ENVIRONMENTAL IMPACT STATEMENT

PURSUANT TO CHAPTER 343 HAWAII REVISED STATUTES

LIHUE AIRPORT MASTER PLAN STUDY

prepared for

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION

JULY 1976
(Revised November 1976)

PMM&Co. Peat, Marwick, Mitchell & Co.

in association with

ENVIRONMENTAL COMMUNICATIONS, INC.
HONOLULU, HAWAII

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Prepared by

Peat, Marwick, Mitchell & Co.
San Francisco, California

In Association With

Environmental Communications, Inc.
Honolulu, Hawaii

July 1976
(Revised November 1976)

FOREWORD

The State of Hawaii Department of Transportation filed an Environmental Impact Statement Preparation Notice for the Lihue Airport Master Plan Study, Project No. G-6, with the Hawaii Environmental Quality Commission (EQC) on October 15, 1975. This notice was published in the EQC Bulletin and the deadline for requests to be a consulted party set for November 24, 1975. Two requests were received and responded to by the State Department of Transportation. Further notification of an anticipated EIS for the Lihue Airport Master Plan was published in the July 1976 EQC Bulletin.

This Environmental Impact Statement has been prepared in accordance with the requirements set forth in Section 343, Hawaii Revised Statutes, and the State of Hawaii Environmental Quality Commission Environmental Impact Statement Regulations.

SUMMARY

1. Study Location: Lihue Airport is located on the southeastern coast of the Island of Kauai, Kauai County, Hawaii, approximately two miles east of the town of Lihue.

2. Study Objectives: The basic objective of the Lihue Airport Master Plan Study is to develop a technically sound and economically feasible long-range development program for aviation facilities at the Lihue Airport. Preparation of an Airport Master Plan will allow for orderly expansion of the Airport to ensure that future developments are economically justifiable, responsive to public air transportation needs, physically effective and efficient, environmentally compatible, and financially feasible. In particular, emphasis will be placed on the need for a new runway alignment to reduce the impact of aircraft operations on schools and residential areas to the south of the Airport and to provide a precision instrument approach capability.

   A second objective of the recommended Airport Master Plan is to provide for development of Airport facilities commensurate with the level of demand rather than to induce growth that will generate even greater demand. Each physical improvement to the Airport will be constructed only when and as its need is demonstrated.

3. Summary of Master Plan Recommendations: Improvements at Lihue Airport as recommended in the master plan are to be divided into three implementation phases: Phase I (1975-1980), Phase II (1981-1985), and Phase III (1986-1995). Phase I improvements include (1) the acquisition of approximately 620 acres of land to develop a new north-south runway (395 acres), extend and widen the existing runway (90 acres), and develop the new passenger terminal complex (135 acres); (2) provide for the construction of a new north-south interisland Runway 17-35, 6,500 feet long by 150 feet wide and associated taxiways; (3) install an instrument landing system (ILS) and medium intensity approach lighting system with runway alignment indicator lights (MALSR); (4) expand the existing parking facilities to accommodate an additional 200 automobiles; (5) a temporary realignment of Ahukini Road; (6) expansion of the aircraft parking apron to provide additional space for general aviation aircraft; (7) construction of a new crash/fire/rescue building; (8) construction of new Airport drainage systems; (9) installation of a new auxiliary electrical power system; and (10) construction of Airport security and perimeter fencing.

(11/76)

Because environmental conditions are not static--especially those involving the man-made or human community--it is anticipated that improvements proposed for implementation after Phase I will require at least an updating of this environmental document and probably the drafting of an entirely new report to reflect future changes in environmental conditions and regulations.

4. Summary of Environmental Impacts: The development of a new runway on a north-south alignment will eliminate adverse noise impacts presently experienced at Kauai High School and adjacent residential areas. Short-term federal air quality standards for all pollutants should be met at Lihue Airport even under peak-hour traffic and worst case meteorological diffusion conditions. However, by 1995, State standards for hydrocarbons and oxides of nitrogen might be exceeded at the passenger terminal under the unlikely combination of peak-hour operations and worst case meteorology. The environmental analyses indicate that there will be no significant adverse impact on wildlife, vegetation, sources of water supply, recreation facilities or archaeological sites in the Lihue Airport area. However, Airport improvements will require the acquisition of 620 acres of land of which approximately 570 acres are planted in sugarcane. The 570 acres represents approximately 3% to 4% of the Lihue Plantation Company's (owners of the property to be acquired) cane lands on Kauai. Sewage disposal and drainage problems could not be completely resolved as a part of the master plan study. Resolution of the drainage problem is presently under way as a part of the detailed engineering design studies for the north-south runway. Land acquisition and sewage disposal problems will be the subject of discussions between the State Department of Transportation and the Lihue Plantation Company and Kauai County, respectively, to be in progress in the near future.

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I. INTRODUCTION

The State of Hawaii, Department of Transportation, retained Peat, Marwick, Mitchell & Co. (PMM&Co.) in October 1974 to prepare a long-range (20-year) Master Plan for Lihue Airport under the Federal Aviation Administration Planning Grant Program (PGP). Lihue Airport is located on the southeastern coast of the Island of Kauai, Kauai County, Hawaii, approximately two miles east of the town of Lihue. One of the primary elements of any PGP study is an analysis of existing and anticipated environmental characteristics that are, or may be, associated with the subject airport. Such an analysis was undertaken as part of the Lihue Airport Master Planning Study.

Environmental Communications, Inc. (ECI) of Honolulu, Hawaii, conducted a complete inventory of conditions relevant to the natural environment in the vicinity of Lihue Airport. This inventory covered such topics as topography, soils, geology, flora, fauna, air quality, water resources and drainage, archaeological and historic sites, and conservation and recreation areas. Results of the inventory and accompanying analyses are contained in the report, Inventory and Initial Analysis of Environmental Conditions - Lihue Airport Master Plan Study prepared in October 1975.

A companion analysis of community environmental concerns was performed by PMM&Co. This analysis focused on existing land use and zoning conditions, long-range plans and policies, utility systems, community facilities, and the present and potential impacts of aircraft noise. An evaluation of alternative courses of action considered in the development of a recommended Airport Master Plan was also included.

The two environmentally oriented work tasks were carried out in parallel with other Master Planning Study elements in order to identify present and potential environmental impacts as early as possible in the work effort. In addition, two public information sessions were conducted on May 22 and August 14, 1975, in Lihue as part of the overall study to obtain citizen input and review of the planning effort as it progressed, and to elicit public comment relative to Airport-oriented impacts on both the natural and community environments.

Following the Public Hearing held on December 18, 1975, and as a result of the testimony presented (Appendix C), the State of Hawaii, Department of Transportation, requested that the proposed plan for improvements to the Lihue Airport be revised. This request was described in a December 24, 1975, press release from the Office of the Director, State of Hawaii, Department of Transportation, which stated in part:

"State Transportation Director E. Alvey Wright said his department will revise its proposed plans for Lihue Airport expansion as a result of testimony obtained at the public hearing in Lihue Dec. 18.

"'As a result of the comments received at that hearing; Wright said, 'we will review the predicted traffic forecasts to reflect the expressed desires to limit growth on Kauai.'

"'We do not believe a substantial change in the first phase development will be anticipated as a result of changes in traffic estimates. Land requirements will be reviewed for possible lesser title interests in lieu of fee simple acquisition. Avigation easements or purchase of development rights or zoning are alternative actions to be considered.'

"Wright said that airfield requirements on the master plan for the airport will provide only a 6,500-foot north-south runway for interisland traffic. Construction of a longer runway is uncertain at this time and will not be included in the master plan to prevent any confusion as to planned development.

"Cost figures also will be revised to eliminate any mention of future construction except that which is anticipated in the first phase development,' he added.

"'Sufficient testimony was introduced to obtain the guidance of the public and action is already being taken thereon as indicated in the above changes in the Lihue Airport planning,' Wright said."

Therefore, as a result of the statements made during the public hearing and the subsequent public response of the State to these comments, the initial Airport Master Plan Study findings have been revised. These revisions, incorporated in this report, involve additional studies and revisions to the economic and air trade analysis; air traffic forecasts; Airport requirements; recommended Airport Master Plan--1995;

recommended staging and financial plan; and preliminary engineering studies. These revisions have been reflected in this environmental document, along with other additional studies and revisions which were required to respond to the revised master plan.

Revisions to the air traffic forecasts were based on the most recent provisional State Visitor forecasts presented in the interim report of the Governor's Tourism Planning Advisory Committee, prepared by the State of Hawaii Department of Economic Development in January 1976.

Requirement to Perform Environmental Studies

This environmental document represents the culmination of environmental activities undertaken as part of the Lihue Airport Master Planning Study. The report is in response to requirements of the "National Environmental Policy Act (NEPA) of 1969" (Public Law 91-190); Federal Aviation Administration Order 5050.2A, "Procedures and Policy for Processing Airport Development Actions Affecting the Environment;" and the State of Hawaii Environmental Quality Commission's "Environmental Impact Statement Regulations" (pursuant to Chapter 343, Hawaii Revised Statutes).

The National Environmental Policy Act of 1969 (NEPA) established the requirement for Environmental Impact Statements (EISs). Specifically, Section 102(2)(c) of NEPA requires that a detailed statement must be prepared for every major federal action significantly affecting the quality of the environment. The statement must cover the following items:

- The environmental impact of the proposed action.
- Any adverse environmental effects which cannot be avoided should the project be implemented.
- The relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity.
- Any irreversible and irretrievable commitments of resources which would be involved in the proposed project should it be implemented.

FAA Order 5050.2A specifies how Environmental Impact Statements submitted for FAA action are to be prepared. The Order requires that each EIS must contain:

- Description of the proposed project.
- Justification for the proposed project.
- Environmental impacts of the proposed project.
- Alternatives (including the impacts of each).
- Problems, objectives, and comments concerning the project.

The State of Hawaii Environmental Impact Statement Regulations are patterned after NEPA, but also include:

- The relationship of the proposed action to land use plans, policies, and controls for the affected area.
- Mitigation measures proposed to minimize impact.
- An indication of what other interests and considerations of Governmental policies are thought to offset the adverse environmental effects of the proposed action.

- Organizations and persons consulted.
- List of necessary approvals.

All of the above requirements have been addressed in the following chapters of this Report.

Summary of Environmental Impacts

This summary provides the reader with a brief overview of anticipated environmental impacts. The following chapters give more detailed information and supporting documentation for each of the environmental impacts noted.

Aircraft Noise. (See Chapter V, pp. V-1 to V-22.) The initial environmental analysis revealed that current aircraft operations at Lihue Airport (particularly air carrier approaches to Runway 3) have an adverse noise impact on Kauai High School, Kauai Community College, and nearby residential areas southwest of the Airport. Also, given no change in the present single-runway airfield configuration and aircraft flight paths, noise levels in the area southwest of the Airport would not appreciably change over the 20-year planning period (1975-1995) even with the introduction of quieter and larger aircraft. Therefore, a two-runway configuration (the existing runway plus a new north-south runway to the east of the existing airfield) has been recommended as part of the

Airport Master Plan. The preferential use of these two runways (with arrivals from the south on the new runway, and departures to the northeast on the existing runway about 90% of the time) will maximize overwater arrivals and departures at Lihue Airport and minimize air carrier overflights of existing urban areas.

Air Quality. (See Chapter V, pp. V-22 to V-46h.) The air quality analysis for Lihue Airport indicates that by 1995 short-term federal standards for all pollutants should be met even under peak hour traffic and worst case meteorological diffusion conditions. Even for worst case conditions, peak hour carbon monoxide concentrations should be less than the more stringent State standards for all significant receptor sites within and in the vicinity of the Airport. For hydrocarbons, three-hour State standards are likely to be met at sites outside the Airport, but the State standard might be exceeded at the passenger terminal under an unlikely combination of peak hour operations and adverse meteorology. The situation for nitrogen oxides is difficult to evaluate. The State standard is for a 24-hour time period and nitrogen oxides are chemically reactive in the atmosphere. Based on one-hour peak nitrogen oxide forecasts, it is likely that the State 24-hour standard will be exceeded at the passenger terminal by 1995, but it is not possible to predict whether this standard will be exceeded at sites outside the Airport or not.

Water Resources. (See Chapter IV, pp. IV-34 to IV-42.) The implementation of improvements recommended in the Lihue Airport Master Plan will not adversely affect sources of domestic water for the Lihue area. The Airport is neither located in an aquifer recharge area nor in an aquifer area used for domestic water supply.

Sewage Disposal. (See Chapter IV, pp. IV-46 to IV-49; Chapter V, pp. V-47 to V-49.) Sewage disposal for the Airport does present problems which cannot be resolved in the Master Plan Study. The Airport presently uses a cesspool system which is totally inadequate both in capacity and in the treatment of effluents. Construction of a new Airport sewer system which should be connected to the Kauai County Sewage Treatment Plant is recommended by the Master Plan. However, the County Plant, south of the Airport, even with its currently planned expansion to a 1.5-million gallon per day capacity in the next year or so, does not have sufficient excess capacity to handle anticipated Airport-generated sewage discharges in the immediate future. It is recommended that in the event that it is not possible to connect with the County Plant in the short term, an interim sewage treatment plant be constructed on the Airport. The planned long-term expansion of the plant to a capacity of 4.5-million gallons per day will be able to accommodate the long range requirements of the Airport.

Drainage. (See Chapter IV, pp. IV-42 to IV-46; Chapter V, pp. V-49 to V-51.) Drainage at Lihue Airport is another problem that cannot be completely resolved as part of the Airport Master Plan Study. The drainage system is undersized and, in part, functions as the irrigation system for surrounding sugarcane fields. During periods of intense rainfall, the

drainage system is inadequate to handle peak storm water flows and flooding occurs in the Airport terminal building, roadway, parking lots, and air cargo areas. Airport Management alone cannot solve the drainage problem. What is needed is a comprehensive drainage study jointly conducted by the State, County, and private interests to determine (1) the size and location of drainage/irrigation facilities, and (2) methods of settling out silt before drainage waters are discharged into the nearby Pacific Ocean from the drainage basin where the Airport is located.

Community and Social Development. (See Chapter IV, pp. IV-1 to IV-21; Chapter V, pp. V-51 to V-57.) The Lihue Airport Master Plan reflects a basic recommendation that some 620 acres adjacent to the existing Airport boundary be acquired. Such an acquisition program will provide land needed to accommodate a new north-south runway, extend the existing runway to the southwest, and develop a new terminal complex.

Although there are no residences within the proposed acquisition area, one home (at Ahukini Landing) is in an area of high noise exposure and should be relocated.

The majority of land to be acquired is planted in sugarcane, of which an estimated 570 acres will be lost to production

over the 20-year planning period in order to permit construction of proposed Airport improvements. The loss of 570 acres of sugarcane represents approximately 1% of the total cane land acreage on Kauai.

Presently, approximately 500 persons are engaged in Airport or Airport-related employment. This employment figure is forecast to increase to approximately 1,000 persons by 1995.

It is not anticipated that implementation of the Airport Master Plan will induce growth on Kauai. The number of people traveling to and from Kauai is primarily a function of the attractiveness of the Island as a visitor destination area and visitor accommodations available on the Island, rather than the Airport itself. The basic objective of the recommended Airport Master Plan is to provide for development of Airport facilities commensurate with the level of demand, rather than to induce growth that will generate even greater demand. Each physical improvement to the Airport will be constructed only when and as its need is demonstrated.

The average daily two-way traffic on Ahukini Road is forecast to increase from 4,700 vehicles in 1975 to approximately 10,500 vehicles in 1995. The existing two-lane Ahukini Road in the immediate vicinity of Lihue Airport has sufficient capacity to accommodate projected traffic volumes. At present, the major problem (bottleneck) for traffic to and from the Airport is the T-intersection of Ahukini Road and Kuhio Highway.

The construction of State Route 51 from Rice Street in Lihue to the Kuhio Highway north of Hanamaulu will relieve the congestion at the Ahukini Road-Kuhio Highway intersection. However, some Airport-oriented traffic will still have to pass through the Ahukini Road-Kuhio Highway intersection.

Parks and Recreation Areas. (See Chapter V, pp. V-57 to V-58.) At the present time, Nawiliwili Park occasionally experiences adverse noise impacts particularly from air carrier aircraft departures on Runway 21 during Kona wind conditions. Construction and use of the proposed north-south runway will relieve these periodic impacts, since air carrier aircraft will depart on Runway 17 to the south overwater. When Runway 3-21 (the existing runway) is closed for repairs, Hanamaulu Beach Park will be adversely affected by aircraft noise. However, such noise impacts will be of a short-term nature lasting only as long as Runway 3-21 is actually out of service.

Archaeological and Historic Sites. (See Chapter V, pp. V-57 to V-68.) One archaeological site has been idenfified within the proposed new Airport boundary. This site contained a heiau which has been completely destroyed, leaving no remnants of the heiau on the site. Heiau are the religious structures or temples of the Hawaiian. Today they consist only of the stone foundations on which grass houses, idols, towers, and other features once stood. The possibility of other archaeological sites being located within the proposed Airport boundary is remote because of the long history of agricultural use of the area.

Wildlife. (See Chapter IV, pp. IV-30 to IV-34; Chapter V, pp. V-68 to V-69.) Intensive agriculture in the area proposed for expansion of the Lihue Airport has already eliminated the habitats of most endemic wildlife species. There are no endangered species in the area to be developed, although two species, the Hawaiian Stilt and the Hawaiian Coot, could frequent the Lihue Mill Settling Basin located approximately 500 feet west of State Route 51 on the south side of Ahukini Road. The Reservoir is outside the area proposed on the Lihue Airport Master Plan for acquisition and development.

Organizations and Persons Consulted in the Preparation of This Report

The following organizations and persons were consulted or contacted by PMM&Co. in the preparation of this environmental document:

Federal

Federal Aviation Administration

Herman Bliss	Chief--Airports Division, Pacific Region
Henry Sumida	Pacific Region
John Carrere	Chief--Lihue Control Tower

Soil Conservation Service

Harry Sato

U.S. Navy

Lt. John Joyner	Pacific Missile Range Facility, Barking Sands

U.S. Coast Guard

Lt. Keller	Operations Division

State

State of Hawaii--Governor's Office

Mrs. Mary Thronas	Governor's Representative on Kauai

State of Hawaii Department of Transportation

E. Alvey Wright	Director
Owen Miyamoto	Chief--Airports Division
Bill Foster	Manager--Lihue Airport
Ernest Kurosawa	Airports Division
Ed Nakano	State Highway Engineer--Kauai

State of Hawaii Department of Agriculture

John Farias	Director
James C. Kirchofer	
Robert A. Souza	

State of Hawaii Department of Education

Yoshio Kojima	Principal, Kauai High and Intermediate School
Bud Carter	Coordinator, Evening Program, Kauai Community College
Albert Nagata	Principal, Wilcox Elementary School, Lihue

State of Hawaii Department of Health

James Kumagai	
Paul Aki	

State of Hawaii Department of Land and Natural Resources

Jane Silverman	Historic Preservation Officer

State of Hawaii Department of Planning and Economic Development

Louis Lopez
Tony Oliver

State Environmental Quality Commission

Dr. Albert Tom	Chairman
Allen Suematsu	

State Office of Environmental Quality Control

Helene Takamoto
Adeline Simpliciano

Hawaii Visitors Bureau

Ernest Donnerhower

County

Kauai County Elected Officials

Eduardo E. Malapit	Mayor of Kauai
Bert Tsuchiya	Kauai County Council
Jerone Hew	Kauai County Council
Abel Mederios	Kauai County Council
Bob Yotsuda	Kauai County Council

Kauai County Planning Department

Brian Nishimoto	Planning Director
Tom Shigemoto	
Gregory Kamm	
Avery Yuen	

Kauai County Office of Economic Development

James N. Kurita	Director
Herman Texeira	

Kauai County Department of Public Works

Kiyoji Masaki
Harry Funamura

Kauai County Water Department

Walter Briant, Jr. Manager
Wayne Hinazume

Private Interests and Environmental Organizations

Citizens Advisory Committee	
John Uyeno	Lihue Development Plan
	President--Kauai Chamber of Commerce
Mike Dyer	Kilauea Management Company
Mr. Bailey	Moloaa Papaya Farmers' Cooperative
George Cooper	Radio Station KIVM
Joseph Harris	University of Hawaii, Sea Grant Advisor, Kauai
Helen Hopkins	Sierra Club, Life of the Land
Robert Hopkins	Sierra Club
Willis Moore	Sierra Club
Ed Brown	Life of the Land
Bob Durant	Life of the Land
Richard Senelly	EDAW, Inc.
Jenny Yukemura	Kauai Community Research Group
James Shinno	Lihue Plantation Company
John Loomis	Amfac, Inc.
Ned Broadbent	Amfac, Inc.
Joe Littleton	Lihue resident
Jess Dudley	Hawaiian Airlines
W. Williamson	Aloha Airlines
Carl Muroda	Muroda and Associates
Marvin Sanders	EDAW, Inc.
Bill Balfour	Lihue Plantation Company
Dave Ballie	Lihue Plantation Company
Ed Sarita	Hanamaulu resident

The following organizations and persons were contacted by Environmental Communications, Inc., during its collection of natural environmental data.

Federal

U.S. Army Corps of Engineers

John Belshe	

State

Leeward Community College

Ralph Bowers	Instructor

University of Hawaii

Edith Chave	Waikiki Aquarium
Keith Chave	Hawaii Institute of Geophysics
Charles De Luca	Waikiki Aquarium
Joseph Harris	Sea Grant Program
Leonard Knowles	Hawaii Institute of Geophysics

Kauai Community College

William Higa	Instructor

Department of Land and Natural Resources

Anthony Nakmura	District Game Warden--Division of Fish and Game
Eric Onizuka	Marine Biologist--Division of Fish and Game
Thomas Telfer	Wildlife Biologist--Kauai Division of Fish and Game

Ralph L. Walker	Chief--Wildlife Branch, Division of Fish and Game
Ralph Saito	Biologist--Fish and Game Division
Robert Schallenberger	Consultant--Fish and Game Division
Bess Walton	Archaeologist--State Parks, Outdoor Recreation and Historic Sites Division

State Department of Health

Paul Aki	Chief--Pollution Investigation and Enforcement Branch, Environmental Protection and Health Services Division

County

Kauai Museum Staff

Private Interests and Environmental Organizations

Hans Krock	Sunn, Low, Tom and Hara, Inc.
Mike Dyer	Kilauea Management Company
Lorenzo Fruto	Sunn, Low, Tom and Hara, Inc.
Various Persons	Lihue Plantation Company
Mrs. Mike Dyer	Wife of Mike Dyer, Kilauea Management Company
Loren Crow	Certified Consultant Meteorologist--American Meteorological Society

II. THE PROPOSED PROJECT

This environmental document concerns the improvements proposed as part of the recommended 1975-1995 Lihue Airport Master Plan Report currently being prepared. The Plan, which provides for the expansion of Airport property from about 177 acres to approximately 800 acres, integrates long-term airfield and terminal complex requirements with current and forecast aviation needs and ground transportation requirements. Existing conditions at Lihue Airport are shown on Exhibit A, while improvements recommended as a part of the Master Plan are shown on Exhibit B. The Airport Master and Land Use Plan represents a guide for airport development throughout the 1995 planning period.

It is an FAA goal that an instrument landing system (ILS) be provided for the principal runway at all airports served by air carrier turbojet aircraft. An ILS is particularly important in alerting pilots to any unexpected deviation from the glide slope at low altitudes close to the runway threshold.

At Lihue Airport, it is estimated that the principal runway (Runway 3) is used 90% of the time. Air carrier jet aircraft approaching Runway 3 must execute a tight circling approach to avoid the Haupu mountain ridge southwest of the Airport. Since current criteria for installation of an ILS require that aircraft be able to execute straight-in approaches at

a prescribed glide slope, usually 3 degrees, along the extended runway centerline, the provision of an ILS on Runway 3 is infeasible because of the Haupu mountain ridge. In addition, a recently completed FAA study determined that an ILS on Runway 21 would be infeasible.

In order to improve both the environmental compatibility of the Airport with the surrounding community and to permit installation of an ILS approach, an analysis was made of using existing Runway 3-21 preferentially in conjunction with a new runway aligned in basically a north-south direction and located east of the existing runway. The use of such a preferential system would permit the transfer of air carrier arrivals (under trade wind conditions) and air carrier departures (under Kona conditions) to the new north-south runway, thereby significantly enhancing both the environmental compatibility of the Airport and the aircraft approach and departure conditions. Therefore, it was concluded that a new air carrier runway in a north-south alignment should be constructed at Lihue Airport and used in conjunction with Runway 3-21 for air carrier operations.

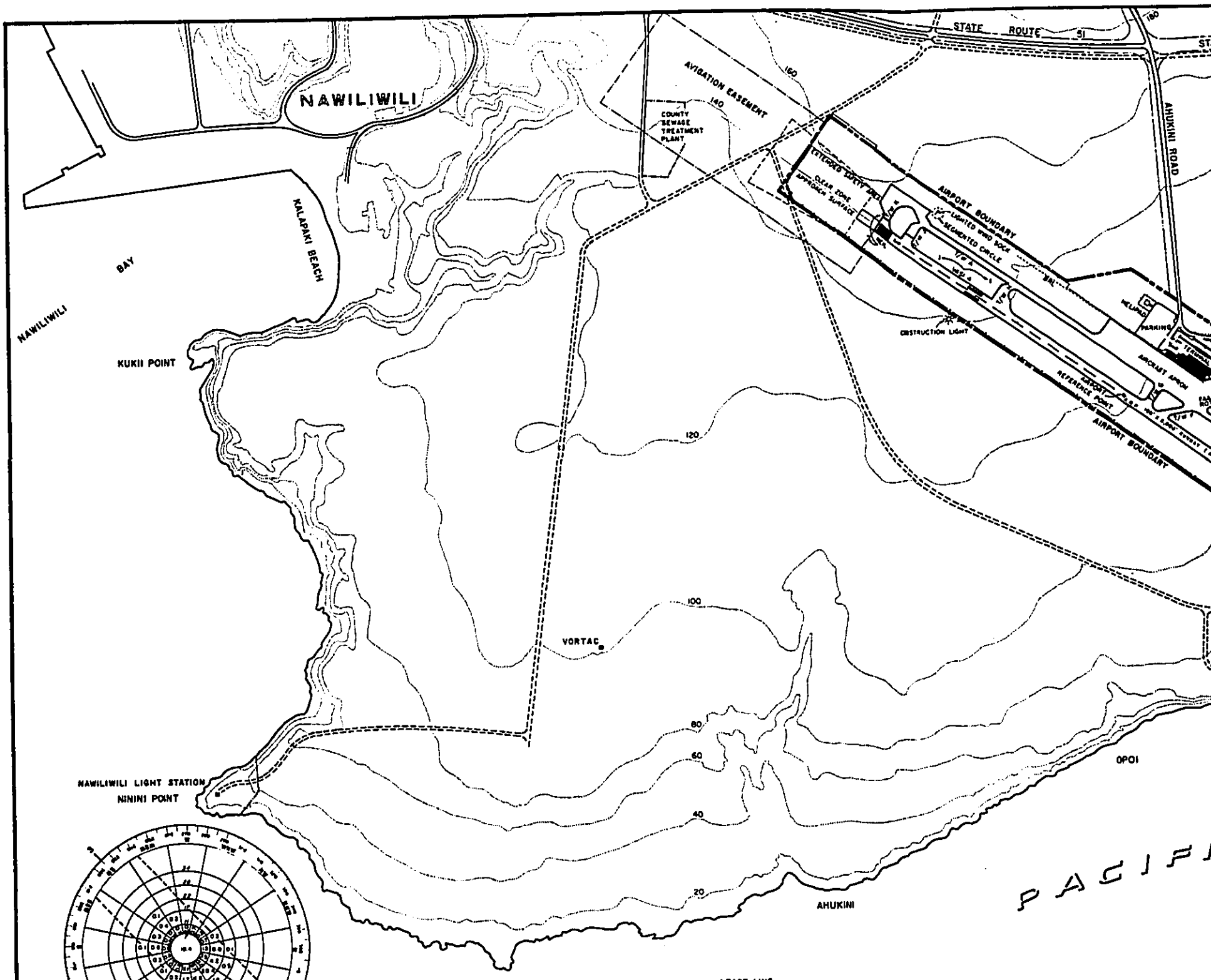
The critical (or governing) interisland aircraft expected to use the Airport in the immediate future are the DC-9-50 and B-737-200 aircraft. These aircraft, operating on the prevailing interisland stage lengths (up to 318 nautical miles to

Hilo), require a runway length of 6,500 feet. Because the length of Runway 3-21 is only 6,000 feet, it is necessary on occasion, under certain weather conditions, for the airlines to reduce payloads on Lihue flights.

Based on responses to questionnaires and meetings with airline operations personnel, the interisland carriers currently operating within the State anticipate that by the 1980s the aircraft used for interisland operations could include the B-727 and possibly the new airbus-type aircraft (such as the DC-10, L-1011, and A-300) capable of carrying up to 250 passengers.

For planning purposes, the airlines indicated a runway length of 6,500 feet for interisland operations would be required based upon FAA Approved Flight Manuals for DC-9-30, DC-9-50, B-737-200, and B-727-200 type aircraft assuming representative payloads, flap settings, and airport conditions. Therefore, a 6,500-foot runway is recommended to accommodate the forecast operations of all current and potential interisland air carrier aircraft through 1995.

Other than the airport development described below, the master planning process should properly provide for the reservation of sufficient land to accommodate facilities that may be required beyond 1995. The reservation of land for such future



WIND COVERAGE:

RUNWAY	10 KNOTS	13 KNOTS
3-21	98.0 %	99.7 %

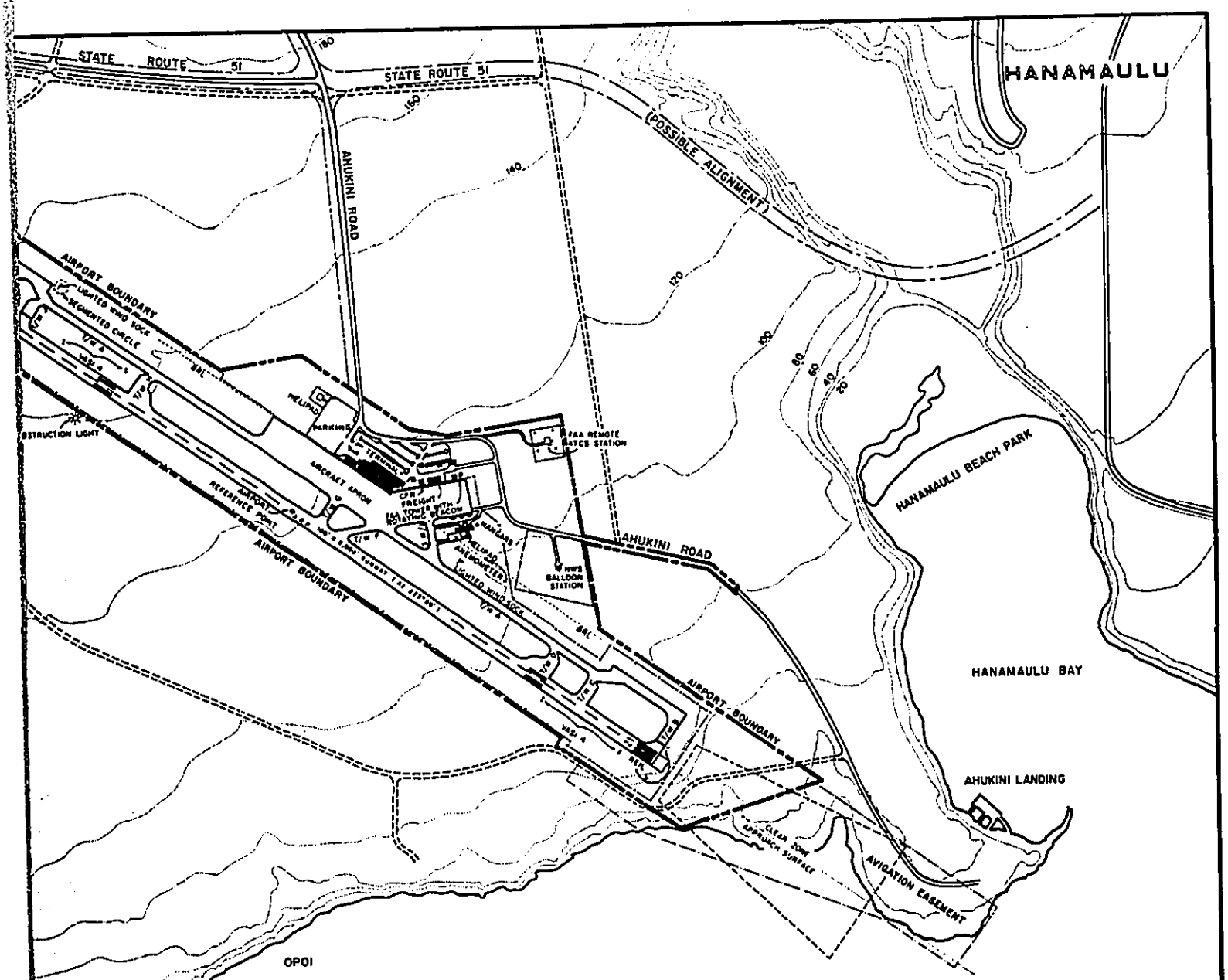
SOURCE :
NATIONAL WEATHER RECORDS CENTER
LIHUE AIRPORT, HAWAII 1950-1967

LEGEND:

- AIRPORT BOUNDARY
- AIRFIELD / APRON PAVEMENT
- BUILDING RESTRICTION LINE
- STRUCTURE
- FENCE
- LEASE LINE
- AVIGATION EASEMENT
- RIGHT-OF-WAY
- CLEAR ZONE
- PAVED PUBLIC ROAD
- MAJOR CANE HAUL ROAD
- GROUND CONTOUR LINE
- AIRPORT REFERENCE POINT

AIRPORT DATA:

AIRPORT REFERENCE POINT (A.R.P.) COORDINATES :	LAT. 21° 58' 56" N. LNG. 159° 20' 40" W
NORMAL MAX. TEMPERATURE (HOTTEST MONTH) :	88° F.
AIRPORT ELEVATION (MSL) :	148
AIRPORT / TERMINAL NAVAIDS :	VORTAC, BEACON LIGHT, UHF/VHF/DF, VASI, REIL, MITL, MIRL



THE PREPARATION OF THIS EXHIBIT WAS FINANCED IN PART THROUGH A PLANNING GRANT FROM THE FEDERAL AVIATION ADMINISTRATION AS PROVIDED UNDER SECTION 13 OF THE AIRPORT AND AIRWAY DEVELOPMENT ACT OF 1970.

EXHIBIT **A**

LIHUE, KAUAI, HAWAII

LIHUE AIRPORT

EXISTING AIRPORT FACILITIES

1976

PEAT, MARWICK, MITCHELL & CO.

AIRPORT DATA:

AIRPORT REFERENCE POINT (A.R.P.) COORDINATES:	LAT. 21° 58'56"N. LNG. 159°20'40"W
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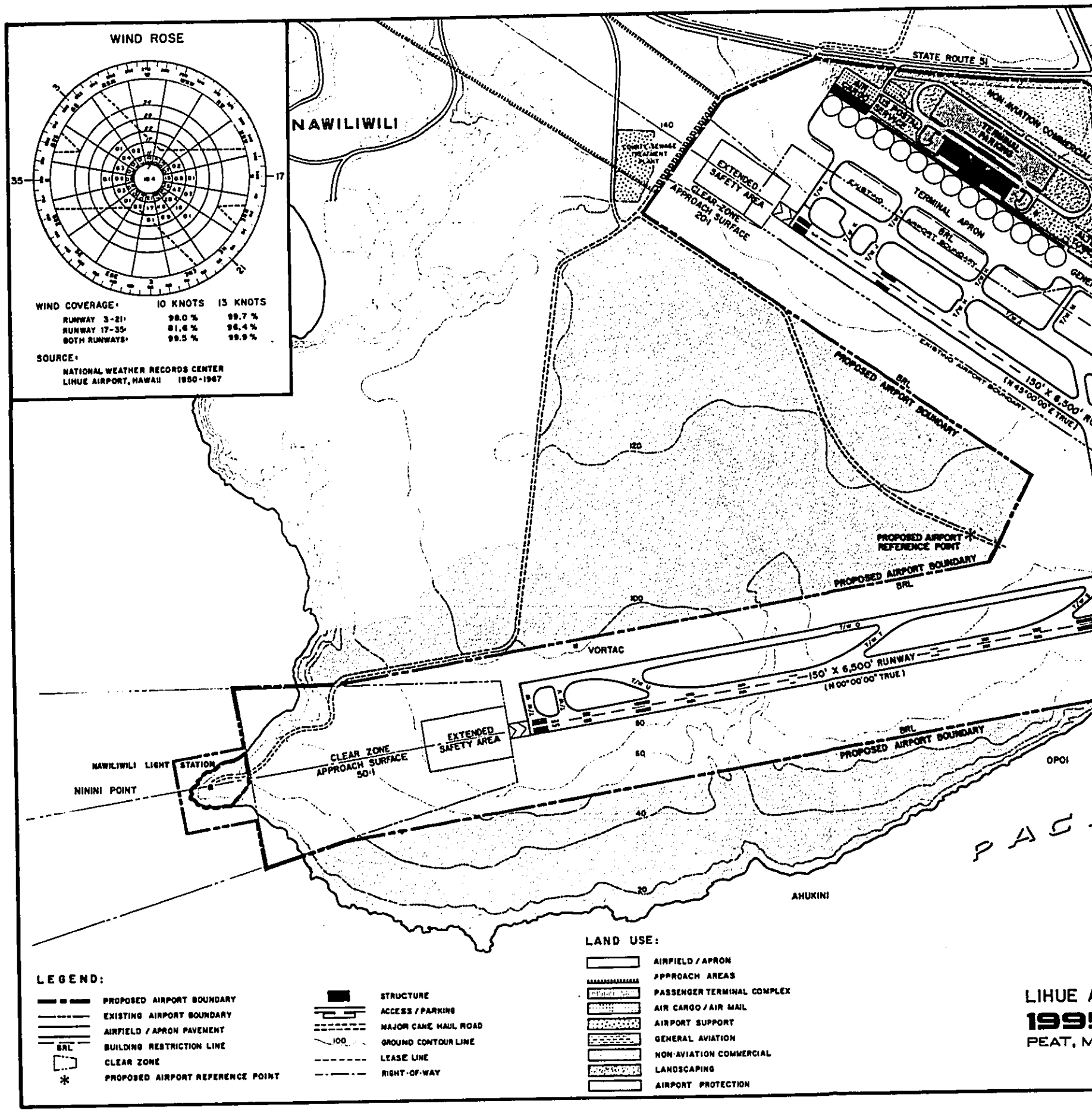
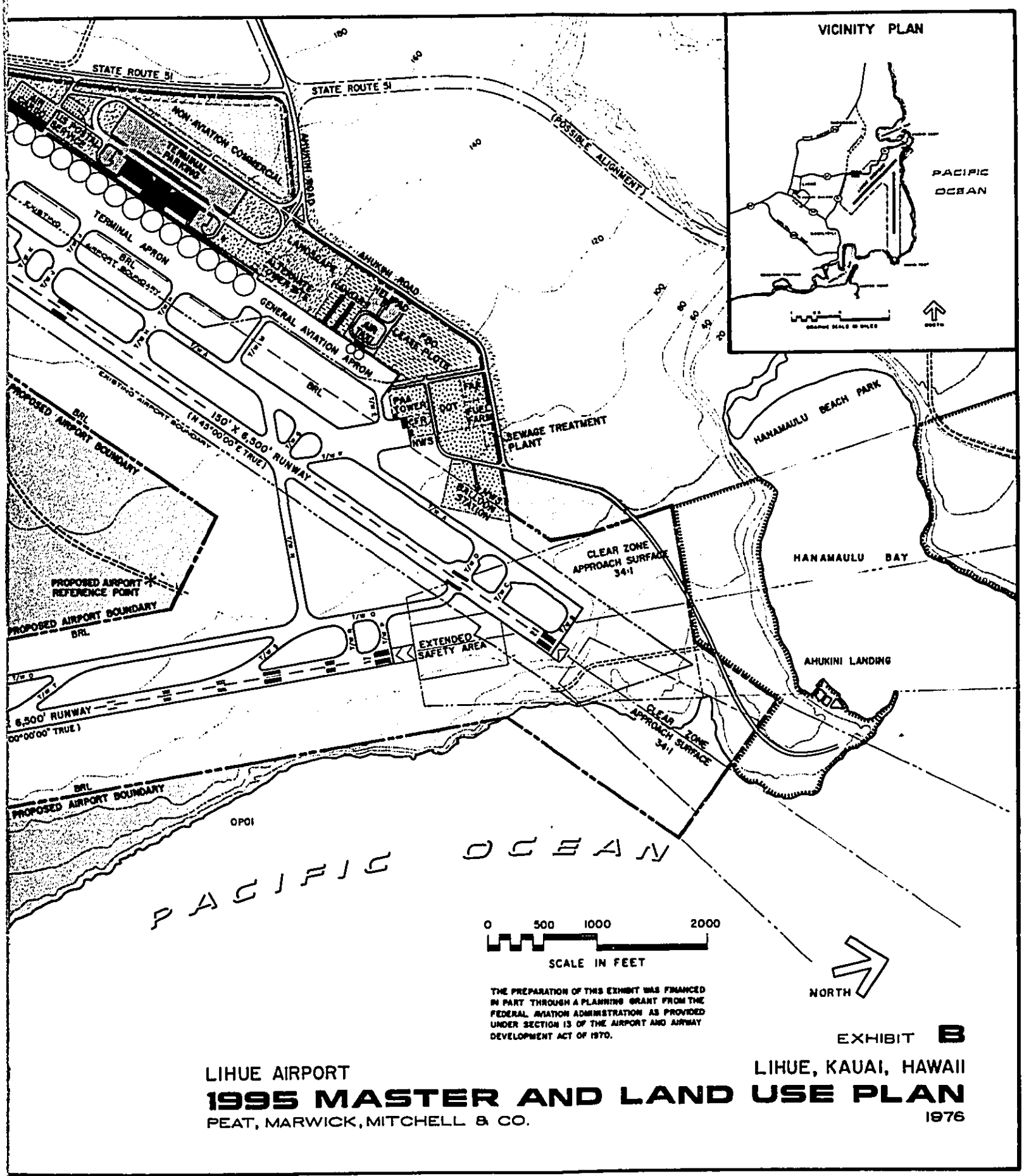
AIRPORT/TERMINAL NAVAIDS:	VORTAC, BEACON LIGHT, UHF/VHF/DF, VASI, REIL, MITL, MIRL.


WIND ROSE
35
17
WIND COVERAGE:
10 KNOTS
13 KNOTS
RUNWAY 3-21: 98.0 % 99.7 %
RUNWAY 17-35: 81.6 % 96.4 %
BOTH RUNWAYS: 99.5 % 99.9 %
SOURCE:
NATIONAL WEATHER RECORDS CENTER
LIHUE AIRPORT, HAWAII 1950-1967
NAWILIWILI
STATE ROUTE 51
NON-AVIATION COMMERCIAL
TERMINAL PARKING
TERMINAL APRON
EXTENDED SAFETY AREA
CLEAR ZONE
APPROACH SURFACE 20:1
BRL
AIRCRAFT BOUNDARY
EXISTING AIRPORT BOUNDARY
150' X 6,500' RUNWAY (N 45°00'00"E TRUE)
PROPOSED AIRPORT BOUNDARY
PROPOSED AIRPORT REFERENCE POINT
VORTAC
150' X 6,500' RUNWAY (N 00°00'00" TRUE)
CLEAR ZONE
APPROACH SURFACE 50:1
EXTENDED SAFETY AREA
NAWILIWILI LIGHT STATION
NININI POINT
OPOI
AHUKINI
PACIFIC
LEGEND:
PROPOSED AIRPORT BOUNDARY
EXISTING AIRPORT BOUNDARY
AIRFIELD / APRON PAVEMENT
BUILDING RESTRICTION LINE
CLEAR ZONE
PROPOSED AIRPORT REFERENCE POINT
STRUCTURE
ACCESS / PARKING
MAJOR CANE HAUL ROAD
GROUND CONTOUR LINE
LEASE LINE
RIGHT-OF-WAY
LAND USE:
AIRFIELD / APRON
APPROACH AREAS
PASSENGER TERMINAL COMPLEX
AIR CARGO / AIR MAIL
AIRPORT SUPPORT
GENERAL AVIATION
NON-AVIATION COMMERCIAL
LANDSCAPING
AIRPORT PROTECTION
LIHUE A
199
PEAT, M



THE PREPARATION OF THIS EXHIBIT WAS FINANCED IN PART THROUGH A PLANNING GRANT FROM THE FEDERAL AVIATION ADMINISTRATION AS PROVIDED UNDER SECTION 13 OF THE AIRPORT AND AIRWAY DEVELOPMENT ACT OF 1970.

EXHIBIT **B**

LIHUE AIRPORT

LIHUE, KAUAI, HAWAII

1995 MASTER AND LAND USE PLAN

PEAT, MARWICK, MITCHELL & CO.

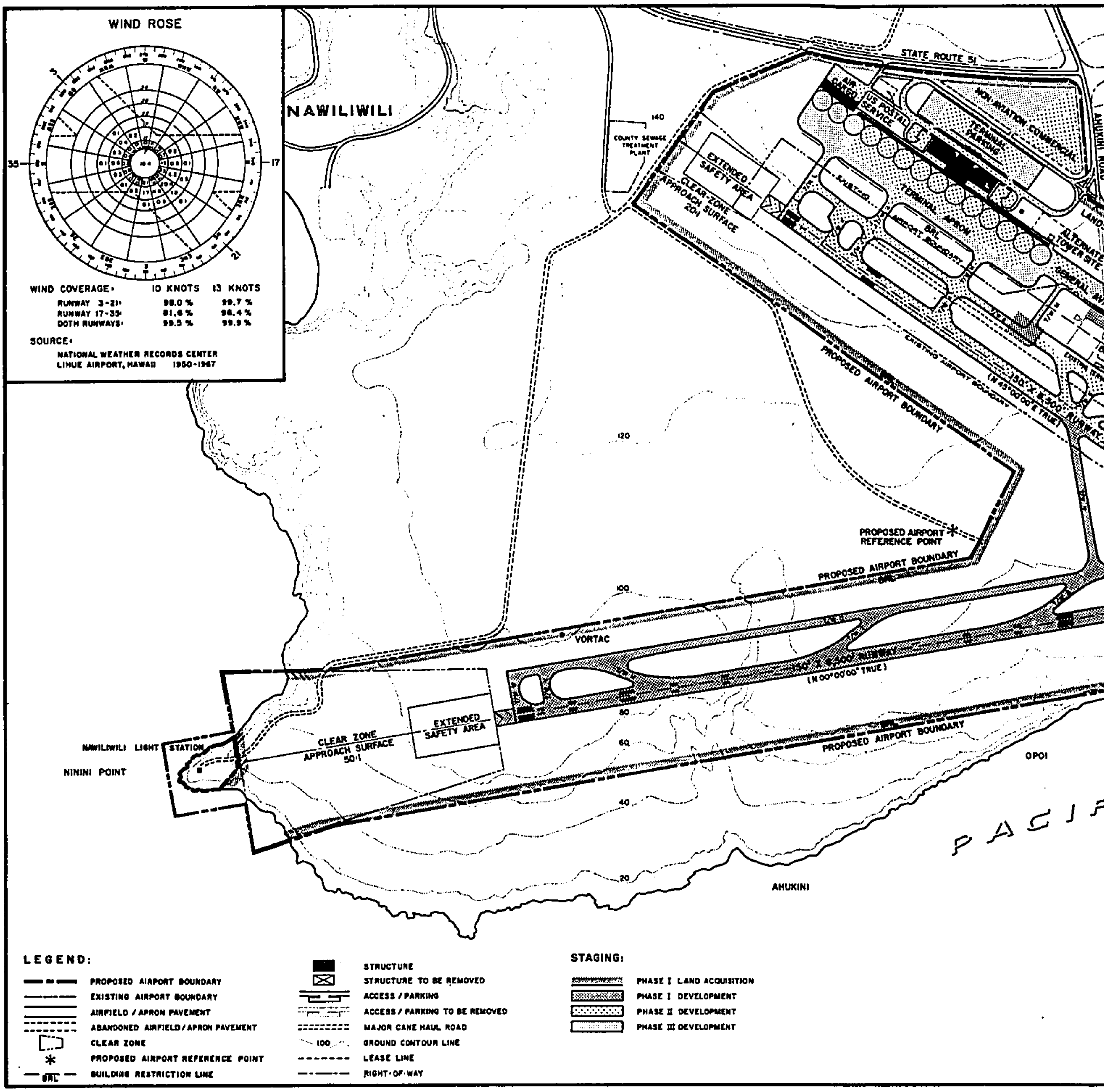
1976

facilities preserves the long-range development potential of the Airport, thereby guaranteeing the longevity of the Airport beyond the current planning period.

There are several reasons for planning in this manner. If air traffic demand should grow more rapidly than that forecast in this report, facilities beyond those forecast through 1995 may be needed. On the other hand, if the air traffic growth rate is lower than that forecast, the construction of facilities may be deferred until the demand develops.

The significant point is to reserve sufficient land in the Master Plan to accommodate possible future requirements so that land within the Airport boundaries will be available when needed for expansion. If it is determined at a later date that further Airport expansion is not required, the land can be released then for uses compatible with Airport activity.

The improvements are in three implementation phases: Phase I (1975-1980), Phase II (1981-1985), and Phase III (1986-1995). Although this environmental document covers improvements proposed by the 20-year Master Plan, it concentrates on those recommended for implementation during Phase I. Because environmental conditions are not static--especially those involving the man-made or human community--it is anticipated that improvements proposed



WIND ROSE
WIND COVERAGE: 10 KNOTS 13 KNOTS
RUNWAY 3-21: 98.0 % 99.7 %
RUNWAY 17-35: 81.6 % 96.4 %
BOTH RUNWAYS: 99.5 % 99.9 %
SOURCE:
NATIONAL WEATHER RECORDS CENTER
LIHUE AIRPORT, HAWAII 1950-1967
NAWILIWILI
STATE ROUTE 51
COUNTY SEWAGE TREATMENT PLANT
AIR CARGO
US POSTAL SERVICE
TERMINAL PARKING
NON-AVIATION COMMERCIAL
EXTENDED SAFETY AREA
CLEAR-ZONE APPROACH SURFACE 20:1
TERMINAL APRON
BRL
AIRPORT BOUNDARY
ALTERNATE TOWER SITE
EXISTING AIRPORT BOUNDARY
PROPOSED AIRPORT BOUNDARY
PROPOSED AIRPORT REFERENCE POINT
VORTAC
(N 00°00'00" TRUE)
EXTENDED SAFETY AREA
CLEAR ZONE APPROACH SURFACE 50:1
NAWILIWILI LIGHT STATION
NININI POINT
OPOI
AHUKINI
PACIF
LEGEND:
PROPOSED AIRPORT BOUNDARY
EXISTING AIRPORT BOUNDARY
AIRFIELD / APRON PAVEMENT
ABANDONED AIRFIELD / APRON PAVEMENT
CLEAR ZONE
PROPOSED AIRPORT REFERENCE POINT
BUILDING RESTRICTION LINE
STRUCTURE
STRUCTURE TO BE REMOVED
ACCESS / PARKING
ACCESS / PARKING TO BE REMOVED
MAJOR CANE HAUL ROAD
GROUND CONTOUR LINE
LEASE LINE
RIGHT-OF-WAY
STAGING:
PHASE I LAND ACQUISITION
PHASE I DEVELOPMENT
PHASE II DEVELOPMENT
PHASE III DEVELOPMENT

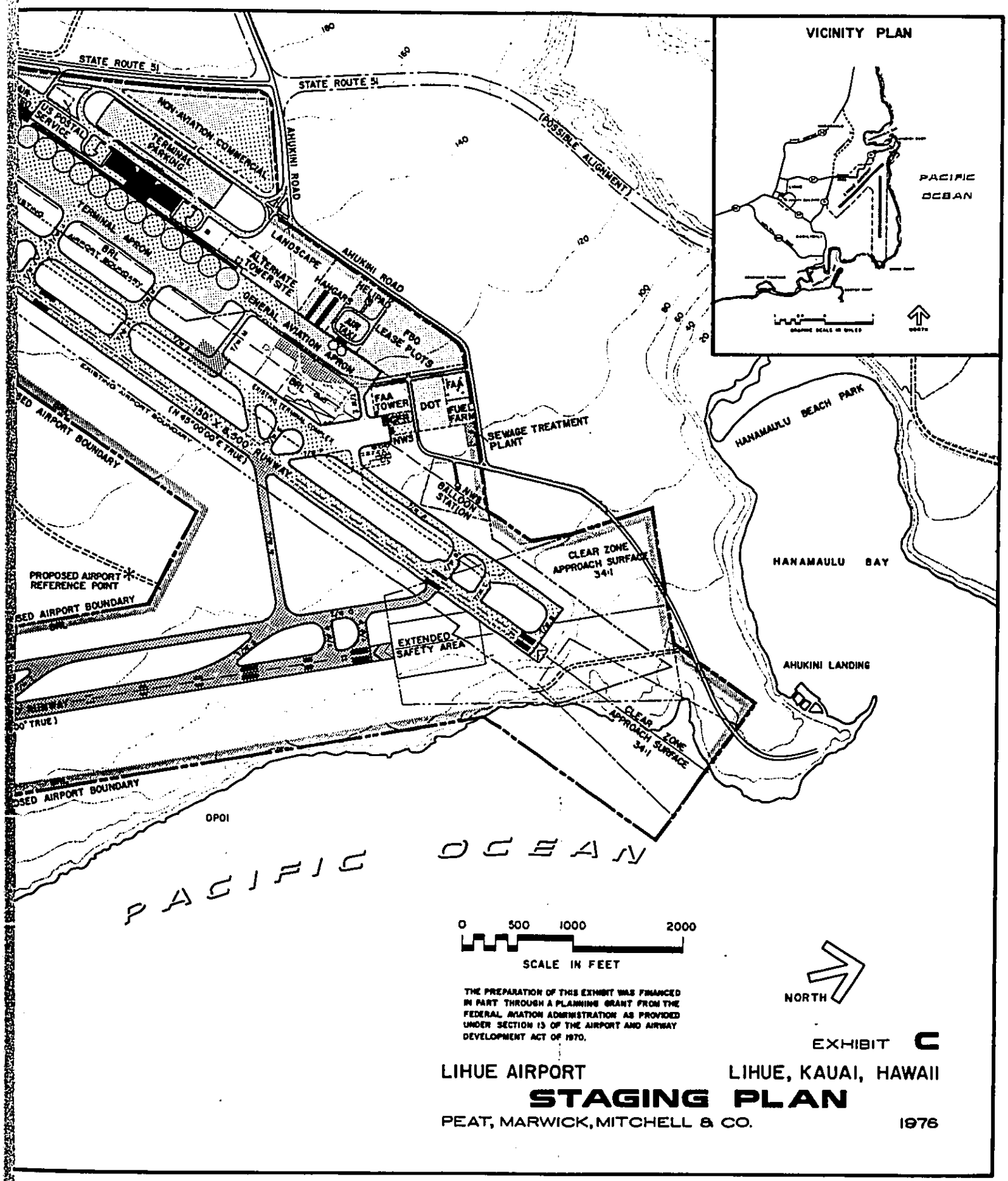


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EXHIBIT C

LIHUE AIRPORT — LIHUE, KAUAI, HAWAII

STAGING PLAN

PEAT, MARWICK, MITCHELL & CO. — 1976

for implementation after Phase I will require at least an updating of this document and probably the drafting of an entirely new report to reflect future changes in environmental conditions. Phase I of the overall improvement program is shown on Exhibit C. The following paragraphs describe specific improvements included in the proposed program.

Phase I

Land Acquisition. The proposed Lihue Airport Master Plan recommends acquisition of approximately 620 acres of land adjacent to the Airport. This acquisition will provide sufficient space to (1) develop a new 6,500-foot north-south interisland Runway 17-35 (395 acres); (2) extend existing interisland Runway 3-21 by 500 feet to the southwest and widen it to 150 feet (90 acres); and (3) develop the new passenger terminal complex (135 acres).

Airfield Improvement. The airfield improvement program proposed for Phase I (1975-1980) provides for the construction of a new north-south interisland Runway 17-35, 6,500 feet long by 150 feet wide and associated taxiways (parallel taxiway, exit/entry taxiways, and connecting taxiways). The Plan recommends Runway 35 be equipped with an instrument landing system (ILS) and a medium-intensity approach lighting system with runway alignment indicator lights (MALSR).

Terminal Area Improvements. The terminal area improvements proposed for Phase I include expansion of the existing automobile parking facilities to the west to accommodate an additional 200 automobiles, and a temporary realignment of Ahukini Road to the northwest of the expanded automobile parking facilities. The Plan provides for expansion of the aircraft parking apron to the southwest to provide additional space for general aviation aircraft.

Other Projects. Other projects recommended for Phase I include construction of a new crash/fire/rescue (C/F/R) building; construction of new Airport drainage systems; installation of a new auxiliary electrical power system; and construction of Airport security and perimeter fencing.

Phase II

Projects recommended for implementation during Phase II (1981-1985) include the extension and widening of Runway 3-21 to 6,500 feet in length and 150 feet in width, with associated taxiways, lighting, and marking. Existing interisland Runway 3-21 (6,000 feet by 100 feet) and associated taxiways should be strengthened with an asphalt concrete overlay; VASI-4/REIL is proposed for Runways 17 and 35.

Terminal area improvements proposed in Phase II include development of the initial phase of a new passenger terminal complex southwest of the existing terminal, including: development of a new passenger terminal building; ten air carrier aircraft parking positions; construction of new terminal access and curbside roadways; 800 automobile parking spaces; construction of a ground transportation building; tour bus and truck parking facilities; and construction of a general aviation aircraft parking apron for 20 aircraft.

Other airport facilities recommended for development in Phase II include: construction of a new sewer system to be connected to the County Sewage Plant south of the Airport; development of new ground transportation lease plots; relocation of the National Weather Service Office; improvements to the water distribution system; and expansion of the drainage system.

Phase III

Terminal area improvements proposed in Phase III include expansion of the passenger terminal building; two additional air carrier aircraft parking positions; expansion of the automobile parking facilities to accommodate an additional 200 automobiles; and demolition of the old passenger terminal.

Expansion of the new air cargo terminal, with a new access road from SR51, and development of an aircraft parking apron to accommodate two air cargo aircraft is also recommended for Phase III.

Development of the general aviation area to the north of the passenger terminal complex is provided for as part of Phase III. Recommended development includes new general aviation fixed base operator lease plots; 20 T-hangar units; an air taxi terminal, including building, roadway, and automobile parking area; expansion of the general aviation aircraft parking apron to accommodate two air taxi aircraft parking positions and 30 general aviation aircraft; and a new helipad built adjacent to the proposed air taxi terminal.

Other improvements proposed in Phase III include construction of a new State Airports Division baseyard facility; development of a fuel storage area; expansion of the water distribution system; expansion of the drainage system; and relocation of the transformer building.

III. PROJECT NEED

Role of Airport

Lihue Airport serves as the primary point of access for the Island and over 95% of passenger travel to and from Kauai is by air. In the National Airport System Plan (NASP), Lihue is a medium hub,* and Lihue Airport ranked 44th out of 692 U.S. air carrier airports in FY 1974. It is the only air carrier airport serving the Island of Kauai. As noted below and in subsequent sections of this report, future trends in passenger travel and in alternative modes of transportation to Kauai indicate that Lihue Airport will continue to be the primary gateway to Kauai.

Therefore, a basic objective of the Airport Master Plan Study has been to develop a technically sound and economically feasible long-range development program for aviation facilities. Implementation of the recommendations contained in the Master Plan will allow orderly expansion of the Airport to ensure that future developments are economically justifiable, responsive to public air transportation needs, physically effective and efficient, environmentally compatible, and financially feasible.

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*A medium air traffic hub is defined by the FAA/CAB as a community enplaning from 0.25% to 0.99% of the total U.S. passengers enplaned on certificated route air carriers in scheduled service in the 50 states and the District of Columbia.

The Airport is served by two certificated airlines (Aloha Airlines and Hawaiian Airlines) and one air taxi (OK Air). In addition, Hawaiian Air Tour Services (HATS) and Panorama Air Tour have sightseeing flights visiting Lihue Airport daily with passengers originating in Honolulu. Sightseeing flights of Kauai by Kenai Air Service, Na Pali Air, and Hawaiian Helicopters International originate at Lihue Airport or at other heliports on the Island.

An Airport System Plan Study for the State of Hawaii is under way. The Lihue Airport Master Plan Study is being coordinated with the Statewide study and the recommendations contained in the Lihue Airport Master Plan will be incorporated into the State Plan. In addition, the NASP will be updated to incorporate the recommended Airport Master Plan.

Economy of Kauai

Air traffic to and from Kauai is closely related to economic activities associated with the Island. The economy of Kauai contains two major industry groups: agriculture and visitors. Although the latter represents the primary generator of air traffic to and from the Hawaiian Islands, it is also important to consider the potential demand for air service by the agricultural industry of the Island. This section briefly analyzes current and expected future developments in the visitor and

agricultural industries on Kauai as they relate to air transportation.

The Visitor Industry. The record of westbound visitors to Kauai County, based on the Hawaii Visitors Bureau (HVB) "survey of intentions," is set forth in Table III-1. Total westbound visitors to Kauai County are estimated to have increased from some 275,000 in 1967 to 596,000 in 1974, or an average annual increase of some 11.9%. These figures are for westbound visitors only; they should be increased by about 25% for each of the past three years (1972-1974) in order to reflect eastbound travelers--mostly Japanese visitors who make one-day trips to Kauai and then return to Oahu for hotel accommodations. As indicated by Table III-1, the estimated number of westbound visitors to Kauai has increased at a slower rate over the last three years than the number for the State as a whole; as a result, the Kauai share of total State visitors decreased from 33.0% in 1971 to 27.5% in 1974.

Statewide Visitor Forecasts. Forecasts of total annual visitors to the State of Hawaii and County of Kauai, both westbound and eastbound, for the period 1974 to 1995 are shown in Table III-2. These projections were based on forecasts prepared by the Governor's Tourism Planning Advisory Committee, Department of Planning and Economic Development (DPED), in January 1976, and are as yet unofficial pending

Table III-1

ESTIMATED ANNUAL WESTBOUND VISITORS TO KAUAI COUNTY
1967-1974

Year	State	Percent Change	Kauai County[a]	Percent Change	Kauai Percent of State Total
1967	893,103	--%	275,461	--%	30.8%
1968	1,015,844	17.1	327,813	19.0	32.3
1969	1,181,029	12.9	363,759	11.0	30.8
1970	1,377,756	16.7	426,030	17.1	30.9
1971	1,430,325	3.8	472,663	10.9	33.0
1972	1,782,737	24.6	565,386	19.6	31.7
1973	2,067,861	16.0	590,475	4.4	28.6
1974	2,184,620	5.6	601,703	1.9	27.5

a. Based on surveyed "intention to visit."

Source: Hawaii Visitors Bureau.

Table III-2

FORECASTS OF TOTAL ANNUAL VISITORS TO
THE STATE OF HAWAII AND COUNTY OF KAUAI
(Eastbound and Westbound)
1974-1995

	State of Hawaii		Kauai County[a]	
Year	Market[b] Projections	Employment[c] Objectives	Market Projections	Employment Objectives
1974	2,786,000[d]	2,786,000[d]	750,000	750,000
1980	3,700,000	3,400,000	1,000,000	920,000
1985	4,700,000	4,000,000	1,220,000	1,040,000
1990	5,700,000a	4,600,000[a]	1,430,000	1,150,000
1995	6,700,000[a]	5,200,000[a]	1,610,000	1,250,000

a. PMM&Co. estimate.
b. State of Hawaii Department of Planning and Economic Development, subcommittee on Market Projections and Capital.
c. State of Hawaii Department of Planning and Economic Development, subcommittee on Tourism and New Jobs.
d. Hawaii Visitors Bureau.

completion of the DPED 10-year Tourism Plan to be presented to the State Legislature in January 1977 or 1978. Consequently, official State visitor forecasts may not be available until 1977 or 1978. (At that time the visitor projections used for the purposes of this airport planning study should be updated to reflect the official Statewide and Kauai visitor projections.) Nevertheless, the State DPED considers these forecasts to be the most realistic Statewide visitor estimates at this time.

Two estimates of Statewide visitors, as presented in the DPED report and shown in Table III-2, were prepared:

1. One set, prepared by the DPED subcommittee on Market projections and Capital (and identified as "Market Projections" on Table III-2), is based on an analysis of projections from various agencies and economic forecasters, plus the results of a survey of travel industry leaders. As a result of the analysis the subcommittee determined that the most realistic visitor forecast envisages an average annual increase in Statewide visitors of approximately 5.5%, or 200,000 visitors per year to 1985.

On this basis, visitors to the State would number 3.7 million in 1980 and 4.7 million in 1985. For purposes of this study, PMM&Co. extended the average annual increase of 200,000 visitors per year to 1995 to derive an estimated 5.7 million visitors in 1990 and 6.7 million visitors in 1995. The percentage annual increase in Statewide visitors decreases from 4.3% in 1985 to 3.5% by 1990 and to 3.0% by 1995.

2. The second set of forecasts, prepared by the DPED subcommittee on Tourism and New Jobs (and identified as "Employment Objectives" in Table III-2), is based on satisfying various possible employment objectives in Hawaii over the next ten years. On this basis between 4.0 million and 4.7 million visitors are projected by the subcommittee to visit the State in 1985.

The lower projections, based on the assumption of a zero net in-migration rate to the State, are shown in Table III-2. For purposes of this study, PMM&Co. extended the average annual increase of over 112,000 visitors per year to 1995 to derive an estimated 4.6 million visitors in 1990 and 5.2 million in 1995.

In summary, for purposes of this airport planning study, the number of Statewide visitors is estimated to range between 3.4 million and 3.7 million by 1980; 4.0 million and 4.7 million by 1985; 4.6 million to 5.7 million by 1990; and 5.2 million to 6.7 million by 1995.

Kauai County Forecasts. Forecasts of annual visitors to Kauai County for the period 1974 through 1995 are also set forth in Table III-2. As shown on Table III-1, the Kauai share of the total State visitors has fluctuated in recent years between 27% and 33% of the State total. However, to respond to the desires expressed at the Public Hearing to limit growth on Kauai, it has been assumed, for purposes of this study, that the Kauai share of total State visitors will slowly decrease to 27% by 1980; to 26% by 1985, to 25% by 1990; and to 24% by 1995. Kauai County visitors, including both westbound and eastbound visitors, are therefore estimated to range between 920,000 and 1,200,000 by 1980; 1,040,000 and 1,200,000 by 1985; 1,150,000 and 1,430,000 by 1990; and 1,250,000 and 1,610,000 by 1995.

By way of comparison, for the Lihue Area Development Plan, being prepared for the County of Kauai, a low estimate or conservative level of tourist demand was used which resulted in projections of between 900,000 and 1,500,000 visitors to Kauai by 1995, or between 15% and 25% of the State total.

Kauai Visitor Destinations. Data on present and proposed visitor accommodations provide a good indication of present and expected visitor destinations on Kauai. Such data are set forth in Table III-3, and the resort areas are graphically shown on Exhibit D.

In 1968, there were some 1,914 visitor accommodation units on Kauai, principally in the Lihue, Wailua-Kapaa, and Poipu areas. By the end of 1974, the number of visitor accommodation units increased by 62% to 3,102 units, and the overall inventory amounted to some 83% of what had been proposed for construction in 1968. The largest discrepancy occurred in the Lihue area where the number of new units constructed between 1967 and 1974 was only 28% of that proposed. At the present time, 51% of the visitor accommodations on Kauai are in the Wailua-Kapaa area, while the Lihue and Poipu areas each have about 20%.

According to the most recent HVB estimates (February 1975), some 2,570 additional units are currently proposed for 1975 and beyond, principally in the Hanalei-Haena area. If these proposals are realized, total visitor accommodation units on Kauai will amount to some 5,700 units within a few years. However,

Table III-3

VISITOR ACCOMMODATION UNITS, EXISTING AND PROPOSED
Island of Kauai

	Resort Regions					
	Lihue	Wailua-Kapaa	Hanalei-Haena	Poipu-Kukuiula	Other	Total
Existing Inventory						
1967	480	292	86	402	--	1,260
1968	615	581	125	570	23	1,914
1969	659	1,181	176	514	35	2,565
1970	659	1,224	169	522	35	2,609
1971	660	1,348	155	521	35	2,719
1972	661	1,333	178	422	35	2,629
1973	618	1,582	91	548	29	2,868
1974	605	1,586	322	557	32	3,102
To Be Completed In						
1975	170	--	395	150	--	715
1976	--	--	450	--	--	450
1977	--	--	--	--	--	0
No Date	--	645	410	350	--	1,405
Total--New Units	170	645	1,255	500	--	2,570
Total--Existing and Proposed	775	2,231	1,577	1,057	32	5,672

Source: Hawaii Visitors Bureau.

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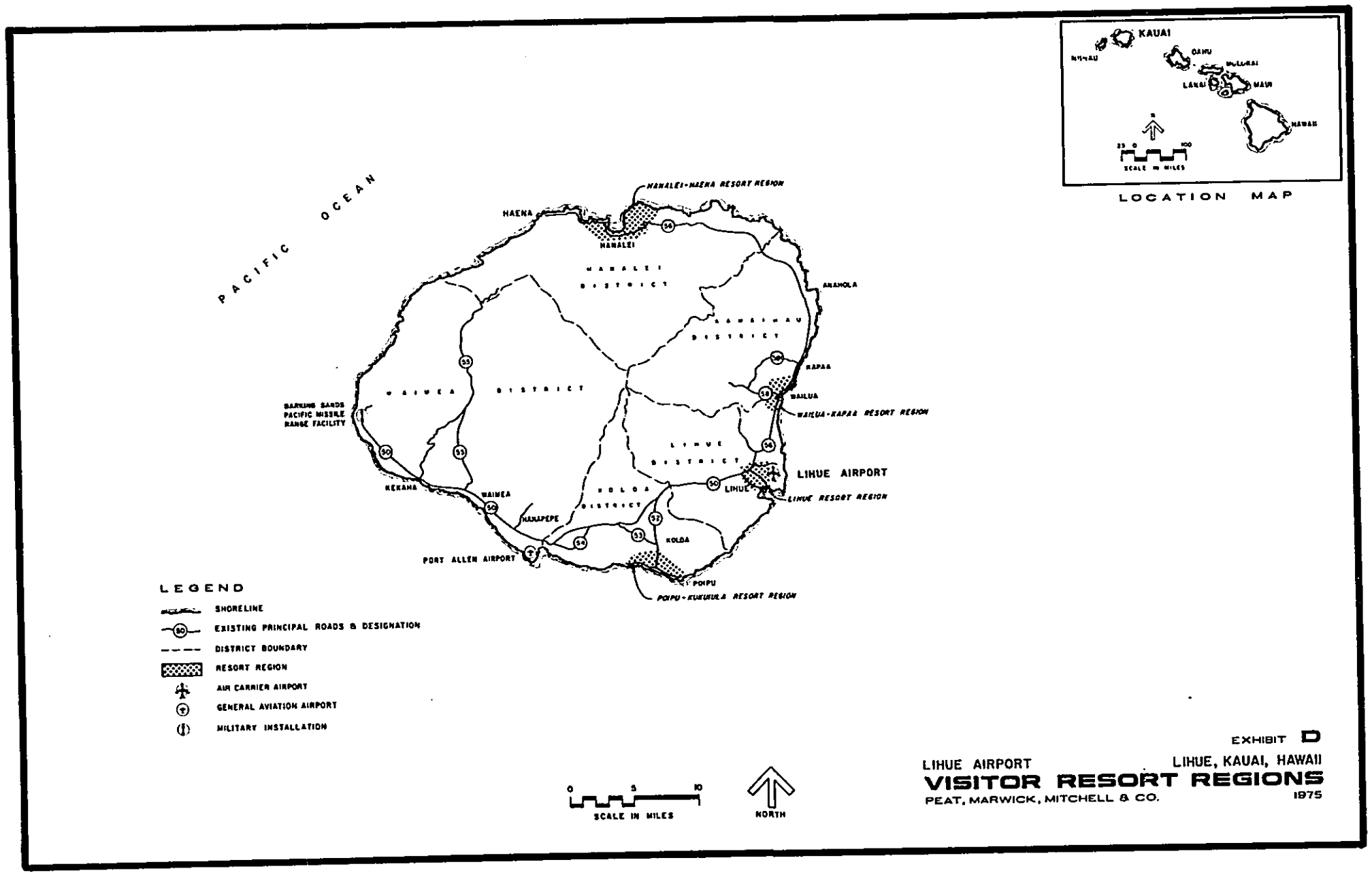

EXHIBIT D

LIHUE AIRPORT — LIHUE, KAUAI, HAWAII

VISITOR RESORT REGIONS

PEAT, MARWICK, MITCHELL & CO. — 1975

information obtained from the Kauai County Office of Economic Development indicates that possible delays may be experienced in the construction of these proposed additional units.

The 1970 Kauai County General Plan projected 4,120 hotel units on the Island by 1975, 6,630 units by 1980, 9,490 units by 1985, and 12,460 units by 1990. Discussions with the County Economic Department indicate that these projections are probably rather optimistic and development of 75% to 80% of these project units is more realistic for the long-term period, 1980 to 1995.

Agriculture. The agricultural industry has historically been the major source of income and employment in the State of Hawaii. Agriculture is one of the State's four major economic components, along with the visitor industry, military activity, and diversified manufacturing.

In 1960, the agricultural industry employed 25% of Kauai's labor force; by 1973, the industry employed only 11% of the labor force. This decrease in agricultural employment is a result of consolidation of the sugar industry and the phase-out of pineapple production on Kauai. As with the other Neighbor Islands, tourism has become an increasingly important part of the economy: 33% of the labor force was engaged in services and trade in 1973, up from 18% in 1960.

Major changes are also taking place in the agricultural industry which could be closely related to the future pattern of air transportation in the State. These changes concern possible future expansion of diversified agriculture for export purposes--particularly papaya, macadamia nuts, flowers, and other nursery products.

In terms of their immediate relation to air transportation, the most important of these commodities are papaya, flowers, and nursery products. In the State as a whole, papaya production increased from 25 million pounds in 1964 to over 37 million pounds in 1974. In 1974, some 58% of total State production was marketed on the Mainland or in Japan, and virtually all of this was exported by air. However, papaya production on the Island of Kauai during the same period remained around 1 million pounds annually or about 3% of the State's total output.

With the development of a 750-acre papaya orchard near Moloaa now under way, the Moloaa Farmers Cooperative expects to be producing from 2 to 3 million pounds of papaya annually within a few years. The Kauai Task Force, County officials, and others are actively marketing the sale of papayas on the Mainland and in Japan. As a result, the County share of the State output is likely to increase in a few years. Since papaya is quite perishable, the continued expansion of papaya

production depends on continued growth of the overseas market and adequate air cargo capacity from Kauai. Based on discussions with the manager of the Moloaa Farmers Cooperative, the Cooperative presently could have good service to the Mainland via the interisland air carriers shipping from Lihue Airport. A similar arrangement could also provide good service to Japan.

Air Traffic Forecasts

The foregoing discussion provides the basis for the air traffic forecasts set out below. The procedure was to first review the Statewide visitor forecasts and then to derive the Lihue Airport air traffic forecasts from the visitor forecasts.

Assessment of the Visitor Market. Forecasting the likely future patterns in the visitor market for the State as a whole, and for the Island of Kauai in particular, requires a highly specialized kind of analysis. Such analysis is well beyond the scope of this report. Nonetheless, the future visitor market is of central importance to the volume and patterns of air travel in Hawaii.

The competitive position of any one of the Neighbor Islands vis-a-vis the others is difficult to assess. To a large degree, competitive positions will depend on travel agent and tour group promotion. At the present time, the Island of Kauai ranks third to Maui and Hawaii, among the Neighbor Islands, in visitor attraction. There is no evident reason for this ranking to change over the long term.

Similarly, the pattern of visitor attractions on Kauai seems well established, and is unlikely to change markedly. As

evidenced by the visitor accommodations inventory, Table III-3, the most substantial development of the visitor market is occurring on the eastern and northern coasts. Again, there is no evidence to suggest that this pattern will change materially in the near future.

The subsequent air traffic forecasts are based upon unofficial visitor projections made by the State of Hawaii Department of Planning and Economic Development in January 1976 (Table III-2). For the purposes of this airport planning study, the unofficial Statewide visitor projections prepared by the DPED subcommittee on Market Projections and Capital have been used as the basis for the air traffic forecasts and subsequent airport facility requirements. This, the higher of the two unofficial DPED visitor projections, has been used to ensure that from a physical planning standpoint, the Airport Master Plan reserves sufficient land now for the development of airline and general aviation airport facilities capable of accommodating foreseeable long-range airport requirements associated with potential tourism. Future community development can then be guided by the long-range air traffic potential so that, should the forecasts become a reality, the Airport will be protected from encroachment by incompatible land uses and the surrounding community will be protected from airport operations. On the other hand, actual physical facilities should be constructed only as the demand arises.

Kauai Visitors. For the purposes of this airport planning study the total number of visitors, both westbound and eastbound, to Kauai is forecast to increase to 1,000,000 by 1980; to some 1,220,000 by 1985; to some 1,430,000 by 1990, and to some 1,610,000 by 1995.

The relationship between airline passengers and visitors to Kauai County is shown in Table III-4. Total passengers at Lihue Airport amounted to some 3.22 times the number of westbound visitors in 1974. If the number of westbound visitors is increased by approximately 25% to include an estimate of eastbound visitors, the ratio between total passengers and the total number of visitors to Kauai County decreases to 2.6 to 1. This ratio is similar to that which existed in the 1960s prior to the great influx of eastbound visitors, particularly Japanese, who take one-day trips to Kauai and return to Oahu for hotel accommodations.

As stated previously, the projections for visitor arrivals to the State and to Kauai (and thus for the air traffic forecasts) appear reasonable in light of available information, but should nevertheless be viewed with considerable caution. This is particularly true for projections of visitors to Kauai since these projections refer to visitors "intending" to visit the Island and therefore may differ significantly from actual visitor arrivals.

Table III-4

RELATION OF AIR TRAFFIC PASSENGERS TO VISITORS
Kauai County

Year	Westbound Visitors[a]	Lihue Airport Passenger Total[b]	Passengers Total ÷ Visitors
1967	275,461	715,674	2.60
1968	327,759	861,512	2.63
1969	363,759	990,796	2.72
1970	426,030	1,112,965	2.61
1971	472,663	1,257,910	2.66
1972	565,386	1,514,623	2.68
1973	590,475	1,845,233	3.12
1974	601,703	1,938,858	3.22

a. Hawaii Visitors Bureau.
b. State of Hawaii, Department of Transportation.

The subsequent air traffic forecasts assume the following:

- A high level of visitor satisfaction with the State of Hawaii as compared to other world visitor destination areas will be maintained.
- The Island of Kauai will attract a slowly decreasing share of visitors to the State.
- The ratio of passenger volumes to visitor arrivals on the Island of Kauai will level off to that of the past few years to reflect the increased number of eastbound visitors to the Island.
- Sufficient hotel capacity will be available in the State and on the Island of Kauai to accommodate potential visitor arrivals.
- The current economic environment in the United States and elsewhere in the world will improve in the near future.

Air Traffic Forecasts. Air traffic forecasts for Lihue Airport are presented on Table III-5 and outlined below are explanatory comments on the forecasts.

Table III-5

AIR TRAFFIC FORECASTS
Lihue Airport
1980, 1985, 1990, 1995

	1974	1980	1985	1990	1995
Kauai Visitors (total)	750,000	1,000,000	1,220,000	1,430,000	1,610,000
Total Passengers	1,938,858	2,575,000	3,170,000	3,720,000	4,190,000
Certificated Airlines	1,884,411	2,500,000	3,080,000	3,610,000	4,060,000
Air Taxi Airlines	54,447	75,000	90,000	110,000	130,000
Aircraft Operations					
Scheduled Certificated Airlines					
Annual	24,291	29,500	32,500	34,500	35,500
Daily	67	81	89	94	97
Air Taxi Operations					
Annual	10,872	12,500	13,000	14,000	14,500
Daily	30	34	36	38	40
Passengers Enplaned per Flight					
Certificated Airlines	78	85	95	105	115
Air Taxi Airlines	5	6	7	8	9
Cargo (tons)	7,275	9,500	12,200	15,000	18,000
Enplaned	921	1,700	2,900	4,200	5,500
Deplaned	6,354	7,800	9,300	10,800	12,500
Mail (tons)	1,778	2,200	2,700	3,200	3,700
Enplaned	364	400	450	500	550
Deplaned	1,414	1,800	2,250	2,700	3,150
Combined Cargo and Mail (tons)	24.8	32.1	40.8	49.9	59.5
Enplaned Daily	3.5	5.8	9.2	12.9	16.6
Deplaned Daily	21.3	26.3	31.6	37.0	42.9
Aircraft Gate Positions					
Certificated Airlines	8	9	10	11	12
Air Taxi Airlines[a]	0	1	1	2	2
Aircraft Cargo Apron Positions	0	1	1	2	2
General Aviation Based Aircraft	17	20	23	26	30
Annual Aircraft Operations					
Air Carrier	24,291	29,500	32,500	34,500	35,500
Air Taxi	10,872	12,500	13,000	14,000	14,500
Military	6,425	6,000	6,000	6,000	6,000
General Aviation Itinerant[b]	9,584	11,000	13,000	15,000	17,000
General Aviation Local	4,638	6,000	7,000	8,000	9,000
Total Operations	55,810	65,000	71,500	77,500	82,000

a. For scheduled air taxis.
b. Excludes air taxis.

Source: PMM&Co.

Total Annual Passengers (Enplaned and Deplaned).

Total passenger forecasts are based on the realization of projected visitor arrivals to the Island of Kauai in relation to the visitor potential for the State of Hawaii. The forecasts anticipate that passenger volumes will continue to increase, but the annual growth rate will continue at a less rapid pace. Table III-5 contains passenger forecasts for Lihue Airport. On the assumption that the ratio between total visitors to Kauai and total passengers at Lihue Airport remains approximately stable at 2.6 to 1, total passengers should increase to some 2,575,000 by 1980, to 3,170,000 by 1985, to 3,720,000 by 1990, and to 4,190,000 by 1995. Within these figures, total passengers on scheduled certificated air carriers are estimated to increase and account for some 2,500,000 by 1980, some 3,080,000 by 1985, some 3,610,000 by 1990, and some 4,060,000 by 1995.

The majority (95%) of the air taxi passengers are traveling on one-day interisland sightseeing tours originating on Oahu. The air taxi passengers have, therefore, been forecast to increase at a slightly higher rate than the air carrier passengers because they relate to Oahu (or Statewide) visitor levels rather than the forecast level of Kauai visitors. In this context, the passenger volume on air taxi airlines at Lihue Airport is forecast to increase from 54,000 in 1974 to

75,000 in 1980, 90,000 in 1985, 110,000 in 1990, and 130,000 in 1995. Most air taxi passengers are expected to be on one-day sightseeing tours originating on Oahu.

Scheduled Air Carrier Aircraft Operations. The number of air carrier aircraft operations is forecast to increase to an annual level of 29,500 by 1980. After 1980, air carrier operations are expected to increase to 32,500 by 1985, to increase to 34,000 by 1990, and to increase to 35,000 by 1995. On a daily basis, total air carrier operations would number 81 in 1980, 89 in 1985, 94 in 1990, and 97 in 1995. The peak hour air carrier operations are forecast to increase from 11 in 1974, to 12 in 1980, to 13 in 1985, and to 14 in 1995.

These forecasts of air carrier aircraft operations assume the gradual introduction of higher capacity aircraft than the present DC-9 and B-737 aircraft. These could include the B-727 and the new airbus-type aircraft such as the DC-10, L-1011, and A-300. The apparent modest increase in forecast operations assumes a continuation of the current interisland air carrier operating practice of high load factors (60% to 65% in the last three years), together with a lower level of aircraft operations than is typical at medium-hub airports on the Mainland. Based on historical interisland air carrier operating practices, this low level of forecasting operations appears reasonable.

Air Taxi Aircraft Operations. Air taxi aircraft operations are expected to increase from 10,872 (30 per day) in 1974 to 12,500 (or 34 per day) by 1980, 13,000 (36 per day) by 1985, and 14,500 (40 per day) by 1995. These estimates could level off earlier in the forecast period if the sightseeing air taxis introduce larger aircraft to replace equipment they presently use.

Passengers per Flight. Passengers per flight on air carrier aircraft are forecast to reach an average of 85 by 1980. After 1980, passengers per flight are expected to increase to 95 by 1985, 105 by 1990, and 115 by 1995.

For air taxi airlines, the number of passengers per flight is expected to increase from 5 in 1974 to 6 by 1980, then to 7 by 1985, and to 9 by 1995.

Air Cargo Volumes. The total of enplaned and deplaned cargo volumes is expected to more than double during the forecast period. Enplaned cargo is forecast to account for an increasing share of the total volume handled, mainly because of increased shipments of agricultural produce. Enplanements are forecast to increase to 1,700 tons by 1980, 2,900 tons by 1985, 4,200 tons by 1990, and 5,500 tons by 1995. Deplaned cargo is expected to continue as the major

portion of total volume and increase to 7,800 tons annually by 1980, 9,300 tons by 1985, 10,800 tons by 1990, and 12,500 tons by 1995.

Air Mail Volumes. Air mail volumes are expected to continue increasing moderately over the forecast period, as they have in the past. The 1,414 tons of mail deplaned in 1974 is expected to increase to 1,800 tons by 1980, 2,250 tons by 1985, 2,700 tons by 1990, and 3,150 tons by 1995. Deplaned mail is expected to account for over 80% of the total volume throughout the forecast period. Enplaned mail is expected to increase more slowly from 364 tons in 1974 to 400 tons in 1980, 450 tons in 1985, 500 tons in 1990, and 550 tons in 1995.

Combined Air Cargo and Mail. On a daily basis, the combined tonnage of deplaned cargo and mail is expected to amount to 26.3 tons per day in 1980, 31.6 tons in 1985, 37.0 tons in 1990, and 42.9 tons in 1995. The combined tonnage of enplaned cargo and mail will involve some 5.8 tons per day in 1980, 9.2 tons in 1985, 12.9 tons in 1990, and 16.6 tons in 1995, according to projections. Combined tonnage of deplaned and enplaned cargo and mail is expected to be 32.1 tons per day in 1980, 40.8 tons in 1985, 49.9 tons in 1990, and 59.5 tons in 1995.

Aircraft Passenger Gate Positions. Based on forecast air carrier aircraft operations, the desirable number of aircraft gate positions available for use by air carrier airlines is forecast to increase to 9 by 1980, 10 by 1985, 11 by 1990, and 12 by 1995. For the air taxi airlines, the forecast activity levels indicate that aircraft parking areas for up to 30 sightseeing aircraft would be desirable throughout the forecast period. It is desirable to provide two aircraft gate positions for scheduled air taxi operations.

Aircraft Cargo Apron Positions. Forecasts of cargo activity indicate that one cargo apron position would be desirable by 1985 and two by 1990 and thereafter.

General Aviation Based Aircraft. The number of general aviation aircraft based at Lihue Airport is expected to increase from 17 in 1975 to 20 by 1980, to 23 by 1985, to 26 by 1990, and to 30 by 1995. As in the past, single engine aircraft are expected to account for the majority of the total.

Annual Aircraft Operations. The total number of aircraft operations at Lihue Airport is expected to increase from the 1974 level of 55,810 to 65,000 operations by 1980, 71,500 by 1985, 77,500 by 1990, and 82,000 by 1995. The preliminary historical and forecast mix of annual aircraft operations are presented on Table III-6.

Table III-6

PRELIMINARY HISTORICAL AND FORECAST MIX OF ANNUAL AIRCRAFT OPERATIONS

Type of Aircraft	1974	1980	1985	1995
Three-Engine Jets				
DC-10 JT-9D	0	0	0	17,500
B-727-200 JT-8D	0	0	16,500	18,000
Two-Engine Jets				
DC-9-50 JT-8D	14,000	17,000	8,000	0
B-737 JT-8D	10,000	12,500	8,000	0
Four-Engine Turboprop (C-130, P-3)	2,000	2,000	2,000	2,000
Two-Engine Turboprop (FA-27)	0	0	1,000	2,000
Four-Engine Piston (Heron, C-54)	2,000	2,000	2,000	2,000
Two-Engine Piston (Dove, Twin Beech, Cessna 310)	9,000	11,500	12,000	14,500
One-Engine Piston (Cessna 150)	17,000	17,000	18,000	21,000
Helicopter	2,000	3,000	4,000	5,000
	56,000	65,000	71,500	82,000

Source: Peat, Marwick, Mitchell & Co.

As previously stated, air carrier operations are forecast to number some 29,500 in 1980, 32,500 in 1985, and 34,500 in 1990, and 35,500 in 1995. These figures do not include air taxi airline operations. Air taxi operations are now classified as a separate statistical reporting unit by the FAA. Under this classification, the term "air taxi" includes commuter air carriers (scheduled air taxis), daily scheduled sightseeing flights, commuter air carrier cargo flights, and air taxis operating on a nonscheduled "for hire" basis. At Lihue Airport, total air taxi operations are forecast to number 12,500 in 1980, 13,000 by 1985, and 14,500 by 1995.

Experience shows that reliable forecasts of military aircraft operations cannot be made for civil airports because of data restrictions and continuous (sometimes unexpected) changes in military commitment levels, programs, strengths, etc. Therefore, military aircraft operations are forecast to continue at the recent level of 6,000 operations per year.

Total general aviation operations, excluding air taxi operations, are expected to increase from the 1974 level of 14,222 operations to 17,000 operations by 1980, 20,000 operations by 1985, 23,000 operations by 1990, and 26,000 operations by 1995. Itinerant general aviation operations, excluding air taxis, are forecast to increase from the 9,584 operations in 1974 to 11,000 by 1980, 13,000 by 1985, 15,000 by 1990, and 17,000 by 1995.

(6/76)

Local general aviation operations have fluctuated between 4,000 and 8,000 annual operations in recent years and are estimated to increase only moderately over the forecast period. Local operations are then forecast to increase to 6,000 operations by 1980, 7,000 by 1985, 8,000 by 1990, and 9,000 by 1995.

IV. ENVIRONMENTAL SETTING

Community Environment

Population Characteristics. Lihue Airport is approximately 2 miles east of the town of Lihue in an agricultural area next to the Kauai Channel on the southeastern coast of the Island of Kauai. Although urban development does not directly abut the Airport, it does form a rough semicircle 0.5 to 1.5 miles from the facility on the north, west, and south.

The 1970 population of the entire County, including the Islands of Kauai and Niihau, was 29,761*--an increase of 5.6% over 1960. The July 1, 1973 resident population of the County was estimated by the State of Hawaii Department of Planning and Economic Development (DPED) at 31,223,** a further increase of 4.9% during the three-year period.

State and County officials and planning consultants have made several population projections for the County over the past five years.

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*U.S. Department of Commerce, Bureau of the Census, "U.S. Census of Population and Housing: 1970, Final Report, PHC (1)-88."

**Hawaii Department of Planning and Economic Development, The State of Hawaii Data Book, A Statistical Abstract (Honolulu: November 1974) p. 10.

After reviewing these projections, the Kauai County Planning Department prepared the following projections:*

Year	Population
1970	29,761
1975	34,076
1980	38,391
1985	42,707

The Lihue District, composed of census tracts 404 and 405, is the area most directly affected by Airport operations. The district had a 1970 population of 6,766 which the County planners forecast to increase to some 7,796 by 1975, 8,830 in 1980, and 9,525 in 1985.

The ethnic makeup of Kauai, according to the 1970 U.S. Census, was 32.9% Japanese; 27.3% Filipino; 26.0% Caucasian; 10.0% Hawaiian; 1.8% Chinese; and 1.9% other.

Existing Land Use. Data on existing land use in the vicinity of Lihue Airport were obtained from aerial photographs taken on August 29, 1974; U.S. Geological Survey (USGS) Lihue and Kapaa Quadrangles dated 1963; various County plans and maps; and field investigations conducted in 1975. Existing land use around Lihue Airport is depicted on Exhibit E.

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*Kauai County Planning Commission, "Testimony to State Land Use Commission on Proposed Land Use District Boundaries and Classifications by the Planning Commission, County of Kauai" (Lihue, Hawaii: 1974) p. 5.

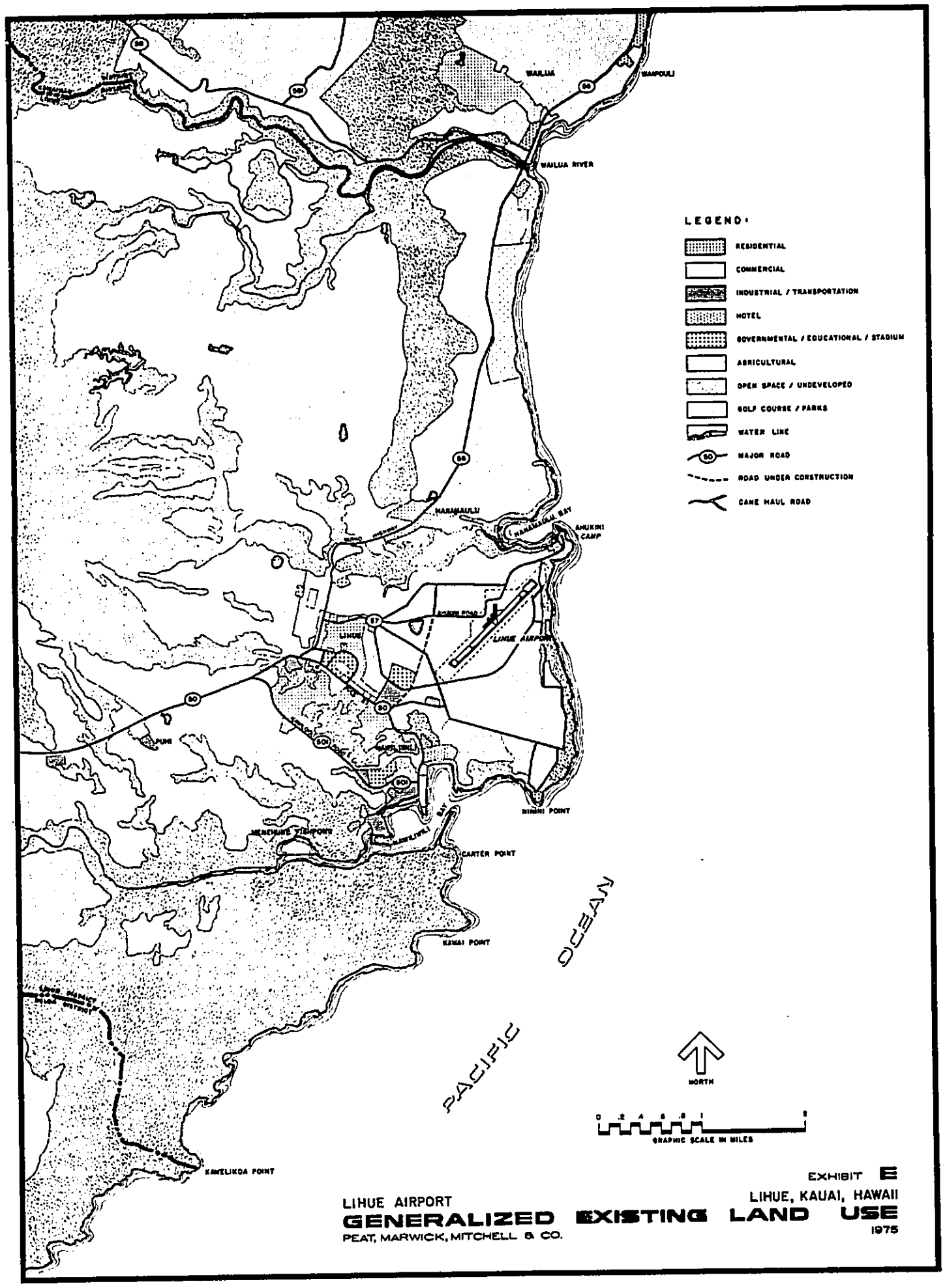

EXHIBIT E

LIHUE, KAUAI, HAWAII

LIHUE AIRPORT

GENERALIZED EXISTING LAND USE

1975

PEAT, MARWICK, MITCHELL & CO.

As the exhibit shows, Lihue Airport is surrounded by intensive agriculture consisting of sugarcane fields owned and operated by the Lihue Plantation Company (part of Amfac, Inc.).

Immediately northeast of the Airport are the remains of Ahukini Landing where sugarcane was once transshipped from railroad to ships. There is one house with one resident in the Ahukini area (the only dwelling in the immediate vicinity of the Airport) and an auto wrecking yard. In addition, the remnants of the landing and adjacent breakwater are popular locations for local fishermen.

The cane fields east of the Airport extend to a point just short of the Pacific Ocean where the terrain drops steeply to the shoreline. The entire shoreline from Hanamaulu Bay in the north to Ninini Point in the south is uncultivated for approximately 500 to 1,000 feet from the shoreline.

The small industrial area shown on the map along the shore east of the Airport served as a solid waste disposal dump until closed in July 1975. The governmental use shown at Ninini Point is the Nawiliwili Coast Guard Light Station.

The town of Lihue, county seat for Kauai County, is 2 miles west of the Airport. Residential, commercial, and industrial

development extends from Nawiliwili Harbor south of the Airport in an almost continuous belt to the Lihue town center. Residential development on the south side of Rice Street is 0.75 miles from the threshold of Runway 3, and directly under the flight path of air carrier aircraft using the Airport. Kauai High School and the Kauai Community College are also under the aircraft flight path and approximately 1.25 miles south of the Airport. Although not directly under the air carrier aircraft flight path, Lihue Stadium is within 0.5 miles southwest of the threshold of Runway 3. The center of Lihue is approximately 2 miles west of the Airport and includes the principal shopping and commercial districts, post office, State and County office buildings, Wilcox Elementary School, and Lihue Park.

Runway 3 is used 90% of the time as the approach path for air carrier aircraft. Because of the Haupu mountain ridge some 4 miles southwest of the Airport, the approach path to Runway 3 involves a tight circling approach from the southeast passing north of Carter Point on the south side of Nawiliwili Bay, over the harbor and urban areas and into the Airport. Therefore, most of the Lihue urbanized area between the town center and the harbor lies under the typical air carrier aircraft approach path currently in use.

Directly south of the Airport and slightly east of the air carrier aircraft approach path is the Kauai Surf Hotel and golf course. The beach area along the north side of Nawiliwili Bay from the hotel out to Ninini Point is undeveloped open space.

Recent residential development has occurred along the south side of Ahukini Road, the Airport access route, up to within 1 mile of the Airport terminal area. Residential development has also taken place northward along the Kuhio Highway northwest of the Airport in the vicinity of Hanamaulu town. This development extends eastward toward Hanamaulu Bay to approximately 0.75 miles northwest of the Airport.

With the exception of the old Ahukini Landing remnants, neither the shoreline around Hanamaulu Bay nor the bottomlands along Hanamaulu Stream are developed at present. The terrain bordering Hanamaulu Stream drops very steeply on both sides, making future development unlikely.

From Hanamaulu north to the mouth of the Wailua River along both sides of the Kuhio Highway, the land is devoted primarily to sugarcane. However, some development is taking place along the east side of the highway toward the beach. Wailua Golf Course is located on the east side of the Kuhio Highway approximately 3 miles north of the Airport. In addition,

Lydgate State Park (which contains Hauola City of Refuge and the Kauai Resort Hotel) is located along the beach and the south shore of the Wailua River. North of the Wailua River, the coastline includes hotel, shop, and restaurant uses for a distance of several miles toward Kapaa.

Community Facilities. Identifying and locating all public and semipublic land uses is of particular concern in analyzing the Airport and its environs. Such uses include schools, hospitals, park and recreation facilities, and places of public assembly.

As previously noted, several schools are affected by current aircraft operations at Lihue Airport. Kauai High School lies under the air carrier aircraft approach path and is approximately 1.25 miles southwest of the Airport. Conversations with local officials, including school officials, indicate that aircraft noise frequently disrupts classes at both the high school and Kauai Community College.

Kauai Community College is adjacent to the high school and is likewise under the air carrier aircraft flight path. However, the present location of the college is only temporary, until a new campus is opened at Puhi in September 1976.

Wilcox Elementary School in the town center is under the air taxi approach path and is within 1.5 miles of the Airport to the west-southwest. The school principal has indicated that there are no problems with aircraft noise at the school although nearby street traffic noise does create interruptions.

Several park and recreation facilities are also under or near aircraft flight paths. Nawiliwili Park, which fronts on Nawiliwili Bay at the foot of Rice Street, lies under the typical aircraft flight path for aircraft arriving from the south and east.

Lihue Park in the town center is under the flight path of air taxi aircraft approaching from the north.

Lihue Stadium, a principal recreation facility for the area, is only 0.5 miles southwest from the threshold of Runway 3. The stadium is so close to flight paths near the end of the runway that its lighting system has had to be shielded in order to prevent undue glare for pilots landing at the Airport after dark.

The only medical facility near the Airport is G. N. Wilcox Memorial Hospital on the east side of the Kuhio Highway approximately 1.5 miles west of the Airport.

Local Plans and Policies. The Kauai General Plan was completed in March 1970 and adopted by the County Council in July 1971. The Plan covers the entire County and is still in effect, although some minor adjustments have been made. The County Planning Department, with consultant assistance, is currently in the process of updating the 1970 Plan through the preparation of specific development plans for each of the County's planning regions. Development plans have already been prepared for the North Shore, Kapaa, and Hanapepe-Eleele areas. The preparation of a specific development plan for the Lihue area is now under way.

The County Planning Department considers that the 1970 General Plan is still valid both in terms of land use and policy statements. However, they have prepared new population projections which are reflected by all specific plans.

The 1970 General Plan includes goals and policies needed to guide future County development and outlines a general land use pattern. In essence, the Plan emphasizes (1) consolidation of urban activities to prevent urban sprawl with its concomitant increased costs for services, and (2) preservation of the natural beauty and agricultural production of the Island.

The Plan's basic concept of transportation facility development is as follows:

"Established transport, service, and public facility systems were considered to constitute an inescapable reality around which the future structure of the Island had to be formulated. Insofar as possible, no gross departures or modifications from these existing systems was recommended, not only to avoid a wasteful burden on the future revenue resources, but also to maintain a continuity of social and cultural order."*

Air transportation is specifically included as an element of the General Plan. The Plan states:

"Air transportation is and will continue to be the major mode of travel between Kauai and the other islands of the state. Of the two major airports on the Island, Lihue is under civilian control, and Barking Sands comes under the jurisdiction of the military and is not open to civilian commercial use.

"While the Lihue Airport is technically adequate from an operational point of view, the approach

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*Eckbo, Dean, Austin & Williams and Muroda, Tanaka & Itagaki, Inc., A General Plan for the Island of Kauai (Lihue, Hawaii: March 1970), p. 37.

path under tradewind conditions is a hazardous one. Aircraft pass directly over Kauai High School, the existing Community College, and the proposed site for Lihue Stadium.

"As the traffic increases, the frequency of exposure to the unsafe and noisy conditions will grow. These conditions could be substantially altered, however, by the construction of a north-south runway.

"If the north-south runway is built, the existing runway would be used only infrequently for landing. The high school could be expanded into the present Community College site. Also, the stadium could be built on the site now proposed.

"If the proposed north-south runway is not built, then the stadium site should be elsewhere and Kauai High relocated. The Community College is to be relocated in any event.

"The Department of Transportation has conducted a preliminary survey of possible trans-Pacific airport sites on Kauai: Under consideration are sites in the Kilauea (Kilauea Bay-Moloaa

Bay) and Hanapepe (Port Allen) areas, and at Lihue Airport. From an aviation point of view, the site with the best potential is at Barking Sands. Current military requirements suggest that this site be discounted temporarily.*

"Although current and projected passenger and freight traffic do not seem to justify the cost of a trans-Pacific airport, the highest priority should be given to the Barking Sands site,* should the demand ever warrant such a facility. In the interim, it is recommended that the proposed north-south runway for Lihue Airport be constructed for interisland traffic only."**

Relative to land use in the vicinity of Lihue Airport, the 1970 General Plan recommended that all land surrounding the Airport be retained in agricultural use. Urban activities (residential, commerical, and industrial) were consolidated by the Plan in the area between the Lihue town center and Nawiliwili Harbor with a somewhat smaller urban concentration

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*Military requirements have not changed since the Kauai General Plan was prepared in 1970. See letter from Commanding Officer U.S. Navy Pacific Missile Range Facility, Barking Sands, in Appendix B.

**Eckbo, Dean, Austin & Williams and Muroda, Tanaka & Itagaki, Inc., A General Plan for the Island of Kauai (Lihue, Hawaii: March 1970), p. 39.

in the vicinity of Hanamaulu town. The shoreline from Nawiliwili Harbor to north of Hanamaulu Bay was retained as open space, with Nawiliwili Harbor and Hanamaulu Bay designated as scenic sites. Recreational facilities recommended in the Plan include a small park on the western end of Hanamaulu Bay (since developed) and the Lihue Stadium approximately 0.5 miles southwest of the threshold of Runway 3. The only resort development recommended was a small area on the north shore of Nawiliwili Harbor where such development was already under construction. The Kauai High School was retained in its existing location.

With the exception of the Lihue Stadium, Kauai High School, and residential areas between Rice Street and Nawiliwili Road, all land uses recommended in the 1970 Plan were compatible with continuing aircraft operations at Lihue Airport. The recommendations concerning the high school and stadium were predicated on the eventual construction of a north-south runway which would eliminate adverse noise impacts.

Existing Zoning. The responsibility for land use zoning in Hawaii is shared by the State and counties. The State Legislature has created four general land use districts and a State Land Use Commission to regulate boundary changes between the districts. These districts are urban, agricultural, rural,

and conservation. Briefly, each district is defined in the State statutes as follows:

> "Urban districts shall include activities or uses as provided by ordinance or regulations of the County within which the urban district is situated.
>
> "Rural districts shall include activities or uses characterized by low density residential lots of not more than one dwelling house per one-half acre in areas where 'city-like' concentration of people, structures, streets, and urban level of services are absent, and where small farms are intermixed with low density residential lots. These districts may include contiguous areas which are not suited to low density residential lots or small farms by reasons of topography, soils, and other related characteristics.
>
> "Agricultural districts shall include activities or uses characterized by the cultivation of crops, orchards, forage, and forestry; farming activities or uses related to animal husbandry, and game and fish propagation; services and uses accessory to the above activities including but not limited to living quarters or

dwellings, mills, storage facilities; processing facilities, and roadside stands for the sale of products grown on the premises; and open area recreational facilities. These districts may include areas which are not used for, or which are not suited to, agriculture and ancillary activities by reason of topography, soils, and other related characteristics.

"Conservation districts shall include areas necessary for protecting watersheds and water sources; preserving scenic and historic areas; providing park lands, wilderness, and beach; conserving endemic plants, fish, and wildlife; preventing floods and soil erosion; forestry; open space areas whose existing openness, natural condition, or present state of use, if retained, would enhance the present or potential value of abutting or surrounding communities; or would maintain or enhance the conservation of natural or scenic resources; areas of value for recreational purposes; and other related activities; and other permanent

uses not detrimental to a multiple use conservation concept."*

The estimated land area within each of the four State Land Use Districts for the Island of Kauai in 1974 was as follows: 9,115 urban acres, 1,137 rural acres, 145,966 agricultural acres, and 197,682 conservation acres.**

Under present State statutes, local jurisdictions (i.e., counties) have complete control over activities taking place within an urban district. The local jurisdictions and the State Land Commission share responsibility for activities within the rural and agricultural districts. That is, the State establishes boundaries and minimum conditions for these districts, which are administered by the local jurisdictions who can require more restrictive conditions than those found in the State statutes. The conservation district and all activities within such a district are regulated by the State Land Use Commission and Department of Land and Natural Resources.

Kauai County has adopted a Comprehensive Zoning Ordinance (County of Kauai Ordinance 164) and established six basic zoning districts. These zoning districts are Residential (R),

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*State of Hawaii Revised Statutes, 1973 Supplement, Vol. 3, Titles 11-15, Chapters 141-280, Section 205-2.

**State of Hawaii Department of Planning and Economic Development, The State of Hawaii Data Book, A Statistical Abstract (Honolulu: November 1974), p. 103.

Resort (RR), Commercial (C), Industrial (I), Agriculture (A), and Open (O). Two overlay districts augment the six basic districts. They are Special Treatment (ST) district, which includes public facilities, cultural/historic, and scenic/ecological and Constraint (S) district, which includes drainage, flood, shore, slope, soils, and tsunami subdistricts. Four of the six basic districts are also subcategorized, reflecting various densities and intensities of the primary use.

The "Open" district can be used to provide open space within a built-up urban area or, as stated in the Ordinance:

> "To preserve, maintain or improve the essential characteristics of the land and water areas that are . . . necessary to insulate or buffer the public and places of residence from undesirable environmental factors caused by, or related to, particular uses such as noise, dust, and visually offensive elements."*

The cane lands surrounding Lihue Airport are classified as a State designated agricultural district as shown on Exhibit F. The towns of Lihue and Hanamaulu, on the other hand, are

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*Kauai County Council, County of Kauai Ordinance 164, Lihue, revised 1974, p. 52.

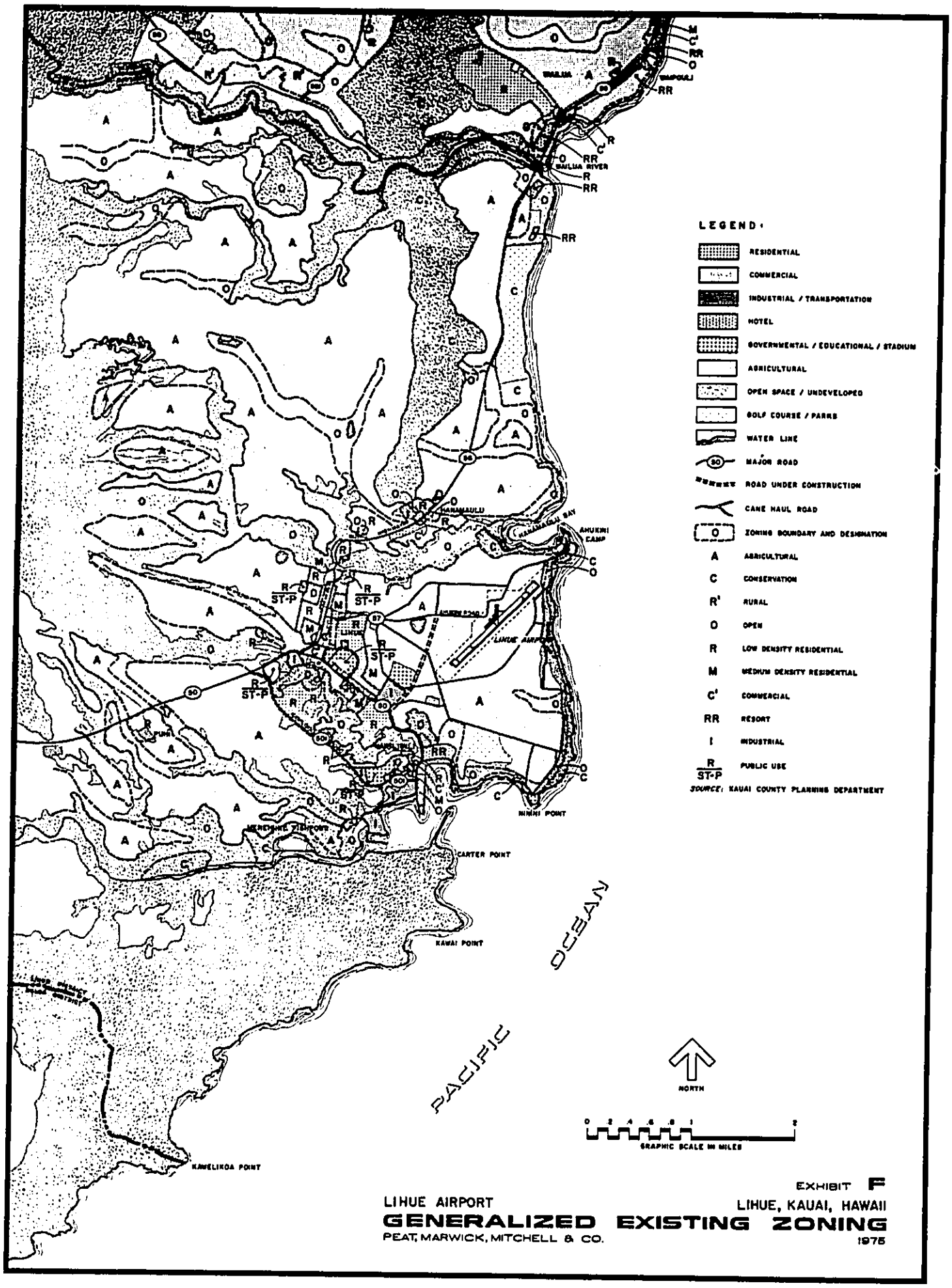

EXHIBIT F

LIHUE AIRPORT

GENERALIZED EXISTING ZONING

PEAT, MARWICK, MITCHELL & CO.

LIHUE, KAUAI, HAWAII

1975

within the State-designated urban district. The Lihue-Hanamaulu urban districts form a rough semicircle around agricultural lands adjacent to the Airport. This semicircle is formed at a distance of from 1 to 1.5 miles out from the Airport proper.

The shoreline fronting on the Ocean and extending inland 200 to 500 feet from Hanamaulu Bay south to Nawiliwili Bay falls within a State conservation district. The Hanamaulu urban district includes all lands fronting on the north side of Hanamaulu Bay and northward approximately 0.5 miles north of the Bay along the Kauai Channel shoreline. The southern shoreline of Hanamaulu Bay is in a conservation district.

In the Hanamaulu urban district north of the Airport, properties are zoned principally for residential use with densities varying from 4 to 10 dwelling units per acre. Some neighborhood commercial and general industrial uses are also permitted in this area. However, the areas on the north shore of Hanamaulu Bay, which are also in the Hanamaulu urban district, are currently zoned in an open classification.

The Lihue urban district contains almost all of the zoning districts set forth in the Kauai County Comprehensive Zoning Ordinance. Residential densities within Lihue range from a low of 4 dwelling units per acre to a high of 20 units per acre. For

example, the residential area on the south side of Ahukini Road just to the west of the Airport is zoned to permit a density of 6 units per acre. Along Rice Street southwest of the Airport and under the air carrier aircraft approach flight path, residential zoning of up to 20 units per acre is permitted. The Lihue Stadium just southwest of the Airport was constructed in an area zoned agricultural. The Kauai Surf Hotel at Kalapaki Beach is zoned Resort with a density of 20 units per acre, while the hotel golf course is in an agricultural district. All lands on the south side of Nawiliwili Bay and Huleia Stream fall within a State-designated conservation district.

The Kauai County Zoning Ordinance does not specifically refer to airports. It has no height restrictions for either Lihue Airport or Port Allen Airport on the south coast, and does not specify in which district an airport is permitted.

According to the State Department of Land and Natural Resources, an airport is an urban use that may be authorized in an agricultural district by means of a special use permit. The existing 177-acre Lihue Airport is classified as agriculture. Expansion of Airport boundaries or acquisition of surrounding properties for future Airport development requires an amended use permit to include all new properties.

(11/76)

Although there are no specific height limitations in the Kauai Zoning Ordinance for airport approach protection, each of the respective zoning districts in the County has height restrictions. The height restriction for single family districts is 30 feet; for neighborhood commercial, 35 feet; multiple family, hotel, or motel districts, 40 feet; and general commercial and agricultural districts, 50 feet. It should also be noted that the State of Hawaii Department of Transportation has adopted height restrictions for control of structures in the vicinity of Lihue Airport. These height restrictions were prepared in accordance with Federal Aviation Regulation (FAR) Part 77.

Natural Environment

This section describes the natural environment in the vicinity of Lihue Airport. It summarizes the report Inventory and Initial Analysis of Environmental Conditions and Concerns, Lihue Airport Master Plan Study, prepared by Environmental Communications, Inc. (ECI). The complete ECI report also analyzes the natural environment in the vicinity of the Port Allen and Kilauea Bay-Moloaa Bay Sites.

Geology. Geologically, the Island of Kauai is considered the oldest inhabited island in the Hawaiian group. It is also considered to be one of the more structurally complex islands (that is, heterogeneous conditions of land mass resulting from

different types of lava flows, age of the flows, weathering, and erosional unconformities). The land mass represents a large shield-shaped volcano that rose from the bottom of the sea.

Principal volcanic activity started during the late Tertiary Period* and was completed before the end of the Pliocene* time. Two major volcanic activities, the Waimea Canyon Volcanic Series and the Koloa Volcanic Series, are believed to have formed the land mass.

The Waimea Canyon Volcanic Series were comprised of several formations, including the highest point on the Island, Kawaikini Peak some 5,170 feet above sea level.

The Koloa Volcanic Series occurred after a long period of inactivity. Lava from this volcanic activity was laid over the older Waimea Canyon Volcanic Series. The Lihue Airport site is located on the Koloa Volcanic Series that erupted during the Pleistocene Epoch. The Koloa Volcanic Series are mostly dense to moderately dense. Lava flows are pahoehoe and aa, the latter being more abundant.

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*Tertiary Period refers to a time period 2 million to 63 million years ago. The Pliocene Epoch is the most recent era in the Tertiary Period occurring from about 2 million to 6 million years ago.

There are approximately 40 vents recognized in the Koloa Volcanic series. However, there are no vents or faults within the Lihue Airport area. Gulches and ravines occurring in this volcanic series result from geologic erosion, not from land slips or faults.

Soils. The soils on the Lihue Airport site are residual soils developed from the weathering of volcanic rocks. Differences in soil characteristics are determined by such factors as climate, moisture, parent materials, and age. As a rule, areas of relatively low rainfall, and thus lower available moisture, result in more productive soils. Where there is an excess of rainfall, the soluable minerals are leached from the soil, leaving oxides as the major soil components. For agriculture, soils found in sunny, drier locations are more productive, if irrigation water is available. In the wetter windward sectors (on the east and northeast side of the Island), soils that are highly leached and acid in reaction will be lower in fertility.

In its "Detailed Land Classification--Island of Kauai," the Land Study Bureau of the University of Hawaii developed a five-class rating system with Class A the most productive; Class B, good, Class C, fair; Class D, poor; and Class E, least productive.

The Lihue Site presents a uniform soil area. The entire area for the proposed new north-south runway is Class B land with the exception of a very small area of Class C.

On soil maps for the vicinity of Lihue Airport contained in the ECI Report, the U.S. Soil Conservation Service (SCS) identifies two major soil classifications in the area. The predominant soil covering well over 90% of the area is the Lihue silty clay series. The second major soil group in the area is the Koloa stony silty clay series found primarily along the coast and in the ravine located southeast of the Airport. The general properties of the Lihue series are:

- Permeability ranges from 2.0 to 6.3 inches per hour
- Soil reaction ranges from pH 5.1 to 7.3
- Shrink-swell potential is moderate
- Corrosivity is moderate to low
- Erosion hazard is slight
- Soils are silty clays

The properties of the Koloa series are:

- Permeability ranges from 2.0 to 6.3 inches per hour
- Soil reaction ranges from pH 6.1 to 7.3
- Shrink-swell potential is moderate
- Corrosivity is low
- Erosion hazard is slight
- Soil is stony silty clay

The dominant Lihue series soil found in the vicinity of Lihue Airport is stable to fairly stable with the exception of small areas of clay soils. The clay soils require additional preparation to stabilize the ground and avoid any shifting of fill or pavement. Where drainage ways are filled, adequate capacity must be provided by culverts to accommodate runoff during heavy rainfall.

The Lihue Airport site's proximity to the Pacific Ocean could present a problem of the siltation of offshore waters by surface water runoff during construction periods if a heavy rain storm occurs. Once proper mechanical structures are completed and plantings are made, erosion hazards should be slight.

Topography. Lihue Airport is located on a plateau between the Hanamaulu and Huleia Streams. The plateau is characterized by uniform soils on slopes of less than 8%. Within the specific area designated for the new north-south runway, the largest percentage of the lands are 5% slope or less. There is a small area at the north end where the slope is steeper, exceeding 15%. A short distance south of the midpoint of the proposed runway is a shallow, steep-sided drainage way. The difference in elevation between low and high points is approximately 30 feet.

Mineral Resources. Several mineral resources have been mined within a 5-mile radius of the Lihue area. These include coral sand at Wailua and coral from Nawiliwili Harbor. There are deposits of basalt on the Island that appear usable for aggregates and road subgrade.

Within the immediate vicinity of Lihue Airport, there are no known deposits of minerals considered economically feasible to mine. All materials for runway construction would have to be imported from other locations. The present supply of road material and aggregates are obtained from the Grove Farm quarry located approximately 8 miles west of Lihue Airport on the north side of State Route 50.

Flora. Because the Lihue Airport vicinity has been in intense cultivation for many decades, native (endemic) flora has been destroyed and replaced by more aggressive introduced or nonnative (exotic) species. Hawaii has plants that are known throughout tropical areas, but the isolation of the Islands has fostered variations of tropical plant species.

It is difficult to ascertain the exact nature of the vegetation that grew in the area now used for the cultivation of sugarcane in the Lihue Airport vicinity. No doubt, the plateau contained grasses and shrubs. Along the streams and in the valleys where water was abundant, taro, sweet potatoes, bananas, breadfruit, Kukui, wauke, and coconuts were cultivated. During early periods, the native fauna were not exposed to foreign diseases, insects, and aggressive exotic fauna introductions. During the late 1800s and early 1900s, sugarcane cultivation replaced almost all of the native vegetation.

With man and feral animals encroaching on the undeveloped land, endemic and indigenous plants will continue to decline. The rapid and aggressive growth of exotics as well as the use of herbicides in agricultural activities has greatly reduced the endemic varieties. But indigenous species are included on the Table IV-1 list of plant species observed in the Airport vicinity.

Table IV-1

PLANTS FOUND IN THE LIHUE AIRPORT VICINITY

ENDEMIC SPECIES

Scientific Name	Common Name
Acacia koa	Hawaiian Koa
Aleurites moluccana	Kukui
Cibotium chamissoi	Tree Fern
Cordyline terminalis	Ti
Dicranopteris linearis	Staghorn Fern
Hibiscus tiliaceus	Hau
Santalum elipticum	Sandalwood

EXOTIC SPECIES

Scientific Name	Common Name
Acacia farnesiana	Kly
Amaranthus spinosus	Spiny Amaranth
Cassia leschenaultiana	Japanese Tea
Chloris radiata	Radiate Fingergrass
Chrysopogon aciculatus	Philipiliula
Cynodon dactylon	Bermuda grass
Demanthus virgatus	Demanthus
Lantana camara	Lantana
Leucaena glauca	Eroa
Mimosa pudica	Sensitive plant
Panicum maximum	Guinea grass
Panicum purpescens	Para grass
Paspalum conjugatum	Hilo grass

Table IV-1 (cont.)
PLANTS FOUND IN THE LIHUE AIRPORT VICINITY

EXOTIC SPECIES (Cont.)

Scientific Name	Common Name
Psidium guajava	Guava
Rhodomyrtus tomentosa	Rhodomyrtus
Rubus rosaefolius	Thimbleberry
Setaria verticillata	Bristly foxtail
Tricholaena repends	Natal red top
Watheria americana	Hilaloa
Xanthium strumarium	Cocklebur

Source: Environmental Communications, Inc., Inventory and Initial Analysis of Environmental Conditions and Concerns--Lihue Airport Master Plan Study (Honolulu, Hawaii: April 1975).

Fauna. The Hawaiian Bat (Lasiurus cinereus semotus), an endemic mammal, and listed as endangered on the federal register, is found on Kauai. No other known endemic or native mammals are found on the Island, but a few have been introduced. Table IV-2 lists the exotic mammal species found in the Lihue Airport vicinity.

With the removal of forests in the vicinity of the Airport, the native birds have retreated to the remote mountainous native forests. Few suitable habitats and nesting areas for endemic and indigenous species are found in the study area. Today, land areas under 2,000 feet in elevation are almost void of native birds because of the introduction of exotic birds, goats, horses, cattle, and sheep.

Table IV-3 lists bird species observed within a 5-mile radius of Lihue Airport. Only two of the four endangered bird species noted on the table are found in the immediate vicinity of the Airport. These endangered waterfowl are the Hawaiian Stilt and the Hawaiian Coot. A preferred habitat of these endangered species is the Lihue Mill Settling Basin southwest of the intersection of Ahukini Road and State Route 51 (SR51).

All proposed Airport development will take place to the east of SR51. The area proposed for Airport development is either cultivated in sugarcane or in ironwood windbreak and contains no suitable habitats for these endangered waterfowl.

Table IV-2

MAMMALIAN SPECIES FOUND IN THE
LIHUE AIRPORT VICINITY

Scientific Name	Common Name
Rattus rattus	Black rat
Rattus exulans	Hawaiian rat
Rattus norvegicus	Norway rat
Mus musculus	House mouse
Sus scrofa	Feral pig
Copra hircus	Feral goat
Felis catus	Feral cat

Source: Environmental Communications, Inc., Inventory and Initial Analysis of Environmental Conditions and Concerns--Lihue Airport Master Plan Study (Honolulu, Hawaii: April 1975).

Table IV-3

BIRD SPECIES FOUND IN THE LIHUE AIRPORT VICINITY

ENDEMIC SPECIES

Scientific Name	Common Name
Anas ocuta	Pintail
Anas platyrhynchos wyv.	Koloa Duck (e)
Arenaria interpres	Ruddy Turnstone
Asio flammeus	Pueo
Crocethia alba	Sanderling
Fulica americana haw.	Hawaiian Coot (e)
Gallinula chlorpus haw.	Hawaiian Gallinule (e)
Heteroschulus incanum	Wandering Tattler
Himantopus mexicanus haw.	Hawaiian Stilt (e)
Nycticorax nycticorax	Black Crowned Heron
Phaethon lepturus	White Tail Tropicbird
Pluvialis dominica	American Golden Plover
Puffinus pacificus	Wedge-tailed Shearwater
Spatula clypeata	Shoveler
Sula sula	Red-footed Booby

(e) Denotes endangered status.

EXOTIC SPECIES

Scientific Name	Common Name
Acridotheres tristis	Mynah
Alectoris graeca	Chukar Partridge
Bubulcus ibis	Cattle Egret
Carpodacus mexicanus fron.	House Finch
Copsychus malbaricus	Shama Thrush

Table IV-3 (cont.)
BIRD SPECIES FOUND IN THE LIHUE AIRPORT VICINITY

EXOTIC SPECIES (cont.)

Scientific Name	Common Name
Coturnix coturnix	Japanese Quail
Garrulux canorus	Chinese Thrush
Geopelia striata striata	Barred Dove
Lonchura punetulata	Ricebird
Meleagris gullopavo int.	Turkey
Mimus polyglothus	Mockingbird
Paroaria cucullata	Brazilian Cardinal
Passer domesticus	House Sparrow
Phasianus colchicus	Ring-neck Pheasant
Richmondena cardinalis	Cardinal
Sturnella neglecta	Western Meadowlark
Tyto alba	Barn Owl

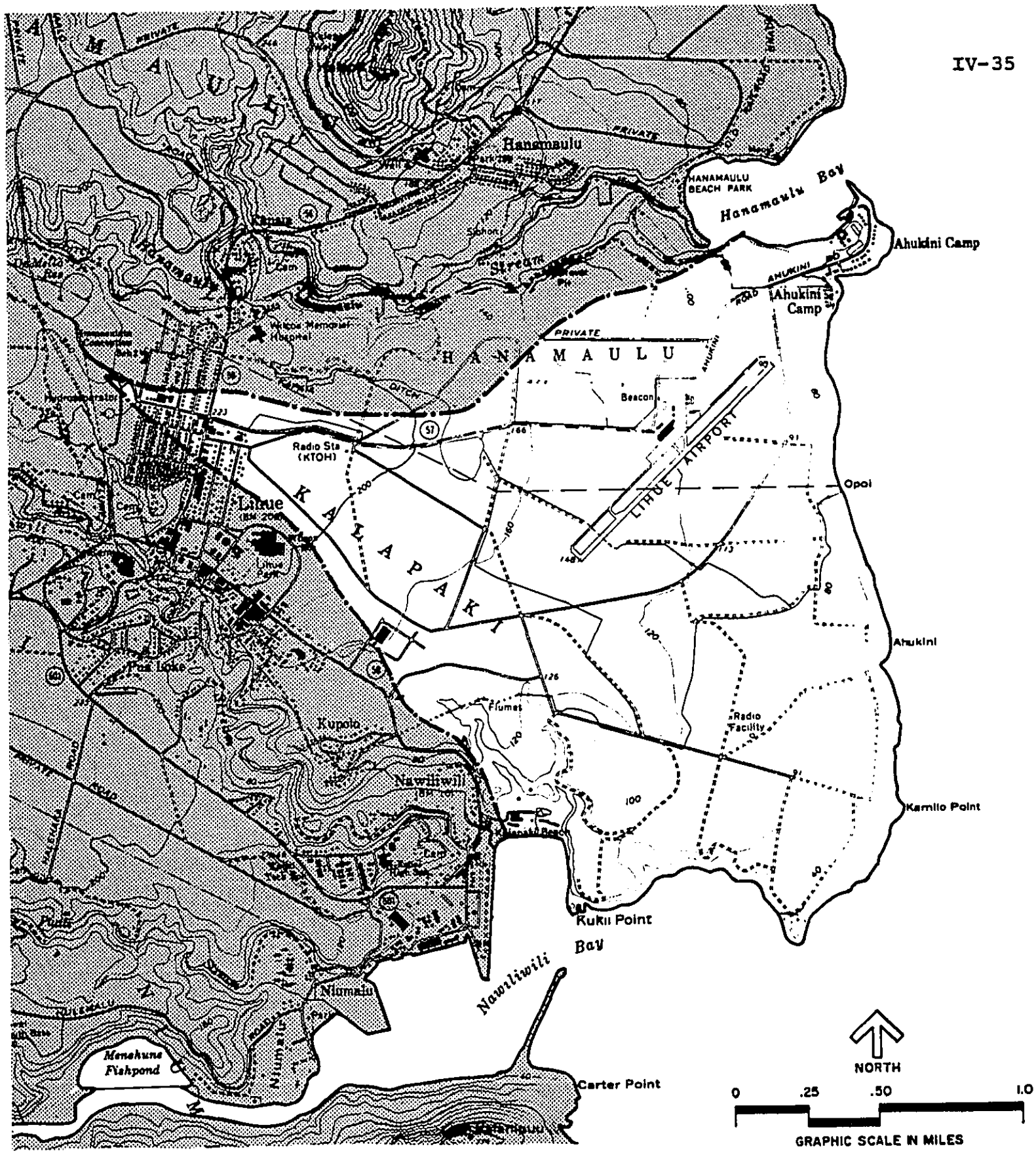
Source: Environmental Communications, Inc., Inventory and Initial Analysis of Environmental Conditions and Concerns--Lihue Airport Master Plan Study (Honolulu, Hawaii: April 1975).

Regarding marine biological data for the waters off Kauai, a list of all fish caught and observed in the waters off Lihue Airport was compiled. This list is presented in the aforementioned ECI Report. Many of these fish species are known to occur in other tropical waters and may have also developed variations over time. Sixteen marine animal species have been introduced into the Island waters, but only three have become established--the Blue-Lined Snapper, the Blue-Spotted Grouper, and the Snapper.

Water Resources. Lihue Airport is situated in a natural drainage area of approximately 2,270 acres, as depicted on Exhibit G, and lies in an annual precipitation belt that averages approximately 45 inches of rainfall per year, as illustrated on Exhibit H. The Airport vicinity gently slopes to the Ocean and drainage is heavily influenced by the Lihue Plantation Company's irrigation scheme.

Geohydrology. This analysis considers possible effects of Airport expansion on the groundwater resources of the region. These potential effects are threefold.

- What is the possibility of polluting any regional or local groundwater source by virtue of uncontrolled runoff from the Airport facility percolating into surrounding permeable lands?



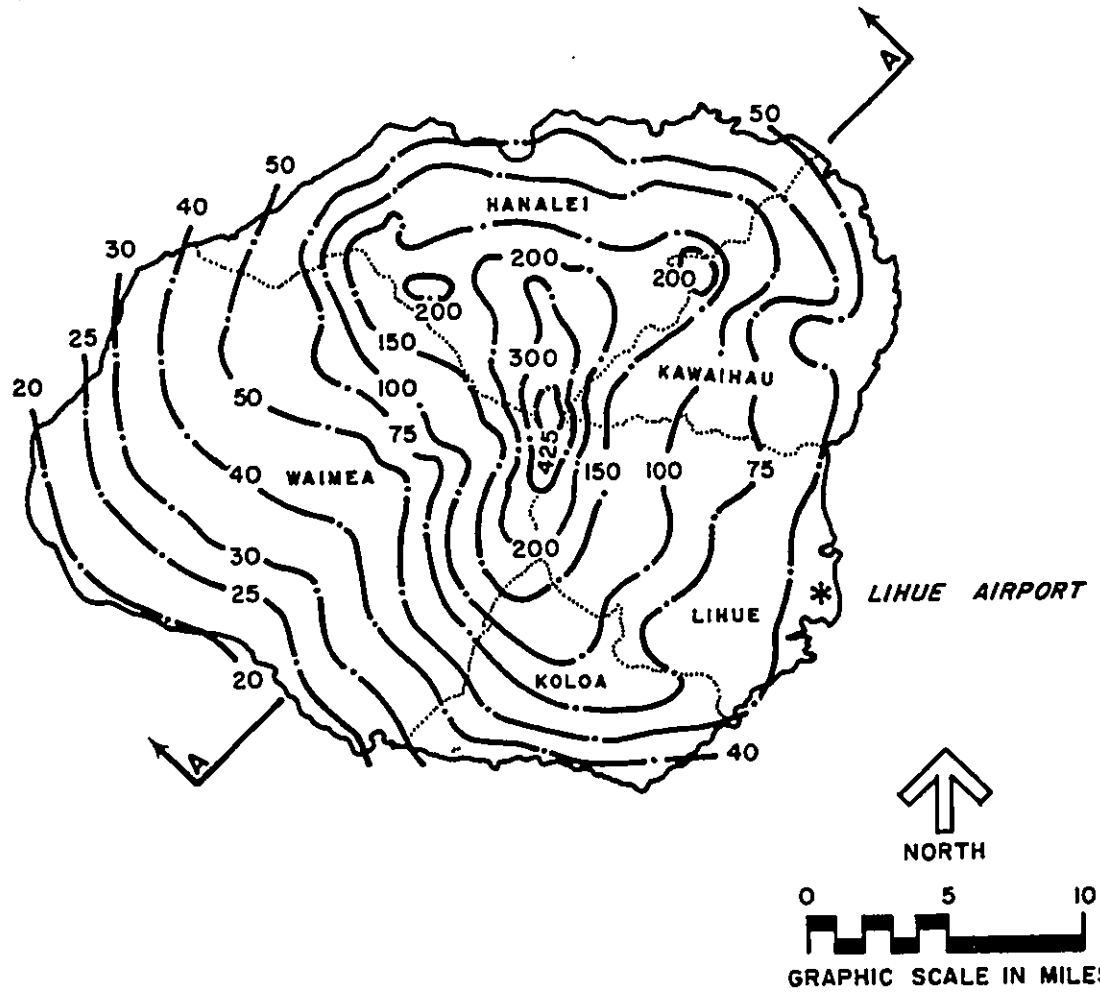
SOURCE: ENVIRONMENTAL COMMUNICATIONS, INC.
INVENTORY AND INITIAL ANALYSIS OF ENVIRONMENTAL CONDITIONS AND CONCERNS, LIHUE AIRPORT MASTER PLAN STUDY, APRIL 1975

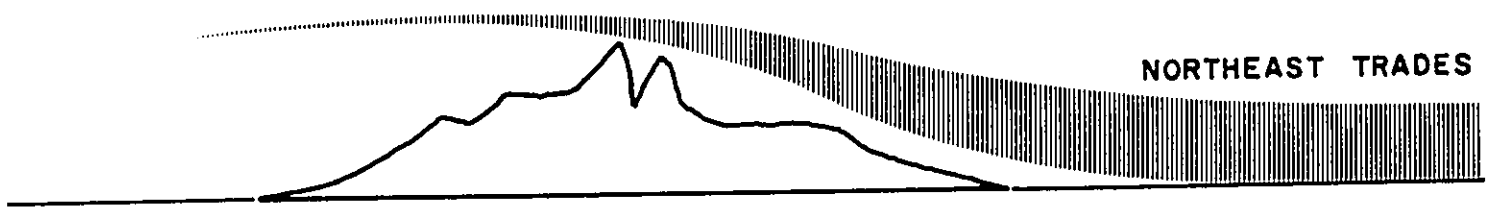
EXHIBIT C

LIHUE AIRPORT — LIHUE, KAUAI, HAWAII

NATURAL WATERSHED AREA

PEAT, MARWICK, MITCHELL & CO. — 1975





SECTION ALONG LINE AA

LEGEND:

* LIHUE AIRPORT

ISOHYETAL LINE

SOURCE: "A GENERAL PLAN FOR DOMESTIC WATER: ISLAND OF KAUAI", DEPARTMENT OF WATER, COUNTY OF KAUAI, FEBRUARY 1972.

EXHIBIT H

LIHUE AIRPORT — LIHUE, KAUAI, HAWAII

ISOHYETAL MAP OF KAUAI

PEAT, MARWICK, MITCHELL & CO. — 1975

- What effect will the Airport facility have on recharge to the groundwater source due to construction of large areas of impermeable surfaces accompanied by drainage to a surface receiving water?

- What will the potential impact on the groundwater source be if the draft is increased?

To gain insight into these areas of concern, ECI investigated the geohydrology of Lihue Airport. Because of a scarcity of data, the geohydrology of Kauai is the least known and most poorly understood of the major Hawaiian Islands. MacDonald, et al,* provided the most detailed description to date, but in developing its Water Quality Management Plan and General Plan for Domestic Water, Kauai County provided additional data.

Two different series of volcanic rocks comprise the Island of Kauai, the older Waimea Canyon Volcanic Series and the younger Koloa Volcanic Series. The Waimea Canyon Series

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*G. A. MacDonald, D. A. Davis, and D. C. Cox, "Geology and Ground Water Resources of The Island of Kauai, Hawaii," Division of Hydrography, State of Hawaii, Bulletin 13, 1960.

consists of relatively thin layers of pahoehoe, aa, and clinker, and generally speaking, is highly permeable. This series is found extensively in the western and northern portion of the Island, extending clockwise from Waimea to Hanalei. The younger Koloa Series is found in the eastern and southern portion of the Island, and consists of a complex system of basalts with denser and thicker layers and fewer intercalations of permeable material than found in the more voluminous primitive basalts. Permeability in the Koloa Series is generally poor to moderate. In terms of aquifer characteristics, therefore, the Waimea Canyon Series is far superior to the Koloa Series, but together they constitute the principal aquifers of Kauai.

The principal geologic feature in the Airport area consists of Koloa lava flows. Groundwater in this series occurs either as basalt groundwater, if the formation extends below sea level, or as high-level groundwater, which may be perched or impounded water caused by the presence of impermeable horizontal strata or vertical dikes. In any event, both must be considered since each may potentially serve as important sources of water supply, depending on yield and quality.

Very little is known about the extent and occurrence of basal groundwater in the Koloa Series rocks in the Lihue area. This

presumably complex system has not been fully explored; however, near the coast, the basal groundwater is probably brackish, as reported by MacDonald, et al. Although those investigators estimate that within half a mile inland the rocks are probably saturated with fresh water to depths of several hundred feet, the quality of the water is questionable in light of recent work performed by Austin Smith and Associates* of Honolulu, Hawaii, for Kauai County.

A test at about 2,500 feet southwest of Runway 3-21 and about 1.3 miles from the coast, located unacceptably high chloride concentrations at depths required for productive yield. The test concluded that brackish water was separating the basal aquifer from the Ocean, and development of this basal groundwater at that site or at any site seaward of the pilot well was not feasible.

MacDonald, et al, also recognized the difficulty of developing the Koloa basalt groundwater due to the relatively low permeability of this aquifer and the resulting low productive yields for the deep wells required. However, further inland at higher elevations, the Koloa basal aquifer could

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*"Draft Environmental Impact Statement for Lihue Sewage Treatment Plant Expansion," Department of Public Works, Kauai County, prepared by Austin Smith and Associates, Inc., Honolulu, Hawaii, 1974.

be developed and deep-well construction on the eastern slopes of Kilonana Crater is the best alternative to future water supply development. Here the chief problem is one of yield, not quality.

The present source facilities for the Lihue area consist of two water tunnels which tap high-level groundwater, Kokolau Tunnel (elevation 313 feet) and the Garlinghouse Tunnel (elevation 280 feet).

In relation to the Lihue Airport location, the Garlinghouse Tunnel is nearest, about 3 miles inland. Austin Smith Associates investigated the feasibility of deep-well injection of treated effluent at the previously described test well. They concluded that there would be no chance of affecting the existing groundwater supply (nor any future high-elevation groundwater source, either basalt or high-level) because of groundwater moving through the area and the hydraulic seaward gradient of the groundwater body. Based on the foregoing discussion, it is reasonable to conclude that expansion of Lihue Airport will have no adverse effects on any existing or future basal groundwater sources, either from the standpoint of pollution or recharge.

Perched groundwater in the Koloa Series in the Lihue area occurs frequently. However, based on Kauai County studies,

these sources are not expected to yield quantities constituting a major supply. There are no plans to develop any perched groundwater in the area of the Lihue Airport.

Water consumption at Lihue Airport in Fiscal Year 1975 was 20,272,000 gallons or an average of 55,540 gallons per day In May and June 1975, the average was 87,300 gallons per day. About 40% of the water consumed on the Airport was used for washing vehicles in the ground transportation area. The Fiscal Year 1975 water consumption does not include water for landscaping because the pipes were in such poor condition that the sprinkler system has been closed down.

Water for the Airport is provided by the Kauai County Water Department via a six-inch water main along Ahukini Road. The water main is large enough to provide the forecast water requirements at the Airport (up to 180,000 gallons per day in 1995) as well as to maintain sufficient flows (1,000 gallons per minute for two hours) for fire protection.

The water distribution system on the Airport is in poor condition and averages two broken pipes a week. The State Department of Transportation has installed pressure-reducing valves on the line and replaced part of the system. Other lines, e.g., those formerly used for landscaping, have been abandoned.

Surface Water Runoff. To estimate a particular storm-induced surface water runoff, it is necessary to determine (1) reasonable rainfall-runoff coefficients for storms of various magnitudes and duration; and land management, vegetation, soils, and soil moisture conditions encountered. Because numerous factors influence rainfall-runoff coefficients and their consequent changes during a storm, general practice for small drainage areas is to base design and evaluation considerations on a uniform coefficient for a particular land use type and rainfall intensity range. Although they are not necessarily unilaterally transferable to Kauai, this analysis uses rainfall-runoff coefficients considered typical for Oahu, as presented in the City and County of Honolulu "Storm Drainage Standards."*

Since the Lihue area has three different soil series or classifications and permeabilities are diverse, rainfall-runoff coefficients are diverse. Thus, the coefficients are best determined using a method reported by the University of Hawaii's Hawaii Environmental Simulation Laboratory (HESL). This method is based primarily on an incorporation of U.S. Soil Conservation Service (SCS) data and the U.S. Weather Bureau "Rainfall-Frequency Atlas of the Hawaiian Islands."

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*Honolulu City and County, "Storm Drainage Standards," Honolulu, Hawaii, March 1969.

The SCS data use curve numbers obtained from empirical data including precipitation, soil and changing soil moisture, and vegetative cover information from the classification of thousands of soils throughout the nation. These soils are segregated into four groups--labeled A, B, C, and D--with Class A soils having the highest water intake rates and Class D the lowest. The curve numbers, which are modified for Hawaiian conditions, and presently considered "tentative" by SCS, only pertain to nonurban conditions. For urban conditions, the HESL method uses information published by Miller & Viessman.*

As previously mentioned, the Airport has a natural drainage area of 2,270 acres, but extensive crossing of irrigation systems over the subbasin boundaries complicates attempts to inventory water movement. The only immediate change to the overall drainage area at Lihue Airport will be the area covered by the Airport complex; therefore, the assumed change in surface water runoff and quality will be that of the incremental changes due to a transformation of land use from agriculture to Airport, and the respective differences in mode of operation. This approach assumes that the Airport complex

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*C. R. Miller, and W. Viessman, Jr., "Runoff Volumes from Small Watersheds," Water Resources Research, Vol. 8, No. 2, April 1972.

will be designed so that it does not interfere with the site's natural drainage courses.

The calculated existing rainfall-runoff coefficients for the Lihue Airport vicinity are based on the proposed Airport complex as provided by PMM&Co. Based on this information, the area to be developed for Airport use at Lihue consists of 69% Class B soils and 31% Class C soils.

Rainfall-runoff coefficients at the Lihue Airport site are presented in Table IV-4, for 1- and 24-hour storms at recurrent intervals of 1, 10, 50, and 100 years. Storms range from 1.9 to 16.7 inches per event with coefficients of 27% to 84% for Lihue. Corresponding rainfall-runoff coefficients for the completed Airport complex could be estimated using the HESL method; however, these determinations are not feasible until detailed engineering design and construction plans for the Airport are formulated. It would be expected, however, that the rainfall-runoff coefficients for the Airport complex would be quite high since a significant percentage of the area would be covered by essentially impervious material--runways, aprons, parking areas, roads, sidewalks, and roofs.

As noted in Exhibit G, Lihue Airport is not situated in a major drainage course. However, the site is located adjacent

Table IV-4

ESTIMATED 1975 RAINFALL-RUNOFF COEFFICIENTS FOR VARIOUS STORM EVENTS AT LIHUE AIRPORT

Storm* Duration (hours)	Storm Recurrence Interval (years)	Storm Quantity (inches/event)	Rainfall-Runoff Coefficient (percent)
1	1	1.9	27%
1	10	3.2	45
1	50	4.0	52
1	100	4.4	55
24	1	4.5	55
24	10	10.6	77
24	50	14.5	82
24	100	16.7	84

*From U.S. Weather Bureau, Rainfall-Frequency Atlas of the Hawaiian Islands,

Source: Environmental Communications, Inc., Inventory and Initial Analysis of Environmental Conditions and Concerns--Lihue Airport Master Plan Study (Honolulu, Hawaii: April 1975).

to Class A waters as designated by the State of Hawaii. Several small settling ponds have been constructed by Lihue Plantation Company adjacent to the coast to settle out solid materials before drainage water from the drainage basin, including the Airport, is discharged into the Ocean.

Water Quality. Incremental water quality changes that might result from converting agricultural land to Airport use cannot be precisely estimated because the investigators are not aware of published information qualifying storm water runoff from the Airport. Therefore, the subject is approached from a comparative point of view. Under agricultural cultivation, the major quality constituents would be suspended solids, nitrogen, phosphorus, and pesticide substitutions. In December 1972, R. C. Loehr* compiled the range of nitrogen and phosphorus levels for rural and agricultural land throughout the United States. Median value indicates that nitrogen values of about 3 pounds per acre per year and phosphorus outputs of one order of magnitude less could be expected. However, these values can change greatly depending on many factors, particularly land management. Suspended solids and pesticides vary considerably depending on conditions, and output information available to date covers a large spectrum.

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*R. C. Loehr, "Agricultural Runoff," ASCE Sanitary Engineering Division, Vol. 98, SA6, pp. 909-925, December 1968.

Suspended solids, nitrogen, phosphorus, and pesticide outputs from an airport complex would be low due to the high percentage of impervious covering and the Airport's mode of operation. If improperly handled, petroleum products and cleaning compounds could contribute to a decrease in surface runoff quality, but again, this aspect depends on the design of the washing and drainage facilities and their mode of operation. In general, the water quality constituents of the runoff from a well-managed airport complex would not create any problems.

During facilities construction, constituent loads could increase, especially if a significant storm occurs between earth moving operations and soil stabilization completion. The impact of construction activities can be minimized by adhering to strict erosion control measures, such as those specified in the City and County of Honolulu's Grading Ordinance,* and in the State of Hawaii Department of Health's Water Quality Standards, Chapter 37-A.**

Wastewater Disposal. In general, the characteristics of wastewater discharge from airport operations has not

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*City and County of Honolulu, "An Ordinance Relating to Grading, Grubbing, and Stockpiling," Ordinance No. 3968, Bill No. 101, Honolulu, Hawaii, 1972.

**State of Hawaii, Department of Health, "Water Quality Regulations," Chapter 37-A, Public Health Regulations, Honolulu, Hawaii, 1968.

been extensively examined; and in the specific case of the Lihue Airport, no study has delineated these characteristics except to note that wastewater is disposed by means of cesspools. The cesspool system at the Airport is totally inadequate to handle present wastewater flows and is currently in violation of both State and federal water quality standards. Because of the limited capacity of the Airport cesspool system, sewage effluent has to be removed and carried by trucks to other cesspools in the Lihue area. On average, over 30 truckloads (38,400 gallons) of sewage effluent had to be removed each week in the summer of 1975.

The physical chemical, and biological characteristics of airport terminal building wastewater resemble sanitary sewage from commercial and institutional facilities such as restaurants, hotels, dormitories, etc. Typically, these establishments generate wastes from food preparation, bathing and human elimination, and clean-up or washdown operations (using a number of different detergents).

Industrial-type wastes (used crank case oils, transmission fluids, grease, etc.) are generated in limited quantity, primarily by the ground transportation and general aviation operations which have maintenance facilities on the Airport. The residual oils, greases, and transmission wastes are put into containers and generally used for Airport fire drills.

There is no formal Airport program for disposing of residual oils. It is done on an individual basis with each ground transportation or general aviation fixed base operator responsible for removing the rest of the residual oils from the Airport.

V. ENVIRONMENTAL IMPACTS OF THE RECOMMENDED AIRPORT MASTER PLAN

Aircraft Noise

In determining the level of aircraft noise exposure associated with Lihue Airport, Noise Exposure Forecast (NEF) and Aircraft Sound Description System (ASDS) methodologies were used.

Aircraft Operations and Flight Paths. The principal impact of airport/aircraft operations is aviation noise. In 1974, some 192 takeoffs and landings occurred on an average day of the peak month at Lihue Airport. Some 82 (42%) of these operations involved air carrier jet aircraft (DC-9-30, B-737-200). On average, an additional 44 operations (23%) entailed multi-engine piston and turboprop aircraft (Heron, Dove, Twin Beech, Cessna 310); 58 operations (30%) were by light single-engine aircraft; and 9 operations (5%) were by helicopters.

By 1995, average day/peak month operations are forecast to increase to 281. Approximately 122 operations (43%) will be air carrier jet aircraft (DC-10, B-727-200), 70 operations (25%) will be multi-engine piston and turboprop aircraft, 72 operations (26%) will be light single-engine aircraft, and 17 operations (6%) will be helicopters.

Runway 3 accommodates approximately 90% of all aircraft operations at Lihue Airport, and Runway 21 accommodates the remaining 10%. During trade wind conditions (prevailing wind from the northeast), air carrier aircraft arrivals are from the south and east over Nawiliwili Harbor, turning northeast to Runway 3, while air taxi sightseeing arrivals are from the north, moving southeast over the Lihue town center before turning northeast to Runway 3. Departures during trade wind conditions are to the northeast over the Ocean. The pattern is reversed during Kona conditions (prevailing winds from the southwest) when aircraft arrivals are from the northeast, and departures are to the southwest, turning southeast as soon as possible toward the Kauai Channel.

The mountainous terrain on the south side of Nawiliwili Harbor dictates a tight, right-hand circling approach for air carrier aircraft landing on Runway 3. During Kona conditions, departing aircraft on Runway 21 make a tight left-hand turn away from the mountains immediately after takeoff. As a result, all air carrier aircraft arriving on Runway 3 and departing on Runway 21 fly over Kauai High School, Kauai Community College, residential areas, and the harbor area.

Calculating Aircraft Noise Exposure Levels. NEF is a method for predicting, by a single number rating, the cumulative noise intruding into airport communities from aircraft

operations. This single number rating is based on several factors that contribute to aircraft noise impact. These include:

- Type of aircraft
- Mix of these aircraft types in daily operation and their noise characteristics
- Number of aircraft operations and the time of day they occur
- Utilization of runways
- Flight paths used by arriving and departing aircraft

Since the NEF is determined by analyzing several factors related to aircraft noise, it cannot be simply measured by a mechanical device but must be generated through analytical means, usually with the aid of a computer. A computer program, developed by Bolt, Beranek, and Newman, Inc., under the auspices of the FAA, assimilates various data on aircraft operations and performance and generates NEF values for the airport and surrounding areas. These values, ranging from 25 to 55, in increments of five, form closed contours along the line of the aircraft flight paths and indicate guidelines for community planning and development.

Land Use Interpretations. Estimates of "total" noise exposure resulting from aircraft operations, as expressed in NEF values, can be interpreted in terms of the probable impact on land uses, utilizing the guide summarized in Table V-1. These guides, developed by Wilsey & Ham and Bolt, Beranek & Newman for the U.S. Department of Housing and Urban Development,* are based on the following major considerations:

- Accumulated case history experience of noise complaints near civil and military airports
- Speech interference criteria
- Subjective judgment tests of noise acceptability and relative "noisiness"
- Need for freedom from noise intrusions
- Typical noise insulation provided by common types of building construction

Each of the generalized land uses listed in Table V-1 encompasses a wide range of human activities having various sensitivities to noise intrusions. Hence, the interpretation of NEF values in Table V-1 should be used only as an indication of the effect aircraft noise has on people living and working

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*Wilsey & Ham and Bolt, Beranek & Newman, Aircraft Noise Impact, Planning Guidelines for Local Agencies, prepared for The U.S. Department of Housing and Urban Development (Washington, D.C.: November 1972) pp. 15-75.

Table V-1

LAND USE COMPATIBILITY GUIDELINES
FOR AIRCRAFT NOISE ENVIRONMENTS

Land Use Category	SLUCM[a] Code	Compatible NEF Contour Value	Compatible NEF Contour Value with Special Sound Attenuating Construction
Residential--Single-Family, Duplex, Mobile Homes	11x	NEF 25	NEF 30
Residential--Multiple-Family, Dormitories, etc.	11x, 12, 13, 19	NEF 25	NEF 30
Transient Lodging	15	NEF 30	NEF 35
Schools, Classrooms, Libraries, Churches	68, 7111	NEF 25	--
Hospitals, Nursing Homes	651	NEF 25	--
Auditoriums, Concert Halls, Music Shells	721	NEF 25	--
Sports Arenas, Outdoor Spectator Sports	722	NEF 30	NEF 35
Playgrounds, Neighborhood Parks	761, 762	NEF 30	--
Golf Courses, Riding Stables, Water Recreation, Cemeteries	741x, 743x, 744	NEF 35	--
Office Buildings, Personal Business and Professional	61, 62, 63 65, 69	NEF 30	NEF 35
Commercial--Retail, Movie Theaters, Restaurants	53, 54, 56, 57, 59	NEF 35	NEF 40
Commercial--Wholesale, Some Retail, Industrial, Manufacturing, Utilities	51, 52, 64 2, 3, 4	NEF 40	NEF 45
Manufacturing, Communications (noise sensitive)	35, 47	NEF 30	NEF 35
Livestock Farming, Animal Breeding	815, 816, 817	NEF 35	--
Agricultural (except livestock), Mining, Fishing	81, 82, 83, 84, 85, 91, 93	NEF 40+	--
Public Right-of-Way	45	NEF 40+	--
Extensive Natural Recreation Area	91, 92, 93, 94, 7491, 75	NEF 35	--

a. Standard Land Use Coding Manual.

Source: PMM&Co. adaptation from Wilsey & Ham and Bolt, Beranek & Newman, Airport Noise Impact--Planning Guidelines for Local Agencies, HUD, November 1973.

in areas surrounding an airport. Although specific NEF values are obtained, they do not dictate certain consequences (NEF values are considered accurate to about ±5) but are merely intended to guide the community in land use development. With reference to a specific site, some adjustments in NEF values or interpretations may be desirable. Typical influences considered by Wilsey & Ham and Bolt, Beranek & Newman include:

- Previous community experience and previous complaint history in the immediate vicinity of the airport in question.

- Local building construction, particularly as influenced by climatic considerations. In northern portions of the U.S., wall and roof construction may be slightly heavier and houses are likely to be more tightly constructed, thus reducing the extent of noise leakage paths. In addition, windows are typically kept closed for a larger portion of the year, and less use is made of outdoor areas. On this basis, one might select a higher NEF value as the boundary for noise compatibility interpretation, rather than a lower NEF value range which might be suitable for a warmer climate.

- Impact of urban or surface transportation noise sources on the existing noise environment. For example, the introduction of aircraft noise in a rural area where existing background noise levels are very low would produce a much more apparent change in noise environment than would the initiation of aircraft operations in a dense urban area long exposed to surface traffic noise. Background noise levels in specific local situations may warrant adjustments in the noise compatibility interpretation boundaries.

- Time period of land use activities. The basic NEF values consider both daytime and nighttime operations, with a heavier weighting factor applied for the latter.

The standard interpretation of NEF values has been adjusted for the Lihue Airport area. Initially, the guidelines in Table V-1 were applied to the Lihue Airport environs. However, field investigations and citizen comments at a scheduled public information session showed that (1) local residential construction, while suitable for the tropical climate, is lighter and more open than Mainland construction and, thus, has lower sound attenuating properties; and (2) the ambient background noise level is lower than in an average urban environment because

Lihue is a relatively small semirural community without heavy vehicular traffic or other major sources of noise. Although the NEF 30 contour is the usual boundary for noise sensitive uses, local conditions indicate that the NEF 25 contour represents a more meaningful permissible boundary in the Lihue area.

Table V-2 compares Kauai County zoning districts with the NEF levels. As shown, all land uses are permitted in areas currently exposed to NEF values of 25 or less. Resort-residential areas are permitted in the NEF 25 to 30 range, while commercial businesses can be located in the NEF 30 to 35 range. Industrial uses are permitted in the NEF 40 to 45 range.

While agriculture and open space are not really limited by noise exposure, agricultural pursuits which involve livestock or animal breeding are sensitive to noise and should be restricted to areas below NEF 35. Likewise, it is not desirable to use open space for passive recreational purposes if the noise exposure exceeds the NEF 35 guidelines.

Limitations of NEF Process. The NEF process represents nothing more than a general planning guide for land development and land use in the vicinity of a busy airport.

Table V-2

KAUAI COUNTY ZONING COMPATIBILITY
WITH AIRCRAFT NOISE ENVIRONMENTS

NEF Contour Value	Compatible Zoning District[a]	Zoning Districts Permitted with Sound Attenuating Construction
Less than NEF 25	All Zoning Districts	
NEF 25 to NEF 30	RR-10, RR-20	R-1, R-2, R-4, R-6, R-10, R-20
NEF 30 to NEF 35	CN, CG	RR-10, RR-20
NEF 35 to NEF 40	--	CN, CG
NEF 40 to NEF 45	IL, IG,	—
NEF 45+	A, O	IL, IG

a. Compatible NEF contour applies to principal allowed use only.

Source: PMM&Co.

A particular NEF contour cannot indicate the actual amount of aircraft noise that a given parcel of property is currently subjected to, or may be subjected to in the future. This is because NEF contours typically result from estimates and generalizations of aircraft categories, mix of aircraft, runway utilization, number and time of operations, flight paths, noise levels in Effective Perceived Noise Decibels (EPNdB), and atmospheric conditions.

For these and other reasons, PMM&Co. cautions that the various NEF contour conditions discussed herein cannot be used as evidence of the degree and nature of aircraft noise exposure that is, or may be, associated with a particular parcel of property--especially if the use is for the purpose of proving a taking or damage.

In a positive sense, however, NEF contours can be utilized to (1) highlight an existing or potential aircraft noise problem that requires attention; (2) assist in the preparation of airport environs land use plans; and (3) provide guidance in the development of land use control devices such as zoning ordinances, subdivision regulations, and building codes.

Moreover, NEF values form the basis for noise standards currently recognized by the U.S. Department of Housing and Urban

Development (HUD) relative to the agency's various assistance programs. For instance, Federal Housing Authority (FHA) approval of housing developments that fall within certain NEF zones* adjacent to or near airports has been denied in several locations. Denial tends to reinforce local efforts to maintain a low density, compatible land use pattern where appropriate within the airport environs.

Noise Impacts of Current Operations. In developing 1974 NEF 25, NEF 30, and NEF 40 contour lines for Lihue Airport, PMM&Co. utilized flight paths that represent typical flight patterns followed by aircraft using the Airport at the present time. As plotted, all NEF contours are based on DC-9, B-737, Heron, Dove, Twin Beech, Cessna 310, and Cessna 150 aircraft. 1974 levels of aircraft activity are those recorded by the Lihue FAA control tower.

Based on the average day of the peak month level of operations at Lihue Airport in 1974, NEF 25, NEF 30, and NEF 40 noise contours are illustrated in Exhibit I. The 1974 NEF 40 line extends in a curve to the southwest and then east approximately 2 miles from the end of Runway 3 and encompasses approximately 12 homes, Kauai High School, and Kauai Community College. The

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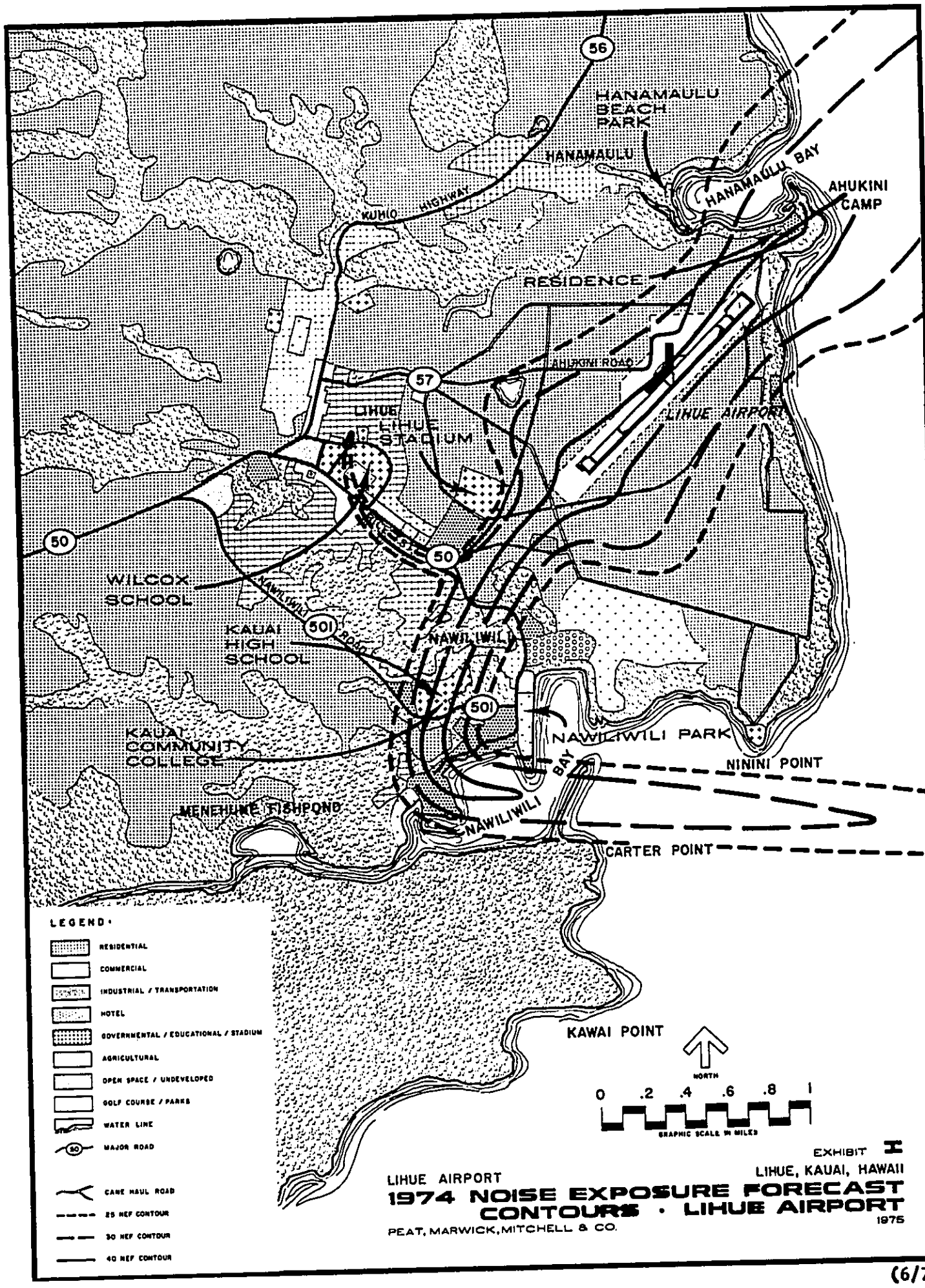
*U.S. Department of Housing and Urban Development, Noise Abatement and Control: Departmental Policy, Implementation Responsibilities, and Standards (Circular #1390.2), August 1971 (as amended September 1, 1971).


56
HANAMAULU BEACH PARK
HANAMAULU
HANAMAULU BAY
AHUKINI CAMP
KUHIO HIGHWAY
RESIDENCE
AHUKINI ROAD
57
LIHUE AIRPORT
LIHUE STADIUM
50
WILCOX SCHOOL
KAWILIWILI
501
ROAD
KAUAI HIGH SCHOOL
NAWILIWILI
501
NAWILIWILI PARK
NININI POINT
BAY
KAUAI COMMUNITY COLLEGE
MENEHUNE FISHPOND
NAWILIWILI
CARTER POINT
KAWAI POINT
NORTH
0 .2 .4 .6 .8 1
GRAPHIC SCALE IN MILES
LEGEND:
RESIDENTIAL
COMMERCIAL
INDUSTRIAL / TRANSPORTATION
HOTEL
GOVERNMENTAL / EDUCATIONAL / STADIUM
AGRICULTURAL
OPEN SPACE / UNDEVELOPED
GOLF COURSE / PARKS
WATER LINE
MAJOR ROAD
CANE HAUL ROAD
25 NEF CONTOUR
30 NEF CONTOUR
40 NEF CONTOUR
EXHIBIT I
LIHUE, KAUAI, HAWAII
LIHUE AIRPORT
1974 NOISE EXPOSURE FORECAST CONTOURS · LIHUE AIRPORT
1975
PEAT, MARWICK, MITCHELL & CO.

(6/76)

1974 NEF 30 contour extends approximately 3.75 miles to the southwest and then east and affects approximately 24 homes, while the 1974 NEF 25 extends 5.1 miles and encompasses about 60 homes. Although noise exposure to the northeast of the Airport is greater than to the southwest, aircraft flight paths are over open Ocean waters; therefore, the flights produce no adverse impact at present, except on one residence at Ahukini Landing which is just outside the NEF 40 contour.

The principal adverse noise impact associated with Lihue Airport involves Kauai High School, Kauai Community College, and certain residential areas. As with residential development, educational uses should not have an exposure in excess of NEF 25. Given the lighter, more open building construction found on Kauai, noise exposure levels in excess of NEF 25 indicate a frequency of overflights and proximity to the ground that results in speech interference and disruption of classroom activities. This is particularly true of aircraft operations at Lihue Airport which coincide with the hours of school sessions.

As illustrated by Exhibit I, Kauai High School falls within the NEF 40 contour for aircraft arrivals on Runway 3 at Lihue Airport. Since Runway 3 is used about 90% of the time, aircraft traffic is frequent throughout the day and during most of the year. Both the high school and the homes nearby are

extremely incompatible uses relative to aircraft noise exposure.

Air taxi and general aviation aircraft (including Heron, Dove, Twin Beech, and light single-engine aircraft) arrivals on Runway 3 approach primarily from the north. Although the noise levels of air taxi and general aviation aircraft are much lower than commercial jets, the high frequency of operations generates both an NEF 25 and NEF 30 contour. Approximately 20 homes are within the air taxi and general aviation aircraft NEF 30 contour, and about 25 homes and the Wilcox Elementary School are in the area between the NEF 25 and NEF 30 contours. As noted previously, there is no disruption of classroom activity by aircraft noise at Wilcox Elementary School.

Noise Impacts of Recommended Airport Master Plan. The recommended Master Plan for Lihue Airport retains Runway 3-21 and proposes development of a new north-south runway (Runway 17-35) to the east of the existing airfield. Under this Plan, the two runways form a "V" configuration, and there would be a preferential runway use system. During trade wind conditions, air carrier jet arrivals would be overwater from the south using the new Runway 35, while air carrier departures would continue on Runway 3 overwater to the northeast. During Kona conditions, the pattern would be reversed with air carrier arrivals overwater from the northeast using existing Runway 21, and departures to the south overwater using new Runway 17.

As noted, the recommended Plan emphasizes mitigation of existing adverse noise impacts on Kauai High School and adjacent residential areas south of the Airport. Construction of a new north-south runway, thereby maximizing overwater arrivals and departures of air carrier jet aircraft, will eliminate the most significant adverse noise impacts. As depicted on Exhibit J, the arrival contours which formerly passed over Kauai High School are shifted to the new runway and extended overwater south of Ninini Point. The departure contour from existing Runway 3 still extends to the northeast but is somewhat narrower in width because of the introduction of quieter aircraft.

The NEF 25 and 30 contours, presently resulting from air taxi and general aviation aircraft operations and extending southwest of the Airport, will be eliminated as the larger air taxi aircraft (Heron, Dove, and Twin Beech) shift operations to the new Runway 17-35. The smaller, single-engine general aviation aircraft which will continue to use Runway 3 do not produce sufficient noise to generate either an NEF 25 or NEF 30 contour.

The 1995 NEF contours are considered compatible with the Airport environs provided that present agricultural land use patterns are maintained.

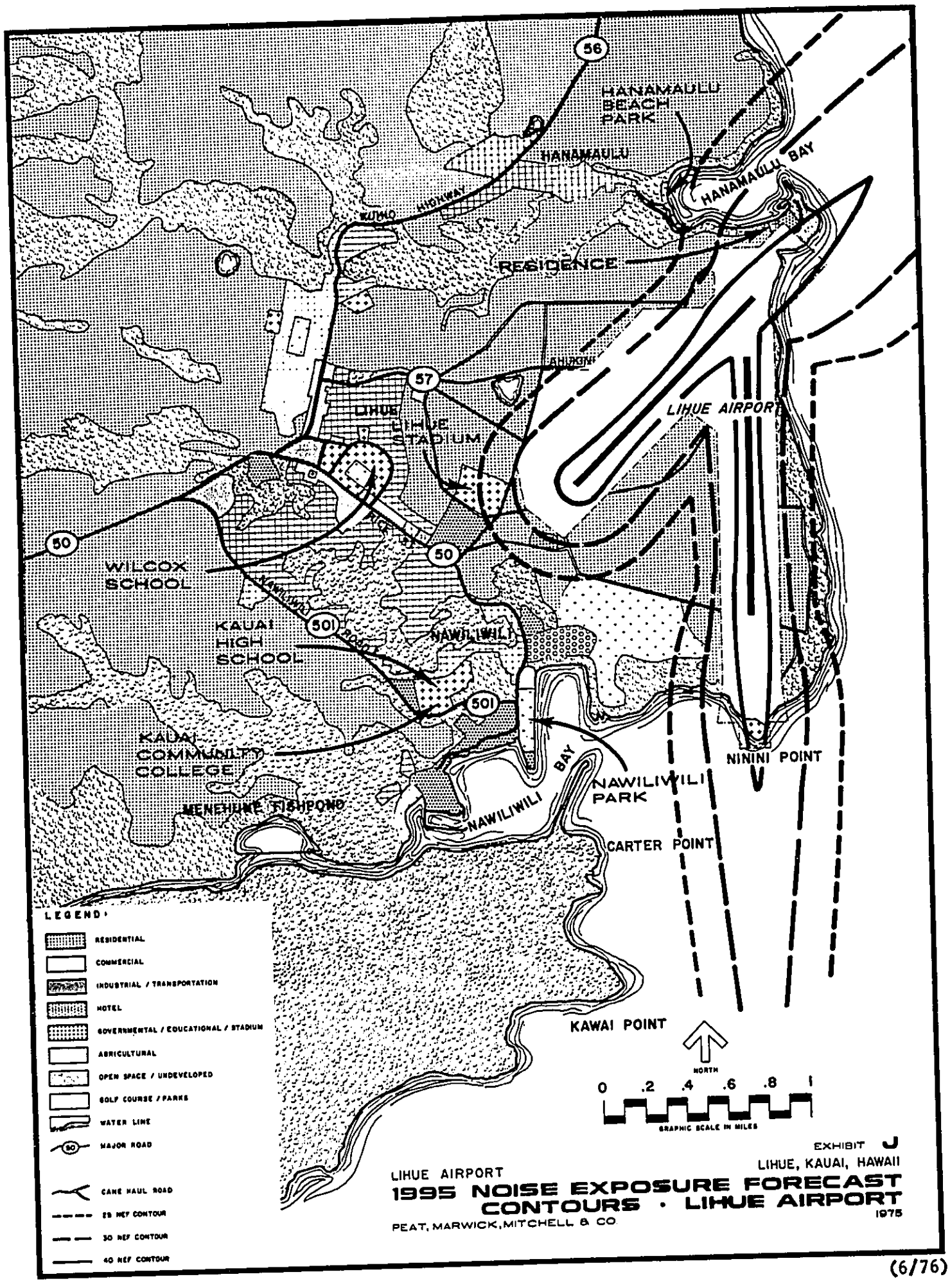


EXHIBIT J

LIHUE, KAUAI, HAWAII

LIHUE AIRPORT

1995 NOISE EXPOSURE FORECAST CONTOURS · LIHUE AIRPORT

1975

PEAT, MARWICK, MITCHELL & CO.

(6/76)

Aircraft Sound Description System. The aircraft Sound Description System (ASDS)* was also used in performing the Lihue Airport noise analysis. ASDS provides a conceptually simple method for characterizing aircraft noise near airports. The technique determines the total amount of time that the sound level resulting from aircraft operations exceeds 85 decibels as measured on the A-weighted scale [dB(A)]. Closed contours representing the 85 dB(A) "footprint" for each aircraft type using the airport are plotted. The result is a graphic display of the total time (in minutes) areas in the

*U.S. Department of Transportation, Federal Aviation Administration, Aircraft Sound Description System (ASDS) Application Procedures, Volume II - Manual Application Procedures, Report FAA-EQ-74-2, II (Washington, D.C.: March 1974).

airport vicinity are exposed to noise levels in excess of 85 dB(A). In addition, a "Situation Index," which states total noise exposure in acre-minutes, can be developed.

ASDS values have not yet been correlated with specific land uses and, therefore, have a limited application in determining land use compatibility for an airport vicinity. However, the ASDS methodology is very useful for comparing the aircraft noise impact of alternative airfield configurations or flight patterns. As noted, the present single runway airfield configuration at Lihue Airport with attendant aircraft approach and departure paths creates adverse noise impacts in the vicinity of Kauai High School, Kauai Community College, and nearby residential areas. The recommendation in the Airport Master Plan for a north-south runway is designed to eliminate these adverse noise impacts. The ASDS methodology has been utilized to measure the potential noise reduction expected to occur after the new runway is in use.

The basic assumptions used in developing ASDS contours* are essentially the same as those used for the NEF contours, except

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*Department of Transportation, Federal Aviation Administration, Aircraft Sound Description System (ASDS) Application Procedures, Volume III - Data Tables, Report FAA-EQ-74-2 (Washington, D.C.: September 1974)

that only air carrier operations were used. General aviation operations were not applied because their "footprints" do not extend beyond the proposed Airport boundaries. Levels of air carrier operations and aircraft flight paths remain the same as in the NEF analysis. A goal of the master planning effort was to reduce adverse noise impacts by maximizing overwater flights, and the Situation Index was computed to reflect this condition.

The ASDS contours for 1974 levels of air carrier operations at Lihue Airport are illustrated on Exhibit K. Average daily noise exposure in excess of 85 dB(A) ranges from 1 minute or less in the Nawiliwili Harbor area, to 5 to 8 minutes in the Kauai High School vicinity, and over 10 minutes within the existing Lihue Airport boundaries. The 1974 Situation Index, including overwater portions of the air carrier arrival and departure paths, was computed as 31,980 acre-minutes of exposure. However, when overwater portions of the ASDS contours and Airport property were excluded, the Situation Index decreases to 6,022 acre-minutes of exposure.

Exhibit L illustrates the ASDS air carrier aircraft contours for 1995. As shown on this exhibit, noise exposure levels in excess of 85 dB(A) are eliminated in the Kauai High School vicinity and Nawiliwili Harbor area. The Situation Index for

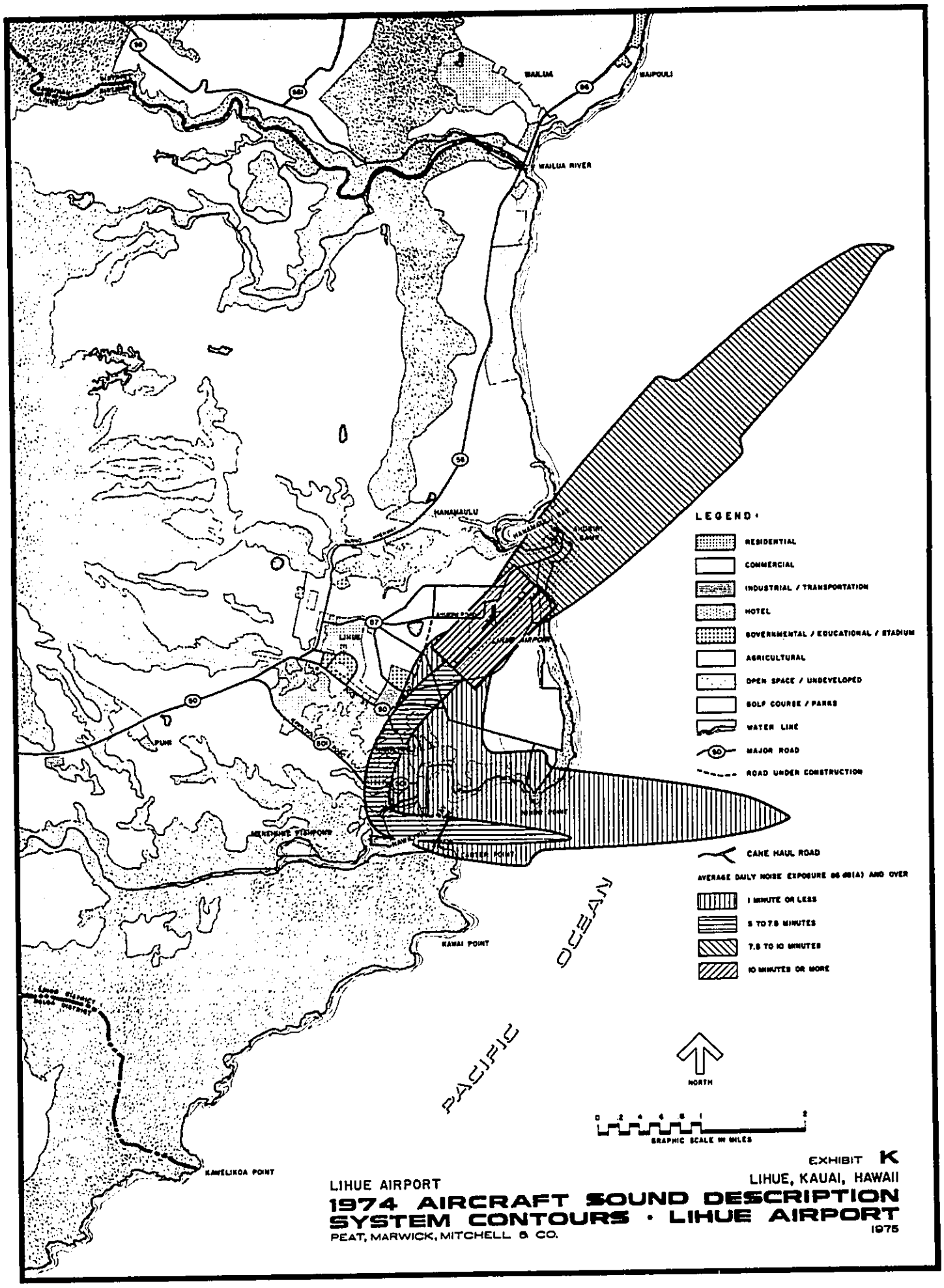

EXHIBIT K

LIHUE AIRPORT

LIHUE, KAUAI, HAWAII

1974 AIRCRAFT SOUND DESCRIPTION SYSTEM CONTOURS · LIHUE AIRPORT

PEAT, MARWICK, MITCHELL & CO.

1975

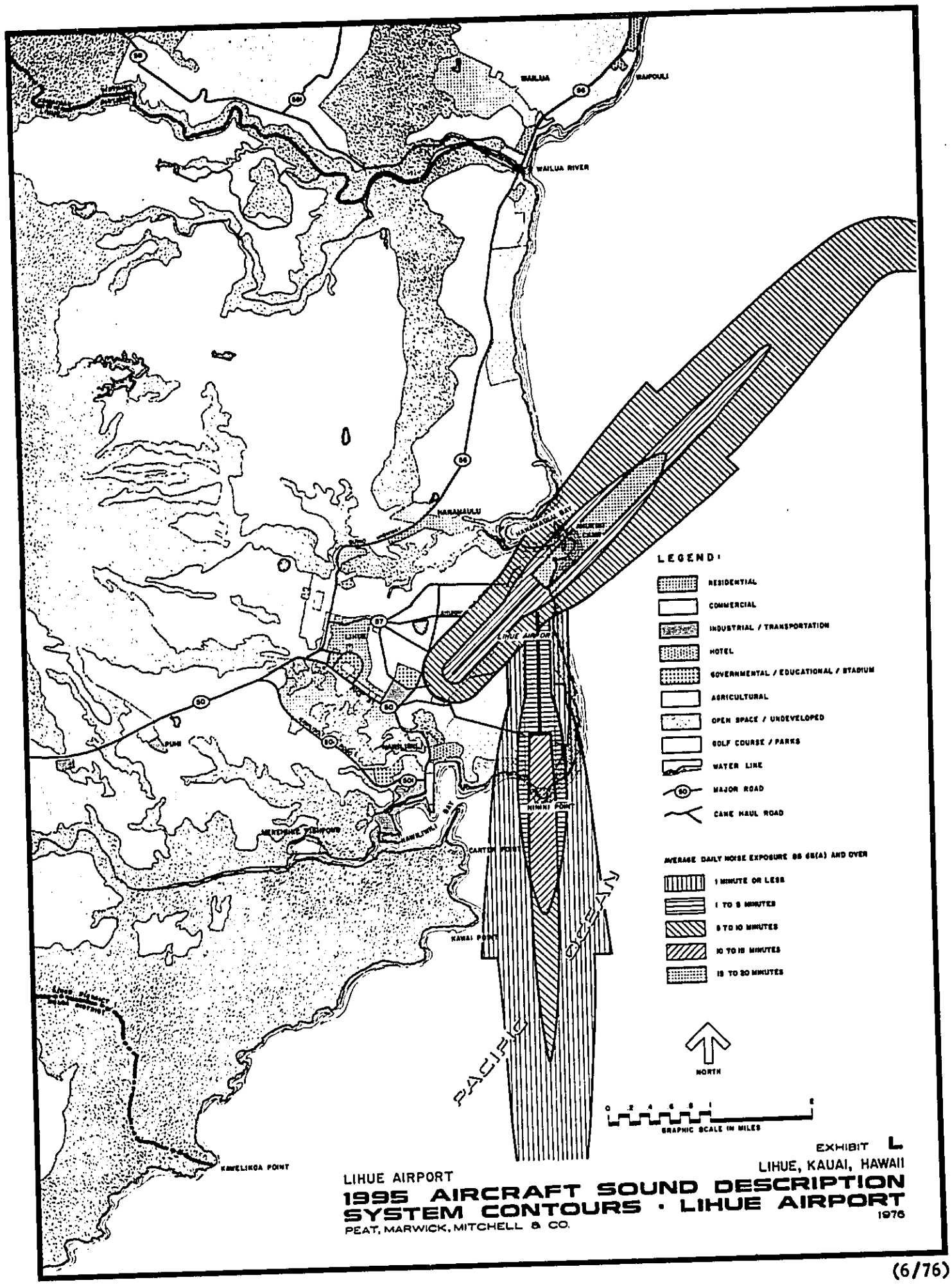

EXHIBIT L

LIHUE, KAUAI, HAWAII

LIHUE AIRPORT

1995 AIRCRAFT SOUND DESCRIPTION SYSTEM CONTOURS · LIHUE AIRPORT

1976

PEAT, MARWICK, MITCHELL & CO.

(6/76)

1995 including overwater portions of the flight paths is 36,049 acre-minutes of exposure. The elimination of the overwater portions of the ASDS contours and all property within the recommended 1995 Airport boundaries reduces the 1995 Situation Index to 1,626 acre-minutes of exposure. Therefore, based on the ASDS technique, the recommended Airport Master Plan significantly reduces noise exposure levels in excess of 85 dB(A) on present or future areas of urban development in the Lihue Airport vicinity.

Air Quality*

The purpose of the air quality analyses conducted as part of this report is to assess the potential impact on air quality within, and in the vicinity of, the Lihue Airport under the most adverse meteorological conditions. Two options were considered, each of which was oriented to peak hour air and ground traffic forecasts of future activity. These options were (1) what levels of air pollutants can be expected if the existing airport is not significantly changed by 1995?; and (2) what levels of air pollutants can be expected if the Master Plan is implemented as proposed?

Highest air pollutant concentrations at an airport can be expected to occur during peak hour operations; this report therefore limits its scope to a peak hour air analysis.

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*Air quality analysis was prepared by Environmental Communications, Inc.

Since particulates and sulfur oxides are only emitted in small quantities by both air and ground transportation sources, a detailed listing of such emissions and resulting concentrations has not been included in this report. A few sample computations indicate tht concentrations of these pollutants--even within the Airport area only--would be insignificant compared to State ambient air quality standards.

As for other primary air pollutants (carbon monoxide, hydrocarbons, and nitrogen oxides), a detailed analysis of peak hour aircraft emissions has been made for the following years: 1974, 1980, 1985, and 1995. Based on these emission values and the proposed Master Plan development schedule, air pollutant concentrations for the above-mentioned pollutants were computed for two years, 1980 and 1995.

Airports are associated with air pollution in two ways. First, there are emissions from operations that occur within the Airport proper. Second, there are emissions that occur outside the Airport boundary, but are induced by activities taking place within the Airport (e.g., increased tour bus traffic between hotels and the Airport).

Only those impacts from activities occurring within the Airport boundary have been considered as part of this report. Furthermore, with regard to receptor points outside the

Airport boundaries, modeling has been carried out for carbon monoxide only. This is due to the fact that hydrocarbons and nitrogen oxides react with other constituents of the atmosphere, and simple models of air pollution diffusion cannot adequately describe such reactions.

Within the delineated Airport boundary, existing and proposed new passenger terminal sites were selected as receptor points for air quality models and short-term hydrocarbon and nitrogen dioxide concentrations were predicted for these sites.

In a recent report to the Environmental Protection Agency (EPA),* the Argonne National Laboratory has outlined the following as activities typically associated with air pollutant emissions that occur within the boundaries of an airport:

1. Aircraft operations
2. Ground service vehicle operations
3. Access traffic
4. Fuel distribution
5. Point sources within the Airport

Based on the above categorization of activities, emissions from each type were evaluated and their potential contribution to air quality within or in the vicinity of the Lihue

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*Argonne National Laboratory, Center for Environmental Studies, An Air Pollution Impact Methodology for Airports, Phase 1, Report prepared for EPA, January 1973.

Airport were evaluated. It should be noted that only aircraft and access traffic functions are expected to have any impact outside the Airport boundaries.

Aircraft Emissions. Estimated peak hour aircraft departures and arrivals are shown in Table V-3, as derived from estimates of the total peak hour operations per aircraft type. In all cases, departures are likely to create more air pollution than arrivals. Thus, where an odd number of peak hour operations was estimated, the extra operation was considered to be a departure. Otherwise, operations were equally divided between arrivals and departures.

Modal emission factors for different types of aircraft are shown in Table V-4. Emissions for single-engine piston aircraft were assumed to be adequately represented by those factors listed for a general aviation piston engine (Lycoming 0-320), as listed in EPA's volume AP-42.* However, this type of engine is too small to be used on most multi-engine aircraft. In fact, the EPA publication does not provide any good estimates of modal emissions for multi-engine piston aircraft.

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*U.S. E.P.A., Compilation of Air Pollutant Emission Factors, AP-42, 2nd Edition, February 1976.

Table V-3

ESTIMATED PEAK HOUR AIRCRAFT DEPARTURES AND ARRIVALS
Lihue Airport, Kauai, Hawaii

Aircraft Type	No. of Engines	Type of Operation	Year 1974	1980	1985	1995
DC-10	3	arrivals	--	--	--	3
		departures	--	--	--	4
B-727	3	arrivals	--	--	3	3
		departures	--	--	4	4
DC-9	2	arrivals	3	3	1	--
		departures	4	3	2	--
B-737	2	arrivals	2	3	1	--
		departures	2	3	2	--
Piston	4	arrivals	1	1	1	1
		departures	1	1	1	1
Piston	2	arrivals	2	2	2	3
		departures	2	2	3	3
Piston	1	arrivals	4	4	4	4
		departures	4	4	4	4
Helicopter	2	arrivals	--	1	1	1
		departures	--	1	1	1

Source: Peat, Marwick, Mitchell & Co.

Table V-4

MODAL EMISSION FACTORS (PER ENGINE) FOR AIRCRAFT TYPES
(kg/hr)

Aircraft Type	Mode	Pollutant CO	HC	NO_x
Jumbo Jet[a] (DC-10)	Taxi-idle	46.3	12.4	2.75
	Takeoff	3.76	1.34	327.0
	Climbout	5.31	1.20	208.0
	Approach	14.8	1.36	24.5
Medium Range Jet[a] (B-727, B-737, DC-9)	Taxi-idle	15.2	3.71	1.32
	Takeoff	3.40	0.353	89.8
	Climbout	4.03	0.418	59.4
	Approach	8.26	0.794	14.0
Multi-Engine Piston[b]	Taxi-idle	17.4	1.11	.035
	Takeoff	117.5	4.67	.58
	Climbout	113.4	4.10	1.02
	Approach	45.8	1.55	.14
General Aviation Piston[a]	Taxi-idle	5.03	0.161	0.006
	Takeoff	32.2	0.676	0.097
	Climbout	29.8	0.594	0.170
	Approach	11.0	0.225	0.023

Source:

a. U.S. E.P.A., Compilation of Air Pollutant Emission Factors, AP-42, 2nd Edition, February 1976.
b. Morrow, J., "Air Quality Impact Assessment for the Proposed General Aviation Airfield, Island of Oahu," research report, undated.

(11/76)

Emission estimates for this type of aircraft are thus based on other sources. In a recent research report, J. Morrow has estimated modal emissions from a 450 hp Pratt & Whitney R985AN-14B engine.*

This engine is probably too large for some of the twin engine aircraft operating or forecast to be operating at Lihue Airport, but it is a more reasonable engine size to use for both 4-engine and 2-engine aircraft than would be the smaller unit listed in EPA's AP-42.

Typical times in mode for a landing and takeoff (LTO) cycle at a major metropolitan airport are listed in Table V-5. In most cases, such typical times cannot be realistically applied to a secondary airport such as Lihue. Even the 1995 forecasts indicate that the Airport should not experience long lines of aircraft waiting to take off or to taxi in from a landing operation. With no significant aircraft congestion now or in the future, it thus seems reasonable to reduce the Table V-5 times in mode by at least 50%. This yields the estimated times in mode utilized for Lihue Airport as shown in Table V-6.

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*Morrow, J., "Air Quality Impact Assessment for the Proposed General Aviation Airfield, Island of Oahu," research report, undated.

Table V-5

TYPICAL TIME IN MODE FOR LTO CYCLE
AT A MAJOR METROPOLITAN AIRPORT
(Minutes)

Aircraft Type	Taxi-idle (out)	Takeoff	Land	Taxi-idle (in)
Jumbo Jet	19.0	0.7	--	7.0
Medium Range Jet	19.0	0.7	--	7.0
Piston Transport	6.5	0.6	--	6.5
General Aviation Piston	12.0	0.3	--	4.0
Helicopter	3.5	--	--	3.5

Source: U.S. E.P.A., Compilation of Air Pollutant Emission Factors, AP-42, Edition, February 1976.

Table V-6

ESTIMATED TIME IN MODE FOR AIRCRAFT
AT LIHUE AIRPORT
(Minutes)

Aircraft Type	Taxi-idle (out)	Takeoff	Land	Taxi-idle (in)
DC-10, B-727, DC-9, B-737	10.0	0.7	0.7	4.0
2 & 4 Engine Piston	10.0	0.6	0.6	4.0
1 Engine Piston	6.0	0.3	0.3	4.0
Helicopter	3.5	--	--	3.5

Source: Environmental Communications, Inc.

Table V-7

ESTIMATED PEAK HOUR AIRCRAFT EMISSIONS AT LIHUE AIRPORT
(kg)

Departures

Aircraft Type	1974			1980			1995 Without Controls			1995 With Federal Emission Controls		
	CO	HC	NO_x	CO	HC	NO_x	CO	HC	NO_x	CO	HC	NO_x
DC-10	--	--	--	--	--	--	93.1	25.0	51.3	37.2	3.8	33.3
B-727	--	--	--	--	--	--	30.9	7.6	15.4	12.4	1.1	10.0
DC-9	20.7	4.8	1.0	15.5	3.6	0.8	--	--	--	--	--	--
B-737	10.4	2.4	0.5	15.5	3.6	0.8	--	--	--	--	--	--
4-Engine Piston	16.2	0.9	0.04	16.2	0.9	0.04	16.2	0.9	0.04	8.1	0.6	0.04
2-Engine Piston	16.2	0.9	0.04	16.2	0.9	0.04	24.3	1.4	0.06	12.2	1.0	0.06
1-Engine Piston	0.7	0.1	--	0.7	0.1	--	0.7	0.1	--	0.4	0.1	--
Total	64.2	9.1	1.6	64.2	9.1	1.6	165.2	35.0	66.8	70.3	6.6	43.4

Table V-7 (continued)

ESTIMATED PEAK HOUR AIRCRAFT EMISSIONS AT LIHUE AIRPORT
(kg)

Arrivals

Aircraft Type	1974			1980			1995 Without Controls			1995 With Federal Emission Controls		
	CO	HC	NO_x	CO	HC	NO_x	CO	HC	NO_x	CO	HC	NO_x
DC-10	--	--	--	--	--	--	29.4	7.6	4.3	11.8	1.1	2.8
B-727	--	--	--	--	--	--	10.0	2.4	2.3	4.0	0.4	1.5
DC-9	6.7	1.5	1.0	6.7	1.5	1.0	--	--	--	--	--	--
B-737	4.4	1.0	0.6	6.7	1.5	1.0	--	--	--	--	--	--
4-Engine Piston	6.5	0.3	--	6.5	0.3	--	6.5	0.3	--	3.3	0.2	--
2-Engine Piston	6.5	0.3	--	6.5	0.3	--	9.8	0.5	--	4.9	0.4	--
1-Engine Piston	1.6	--	--	1.6	--	--	1.6	--	--	0.8	--	--
Total	25.7	3.1	1.6	28.0	3.6	2.0	57.3	10.8	6.6	24.8	2.1	4.3

Arrivals and Departures

	1974			1980			1995 Without Controls			1995 With Federal Emission Controls		
	CO	HC	NO_x	CO	HC	NO_x	CO	HC	NO_x	CO	HC	NO_x
Grand Total	89.9	12.4	3.2	92.2	12.7	3.6	222.5	45.8	73.4	95.1	8.7	47.7

Source: Environmental Communications, Inc.

Total peak hour emissions from fixed wing aircraft have been computed using the latter times in mode and the other information previously described. These emissions are listed in Table V-7; they all represent ground-based emissions and do not include emissions occurring on climb-out or approach which are separately treated later in the report.

Table V-7 shows the predicted impact of federal aircraft emission standards on 1995 emissions. These standards are applicable for all aircraft operating after 1983 and include the following percentage reductions by engine type:*

- JT8D, JT9D (B-727, DC-10)--CO reduced by 50%; HC reduced by 85%; NO_x reduced by 35%.
- All piston aircraft--CO reduced by 50%; HC reduced by 30%.

All 1995 aircraft-related pollutant concentrations for Lihue Airport are based on those predicted emission reductions.

Helicopter Operations. Emissions from helicopter operations will not occur on the runway, but at special helipads. The existing helipad area at Lihue Airport is some 43 meters square, and about 150 meters distant from the existing passenger terminal. The proposed Master Plan indicates that the new helipad would be located about 600 meters from the proposed

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*Federal Register, Vol. 38, pp. 19088 to 19103, July 17, 1973.

new passenger terminal scheduled for development after 1980. In both cases, emissions from helicopters would reach the terminal buildings only under wind conditions that would direct pollutants from other aircraft away from the terminal sites. Thus, pollutant concentrations from fixed wing aircraft and helicopters would not be additive.

Predicted emissions and pollutant concentrations from peak hour helicopter operations are shown in Table V-8. The emission value assumes that one-third of helicopter-generated emissions occur while the equipment is on the ground and that total emissions for one LTO are 2.6 kg of CO, 0.24 kg of HC, and 0.26 kg of NO_x.

Pollutant concentrations for Lihue Airport are based on a Gaussian area source model with an emission area equal to the existing helipad. Although a helicopter could be treated as a point source, the nature of its operation is such that any pollutants emitted are very quickly mixed with the atmosphere of the emission site. It thus seemed more reasonable to treat these emissions as if they were emanating from the helipad area. For downwind diffusion conditions, a wind speed of 1 m/sec and stability Catégory F were assumed. These are extremely conservative atmospheric assumptions. For receptor sites outside the Airport, pollutant concentrations from helicopter operations would be insignificant (e.g., <0.1 mg/m^3).

Table V-8

PEAK HOUR EMISSIONS AND POLLUTANT CONCENTRATIONS
FROM HELICOPTER OPERATIONS AT LIHUE AIRPORT

Pollutant	Emissions (kg/hr)	Concentrations	
		Existing Terminal (1980)	Proposed New Terminal (1995)
CO	1.73	3.03 mg/m^3	0.76 mg/m^3
HC	0.16	280 $\mu g/m^3$	54.9 $\mu g/m^3$
NO_x	0.17	303 $\mu g/m^3$	59.4 $\mu g/m^3$

Source: Environmental Communications, Inc.

Pollutant Concentrations from Airborne Aircraft. Emissions generated by climb-out and approach activities were not tabulated with the ground-based emissions in Table V-7 because these different emission sources cannot be treated in the same fashion in an air pollution diffusion model. Each of the aircraft operating at Lihue Airport will have a slightly different climbout and approach pattern. As a consequence, such emissions will occur at different spatial locations. The three dimensional aspect of this emission pattern greatly complicates modeling efforts.

It is possible, however, to show that air pollutant concentrations on the ground from airborne aircraft are small enough to be essentially ignored (at least for an airport the size of Lihue). This can be done as outlined below.

Using aircraft operational characteristics described in Table V-9, it is possible to describe a geometric picture of the flight path of each aircraft just after takeoff and just before landing. From these diagrams, one can deduce how long each aircraft will take to reach a height of 15 m above the end of the runway on takeoff or to descend from 15 m above the end of the runway for a landing.

Considering the midpoint of this ascent or descent path (at 7 m above the ground), instantaneous ground level concentrations

Table V-9

TYPICAL AIRCRAFT OPERATIONAL CHARACTERISTICS

Aircraft Type	Type of Operation	Angle (degrees)	Speed (knots)	Runway Length (m)
Heavy Commercial Jet (DC-10)	Arrival	3.5	135	1,500
	Departure	5.0	160	2,250[a]
Light Commercial Jet (DC-9, B-727, B-737)	Arrival	3.5	130	1,050
	Departure	6.0	145	1,350
Heavy Commercial Piston (4-Engine & 2-Engine)	Arrival	3.5	120	1,050
	Departure	3.5	120	1,350
Light Commercial Piston (Single-Engine)	Arrival	12.0	85	600
	Departure	2.0	80	450
Helicopter	Arrival/Departure	Vertical	34	--

a. A runway length of 2,000 meters is required for interisland operations at Lihue Airport.

Source: Daniels, A. and Bach, W., "Simulation of the Environmental Impact of an Airport on the Surrounding Air Quality," Journal of the Air Pollution Control Association, April 1976.

can be easily computed using modal emission factors from Table V-4 and a graph from Turner's Workbook of Atmospheric Dispersion Estimates.*

The higher the aircraft is above the ground, the lower the maximum ground level concentration. Moreover, such maximum concentration occurs further and further away from the ground centerline of the flight path. Thus, for an aircraft at only 7 m above ground, the maximum concentration (for stability category F) occurs 250 m away from the flight path. These values are shown in Table V-10 along with a time-weighted average for one hour (assuming a background concentration of zero). The time-weighted average shown is based on the further assumption that all aircraft reach the same 7 m above-ground-level point in three dimensional space. In fact, this would not occur because each of these aircraft uses a different length of runway to take off.

By the time any of the aircraft that do or could use Lihue Airport reach a height of 15 m above the ground, maximum ground level pollutant concentrations would occur about 600 m away from the ground center line of the flight path and are about one order of magnitude lower. Higher ground level pollutant concentrations would occur on climb out if more unstable

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*Turner, D.B., Workbook of Atmospheric Dispersion Estimates, U.S. Public Health Service, 1970.

Table V-10

CARBON MONOXIDE CONCENTRATIONS FROM
PEAK HOUR AIRCRAFT ASCENTS AND DESCENTS
AT LIHUE AIRPORT
1995

Departures

Aircraft Type	Time to 15 m (sec)	No. of Operations	Concentration at 250 m (mg/m^3)
DC-10	2	4	11.1
B-727	2	4	8.4
4-Engine Piston	4	1	326.7
2-Engine Piston	4	3	163.3
1-Engine Piston	10	4	22.4
Time Weighted Average (1 hr.)			1.1

Arrivals

Aircraft Type	Time to 15 m (sec)	No. of Operations	Concentration at 250 m (mg/m^3)
DC-10	4	3	30.9
B-727	4	3	17.2
4-Engine Piston	4	1	127.3
2-Engine Piston	4	3	63.7
1-Engine Piston	2	4	7.6
Time Weighted Average (1 hr.)			0.5

Source: Environmental Communications, Inc.

(11/76)

atmospheric conditions were considered (i.e., stability categories B or A), but then pollutant concentrations from ground based operations would be drastically reduced. These same remarks apply to the approach situation as well. What all of this means in actual practice is that ground level pollutant concentrations from airborne aircraft occur for such short duration and are spread out over such a wide area that their impact on air quality--even at the ends of the runways-- is not very significant.

For the number of peak hour operations forecast to occur at Lihue by 1995, the one-hour carbon monoxide contribution from aircraft on climb out at a receptor site near the end of the runway, such as Ahukini Camp, would be around 0.6 mg/m^3 (under most stable atmospheric conditions). This sum amounts to just 5% of the current State air Quality standard for CO.

Pollutant Contributions from Aircraft on the Ground. For sites both within and near the Airport, aircraft ground traffic will be the most significant contributor to ground level air pollutant concentrations. The terminal building functions as the main receptor site within the Airport boundary. Air pollutant concentrations at this site have been computed using the emissions data in Table V-7 and treating the runway/taxiway complex as a line source. Highest pollutant concentrations at the terminal would occur with the wind blowing perpendicular to Runway 3-21.

The current Airport configuration was considered first as part of the analysis. Assuming that no new runway is built, but that Runway 3-21 will be extended to 6,500 feet, and that forecast 1980 and 1995 traffic operate solely from this runway, the pollutant concentrations shown in the upper part of Table V-11 can be expected. If, for the purposes of this analysis, the new passenger terminal complex as well as Runway 17-35 are assumed to be in place and in use by 1980, and assuming that one-third of arrival emissions occur on the new runway, the maximum peak hour pollutant concentrations shown in the lower section of Table V-11 can be expected. Both of these computations assume atmospheric stability Category F.

For less stable atmospheric conditions, pollutant concentrations would be much lower. Under Category D conditions, for example, the concentrations would be only one-half those shown. In modeling the Honolulu International Airport, Daniels and Back* used Category D for the most stable conditions and Turner** lists Category D as the most stable condition likely to occur during daylight hours. Thus, the values shown in Table V-11 are no doubt somewhat high.

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*Daniels, A. and W. Bach, "Simulation of the Environmental Impact of an Airport on the Surrounding Air Quality," Journal of the Air Pollution Control Association, April 1976.

**Turner, D. B., Workbook of Atmospheric Dispersion Estimates, U.S. Public Health Service, 1970.

Table V-11

AIR POLLUTANT CONCENTRATIONS FROM AIRCRAFT
ON THE GROUND AT LIHUE AIRPORT

At Existing Passenger Terminal

Pollutant	1980	1995
CO	9.0 mg/m^3	9.3 mg/m^3
HC	1240 $\mu g/m^3$	855 $\mu g/m^3$
NO_x	350 $\mu g/m^3$	4680 $\mu g/m^3$

At Proposed New Passenger Terminal

Pollutant	1980	1995
CO	2.0 mg/m^3	2.2 mg/m^3
HC	280 $\mu g/m^3$	190 $\mu g/m^3$
NO_x	73 $\mu g/m^3$	1100 $\mu g/m^3$

Source: Environmental Communications, Inc.

Pollutant Contributions from Ground Service Vehicles. Detailed information on emissions from ground service vehicles at Lihue Airport is not available, but such emissions can be estimated as a proportion of peak hour aircraft emissions. A recent report from PEDCO Environmental Specialists, Inc.* states that peak hour ground service vehicles emit about 25% as much CO as peak hour aircraft. Daniels and Bach estimated for Honolulu International Airport that ground service vehicles emitted 46% as much CO, 23% as much HC, and 19% as much NO_x as aircraft. Using the PEDCO 25% figure as a basis for CO emissions from ground service vehicles at smaller airports, and Daniels and Bach figures as scaling factors, it is estimated that ground service vehicle emissions for Lihue Airport peak hour conditions are equal to 25% of the CO, 12.5% of the HC, and 10.3% of the NO_x produced as a result of aircraft operations.

These emission levels were then treated as line sources with the line located 30 m in front of the current terminal and 100 m in front of the planned new terminal. Ground service vehicles would have a much larger working area at the airport under the proposed master plan, and their emissions would thus be spread out over a much greater area. This factor

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*Briggs, T. M., et al., Air Pollution Considerations in Residential Planning, PEDCO Environmental Specialists, Inc., Report for EPA, July 1974.

accounts for the lower concentrations shown in the lower part of Table V-12.

Pollutants from Acces Traffic and Parking. Both the current and proposed configurations of Lihue Airport are such that emissions from access traffic and aircraft operations could not reach the terminal site(s) under the same wind conditions. A simple methodology for evaluating carbon monoxide concentrations from traffic is described in Volume 9 of EPA's Air Quality Maintenance series.* Unfortunately, no such simple approach exists for assessing HC and NO_x concentrations, so these two pollutants are not considered in this part of the analysis.

As before, the passenger terminal site locations were selected as receptor sites for computational purposes. Peak hour traffic forecasts at the Airport involve 650 vehicles per hour in 1980, and 850 vehicles per hour in 1995. These forecast traffic levels are for Ahukini Road going to and from the Airport. Carbon monoxide concentrations at an airport terminal location are typically derived as a result of contributions from three types of traffic activities: (1) baggage and passenger drop-off and pickup in front of the terminal; (2) through traffic; and (3) traffic in the parking lot.

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*U.S. E.P.A., Guidelines for Air Quality Maintenance Planning and Analysis, Volume 9; Evaluating Indirect Sources, January 1975.

Table V-12

AIR POLLUTANT CONTRIBUTIONS FROM GROUND SERVICE VEHICLES AT LIHUE AIRPORT

Existing Passenger Terminal Site

Pollutant	1980	1995
CO	12.4 mg/m^3	12.8 mg/m^3
HC	830 $\mu g/m^3$	570 $\mu g/m^3$
NO_x	180 $\mu g/m^3$	2700 $\mu g/m^3$

Proposed New Passenger Terminal Site

Pollutant	1980	1995
CO	2.7 mg/m^3	2.9 mg/m^3
HC	170 $\mu g/m^3$	53 $\mu g/m^3$
NO_x	87 $\mu g/m^3$	600 $\mu g/m^3$

Source: Environmental Communications, Inc.

Considering just the short-term parking zone in front of the terminal, and assuming that these spaces are fully utilized during peak hour activities, then each car may be expected to spend about one-fourth of its time in an engine-on condition. Such a condition produces carbon monoxide at the rate of 20 grams/minute per car. Based on each one of the aforementioned parking spaces as a point source, carbon monoxide concentrations at curbside and 10 meters inside the terminal have been calculated, assuming stability Category F. These values would be the same for both the existing and proposed new passenger terminals for 1980, assuming that 1975 emission values are valid for that year. By 1995, however, applicable emission values are expected to be reduced to 24% of 1975 emissions. The resulting concentrations are shown in Table V-13.

If through traffic moving past the terminal location(s) is assumed to make one trip per vehicle along the terminal curbside roadway at an average speed of 10 mph, then a Gaussian line source model for a worst wind angle of 10^{o} will yield the values shown on Table V-13. Parking lots were treated as area sources by assuming that 75% of all traffic arriving or leaving spends at least 5 minutes moving around within the parking lot at a speed of 5 mph.

It should be noted that since major traffic contributions to air quality at the airport will come from vehicles at curbside loading zones, there is not much difference in expected

Table V-13

PEAK HOUR CARBON MONOXIDE CONCENTRATIONS
FROM ACCESS TRAFFIC AT LIHUE AIRPORT
(mg/m^3)

Existing Terminal

	1980	1995
BLZ[a]		
Curbside	25.0	6.0
10 m inside terminal	19.0	4.6
Through Traffic	2.3	0.7
Parking	1.7	0.6
Total (Curbside)	29.0	7.3

Proposed New Terminal

	1980	1995
BLZ[a]		
Curbside	25.0	6.0
10 m inside terminal	19.0	4.6
Through Traffic	2.3	0.7
Parking	1.3	0.4
Total (Curbside)	28.6	7.1

a. Baggage Loading Zone--the short-term parking zone in front of the respective terminal building location.

Source: Environmental Communications, Inc.

carbon monoxide levels between the existing and proposed plan traffic configurations.

Pollutant Contributions from Fuel Storage and Handling. The pollutant of concern here is hydrocarbons (HC). Lihue Airport is a secondary airfield and most refueling operations take place in Honolulu. For Honolulu International Airport with 291,415 aircraft operations in 1972, HC from fuel handling were emitted at the rate of 25 tons/year. In 1980, Lihue is forecast to have 65,000 aircraft operations, and by 1995, 82,000 aircraft operations. Assuming a proportional relationship, Lihue's hydrocarbon emissions ought to be 6 tons/year in 1980 and about 7 tons/year in 1995.

Pollutant Contributions from Point Sources Within the Airport. Most aircraft operating at Lihue Airport are maintained and routinely serviced at Honolulu International Airport. Thus, the engine test cells and associated maintenance activities found at major airports would not be of particular concern in evaluating air pollution at Lihue. Heating or air conditioning units can likewise be ignored. Although parts of Lihue Airport might be air conditioned, these units would most likely be electric and in that case pollutants would be emitted at a distant power plant, but not at the Airport proper.

Air Pollutant Receptors Outside the Airport Boundaries. Estimated peak hour CO concentrations at selected receptor points outside the Airport boundaries are shown in Table V-14. The concentrations shown are considered likely to occur by 1980 (and by 1995) if the present Airport configuration remains essentially unchanged and if the Master Plan is implemented as currently scheduled. Contributions from ground based aircraft operations, ground service vehicles, and access traffic have been considered. In each case, worst wind direction and atmospheric diffusion conditions have been assumed.

The values projected in Table V-14 do not reflect any background conditions that may exist at the selected receptor sites. It is also important to understand that these values could not all occur at the same time since each is a maximum concentration based on a unique "worst case" wind direction.

In order to test or validate model calculations, the predicted 1980 aircraft emissions (very similar to actual 1974 values) were used in the model to predict a peak hour NO_x concentration at Lihue Town Center. A State of Hawaii Department of Health monitoring station is located in the Town Center. Using the existing runway configuration, a peak hour NO_x value of 39.4 mg/m^3 was predicted for the Center. Average 24-hour monitoring results in that location indicate a 24-hour concentration (during all months of the year) of less

Table V-14

ESTIMATED PEAK HOUR CARBON MONOXIDE CONCENTRATIONS
AT RECEPTOR SITES OUTSIDE LIHUE AIRPORT BOUNDARIES
(mg/m^3)

Location	Airport Layout	1980	1995
Lihue Town Center	No Change	1.02	1.06
	Master Plan	0.96	1.00
Lihue Stadium	No Change	1.76	1.82
	Master Plan	1.61	1.70
Kalapaki Beach	No Change	1.00	1.04
	Master Plan	0.90	0.95
State Route 51-- Ahukini Road Intersection	No Change	1.15	1.20
	Master Plan	1.34	1.19
Hanamaulu Beach Park	No Change	1.26	1.31
	Master Plan	1.28	1.32
Ahukini Camp	No Change	5.68	6.39
	Master Plan	5.10	5.88

Source: Environmental Communications, Inc.

than 20 mg/m^3. While it is certainly possible that one-hour peaks may occur at this site that are twice as high as the recorded mean, the latter also reflects conbributions from traffic closer to the monitoring station. It would thus appear that the model predictions presented in this report are of the right order of magnitude. If anything, they are probably high or exactly what was intended by assuming meteorological conditions that would be more stable than those that are likely to occur.

Summary and Conclusions. Table V-15 is a summary of peak hour carbon monoxide concentrations that are predicted to occur under the most adverse atmospheric diffusion conditions (worst case wind direction; wind speed = 1 m/sec; stability Category F) at Lihue Airport, considering both the current configuration and the proposed Master Plan layout. Concentrations produced by total runway operations, helicopters, and access traffic have not been added together because physically the wind cannot blow simultaneously for one hour from three separate wind directions. Peak hour pollutant concentrations from these Airport activities must therefore be separately considered. Relevant State and Federal ambient air quality standards for CO are included for each comparison.

Table V-15

SUMMARY OF PEAK HOUR CARBON MONOXIDE CONCENTRATIONS
AT LIHUE AIRPORT TERMINAL BUILDING SITES
(mg/m^3)

	1980	1995	State Standard	Federal Standard
Existing Terminal Location				
From: Aircraft	9.0	9.3		
Ground Service Vehicles	12.4	12.8		
Total Airfield and Apron Operations	21.4	22.1	10	40
Helicopter	3.0	3.0	10	40
Access Traffic	29.0	7.3	10	40
Proposed New Terminal Location				
From: Aircraft	2.0	2.2		
Ground Service Vehicles	2.7	2.9		
Total Airfield and Apron Operations	4.7	5.1	10	40
Helicopter	0.6	0.6	10	40
Access Traffic	28.6	7.1	10	40

Source: Environmental Communications Inc.

Based on this worst case analysis, the Master Plan should produce lower overall air pollution concentrations at the terminal than will result if forecast air and ground traffic is channeled through the existing Airport configuration.

In addition, peak hour carbon monoxide concentrations outside the Airport at all significant receptor sites should be below State ambient air quality standards for all years through 1995, even under the most unfavorable meteorological conditions.

Unfortunately, the air pollution situation at the Airport regarding hydrocarbons, nitrogen oxides, and resulting photochemical oxidants is not as clear. Because of stringent Federal limitations on HC emissions from jet aircraft, 1995 hydrocarbon concentrations are expected to be slightly lower than those that will occur in 1980, but the peak hour 1995 HC forecast for the new passenger terminal is still 250 mg/m^3. The State 3-hour standard is 100 mg/m^3, while the Federal limit is 160 mg/m^3. It is difficult to compare standards and predicted concentrations in this case because the standards refer to a specific time period--6 to 9 a.m.--when the role of HC as precursors to the formation of photochemical smog is most important. Peak hour aircraft traffic at Lihue is not expected to occur during these hours. In any

case, the HC standard is based on considerations not directly related to observed adverse health effects, thus making it difficult to evaluate the environmental impact that may be expected if HC standards are exceeded. Forecast peak hour HC concentrations for the passenger terminal are low enough to conclude that HC concentrations which exceed State standards are not likely to occur outside the boundaries of Lihue Airport.

There are no short-term Federal standards for nitrogen oxide concentrations, but the State of Hawaii has set a 24-hour limit of 150 mg/m^3. Emissions of NO_x are expected to increase substantially as larger jet aircraft begin operating at Lihue. By 1995, concentrations at the passenger terminal could be as high as 1700 mg/m^3 for a peak traffic one-hour period under the most unfavorable meteorological conditions. Even for Lihue Town Center (2.5 km from the Airport) a worst peak hour concentration (from aircraft alone) of 520 mg/m^3 could occur.

It is no simple matter, however, to convert these on-hour peak values to 24-hour maximums because the nitrogen oxides react chemically in the atmosphere in shorter time periods than 24 hours (and over shorter distances than the 2.5 km from the Airport to Lihue Town). Current 24-hour nitrogen oxide averages at Lihue Town are now measured at less than 20 mg/m^3. From this study it seems likely that 24-hour NO_x

averages at Lihue Town will increase substantially by 1995 because of increased NO_x emissions at the Airport, but it is not possible to determine conclusively whether 24-hour State NO_x standards will be exceeded or not. It does not appear, however, that at the new passenger terminal State 24-hour NO_x limits may be exceeded by 1995.

Water Quality and Drainage

Water Supply. As noted in Section IV, basal groundwater in the vicinity of Lihue Airport is of limited quantity and poor quality and cannot be used as a source of water for the Airport or the surrounding area. Development of the Airport as recommended in the Master Plan will not have any impact on groundwater in the Airport vicinity. Likewise, since groundwater supplies for the Lihue area and the Airport are at high elevations, they will not be affected by Airport development in terms of either recharge or water quality.

The Airport will continue to draw water from the Kauai County Water System via the water main paralleling Ahukini Road. The Airport's future water demand is forecast at up to 180,000 gallons per day which can be handled by the existing water main. The Airport Master Plan recommends construction of an entirely new water distribution system, within the Airport, to serve the new passenger terminal complex and other proposed developments.

Sewage Disposal. Because of the total inadequacy of the existing Airport cesspool system, the Airport Master Plan contains a recommendation for a new sewer system for the Lihue facility. This sewer system should be connected to either an on-Airport sewage treatment plant or to the existing Kauai County Sewage Treatment Plant south of the Airport. Logically,

the latter course of action is the best, because it avoids duplication of public investment and operating and maintenance requirements in similar facilities. Although Kauai County has a program to expand the County Sewage Treatment Plant starting in 1976 to a capacity of 1.5-million gallons per day, Airport needs have not been included.

This first phase of plant expansion is intended to handle only existing community sewage treatment needs; it does not have enough capacity to accommodate Airport-generated effluent as well. However, the ultimate County expansion program (up to a capacity of 4.5-million gallons per day) will have sufficient capacity to handle future (1995) Airport discharges estimated at up to 130,000 gallons per day. To date, the County Public Works Department has not established a timetable for expanding the Sewage Treatment Plant beyond the first phase. Therefore, the problem of properly handling and treating Airport-generated sewage discharge remains unresolved until such time as the County and State coordinate their requirements. If agreements cannot be reached between the County and State, it may be necessary to construct an interim on-Airport sewage treatment plant.

In addition to this problem, implementation of the recommended Airport Master Plan may have a secondary impact on the Kauai County Sewage Treatment Plant. Specifically, Lihue Plantation

Company has agreed to accept up to 500,000 gallons per day of discharge from the County Plant for use in irrigating the cane fields east of the Airport. The reduction in cane field acreage that would take place with construction of the new north-south runway could result in some modification of this agreement.

As a part of the short-term sewage treatment expansion program (up to 1.5 mgd capacity), the County intends to construct injection wells near the Sewage Treatment Plant. However, conversations with State Health Department officials indicate that there is some question as to the adequacy of injection wells and that Kauai County may have to construct a deep-water outfall for the Plant, east of the Airport. The alignment for the sewer main connecting the outfall (if required) with the Plant could pass through the recommended alignment of the north-south runway. Therefore, State and County officials should meet to resolve the question of an outfall before the construction of the new runway.

Drainage. Drainage on and in the vicinity of Lihue Airport poses some problems. The Airport is presently drained by a combination of underground and open ditches. Runoff from adjacent cane fields generally flows in an easterly direction and enters the Airport site along the western boundary near the terminal area.

External drainage flows are collected in two open ditches. One of these is on the northwest side of the terminal area paralleling Ahukini Road and traverses the Airport to the Northeast. A second drainage flow follows a ditch southeasterly from the Ahukini Reservoir on the south side of Ahukini Road to a culvert which passes under Runway 3-21, and then continues eastward through a series of other ditches to the Pacific Ocean in the vicinity of Opoi. All drainage channels in the Airport vicinity serve a dual function in that they are also used to irrigate Lihue Plantation cane fields.

Drainage for the terminal area and adjacent aircraft parking apron is via an underground culvert with two drop inlets, one situated in the curbside roadway adjacent to the terminal building, and the other located in the apron proper.

During heavy rainstorms, combined runoffs from nearby cane fields and Ahukini Road flood across the terminal area roadways and automobile parking lots into the terminal building and air cargo area. On occasion, water backs up via storm drain inlets in the terminal area and aircraft parking apron because present drainage facilities are unable to carry all surface water during heavy rainfalls.

Existing facilities do not now have the capacity to handle airport-oriented runoff in addition to runoff generated outside the Airport boundaries. Flooding is due to a combination

of inadequate surface drainage facilities, over irrigation of the cane fields, and soil conditions in the vicinity of the Airport (during short periods of extremely heavy rainfall, the upper soil layers become saturated, resulting in sheet runoff conditions).

To prevent sedimentation of offshore waters, Lihue Plantation Company has constructed small settling ponds adjacent to the coast where drainage ditches discharge into the Ocean. These settling ponds have insufficient capacity to handle peak storm water flows so that silt pollution of offshore waters still occurs.

Expansion of the Airport as proposed will increase impervious surfaces (airfield, aircraft parking apron, roadways and parking, and roofs), thus increasing surface runoff and aggravating the poor drainage situation now in existence.

A key recommendation in the Airport Master Plan, therefore, is to perform a detailed drainage study as soon as possible of the entire regional drainage basin. This would include the Airport, the surrounding sugarcane fields, and urban development west of the Airport. The detailed drainage analysis should also investigate the need for additional settling ponds to handle anticipated peak flows and thus reduce potential problems caused by pollutants, especially silt.

Social and Community Development

Displacement and Relocation of People. Although the Master Plan for Lihue Airport recommends acquisition of some 620 acres,

no homes are located in the area to be acquired. However, one home is located just outside the NEF 40 contour at Ahukini Landing and is recommended for relocation because of high noise exposure.

Surface Traffic and Airport Access. According to the State of Hawaii Department of Transportation, Highways Division, the average daily two-way traffic on Ahukini Road is approximately 4,700 vehicles according to traffic counts in April and May 1975. In determining terminal complex access roadway requirements, PMM&Co. assumed that vehicular traffic will increase roughly in proportion to forecast air carrier passenger volumes. On this basis, it is estimated that average daily two-way traffic on Ahukini Road in 1995 will approximate 10,500 vehicles on an average day of the peak month as shown on Table V-16. The corresponding one-way, peak hour traffic volume in 1995 is estimated at about 400 vehicles.

The existing two-lane Ahukini Road in the immediate vicinity of Lihue Airport has sufficient capacity to accommodate projected traffic volumes. If required, additional capacity on both Ahukini Road and the new State Route 51 could be provided by widening the pavements to two lanes in each direction within presently available rights-of-way.

The major problem (bottleneck) at present for traffic to and from the Airport is the T-intersection of Ahukini Road and Kuhio Highway. With its present arrangement, significant delays will be experienced at peak hours due to the large number

Table V-16

ESTIMATED PROJECTION OF VEHICULAR TRAFFIC
ON AHUKINI ROAD AT LIHUE AIRPORT

	1974	1980	1985	1995
Average Daily Traffic[a]	4,800	6,500	8,000	10,500
Peak Hour Traffic[a]	510	650	750	850
Automobiles	420	535	615	680
Limousines	25	30	35	45
Tour Buses	10	15	20	25
Trucks	55	70	80	100
Peak Hour as Percent of 24-Hour Volume	10.5%	10%	9%	8%

a. Total in both directions.

Source: Peat, Marwick, Mitchell & Co.

of left-turn movements from Kuhio Highway (southbound) onto Ahukini Road (eastbound), and from Ahukini Road (westbound) onto Kuhio Highway (southbound).

Construction is presently under way that will greatly improve the situation in future years. The new State Route 51 will by-pass part of Kuhio Highway (State Route 56) from Rice Street in Nawiliwili to north of Hanamaulu, and intersect Ahukini Road about 0.5 miles west of the existing terminal area. The section of State Route 51 between Ahukini Road and Rice Street was recently completed. Although the route alignment north of Ahukini Road is not yet finalized, it will greatly improve Airport access for traffic to and from the east and north shores of Kauai.

It is of interest to note that Lihue Airport generates far less traffic than other U.S. airports handling comparable passenger volumes. Approximately 50% of passengers using the Airport travel by tour bus or limousine as compared to 5% to 6%* for Mainland airports.

Consistency With Established Community Planning. The recommended Airport Master Plan for Lihue Airport is consistent

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*David R. Miller, et al, "The Remote Airport: A Study of Access Feasibility," Transportation Engineering Journal, February 1974, p. 183.

with the 1970 Kauai General Plan (as to both location and configuration). The General Plan specifies that the Airport be retained in its present location and that a north-south interisland runway be developed to relieve adverse noise impacts in the Kauai High School vicinity. The recommendation in the General Plan for the development of an overseas airport at Barking Sands is predicated on continuing military requirements for this facility. The U.S. Navy has stated that joint civil/military use is not possible at this time (see Navy letter in Appendix B).

Present State and County zoning regulations protect the Airport from incompatible urban encroachment. All lands adjacent to Lihue Airport are in a State-designated agricultural district; approval of the State Land Use Commission must be secured before redesignation to a more intensive use district can be accomplished. Both the State and the County should make every effort in the future to insure that properties (1) under the critical aircraft approach and departure paths and (2) within the NEF 25 noise contour are retained in uses compatible with aircraft/Airport operations.

Socioeconomic Impacts. Ultimate development of Lihue Airport as recommended in the Master Plan is estimated to take 570 acres of sugarcane land out of production, or approximately 1% of the total cane land on the Island of Kauai. The

affected acreage is owned by the Lihue Plantation Company, which presently has 17,000 acres of cane land in use on Kauai and employs 750 people. The actual reduction in employment resulting from the loss of cane production will be negligible because it can take place through natural attrition or personnel can be transferred to other plantation jobs.

Nonetheless, the loss of any agricultural land is of great concern to County residents. Agriculture is one of the two economic mainstays of Kauai, and it is the declared policy of both the State and the Mayor of Kauai to preserve agricultural productivity. The Kauai Task Force was organized by the State to examine ways and means of strengthening the County's economy in general and to look into ways of diversifying agriculture specifically.

On the positive side, however, a continued high level of air service will support the planned expansion of papaya and other agricultural produce production by providing frequent and reliable transportation for the products. Papaya, in particular, spoils rapidly and depends on air transportation to arrive fresh at Mainland and Japanese markets.

Because of Kauai's dependence on air transportation for residents and visitors, it is essential that the Airport be open at all times. Developing a new north-south runway will insure that even if one runway is closed for repairs, the second

runway will remain open. At present, if Runway 3-21 has to be closed, Kauai is cut off from resident, business, visitor, and cargo transportation by air for the length of time it takes to restore Runway 3-21 to service whether this is a matter of hours, days, or longer.

Improvement of the Lihue Airport will also increase employment opportunities for Kauai residents. Presently, 500 persons are employed in Airport-related jobs (300 on the Airport site and 200 in Airport support positions, primarily ground transportation), and the total number is expected to increase to at least 1,000 over the 20-year planning period.

There will also be an increase in construction-related jobs as recommended airport improvement programs are implemented. It is difficult to forecast the number of construction jobs that will be generated by the Airport improvement programs or how many of the local labor force will be utilized. However, because the construction projects will be short-term in nature and phased over a 20-year period, the permanent population should not be increased greatly, even if some workers are not from Kauai. Also the construction payrolls will be spent in Kauai which will help to stimulate the local economy.

In addition to the direct socioeconomic effects of implementing the recommended Airport Master Plan, a possible secondary impact--induced growth--must be considered.

(6/76)

Basically, the Airport Master Plan specifies a staged development program over a 20-year period to accommodate forecast demand. The purpose of the recommended Airport Master Plan is to provide airport facilities commensurate with the level of demand, rather than to induce growth in order to generate greater demand. The existing Lihue Airport functions as a service facility and neither promotes nor restricts growth on the Island. The number of people traveling to and from Kauai (other than local residents) is primarily a function of (1) the attractiveness of Kauai as a visitor destination area and (2) the visitor accommodations available on the Island. The control of development to accommodate visitors rests with County government through the regulation of land use zoning and the issuance of building permits for commercial, resort, and residential development.

Even if the State does nothing to improve Lihue Airport, tourism on Kauai could continue to grow if County government finds it in the best interests of the Island to authorize additional commercial, resort, and residential development. On the other hand, the State could greatly expand the Airport and not induce additional growth if the County government were to adopt a very restrictive policy toward resort development, for example, by not permitting development of any additional visitor accommodation units on the Island. The secondary impacts associated with tourism, including the impact on water supply, land values,

existing lifestyles, and other public utilities will therefore be determined by what happens elsewhere than on the Airport proper.

Each physical improvement to the Airport should be constructed only when and as its need is demonstrated. If passenger volumes or aircraft operations do not increase at the rates forecast, development of additional facilities would be delayed accordingly. However, if air travel to Kauai increases more quickly than predicted, development projects could be moved forward in time to accommodate demand.

It should also be noted that the planned improvement of Airport facilities to meet forecast air traffic activity will increase the demand on certain utilities, particularly the local water and sewer systems, as noted previously.

Public Park and Recreation Areas

No public parks exist in the proposed acquisition area for improvement of Lihue Airport. However, when Runway 3-21 is closed for repairs and all operations are necessarily shifted to Runway 17-35, Hanamaulu Beach Park will be adversely affected by aircraft noise. These noise impacts will be short-term, lasting only as long as Runway 3-21 is actually out of

service. Nawiliwili Park occasionally experiences adverse noise impacts from air carrier arrivals on Runway 3 during trade wind conditions and from departures on Runway 21 during Kona conditions. Construction of Runway 17-35 will relieve these impacts.

Archaeological and Historic Sites

Archaeological information on the Island of Kauai is sparse. Although some detailed site or area surveys have been accomplished and papers published, the information covers locations outside the designated 5-mile area analyzed during the Lihue Airport Study.

One comprehensive reference used in this report is Wendell Bennett's "Archaeology of Kauai."* It is based on nine months of field work (1928-29), and "supplemented by a study of available collections, published literature, and manuscript notes on file in the Bernice P. Bishop Museum." Bennett's survey and sources are dated prior to 1930. Many of the archaeological or historic sites described by Bennett were destroyed

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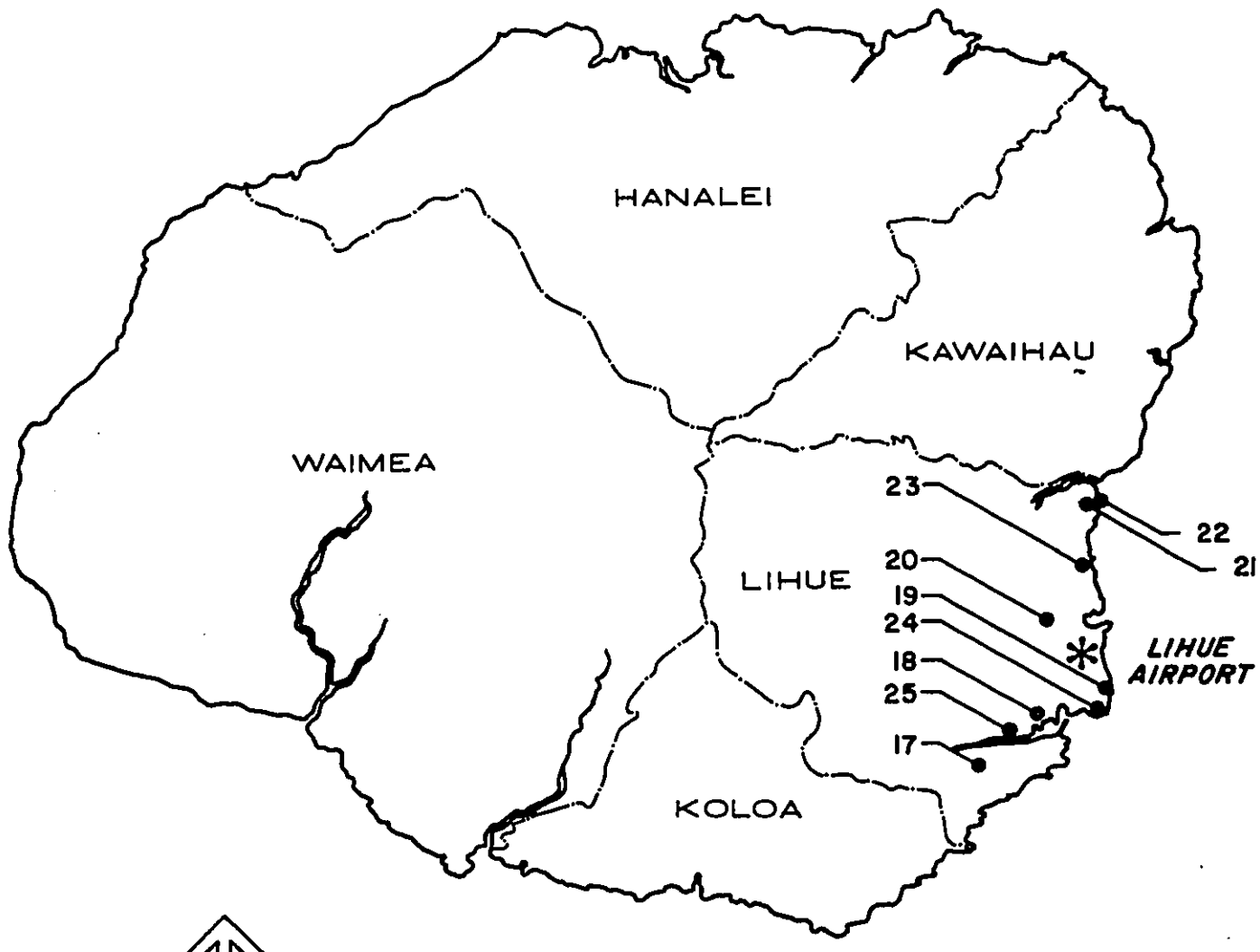
*Weldell Clark Bennett, Archaeology of Kauai, Bernice P. Bishop Museum Bulletin 80 (Honolulu, Hawaii: 1931). Reprinted in 1971.

(before his survey), or have since been destroyed. However, because Bennett's studies stand out as a major comprehensive archaeological work on Kauai, it is extensively used in this section. Whenever possible, information on the sites mapped and described by Bennett have been updated.

Additionally, the State Parks, Outdoor Recreation and Historic Sites Division, Department of Land and Natural Resources, was solicited for pertinent information. Based on their working maps and files, known archaeological or historic sites within the immediate area of the Airport are as mapped and described in this section.

Exhibit P delineates the archaeological and/or historic sites noted by Bennett in 1931. The number identifications on Exhibit P are not similar to those used by Bennett; therefore, the corresponding numbers of Exhibit P and Bennett's are provided below.

Exhibit P	Bennett
17	94
18	99
19	101
20	102
21	104
22	105
23	103
24	100
25	98
26	93



NORTH

0 1 2 3 4 5 10

GRAPHIC SCALE IN MILES

LEGEND:

* LIHUE AIRPORT

● ARCHAEOLOGICAL / HISTORICAL SITE

SOURCE: ARCHAEOLOGY OF KAUAI, WENDELL BENNETT, B.P. BISHOP MUSEUM BULLETIN 80, 1931.

EXHIBIT P

LIHUE AIRPORT
ARCHAEOLOGICAL / HISTORICAL SITES
• W. BENNETT, 1931

LIHUE, KAUAI, HAWAII

PEAT, MARWICK, MITCHELL & CO.

1975

Bennett provided the following descriptions of the sites identified in Exhibit P (17 through 25).

Site 17. Near Site 93 are numerous house sites marked by rows of stones and a 15- by 12-foot flat area on the side of the hill. One structure is composed of a platform 65 feet long and 45 feet wide. It is built up in front 3 feet, has a solidly paved area for 10 feet back, and loose paving for the rest of the platform. At the west end, there is a wall 5 feet wide and 1 foot high. There is a secondary platform on the big one which is unpaved. It measures 45 feet by 20 feet. It is clearly marked off from the larger one by a loose row of stones which face the 1- to 2-foot rise. At the back of it is a 1-foot rise unfaced.

Site 18. Kuhiau heiau, at Nawiliwili, is near the site of the courthouse. Thrum* describes this structure as follows:

"A large paved heiau, whose enclosure covered an area of about four acres; long since destroyed. The rock Paukini, now separate from, but formerly connected with the shore, was where the kahuna lived. This is said to have been the largest and most famous on Kauai in its day."

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*T. G. Thrum, "Tales from the Temples," Hawaiian Annual for 1907, pp. 49-69.

Site 19. Ahukini heiau, in Kalapaki near Ahukini Point is on the bluff overlooking the sea. This is now entirely destroyed.

Site 20. Kalauokamanu heiau is in Hanamaulu above the present mill. Described by Thrum as "A large walled heiau that stood above the present mill; destroyed about 1855. Of pookanaka class."

Site 21. Malae heiau is 40 feet north of the government road, a short distance south of the Wailua River. The site is on a raised area that has a good view of the country. As the walls, greatly modified, are all that remain, Thrum's description is quoted in full. ". . . A walled and paved heiau 273 by 324 feet in size of traditional Menehune construction. The place of its altar is pointed out near the center toward the west wall and around on all sides ran a ledge about six feet wide whereon the people is said to have sat during its ceremonies. The outer walls are yet standing in good order. The corners buttressed with 13-foot walls. [a unique feature] Kapule (Queen Deborah) changed this heiau about 1830, and erected division walls for cattle and calf pens with its inner structures and stone pavements. A portion is now planted to cane." A ledge is said to have extended all around its four walls (similar to the feature noted in Oahu's largest temple). . . The companion heiau of Malae was Poliahu situated some little

distance from it, further inland, but the two were in plain sight of each other.

Bennett categorized this heiau as a large, wall-enclosed, square/rectangular heiau.

Site 22. Hikinaakala heiau is on the south bank of the Wailua River at the shore.

Thrum describes this structure as follows: "The ruins of this heiau stand along the shore near the south side on the stream. It shows three distinct divisions, paved; the inner section still in fair condition 120 feet in depth. End and S.E. corner walls are 6 feet high and 11 feet thick, of heavy stones. Two large boulders stand near the division wall of this section. The outer or front section of 80 feet includes a width that runs back beyond the division wall. . . .A number of graves mark the middle and outer sections, said to be the remains of an entire family in consequence of their desecrating the temple by living and cultivating within its walls."

Today much of the stone has been removed, reducing the walls to bare outlines, and obliterating the paving entirely. The outer section is also destroyed. The stones remaining show the construction of the walls to have been that of placing large stone slabs on edge in a double row, 8 feet wide, and filling in between with smaller stones.

The division between the front and the middle sections is now marked by a rough row of stone that extends 50 feet or more west of the line of the old wall. This is probably later work, an assumption substantiated by the finding of a particular stone. Although a surface of the stone was once used for adz grinding, it is placed in the wall in such a way that it would be impossible to use it for grinding. The Kauai Historical Society has called this a place of refuge "Hauola" as well as a heiau.

Bennett classified this heiau as a large, wall-enclosed, divisioned (inner walls) heiau.

Site 23. Many burials are located in the sand dunes that run along the shore halfway between Hanamaulu Bay and Wailua River.

Site 24. Ninini heiau is in Kalapaki near the site of the Nawiliwili lighthouse. It is now destroyed.

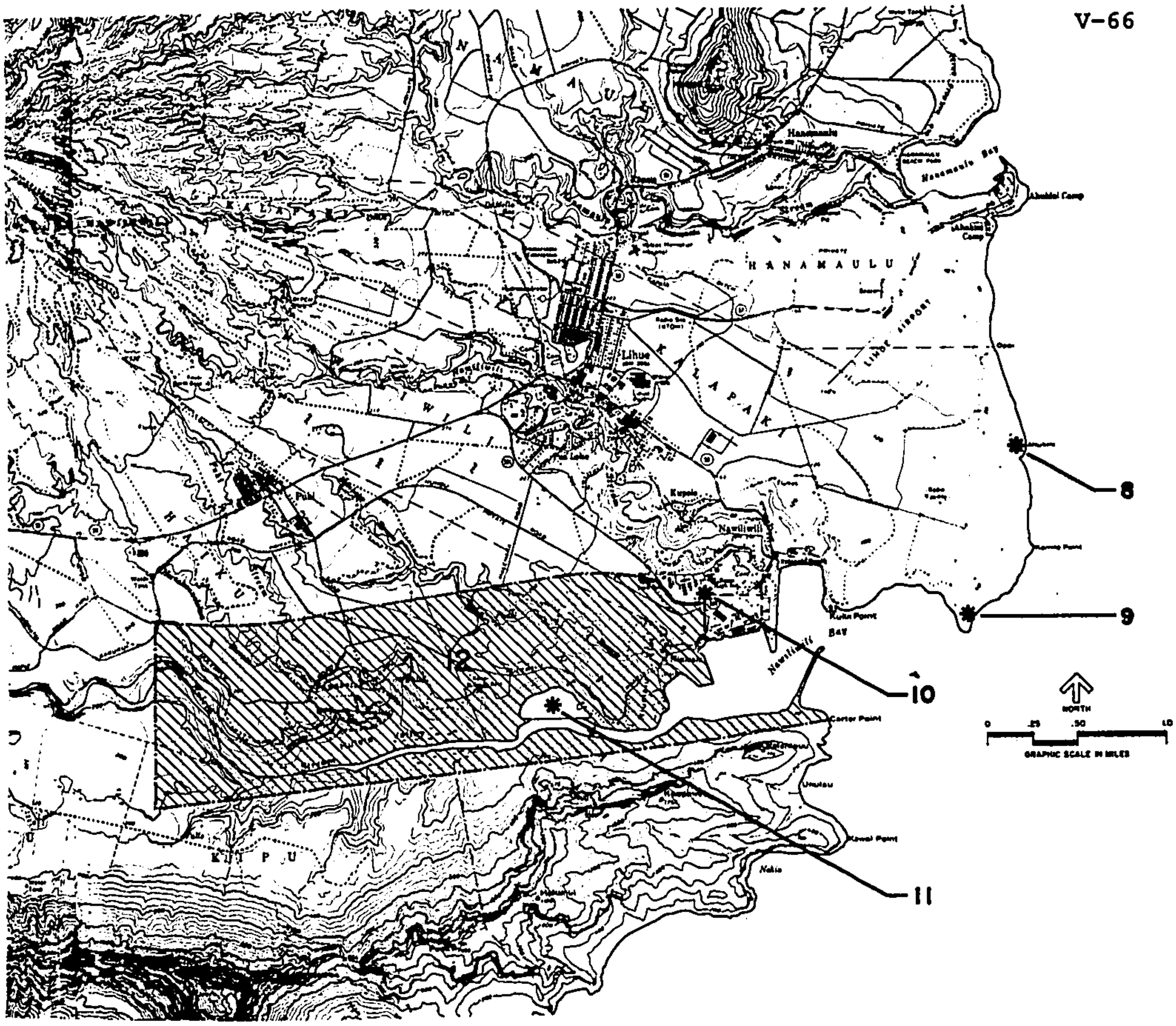
Site 25. The Niamahu (Menehune) Fishpond is near the mouth of the Huleia River, Lihue district. It consists principally of a stone-faced, dirt wall that runs for over 900 yards and cuts off a large bend in the River for use as a fishpond. It is used for both fish and ducks. Cement walls and iron gates have obscured any old method of controlling the water or the fish.

Between the west end of the wall and the shore, there are 50 yards of shallow and reedy swamp land. The dirt wall is 5 feet above the water level, 4 feet wide on top, and the dirt slants up on the sides. The facing wall starts with a single row of stones but soon becomes of double thickness as it gets farther out into the river and the current starts to be effective. The stones also become larger until the double layer is 2 feet thick. The stone facing only on the outside, is 5 feet high in most places, and quite perpendicular. The stones are not uniform in size but are fitted together quite well. The stone facing runs only for 588 yards although the dirt wall continues beyond.

Reviewing various maps, it is noted that although Bennett refers to this Fishpond as the Niamalu Fishpond, it is commonly referred to today as Menehune Fishpond." The Fishpond is still in existence today.

To update and add to the inventory above, additional information was obtained from the Historic Sites Section, State of Hawaii Department of Land and Natural Resources. These sites are illustrated on Exhibit Q and described below.

Site 8. Identified by the Historic Sites Section as Site 50. This was Ahukini heiau. Now completely destroyed.



LEGEND:

✱ ARCHAEOLOGICAL SITE

[12] AREA OF ARCHAEOLOGICAL INTEREST

SOURCE: HAWAII DEPARTMENT OF LAND AND NATURAL RESOURCES

EXHIBIT Q

LIHUE AIRPORT

LIHUE, KAUAI, HAWAII

ARCHAEOLOGICAL SITES · HAWAII DEPT. OF LAND AND NATURAL RESOURCES

PEAT, MARWICK, MITCHELL & CO.

1975

Site 9. Identified by the Historic Sites Section as Site 100. This was Ninini heiau near the Nawiliwili lighthouse. It is completely destroyed.

Site 10. Identified by Historic Sites Section as Site 99. It is completely destroyed; presently the site of Kauai High School.

Site 11. Menehune Fishpond. Bennett's description of this Fishpond is on page V-64. Menehune Fishpond (Alakoko) is on the National Register of Historic Places (placed on the register March 14, 1973). It is considered a valuable archaeological/historic site.

Site 12. The lined area shown on Exhibit Q represents the approximate area of archaeological interest. Although not fully investigated, the area is considered significant because of a prehistoric Hawaiian settlement in this area. It is identified as the North Niumalu Complex (HRHP #30:11:3168) and classified reserve.

Only Site 9 depicted on Exhibit Q is within the area recommended for airport development and use. As noted by Bennett in 1931, this site is completely destroyed. The immediate areas surrounding Lihue Airport have either been urbanized or planted in sugarcane. These developments have already destroyed archaeological and/or historic sites that might have

been located in the area. The low likelihood of any archaeological values existing within the area recommended for acquisition adjacent to Lihue Airport has been verified by the State of Hawaii Historic Preservation Office. (see letter from Ms. Jane L. Silverman in Appendix B.)

Wildlife and Vegetation

Intensive agriculture in the area proposed for Lihue Airport expansion has already eliminated the habitats of most endemic wildlife species. There are no endangered species in the area to be developed, although two species, the Hawaiian Stilt (Himantopus mexicanus haw.), and the Hawaiian Coot (Fulica americana haw.), could frequent the Ahukini Reservoir located approximately 500 feet west of State Route 51 on the south side of Ahukini Road. The reservoir falls outside the area proposed for acquisition and development as part of the Master Plan.

Since the areas proposed for Airport improvement are presently planted in sugarcane, there will be little loss of vegetation (other than the cane) as specific changes or additions are made. However, the construction of Runway 17-35 will result in the loss of at least part of the ironwood windbreak located just inland from the coast. About one-half of the trees will have to be removed (primarily at the northern end) to place

fill material for the runway and meet recommended obstruction clearance criteria.

Coastal Zones

Preserving the coastline from Hanamaulu Bay south to Nawiliwili Bay was an important element of the Lihue Airport Master Plan. The location of the north-south runway avoids any physical encroachment on the shoreline. In addition, public access to the shoreline will be maintained, by road to Ahukini Landing and by trail to the remainder of the shoreline. The coastal zone should remain as a State-designated conservation district and, therefore, will not be utilized for future Airport expansion or development.

VI. ANY ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED SHOULD THE PROJECT BE IMPLEMENTED

Although the recommended Master Plan for Lihue Airport is planned to minimize present and potential adverse environmental impacts from aircraft operations at the Airport, some residual adverse environmental effects will result from implementing the Plan. In particular, these adverse environmental effects concern aircraft noise, the loss of agriculturally productive cane land, increased surface water runoff, sewage disposal, and increased demand on certain utilities.

Aircraft Noise

The construction and use of Runway 17-35 will eliminate noise exposure forecast levels in excess of NEF 25 over all residential areas of Lihue. The shifting of air carrier aircraft operations to Runway 17-35 will eliminate overflights of Kauai High School and adjacent areas. Additionally, the use of Runway 17-35 by the air taxi aircraft will reduce noise exposure forecast levels over Rice Street and Wilcox School to below NEF 25.

When Runway 3-21 is temporarily closed for repair or reconstruction and only Runway 17-35 is used for aircraft operations, adverse noise levels (illustrated on Exhibit R) would result at Hanamaulu Beach Park and residential areas at the eastern end of Hanamaulu.

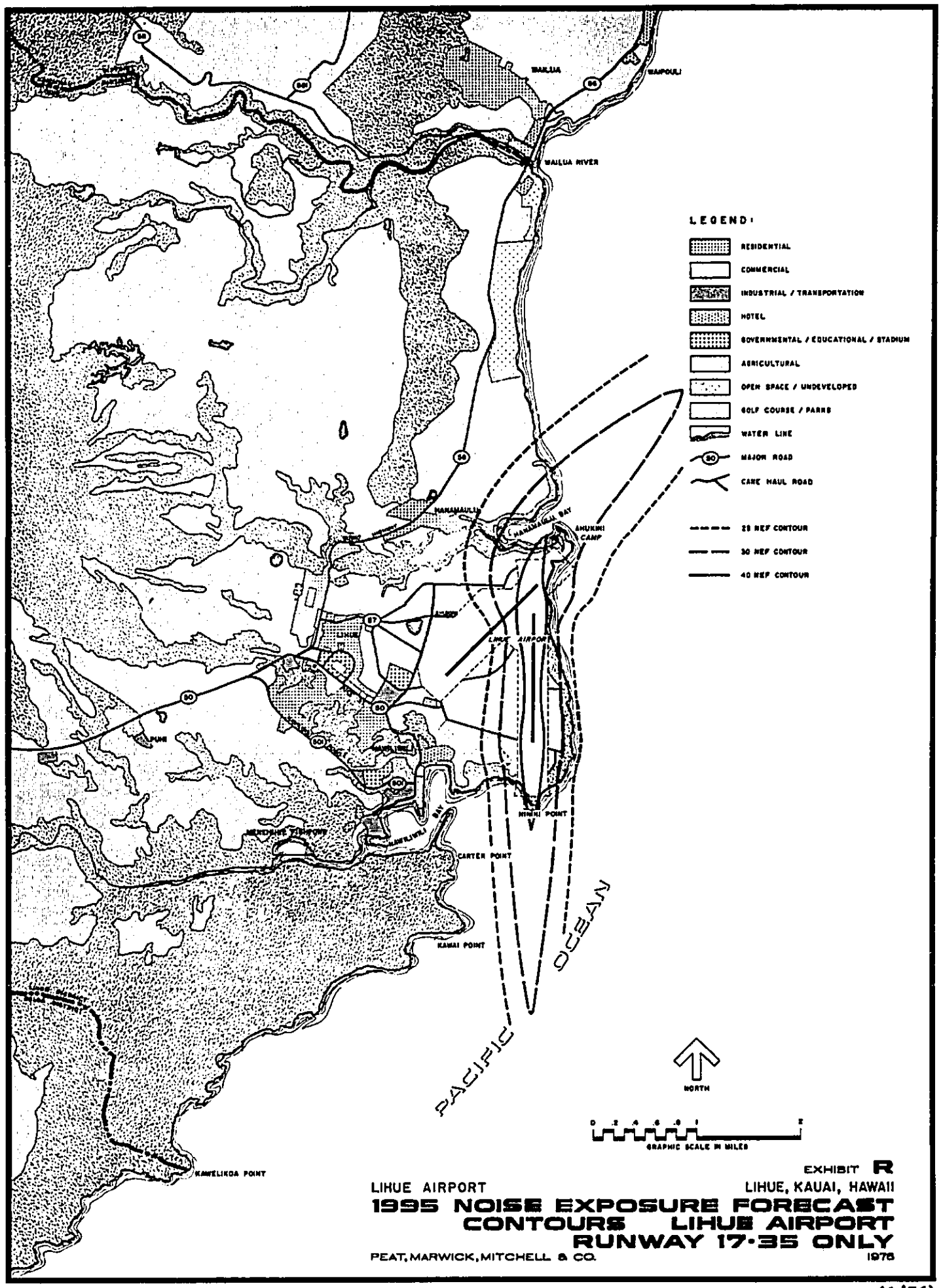


EXHIBIT R

LIHUE AIRPORT — LIHUE, KAUAI, HAWAII

1995 NOISE EXPOSURE FORECAST CONTOURS LIHUE AIRPORT RUNWAY 17-35 ONLY

PEAT, MARWICK, MITCHELL & CO. — 1976

(6/76)

For departures to the north on Runway 35, the flight procedures would involve a turn to the right overwater as soon as practicable, in order to reduce noise impacts on the shoreline to the north.

Loss of Agricultural Land

The loss of 570 acres of cane land represents an adverse impact that would reduce the Island's cane lands by about 1%. If agriculture is diversified as planned, any loss of cane production jobs could be offset by new jobs elsewhere on the Island. The most direct impact will be felt by the Lihue Plantation Company which could lose approximately 3% to 4% of its present land in cane production on Kauai. This is very productive land close to the mill.

Water Runoff

Lihue Airport suffers from occasional flooding during peak rainfall because of poor drainage facilities in the vicinity of the site. Additional paving and construction of a new terminal complex will increase the area of impervious surface, and thereby increase storm water runoff. Although the Airport Master Plan provides for a new drainage system, the poor drainage situation is not one that can be solved on the Airport alone, since the Airport lies in the lower part of a 2,270-acre drainage basin and receives inflows from nearby cane fields and urban areas. It is imperative that an overall drainage study

be conducted involving State, County, and private interests in an effort to solve the overall drainage problem. Such a study should ascertain peak flows, drainage facilities that are needed, and the facilities required to prevent siltation of coastal waters.

Sewage Disposal

Sewage disposal also remains an unresolved problem. The Airport cannot continue using the present cesspool system for much longer, since it violates both federal and State water quality standards and is inadequate to handle today's flows, much less the greatly increased flows forecast for future years. Realistic, near-term solutions to handling Airport sewage disposal or problems, using either the County Sewage Treatment Plant or, if necessary, constructing an on-Airport interim sewage treatment plant, will have to be agreed upon by the State and the County of Kauai.

Utilities

The planned improvement of Airport facilities to meet forecast air traffic activity will increase the demand on certain utilities, particularly the local water and sewer systems, as indicated above.

VII. MITIGATING MEASURES TAKEN TO REDUCE OR MINIMIZE IMPACTS

One of the major improvements recommended in the Lihue Airport Master Plan is the construction of Runway 17-35, which will relieve adverse noise impacts at Kauai High School and adjacent residential areas.

Although the Plan recommends the acquisition of 620 acres, 570 acres of which is planted in cane, the actual loss of productive cane land will be kept to a minimum.

Another mitigating feature of the Airport Master Plan is the location of Runway 17-35. While the runway is located as far east as possible to provide maximum separation from existing and planned residential areas, it is still possible to provide access to the shoreline for public use and enjoyment.

The noise impact from aircraft operations on passengers and workers on the ground will be greatly reduced as shown by comparing Exhibits I and J on pages V-12 and V-16. Based on 1974 aircraft operations (Exhibit I on page V-12) the passenger terminal complex is within the NEF 40 contour. However, based on estimated 1995 aircraft operations and location of the proposed new passenger terminal complex further away from the existing runway, the new complex will lie between the NEF 25 and 30 contours (Exhibit J on page V-16).

In addition, noise mitigation measures for passengers and workers on the ground are a function of the specific architectural design and construction of the terminal and other buildings. The architectural design of Airport structures takes into account high noise levels resulting from aircraft operations.

Regarding construction impacts, this document addresses an Airport Master Plan and does not constitute actual approval of any specific construction project. Further, the subject Master Plan does not contain the detailed architectural and engineering studies and designs needed to assess actual construction impacts (such as precise amounts of cut and fill grading, actual types and amounts of building materials to be used, or the sources of such materials, etc.). Construction impacts will be thoroughly covered at such time as detailed engineering and/or architectural designs are completed and specific construction project approvals sought.

It is reasonable to assume that accepted State and federal procedures will be utilized to minimize impacts during construction, as has been the case in other Airport construction projects performed by the State Department of Transportation.

VIII. ALTERNATIVES TO THE PROPOSED PROJECT

Many alternatives were considered during the Lihue Airport Master Planning Study before the recommended Master Plan was developed. Among the alternatives analyzed were the possible use of other modes of transportation; other existing airports; alternative airport locations; the existing Airport without improvement ("do-nothing" alternative); and the Airport with alternative airfield and terminal area locations and configurations that might alleviate present and potential adverse environmental impacts on the Airport environs.

Alternative Modes of Transportation

As noted in Section III, Lihue Airport serves as the principal access point for passenger travel on the Island of Kauai. Air transportation was the only means of interisland passenger travel available in the State of Hawaii until June 1975, when hydrofoil service between Oahu and Kauai was introduced. Service involves one trip a day in each direction. A total of three hydrofoils are planned for interisland service. They travel at speeds up to 45 knows (52 miles per hour), and take approximately two-and-one-half hours to make a one-way journey between the two islands.

The hydrofoils in service carry a maximum of 190 passengers. The Pacific Sea Transportation Hydrofoil Service (PST) Environmental Impact Statement anticipates a 50% load factor in 1975, increasing to 70% by 1980. PST also estimates that 10% of the time the hydrofoils will not be able to make the journey due to sea conditions. On this basis, one round-trip per day could carry 31,200 passengers annually in each direction, increasing to 43,700 passengers each way in 1980. This represents approximately 3% of the estimated air passengers traveling to and from Kauai between 1975 and 1980. A 280-passenger vessel is being considered.

Hydrofoil service is considered a supplement to air service, not a replacement. To accommodate the 1995 forecast of 4,190 air passengers would require approximately the same number of round trips per day as the airlines make, with the same schedule reliability. The exclusive use of hydrofoils would greatly increase travel time (two-and-one-half hours by hydrofoil versus 20 to 25 minutes by air to Oahu), particularly to other Neighbor Islands beyond Oahu.

The State of Hawaii is also considering an interisland ferry system to provide additional Statewide mass transit facilities. Alternatives for passenger, vehicular, and cargo transportation will be studied by the State together with their impacts before any final recommendation is made on an interisland ferry system.

(6/76)

Use of Existing Airports

The only other publicly owned civil airport on Kauai is the Port Allen Airport near Hanapepe on the south coast of the Island. Although the NASP includes future improvements to Port Allen Airport, these improvements will not change the role of the Airport from that of a small general aviation facility. It is not possible to expand the existing Port Allen Airport to accommodate air carrier operations because of its restricted site and the presence of nearby historic features.

Alternative Airport Locations

PMM&Co. performed an exhaustive aeronautical study of all potential air carrier airport sites on the Island of Kauai in 1969. The initial results of the 1969 study indicated that, in addition to the existing Lihue Airport, four other sites--Port Allen, Kilauea Bay-Moloaa Bay, Barking Sands, and Poipu--had potential for an airport from an aeronautical and engineering standpoint.

Later in the analysis, Barking Sands, a naval facility, was eliminated because of airspace conflicts and military requirements (see letter from U.S. Navy Pacific Missile Range Facility in Appendix B). The Poipu Site was also eliminated due to its proximity to resort areas then under development along the coast, and volcanic cinder cones indigenous to the site. As a consequence, the present analysis only addresses the environmental

impacts associated with Lihue Airport and the two remaining sites, Kilauea Bay-Moloaa Bay and Port Allen.

In the spring of 1975, ECI conducted an inventory and initial analysis of conditions relevant to the natural environment in the vicinity of the two alternative sites, as well as Lihue Airport. These studies of the natural environment covered topics such as flora and fauna, topography, soils, geology, air quality, water resources, archaeological and historic sites, and conservation and recreation areas.

PMM&Co. analyzed the associated community environmental conditions, including population characteristics, economic factors, existing land use, community facilities, local plans and policies, zoning, and aircraft noise impacts.

Results of the various environmental analyses of the two alternative sites as compared to the existing Lihue Airport are summarized on Table VIII-1. A brief summary of the environmental impacts associated with each of the two alternate sites is set forth below.

Kilauea Bay-Moloaa Bay. The Kilauea Bay-Moloaa Bay Site is on the northeastern coast of the Island in a sparsely populated agricultural area. A runway alignment at this location

Table VIII-1

COMPARATIVE LEVELS OF ENVIRONMENTAL IMPACT
(1975)

	Alternative Sites		
	Lihue Airport	Kilauea Bay-Moloaa Bay	Port Allen
Impacts From:			
Aircraft Noise	High	Low	High
Grading	Moderate	High	High
Sewage Disposal	High	High	Moderate
Access/Vehicle Miles Traveled	Low	High	High
Loss of Agricultural Land	Moderate	High	High
Impacts On:			
Air Quality	Low	Low	Low
Drainage	High	High	Low
Vegetation	Low	Low	Low
Wildlife	Low	Low	Moderate
Archaeological/ Historic Sites	Low	Low	High
Conservation Areas	Low	Low	Low
Park and Recreation Areas	Moderate	Low	High
Existing Land Use	Moderate	High	High
Local Plans and Programs	Low	High	High
Existing Zoning	Moderate	High	High

Source: PMM&Co.; natural environment impacts based on work performed by Environmental Communications, Inc.

could be developed so that aircraft noise impacts, as depicted on Exhibit S, would not be adverse to human habitation.

Exhibit S-1 depicts the ASDS contours for existing conditions. The 1974 Situation Index would be 26,163 acre-minutes of exposure over 85 dB(A) if an airport were to be located here. This is 334% higher than the 1974 Situation Index for Lihue Airport (6,022 acre-minutes). Additionally, the Situation Index would increase over time at this site as aircraft operations increase, whereas at Lihue Airport, the Situation Index decreases with the introduction of overwater flights.

Additionally, construction of an airport on this site would result in the loss of considerable acreage presently used for grazing and other agricultural pursuits. The 1970 Kauai General Plan retains the Kilauea Bay-Moloaa Bay area in agricultural uses. County zoning in the area likewise calls for agricultural uses in conformance with the General Plan. Attempts to rezone properties in the Kilauea area to an urban use classification were denied by the State Land Use Commission in December 1974. In addition, both the Kauai Task Force and the present Mayor of Kauai have reiterated their belief that the area should remain in an agricultural use and that every effort should be made to increase the agricultural productivity of the area. Therefore, the development of an airport on the

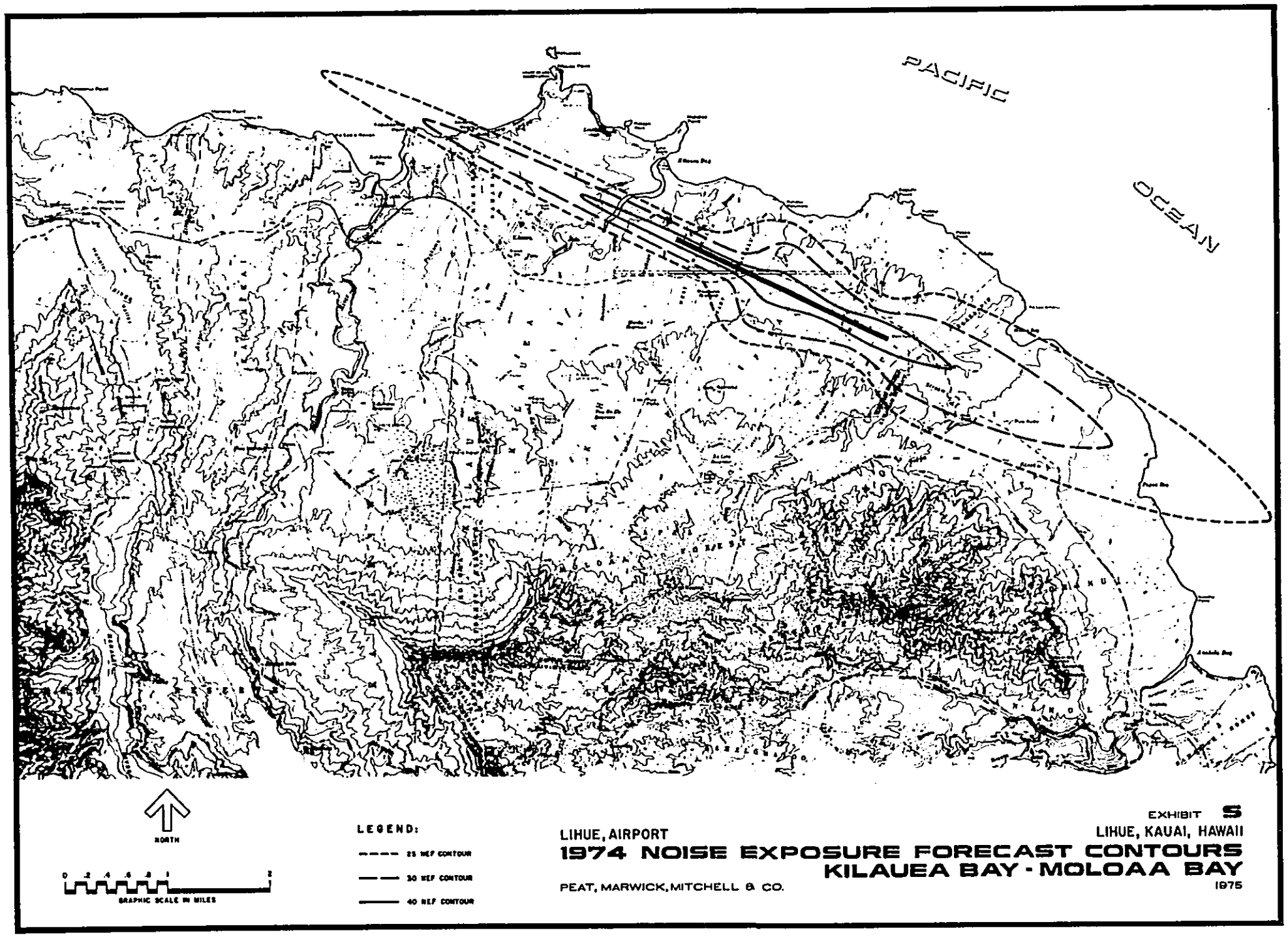


EXHIBIT 5

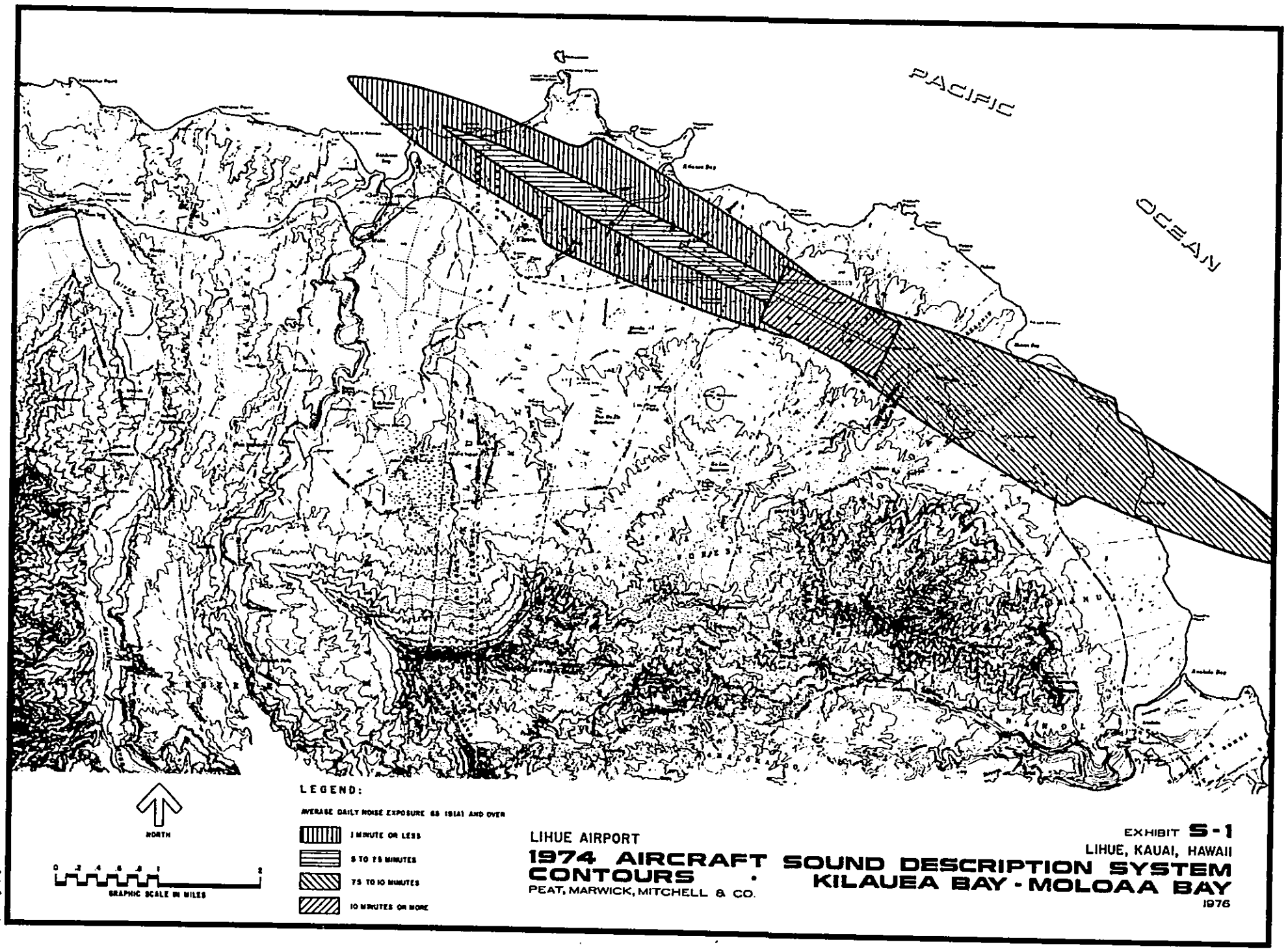
LIHUE, AIRPORT

LIHUE, KAUAI, HAWAII

1974 NOISE EXPOSURE FORECAST CONTOURS KILAUEA BAY - MOLOAA BAY

PEAT, MARWICK, MITCHELL & CO.

1975


PACIFIC
OCEAN
LEGEND:
AVERAGE DAILY NOISE EXPOSURE 65 (EPNL) AND OVER
1 MINUTE OR LESS
5 TO 75 MINUTES
75 TO 10 MINUTES
10 MINUTES OR MORE
NORTH
GRAPHIC SCALE IN MILES
LIHUE AIRPORT
1974 AIRCRAFT SOUND DESCRIPTION SYSTEM CONTOURS
PEAT, MARWICK, MITCHELL & CO.
EXHIBIT S-1
LIHUE, KAUAI, HAWAII
KILAUEA BAY - MOLOAA BAY
1976

(6/76)

Kilauea Bay-Moloaa Bay Site is inconsistent with existing land use, zoning, and General Plan policies, as well as the desires of key elected officials and the Kauai Task Force.

Development of an airport at the Kilauea Bay-Moloaa Bay Site would cause a number of adverse impacts on the environment.

- Disruption of Streams. The possible northwest-southeast runway alignment shown on Exhibit S crosses Waipake Stream and several other natural stream courses, as well as the Koolau Ditch which provides irrigation water to the area.

- Higher Surface Water Runoff. Rainfall in this area is higher at either Lihue or Port Allen, resulting in higher surface water runoff. Consequently, a very extensive surface drainage system would have to be installed to reroute present drainage patterns and handle increased storm water runoff flows from impervious paved surfaces on the airport proper.

- Loss of Irrigation Water. The Waiakalua Reservoir would have to be filled in, resulting in the loss of irrigation water for the area.

- Extensive Grading. Although the runway location is relatively level, the terminal complex would be on steeper terrain south of the airfield, thus requiring extensive grading. Unless it is carefully graded, unsightly scars could be left on the landscape.

Impacts on vegetation and wildlife would be minimal because of the area's long history of agricultural cultivation. Likewise, intensive cultivation has already destroyed known archaeological and historic sites.

The nearly pristine air quality of the locale would not be adversely impacted by current or future levels of aircraft operations or vehicular traffic to and from an airport at the Kilauea Bay-Moloaa Bay Site. The scattered, essentially rural population of the Island does not generate high levels of air pollutants, and those generated are carried away from the Island by the regular trade or Kona winds, depending on the season.

Sewage disposal at the Kilauea Bay-Moloaa Bay Site could be a problem. No sewage treatment facilities exist, and none are planned for the area, so airport development would require the construction of an on-site sewage treatment plant to handle airport-generated wastewater.

Developing an airport with its concomitant sewer and water facilities in the center of an agricultural area could induce urban growth where local and state officials are attempting to preserve agricultural uses. Unplanned urban growth in an agricultural location would be detrimental to overall development programs for the Island.

Finally, the Kilauea Bay-Moloaa Bay Site is not central to present or planned development on the Island. Airport employees would have to travel longer commute distances and visitors would have longer travel times to resort areas and tourist attractions on the south coast. The result would be an increase of some 66% in total vehicle-miles traveled for airport-related trips over the total presently generated at Lihue Airport, as Table VIII-2 illustrates.

Port Allen. The Port Allen Site is on the south coast of Kauai approximately two miles west of Hanapepe Bay and one mile northwest of the existing Port Allen Airport. Development of a new aircarrier airport at this site would require closing the existing Port Allen Airport. As illustrated on Table VIII-1, this site has more "high" environmental impacts than the other two sites. The primary adverse impacts that would result from an airport at Port Allen are aircraft noise and degradation of the Salt Pond Park, an important archaeological and historic site.

Sideline noise depicted on Exhibit T from air carrier aircraft using the runway alignment of this site would adversely affect approximately 310 homes in the Kaumakani, Hanapepe, and Port Allen areas. In addition, Salt Pond Park would be adversely affected to an even greater degree than the residences. This park and historic site reflects an important facet of Hawaiian culture, the manufacture of salt, and has been recently nominated to the National Register of Historic Places. The park is already included in the Hawaii Register of Historic Places.

Exhibit T-1 depicts the ASDS contours for existing conditions at the Port Allen Site. The 1974 Situation Index would be 10,256 acre-minutes of exposure over 85 dB(A), lower than at the Kilauea Bay-Moloaa Bay Site but 70% higher than Lihue Airport. However, as with the Kilauea Bay-Moloaa Bay Site, the Situation Index for the Port Allen Site would increase over time as opposed to Lihue Airport which would decrease.

Adjacent to the Salt Pond is a bird and waterfowl habitat which is recommended as a wildlife refuge in the initial draft of the Hanapepe-Eleele Community Development Plan currently in preparation.

Table VIII-2

1974 ESTIMATED DAILY VEHICLE-MILES TRAVELED

	Lihue	Kilauea Bay-Moloaa Bay	Port Allen
Automobile	63,100	109,000	93,300
Limousine	6,600	8,400	7,800
Bus	3,300	4,200	3,900
Truck	5,000	7,500	10,000
Total	78,000	129,100	115,000

Source: PMM&Co.

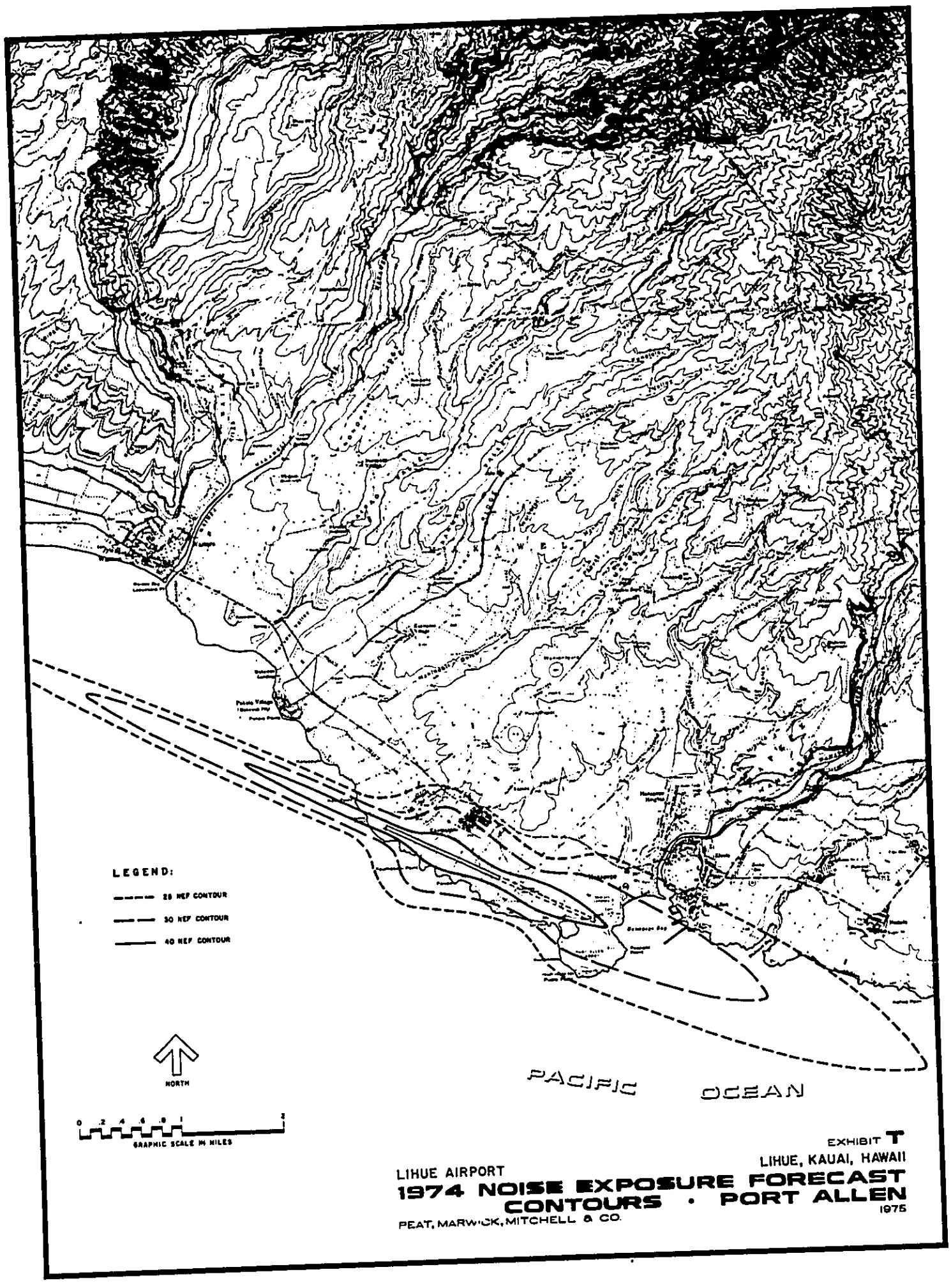


EXHIBIT T

LIHUE, KAUAI, HAWAII

LIHUE AIRPORT

1974 NOISE EXPOSURE FORECAST CONTOURS • PORT ALLEN

1975

PEAT, MARWICK, MITCHELL & CO.

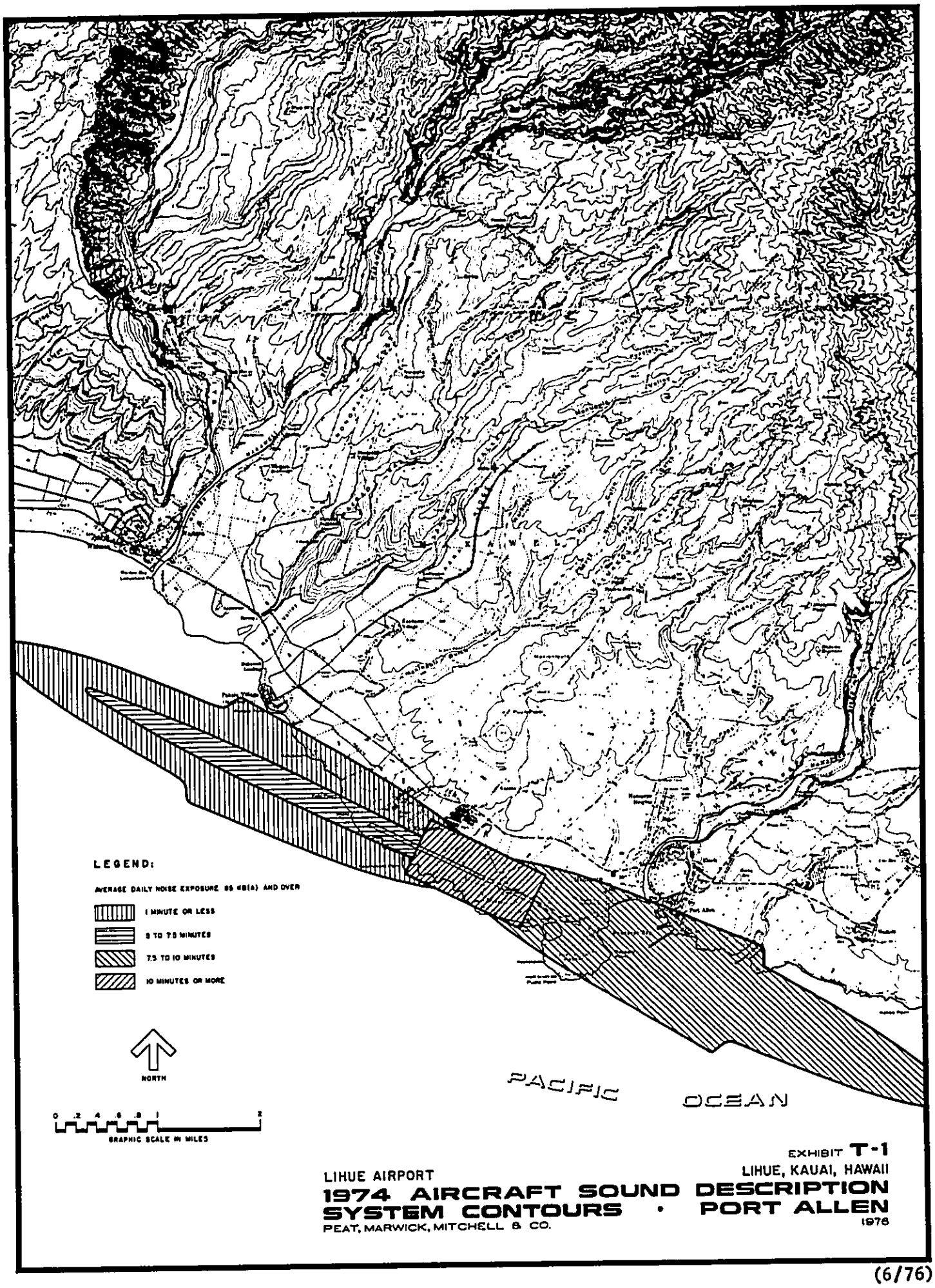


EXHIBIT T-1

LIHUE AIRPORT

1974 AIRCRAFT SOUND SYSTEM CONTOURS

LIHUE, KAUAI, HAWAII

DESCRIPTION • PORT ALLEN

1976

PEAT, MARWICK, MITCHELL & CO.

(6/76)

The development of an airport on the Port Allen Site is inconsistent with existing land use and zoning patterns, and with long-range development plans for the area. With the exception of the area around Olokele Mill, the site is under sugarcane cultivation and zoned for this use. The 1970 Kauai County General Plan recommends that the area be retained in an agricultural use and that the coastline south of the site be reserved for resort development. The coastal area is, in fact, zoned as an urban district which would permit resort development. The initial draft of the Hanapepe-Eleele Community Development Plan recommends that the coastal area be rezoned as open space and that Salt Pond Park be expanded westward into the area formerly reserved for resort-type uses. In any event, both resort development or park expansion are incompatible with airport development.

Because of several ridges which traverse the site, elevation above mean sea level (MSL) along the preferred runway alignment ranges from 20 feet MSL to 120 feet MSL. Therefore, considerable grading would be required to achieve a uniform runway gradient of less than 1%. Considerable grading would also be required to develop a terminal complex north of the runway.

Drainage would not be as serious a problem at Port Allen as at Lihue Airport and the Kilauea Bay-Moloaa Bay Site. Rainfall is lower than at the other two sites with a consequent decrease in surface water runoff. Localized surface drainage would have to be rerouted, but there are no permanent streams flowing through the site as at Kilauea Bay-Moloaa Bay.

Sewage disposal would not be a major concern either. The County presently has a program under way to upgrade sewage treatment facilities in the Hanapepe-Eleele area. An airport at Port Allen could be tied into the new sewage treatment facilities. Also, because the area is under intensive sugarcane cultivation, there would be no loss of native vegetation.

Like the Kilauea Bay-Moloaa Bay Site, the Port Allen Site is not centrally located relative to the development patterns of the Island. As shown on Table VIII-2, the estimated total

daily vehicle-miles traveled to and from the Port Allen Site would be some 47% higher than those for Lihue Airport.

Do-Nothing Alternative

The do-nothing alternative considers the environmental consequences of continued use of the existing Airport without improvements of any kind. From the standpoint of airfield capacity only, a single runway should be adequate to accommodate forecast demand throughout the 1995 planning period. However, as previously discussed, the construction of a new air carrier runway is recommended to improve the compatibility of the Airport with the surrounding environment and to improve aircraft approach conditions by permitting the installation of an instrument landing system (ILS). In addition to reducing present and potential adverse noise impacts on the surrounding community, the early construction of the new runway would permit the Airport to remain open when it eventually becomes necessary to lengthen, widen, and strengthen existing Runway 3-21. Otherwise, the Island of Kauai would be without air service for a period of time while improvements or maintenance to Runway 3-21 are carried out.

The terminal complex, although already inadequate and inefficient, will not by itself limit forecast passenger activity. The lack of facilities on the aircraft parking apron and in the terminal building could result in the airlines expanding

flight schedules into nonpeak hours and thus cause additional traffic congestion on the aircraft parking apron, in the terminal building, along the airport access road, in the parking lots, and along the terminal curbside. This congestion would tend to generate greater time delays in getting to and from the Airport. Business travelers will suffer the greatest inconvenience from time delays, since they must meet specific deadlines. However, residents of Kauai and visitors to the Island will also experience similar inconveniences and delays.

Perhaps the most serious adverse environmental impact associated with the do-nothing alternative is that of aircraft noise. As illustrated on Exhibit U, anticipated 1995 noise exposure impacts will be greater than in 1974, if the new runway is not constructed or if the terminal complex remains as is. Kauai High School will still fall within the NEF 40 contour, as will homes in the vicinity of the high school and the residence at Ahukini Landing. Therefore, the noise situation will worsen because of increasing numbers of aircraft operations by smaller aircraft rather than improve because of fewer operations of larger and quieter aircraft.

The Aircraft Sound Description System (ASDS) was also used in analyzing the do-nothing alternative. Exhibit V illustrates the ASDS contours for 1995, assuming no changes in the airfield

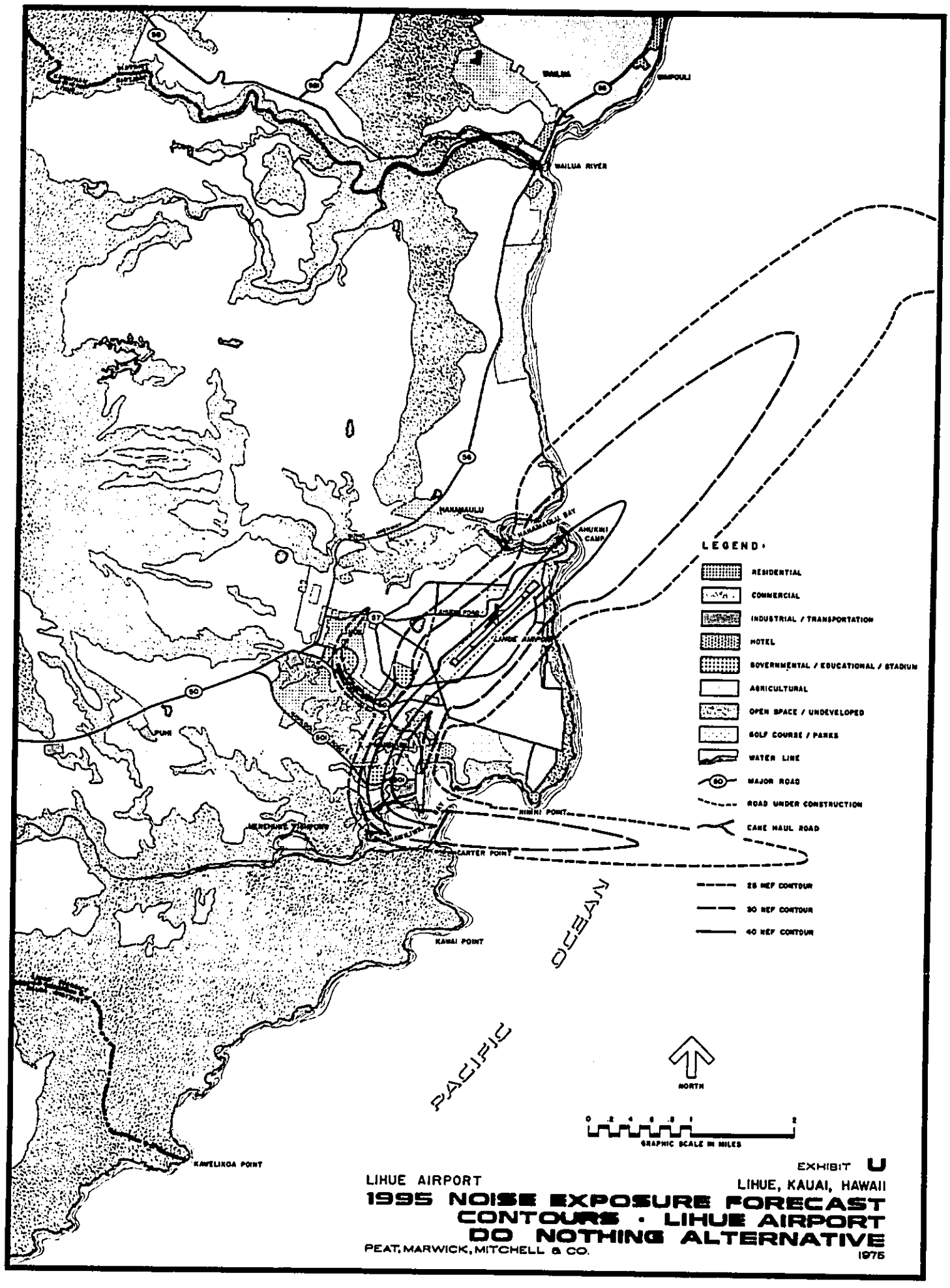


EXHIBIT U

LIHUE AIRPORT

LIHUE, KAUAI, HAWAII

1995 NOISE EXPOSURE FORECAST CONTOURS · LIHUE AIRPORT DO NOTHING ALTERNATIVE

PEAT, MARWICK, MITCHELL & CO.

1975

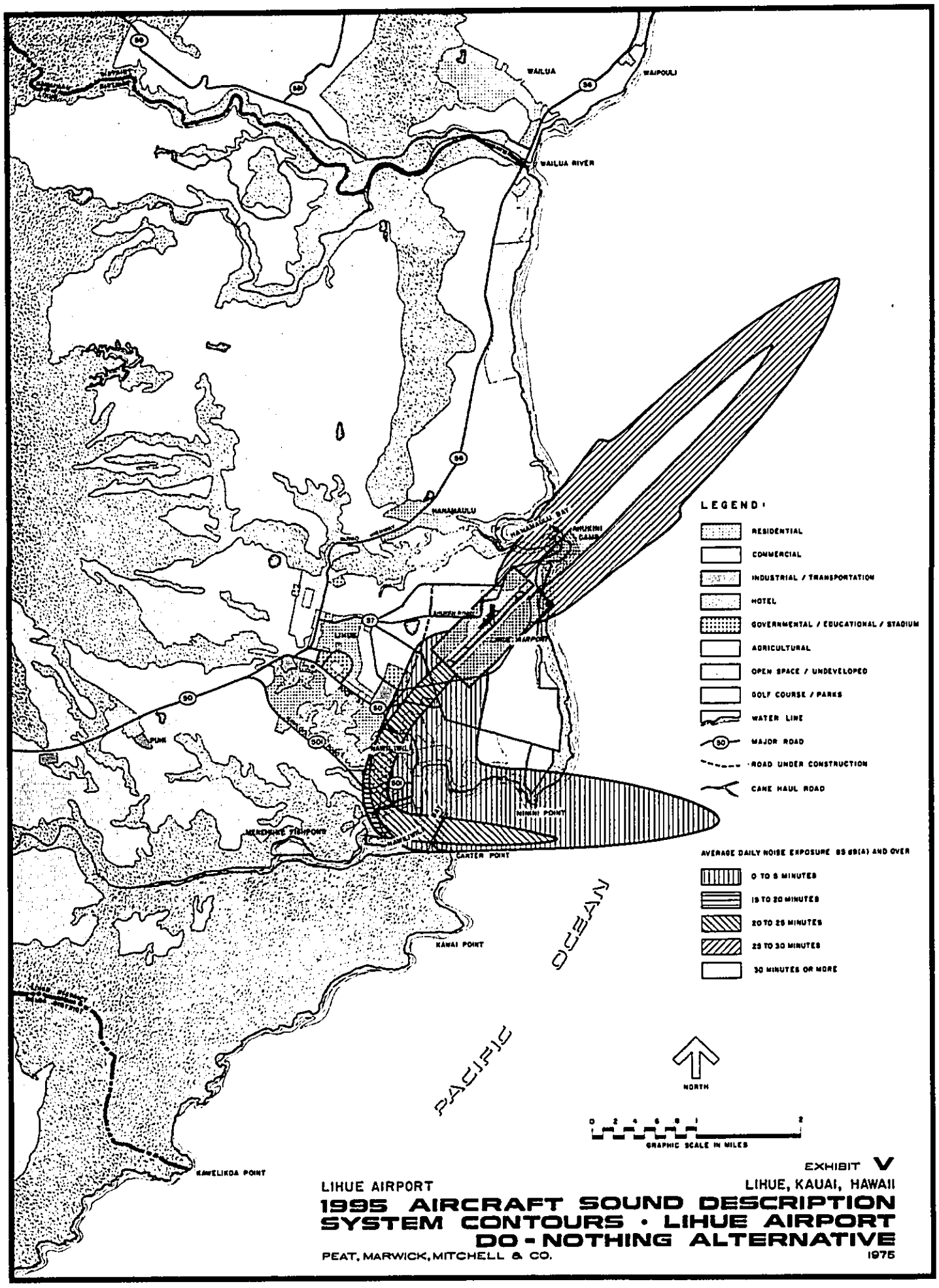


EXHIBIT V

LIHUE AIRPORT — LIHUE, KAUAI, HAWAII

1995 AIRCRAFT SOUND DESCRIPTION SYSTEM CONTOURS • LIHUE AIRPORT DO-NOTHING ALTERNATIVE

PEAT, MARWICK, MITCHELL & CO. — 1975

configuration. A comparison of Exhibit V with existing (1974) conditions depicted on Exhibit K indicates that the daily noise exposure in excess of 85 dB(A) in the Kauai High School vicinity will increase from 5 to 7.5 minutes in 1974 to 20 to 25 minutes in 1995. The Situation Index (excluding airport property and overwater portions of the flight paths) likewise will increase from 6,022 acre-minutes of exposure in 1974 to 16,950 acre-minutes of exposure in 1995.

Because the do-nothing alternative does not include the purchase of additional land, there will be insufficient space on the Airport for necessary improvements to ground transportation facilities; parking lots; air cargo facilities; crash, fire, and rescue facilities; and general aviation areas. In addition, problems with the drainage, sewage disposal, and water supply systems which are completely inadequate even for present day needs, will only worsen under this alternative.

Alternative Airport Configurations

Restrictions placed upon the utilization of airspace by the mountainous terrain dictate the location and orientation of the north-south runway. A north-south orientation is necessary to provide for a precision instrument approach procedure which avoids the Haupa mountain ridge to the southwest and permits overwater approaches during trade wind conditions

(and departures during Kona conditions). This new runway is located as far east as possible in order to maximize the distance between it and urbanized areas. At the same time, the runway could not be located too close to the Ocean because the eastward drop in elevation would require excessive fills that would extend to, and effectively eliminate, the shoreline. Several alternative sites and concepts for development of a new passenger terminal complex were analyzed in conjunction with the use of existing Runway 3-21 and a new north-south air carrier Runway 17-35. Two potential concepts for development of a new passenger terminal complex were analyzed: linear and finger. The two general areas considered for the new complex were Site I, west of existing Runway 3-21, and Site II, between existing Runway 3-21 and the new Runway 17-35.

Each of these sites was evaluated on the basis of estimated land required, potential disruption of existing or probable land uses, potential disruption of existing airport operations during construction, and development potential throughout and beyond the 20-year planning period. The evaluation is summarized below.

Site I would permit the development of the first phase terminal complex without disrupting operations in the existing terminal complex or access to the Airport via Ahukini Road.

It would also allow for the development of a linear terminal with a minimum of land acquisition for the first-phase development. In addition, Site I would permit use of the existing terminal area buildings, aircraft parking apron, and automobile parking areas for other uses after the first phase of the new terminal complex is in use.

A terminal located on Site II would require considerably more land and, therefore, a considerably greater loss of sugarcane production than would be necessary for terminal Site I. Development of this site would involve construction of a completely new access road, of up to two miles, connecting to the nearest highway (State Route 51); require installation of completely new systems for all utilities to serve the terminal site; and necessitate relocation of the FAA control tower for the first phase of development.

Therefore, because of the lesser amount of land required and the relative ease of developing the first phase without disrupting activities at the existing passenger terminal complex, it was recommended that a new linear passenger terminal complex be developed on Site I, west of Runway 3-21. This site is already well established as the historical location for the Lihue Airport passenger terminal.

IX. THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Improvements proposed as part of the Lihue Airport Master Plan are recommended for construction in three stages over the 20-year planning period. Because the Plan is conceptual in nature, it is difficult to assess the short-term impacts that would be associated with construction until detailed engineering and architectural design and construction plans for specific improvements are developed. However, certain measures must be implemented during the construction period to ensure that no adverse impacts on the environment are generated. The measures include:

- Control of dust during the grading and construction phases.
- Temporary rerouting of natural drainage ways leading to the permanent realignment of drainage channels with sufficient capacity to handle potential surface water flows so as to avoid flooding on the Airport site.
- The installation, if necessary, of additional settling ponds to prevent silt deposition in nearby coastal waters.

Implementation of the proposed Plan is expected to enhance the long-term productivity and goals of Kauai by providing an Airport facility capable of accommodating the air transportation requirements of the Island through the 20-year planning period and beyond.

Conservation of Energy

During Tradewind conditions, occurring approximately 90% of the time, the distance on approach to Runway 35 will be reduced by up to three nautical miles over the present approach to Runway 3. A similar reduction will occur during Kona conditions (about 10% of the time) for takeoffs on Runway 17 instead of the existing Runway 21. Use of the new Runway 17-35 will increase taxiing distances by about 500 feet for landings under Tradewind conditions. However, the distance required to taxi for takeoff under Kona conditions will be reduced by 400 feet with the new runway. Since aircraft burn more fuel in the air than taxiing on the ground, there should be a fuel savings with the addition of the new runway, even if the amount of such "saved" fuel is nominal.

The total vehicle-miles traveled by Airport employees and passengers, and therefore the fuel consumed for Airport-related trips (refer to Table VIII-2 on page VIII-11), is reduced by retaining the Airport at Lihue rather than relocating it to an alternative location at either Kilauea Bay - Moloaa Bay or Port Allen as discussed in Section VIII.

X. ANY IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES WHICH WOULD BE INVOLVED IN THE PROPOSED PROJECT SHOULD IT BE IMPLEMENTED

The principal irreversible and irretrievable commitment of resources that would result from implementing the recommended improvements at Lihue Airport is the loss of 570 acres of agriculturally productive land. Once this area is paved over for airfield or terminal complex use, it is permanently lost to agricultural use.

Other resources that would be lost if all improvements are implemented as proposed include the materials (cement, gravel, asphalt, timber, etc.) necessary to construct the improvements. Although most of the materials needed for grading and fill operations can be obtained locally from existing quarries, manufactured materials (steel reinforcing rods, etc.) will have to be imported from Oahu or elsewhere.

XI. LIST OF NECESSARY APPROVALS

Prior to proceeding with implementation of the Lihue Airport Master Plan, the Hawaii Department of Transportation will request approvals and permits from the following agencies:

Federal Aviation Administration

Chairman, State Department of Land and Natural Resources

Chief, State Department of Transportation, Highways Division

Kauai County Planning Director

Kauai County Public Works Director

Kauai County Water Department Manager

Kauai County Chief Sanitarian

Kauai County Fire Marshall