona Airport State Recreation Area (116 acres)
In 1970, the Old Kona Airport was shut down and converted into a state park. The runway is converted into a parking lot for park users.

4) Huehue Ranch/Makalei Golf Course (1,647 acres)
Originally part of the Huÿehuÿe Ranch, the parcels were sold off with the intention of developing it into an agricultural subdivision with homes, a golf course, cattle ranch, and equestrian facilities. Within the last fifteen years, the parcels have changed ownership three times. In the mean time, Makalei Hawaii Corporation developed the existing Makalei Golf Course. In April 2008, under pressure from difficult economic circumstances, Lynch Investments, the current owner of the properties was forced to sell under foreclosure. Parcels were auctioned May 15th, 2008.

06MP06-D1-1/28/09

LINEAR SCALE (feet)
8,000
4,000
2,000
1,000
0
North

LEGEND

1, Hualalai Resort
2, WB Kuki'o
3a, Keahole Agricultural Park
3b, Honua'ula Forest Reserve
3c, Kekaha Kai (Kona Coast) State Park
3d, West Hawaii Community College
3e, Old Kona Airport State Recreation Area
4, Hu'ehu'e Ranch / Makalei Golf Course
5, Makalei Estates
6, Lokahi Makai
7, N.E.L.H.A.
8, Kula Nei
9, Kaloko Heights
10, Kaloko Makai Project
11, 'O'oma Beachside Village
12, The Shores at Kohanaiki
13, Kaloko-Honokohau National Park
14, Queen Lili'uokalani Trust
15, Kanehameha Schools / Bishop Estate
16, Palamanui (Hiluhilu Development)
17a, La'i'opua
17b, Honokohau
17c, Govt. State DHHL
18, Palani Ranch
19, Kona Kai Ola
20, HHFDC Keahuolu Affordable Housing
21, HELCO Keahole Power Plant

LEGEND (continued)

22, Kaloko Industrial Park
23, West Hawaii Industrial Park
24, Kealakehe Waste Water Treatment Plant (WWTP)
25, Kohanaiki Business Park
26, Kaloko Land Company / Rutter Development Company
27, McClean Honokohau Properties / Mclean Quarry
28, West Hawaii Veterans Cemetery
29, U.S.C.G. Lighthouse - Keahole Point Light Station
30, U.S. Postal Service
31, Lanihau Partners
32, Kona View Estates
33, Kona International Airport at Keahole

Source: PBR Hawaii & Associates, INC.
Disclaimer: This graphic has been prepared for general planning purposes only

5) Makalei Estates (246 acres)

Makalei Estates is a 246 acre residential housing west of the Huehue Ranch property. Each individual lot is approximately three acres. All 77 lots are zoned Ag-3.

6) Lokahi Makai (126 acres)

Lokahi Makai is a planned 191 unit residential community located on the makai portion of Kona Palisades. All newly built homes are in process of being constructed.

7) Natural Energy Laboratory of Hawaii Authority (NELHA)/Hawaii Ocean Science Technology (HOST) (548 acres)

NELHA/HOST serves as a science technology park that focuses on research, education, and commercial activities that support sustainable industry development which makes use of deep seawater resources. Currently, there are over approximately thirty tenants on NELHA/HOST land. In addition to various research institutions such as the University of California at Santa Cruz, University of Hawaii Infrasound Laboratory of Hawaii, and Oceanic Institute, private operations such as Big Island Abalone and Searider Seahorse Farms are some of the unique tenants at NELHA. Three tenants utilize the park's deep seawater pumps to collect water rich with minerals which are then bottled for consumption. Combined, NELHA tenants generate between $30-40 million in annual in revenue and provide jobs for over two hundred people.

8) Kula Nei (128 acres)

In 2006, the Shopoff Group proposed to the State to develop approximately 270 residential units with up to 220 single family home units. In addition to these homes, the development will include a 2.5 acre community park, community trails and all related infrastructure necessary for the community. The proposed homes would serve the primary housing market.

9) Kaloko Heights (394 acres)

Stanford Carr Development purchased the lands in 2005 to begin construction of a 1,500 unit master planned community. Homes are projected to be moderately priced.

10) Kaloko Makai Project (1,144 acres)

Originally purchased by the TSA Corporation in the 1980's Kaloko Makai was then purchased by the MID Corporation in 1997. Through a partnership with Stanford Carr Development (SCD), the existing parcels of land are proposed to be converted into a mixed-used planned community with 5,000 units of single-family and multiple-family homes. In addition to the residential units, recreational facilities, trails and space set aside for schools are also planned to be incorporated into the master plan. Current plans also call for preservation of the existing native dry land forest.

11) 'O'oma Beachside Village (303 acres)

'O'oma Beachside Village is a planned community south of the Kona International Airport along the Kohala Coast. In addition to building residential homes, developers also plan to incorporate a mixed-use village center, a smaller private beach club with mixed-use facilities, community parks, shoreline park with a public canoe hale, and pathways for beach access. With this "live-work-play" model of development, the proposed 'O'oma Beachside Village project aims to mitigate additional traffic congestion on the Queen Kaahumanu Highway by creating homes, jobs, and recreational activities all in one area.

12) The Shores at Kohanaiki (442 acres)

The Shores at Kohanaiki is a 500-unit golf course community under development by Kennedy Wilson and Rutter Development. Existing shoreline, anchialine ponds, and historic areas on site are proposed to be preserved. Housing will be set back at least 400 feet from the shoreline. In addition to a golf course and clubhouse, tennis courts, and workout facilities will also be incorporated into the design. A shoreline park is proposed, with parking, an 8,000 square foot beach facility, with snack bar, restrooms and showers.

13) Kaloko- Honokōkua National Park 1,160)

The 1,160 acre Kaloko-Honokōkua National Park stretches along the Kohala Coast. In addition to being home to a vast array of native Hawaiian birds, the park also preserved the Kaloko Fishpond, a native Hawaiian rock structure which fostered their ability to live off the land in a sustainable manner.

14) Queen Lili'uokalani Trust (3,517 acres)

In 1909, Queen Lili'uokalani bequeathed her personal fortune toward the creation of a trust for orphan children. From this initial generous gift the Queen Lili'uokalani Trust was created. Funds generated from trust lands provide resources promote the healthy growth of children through fostering strong family relations and stable home environments within the community. Trust lands in the Kona area include the Makalapua Center which includes cinemas and a Macy's Department Store, Queen Lili'uokalani Children's Center, and Kona Industrial Sub-division.

15) Kamehameha Schools/Bishop Estate (22,120 acres)

Kamehameha Schools is the largest private landowner in the state of Hawaii. Kamehameha Schools is a private, charitable, perpetual trust dedicated to the education of Hawaiian children and youth. Established in her will of 1883, the Kamehameha Schools is a legacy of Princess Bernice Pauahi Bishop, great-granddaughter and last direct royal descendant of King Kamehameha the Great. Income generated from numerous investments, and residential, commercial, and resort leases, fund the schools' maintenance and educational services. Unencumbered lands owned by KSBE are designated as unique resource lands for probable educational/cultural program expansion.

16) Pālamanui (Hiluhilu Development) (725 acres)

Pālamanui is a master planned community, which will include single and multiple-family residential units, University residential facilities, health facilities, research and development facilities, mixed commercial development, a small hotel, archaeological preserves, cave and lava tube preserves, a dry forest preserve, passive and active parks, open space and parking areas. Pālamanui will provide the infrastructure facilities to support the Pālamanui Development.

17) Department of Hawaiian Home Lands (DHHL) (1,407 acres)

DHHL's mission is to manage effectively the Hawaiian Home Lands Trust and to develop and deliver lands to native Hawaiians. DHHL manages 1,400 acres in the Kona area.

a) Lai'opua

The Lai'opua homestead lands lay north of Kailua-Kona. Lai'opua itself is comprised of three areas; Honokohau, Keahole, and the Villages of Lai'opua. The Villages of Lai'opua is a master planned community with fourteen different villages, single and multi-family residential units, recreational facilities, community facilities, neighborhood/commercial complexes, several parks, and several archaeological preserve sites.

b) Honokohau

Though part of the Lai'opua homestead, the 200 acre Honokohau parcel is currently being developed by Jacoby Development Company to coincide with their Kona Kai Ola Project near Honokohau Boat Harbor. The project will include developing an 800 slip marina with mixed-use commercial village and residential housing. Income generated from the lease will go towards the funding of more homes for homestead applicants.

c) Other lands (482 acres)

Other DHHL lands nearby the Kona International Airport are currently zoned for residential and industrial use.

18) Palani Ranch (2,521 acres)

With constant growth of the Kona area changing the landscape of the Kohala Coast, Palani Ranch has begun the process of repositioning their role in the community. Lands in the mauka region will be primarily reserved for pastoral usage. Lands closer to Māmalahoa Highway have been identified as areas that have the potential to be transformed into commercial, residential, and farm lot subdivisions. In the southern portion of the Palani Ranch parcels is the Hualālai Academy, a private school for grades K-12.

19) Kona Kai Ola (330 acres)

Kona Kai Ola is a proposed mixed-use commercial project that strives to protect natural resources in the Kealakehe ahupua'a. Through planned development,

Kona Kai Ola will eventually connect Kailua Village, Kona International Airport, and the ahupuaʻa. The construction goals focus on minimizing the impact associated with development on the surrounding environment. Development will take place in various phases over fifteen years. Phase 1 of construction is expected to begin in 2008.

20) Hawaii Housing Finance and Development Corporation (HHFDC) Keahuolu Affordable Housing (272 acres)

The HHFDC was created in 2006 to increase the availability of affordable housing within the State of Hawaii. Funding for master plans and EIS were received in 2006. In July 2007, HHFDC received title of ownership for the Keahuolu parcel.

21) HELCO Keahole Power Plant (15 acres)

The Keahole Power Plant is located mauka of the Kona International Airport and immediately adjacent to Department of Agriculture Keahole Agriculture Park farm lots. Keahole's MW output represents 24 percent of HELCO's islandwide production capacity. The plant's current capacity of 65.3 MW helps serve the Big Island's 76,000 customers.

22) Kaloko Industrial Park (215 acres)

Kaloko Industrial Park is host to many small commercial enterprises. Average lot size is approximately 2.9 acres. The largest parcel tenants in the area are Costco Wholesale and Home Depot.

23) West Hawaii Industrial Park (326 acres)

Situated mauka of the Queen Kaahumanu Highway, the West Hawaii Industrial Park is currently a quarry site. However, the site is currently classified as a conversation zone. In order for the site to be converted into an industrial zone, re-zoning will be necessary.

24) Kealakehe Waste Water Treatment Plant (WWTP) (53 acres)

The Kealakehe WWTP is managed by the County of Hawaii. Coverage for the WWTP is for North and South Kona. Projected flow is average design flow for this facility is 7.82 million gallons per day (MGD). Currently, approximately 6.21 MGD of raw sewage is currently processed at Kealakehe.

25) Kohanaiki Business Park (62 acres)

Kohanaiki Business Park is divided into two different phases. There are approximately 44 lots that are one acre in size. Existing businesses at the park include; crematory services, trucking, and other light industrial and commercial operations.

26) Kaloko Land Company/Rutter Development Company (93 acres)

Rutter Development, the owner of Kaloko Land Company is also responsible for the development of The Shores of Kohanaiki, an adjacent 500 home golf-course community along the Kona Coast. There are no plans for the current 93 acre Kaloko Land Company Parcel.

27) McClean Honokōkua Properties/McClean Quarry (146 acres)

Auto body, warehousing, and construction operations are some of the various commercial and light industrial tenants. A fully operational quarry is located in the mauka portion of the parcel. Based on 2004 license re-application testimonies, the existing quarry is operating at 50 percent capacity.

28) West Hawaii Veterans Cemetery (62 acres)

Located mauka of the Queen Kaahumanu Highway and south of Hualālai Resort, the West Hawaii Veterans Cemetery is managed by the Office of Veteran Affairs.

29) U.S.C.G. Lighthouse-Keahole Point Light Station (11 acres)

The USCG Lighthouse at Keahole Point is the western-most lighthouse on the island of Hawaiÿi.

30) U.S. Postal Service (4 acres)

The existing facility assists in the delivery and distribution of out/in-going mail to the Big Island.

31) Lanihau Partners (423 acres)

Lying adjacent to the Villages of Lai'opua, consideration was made to developing a residential community on the largest parcel (394 acres) along Kealakehe Parkway. Currently no decision has been made to move ahead with any further development on Lanihau Partners Land.

32) Kona View Estates (293 acres)

Kona View Estates is a planned community that allows residents to enjoy an agricultural environment while being close in proximity to Kona. Currently, the whole 293 acres is not developed. Phase I of Kona View Estates incorporates 29 one acre units. Phase I is lies makai of Māmalahoa Highway. Phase II of Kona View Estates is going through a planning and design phase.

33) Kona International Airport

The Kona International Airport (KOA) is the primary airport hub of West Hawaiÿi. 2006 DBEDT tourism statistics indicate over 1.3 million visitors arrived in the Kona region. Recent State Legislature appropriations earmarked over $17 million in upgrades and terminal construction.

Appendix E

AIRPORT LAYOUT PLAN DRAWINGS

AIRPORT LAYOUT PLANS

FOR

KONA INTERNATIONAL AIRPORT AT KEAHOLE (KOA)

KEAHOLE, NORTH KONA, HAWAII

Prepared for the

AIRPORTS DIVISION
DEPARTMENT OF TRANSPORTATION
HONOLULU, HAWAII

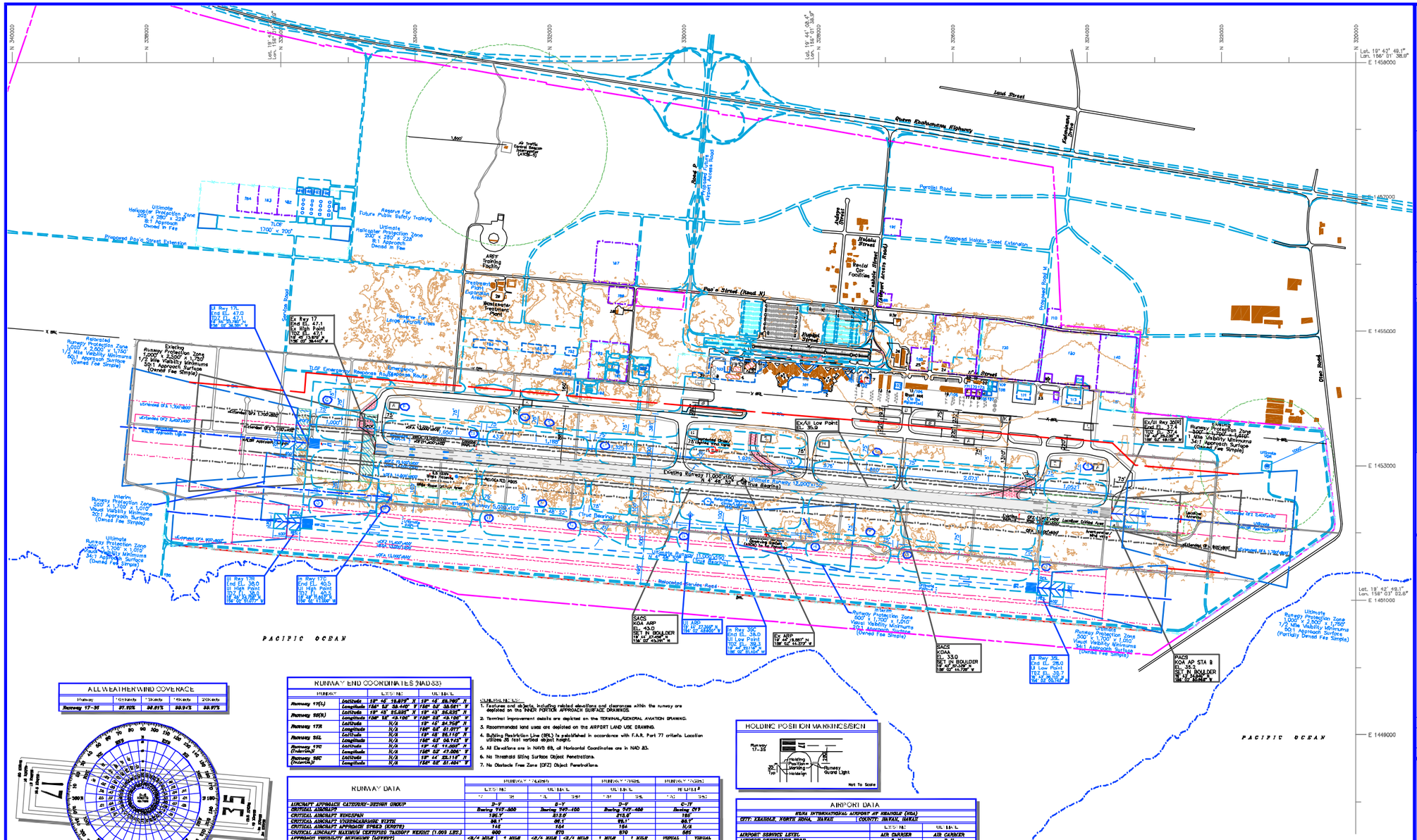
INDEX OF DRAWINGS

1. AIRPORT LAYOUT DRAWING
2. PART 77 AIRSPACE DRAWING
3. RUNWAY PROFILES
4. APPROACH ZONE PROFILES
5. INNER PORTION OF RUNWAY 17L APPROACH SURFACE DRAWING
6. INNER PORTION OF RUNWAY 35R APPROACH SURFACE DRAWING
7. INNER PORTION OF RUNWAY 17R-35L APPROACH SURFACE DRAWING
8. INNER PORTION OF INTERIM RUNWAY 17C-35C APPROACH SURFACE DRAWING
9. TERMINAL/GENERAL AVIATION DRAWING
10. AIR CARGO DRAWING
11. AIRPORT LAND USE DRAWING
12. EXHIBIT A - AIRPORT PROPERTY MAP

DRAFT
August 19, 2010

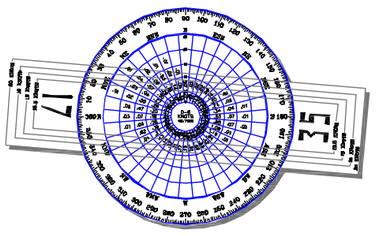
KOBER HANSSEN MITCHELL ARCHITECTS

Coffman Associates Airport Consultants



ALL WEATHER WIND COVERAGE

Runway	10 Knots	13 Knots	16 Knots	20 Knots
Runway 17-35	97.92%	98.91%	99.91%	99.97%

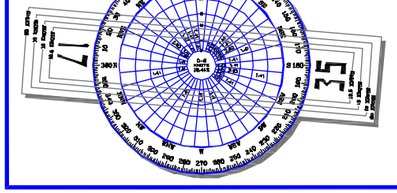


SOURCE:
HCAA National Climatic Center
Data Period: 1 January 1965 - 31 December 1974
Station: Kona, Hawaii (NOAA)

OBSERVATION:
Full Time Weather Observations
1990-2000

IFR CAT-I WIND COVERAGE

Runway	10 Knots	13 Knots	16 Knots	20 Knots
Runway 17-35	99.89%	99.95%	99.99%	100.00%



RUNWAY END COORDINATES (NAD 83)

RUNWAY	LOW NO	UL BAL
Runway 17(L)	Latitude	19° 44' 15.890" N
	Longitude	156° 02' 38.440" W
Runway 35(R)	Latitude	19° 43' 35.826" N
	Longitude	156° 02' 43.126" W
Runway 17R	Latitude	N/A
	Longitude	N/A
Runway 35L	Latitude	N/A
	Longitude	N/A
Runway 17C (Interim)	Latitude	N/A
	Longitude	N/A
Runway 35C (Interim)	Latitude	N/A
	Longitude	N/A

GENERAL NOTES:
1. Features and objects, including related elevations and clearances within the runway are depicted on the FAA'S PORTION APPROACH SURFACE DRAWINGS.
2. Terminal improvement details are depicted on the TERMINAL/GENERAL AVIATION DRAWING.
3. Recommended land uses are depicted on the AIRPORT LAND USE DRAWING.
4. Building Restriction Line (BRL) is established in accordance with F.A.R. Part 77 criteria. Location utilizes 35 foot vertical object height.
5. All Elevations are in NAVD 88, all Horizontal Coordinates are in NAD 83.
6. No Threshold Siting Surface Object Penetrations.
7. No Obstacle Free Zone (OFZ) Object Penetrations.

RUNWAY DATA

	RUNWAY 17-35		RUNWAY 11-29		RUNWAY 4-22		RUNWAY 17(R)-35(R)	
	LOW NO	UL BAL	UL BAL	UL BAL	UL BAL	UL BAL	UL BAL	UL BAL
	17	35	11	29	04	22	17(R)	35(R)
AIRCRAFT APPROACH CATEGORY-DESIGN GROUP	D-V		D-V		D-V		C-IV	
CRITICAL AIRCRAFT	Boeing 747-400		Boeing 747-400		Boeing 747-400		Boeing 747	
CRITICAL AIRCRAFT WINGSPAN	196.7'		213.0'		213.0'		195'	
CRITICAL AIRCRAFT UNDERCARRIAGE WIDTH	98.1'		98.1'		98.1'		88.1'	
CRITICAL AIRCRAFT APPROACH SPEED (KNOTS)	144		144		144		N/A	
CRITICAL AIRCRAFT MAXIMUM CERTIFIED TAKEOFF WEIGHT (1,000 LBS.)	900		870		870		585	
APPROACH VISIBILITY MINIMUMS (LATEST)	</=¾ MILE	1 MILE	</= ½ MILE	¾ MILE	1 MILE	1 MILE	VISUAL	VISUAL
F.A.R. PART 77 CATEGORY	C	C	C	C	C	C	VISUAL	VISUAL
PERCENTAGE OF RUN OUTSIDE (AS VERIFIED IN NPES)	0.00%/0.00%/0.00%/0.00%		0.00%/0.00%/0.00%/0.00%		0.00%/0.00%/0.00%/0.00%		0.00%/0.00%/0.00%/0.00%	
LINE OF SIGHT REQUIREMENT KEY	YES		YES		YES		YES	
MAXIMUM ELEVATION (FEET ABOVE MSL)	43.1		49.1		38.0		40.5	
LOWEST ELEVATION (FEET ABOVE MSL)	28.3		28.3		28.0		40.5	
RUNWAY DIMENSIONS (LENGTH X WIDTH)	11,000' x 150'		12,000' x 150'		11,000' x 150'		5,080' x 150'	
RUNWAY BEARING (TRUE BEARING - MAGNETIC BEARING)	4.8S	184.8S	4.8S	184.8S	4.8S	184.8S	4.8S	184.8S
RUNWAY APPROACH SURFACE (F.A.R. PART 77)	50:1	34:1	50:1	50:1	34:1	34:1	20:1	20:1
RUNWAY END ELEVATION (NAVD 88)	47.1	37.4	47.8	37.4	38.0	38.0	46.5	37.5
RUNWAY THRESHOLD DISPLACEMENT	0	0	0	0	0	0	0	0
RUNWAY THRESHOLD SITING REQUIREMENTS (APPENDIX 2, CATEGORY)	9	9	9	9	9	9	9	9
RUNWAY STOPWAY	0'	0'	0'	0'	0'	0'	0'	0'
RUNWAY BLAST PAD WIDTH (MSL)	200'		200'		200'		200'	
RUNWAY SAFETY AREA (RSA) BEYOND RUNWAY STOP END	1,000'	1,000'	1,000'	1,000'	1,000'	1,000'	300'	300'
RUNWAY OBSTACLE FREE ZONE WIDTH (OFZ)	400'		400'		400'		400'	
RUNWAY OBSTACLE FREE ZONE (OFZ) BEYOND RUNWAY STOP END	200'	200'	200'	200'	200'	200'	200'	200'
RUNWAY OBJECT FREE AREA WIDTH (OFA)	800'		800'		800'		800'	
RUNWAY OBJECT FREE AREA (OFA) BEYOND RUNWAY STOP END	1,000'	1,000'	1,000'	1,000'	1,000'	1,000'	300'	300'
TAKEOFF RUN AVAILABLE (TORA)	11,000'	11,000'	12,000'	12,000'	11,000'	11,000'	4,930'	4,930'
TAKEOFF DISTANCE AVAILABLE (TODA)	11,000'	11,000'	12,000'	12,000'	11,000'	11,000'	4,930'	4,930'
ACCELERATE-STOP DISTANCE AVAILABLE (ASDA)	11,000'	11,000'	12,000'	12,000'	11,000'	11,000'	4,930'	4,930'
LANDING DISTANCE AVAILABLE (LDA)	11,000'	11,000'	12,000'	12,000'	11,000'	11,000'	4,930'	4,930'
RUNWAY SURFACE MATERIAL	ASPHALT-GROOVED		ASPHALT-GROOVED		ASPHALT		ASPHALT	
RUNWAY PAVEMENT STRENGTH (IN THOUSAND LBS.)	75(S)/800(D)/1400(2D)/850(2D/2D)		75(S)/800(D)/1400(2D)/850(2D/2D)		75(S)/800(D)/1400(2D)/850(2D/2D)		60(S)/200(D)/400(2D)/160(2D/2D)	
RUNWAY EFFECTIVE GRADIENT	0.09%		0.96%		0.09%		0.97%	
RUNWAY MAX GRADIENT	0.40%		0.40%		0.40%		0.97%	
RUNWAY TOUCHDOWN ZONE ELEVATION (FEET ABOVE MSL)	47.1	37.4	47.1	37.4	38.0	30.7	46.5	39.6
RUNWAY MARKINGS	PRECISION	PRECISION	PRECISION	PRECISION	NON-PRECISION	NON-PRECISION	VISUAL	VISUAL
RUNWAY LIGHTING	HIRL		HIRL		HIRL		NONE	
RUNWAY APPROACH LIGHTING	MALSR	NONE	MALSR	MALSR	NONE	NONE	NONE	NONE
RUNWAY TO TAXIWAY SEPARATION (FROM CENTERLINE TO CENTERLINE)	661'		500'		650'		N/A	
RUNWAY HOLD LINE POSITION (FROM RUNWAY CENTERLINE)	300'		200'		250'		N/A	
TAXIWAY TAXILANE SEPARATION (FROM CENTERLINE TO CENTERLINE)	320'/462'		320'/462'		0		N/A	
TAXIWAY CENTERLINE TO FIX OR MOVABLE OBJECT	160'		160'		160'		N/A	
TAXIWAY LIGHTING	EDTL		EDTL		EDTL		N/A	
TAXIWAY MARKING	CENTERLINE/EDGE/HOLDS		CENTERLINE/EDGE/HOLDS		CENTERLINE/EDGE/HOLDS		N/A	
TAXIWAY SURFACE MATERIAL	ASPHALT		ASPHALT		ASPHALT		N/A	
TAXIWAY STRENGTH	60		60		60		N/A	
TAXIWAY WIDTH	75'		75'		75'		N/A	
TAXIWAY SAFETY AREA WIDTH	214'		214'		214'		N/A	
TAXIWAY OBJECT FREE AREA WIDTH	259'		259'		259'		N/A	
RUNWAY VISUAL AIDS	PAPI-4L	PAPI-4L	PAPI-4L	PAPI-4L	PAPI-4L REIL	PAPI-4L REIL	WDWS	NONE
RUNWAY ELECTRONIC NAVIGATIONAL AID	ILS Y09/DME/ NDB/ GPS	CAT-I GPS	VOR LOC BC NDB/ GPS	CAT-I GPS	GPS	GPS	WDWS	NONE

*Pavement strengths are expressed in Single(S), Double(D), Dual Tandem(2T) and Double Dual Tandem(2D2T) wheel loading capacities.
Runway 17C-35C is future interim northerly training runway for military pilot proficiency training.

HOLDING POSITION MARKINGS/SIGN

AIRPORT DATA

KONA INTERNATIONAL AIRPORT AT KEAHOLE (KOA)
CITY: KEAHOLE, NORTH KONA, HAWAII | COUNTY: HAWAII, HAWAII

	LOW NO	UL BAL
AIRPORT SERVICE LEVEL	AIR CARRIER	AIR CARRIER
AIRPORT REFERENCE CODE	D-V	D-V
DESIGN AIRCRAFT	BOEING 747-200	BOEING 747-400
AIRPORT ELEVATION (feet)	47.1 MSL	47.1 MSL
AIRPORT REFERENCE POINT (ARP)	LATITUDE	19° 44' 15.557" N
COORDINATES (NAD 83)	LONGITUDE	156° 02' 44.772" W
AIRPORT/LAND TRAFFIC NAVIGATIONAL AIDS	ROTATING BEACON	SEGMENTED CIRCLE
	ILS CAT-I (17)	ROTATING BEACON
	NDAT (17/35)	CAT-I GPS (17L/35R)
	VOR/DME (17)	GPS (17R/35L)
	VOR (35)	
GPS APPROACH	17/35	17/35

LEGEND

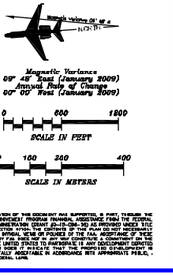
LOW NO	UL BAL	DESCRIPTION
		ABANDONED/REMOVED PAVEMENT
		AIRPORT PROPERTY LINE
		AIRPORT PARCEL LINE
		AIRPORT REFERENCE POINT (ARP)
		AIRPORT ROTATING BEACON
		AVIGATION EASEMENT (if applicable)
		BUILDING RENTAL
		BUILDING DESIGNATION (No./Of Hangar)
		BUILDING RESTRICTION LINE (BRL)
		PAVING (PAVEMENT) CONSTRUCTION
		PERIMETER
		RELOCATED
		LOW-USER AGREEMENT
		RUNWAY-INTERSECT APPROACH LIGHTING SYSTEM WITH SEQUENCE FLASHER INDICATOR (MALSR)
		RUNWAY TOUCH DOWN ZONE LIGHTING
		RUNWAY CRITICAL AREA (Localizer/Glide Slope)
		PRECISION APPROACH PATH INDICATORS
		PRECISION OBJECT FREE ZONE
		TEMPORARY AIRPORT CONTROL STATION
		RUNWAY 17/35 PAVE AREA
		RUNWAY 17/35 PAVE EDGE
		RUNWAY 17/35 SAFETY AREA
		RUNWAY END IDENTIFICATION LIGHTS (REIL)
		RUNWAY THRESHOLD LIGHTS
		RUNWAY END TONDLE WIND INDICATOR
		TAXIWAY DESIGNATION
		TAXIWAY HOLD LINE
		TERMINAL
		WIND INDICATOR (Lighted)

EXISTING BUILDINGS/FACILITIES

NO	DESCRIPTION
1	NORTH HANGER/ATCT TERMINAL
2	SOUTH PASSENGER TERMINAL
3	INTERNATIONAL ARRIVALS BUILDING
4	INTERNATIONAL FEDERAL INSPECTION FACILITY
5	AIRPORT MANAGEMENT OFFICES
6	AIRPORT TRAFFIC CONTROL TOWER (ATCT)
7	AIRPORT RESCUE FIREFIGHTING FACILITY (ARFF)
8	AIRLINE EQUIPMENT STORAGE AREA
9	MAINTENANCE SHOP STATION
10	OFFICE BUILDING (ITB)
11	HELICOPTER MEMORIAL SPACE CENTER
12	PARKING TOLL BOOTH
13	T-HANGAR
14	T-HANGAR
15	AIR CARGO BUILDING
16	HANGER BUILDING
17	COMMUTER AIR TERMINAL
18	HANGER/ HELICOPTERS
19	MAUNA LOA HELICOPTERS
20	HANGER/ PACIFIC AVIATION
21	HAWAII FLIGHT NURSERY/ MAUI EXHIBITION
22	AIR EXOTICS HAWAII
23	FUEL FARM
24	CIVIL AIR PATROL
25	TROPICAL FLIGHT SERVICE
26	AIRPORT MAINTENANCE FACILITY
27	EQUIPMENT WASH RACK
28	WASTEWATER PUMP STATION
29	WASTEWATER TREATMENT PLANT

ULTIMATE BUILDINGS/FACILITIES

NO	DESCRIPTION
101	TERMINAL EXPANSION
102	COURTYARD AIR TERMINAL
103	TERMINAL EXPANSION (LONG TERM)
104	GA SPECIALTY SUITES
105	GA SPECIALTY SUITES
106	GA BUILDING
107	INTERNAL CONNECTOR AIR TERMINAL
108	INTERNAL CONNECTOR AIR TERMINAL
109	GA BUILDING
110	TEXT EXCHANGER SITE
111	PBG HANGAR
112	FUEL STORAGE
113	PBG HANGAR
114	WAPU HACK
115	CA PARCEL
130	CA PARCEL
140	CA PARCEL
161	AIRPORT TRAFFIC CONTROL TOWER (ATCT)
162	AIRCRAFT RESCUE AND FIREFIGHTING FACILITY (ARFF)
163	CARGO BUILDING
164	CARGO BUILDING
165	AIRPORT MAINTENANCE
166	HELICOPTER HANGAR
167	HELICOPTER HANGAR
168	HELICOPTER HANGAR
169	HELICOPTER HANGAR
170	PARKING TOLL BOOTH
171	CA AVIATION PARCEL
172	CA AVIATION PARCEL
173	CA AVIATION PARCEL
181	AVIATION RELATED PARCEL
182	HELIPORT PARCEL
183	HELIPORT PARCEL
184	HELIPORT PARCEL
185	AIRPORT MAINTENANCE EXPANSION
186	UTILITY BUILDING SITE
187	FUEL FARM
188	U.S. POSTAL SERVICE PROPERTY
189	FLIGHT KITCHEN PARCEL
191	MOTION PICTURE FILMING
192	JUMP INSTRUCTION FACILITY
193	FAA PARCEL
194	RENTAL CAR FUELING STATION
195	WATER RESCUE FACILITY/BOAT LAUNCH



THE INFORMATION OF THIS DRAWING IS INTENDED, IN PART, TO ENABLE THE AIRPORT IMPLEMENT PROGRAM FINANCING ASSISTANCE FROM THE FEDERAL AVIATION ADMINISTRATION (GRANT 03-15-0006-30) AS PROVIDED UNDER TITLE 49 U.S.C. SECTION 47101, ET SEQ. THE INFORMATION ON THIS DRAWING DOES NOT NECESSARILY REFLECT THE OFFICIAL VIEWS OR POLICIES OF THE FAA, ACCEPTANCE OF THESE DRAWINGS DOES NOT IN ANY WAY COMMIT THE FAA TO FINANCIAL PARTICIPATION IN ANY PART OF THE COSTS OF THE PROJECTS TO BE APPROVED IN ANY DEVELOPMENT GRANT AGREEMENT WHICH MAY BE OFFERED BY THE FAA. IT IS UNDERSTOOD THAT THE PROJECTS DEVELOPMENT IS SUBJECT TO ENVIRONMENTAL APPROVAL AND IS NOMINATED WITH APPROPRIATE REVISE, STATE OR FEDERAL LAWS.

Airports Division

DSCN.	DRWN.	CHKD.	APPD.

KEY PLAN / NOTES :

LOCATION MAP

NO	DATE	PROPOSED REVISIONS

FAA ALP APPROVED:
SEPTEMBER 20 2010
FAA APPROVAL

FAA APPROVED:
REFER TO LETTER DATED

DIRECTOR, DEPARTMENT OF TRANSPORTATION — DATE
STATE OF HAWAII

KONA INTERNATIONAL AIRPORT AT KEAHOLE
KEAHOLE, NORTH KONA, HAWAII

AIRPORT LAYOUT PLANS

SHEET TITLE:

AIRPORT LAYOUT DRAWING

DRAFT

DATE: AUGUST 19, 2010
DWG NO:
SHEET 1 OF 12 SHEETS

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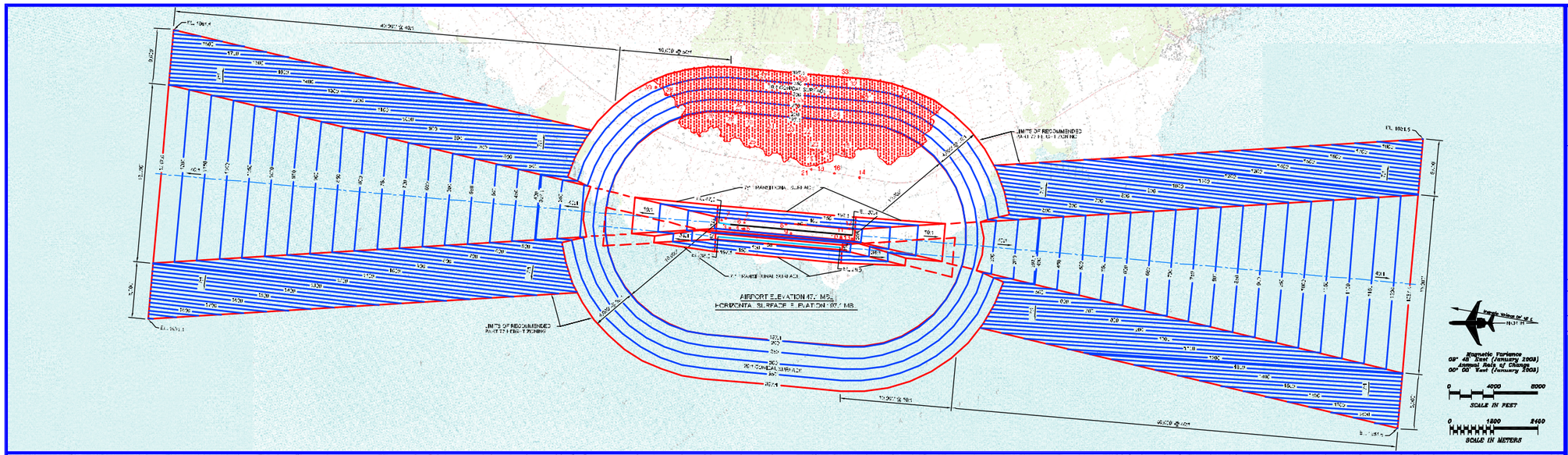

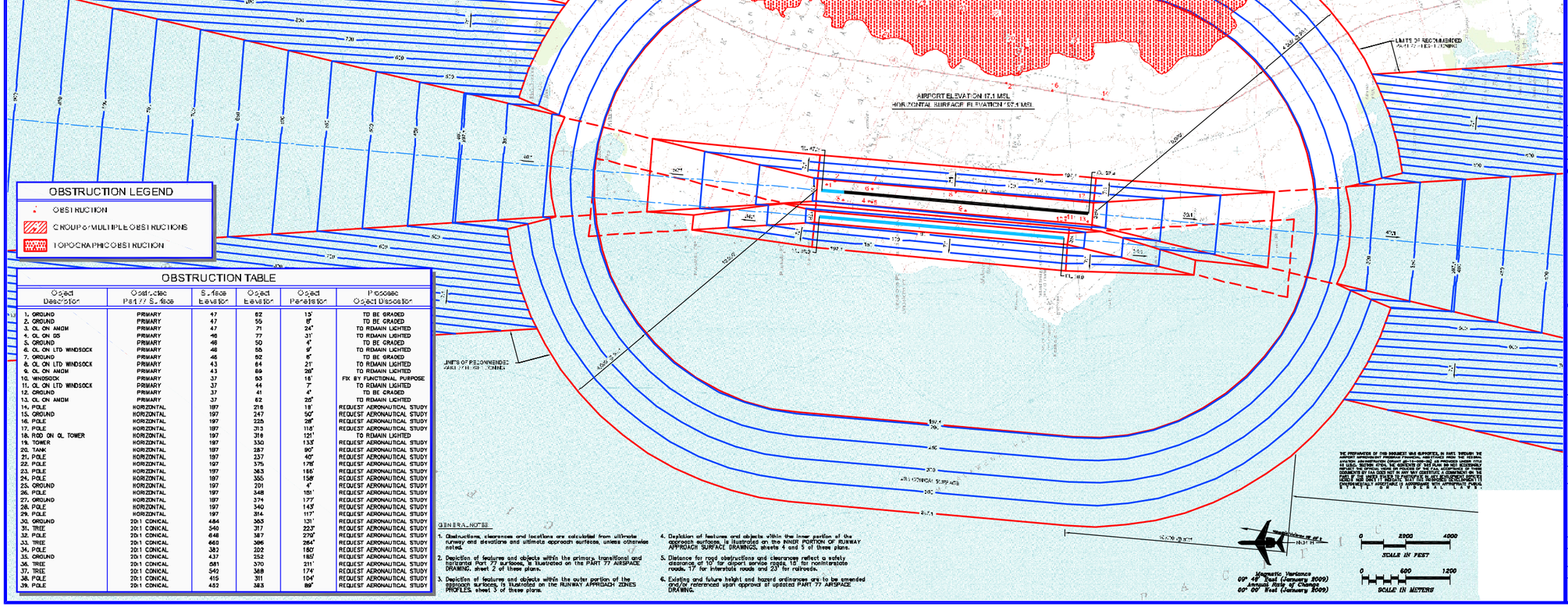

OBSTRUCTION LEGEND

- OBSTRUCTION
- GROUP OF MULTIPLE OBSTRUCTIONS
- TOPOGRAPHIC OBSTRUCTION

OBSTRUCTION TABLE

Object Description	Obstacle Part 77 Surface	Surface Elevation	Object Elevation	Object Penetration	Proposed Object Disposition
1. GROUND	PRIMARY	47	62	15'	TO BE GRADED
2. GROUND	PRIMARY	47	55	8'	TO BE GRADED
3. OL ON ANEMOMETER	PRIMARY	47	71	24'	TO REMAIN LIGHTED
4. OL ON GS	PRIMARY	48	77	31'	TO REMAIN LIGHTED
5. GROUND	PRIMARY	48	50	4'	TO BE GRADED
6. OL ON LTD WINDSOCK	PRIMARY	48	55	9'	TO REMAIN LIGHTED
7. GROUND	PRIMARY	46	52	8'	TO BE GRADED
8. OL ON LTD WINDSOCK	PRIMARY	43	64	21'	TO REMAIN LIGHTED
9. OL ON ANEMOMETER	PRIMARY	43	89	28'	TO REMAIN LIGHTED
10. WINDSOCK	PRIMARY	37	53	16'	FIX BY FUNCTIONAL PURPOSE
11. OL ON LTD WINDSOCK	PRIMARY	37	44	7'	TO REMAIN LIGHTED
12. GROUND	PRIMARY	37	41	4'	TO BE GRADED
13. OL ON ANEMOMETER	PRIMARY	37	62	25'	TO REMAIN LIGHTED
14. POLE	HORIZONTAL	197	216	19'	REQUEST AERONAUTICAL STUDY
15. GROUND	HORIZONTAL	197	247	50'	REQUEST AERONAUTICAL STUDY
16. POLE	HORIZONTAL	197	225	28'	REQUEST AERONAUTICAL STUDY
17. POLE	HORIZONTAL	197	313	116'	REQUEST AERONAUTICAL STUDY
18. ROD ON OL TOWER	HORIZONTAL	197	318	121'	TO REMAIN LIGHTED
19. TOWER	HORIZONTAL	197	330	133'	REQUEST AERONAUTICAL STUDY
20. TANK	HORIZONTAL	197	287	90'	REQUEST AERONAUTICAL STUDY
21. POLE	HORIZONTAL	197	237	40'	REQUEST AERONAUTICAL STUDY
22. POLE	HORIZONTAL	197	375	178'	REQUEST AERONAUTICAL STUDY
23. POLE	HORIZONTAL	197	383	186'	REQUEST AERONAUTICAL STUDY
24. POLE	HORIZONTAL	197	355	158'	REQUEST AERONAUTICAL STUDY
25. GROUND	HORIZONTAL	197	201	4'	REQUEST AERONAUTICAL STUDY
26. POLE	HORIZONTAL	197	348	151'	REQUEST AERONAUTICAL STUDY
27. GROUND	HORIZONTAL	197	374	177'	REQUEST AERONAUTICAL STUDY
28. POLE	HORIZONTAL	197	340	143'	REQUEST AERONAUTICAL STUDY
29. POLE	HORIZONTAL	197	314	117'	REQUEST AERONAUTICAL STUDY
30. GROUND	20:1 CONICAL	484	383	131'	REQUEST AERONAUTICAL STUDY
31. TREE	20:1 CONICAL	540	317	223'	REQUEST AERONAUTICAL STUDY
32. POLE	20:1 CONICAL	648	387	276'	REQUEST AERONAUTICAL STUDY
33. TREE	20:1 CONICAL	660	396	264'	REQUEST AERONAUTICAL STUDY
34. POLE	20:1 CONICAL	382	202	180'	REQUEST AERONAUTICAL STUDY
35. GROUND	20:1 CONICAL	437	252	185'	REQUEST AERONAUTICAL STUDY
36. TREE	20:1 CONICAL	581	370	211'	REQUEST AERONAUTICAL STUDY
37. TREE	20:1 CONICAL	540	368	174'	REQUEST AERONAUTICAL STUDY
38. POLE	20:1 CONICAL	415	311	104'	REQUEST AERONAUTICAL STUDY
39. POLE	20:1 CONICAL	452	383	89'	REQUEST AERONAUTICAL STUDY

GENERAL NOTES

1. Obstructions, clearances and locations are calculated from ultimate runway end elevations and ultimate approach surfaces, unless otherwise noted.
2. Depiction of features and objects within the primary, transitional and horizontal Part 77 surfaces, is illustrated on the PART 77 AIRSPACE DRAWING, sheet 2 of three plans.
3. Depiction of features and objects within the outer portion of the approach surfaces, is illustrated on the RUNWAY APPROACH ZONES PROFILES, sheet 3 of three plans.
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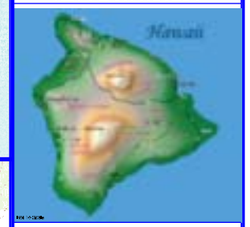
6. Existing and future height and hazard ordinances are to be amended and/or referenced upon approval of updated PART 77 AIRSPACE DRAWING.

Magnetic Variance
09° 48' East (January 2009)
Annual Rate of Change
00° 09' East (January 2009)

Airports Division

DSCN.	DRWN.	CHKD.	APPD.

KEY PLAN / NOTES :



LOCATION MAP

NO	DATE	PROPOSED REVISIONS

FAA ALP APPROVED:
SEPTEMBER 20 2010
FAA APPROVAL

FAA APPROVED:
REFER TO LETTER DATED

DIRECTOR, DEPARTMENT OF TRANSPORTATION — DATE
STATE OF HAWAII

KONA INTERNATIONAL AIRPORT AT KEAHOLE
KEAHOLE, NORTH KONA, HAWAII

AIRPORT LAYOUT PLANS

SHEET TITLE:

PART 77 AIRSPACE DRAWING

DRAFT

DATE: AUGUST 19, 2010

DWG NO:

SHEET 2 OF 12 SHEETS

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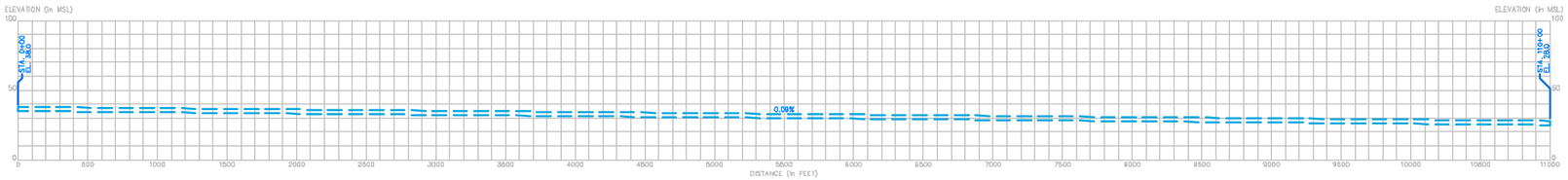
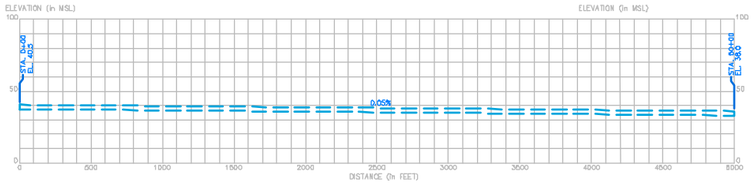
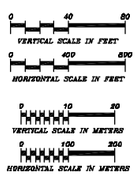
Runway 7(L)-35(R)

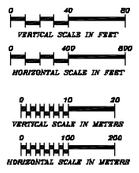


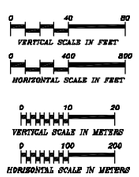
Runway 17R-35L



Interim Runway 17C-35C







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Magnetic Variance
09° 43' East (January 2009)
Annual Rate of Change
08° 00' East (January 2009)

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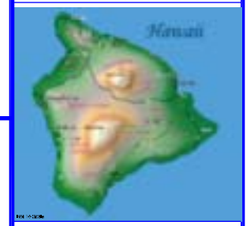
Airports Division

DSCN.	DRWN.	CHKD.	APPD.

KEY PLAN / NOTES :



LOCATION MAP

NO	DATE	PROPOSED REVISIONS

FAA ALP APPROVED:
SEPTEMBER 23 2010
FAA APPROVAL

FAA APPROVED:
KEEPER TO LETTER DATED

DIRECTOR, DEPARTMENT OF TRANSPORTATION STATE OF HAWAII — DATE

KONA INTERNATIONAL AIRPORT AT KEAHOLE
KEAHOLE, NORTH KONA, HAWAII

AIRPORT LAYOUT PLANS

SHEET TITLE:

RUNWAY PROFILES

DRAFT

DATE: AUGUST 19, 2010
DWG NO:

SHEET 3 OF 12 SHEETS

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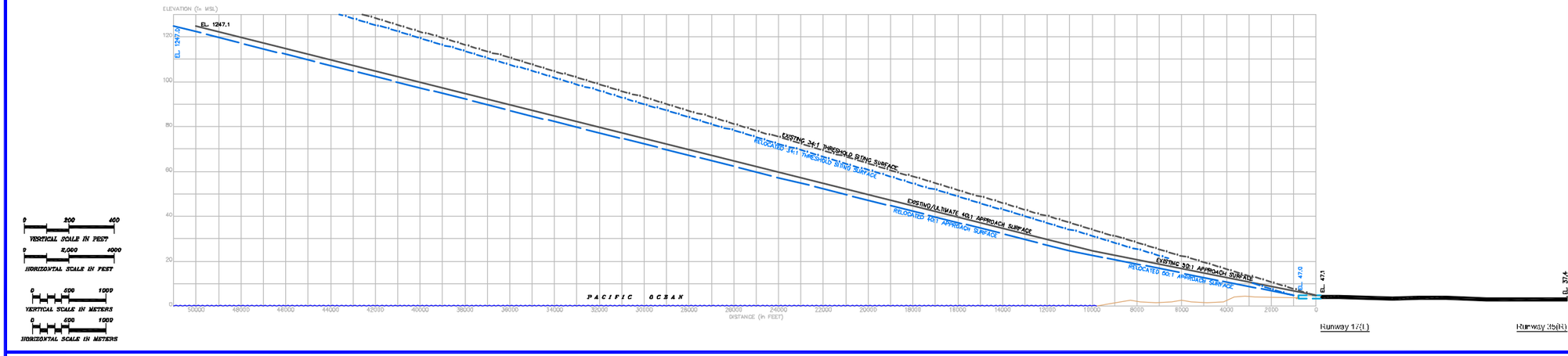

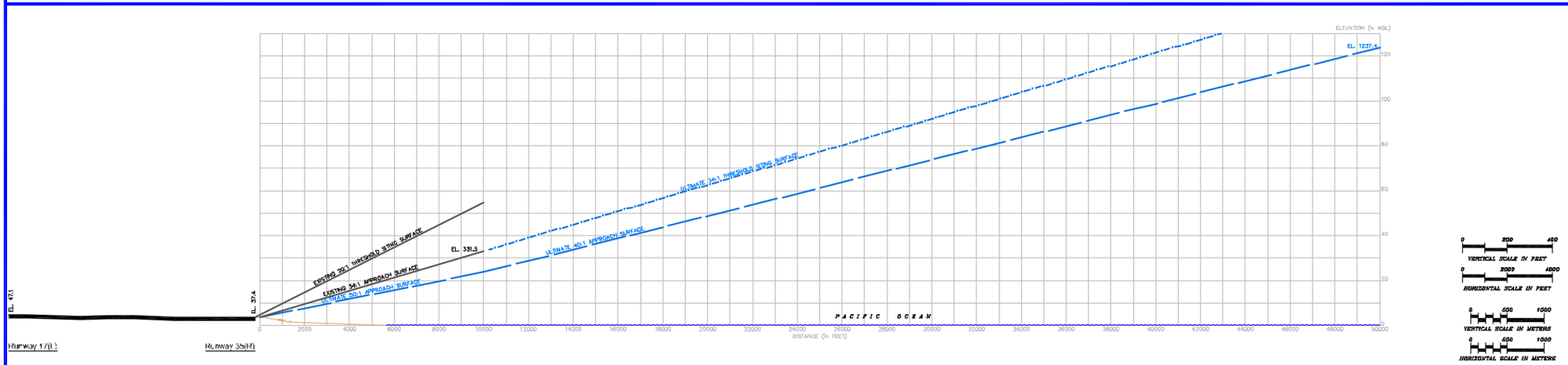

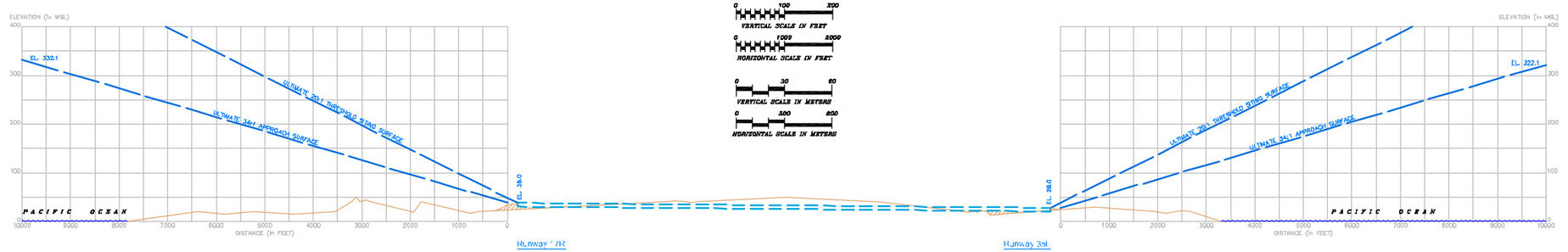

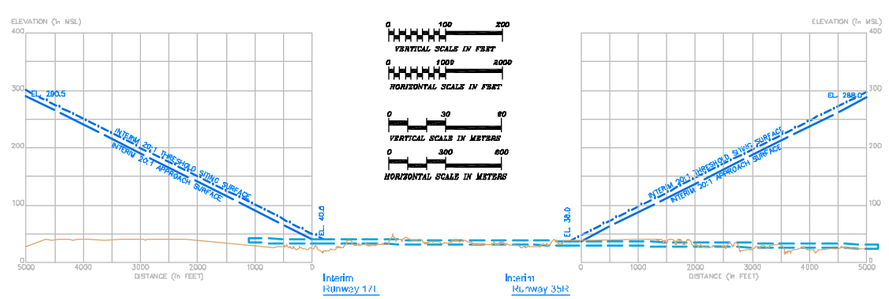

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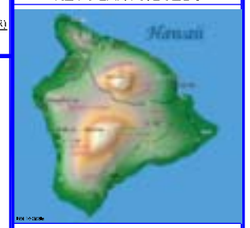
Magnetic Variance
09° 42' East (January 2009)
Annual Rate of Change
09° 09' West (January 2009)

THE PREPARATION OF THIS DOCUMENT WAS SUPPORTED, IN PART, THROUGH THE AIRPORT IMPROVEMENT PROGRAM (AIP) GRANT ASSISTANCE FROM THE FEDERAL AVIATION ADMINISTRATION. THE CONTENTS OF THIS ALP DO NOT NECESSARILY REFLECT THE OFFICIAL VIEWS OR POLICIES OF THE FAA. ACCEPTANCE OF THESE DOCUMENTS BY THE FAA DOES NOT IN ANY WAY COMMIT THE FEDERAL GOVERNMENT TO PARTICIPATE IN ANY DEVELOPMENT DEPICTED HEREON NOR DOES IT INDICATE THAT THE PROPOSED DEVELOPMENT IS ENVIRONMENTALLY ACCEPTABLE IN ACCORDANCE WITH APPLICABLE PUBLIC LAWS.

Airports Division

DSCN.	DRWN.	CHKD.	APPD.

KEY PLAN / NOTES :



LOCATION MAP

NO	DATE	PROPOSED REVISIONS

FAA ALP APPROVED:
SEPTEMBER 23 2010
FAA APPROVAL

FAA APPROVED:
KEEPER TO LETTER DATED

DIRECTOR, DEPARTMENT OF TRANSPORTATION, STATE OF HAWAII — DATE

KONA INTERNATIONAL AIRPORT AT KEAHOLE
KEAHOLE, NORTH KONA, HAWAII

AIRPORT LAYOUT PLANS

SHEET TITLE:

APPROACH ZONE PROFILES

DRAFT

DATE: AUGUST 19, 2010
DWG NO:

SHEET 4 OF 12 SHEETS

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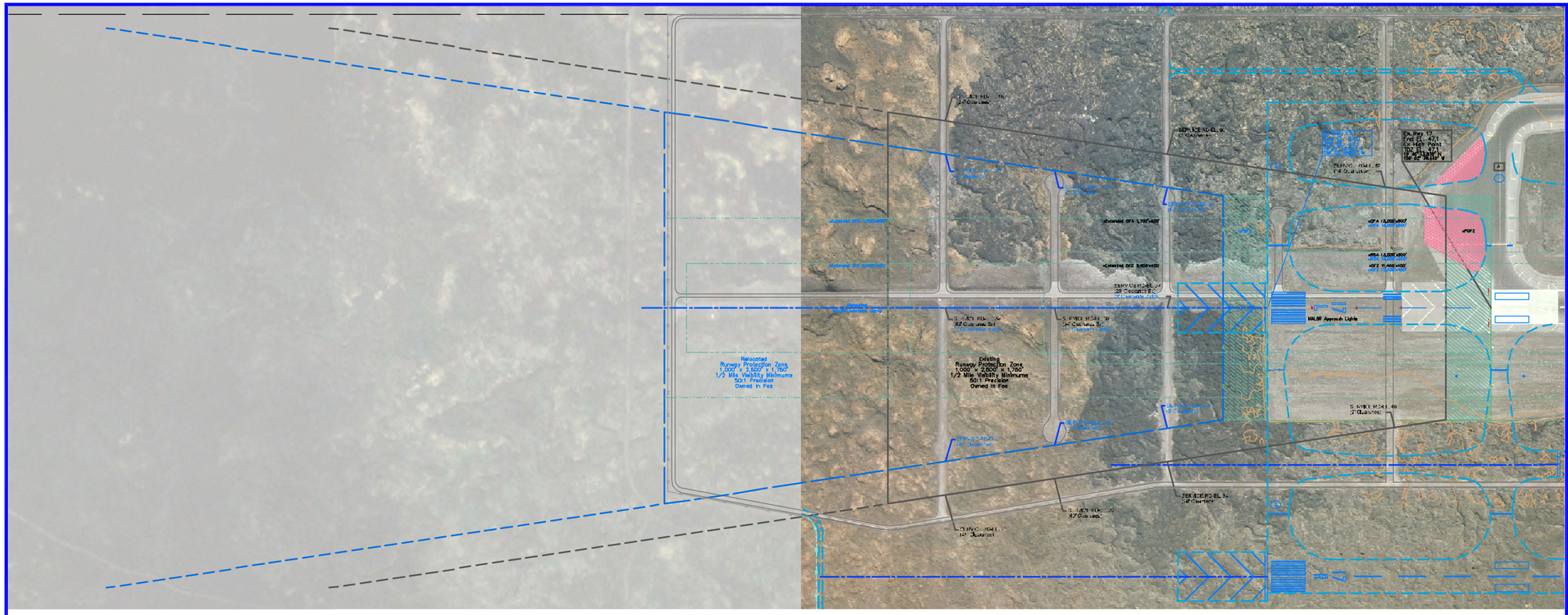

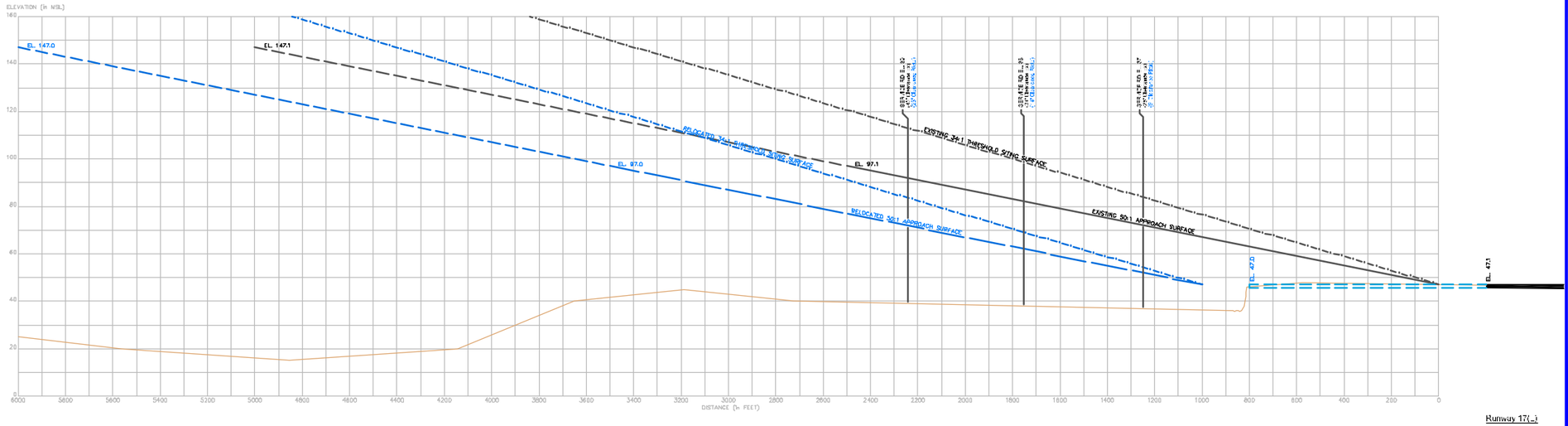

OBSTRUCTION TABLE					
Object Description	Obstructed Part 77 Surface	Object Elevation	Surface Elevation	Object Penetration	Proposed Object Disposition
NONE					

GENERAL NOTES:

1. Obstructions, clearances and locations are calculated from ultimate runway end elevations and ultimate approach surfaces, unless otherwise noted.
2. Depiction of features and objects within the primary, transitional and horizontal Part 77 surfaces, is illustrated on the PART 77 AIRSPACE DRAWING, sheet 2 of these plans.
3. Depiction of features and objects within the outer portion of the approach surfaces, is illustrated on the RUNWAY APPROACH ZONES PROFILES, sheet 3 of these plans.
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6. Existing and future height and hazard ordinances are to be amended and/or referenced upon approval of updated PART 77 AIRSPACE DRAWING.

0 50 100 VERTICAL SCALE IN FEET

0 200 400 HORIZONTAL SCALE IN FEET

0 6 12 VERTICAL SCALE IN METERS

0 60 120 HORIZONTAL SCALE IN METERS

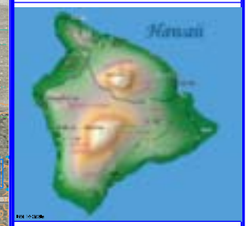
Magnetic Variance
09° 42' East (January 2009)
Annual Rate of Change
09° 09' West (January 2009)

THE PREPARATION OF THIS DOCUMENT WAS SUPPORTED, IN PART, THROUGH THE AIRPORT IMPROVEMENT PROGRAM (AIP) GRANT NUMBER(S) FROM THE FEDERAL AVIATION ADMINISTRATION, AS PROVIDED BY 49 USC 47104. ANY OPINIONS, FINDINGS, CONCLUSIONS OR RECOMMENDATIONS EXPRESSED IN THIS DOCUMENT DO NOT NECESSARILY REFLECT THE OFFICIAL VIEWS OR POLICIES OF THE FAA. ACCEPTANCE OF THIS PLAN DOES NOT COMMIT THE FAA TO FUND ANY PROJECT OR TO APPROVE THE PLANNING OR DESIGN OF ANY PROJECT. ACCEPTANCE ALSO DOES NOT COMMIT THE FAA TO PARTICIPATE IN ANY DEVELOPMENT THAT MAY BE PROPOSED. ACCEPTANCE ONLY INDICATES THAT THE PROPOSED DEVELOPMENT IS ENVIRONMENTALLY PRACTICABLE IN ACCORDANCE WITH APPROPRIATE PUBLIC LAWS.

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
Airports Division

DSGN.	DRWN.	CHKD.	APPD.

KEY PLAN / NOTES :



LOCATION MAP

NO	DATE	PROPOSED REVISIONS

FAA ALP APPROVED:
SEPTEMBER 30 2010
FAA APPROVAL

FAA APPROVED:
REFER TO LETTER DATED

DIRECTOR, DEPARTMENT OF TRANSPORTATION STATE OF HAWAII — DATE

KONA INTERNATIONAL AIRPORT AT KEAHOLE
KEAHOLE, NORTH KONA, HAWAII

AIRPORT LAYOUT PLANS

SHEET TITLE:
INNER PORTION OF RUNWAY 17 APPROACH SURFACE DRAWING

DRAFT

DATE: AUGUST 19, 2010
DWG NO:
SHEET 5 OF 12 SHEETS

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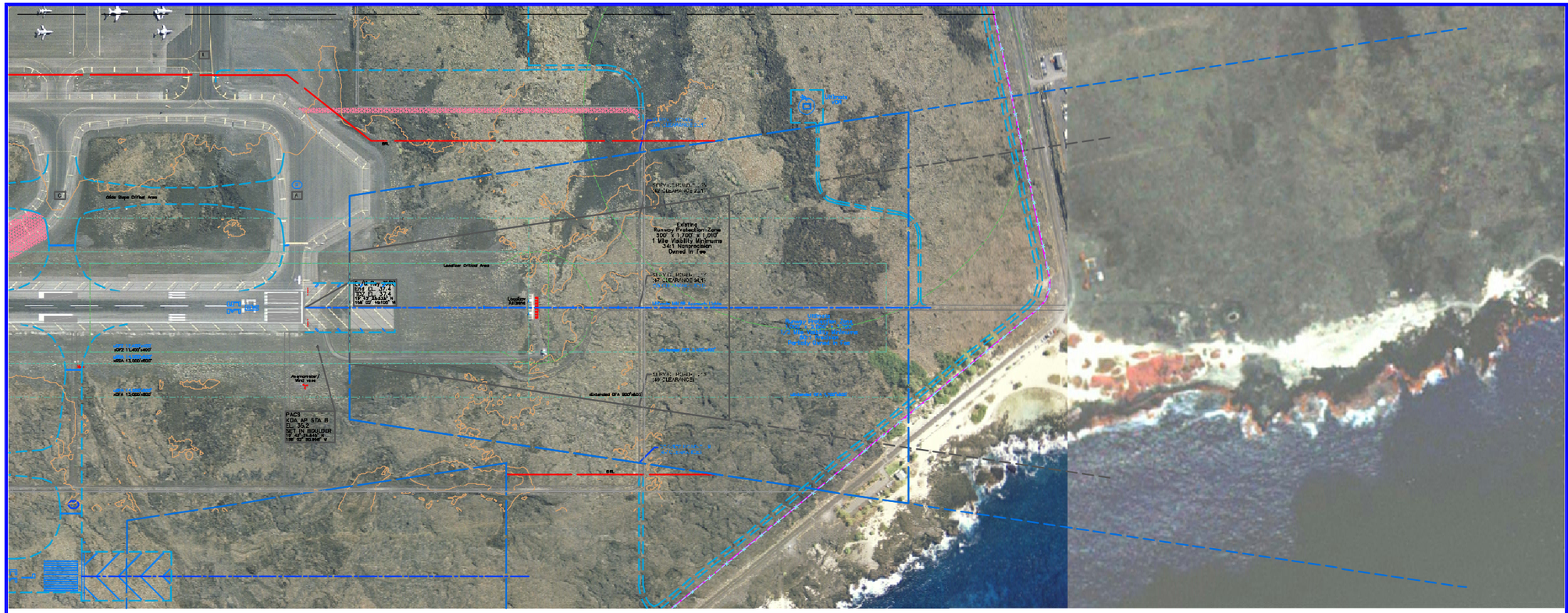
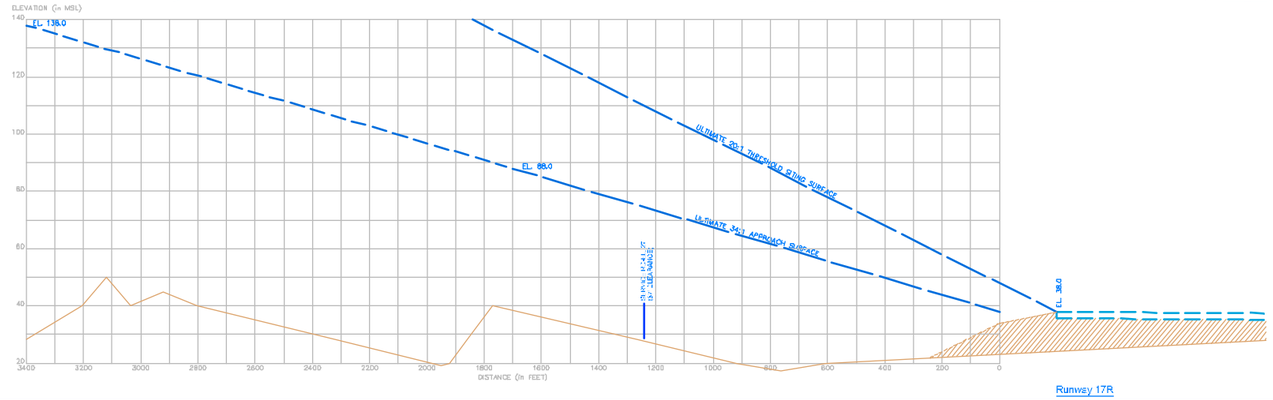
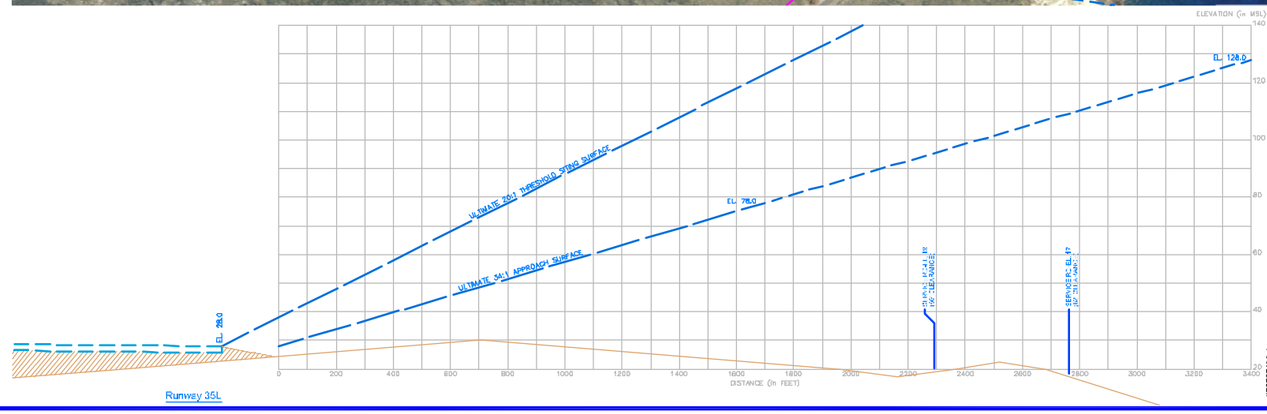

Glide Slope Offset Area
Localizer Critical Area
Existing
Runway Protection Zone
1 Mile Visibility Minimums
Owned in Fee
Localizer
Anemometer/
Wind Vane
PACS
KOA AP STA B
SET IN BOULDER
Extended RPZ
Extended RSA
Extended OFA
Extended OFZ
Extended ARA
Extended OFA
SURVEY POINT
SURVEY POINT
SURVEY POINT





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0 20 40
VERTICAL SCALE IN FEET
0 200 400
HORIZONTAL SCALE IN FEET
0 6 12
VERTICAL SCALE IN METERS
0 60 120
HORIZONTAL SCALE IN METERS

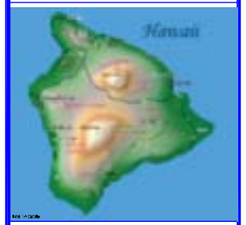
OBSTRUCTION TABLE

Object Description	Obstruction Part 77 Surface	Object Elevation	Surface Elevation	Object Penetration	Proposed Object Disposition
NONE					

Airports Division

DSGN.	DRWN.	CHKD.	APPD.

KEY PLAN / NOTES :



LOCATION MAP

NO	DATE	PROPOSED REVISIONS

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SEPTEMBER 23 2010
FAA APPROVAL

FAA APPROVED:
REFER TO LETTER DATED

DIRECTOR, DEPARTMENT OF TRANSPORTATION STATE OF HAWAII — DATE

KONA INTERNATIONAL AIRPORT AT KEAHOLE
KEAHOLE, NORTH KONA, HAWAII

AIRPORT LAYOUT PLANS

SHEET TITLE:
INNER PORTION OF RUNWAY 17R-35L APPROACH SURFACE DRAWING

DRAFT

DATE: AUGUST 19, 2010
DWG NO:
SHEET 7 OF 12 SHEETS

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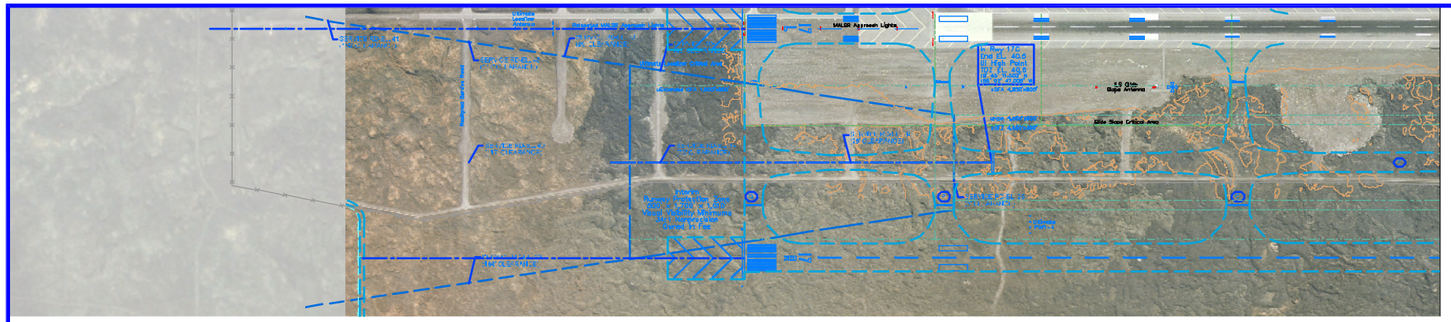
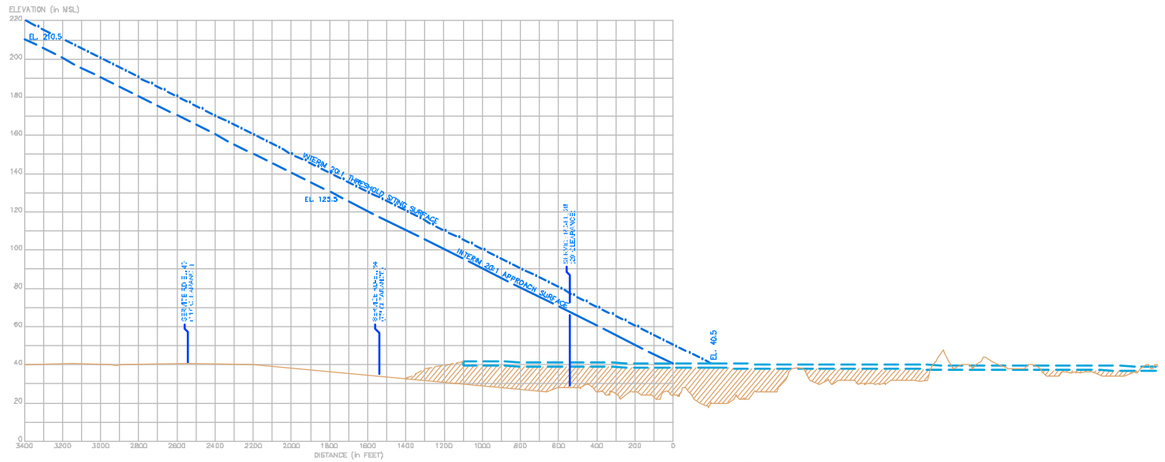
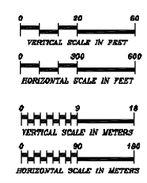
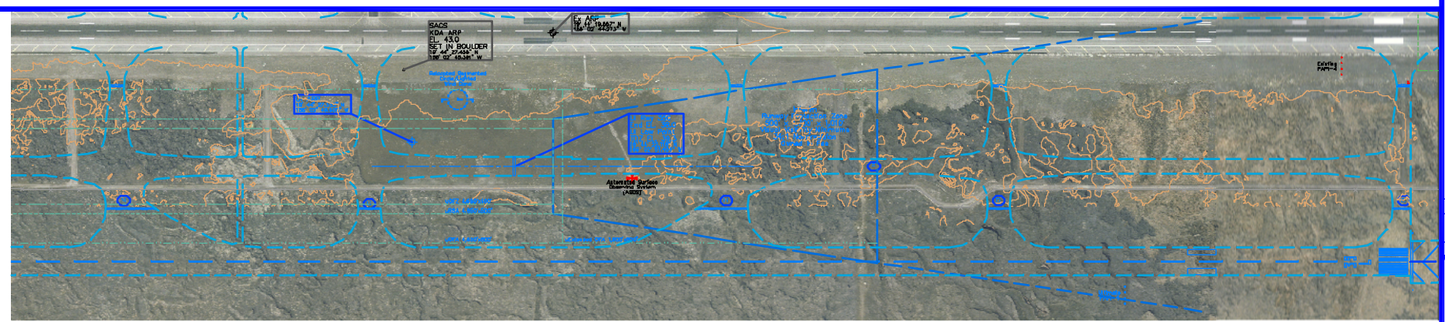
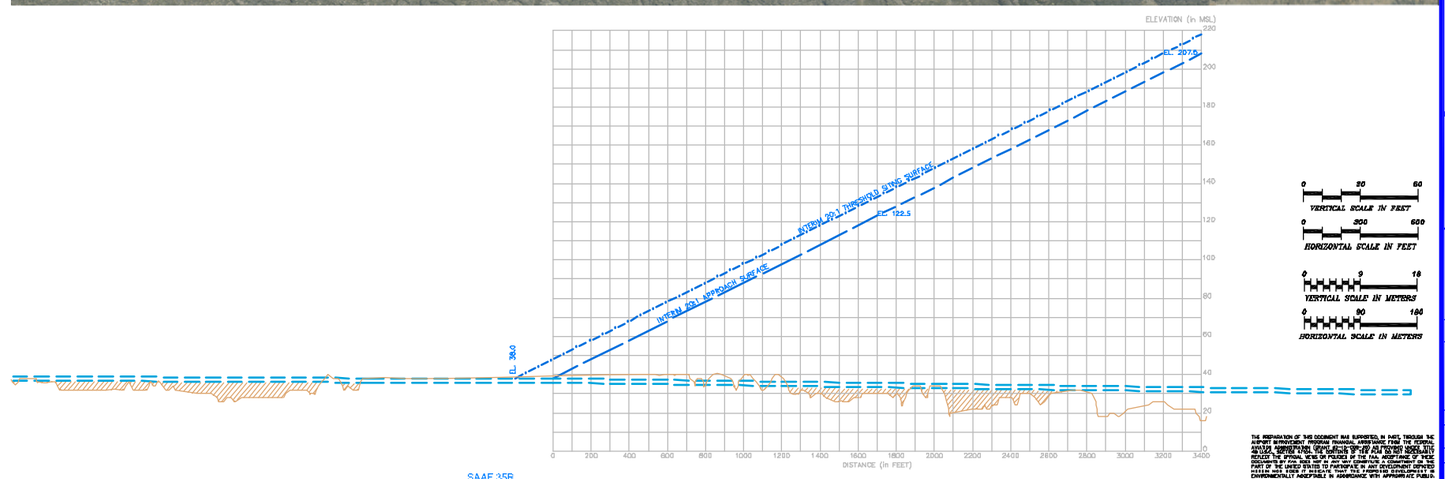




SAAF 17-







SAAF 35R

OBSTRUCTION TABLE					
Object Description	Obstructed Part of Surface	Object Elevation	Surface Elevation	Object Penetration	Proposed Object Disposition
NONE					

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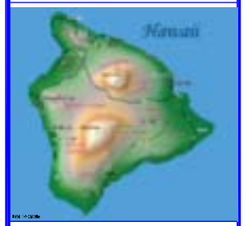
STATE OF HAWAII 1959

Airports Division

DSGN.	DRWN.	CHKD.	APPD.

KEY PLAN / NOTES :



LOCATION MAP

NO	DATE	PROPOSED REVISIONS

FAA ALP APPROVED:
SEPTEMBER 23 2010
FAA APPROVAL

FAA APPROVED:
REFER TO LETTER DATED

DIRECTOR, DEPARTMENT OF TRANSPORTATION STATE OF HAWAII — DATE

KONA INTERNATIONAL AIRPORT AT KEAHOLE

KEAHOLE, NORTH KONA, HAWAII

AIRPORT LAYOUT PLANS

SHEET TITLE:

INNER PORTION OF INTERIM RUNWAY 17-35 APPROACH SURFACE DRAWING

DRAFT

DATE: AUGUST 19 2010

DWG NO:

SHEET 8 OF 12 SHEETS

THE PREPARATION OF THIS DOCUMENT WAS SUPPORTED, IN PART, THROUGH THE AIRPORT IMPROVEMENT PROGRAM FINANCIAL ASSISTANCE FROM THE FEDERAL AVIATION ADMINISTRATION. VIEWS AND OPINIONS OF EMPLOYEES WHILE CARRYING OUT THEIR ASSIGNMENTS ON BEHALF OF THE STATE DO NOT NECESSARILY REFLECT THE OFFICIAL VIEWS OR POLICIES OF THE FAA. ACCEPTANCE OF THESE DOCUMENTS BY THE FAA DOES NOT IN ANY WAY CONSTITUTE A COMMITMENT ON THE PART OF THE UNITED STATES TO PARTICIPATE IN ANY DEVELOPMENT DEPICTED HEREIN NOR DOES IT INDICATE THAT THE PROPOSED DEVELOPMENT IS ELIGIBLE FOR FEDERAL FUNDING. ALL DEVELOPMENT IS SUBJECT TO THE PROJECT FORMULATION AND APPROVAL PROCESS.

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LEGEND

EXISTING	ULTIMATE	DESCRIPTION
		ABANDONED/REMOVED PAVEMENT
		AIRPORT PROPERTY LINE
		AIRPORT PARCEL LINE
		AIRPORT REFERENCE POINT (ARP)
		AIRPORT ROTATING BEACON
		AVIATION EASEMENT (if applicable)
		BLAST PAD
		BUILDING REMOVAL
		BUILDING CONSTRUCTION (On/Off Airport)
BRL	SARC	BUILDING RESTRICTION LINE (BRL)
		FACILITY (PAVEMENT) CONSTRUCTION
		FENCING
		HELIPAD
localizer	localizer	LOCALIZER ANTENNA
		MEDIUM-INTENSITY APPROACH LIGHTING SYSTEM WITH RUNWAY ALIGNMENT INDICATOR (MALSR)
Offset Area	Offset Area	NAVAID CRITICAL AREA (Localizer/Glide Slope)
PAPI-4	PAPI-4	PRECISION APPROACH PATH INDICATOR
OFZ	OFZ	PRECISION OBJECT FREE ZONE
		PRIMARY/SECONDARY AIRPORT CONTROL STATUS
ROFA	ROFA	RUNWAY OBJECT FREE AREA
OFZ	OFZ	RUNWAY OBSTACLE FREE ZONE
RPZ	RPZ	RUNWAY PROTECTION ZONE (RPZ)
RSA	RSA	RUNWAY SAFETY AREA
NONE		RUNWAY END IDENTIFICATION LIGHTS (REIL)
		RUNWAY THRESHOLD LIGHTS
		SEGMENTED CIRCLE/WIND INDICATOR
		TAXIWAY DESIGNATION
		TAXIWAY HOLD LINE
	N/A	TOPOGRAPHY
		WIND INDICATOR (Lighted)

EXISTING BUILDINGS/FACILITIES

NO.	DESCRIPTION
1	NORTH PASSENGER TERMINAL
2	SOUTH PASSENGER TERMINAL
3	INTERNATIONAL TERMINAL
4	INTERNATIONAL FEDERAL INSPECTION FACILITY
5	AIRPORT MANAGEMENT OFFICES
6	AIRPORT TRAFFIC CONTROL TOWER (ATCT)
7	AIRCRAFT RESCUE AND FIREFIGHTING FACILITY (ARFF)
8	AIRLINE EQUIPMENT STORAGE AREA
9	WASTEWATER PUMP STATION
10	OFFICE BUILDING (ITO)
11	ONIZUKA MEMORIAL SPACE CENTER
12	AIRPORT CAFE
13	T-HANGAR
14	T-HANGAR
15	AIR CARGO BUILDING
16	AIR CARGO BUILDING
17	COMMUTER AIR TERMINAL
18	PARADISE HELICOPTERS
19	MAUNA LEA HELICOPTERS
20	BRADLEY PACIFIC AVIATION
21	HAWAII FLIGHT ACADEMY/HEARD HELICOPTERS
22	AIR SERVICE HAWAII
23	FUEL FARM
24	CIVIL AIR PATROL
25	TROPICBIRD FLIGHT SERVICE
26	AIRPORT MAINTENANCE FACILITY
27	EQUIPMENT WASH RACK
28	WASTEWATER PUMP STATION

ULTIMATE BUILDINGS/FACILITIES

NO.	DESCRIPTION
101	TERMINAL EXPANSION
102	COMMUTER TERMINAL
103	TERMINAL EXPANSION (LONG TERM)
104	GA SPECIALTY SUITES
105	GA SPECIALTY SUITES
106	GA BUILDING
107	INTERIM COMMUTER TERMINAL
108	INTERIM COMMUTER TERMINAL
109	GA BUILDING
110	HEAT EXCHANGER SITE
111	FBO HANGAR
112	FUEL STORAGE
113	FBO HANGAR
114	WASH RACK
120	GA BUILDING PARCEL
130	GA BUILDING PARCEL
140	GA BUILDING PARCEL
170	PARKING TOLL BOOTH
171	GA PARCEL
172	GA PARCEL
173	GA PARCEL
181	HELIPORT PARCEL
185	AIRPORT MAINTENANCE EXPANSION
186	UTILITY BUILDING SITE
191	MUSEUM PARCEL

Existing Runway 11,000'x150'
Ultimate Runway 12,000'x150'
N 4° 48' 52" W (True Bearing)

Magnetic Variance
09° 48' East (January 2006)
Annual Rate of Change
09° 00' West (January 2009)

SCALE IN FEET
0 200 400

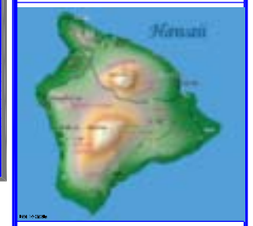
SCALE IN METERS
0 60 120

THE PREPARATION OF THIS DOCUMENT WAS SUPPORTED, IN PART, THROUGH THE AIRPORT IMPROVEMENT PROGRAM FINANCIAL ASSISTANCE FROM THE FEDERAL AVIATION ADMINISTRATION, AS PROVIDED UNDER TITLE 49, U.S.C. SECTION 47104. THE CONTENTS REFLECT THE VIEWS OF THE STATE OF HAWAII DEPARTMENT OF TRANSPORTATION. THE CONTENTS DO NOT NECESSARILY REFLECT THE OFFICIAL VIEWS OR POLICIES OF THE FAA. ACCEPTANCE OF THESE PAGES BY THE FAA DOES NOT IN ANY WAY CONSTITUTE A COMMITMENT ON THE PART OF THE UNITED STATES TO PARTICIPATE IN ANY DEVELOPMENT DEPICTED HEREIN NOR DOES IT INDICATE THAT THE PROPOSED DEVELOPMENT IS ENVIRONMENTALLY ACCEPTABLE IN ACCORDANCE WITH APPROPRIATE PUBLIC LAWS.

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
Airports Division

DSCN.	DRWN.	CHKD.	APPD.

KEY PLAN / NOTES :



LOCATION MAP

NO	DATE	PROPOSED REVISIONS

FAA ALP APPROVED:
SEPTEMBER 20 2010
FAA APPROVAL

FAA APPROVED:
REFER TO LETTER DATED

DIRECTOR, DEPARTMENT OF TRANSPORTATION, STATE OF HAWAII — DATE

KONA INTERNATIONAL AIRPORT AT KEAHOLE
KEAHOLE, NORTH KONA, HAWAII

AIRPORT LAYOUT PLANS

SHEET TITLE:
TERMINAL/GENERAL AVIATION DRAWING
DRAFT

DATE: AUGUST 19, 2010
DWG NO:

SHEET 9 OF 12 SHEETS

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LEGEND

EXISTING	ULTIMATE	DESCRIPTION
		ABANDONED/REMOVED PAVEMENT
		AIRPORT PROPERTY LINE
		AIRPORT PARCEL LINE
		AIRPORT REFERENCE POINT (ARP)
		AIRPORT ROTATING BEACON
		AVIATION EASEMENT (if applicable)
		BLAST PADS
		BUILDING REMOVAL
		BUILDING CONSTRUCTION (On/Off Airport)
BRL	BRL	BUILDING RESTRICTION LINE (BRL)
		FACILITY (PAVEMENT) CONSTRUCTION
		FENCING
		HELIPAD
		LOCALIZER ANTENNA
		MEDIUM-INTENSITY APPROACH LIGHTING SYSTEM WITH RUNWAY ALIGNMENT INDICATOR LIGHTS (MALSR)
Object Area	Object Area	RUNWAY CRITICAL AREA (Localizer/Glide Slope)
PAPI-4	PAPI-4	PRECISION APPROACH PATH INDICATOR
POFZ	POFZ	PRECISION OBJECT FREE ZONE
		PRIMARY/SECONDARY AIRPORT CONTROL STATION
ROFA	ROFA	RUNWAY OBJECT FREE AREA
ROFZ	ROFZ	RUNWAY OBSTACLE FREE ZONE
RPZ	RPZ	RUNWAY PROTECTION ZONE (RPZ)
RSA	RSA	RUNWAY SAFETY AREA
NONE		RUNWAY END IDENTIFICATION LIGHTS (REIL)
		RUNWAY THRESHOLD LIGHTS
		SEGMENTED CIRCLE/WIND INDICATOR
		TAXIWAY DESIGNATION
		TAXIWAY HOLD LINE
	N/A	TOPOGRAPHY
		WIND INDICATOR (Lighted)

EXISTING BUILDINGS/FACILITIES

NO.	DESCRIPTION
28	WASTEWATER PUMP STATION
29	WASTEWATER TREATMENT PLANT

ULTIMATE BUILDINGS/FACILITIES

NO.	DESCRIPTION
151	AIRPORT TRAFFIC CONTROL TOWER (ATCT)
152	AIRCRAFT RESCUE AND FIREFIGHTING FACILITY (ARFF)
163	CARGO BUILDING
164	CARGO BUILDING
165	HELIPORT TERMINAL
166	HELICOPTER HANGAR
167	HELICOPTER HANGAR
168	HELICOPTER HANGAR
169	HELICOPTER HANGAR
182	HELIPORT PARCEL
183	HELIPORT PARCEL
184	HELIPORT PARCEL
187	FUEL FARM
188	UNITED STATES POSTAL SERVICE (4.0 ACRES)
189	FLIGHT KITCHEN PARCEL
192	JOINT INSPECTION FACILITY
193	FAA PARCEL
194	REMOTE FUELING STATION

Proposed Frontage Road

Air Traffic Control Tower (ATCT-S)

ARFF Training Facility

Reserve for Public Safety Training

Proposed Haleu Street Extension

Texiana Object Free Area

Ultimate Helicopter Protection Zone 250' x 250' x 25:1 Approach Owned in Fee

Ultimate Helicopter Protection Zone 200' x 780' x 32:1 Approach Owned in Fee

Pua'a Street (Road N)

Treatment Plant Expansion Areas

Wastewater Treatment Plant

Reserve For Large Aircraft Uses

Future Cargo Apron

Relocated Road Alignment

Existing Runway Protection Zone 1,000' x 2,500' x 1,750' 1/2 Mile Visibility Minimums 50:1 Precision Owned in Fee

Relocated Runway Protection Zone 1,000' x 2,500' x 1,750' 1/2 Mile Visibility Minimums 50:1 Precision Owned in Fee

Ultimate Runway 17 End EL 47.0 TCH 53.0 Glide Slope Intercept Point 1,000' FROM RW 17 End 1,000' FROM RW 17 CL 1,000' FROM RW 17 CL

Ex. Runway 17 End EL 47.1 Ex. Glide Slope Intercept Point 1,000' FROM RW 17 End 1,000' FROM RW 17 CL

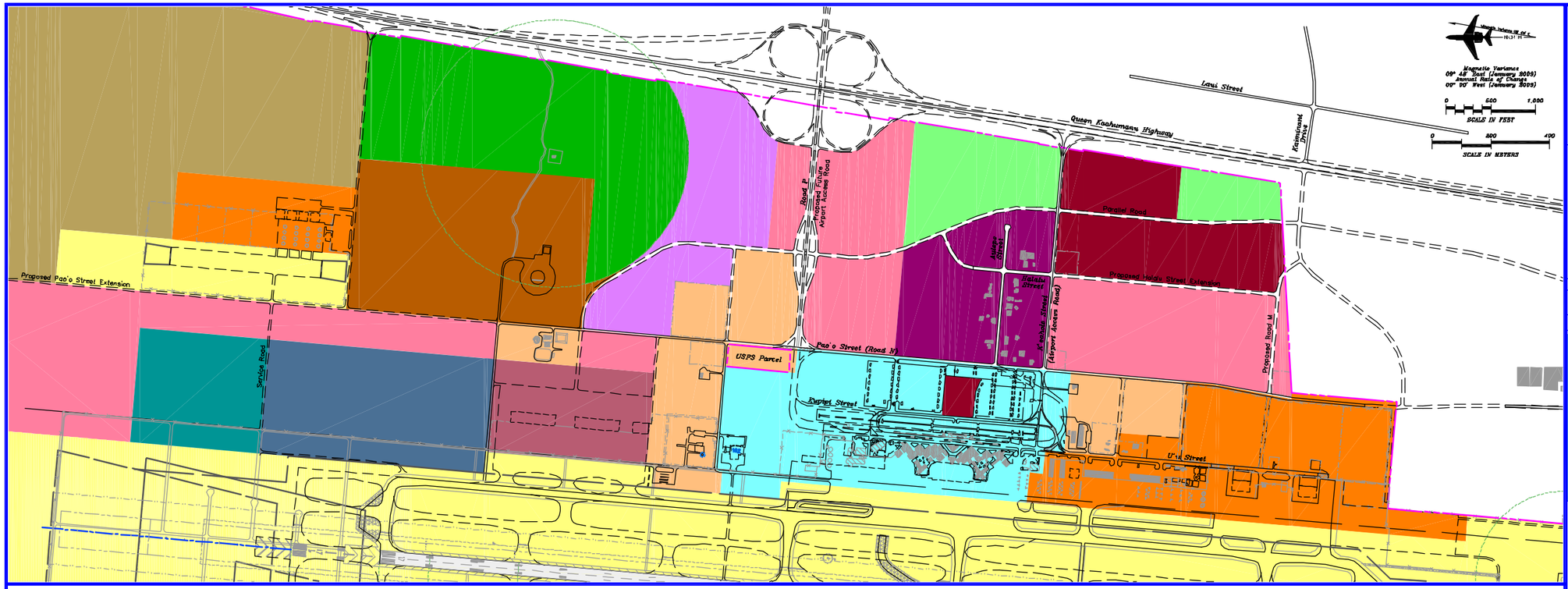
Extended RPZ 1,700'x1,510'x1,000'

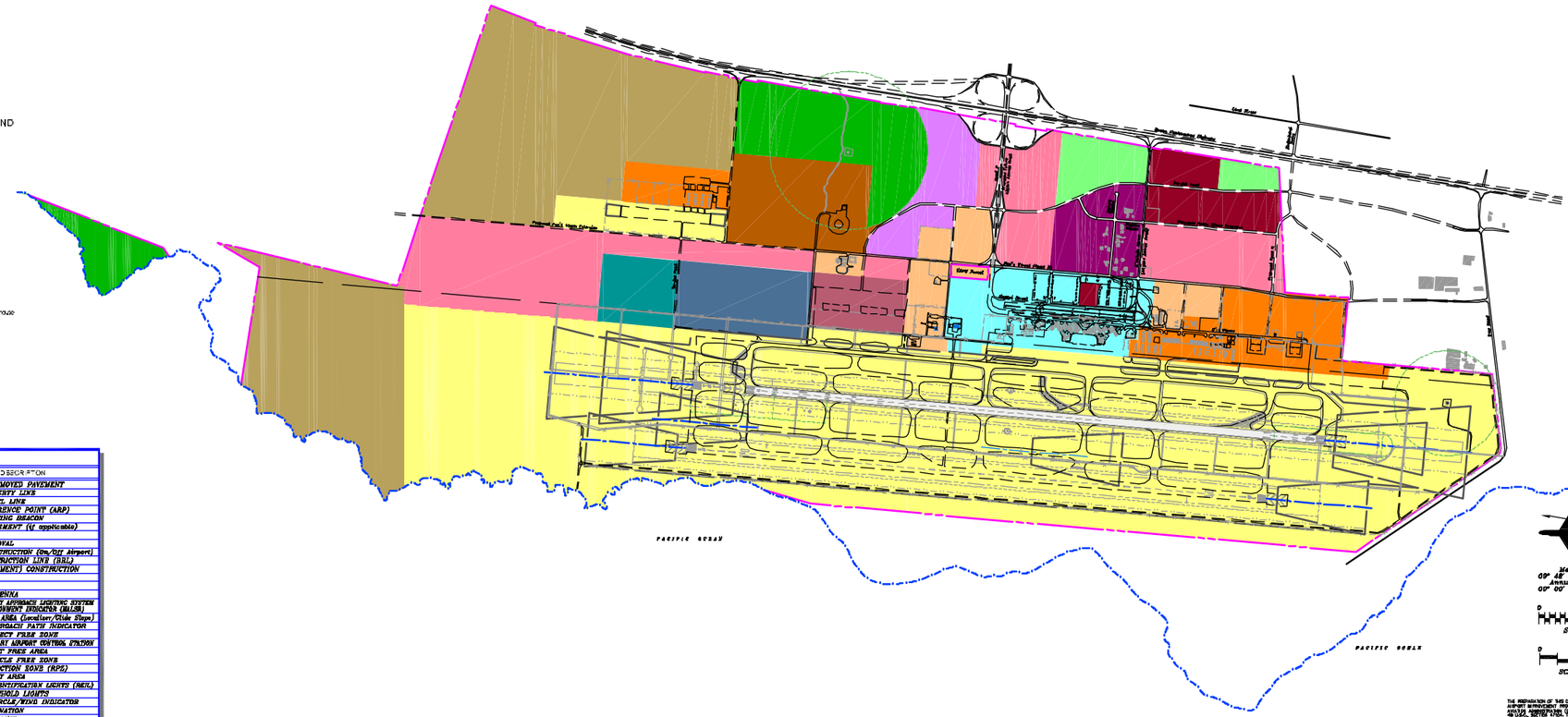
Extended RPZ 1,700'x1,510'x1,000'

Relocated Taxiway A

Relocated Taxiway A

Relocated Taxiway A





LEGEND

EXISTING	PROPOSED	DESCRIPTION
		ABANDONED/REMOVED PAVEMENT
		AIRPORT PROPERTY LINE
		AIRPORT PARCEL LINE
		AIRPORT REFERENCE POINT (ARP)
		AIRPORT ROTATING BEACON
		AVIGATION EASEMENT (if applicable)
		BLAST PADS
		BUILDING TO REMOVAL
		BUILDING CONSTRUCTION (On/Off Airport)
BRL	BRL	BUILDING RESTRICTION LINE (BRL)
		FACILITY (PAVEMENT) CONSTRUCTION
		FENCING
		HELIPAD
		LOCALIZER ANTENNA
		MEDIUM-INTENSITY APPROACH LIGHTING SYSTEM WITH RUNWAY ALIGNMENT INDICATOR (MALSR)
Offset Area	Offset Area	NAVAID CRITICAL AREA (Localizer/Glide Slope)
PAPI-4	PAPI-4	PRECISION APPROACH PATH INDICATOR
		PRECISION OBJECT FREE ZONE
		PRIMARY/SECONDARY AIRPORT CONTROL STATION
ROFA	ROFA	RUNWAY OBJECT FREE AREA
ROFZ	ROFZ	RUNWAY OBSTACLE FREE ZONE
RPZ	RPZ	RUNWAY PROTECTION ZONE (RPZ)
RSA	RSA	RUNWAY SAFETY AREA
NONE		RUNWAY END IDENTIFICATION LIGHTS (REIL)
		RUNWAY THRESHOLD LIGHTS
		SEGMENTED CIRCLE/WIND INDICATOR
		TAXIWAY DESIGNATION
		TAXIWAY HOLD LINE
	N/A	TOPOGRAPHY
		WIND INDICATOR (lighted)

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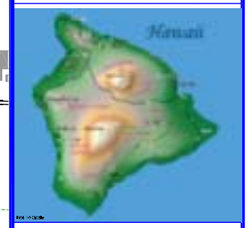
Airports Division

DSGN.	DRWN.	CHKD.	APPD.

KEY PLAN / NOTES :



LOCATION MAP

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KEEPER TO LETTER DATED

DIRECTOR, DEPARTMENT OF TRANSPORTATION, STATE OF HAWAII — DATE

KONA INTERNATIONAL AIRPORT AT KEAHOLE
KEAHOLE, NORTH KONA, HAWAII

AIRPORT LAYOUT PLANS

SHEET TITLE:

AIRPORT LAND USE DRAWING

DRAFT

DATE:
AUGUST 19, 2010

DWG NO:

SHEET 11 OF 12 SHEETS

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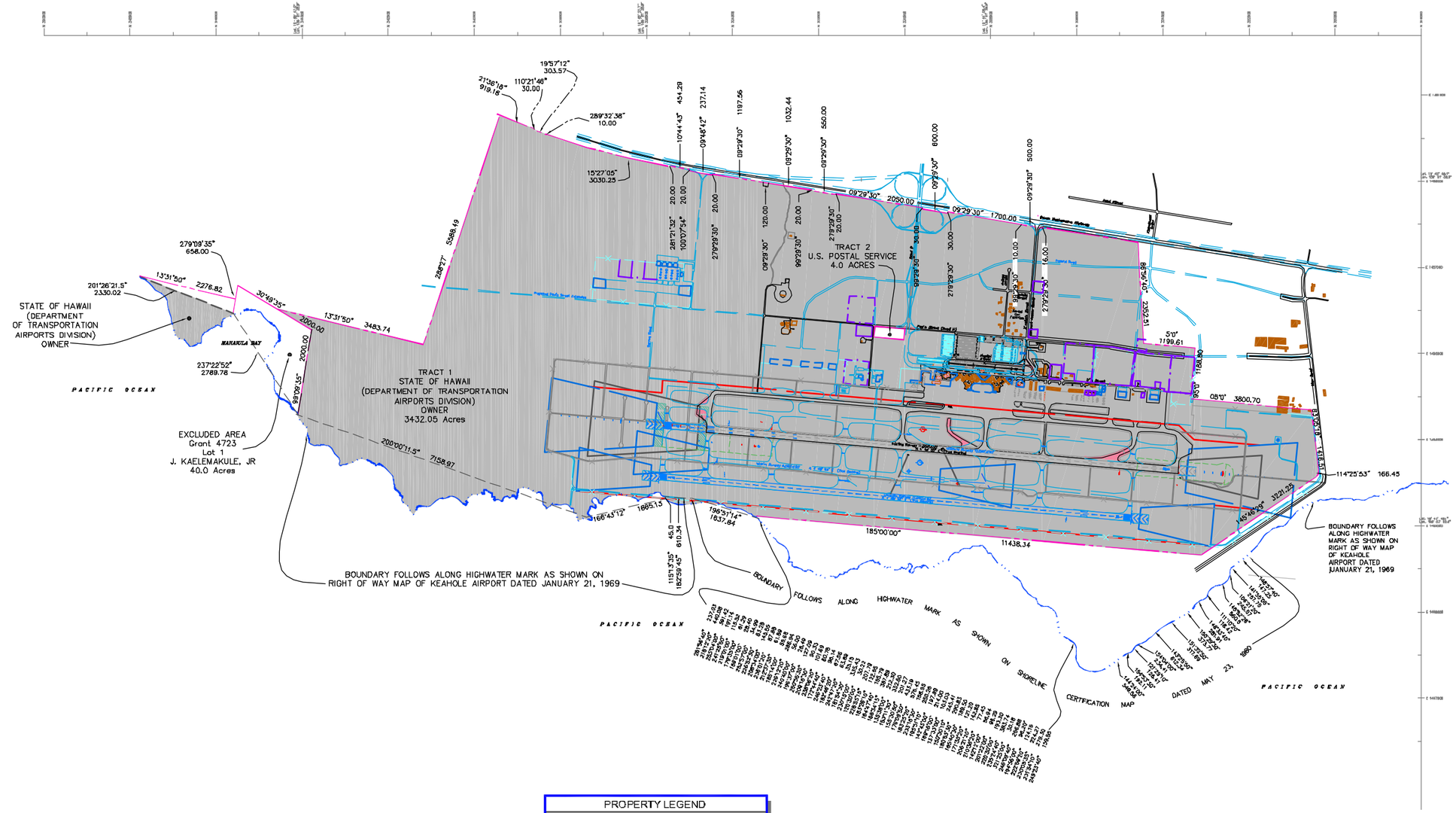


PROPERTY LEGEND

- EXISTING PROPERTY BOUNDARY LINE
- AIRPORT PROPERTY
- ULTIMATE PARCEL LINE
- SURVEY LINE
- SHORE LINE

GENERAL NOTES:

1. Property data from Boundary Map, dated June 2001 State of Hawaii Department of Transportation, Airports Division.

EXISTING PROPERTY DATA

TRACT	ACREAGE	PROPERTY INTEREST	OWNER	RECORD DATE	PROJECT NUMBER	REMARKS
1	3432.05	DEED	STATE OF HAWAII DEPARTMENT OF TRANSPORTATION	08/06/1987		AIRPORT PORTION OF ORIGINAL 42011 ACRES
2	4.0	RELEASED	U.S. POSTAL SERVICE	12/18/1998		GRANTEE - U.S. POSTAL SERVICE

Magnetic Variance
09° 48' East (January 2009)
Annual Rate of Change
09° 00' West (January 2009)

0 1000 2000
SCALE IN FEET

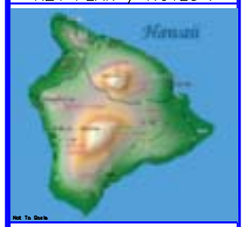
0 300 600
SCALE IN METERS

THE APPROVAL OF THIS DOCUMENT AND SUPPORTING PLANS INDICATES THE AIRPORT IMPROVEMENT PROGRAM (AIP) GRANT ASSURANCES AND FEDERAL AVIATION REGULATIONS THAT THE PROPOSED DEVELOPMENT IS ELIGIBLE FOR FEDERAL FUNDING. THE APPROVAL OF THE FAA DOES NOT INCLUDE ANY APPROVAL OF ROUTES OR PROCEDURES OR REVISIONS THERETO, NOR DOES IT INDICATE THE FINAL TERMS OR POLICIES OF THE FAA REGARDING ANY FUTURE APPLICATION FOR FEDERAL FUNDING TO IMPLEMENT THE PROPOSED PROJECT. IT IS NOT PART OF THE UNITED STATES GOVERNMENT'S PLANNING OR ANY DEVELOPMENT APPROVAL DECISION WHICH EXISTS OR WOULD EXIST THAT THE PROPOSED DEVELOPMENT BE ENVIRONMENTALLY ASSESSED IN ACCORDANCE WITH APPROPRIATE FEDERAL, STATE OR FEDERAL LAWS.

Airports Division

DSGN.	DRWN.	CHKD.	APPD.

KEY PLAN / NOTES :



LOCATION MAP

NO	DATE	PROPOSED REVISIONS

FAA ALP APPROVED:
SEPTEMBER 20 2010
FAA APPROVAL

FAA APPROVED:
REFER TO LETTER DATED

DIRECTOR, DEPARTMENT OF TRANSPORTATION, STATE OF HAWAII — DATE

KONA INTERNATIONAL AIRPORT AT KEAHOLE
KEAHOLE, NORTH KONA, HAWAII

AIRPORT LAYOUT PLANS

SHEET TITLE:

EXHIBIT A - AIRPORT PROPERTY MAP

DRAFT

DATE: JUNE 30, 2010
DWG NO:

SHEET 12 OF 12 SHEETS

Coffman Associates R:\ADV\Lahaina\Master Plans\KOA Kona\ALP Set\KOA ARP.dwg Printed Date: 10-04-10 09:43:52 AM Dhopkins

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