

DRAFT

**regional airport  
system plan, 1980 - 2000**

**central puget sound region**

**puget sound council of governments**

**november 1980**

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KING SUBREGIONAL COUNCIL  
655 - 120TH N E  
BELLEVUE WA 98005



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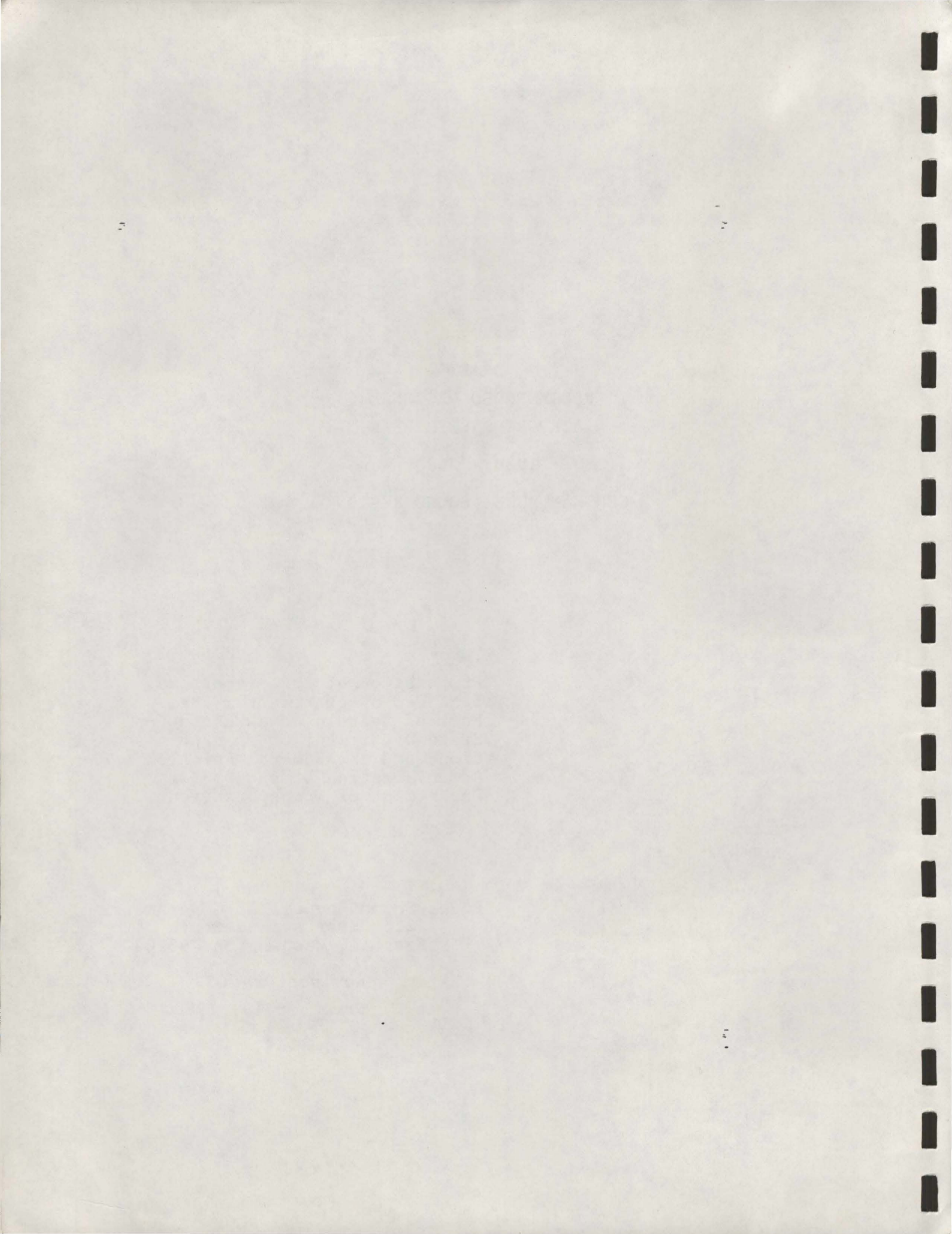
DRAFT  
RECOMMENDED REGIONAL  
AIRPORT SYSTEM PLAN  
1980 - 2000  
CENTRAL PUGET SOUND REGION

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Puget Sound Council of Governments  
216 First Avenue South  
Seattle, Washington 98104

Revised Draft  
November 19, 1980







## FOREWARD

This document is the result of a twelve month effort to update the Recommended Regional Airport System Plan. The purpose of the Plan is to identify airport facility needs and to formulate policies and facility improvement recommendations for responding to those needs.

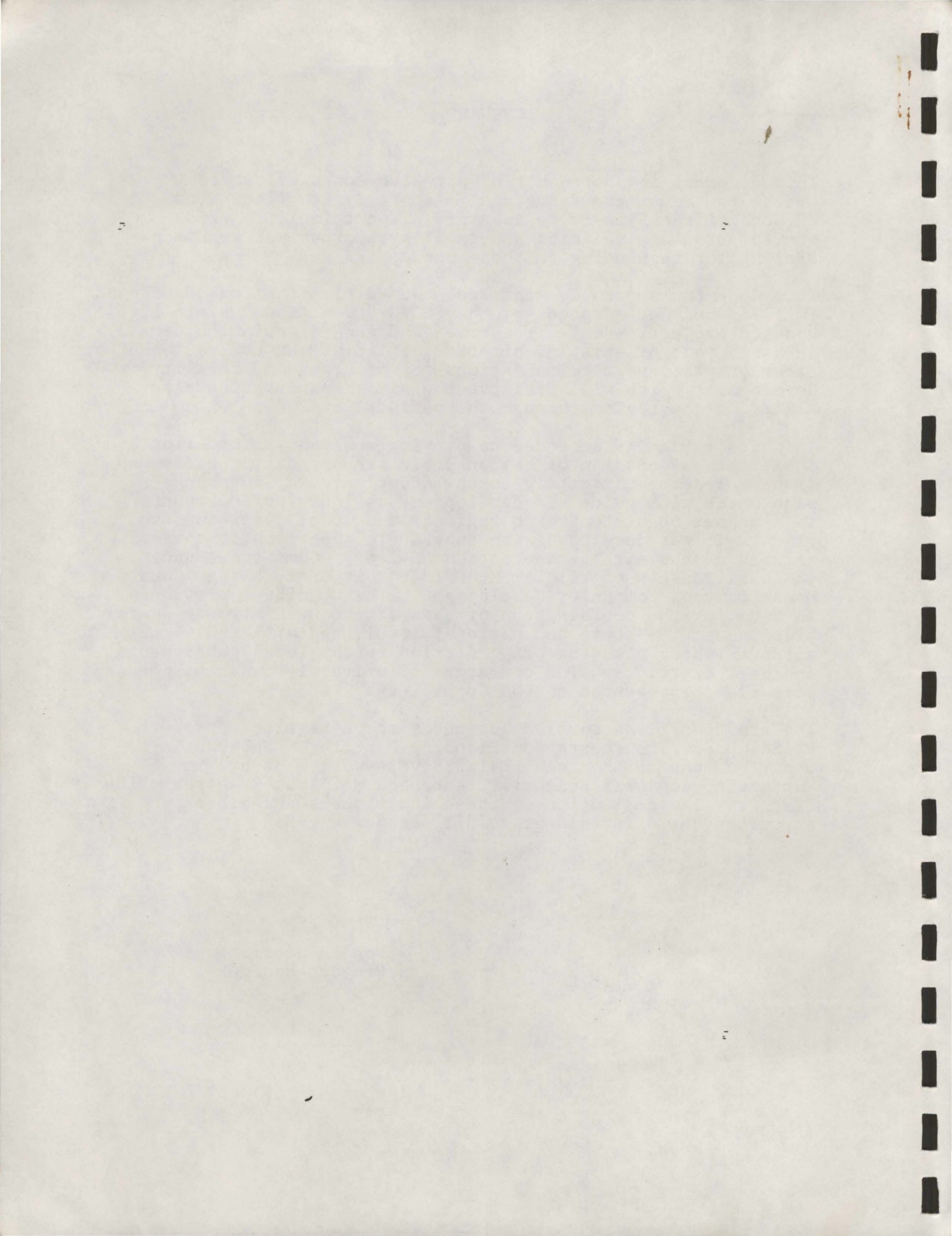
This document supersedes the Recommended Plan that was developed in 1975, but not adopted by the PSCOG. Contained herein are updated projections of air carrier and general aviation demand, an assessment of existing airport facilities, an evaluation of alternatives, and recommendations for programs and facility development which will preserve the air transportation capability of the region through the period 1980-2000.

This draft Plan is intended to provide relevant information and facilitate discussion of regional air transportation needs and issues, leading ultimately to the adoption of a long range plan which will guide the development of individual airports in a manner consistent with regional and local comprehensive plans. It was developed with substantial contributions from members of the Air Transportation Advisory Committee, under the chairmanship of William M. Palmer, Director, Kitsap County Department of Community Development. The Committee provided a forum for the coordination of this effort with airport system planning at the state and national level, and with individual airport master planning being carried out by local governments and port districts. The operators of privately owned airports were also represented on the Committee.

The staff work was carried out under the direction of Robert L. Shindler, Transportation Planning Director. Substantial contributions to the technical analysis were made by Tim Watterson, Regional Economist, and Jack Meijsen, Transportation Planner. The dedication of these individuals and others who supported the effort is gratefully acknowledged.

Donald Secrist  
Project Manager



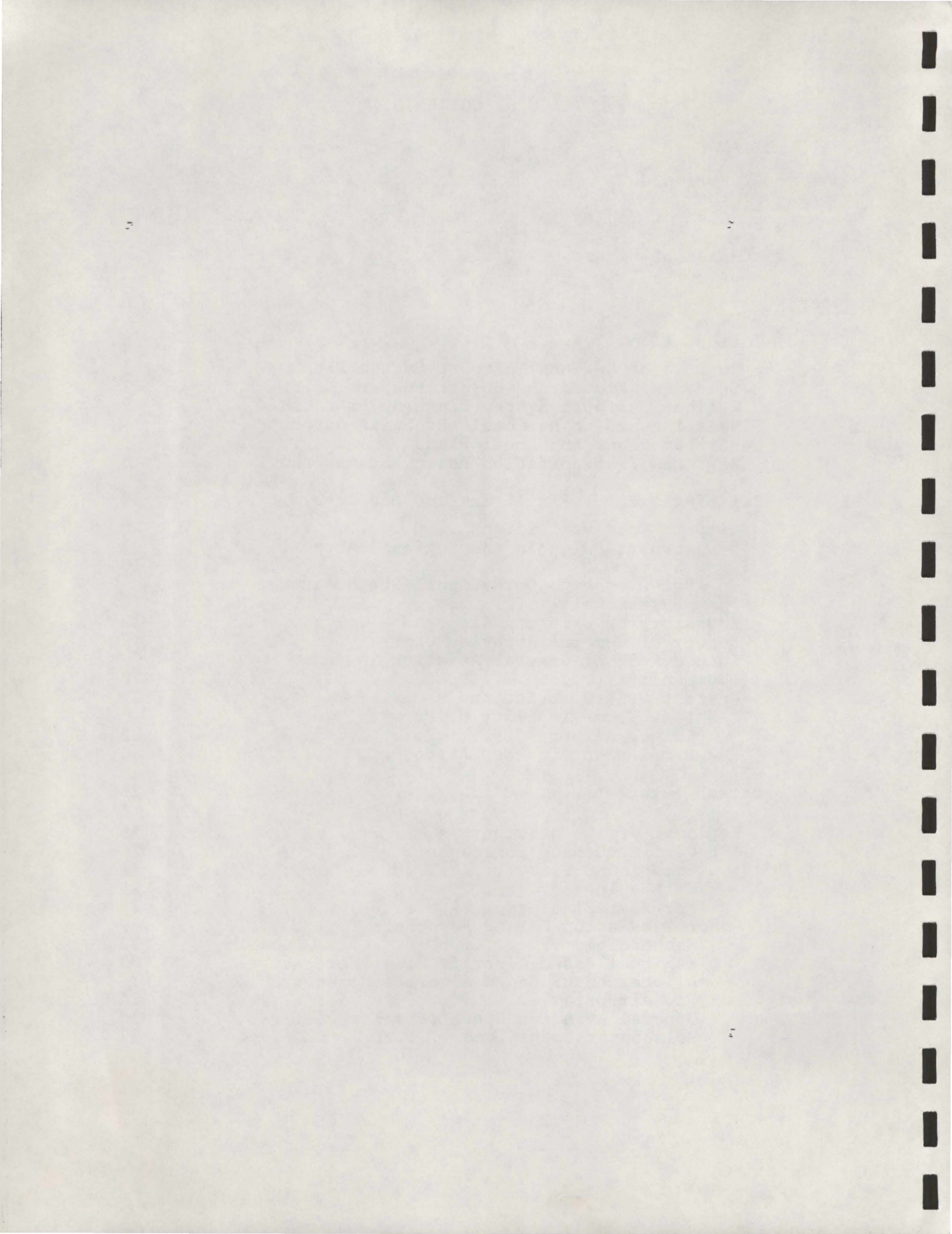




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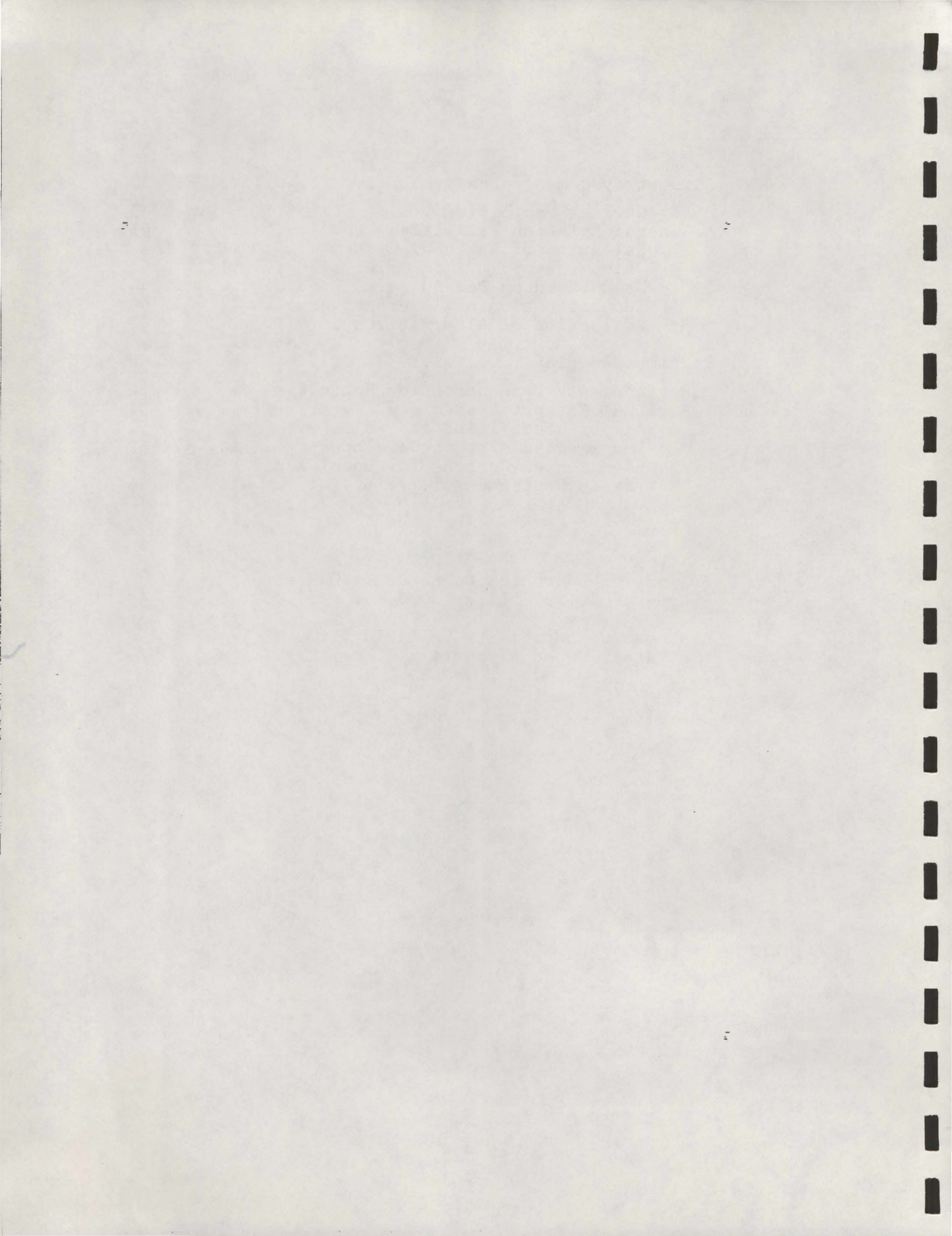
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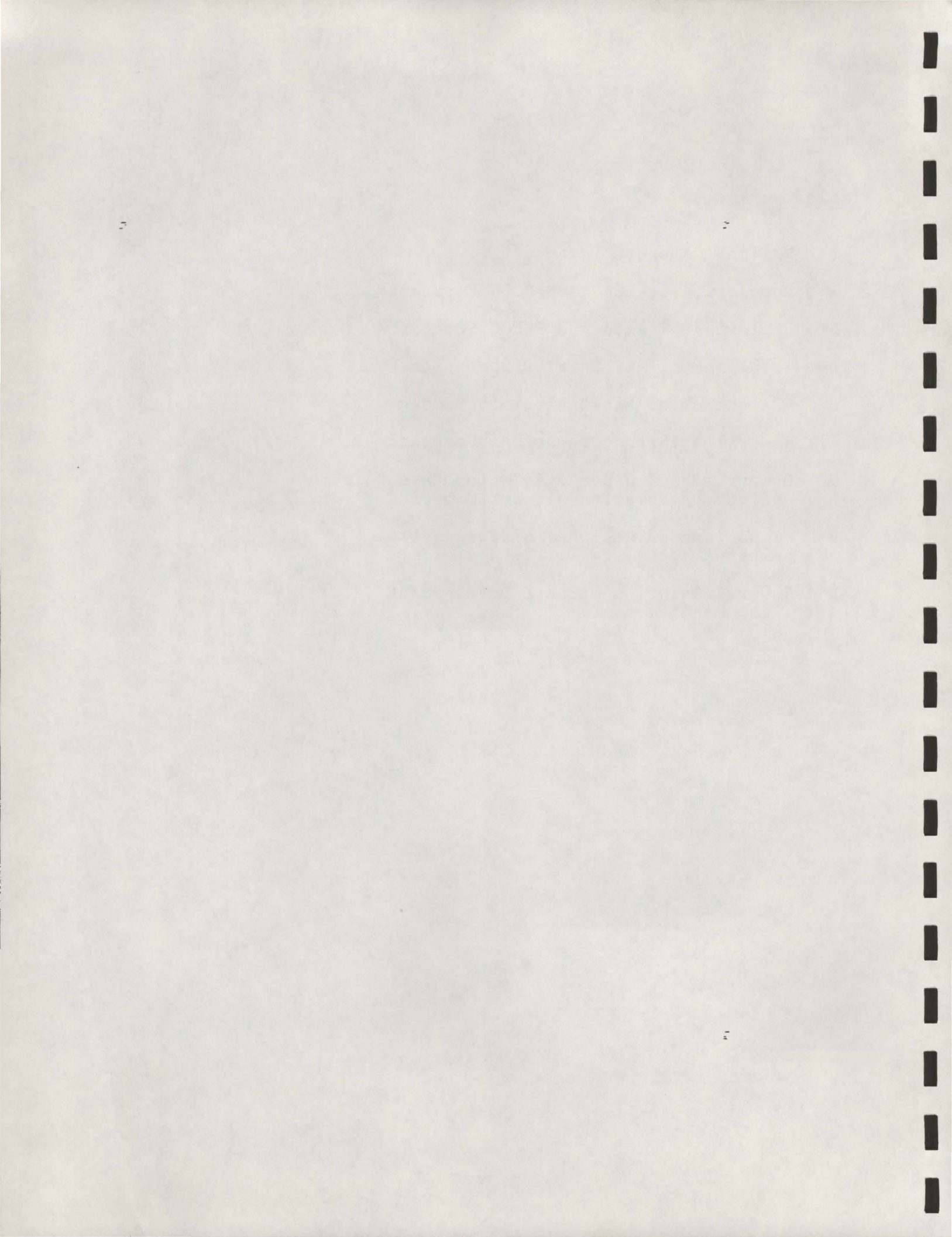




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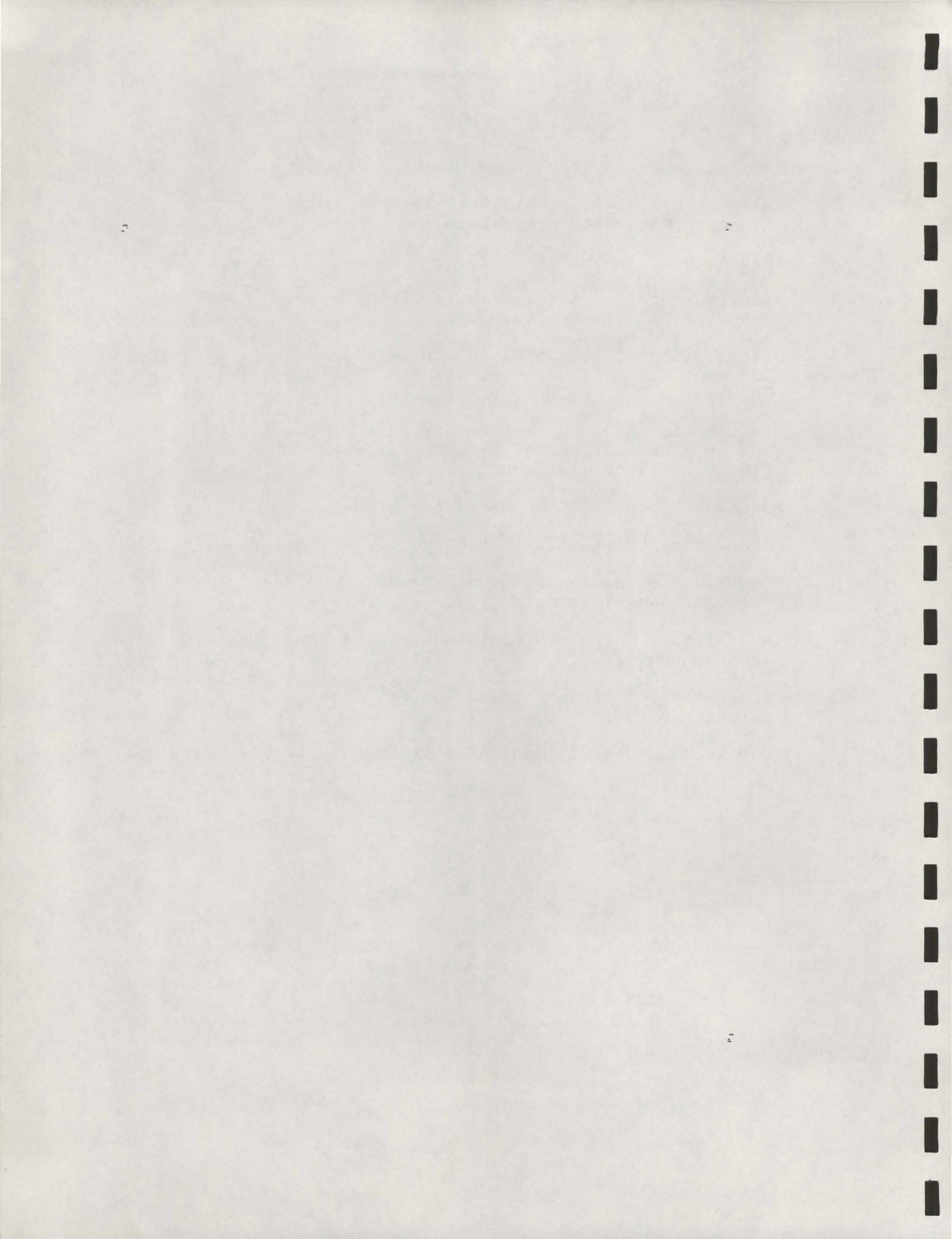




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## CHAPTER I

### INTRODUCTION

#### Purpose of Regional Airport System Plan

Air transportation is a primary mode of travel to and from the Central Puget Sound Region. For long-range domestic and international trips it is the predominant mode. For short to intermediate range travel both outside and within the four-county area, it offers an alternative to private and public modes of ground transportation. An adequate air transportation system contributes to the economic well-being of the region. Its development should be integrated with the development of other transportation modes and be consistent with policies for environmental quality and overall regional development.

The Regional Airport System Plan is one of the modal elements of the Regional Transportation Plan. Its purpose is to identify airport facility needs and to formulate policies and facility improvement recommendations for responding to those needs. The Plan provides forecasts of air transportation demand through the 20 year planning period. It provides an assessment of the adequacy of existing airport facilities in meeting that demand and an evaluation of alternatives for providing additional facilities where there is a need. The Plan addresses air carrier demand, which is primarily served by Seattle-Tacoma International Airport (Sea-Tac) and general aviation demand, which entails the wide range of business, industrial, and personal uses served by the other airports in the region.

The data and information contained in the Plan are intended to be a resource to local governments and transportation operating agencies. By recognizing those airport facilities which are serving a transportation need in the urban areas of the region, effective coordination can occur in planning for other transportation modes and in community comprehensive planning.

#### Study Background and Objectives

A Draft Regional Airport System Plan was developed in 1975 but not adopted. A decision was made by the PSCOG Executive Board not to seek the funding necessary to carry out the review process, refine the Plan, and present it for adoption. Since that time several planning studies have been carried out which effect general aviation airports in the region. These include the Washington State Airport System Plan Update, the Snohomish County Paine Field Community Plan, the Eastside Aviation Study, and the Pierce County Multi-Airport Master Plan. Other airports have updated their master plans - Auburn Municipal, Renton Municipal, Kitsap County Airport and Arlington Municipal.



In addition the status of some privately owned airports in the region has changed. The most notable of these are the announced closure of Bellevue Airport and the announced purchase of Puyallup Industrial Airport by Pierce County.

On the regional scale, the updating in 1977 of the economic base forecasts (population, employment, and per capita income) generated interest in updating the air carrier demand forecasts as well as the general aviation demand forecasts.

In light of these developments, it became an objective of the PSCOG to update the Draft Regional Airport System Plan and to carry it out as a parallel effort with the major update of the other elements of the Regional Transportation Plan (highway, ferry, mass transit, paratransit) occurring in 1980 and 1981. The specific study objectives for updating the Draft Regional Airport System Plan were:

- o Maintain the coordination of airport planning with other transportation and land use planning activities; provide the opportunity for citizen and interest group involvement.
- o Update the regional forecasts of air carrier passenger and cargo demand and general aviation activity based on revised projections of growth in population and economic activity.
- o Address the needs, issues, and implementation obstacles related to the development of general aviation facilities; propose policies to guide development of new airports and/or retention of existing airports for general aviation use.
- o Update the regional airport system plan and include it as an element of the Regional Transportation Plan.

#### Regional Airport System Planning Process

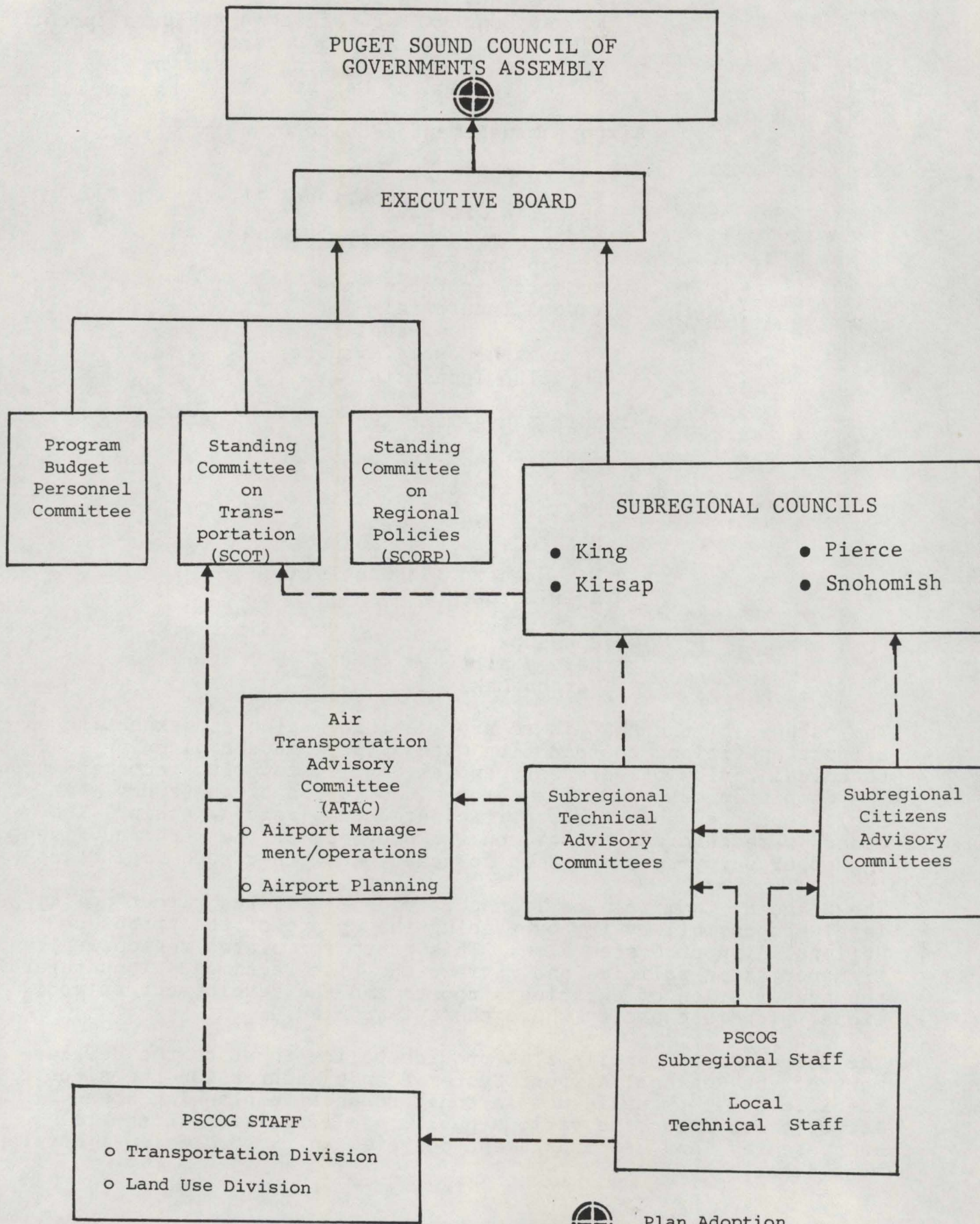
The PSCOG organizational structure for development of the Regional Airport System Plan is shown in Figure 1. Primary staff responsibility for the technical work rests with the Transportation Planning Division. Support is provided by the Land Use Planning Division and the four subregional planning staffs. The focal point for technical review and coordination is the Air Transportation Advisory Committee (ATAC). This group consists of planning staff representatives from affected local, state and federal jurisdictions and airport management representatives. Organizations represented on the ATAC include the following:

##### Planning:

Federal Aviation Administration  
W.S.DOT, Division of Aeronautics  
Port of Seattle



FIGURE 1  
 REGIONAL AIR TRANSPORTATION PLANNING PROCESS



Plan Adoption

Policy Formulation

Advisory and Technical Analysis



Port of Tacoma  
King County Planning Division  
Kitsap County Dept. of Community Development  
Pierce County Planning Department  
Snohomish County Planning Department  
Bellevue Planning Department

Airport Management (Public Owned):-

Auburn Municipal  
King County International (Boeing Field)  
Renton Municipal  
Seattle-Tacoma International  
Kitsap County  
McChord Air Force Base  
Tacoma Industrial  
Arlington Municipal  
Snohomish County Airport  
Puyallup Industrial

Airport Management (Privately Owned):

Cedar Grove Airpark  
Crest Airpark  
Enumclaw  
Kenmore Air Harbor  
Lake Union Air/Kurtzer Flying Service  
Wax Orchard (Vashon Island)  
Apex Airpark  
Port Orchard  
Spanaway  
Harvey Airfield  
Martha Lake

The purpose of the ATAC is to provide information and expertise on airport operations coordination with airport master planning, and technical review of forecasts and airport system plan recommendations. The Committee met bimonthly through the course of the study. A nucleus of the above group participated on a regular basis. The others were informed by mail on the progress of the work and given the opportunity to comment on forecasts and other technical data.

The Standing Committee on Transportation (SCOT) has direct policy level responsibility for overseeing the update of the proposed Regional Airport System Plan. This group formulates regional air transportation policies and reviews the Plan recommendations regarding the preservation of existing airports and the development of additional airport capacity where there is a need.

The Subregional Councils also provide policy input to the development of the Regional Airport System Plan by addressing the airport-specific development issues in their respective planning areas. Airports are among the various public use facilities which are addressed by land use management policies in the Subregional Development Plans.



The Subregional Councils and the SCOT will ultimately recommend the adoption of the Regional Airport System Plan to the PSCOG Assembly.

#### Relationship to National and State Airport System Plans and Local Plans.

The relationship of the Regional Airport System Plan with national, state and local plans is illustrated in Figure 2. National air transportation policies are established in acts passed by Congress. The Airport and Airways Act of 1970 authorized various user fees and taxes to provide a funding base for the development and maintenance of airport facilities to serve the nation's air transportation needs. The FAA was mandated to create a National Airport System Plan (NASP) to identify those airports which would be eligible to receive federal financial aid from the aviation trust fund.

The data and planning basis for the NASP is developed in state and regional airport system plans. The purpose of these plans is to assess the air transportation needs for a given state or regional geographic area and to make recommendations regarding the development and use of airports common to that area. To be effective these system plans must be closely coordinated with surface transportation plans and community comprehensive plans at the regional and local level. State system plans focus on the formulation of state level air transportation policies, and forecasts of demand and capital funding needs as a basis for state legislation. Regional system plans can more effectively deal with the allocation of demand to specific airport facilities, definition of their role in the community and recommendation of general land use planning guidelines to local governments.

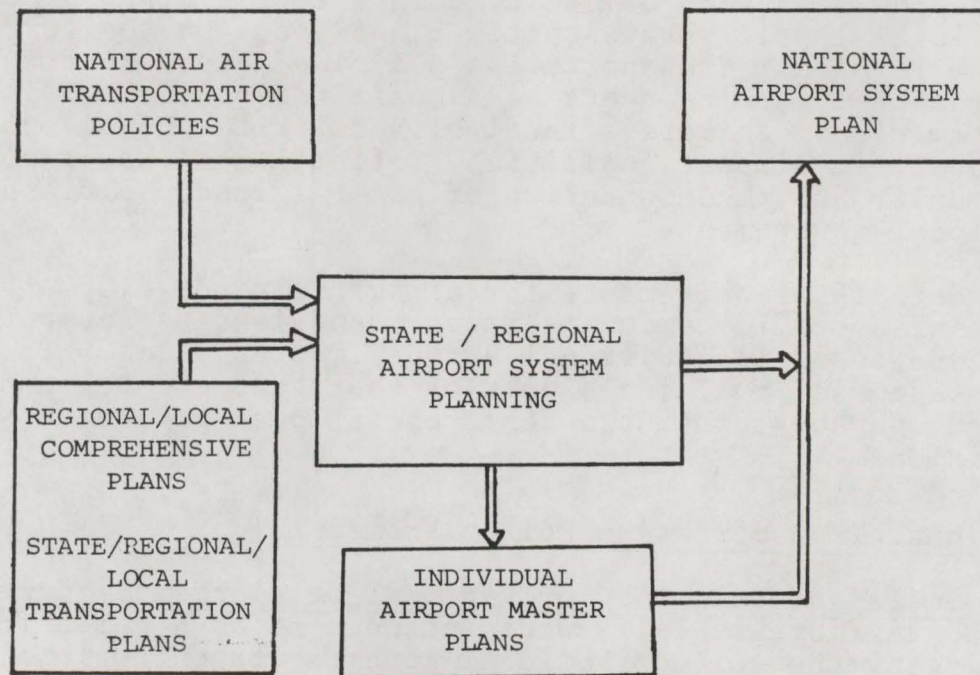
The detailed requirements for airport site development, the assessment of specific community impacts and land use compatibility issues are addressed in individual airport master plans. The master plans are essential building blocks of the state and regional system plans and they provide a resource to local governments in land use decisions.

#### Regional Transportation Policy Framework

The Goals and Policies for Regional Development, adopted by the PSCOG in February 1977, were intended to be a guide for decision making by the collective local governments on regional growth management issues and on the development of public facility systems such as the Regional Airport System. They provide a general planning framework for the development of the plan contained herein. The transportation goal and supporting policies are shown below with those that particularly pertain to airport system planning shown in upper case type.



FIGURE 2  
RELATIONSHIP OF REGIONAL AIR TRANSPORTATION  
PLANNING WITH NATIONAL, STATE, AND LOCAL PLANS





Goal

It is in the public interest to provide mobility for people and goods. Provision of transportation services should be coordinated to maximize use of existing facilities and direct new growth into areas already developed and serviced.

Policies

- 1) Support measures both public and private to increase vehicle occupancy that make transit and carpools more convenient and accessible, expedite their movement and provide incentives for their use.
- 2) Support public and private actions to spread peak-hour demand for transportation services and facilities, such as staggered work hours and the four-day/forty-hour work week.
- 3) Support projects and programs to remove hazards and bottlenecks from the existing highway system, to protect and enhance its capacity through traffic flow management, and to improve existing links between activity centers.
- 4) Encourage the development of additional pedestrian and bicycle facilities to provide alternatives to automobile usage.
- 5) Encourage transportation improvement programming that relates extension of facilities to local plans for accommodating new growth and for the orderly extension of other public facilities.
- 6) ENCOURAGE AIRPORT SPONSORS AND SURROUNDING GENERAL PURPOSE GOVERNMENTS TO PLAN JOINTLY FOR ANY EXPANSION OF EXISTING OR CONSTRUCTION OF NEW AVIATION FACILITIES IN ORDER TO ASSURE THAT THE NET IMPACT IS IN THE SHORT AND LONG-TERM INTERESTS OF THE COMMUNITY.
- 7) ENCOURAGE LOCAL GENERAL PURPOSE GOVERNMENTS AND AIRPORT SPONSORS TO TAKE MEASURES THAT ASSURE THE CONTINUED AVAILABILITY OF ADEQUATE GENERAL AVIATION FACILITIES.
- 8) Encourage Port Commissions and general purpose government to plan jointly for any expansion of existing or construction of new marine facilities to assure the net impact is in the short and long-term interests of the community.
- 9) Support improved interfacing of all transportation modes, including increased coordination of plans and schedules for for all transportation services.
- 10) Promote increased transportation opportunities for persons who cannot drive or do not have access to automobiles through effective integration, design and use of publicly available transportation services.



- 11) Encourage a careful assessment of transportation investments that may further increase the efficiency of present transportation facilities and services, taking account of energy, environment, community and fiscal implications.
- 12) SUPPORT THE CONSTRUCTION OF NEW TRANSPORTATION FACILITIES WHEN UP-TO-DATE PROJECTIONS OF DEMAND SHOW THAT PRESENT FACILITIES, FULLY UTILIZED, WILL NOT MEET THE DEMAND.
- 13) ENCOURAGE ANALYSES OF LONG RANGE ALTERNATIVES TO EXISTING TRANSPORTATION FACILITIES AND SERVICES THAT MAY BECOME NECESSARY OR DESIRABLE DUE TO ENERGY SCARCITY, TECHNOLOGICAL OR ECONOMIC CHANGE, OR NEEDS FOR MOVEMENT THAT CANNOT BE MET BY EVEN THE MOST EFFICIENT USE OF EXISTING FACILITIES.
- 14) TRANSPORTATION FACILITY IMPROVEMENTS AND DEVELOPMENTS WILL CONSIDER THE SPECIAL NEEDS OF GOODS MOVEMENT.
- 15) Include economic needs of and impacts on the community as factors to be considered in locational decisions for transportation facilities.
- 16) The Goals, Objectives and Policies of the adopted 1990 Regional Transportation System Plan are recognized as providing guidance for the planning of transportation facilities and services.

In the 1975 regional airport system study, the Air Transportation Advisory Committee drafted a set of regional air transportation policies to guide the planning for and development of a regional airport system. The policies were written in the context of the goals, objectives and policies for the 1990 Transportation System Plan. They were reviewed and refined in citizen workshops and approved as a guide for plan development by the Transportation Policy Advisory Committee.

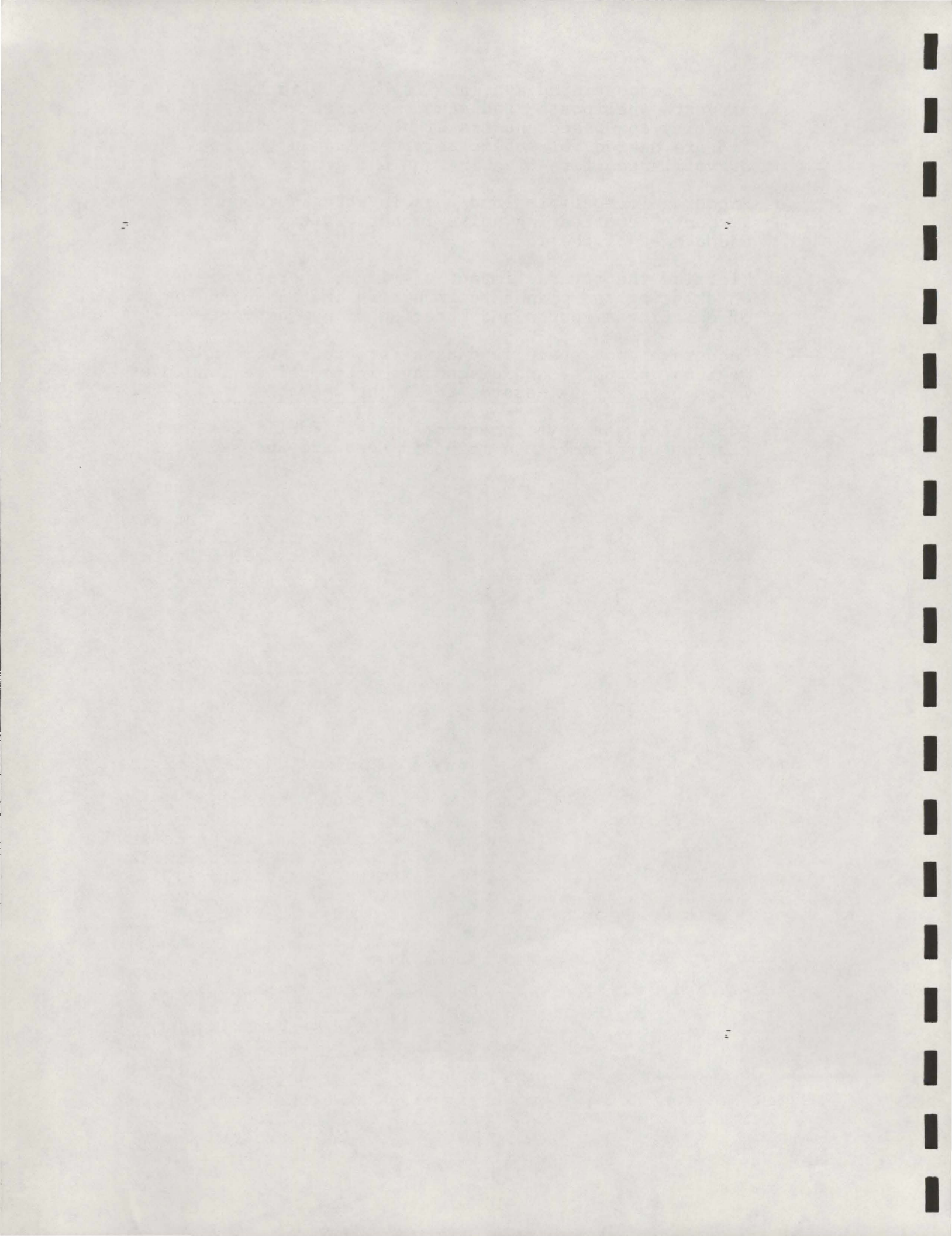
In the current update of the Recommended Region Airport System Plan these policies have standing as supplementary planning guidelines (note Policy 16 in the above Goals and Policies for Regional Development). Those which are appropriate to the current objective of developing a Regional Airport System Plan are listed below:

- o Identify airport facilities which are of regional and subregional significance and include these as physical elements in the transportation planning process.
- o Coordinate the development of regional airport facilities to satisfy a range of air transportation needs with maximum utilization of existing facilities and minimum adverse environmental impact on local communities.
- o Encourage air carrier and commuter service, and general aviation, to provide adequate air access within the Puget Sound Region and to other regions for both passengers and cargo.



- o Encourage continued availability of public and private airports, heliports, and seaplane bases which provide capacity for based and transient aircraft operations and are needed for public services such as police surveillance, fire fighting and emergencies.
- o Encourage compatible land uses in areas surrounding airports, considering noise impact, safety and usefulness of the land.
- o Minimize the adverse impact of flight operations on existing and planned communities in the upgrading of existing airports and location of new airports.
- o Encourage open space land uses for areas surrounding regional airports and discourage incompatible land uses which pose safety hazards to flight operations.
- o Coordinate the development of surface facilities with airport development to maintain adequate access.







## CHAPTER II

### EXISTING AIRPORT FACILITIES & SERVICES

#### Airport Role Definitions

##### *Airport Roles in the Regional Airport System*

The types of air transportation services provided by an individual airport define the physical facilities needed, the general intensity of use, and the impacts on the surrounding community. To aid in understanding the role of various airports in the region and their relationship to one another and the community, the following generalized role definitions will be used.

##### Air Carrier:

Air carrier airports have facilities for handling passengers and cargo served by certified airlines, ranging from major international and domestic trunk carriers to regional commuter airlines and air taxi operators. These airports have extensive and up-to-date airfield and terminal facilities for handling the full range of aircraft sizes and types, and weather conditions. Custom and immigration services are usually available. Access by highways and mass transit is good, and extensive parking facilities are usually provided. Some general aviation operations usually occur at air carrier airports but there are usually not facilities for basing general aviation aircraft.

##### General Aviation - Major:

Major general aviation airports have airfield facilities similar to air carrier airports, though not usually as extensive. Terminals at these airports, while adequate, are not as sophisticated as those at air carrier airports.

Operations can include some commuter airline or charter service for passengers and cargo. The operations do include the full range of general aviation activity, including air taxi, private business and executive transportation, personal travel and recreation, pilot training, and special industrial or agricultural use. The airfield accommodates the full range of aircraft size and performance and is equipped for instrument operations. There are extensive facilities to hangar or tie down based aircraft and support their operation.

##### General Aviation - Industrial/Commuter:

Industrial/Commuter type airports are equipped to handle the full range of general aviation uses, with some limitations on aircraft size and operating conditions. The airfield is capable of handling multi-engine propeller aircraft and business jets, but probably not large transports. It has an air traffic control tower but may or may not have an instrument landing approach. The airport has surrounding land uses which are usually industrial or commercial in nature. Predominant activities include private business and executive transportation, special industrial and agricultural uses, personal travel and recreation, and pilot



training. Depending on the location, it can serve commuter or air taxi connections to the major air carrier airport to destinations outside the region. The Industrial/Commuter airport has substantial facilities to hangar or tie down based aircraft and provide fuel and maintenance services.

General Aviation - Basic:

Basic general aviation airports primarily serve personal travel and recreation purposes. One or more fixed base operators at the airport provide fuel, maintenance, flying instruction, and various flying services. The runway is capable of handling single engine propeller aircraft and light multi-engine aircraft (less than 12,500 lbs. gross weight). The airport is usually located in outlying suburban and rural areas of the region. They may be publicly or privately owned.

Heliport:

Heliports are usually small landing areas and parking spaces to accommodate helicopter operations. They are frequently located on top of buildings or in open areas adjacent to hospitals, industrial sites or recreation areas. The principal advantages as a transportation facility are in providing quick access by air to central business districts, connections to major airports or marine terminals, and emergency access.

Military:

The principal function of a military airport is to serve a U.S. Department of Defense facility, therefore most are not open to civilian use. However, they are usually well developed and well equipped airports, representing a considerable public investment in a transportation facility. The potential exists for joint use or conversion to a civilian airport if their role as a military facility changes.

*Relationship to National/State Airport System Roles*

The National Airport System Plan (NASP) has a different hierarchy of airport role definitions than those defined above for the regional plan. The NASP roles are oriented to the national air transportation network with an emphasis on the maintenance of air carrier services, although general aviation needs are addressed also. The NASP roles are used primarily for determining levels of eligibility for federal funding assistance. The Washington State Airport System Plan utilizes the same hierarchy of roles and in addition identified other facilities of special state interest.

The NASP definition of air carrier airports is essentially the same as the above regional role definition. They provide residents of the area access to major airline services and the world-wide air transportation system.



The NASP defines "commuter service" airports as those which provide facilities for scheduled commuter airline services as well as meeting the needs of general aviation. Commuter airlines usually serve a particular geographic region, the north-west states for example, with service between major urban areas and smaller communities.

The category of "reliever" airports in the NASP refers to those which have a primary function of serving general aviation demand and in doing this relieve congestion at the air carrier airport. Thus their function is to divert general aviation traffic so that quality scheduled airline service can be maintained at the air carrier airport.

The NASP defines "general aviation" airports as those serving essential general aviation needs but not functioning in a commuter or reliever role.

### Inventory of Existing Airports

At the present time there are about 40 public use airport facilities in the Central Puget Sound Region. Collectively, they serve the region's air transportation needs ranging from scheduled domestic and international airline service to various general aviation purposes such as private business and executive transportation in industrial and agricultural applications, air taxi services, personal travel and recreation, pilot training, and emergency access. The facility types include land based airports, seaplane bases and heliports. They are both publicly and privately owned but all open to public use.

In addition there are about 50 restricted use airport facilities in the region. These include two military airports, several private residential or training airstrips, and numerous heliports located at business centers, hospitals and recreation areas.

The public use and military airport facilities shown in Figure 3 are of primary interest in the development of a regional airport system plan and constitute the basic inventory for this study. Pertinent characteristics of the public use airports are summarized in Table 1. The role of each airport according to the above definitions is indicated. Other data include the ownership status, responsible jurisdictions, current level of use, and physical characteristics.

### Survey of General Aviation Users

General aviation encompasses a broad range of transportation purposes involving all airports in the region except for military facilities. To obtain more definitive information on the trip purposes being served, their origins and the choice of airport, a survey of aircraft owners in the four county area was taken in the spring of 1980.

The survey population was a 25% random sample of aircraft owners taken from the FAA aircraft registration file as updated in May,



FIGURE 3

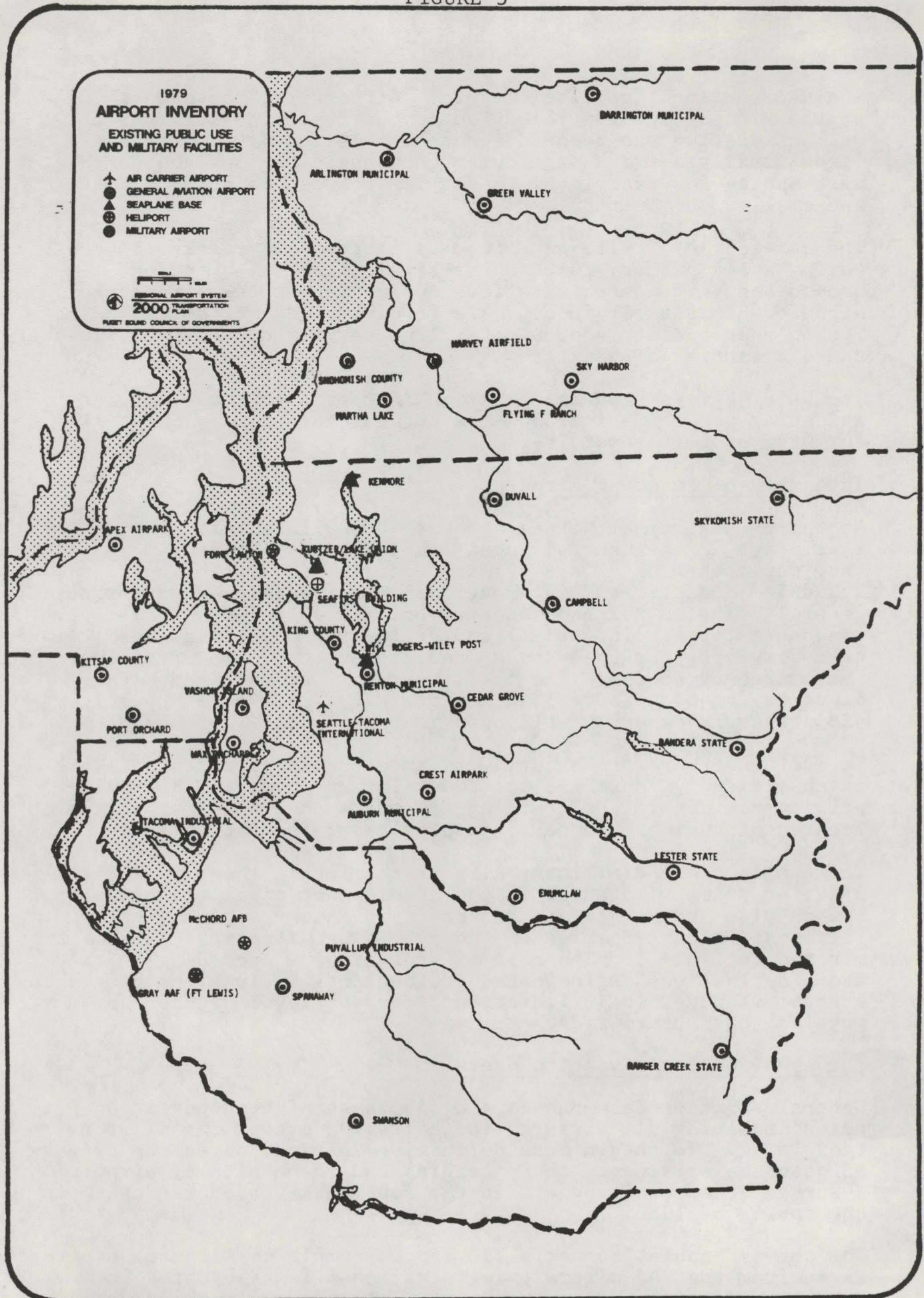




TABLE 1  
REGIONAL AIRPORT INVENTORY

Airport	Role	Ownership Status (in 1979)	Operator	Jurisdiction Responsible for Land Use Planning	Under Open Space Taxation Program (Pri- vate Airports Only)	Based Aircraft		Annual Operations		Runway Length(s)	Airport Property 3 (Acres)	Navigation Aids	
						Current (1979)	Ultimate Capacity 1/	Current (1979)	Ultimate Capacity 2/			Control Tower	Instr. Approach
<u>King Subregion</u>													
Auburn Muni.	General Aviation Basic	Public	City of Auburn	City of Auburn	-	185	300	146,210	350,000	2,900	300	No	No
Bellevue	"	Private	Puget Sd. Air Svc. Inc.	City of Bellevue	No	128	130	50,500	75,000	2,325	35	No	No
Cedar Grove	"	Private	Alpine Helicopters Inc.	King Co.	No	26	100	-	150,000	1,850	300	No	No
Crest Airpark	"	Private	Norm Grier and Bill Lardent	King Co.	Yes	106	200	15,800	140,000	3,500	130	No	No
Enumclaw	"	Private	L.L.Kammeyer	King Co.	No	17	85	4,300	100,000	1,850	20	No	No



REGIONAL AIRPORT INVENTORY (continued)

Airport	Role	Ownership Status (in 1979)	Operator	Jurisdiction Responsible for Land Use Planning	Under Open Space Taxation Program (Private Airports Only)	Based Aircraft		Annual Operations		Runway Length(s)	Airport Property <u>3/</u> (Acres)	Navigation Aids	
						Current (1979)	Ultimate Capacity <u>1/</u>	Current (1979)	Ultimate Capacity <u>2/</u>			Control Tower	Instr. Approach
King Subregion Continued													
Kenmore SPB	Seaplane Base	Private	R.B.Munro	King County	No	90	100	26,500	-	10,000 3,000	10	No	No
King Co. Intl./Boeing Field	Gen. Av. - Major	Public	King Co.	City Of Seattle/ King Co.	-	617	550	416,004	558,000	3,710 10,000	575	Yes	Yes
Kurtzer/ Lk.Union SPB	Seaplane Base	Private	L.R.Kurtzer	City of Seattle	No	9	20	3,200	-	5,000	1	No	No
Renton Muni.	Gen. Av. - Indust/ Commuter	Public	City of Renton	City of Renton	-	252	275	146,400	175,000	5,379	170	Yes	Yes
Sea-Tac Intl.	Air Carrier	Public	Port of Seattle	King Co.	-	0	-	34,000*	278,000	11,899 9,424	2,000	Yes	Yes
Wax Orchard	Gen. Av. - Basic	Private	Robert Sestrap	King Co.	Yes	10	100	-	120,000	2,200	200	No	No
Will Rogers/ Wiley Post SPB	Seaplane Base	Public	City of Renton	City of Renton	-	20	25	2,000	-	5,000	1	No	No

\* general aviation operations only, does not include air carrier operations

- Notes: 1/ Number of based aircraft which could be hangared/tied down if existing airport property is developed to its potential.
- 2/ Practical annual capacity for aircraft operations using existing runways and future runways which are expected to be developed.
- 3/ Includes property which is designated for airport use; does not include adjacent property containing industrial parks or other non-airport uses.



REGIONAL AIRPORT INVENTORY (continued)

Airport	Role	Ownership Status (in 1979)	Operator	Jurisdiction Responsible for Land Use Planning	Under Open Space Taxation Program (Pri- vate Airports Only)	Based Aircraft		Annual Operations			Airport Property <sup>3/</sup> (Acres)	Navigation Aids	
						Current (1979)	Ultimate Capacity 1/	Current (1979)	Ultimate Capacity 2/	Runway Length(s)		Control Tower	Instr. Approach
<u>Kitsap Subregion</u>													
Apex Airpark	Gen. Av.- Basic	Private	Roberta Walker	Kitsap Co.	No	26	75	17,200	130,000	2,400	160	No	No
Kitsap Co.	Gen. Av.- Indust. / Commuter	Public	Port of Bremerton	Kitsap Co.	-	95	196	120,000	200,000	6,200 4,800	1,240	No	Yes
Port Orchard	Gen. Av.- Basic	Private	Joe Haas	Kitsap Co.	No	33	80	37,000	130,000	2,575	120	No	No
<u>Pierce Subregion</u>													
Puyallup Indust. (Thun Field)	Gen. Av. - Basic	Private	Puyallup Valley Dev. Co.	Pierce Co.	Yes	205	210	111,000	130,000	3,300	346	No	No
Spanaway	"	Private	Tahoma Flying Svc. Inc.	Pierce Co.	Yes	84	100	53,500	130,000	2,700	21	No	No
Tacoma Indust.	Gen. Av. - Indust./ Commuter	Public	City of Tacoma	Pierce Co.	-	118	300	160,000	156,000	5,002	531	Yes	Yes

- Notes: 1/ Number of based aircraft which could be hangared/tied down if existing airport property is developed to its potential.
- 2/ Practical annual capacity for aircraft operations using existing runways and future runways which are expected to be developed.
- 3/ Includes property which is designated for airport use; does not include adjacent property containing industrial parks or other non-airport uses.



REGIONAL AIRPORT INVENTORY (continued)

Airport	Role	Ownership Status (in 1979)	Operator	Jurisdiction Responsible for Land Use Planning	Under Open Space Taxation Program (Private Airports Only)	Based Aircraft		Annual Operations		Runway Length(s)	Airport Property <sup>3/</sup> (Acres)	Navigation Aids	
						Current (1979)	Ultimate Capacity <sup>1/</sup>	Current (1979)	Ultimate Capacity <sup>2/</sup>			Tower	Instr. Approach
<u>Snohomish Subregion</u>													
Arlington Muni.	Gen. Av.- Indust./ Commuter	Public	City of Arlington	City of Arlington	-	195	522	112,300	232,000	4,800 5,336	1,137	No	Yes
Harvey Field	Gen. Av.- Basic	Private	E. Harvey	City of Snohomish/ Snohomish Co.	No	199	300	37,000	150,000	2,400 2,660	76	No	No
Martha Lake	Gen. Av.- Basic	Private	Mrs. D. Hauter	Snohomish Co.	No	74	175	26,040	150,000	1,700	32	No	No
Snohomish Co. (Paine Fld)	Gen Av.- Major	Public	Snohomish County	Snohomish Co.	-	371	510	207,144	375,000	3,726 4,948 9,010	969	Yes	Yes

- Notes: <sup>1/</sup> Number of based aircraft which could be hangared/tied down if existing airport property is developed to its potential.
- <sup>2/</sup> Practical annual capacity for aircraft operations using existing runways and future runways which are expected to be developed.
- <sup>3/</sup> Includes property which is designated for airport use; does not include adjacent property containing industrial parks or other non-airport uses.



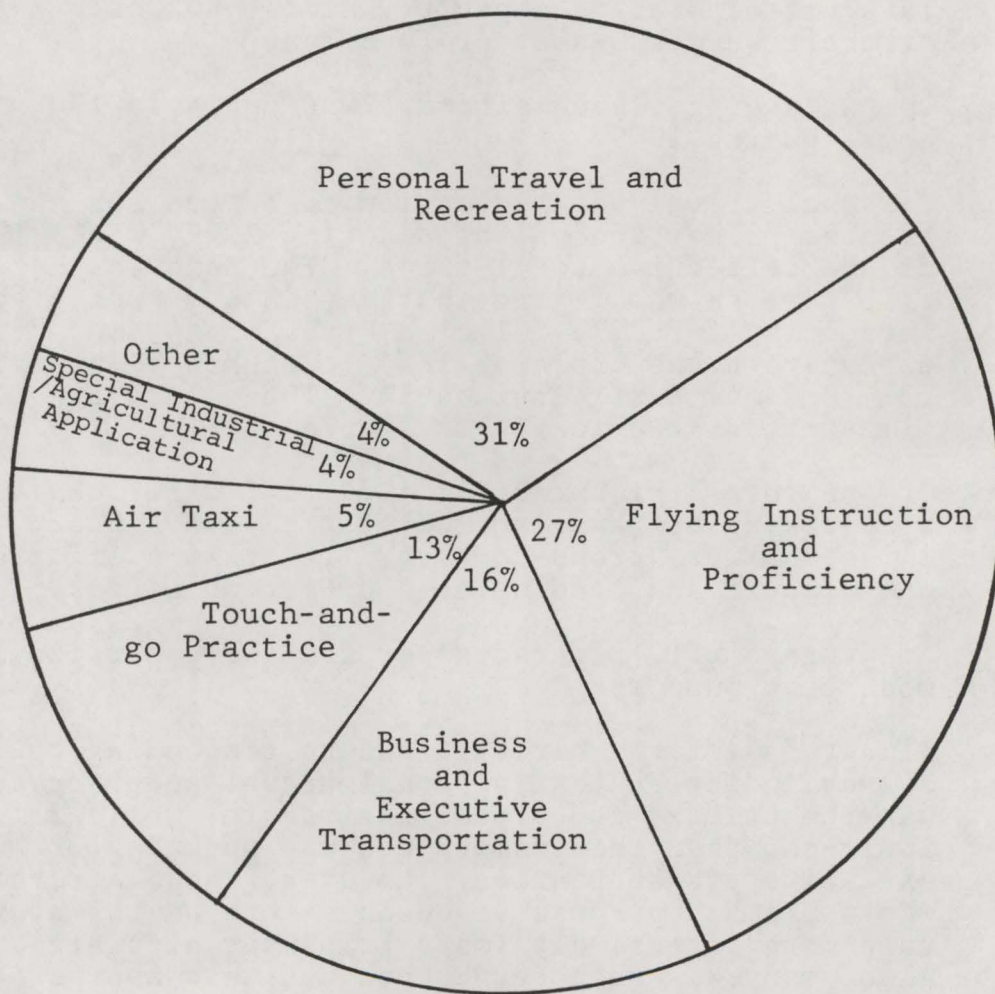
1979. Approximately 970 questionnaires were mailed out, of which 290 were returned. The distribution of responses to the survey among the four counties was similar to the distribution of based aircraft among the four counties, thus the sample was considered representative of the region's general aviation users. Analysis of the responses to the survey provided the following profile of current general aviation use in this region:

- o Over 88% of the aircraft included in the survey responses were single engine piston (propeller driven); 6% were twin engine piston; 1% were turbojet or turboprop and 2.4% were helicopters. In terms of seating capacity, almost 80% of all the aircraft were two-seat or four-seat.
- o On the average, each aircraft was operated 190 hours during 1979.
- o Personal travel and recreation accounted for the greater proportion of trips during 1979, with 31% of the collective total trips. The next largest trip purpose was flying instruction and proficiency accounting for 27%, followed by business and executive transportation 16%, touch-and-go practice 13%, and air taxi services 5%. These data are illustrated graphically in Figure 4.
- o Of the total trips made in 1979, 64% were local, i.e. taking off and landing at the same airport, while 36% were cross-country, i.e. taking off from one airport and landing at a different airport.
- o An average of 2-3 persons per trip were carried for most trip purposes.
- o Almost 54% of the aircraft owners responding to the survey indicated that personal travel and recreation was the primary use of their aircraft, while 23% indicated that the primary use was business or executive transportation. However, those aircraft whose primary purpose is business are on the average used more intensively (more trips per aircraft). Also, many aircraft serve both business and personal purposes.
- o About 2/3 of the total trips taken in 1979 were less than 100 miles one way; 15% of the trips were greater than 300 miles.
- o The reasons for choice of an airport at which to base aircraft were mixed. Proximity to home was most frequently given as the primary reason (36% of the responses). The remainder of the responses were about evenly divided between proximity to business, operational requirements, quality of airport, cost considerations and other.



FIGURE 4

DISTRIBUTION OF GENERAL AVIATION TRIPS BY PURPOSE





- o The residence was the most frequent trip origin for about 2/3 of the aircraft owners.
- o The average travel time from residence or business to the airport was 20 minutes.

An analysis of the geographic distribution of responses to the survey provided some indication of the "service area" of each airport, i.e. the area encompassing the business or residence addresses of current users of the airport. By inspection of these individual airport service areas and the degree of overlap between the service areas of adjacent airports, it was concluded that large subregional market areas exist and that the assessment of airport facility needs should be related to these market areas.

Figures 5 and 6 show the distribution of responses to the survey. It can be seen that a major subregional market service area is the combined King-Snohomish County area. The several airports of this area seem to serve the collective market of general aviation users. A significant number of King County aircraft owners base their aircraft at airports in Snohomish County. The other market service areas are Kitsap County and Pierce County. The aircraft owners in each of these two areas base their aircraft at airports in the same county as the one in which they reside.

#### Future Role of General Aviation in the Community

General aviation has historically had an active role in providing transportation for people and goods in the Central Puget Sound Region. The per capita ownership of aircraft for this region and for Washington State has been higher than the national average. There have been a relatively large number of airports well distributed through the region providing good access for most of the urban area residents and businesses. The large bodies of water that exist in Western Washington and the long distances to other urban areas of the Pacific Northwest have fostered a dependence on general aviation as a mode of travel.

A well located, well equipped general aviation airport system contributes to the economic well being of the region. It provides the means for quick access to and from various business and industrial activities where use of scheduled airlines is not cost effective. It provides for an alternative to the private auto for travel to communities not served by the scheduled airlines. In this region general aviation serves a unique need in providing access to many remote areas not accessible by even the private auto.

It is reasonable to expect that over the next 20 years the dependence on general aviation to satisfy certain travel needs will remain. These specific needs include:



FIGURE 5

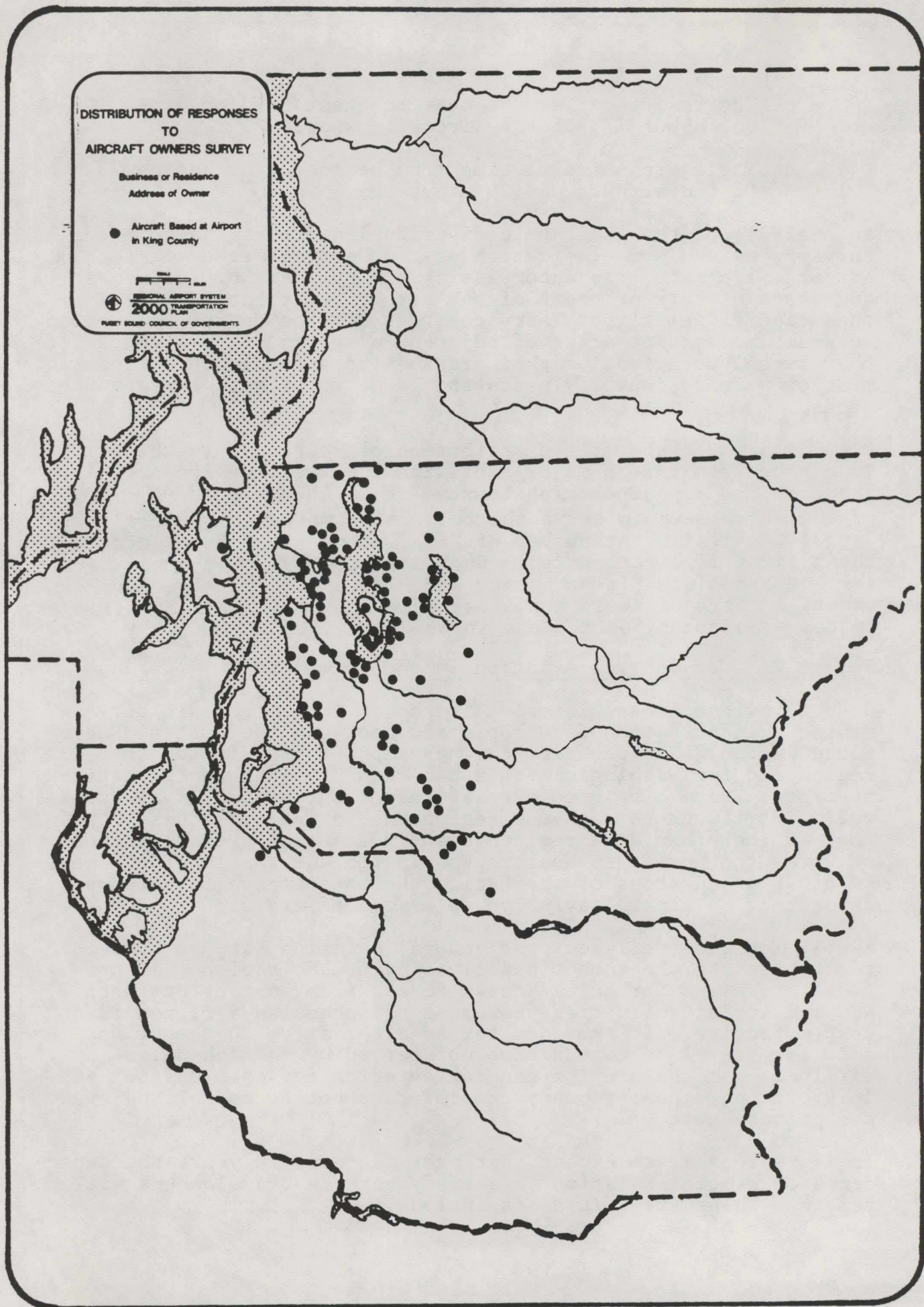
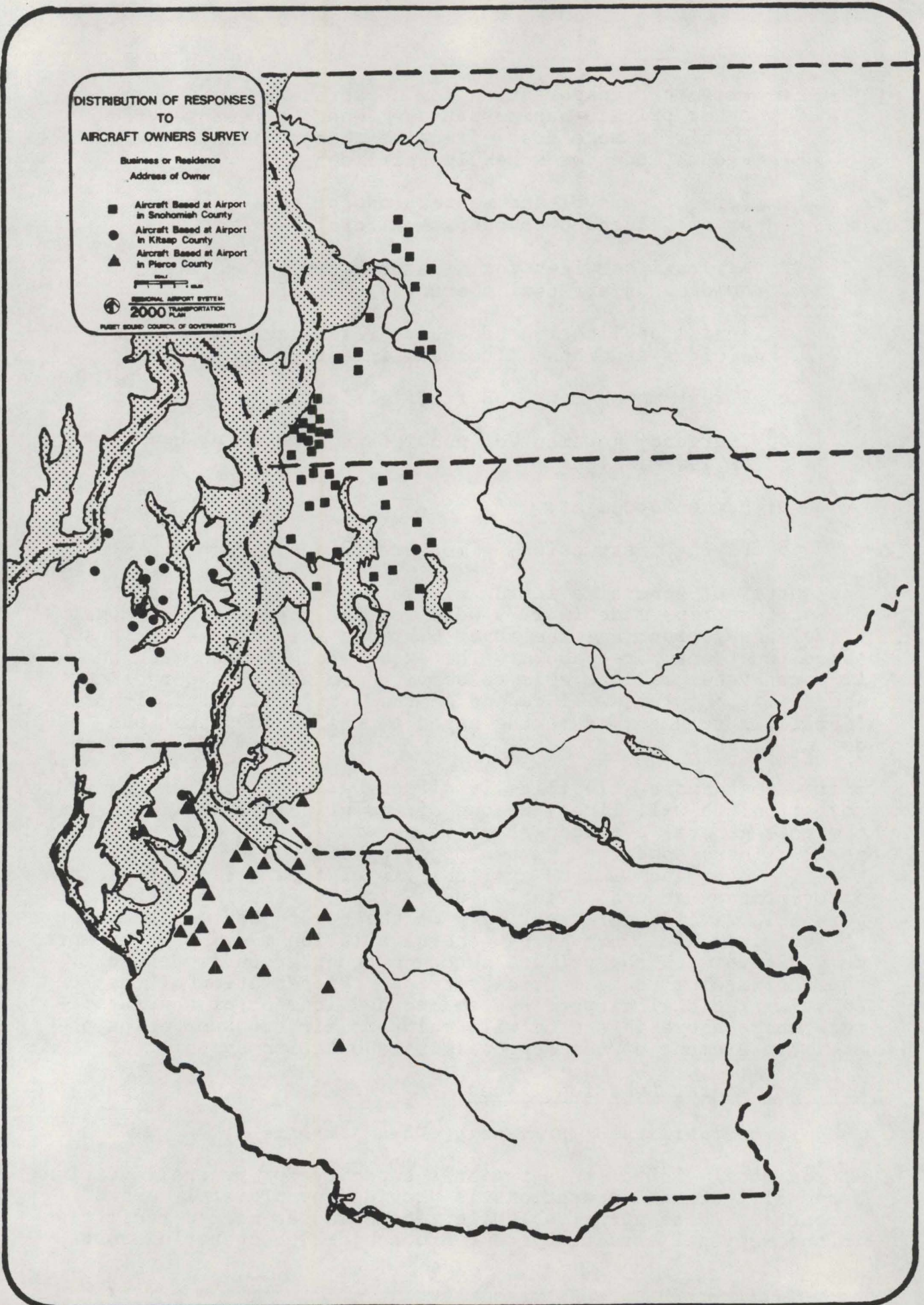




FIGURE 6





- o Private transportation for corporate executives; other private business travel where direct service by air is more cost effective than available ground modes or scheduled airlines.
- o Personal travel and recreation for those who own or are licensed to operate aircraft.
- o Air taxi services for hire provided by operators holding an air taxi operating certificate.
- o Aerial application of seeds, fertilizers or insecticides to crops; livestock inventory and control.
- o Forest management and firefighting.
- o Emergency movement of people and goods; rescue/relief missions.
- o Law enforcement.
- o Flying instruction; pilot proficiency training.

The survey of general aviation aircraft owners indicated that 31% of the trips made in 1979 were for the purpose of personal travel and recreation; the other 69% were serving the various other functions noted above. The extent to which the Regional Airport System will be able to serve these air transportation needs in the future will depend on the availability of airport facilities to accommodate the based aircraft and operations demand.

Energy cost and availability is affecting every mode of transportation; it will likely be one of the principal influences on the role general aviation plays in serving future transportation needs. There appear to be two opposing effects. One is that the high cost and limited availability of fuel will decrease the discretionary general aviation use - the biggest impact being on personal travel and recreation. On the other hand, as the cost of fuel increases, travel by general aviation modes becomes more competitive with the private auto and other ground modes for short to medium range intercity trips. Preservation of the existing regional airport system and development of new facilities where there is a need will maintain air transportation as a viable element of the regional transportation system.

#### Current General Aviation Issues

##### *Long Term Viability of Privately Owned Airports*

Approximately 33% of this region's capacity for general aviation based aircraft and operations is provided by privately owned airports. These airports, while recognized as needed facilities in the Regional Airport System, are subject to operating costs



and urban development pressures which threaten their viability as an airport. The option to preserve their role as a public use transportation facility as a matter of public policy does not exist as it does with publicly owned airports. Support for privately owned airports, however, can be provided indirectly through policies of federal, state and local government. Local government can provide support by adopting land use policies which foster compatibility between the airport and the community. Noise impact and safety impact are the primary issues. In both cases the area of concern usually extends beyond the boundaries of the airport property. Therefore, the viability of the airport and its acceptance in the community depend in part on the land use and zoning decisions made for adjacent areas. The FAA has developed criteria by which to identify the noise impacted areas and areas of primary concern for safety of aircraft operations. Application of these criteria to privately owned airports in this region is contained in Appendix B.

Federal and state government can provide additional support to essential privately owned public use airports through legislation which makes financial aid for capital improvements available to them. Proposed new federal legislation to extend the recently expired Airport Development Aid Program contains provisions for financial aid for certain privately owned airports recognized in the National Airport System Plan (NASP). At the state level, legislative proposals are being considered which could provide either direct or indirect financial assistance to privately owned airports identified as needed public use facilities.

The existing State of Washington Open Space Taxation Law passed in 1970 (RCW 84.34.010-140) allows privately owned airports to register for a reduced property tax in return for a commitment to remain an open space use for 10 years. At the present time only three airports in the region have taken advantage of this option.

#### *Development of New Airports*

The need for additional capacity in the Central Puget Sound region for general aviation based aircraft and operations has been recognized for some time. Past regional and state level airport system plans have recommended construction of new airports. The NASP has also identified the need for a new general aviation airport to divert general aviation operations from Sea-Tac and to relieve congestion at other existing airports. Recently the issue has focused on the development of a single new general aviation airport to serve the King-Snohomish urban area. The major arguments in favor of developing a new airport have been:

- 1) There have been several closures of privately owned public use airports in recent years, creating a net loss in the capacity for growth in general aviation.
- 2) The long term capacity of Sea-Tac as the region's air carrier airport and the safety of operations within the Sea-Tac terminal



control area are greatly enhanced if reliever facilities for general aviation operations are provided.

- 3) Based on the historical relationship between growth in general aviation use and growth in regional population and employment, there will be more demand for based aircraft and operations than can be provided by existing airports.

The Eastside Aviation Study completed in 1978 evaluated the user market and physical requirements for such a facility and made a survey of suitable sites in the King County Eastside area. Six sites were identified as being environmentally compatible and were recommended for consideration in site acquisition.

Since completion of the study, however, there has not been a clear definition of responsibilities nor a concerted effort to move ahead with acquisition of an airport site. There is an apparent consensus on the long term need but not on the suitability of the preferred sites from the Eastside Aviation Study. Additional funding is being sought to carry out the work needed to resolve the outstanding land use issues and progress toward selection of a single site.



CHAPTER III  
DEMAND FORECASTS

Regional Growth Assumptions

Demand forecasts are necessary in order to assess future transportation facility needs. Forecasts of the demand for travel, by air as well as other modes, are derived from projections of population and employment growth. The basis of forecasts of air carrier and general aviation demand used for the update of the Draft Regional Airport System Plan are shown in Tables 2 and 3. Population and employment growth through the year 2000 are summarized by subregion and for the region as a whole. These were adopted by PSCOG and its Subregional Councils in 1979.

By 1990 the region's projected population will reach 2,569,500 people, an increase of 25% over 1978. Employment over the same period is expected to grow by 18% to a total of 1,083,900 employees. By the year 2000 regional population is projected to increase by 45% over the 1978 level, and regional employment by 37%. Slightly higher rates of population growth are projected to occur in Snohomish and Kitsap Counties than will occur in King and Pierce Counties.

Air Carrier Demand Forecasts

*Background*

The two principal components of air carrier demand are passengers and cargo. Forecasts of these components, and their attendant aircraft operations, are among the primary considerations in decisions by public agencies on the development of physical airport facilities and the surface transportation facilities providing access to them. In the Central Puget Sound Region the large majority of commercial air carrier operations are accommodated at Sea-Tac. Some supplemental operations, such as air charters and non-scheduled air taxis, are accommodated at King County International (Boeing Field), Snohomish County Paine Field and Kitsap County Airport. The forecasts contained in this section, however, relate primarily to facility requirements at Sea-Tac.

Regional air carrier demand forecasts were previously developed by the PSCOG in 1972-3 and published in a technical report in March 1974. These forecasts provided a part of the data base for the 1973 Washington State Airport System Study. An air carrier demand forecast was also developed specifically for Sea-Tac as part of the Sea-Tac Communities Plan. These forecasts further refined work done by PSCOG as a basis for airport facilities plans and land use plans in the Sea-Tac community.

The most recent work to update air travel demand forecasts was carried out in a national scale effort by the Federal Aviation Administration (FAA). The Seattle-Tacoma Hub was one of 25 major metropolitan hubs for which forecasts of air passengers, air cargo, air carrier operations, and general aviation operations through 1990 were developed. The forecasts for the Seattle-Tacoma Hub were published in May 1979.



TABLE 2  
POPULATION TRENDS AND PSCOG FORECASTS  
(in thousands)

	<u>King</u>	<u>Kitsap</u>	<u>Pierce</u>	<u>Snohomish</u>	<u>Region</u>	
					<u>Total Population</u>	<u>Annual % Change</u>
1970	1159.4	101.7	412.3	265.2	1938.7	
1975	1157.3	116.1	410.8	270.9	1955.1	+0.2
1976	1156.7	120.9	421.5	275.5	1974.6	+1.0
1977	1169.0	126.6	425.2	281.2	2002.0	+1.4
1978	1189.0	129.4	443.2	292.7	2054.3	+2.5
1979	1231.5	135.0	453.9	304.7	2125.1	+3.5
1980 est.	1235.3	143.2	456.6	340.2	2175.3	+2.4
1990	1399.7	176.7	560.6	432.6	2569.5	+1.8
2000	1575.3	188.9	672.1	537.2	2973.6	+1.6

SOURCES:

1. The 1970-79 figures are actual estimates, State of Washington, Office of Financial Management, revised July, 1979.
2. The 1980-2000 figures are PSCOG forecasts, adjusted to May, 1979.

TABLE 3  
EMPLOYMENT TRENDS AND PSCOG FORECASTS  
TOTAL RESIDENT CIVILIAN EMPLOYMENT - BY PLACE OF RESIDENCE  
(in thousands)

	<u>King</u>	<u>Kitsap</u>	<u>Pierce</u>	<u>Snohomish</u>	<u>Region</u>	
					<u>Total Employment</u>	<u>Annual % Change</u>
1970	481.9	34.4	128.4	86.1	730.8	
1975	493.9	38.9	135.8	101.8	770.4	+1.1
1976	507.8	42.4	139.8	104.7	794.7	+3.2
1977	534.7	45.7	142.8	110.2	833.4	+4.9
1978	591.2	49.7	152.2	121.8	914.9	+9.8
1990	666.2	58.4	186.9	172.4	1083.9	+1.5
2000	755.9	62.8	221.3	214.0	1254.0	+1.5

Sources:

1. The 1970-78 figures are actual estimates, State of Washington, Department of Employment Security, revised April, 1979.
2. The 1990 figures are PSCOG forecasts, adjusted to December, 1978.



### *Methodology*

The forecast methodology consisted of updating and refining the previously developed multiple regression equations relating regional air passenger and air cargo demand to user costs and indices of population and economic growth in the region. With these equations the future demand was forecast based on alternative scenarios regarding future changes in population, average air fares and freight rates and average per capita income. The most optimistic assumptions on these factors were combined to produce the "High Forecasts", and the most pessimistic grouped for the "Low Forecast".

Projections of annual passenger and cargo movements were made for 5-year intervals between 1980 and 2000. The passenger demand was related to the projected ultimate passenger handling capacity of Sea-Tac.

From the forecasts of demand for air passengers travel and air cargo movement, estimates were made of the required aircraft operations, both on an annual basis and for typical peak hours. To do this assumptions were made regarding future aircraft seating and cargo capacity and load factors. The forecasts of operations were related to the projected future capacity of Sea-Tac for aircraft operations.

The historical data base, the development of the forecast equations and the assumptions used in the analysis are documented in the technical report, Update of Air Carrier Demand Forecasts for the Central Puget Sound Region, 1980 - 2000, PSCOG, June 1980.

### *Forecast Findings*

Total annual air passengers is projected to increase from 8.4 million in 1978 to 22 million in the year 2000 under the high forecast, or optimistic growth scenario, and to approximately 14 million under the low forecast, or pessimistic growth scenario. The high forecast calls for a 1978-2000 growth rate of 4.3% per year compared to 8.9% annual growth rate averaged over the historical 1954-1978 period. The lower growth rates are attributed to a "maturing" of the air travel industry, and the fact that almost everything (including income) is expected to grow more slowly in the coming years than in the booming past decades, particularly in the face of sharply increased fuel costs. A comparison of the updated forecasts with the previous PSCOG forecast and the current Federal Aviation Administration (FAA) forecast for the Seattle-Tacoma Hub is shown in Figure 7.

*A* The ultimate capacity of Sea-Tac airport has been estimated to be 20 million annual passengers. This capacity exceeds the year 2000 demand under the low forecast, but would be considered only marginally adequate under the high forecast. Typical peak hour congestion problems will likely become more frequent toward the end of the forecast period.

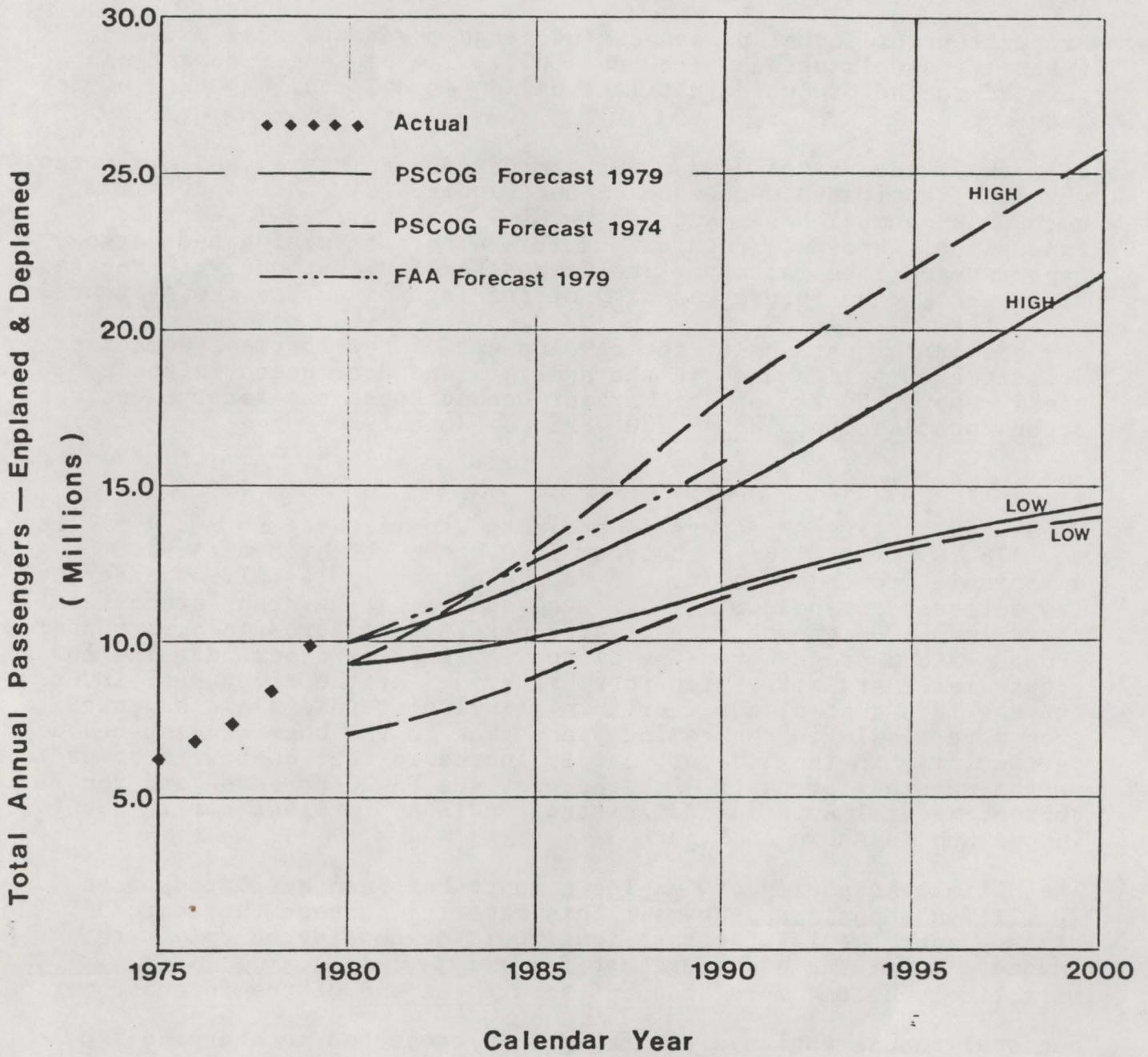
Regional annual enplaned air freight is projected to increase from 93,000 tons in 1978 to 625,000 tons in the year 2000 under the high forecast, and to 299,000 tons under the low forecast. The high forecast calls for a 1978-2000 growth rate of 9.0% per year, compared



FIGURE 7

FORECAST OF TOTAL AIR PASSENGERS

Central Puget Sound Region





with the 11.7% annual growth rate averaged over the 1954-1978 historical period. The lower growth rate for the forecast period is attributed primarily to the expected slower growth of real personal income in the region. The volume of airmail is very difficult to forecast due to its dependence on policies of the U.S. Postal Service. However, for purposes of this forecast it was assumed to increase only minimally from its present level (26,000 enplaned tons annually) through the forecast period. A comparison of the updated forecast for total air cargo (freight plus mail) with the previous PSCOG forecast and the FAA forecast is shown in Figure 8.

Annual air carrier aircraft operations at Sea-Tac including scheduled passenger service, other passenger service (commuters, air taxis, and charters), and all cargo service, are projected to increase from approximately 162,000 in 1978 to 269,000 in the year 2000 under the high forecast and 196,000 under the low forecast. The operations forecasts are tabulated in Table 4. The annual operating capacity of Sea-Tac is rated at 278,000 under assumed conditions of operation in 1993 (Reference Sea-Tac Communities Plan).

\* Typical peak hour air carrier operations at Sea-Tac are projected to reach a maximum of 54 operations (takeoffs and landings) per hour under the high forecast, and 40 operations per hour under the low forecast. The capacity of Sea-Tac is estimated to be 46-50 operations per hour under instrument flight conditions. However, instrument flight operations occurring during the same peak hour at nearby airports, especially Boeing Field, can effectively reduce this capacity. Therefore within the forecast period the potential exists for peak hour capacity deficiencies due to general aviation operations at nearby airports competing for the same airspace.

### General Aviation Demand Forecasts

#### *Methodology*

The methodology for updating the general aviation demand forecasts was the same as that used by PSCOG in the 1975 regional airport system study. It has also been used in the development of the Washington State Airport System Plan (WSASP), most recently updated in 1979. The method was based on the historical relationship between growth in the regional based aircraft fleet and growth in regional population. Assumptions were made for future aircraft ownership rates and then applied to the projected population through the forecast period.

The regional based aircraft forecast was allocated to individual general aviation airports based on their "market share" in the base year (1979). As airports reached their ultimate capacity for based aircraft, additional aircraft demand was reallocated to the nearby airports with equivalent operations capability, or to new airports.

Annual aircraft operations were determined by applying typical utilization rates to the based aircraft at each airport. Total operations were related to the estimated operations capacity of the airport. Refinements of the based aircraft allocation were made if necessary due to operations capacity limitations.



FIGURE 8

FORECAST OF ORIGINATING AIR CARGO  
Central Puget Sound Region

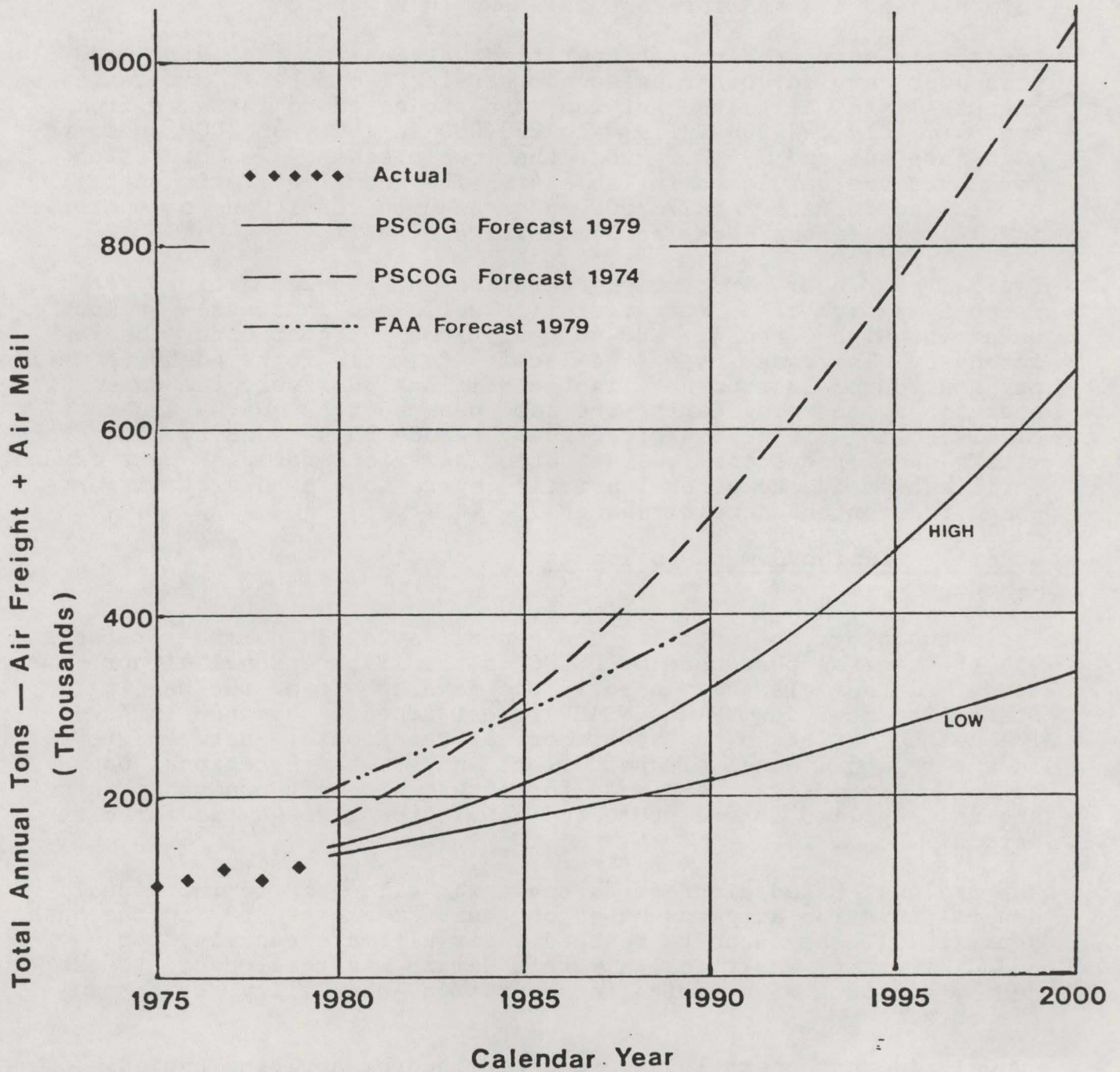




TABLE 4

## TOTAL ANNUAL AIR CARRIER OPERATIONS

<u>Year</u>	<u>Scheduled Passenger</u>	<u>Other Passenger <sup>1/</sup></u>	<u>All-Cargo</u>	<u>Total</u>
1975	105,684	30,896	4,276	140,856
<u>High Forecast</u>				
1980	118,200	41,370	7,502	167,072
1985	116,400	46,560	9,520	172,480
1990	130,200	58,590	11,628	200,418
1995	139,000	68,110	16,032	223,142
2000	161,800	85,754	21,952	269,146
<u>Low Forecast</u>				
1980	112,600	39,410	7,164	159,174
1985	106,600	42,640	7,592	156,832
1990	112,600	50,670	7,970	171,240
1995	112,000	54,880	9,386	176,266
2000	121,200	64,236	11,098	196,534

<sup>1/</sup> "Other" includes non-scheduled air taxi and charter; for forecast years assumed increasing share of "other" passenger operations relative to "scheduled" passenger operations due to recent trends and long-term effect of airline deregulation.



In the 1975 PSCOG study, a forecast range was developed by varying the assumptions on future change in the aircraft ownership rate. The high, or optimistic, forecast reflected recent trends in Washington State projected into the future; the low, or pessimistic, forecast reflected general conditions of economic slowdown and energy crisis which would dampen the growth in aircraft ownership. Following an evaluation of the forecast alternatives and their implications, the ATAC elected to use a mid-range forecast as the most realistic for planning purposes. The mid-range forecast was based on the projected national average growth in aircraft ownership. The updated forecasts in this report, therefore reflect a mid-range forecast which was used for airport demand/capacity analysis.

*Regional Based Aircraft Fleet Forecast*

A forecast of the total regional based aircraft fleet was made for 1990 and 2000 using the following equation:

$$\text{Based Aircraft (19xx)} = [\text{BYO} + (\text{AGI} \times \Delta \text{ years})] \frac{\text{Forecast population 19xx}}{10,000}$$

Based Aircraft = total number of based aircraft in region

19xx = forecast year

BYO = Base Year Ownership

= number of aircraft per 10,000 population in base year (1979)

AGI = Annual Growth Increment

= average annual increase in aircraft per 10,000 population

$\Delta$  years = 19xx - 1979

The assumptions made for the above parameters were:

<u>Population (000)</u>	<u>Year</u>
2,125,100	1979
2,175,300	1980
2,569,500	1990
2,973,600	2000

(Source: Washington State Office of Financial Management Population Trends, revised 1979)

$$\text{BYO} = \frac{3062}{212.51} = 14.41 \text{ based aircraft per } 10,000 \text{ population (1979)}$$

$$\text{AGI} = .24 \text{ based aircraft per } 10,000 \text{ pop. (national average 1960-1975, used for mid-range forecast)}$$

The resulting regional fleet forecasts is as follows:



<u>Year</u>	<u>Aircraft per 10,000 Population</u>	<u>Regional Based Aircraft</u>
1979	14.41	3,062
1980	14.65	3,187
1990	17.05	4,381
2000	19.45	5,784

The updated regional based aircraft fleet forecast is shown in Figure 9, compared with the historical trend, the previous PSCOG forecast, and the updated WSASP forecast.

*Allocation of Based Aircraft Forecast to Airports*

The incremental growth in based aircraft demand for 1990 and 2000 was allocated to the region's general aviation airports based on "market shares" of based aircraft in 1979. The number of based aircraft has historically been a strong indicator of general aviation usage and level of activity served by a given airport.

The airports included in the allocation process for this forecast were those identified as candidate regional system airports in the 1975 PSCOG study. Those airports were selected from an inventory of all airports in the region based on criteria of location, service to urban area population, conformance with design standards, and environmental constraints. In addition, for purposes of the analysis a new airport in King County was included.

The allocation process was influenced by the results of the general aviation aircraft owners survey conducted in March 1980 as part of the current study. The geographical distribution of responses to the survey provided an approximation of the "service area" of each airport. By inspection of the airport "service areas", the airports could be grouped into subregional market areas. Therefore both regional and subregional market shares were calculated as shown in Table 5. The regional shares were used to allocate new demand; subregional shares were used to allocate displaced aircraft from an airport closure such as is anticipated in the case of Bellevue airport.

The allocation for each forecast year (1990 and 2000) was done in two steps. First, an unconstrained allocation was made, based on the 1979 market shares. The results were then compared to estimates of ultimate based aircraft capacity for each airport. In cases where the demand significantly exceeded airport capacity, the excess aircraft were reallocated to nearby airports with overlapping service areas. The result was the adjusted allocation shown in Table 5. The 1990 adjusted allocation became the basis for regional market shares for allocating the year 2000 based aircraft forecast.

*General Aviation Operations Forecast*

Forecasts of annual operations (take-offs and landings) for each airport were made by determining the aircraft utilization rate unique to each airport and then applying that rate to the forecast number of based aircraft for 1990 and 2000. The forecast



Figure 9

COMPARISON OF HISTORICAL AND  
FORECAST REGIONAL BASED AIRCRAFT  
Central Puget Sound Region

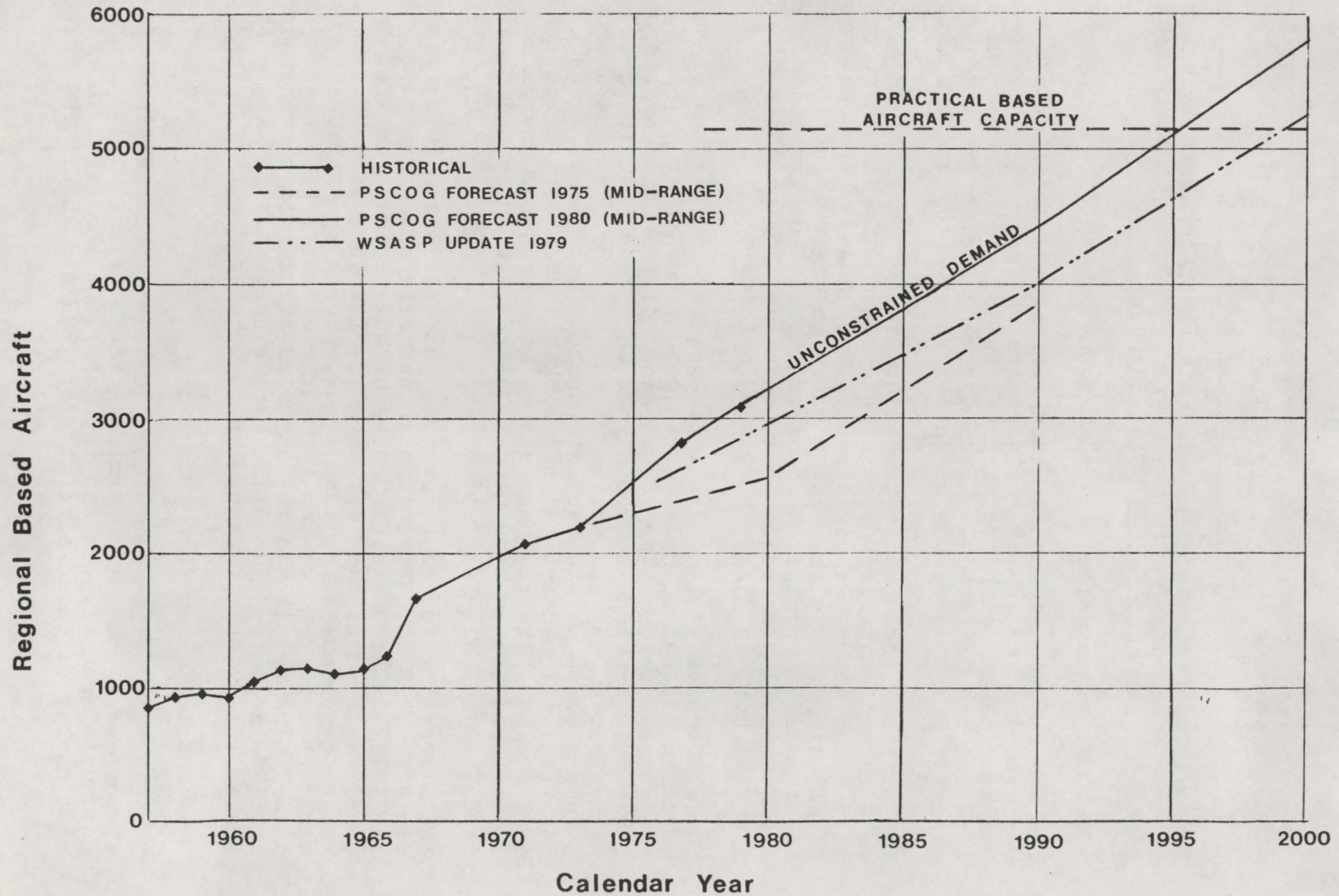




TABLE 5: ALLOCATION OF BASED AIRCRAFT DEMAND

AIRPORT	1979 BASED AIRCRAFT	1979 REG. MARKET SHARE	1979 SUBREG. MARKET SHARE	ALLOCATION OF 1990 BASED AIRCRAFT						ALLOCATION OF YEAR 2000 BASED AIRCRAFT					
				Δ DEMAND 1980-1990		UNCONSTR. ALLOCATION	AIRPORT CAPACITY	DEM/CAP RATIO	ADJUSTED ALLOCATION	1990 SUBREG. MARKET SHARE	Δ DEMAND 1990-2000	UNCONSTR. ALLOCATION	AIRPORT CAPACITY	DEM/CAP RATIO	ADJUSTED ALLOCATION
				DISP.	NEW										
<u>KING</u>															
Auburn Muni.	185	.0604	.0759	3	60	248	300	.8	345	.0972	110	455	300	1.5	412
Bellevue	128	.0418	(.0525)	(2)	(41)	-	-	-	-	-	-	-	-	-	-
Cedar Grove	26	.0085	.0107	1	8	35	100	.4	43	.0121	14	57	100	.6	100
Crest Airpark	106	.0346	.0435	2	34	142	200	.7	197	.0555	63	260	200	1.3	260
Eastside (New)	-	-	2/	87	304	391	500	.8	446	.1256	143	589	500	1.2	589
Enumclaw	17	.0056	.0070	-	6	23	85	.3	32	.0090	10	42	85	.5	85
Kenmore Sp.B	90	.0294	.0369	2	29	121	100	1.2	121	.0341	39	160	100	1.6	160
King Co. Intl.	617	.2015	.2533	11	200	828	550	1.5	617	.1738	198	815	550	1.5	753
Kurtzer/L.Union	9	.0029	.0037	-	3	12	20	.6	12	.0034	4	16	20	.8	16
Renton Muni.	252	.0823	.1034	4	82	338	275	1.2	275	.0774	88	363	275	1.3	363
W.Rogers/W.Post Sph	20	.0065	.0082	-	6	26	25	1.0	26	.0073	8	34	25	1.4	34
Wax Orchard	10	.0033	.0041	-	3	13	100	.1	16	.0045	5	21	100	.2	30
Other	87	.0284	.0359	2	28	117	144	1.0	144	.0405	46	190	190	1.0	200
SUBTOTAL	1547	.5052	.6351	112	763	2294	2399	-	2274	.6404	728	3002	2445	-	3002
<u>KITSAP</u>															
Apex Airpark	26	.0085	.1688	-	11	37	75	.5	37	.1682	12	49	75	.7	49
Kitsap Co.	95	.0310	.6169	-	41	136	196	.7	136	.6182	44	180	196	.9	180
Port Orchard	33	.0108	.2143	-	14	47	80	.6	47	.2136	15	62	80	.8	62
Other	0	-	-	-	0	-	0	-	-	-	0	-	0	-	-
SUBTOTAL	154	.0503	1.000	-	66	220	351	.6	220	1.0000	71	291	351	.8	291
<u>PIERCE</u>															
Puyallup Ind.	205	.0670	.4343	-	88	293	210	1.4	210	.3443	67	277	210	1.3	277
Spanaway	84	.0274	.1780	-	36	120	100	1.2	100	.1639	32	132	100	1.3	132
Tacoma Ind.	118	.0385	.2500	-	51	169	300	.6	194	.3180	62	256	300	.9	256
Other	65	.0212	.1377	-	28	93	106	1.0	106	.1738	34	140	140	1.0	140
SUBTOTAL	472	.1541	1.000	-	203	675	716	.9	610	1.0000	195	805	750	1.1	805
<u>SNOHOMISH</u>															
Arlington Muni	195	.0637	.0800	3	63	261	522	.5	261	.0735	84	345	522	.7	388
Harvey	199	.0650	.0817	4	64	267	300	.9	315	.0887	101	416	300	1.4	344
Martha Lake	74	.0242	.0304	1	24	99	175	.6	122	.0343	39	161	175	.9	161
Snohomish Co.	371	.1212	.1523	7	120	498	510	1.0	512	.1442	164	676	510	1.3	676
Other	50	.0163	.0205	1	16	67	67	1.0	67	.0189	21	88	88	1.0	117
SUBTOTAL	889	.2904	.3649	16	287	1192	1574	-	1277	.3596	409	1686	1595	-	1686
KING & SNOH.SUBTL.	2436	.7956	1.0000	(128)	1050	3486	3973	.89	3551	1.0000	1137	4688	4040	1.16	4688
REGION TOTAL	3062	1.0000	-	-	1319	4381	5040	.87	4381	-	1403	5784	5141	1.13	5784

Note: 1/ King and Snohomish treated as one subregion, Kitsap and Pierce as individual subregions

2/ Assumed that new eastside airport would capture 25% of new based aircraft demand for King/Snohomish subregion, plus 2/3 of displaced aircraft from Bellevue airport, plus Bellevue's share if it had remained open. (Source: Eastside Aviation Study & PSCOG Analysis)



annual operations were compared to the estimated operations capacity for each airport. Results are shown in Table 6 . An operations/capacity ratio greater than 1.0 indicates a potential condition of congestion and delay during typical peak period operations.

#### *Helicopter Operations*

Helicopters serve a unique transportation function in providing relatively quick access by air to areas which are either very densely inhabited with impeded surface transportation access or very remote with non-existent surface transportation access. Helicopter operations are common in this region for purposes such as air taxi to business centers and industrial sites, medical emergency transportation, law enforcement, traffic surveillance, news reporting and others.

At the present time there are approximately 40 heliports in the Central Puget Sound Region registered with the FAA. However, only one of these is registered as a public use facility (Sea-First Building in the Seattle CBD). The others are restricted use facilities owned by private businesses, hospitals, and other organizations. While these facilities serve many of the special purpose air transportation needs, the helicopter facilities to serve the air taxi transportation need are limited.

The current level of demand for helicopter operations and thus heliport facilities has not been quantified, nor has future demand been estimated. However, the operators of helicopter services in this region have responded to an informal survey by the FAA on their current level of operations and the most critical constraints to their operations. The apparent concensus from operators' responses can be summarized as follows:

- 1) There is currently unmet demand for air taxi services by helicopter due to the limited availability of safe public use heliport facilities in downtown areas.
- 2) There is a need for a landing surface as well as short term parking space in major CBD's and other activity centers.
- 3) The locations of greatest need based on current requests for air taxi service are Seattle CBD, Sea-Tac Airport (relocation of existing site) and Bellevue CBD.

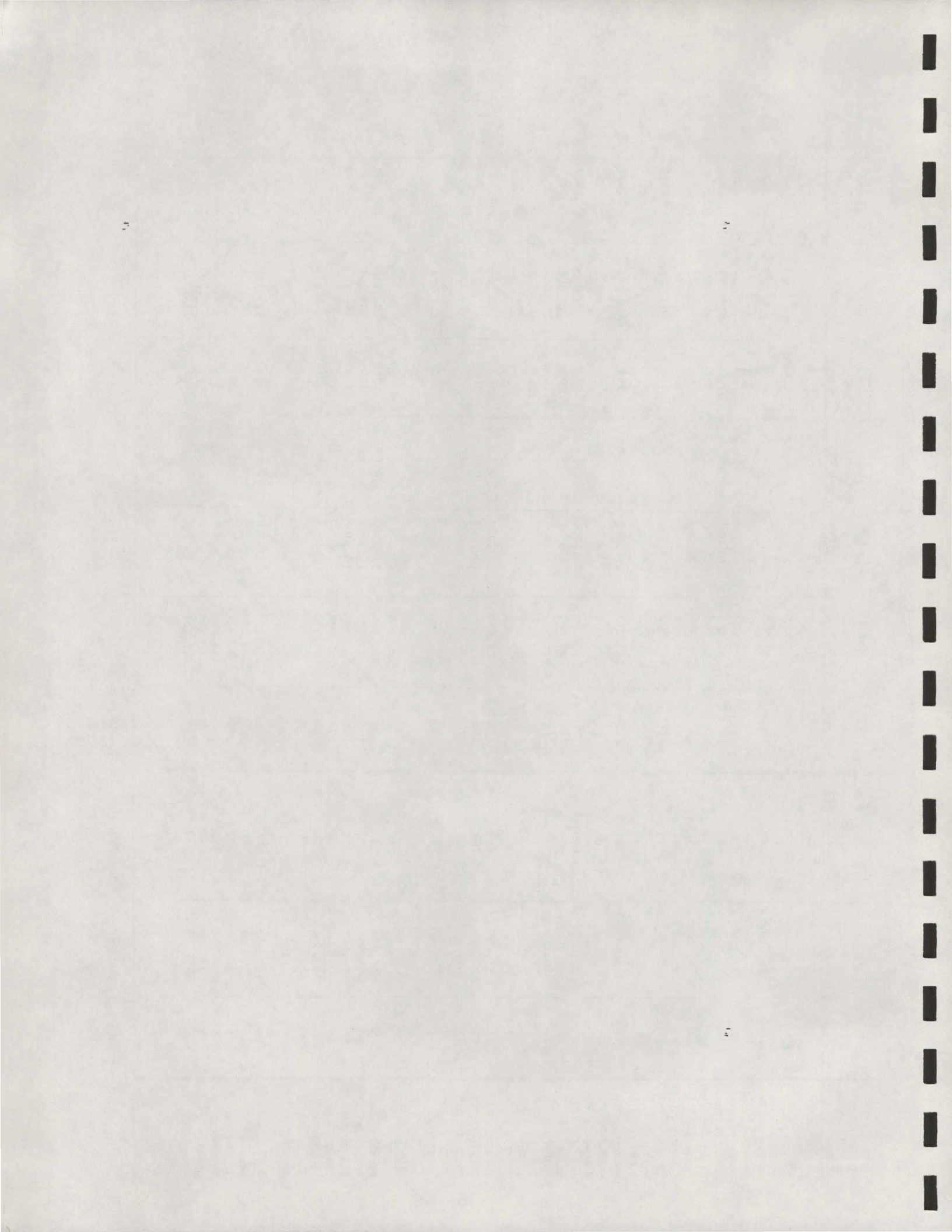


TABLE 6: GENERAL AVIATION OPERATIONS FORECAST

AIRPORT	BASE YEAR OPERATIONS			1990 OPERATIONS FORECAST				2000 OPERATIONS FORECAST			
	1979 BASED AIRCRAFT	1979 TOTAL OPERATIONS	AVERAGE OPERATIONS/ BASED AIRCRAFT	1990 BASED AIRCRAFT	1990 ANNUAL OPERATIONS	ULTIMATE OPERATIONS CAPACITY	RATIO OPERATIONS/ CAPACITY	2000 BASED AIRCRAFT	2000 ANNUAL OPERATIONS	ULTIMATE OPERATIONS CAPACITY	RATIO OPERATIONS CAPACITY
<u>KING</u>											
Auburn	185	146,210	790	345	272,550	350,000	0.78	412	325,480	350,000	0.93
Bellevue	128	50,500	395	-	-	-	-	-	-	-	-
Cedar Grove	26	13,000	500	43	21,500	150,000	.14	100	50,000	150,000	0.33
Crest Airpark	106	15,800	149	197	29,353	140,000	0.21	260	38,740	140,000	0.28
Eastside (New)	-	-	600 <sup>1/</sup>	446	267,600	225,000	1.19	589	353,400	225,000	1.57
Enumclaw	17	4,300	253	32	8,096	100,000	0.08	85	21,505	100,000	0.22
Kenmore (Sp.b)	90	26,500	294	121	35,574	-	-	160	47,040	-	-
King Co. Int'l	617	416,004	674	617	415,858	558,000	0.75	753	507,522	558,000	.91
Kurtzer/ L.Union Sp.b	9	3,200	356	12	4,272	-	-	16	5,696	-	-
Renton Muni.	252	146,400	581	275	159,775	175,000	0.91	363	210,903	175,000	1.21
W. Rogers/ W.Post Sp.b	20	2,000	100	26	2,600	-	-	34	3,400	-	-
Wax Orchard	10	10,000	1,000	16	16,000	120,000	0.13	30	30,000	120,000	0.25
Other	87	52,200	600	144	86,400	-	-	200	120,000	-	-
SUBTOTAL	1,547	886,114	573	2,274	1,319,578	-	-	3,002	1,713,686	-	-
<u>KITSAP</u>											
Apex Airpk.	26	17,200	662	37	24,494	130,000	0.19	62	41,044	130,000	0.32
Kitsap Co.	95	120,000	1,263	136	171,768	200,000	0.85	180	227,340	200,000	1.13
Port Orchard	33	37,000	1,121	47	52,687	130,000	0.41	49	54,929	130,000	0.42
Other	0	-	-	-	-	-	-	-	-	-	-
SUBTOTAL	154	174,200	1,131	220	248,949	-	-	291	323,313	-	-
<u>PIERCE</u>											
Puyallup Ind.	205	111,000	541	210	113,610	130,000	0.87	277	149,857	130,000	1.15
Spanaway	84	53,500	637	100	63,700	130,000	0.49	132	84,084	130,000	0.65
Tacoma Ind.	118	160,000	1,356	194	263,064	156,000	1.69	256	347,136	156,000	2.23
Other	65	39,000	600	106	63,600	-	-	140	84,000	-	-
SUBTOTAL	472	363,500	770	610	503,974	-	-	805	665,077	-	-
<u>SNOHOMISH</u>											
Arlington Mun.	195	112,300	576	261	150,336	232,000	0.65	388	223,488	232,000	0.96
Harvey	199	37,000	186	315	58,590	150,000	0.39	344	63,984	150,000	0.43
Martha Lk.	74	26,040	352	122	42,944	150,000	0.29	161	56,672	150,000	0.38
Snohomish Co.	371	207,144	558	512	285,696	375,000	0.76	676	377,208	375,000	1.01
Other	50	30,000	600	67	40,200	-	-	117	70,200	-	-
SUBTOTAL	889	412,484	464	1,277	577,766	-	-	1,686	791,552	-	-
REGION TOTAL	3,062	1,836,298	600	4,381	2,650,267	-	-	5,784	3,493,628	-	-

Notes: <sup>1/</sup> Source: Eastside Aviation Study, July, 1977







## CHAPTER IV

### AIRPORT SYSTEM ALTERNATIVES

The two principal elements of the regional airport system are air carrier and general aviation. The air carrier element consists of those facilities providing access to commercial airline services for passengers and cargo. The airlines range from major international and domestic trunk carriers to regional commuter airlines and air taxi operators. It includes all cargo carriers and charter airlines. At the present time, most air carrier activity in this region occurs at Seattle-Tacoma International Airport (Sea-Tac). In the past air carrier operations have been maintained at two other major airports in the region, King Co. Int'l. and Tacoma Indust.

The general aviation element consists of those airports providing facilities for all air transportation uses other than air carrier, such as private business and executive travel, various industrial and agricultural purposes, personal travel and recreation, emergency access, and flying instruction. Non-scheduled air taxi and charter services fall within the realm of general aviation. Some general aviation airports are publically owned, others are privately owned; of interest here are all those that are open to public use.

Although the air carrier element and the general aviation element have markedly different facility and service requirements, the actual operations are interchangeable between the two types of facilities except for limitations imposed by size of aircraft and required navigation aids. Therefore the level of demand and airport capacity available for air carrier operations can effect the level of service for general aviation operating and vice versa. In the following paragraphs the long range alternatives for both elements of the regional airport system will be identified and then implications discussed.

#### Air Carrier Facilities

In general the facility requirements for handling air carrier services must consider both air passenger and air cargo movements. However, air passenger demand has traditionally been the primary criterion, and will be used as a basis for the discussion here.

The total air passenger movements in and out of this region in 1979 was 9.93 million. Almost all of these were accommodated at Sea-Tac. In the year 2000 the regional air passenger demand is projected to reach 22 million under the high forecast, or optimistic growth scenario, and 14 million under the low forecast, or pessimistic growth scenario <sup>1/</sup>. The ultimate capacity of Sea-Tac if the existing facility is developed to its full potential, is estimated to be 20-25 million annual passengers. Under the high forecast, Sea-Tac could approach its ultimate capacity for passenger handling in the 1995-2000 time period.

<sup>1/</sup> Puget Sound Council of Governments, Draft Air Carrier Demand Forecasts for the Central Puget Sound Region, 1980-2000, June 1980



Under the low forecast, there is adequate capacity well beyond the year 2000.

The other primary determinant of air carrier airport facility needs is capacity for aircraft operations. Airfield capacity is related to aircraft mix, runway/taxiway configuration and occupancy times, and visibility. It is defined as the point where aircraft delays exceed a maximum allowable limit. (This is usually four minutes during typical peak hour operations; on an annual basis the limit is four minutes for 10% of the annual operations or 5% of the time). Sea-Tac airport is estimated to have an annual capacity of 278,000 aircraft operations under assumed conditions of operation in 1993 2/. The hourly capacity in 1993 is estimated to be 46 operations under Instrument Flight Rule (IFR) conditions and 55 operations under Visual Flight Rule (VFR) conditions.

In the year 2000 it is projected that total annual air carrier operations at Sea-Tac will reach 269,000 under the high forecast and 197,000 under the low forecast. Typical peak hour operations are estimated to be 54 and 40 respectively. The annual operations capacity is not exceeded by either the high or the low forecast. However, peak hour aircraft operations occurring under IFR conditions when combined with operations at Boeing Field and other nearby airports could be exceeding the joint airfield capacities by the mid 1990's. It is further noted that the above operations forecast does not include general aviation and military operations. As a point of reference, in 1979 general aviation and military operations for Sea-Tac accounted for 16% of the total annual operations.

The above demand and capacity relationships have certain implications regarding the demands placed on other airports in the region. However, conclusions can be drawn at this time regarding the long range adequacy of the air carrier element of the Regional Airport System. The implications and conclusions can be summarized as follows:

- o The Sea-Tac airport facility if developed to its full potential will likely have sufficient capacity to serve projected air travel demand through the year 2000 and beyond. It appears that the air field capacity is well balanced with the capacity potential of passenger and cargo handling facilities.
- o If the optimistic growth scenario is realized, there could be congestion and over-capacity conditions in typical peak hours in the 1995-2000 time frame.
- o Additional capacity for air carrier operations if needed, is available at other airports in the region such as King County International Boeing Field, Tacoma Industrial Airport, and Snohomish County Paine Field (subject to final policy on role determination in Paine Field Master Plan).



- o As conditions of air field congestion begin to occur at Sea-Tac there is increased potential for conflict between air carrier operations and general aviation operations. This will likely result in diversion of general aviation operations to other airports, some of which are projected to be operating at capacity by the year 2000.
- o It is concluded that the air carrier element of the Regional Airport System is adequate; alternatives for additional air carrier airport capacity do not need to be considered at this time. However, as congestion grows in the Sea-Tac terminal control area airspace, peak hour operations may have to be restricted at nearby airports to maintain adequate air carrier capacity at Sea-Tac.

### General Aviation Facilities

#### *Selection of Regional System Airports*

At the present time there are about 40 airports, seaplane bases and heliports in the Central Puget Sound Region which are open to public use. There are several more airports and heliports throughout the region which are private or restricted use facilities. It is the public use facilities which are of primary concern in planning for the region's general aviation facilities and services. In the 1975 regional airport system study, the Air Transportation Advisory Committee evaluated all of the public use facilities to determine those which have the most potential for serving regional air transportation needs. The following selection criteria were applied in sequence to the inventory of all public use airports:

- o Public-use airports within the four-county region (see Fig.10)
- o Military airports with potential for civilian use.
- o Airports located within the 1990 urbanized area boundary.
- o Airports outside the 1990 urbanized area which primarily serve communities over 2000 population.
- o Airports with potential to develop minimally to basic utility standards as specified by the FAA.
- o Airports with potential for growth with economically feasible operation and acceptable community impacts.
- o New airports needed to meet future air transportation demand.

The application of the criteria is shown in Figure 11. The airports identified as existing regional airports are serving the large majority of the region's general aviation demand. They make up the existing facilities of the Regional Airport System and provide a basis for identifying system needs and long range alternatives.



FIGURE 10

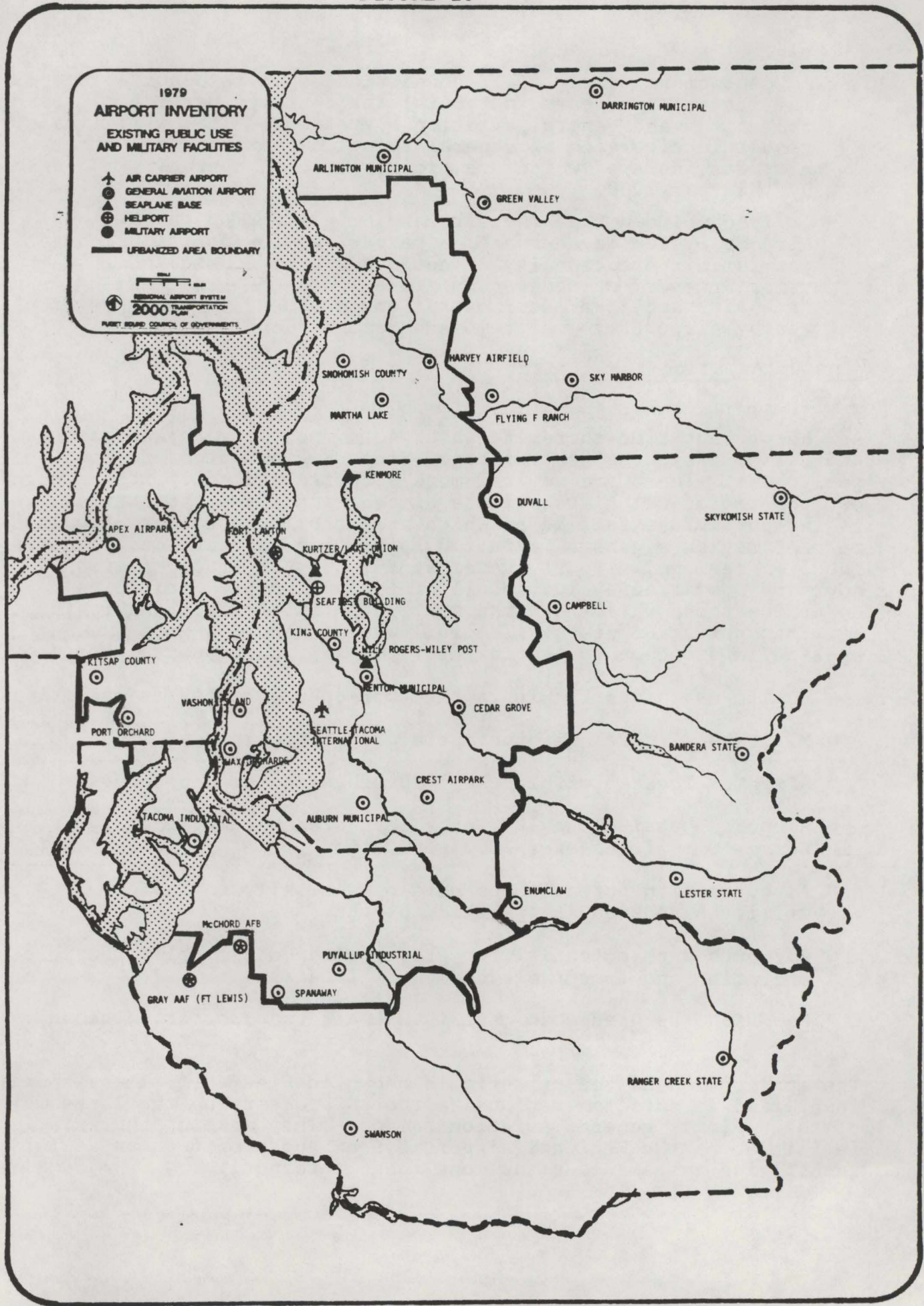




FIGURE 11

APPLICATION OF AIRPORT SELECTION CRITERIA TO EXISTING AIRPORTS

	Step 1 Airport Inventory	Step 2 Urban Area Boundary	Step 3 Airport Design Standards	Step 4 Environmental Constraints	Step 5 Existing Regional Airports
<b>KING COUNTY</b>					
Auburn Municipal					
Bandera State					
Campbell					
Cedar Grove					
Crest Airpark					
Duvall					
Enumclaw					
Fort Lawton					
Kenmore Air Harbor					
King Co. International					
Kurtzer/Lake Union					
Lester State					
Renton Municipal					
Sea-First Bldg. Heliport					
SeaTac International					
Skykomish State					
Vashon Island					
Wax Orchards					
Will Rogers-Wiley Post					
<b>KITSAP COUNTY</b>					
Apex Airpark					
Kitsap County					
Port Orchard					
<b>PIERCE COUNTY</b>					
Gray AAF					
McChord AFB					
Puyallup Ind.					
Ranger Creek State					
Spanaway					
Swanson					
Tacoma Ind.					
<b>SNOHOMISH COUNTY</b>					
Arlington					
Darrington					
Flying F. Ranch					
Green Valley					
Harvey Airfield					
Martha Lake					
Sky Harbor					
Snohomish County					



*Need Based on Demand*

The needs of general aviation can be expressed in terms of the demand for facilities to house based aircraft and support their operation for various transportation purposes. Two primary criteria are used to evaluate the adequacy of existing facilities and the need for new ones. The first is the projected based aircraft demand as related to the collective capacity of the region's airports. The second is the location of general aviation users relative to the location of airport facilities. Data on the location of general aviation users was obtained in the survey of aircraft owners conducted as part of this study (Ref. "Task Report - General Aviation Aircraft Owner Survey", June 9, 1980). The geographical distribution of responses to the survey provided an approximation of the "service area" of each airport. By inspection of the airport "service areas" it was concluded that large subregional market areas exist and that demand/capacity relationships should be evaluated for these areas in the determination of airport facility needs.

The major subregional market service area is the combined King-Snohomish County area. The collective airports of this area seem to serve the collective general aviation users. A significant number of King County aircraft owners base their aircraft at airports in Snohomish County. The reverse is also true, but to a lesser degree. The other market service areas are Kitsap County and Pierce County. The aircraft owners in each of these two areas base their aircraft in the same county.

An updated forecast of regional based aircraft demand and the allocation to regional system airports was also completed as part of this study (Ref. "Task Report on Update of General Aviation Based Aircraft and Operations Forecast", revised June 20, 1980). For purposes of forecast allocations, "airport capacity" was defined to be the number of based aircraft which could be supported if the existing airport property is developed to its potential. A comparison of this capacity to the unconstrained demand for the subregional market service areas is contained in Table 7. The unconstrained demand represents a continuation of current trends in aircraft ownership and utilization. From the information in Table 7 the following conclusions are drawn:

- o The need for new or expanded general aviation airport facilities in the King-Snohomish market service area is near term. The existing airports, if developed to their potential, will not provide sufficient capacity through 1990.
- o The need for additional airport facilities in the Pierce market service area is mid-range, i.e. demand will exceed the capacity of existing airports in the 1990-2000 time period.
- o In the Kitsap market service area there is sufficient based aircraft capacity through the 20 year planning horizon.



TABLE 7: COMPARISON OF GENERAL AVIATION BASED AIRCRAFT DEMAND TO EXISTING AIRPORT CAPACITY

General Aviation Market Service Area <u>1/</u>	Unconstrained Based Aircraft Demand	1 9 9 0		2 0 0 0		Staging of Need	
		Total Capacity of Existing Airports <u>2/</u>	Unmet Demand	Unconstrained Based Aircraft Demand	Total capacity of Existing Airports <u>2/</u>		Unmet Demand
King-Snohomish	3551	3262	289	4688	3262	1426	1980-1990
Pierce	610	610	None	805	610	195	1990-2000
Kitsap	220	351	None	291	351	None	Post 2000
Region Total	4381	4223	289	5784	4223	1621	

1/ The existing airports included in each service area are as follows:

<u>King-Snohomish</u>		<u>Pierce</u>	<u>Kitsap</u>
Auburn Municipal	King Co. Int'l. (Boeing Field)	Puyallup Industrial	Apex Airpark
Cedar Grove Airpark	Kurtzer/L.Union Sp B	Spanaway	Kitsap County
Crest Airpark	Renton Municipal	Tacoma Industrial	Port Orchard
Enumclaw	W. Rogers/W. Post Sp B		
Kenmore Sp B	Wax Orchard (Vashon Is.)		
Arlington Municipal	Harvey Airfield		
Martha Lake	Snohomish Co. (Paine Field)		

2/ Assumed that some based aircraft capacity now provided by privately owned airports will be lost by target year (approximately 6% of total regional based aircraft capacity).



- o In the 1995-2000 time period, the annual operations at several of the major general aviation airports in the region are projected to be greater than their rated operations capacity. This condition could be more acute if Sea-Tac reaches its operations capacity, causing general aviation traffic to be diverted to other airports.

#### *Identification of Alternatives*

The foregoing analysis substantiates the need to plan for additional general aviation facilities in this region within the year 2000 time frame. Development of the additional facilities would serve two purposes. First, the capability of Sea-Tac as the region's major air carrier airport could be extended further into the future by providing alternative facilities for non-air carrier operations. Secondly, the forecasts for aircraft ownership and use of the general aviation mode of transportation indicate a greater demand for airport facilities than can be provided by existing airports.

The costs and benefits to the region of providing additional general aviation airport facilities were assessed by comparative evaluation of a range of system alternatives. The alternatives analyzed were:

#### 1) No New Airports

General aviation based aircraft and operations would be served to the extent possible with existing airports in their current roles. Expansion of existing airports would be within the limits of currently committed capital improvements or likely development based on needs identified in current master plans, reflecting capacities used in the general aviation demand forecasts. The privately owned airports identified as regional system airports are assumed to continue in their current role with resources for modest expansion to the based aircraft capacity used in the forecast allocations.

#### 2) Expansion of One or More Existing Airport Facilities

To provide additional capacity for general aviation based aircraft and operations, one or more existing facilities would be selected for major expansion and change in role. The primary location of need would be the King-Snohomish service area. The secondary location would be the Pierce service area. The selection of one or more airports for major expansion could be from the publicly or privately owned facilities. The expansion would necessarily be consistent with local zoning and land use policies. This alternative should be supplemented by an aggressive program to protect the viability of existing privately owned airports which are open to public use.



3) Limited New Airport in the Primary Area of Need

A new "General Aviation-Basic" airport would be sited in the King-Snohomish service area. It would have a limited role in terms of size of aircraft which could use it and the transportation purposes it could serve. The facility could be compatible with a rural setting. It would be assumed to accommodate a maximum of 400 based aircraft and have a single runway 2500-3500 feet long. In addition it is assumed that existing airports would be developed to their full potential within their current role and physical plant.

4) Medium-Scale New Airport in the Primary Area of Need

A new "General Aviation-Industrial/Commuter" airport facility would be sited in the King-Snohomish service area. It would service the larger range of general aviation uses including executive and business transportation, non-scheduled air taxi, industrial purposes, and flying instruction, as well as the personal travel and recreation purpose. It would be located with good access to the major employment and business centers but separated from currently congested airspace. It would be assumed to have a primary runway in the 5000 foot range with potential for a smaller parallel runway in the long range future. The airport would be assumed to accommodate a maximum of 600 based aircraft. In addition it is assumed that existing airports would be developed to their full potential within their current role and physical plant.

5) Two New Airports Staged Over the 20-Year Period

Two new "General Aviation-Basic" airports would be sited, one in the King-Snohomish service area in the near term, and a second in the Pierce service area in the early 1990's. Each would have a single runway 2500-3500 feet in length and would accommodate a maximum of 400 to 600 based aircraft. The second airport would be sited to serve some of the King-Snohomish demand as well as demand in the Pierce service area. These airports would have a limited role, serving primarily the personal travel/recreation and other light general aviation operations.

*Evaluation of Alternatives*

The five airport system alternatives were evaluated and compared to each other in terms of the level of service provided for air transportation and in terms of generalized impacts on communities and funding resources. The specific criteria and their definition were as follows:



<u>Criteria</u>	<u>Qualitative or Quantitative Measure</u>
Level of Service for Air Carrier Operations	Air carrier operations demand vs. capacity - annual and peak hour; degree of interference from general aviation operations.
Level of Service for General Aviation Operations	General aviation operations demand vs. capacity by airport type for airport service areas; degree of restriction at major airports; capability of airport system to serve full range of general aviation trip purposes.
Capacity for General Aviation Based Aircraft	Based aircraft demand vs. capacity for subregional airport service areas.
Airspace Use - Safety	Degree of interference between operating airspace for individual airports, primarily Sea-Tac in relation to the nearby general aviation airports (Boeing Field, Renton Municipal, Auburn Municipal); the accident potential, i.e. the number and types of operations competing for same airspace during peak traffic periods.
Community Impact	Additional land area within approach zone and/or Ldn 65 contours due to operations at new airport or expanded operations at existing airports.
Capital Cost	Cost of upgrading existing facilities and construction of new facilities.
Indirect Benefits	Potential of the collective regional system airport locations to enhance economic benefit to the community, i.e. stimulate industrial development and new jobs, facilitate goods movement, provide intermodal connections.

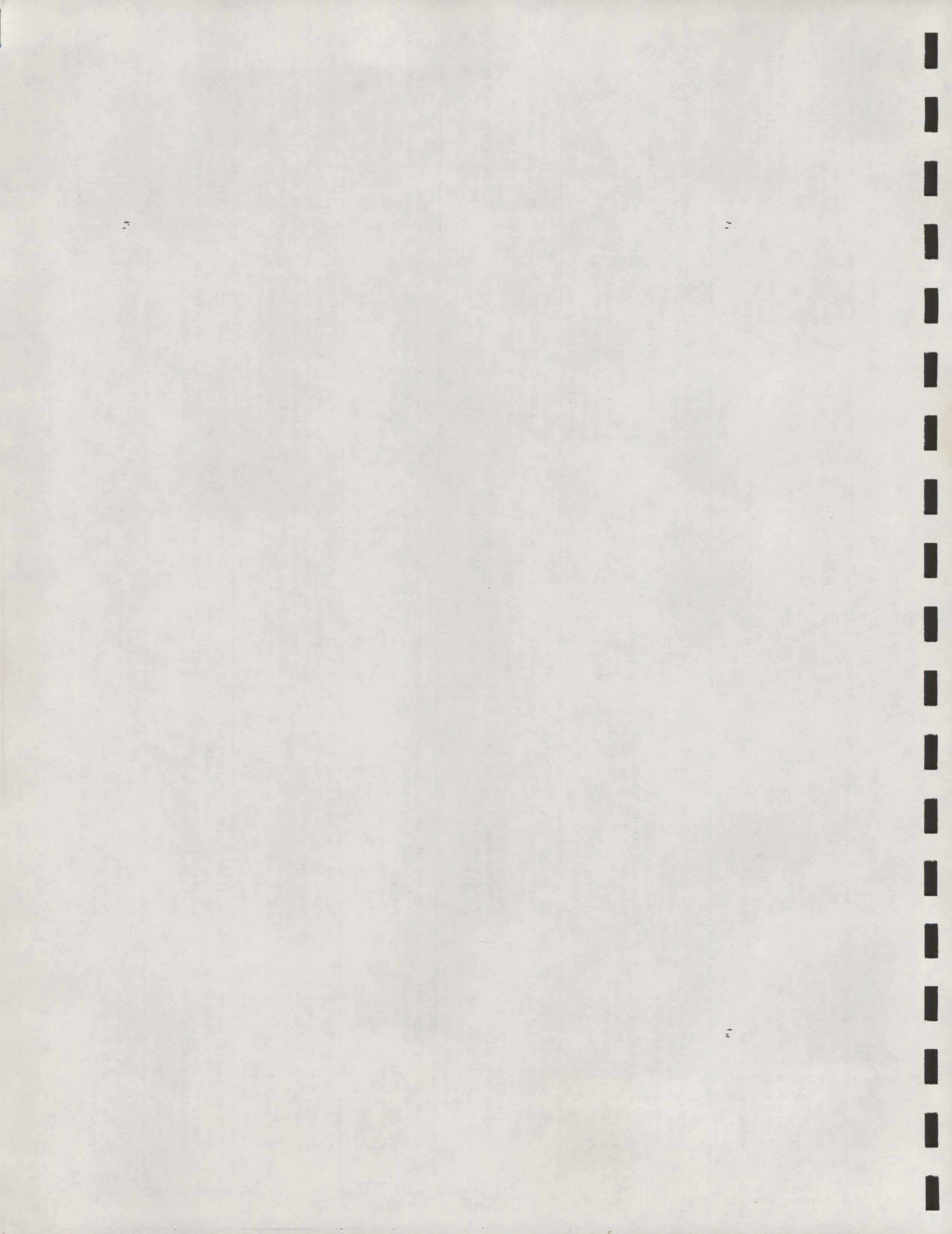
A comparison of the alternatives by the above criteria is summarized in Table 8. These comparisons are not based on in-depth analyses but represent the collective judgments of the Air Transportation Advisory Committee utilizing information resources from airport master plans and state/regional data bases.



TABLE 8  
COMPARISON OF REGIONAL AIRPORT SYSTEM ALTERNATIVES

	① NO NEW AIRPORTS	② EXPAND EXISTING AIRPORTS	③ LIMITED NEW AIRPORT	④ MEDIUM-SCALE NEW AIRPORT	⑤ TWO NEW AIRPORTS STAGED
LEVEL OF SERVICE FOR AIR CARRIER OPERATIONS	<ul style="list-style-type: none"> <li>Continuation of joint use of Sea-Tac for air carrier and general aviation operations.</li> <li>More frequent peak hour congestion due to competing air carrier and general aviation operations</li> </ul>	<ul style="list-style-type: none"> <li>Provides limited diversion of non-air carrier operations from Sea-Tac</li> <li>More potential conflict between air carrier and general aviation operations</li> </ul>	<ul style="list-style-type: none"> <li>Diversion of light aircraft operations from existing major general aviation airports which in turn serve as relievers for Sea-Tac</li> <li>Improve long term role of Sea-Tac as region's air carrier airport</li> </ul>	<ul style="list-style-type: none"> <li>Diversion of all types of general aviation operations from Sea-Tac and other congested airports</li> <li>Preserves long term role of Sea-Tac as region's air carrier airport</li> </ul>	<ul style="list-style-type: none"> <li>Provides greatest overall capacity for diverting non air carrier traffic from Sea Tac.</li> <li>Maximum separation of air carrier and light general aviation operation.</li> </ul>
LEVEL OF SERVICE FOR GEN. AVIATION OPERATIONS	<ul style="list-style-type: none"> <li>Constrained growth in general aviation due to saturation of existing airports</li> <li>Restriction of some general aviation operations from major airports as they become congested</li> </ul>	<ul style="list-style-type: none"> <li>Provides limited capacity for growth in general aviation</li> <li>Provides additional capacity at locations with good accessibility</li> <li>Provides greatest potential for congestion of existing airport facilities and services</li> </ul>	<ul style="list-style-type: none"> <li>Provides alternate location for personal travel and recreation uses</li> <li>Protects capacity of major and industrial/commuter airports to serve business, air taxi, and industrial uses</li> </ul>	<ul style="list-style-type: none"> <li>Provides alternate location for all types of general aviation use - relieves all existing airports</li> <li>Provides capacity for growth in business and industrial uses - enhances economic benefit of general aviation</li> </ul>	<ul style="list-style-type: none"> <li>Greatest capacity for serving personal travel and recreational uses</li> <li>Best overall access to airport facilities from population centers</li> </ul>
AIRSPACE CONFLICTS - SAFETY	<ul style="list-style-type: none"> <li>Concentration of aircraft operations at existing airports</li> <li>Continuation of existing airspace conflicts</li> <li>Growth in airspace use limited due to lack of based aircraft capacity</li> </ul>	<ul style="list-style-type: none"> <li>Concentration of aircraft operations at existing airports</li> <li>Greatest potential for airspace conflict and saturation around existing airports</li> </ul>	<ul style="list-style-type: none"> <li>Diversion of light gen'l. aviation aircraft operations away from existing saturated airports</li> <li>Relieves airspace conflicts to a limited degree</li> </ul>	<ul style="list-style-type: none"> <li>Diversion of all types of general aviation aircraft operations from existing saturated airports</li> <li>Relieves airspace conflicts significantly</li> </ul>	<ul style="list-style-type: none"> <li>Greatest dispersion of aircraft operations</li> <li>Minimum conflict of light general aviation traffic with existing crowded airspace</li> </ul>
CAPACITY FOR GEN. BASED AIRCRAFT	<ul style="list-style-type: none"> <li>Percent of new based aircraft demand accommodated through 2000</li> <li>King/Snohomish - 37%</li> <li>Pierce - 41%</li> <li>Kitsap - 100%</li> </ul>	<ul style="list-style-type: none"> <li>Percent of new based aircraft demand accommodated through 2000</li> <li>King/Snohomish - 50%</li> <li>Pierce - 41%</li> <li>Kitsap - 100%</li> </ul>	<ul style="list-style-type: none"> <li>Percent of new based aircraft demand accommodated through 2000</li> <li>King/Snohomish - 54%</li> <li>Pierce - 41%</li> <li>Kitsap - 100%</li> </ul>	<ul style="list-style-type: none"> <li>Percent of new based aircraft demand accommodated through 2000</li> <li>King/Snohomish - 63%</li> <li>Pierce - 41%</li> <li>Kitsap - 100%</li> </ul>	<ul style="list-style-type: none"> <li>Percent of new based aircraft demand accommodated through 2000.</li> <li>King/Snohomish - 77%</li> <li>Pierce - 71%</li> <li>Kitsap - 100%</li> </ul>
COMMUNITY IMPACT	<ul style="list-style-type: none"> <li>No new land required</li> <li>Minimal change in land area within Ldn 65 noise contours</li> <li>No change in land area within runway approach safety zones</li> </ul>	<ul style="list-style-type: none"> <li>Minimum new land area required</li> <li>Some increase in land area within Ldn 65 noise contours at existing airports</li> <li>No change in land area within runway approach safety zones</li> </ul>	<ul style="list-style-type: none"> <li>115-210 acres required for new airport site</li> <li>Minimum new land area within Ldn 65 noise contours</li> <li>Minimum new land area within runway approach safety zones</li> </ul>	<ul style="list-style-type: none"> <li>230-440 acres required for new airport site</li> <li>Moderate new land area within Ldn 65 noise contours</li> <li>Moderate new land area within runway approach safety zones</li> </ul>	<ul style="list-style-type: none"> <li>230-420 acres required for two new airport sites</li> <li>Maximum new land area within Ldn 65 noise contours</li> <li>Maximum new land area within runway approach safety zones</li> </ul>
CAPITAL COST	<ul style="list-style-type: none"> <li>Baseline capital needs - completion of currently committed projects; implementation of airport master plans within available funding resources</li> </ul>	<ul style="list-style-type: none"> <li>Baseline capital needs plus Development costs for major expansion of one or more existing airports</li> <li>High land costs around existing airport locations</li> </ul>	<ul style="list-style-type: none"> <li>Baseline capital needs plus Development costs for new basic general aviation airport</li> </ul>	<ul style="list-style-type: none"> <li>Baseline capital needs plus Development costs for new industrial/commuter airport</li> </ul>	<ul style="list-style-type: none"> <li>Baseline capital needs plus Development costs for two new general aviation airports</li> </ul>
INDIRECT BENEFITS	<ul style="list-style-type: none"> <li>Economic benefits of general aviation constrained due to limited capacity for growth</li> </ul>	<ul style="list-style-type: none"> <li>Limited land available for industrial &amp; business development at existing locations</li> <li>Established locations close to urban area business/ industrial centers</li> </ul>	<ul style="list-style-type: none"> <li>Minimal potential for new employment at airport site but relieves existing airports</li> <li>Location less accessible to urban activity centers</li> </ul>	<ul style="list-style-type: none"> <li>Significant potential for industrial development and job opportunities at new site; relieves existing sites</li> <li>Good intermodal connections with urban area surface transportation</li> </ul>	<ul style="list-style-type: none"> <li>Limited potential for new employment at airport sites but relieves existing airports significantly</li> <li>Locations less accessible to urban activity centers</li> </ul>







CHAPTER V  
RECOMMENDED PLAN

Regional Air Transportation Policies

The following regional air transportation policies are recommended for adoption as general guidelines for the planning and development of a Regional Airport System to serve the region's air carrier and general aviation needs. The policies, and the recommendations which result from them, are intended to provide recognition of certain airports as essential public use transportation facilities in this region, and to provide information necessary for their inclusion in regional and local comprehensive planning processes.

- o Identify airport facilities which are of regional and subregional significance and include these as physical elements in the transportation planning process.
- o Coordinate the development of regional airport facilities to satisfy a range of air transportation needs with maximum utilization of existing facilities and minimum adverse environmental impact on local communities.
- o Encourage air carrier and commuter service, and general aviation, to provide adequate air access within the Puget Sound Region and to other regions for both passengers and cargo.
- o Encourage continued availability of public and private airports, heliports, and seaplane bases which provide capacity for based and transient aircraft operations and are needed for public services such as police surveillance, fire fighting and emergencies.
- o Encourage compatible land uses in areas surrounding airports, considering noise impact, safety, and usefulness of the land.
- o Minimize the adverse impact of flight operations on existing and planned communities in the upgrading of existing airports and location of new airports.
- o Encourage open space land uses for areas surrounding regional airports and discourage incompatible land uses which pose safety hazards to flight operations.
- o Coordinate the development of surface transportation facilities with airport development to maintain adequate access.



## Regional Airport System

### *Airport Facilities and Roles*

Based on the assessment of air carrier and general aviation needs through the year 2000 and the evaluation of system alternatives in the preceding sections, the following airport facilities are recommended for inclusion in the Regional Airport System. They are grouped according to their recommended future role.

#### Air Carrier:

Sea-Tac

#### General Aviation - Major:

King County International, Boeing Field  
Snohomish County, Paine Field

#### General Aviation - Industrial/Commuter:

Renton Municipal  
New Airport - King/Snohomish Service Area  
Tacoma Industrial Airport  
Kitsap County Airport

#### General Aviation - Basic:

Auburn Municipal  
Cedar Grove Airpark  
Crest Airpark  
Enumclaw  
Kenmore Seaplane Base  
Kurtzer/L. Union Seaplane Bases  
Wax Orchard (Vashon Island)  
W. Rogers/W. Post Seaplane Base  
Arlington Municipal  
Harvey Airfield  
Martha Lake  
Puyallup Industrial  
Spanaway  
Apex Airpark  
Port Orchard

#### Heliports:

Sea-First Building - downtown Seattle

#### Military:

Gray Army Airfield (Fort Lewis)  
McChord Air Force Base



The location of the existing airports and general service area of the new airports are shown in Figure 12. Their inclusion in the Regional Airport System Plan implies a commitment on the part of local, state and federal government jurisdictions to preserve their role as an air transportation facility. It further implies a commitment to guide development of both the airport facility and the surrounding community to maintain land use compatibility and community acceptability.

#### *Recommended Airport Development*

##### Air Carrier Facilities

The assessment of demand and capacity for air carrier operations in this region led to the conclusion that Sea-Tac, if developed to its full potential will probably have sufficient capacity for handling air passenger traffic, air cargo movement and air carrier aircraft operations through the year 2000, although the potential exists for operating restrictions due to airspace conflicts with nearby airports during peak hours. It was concluded that alternatives for additional air carrier airport capacity do not need to be addressed at this time. The recommendations concerning the air carrier element of the Regional Airport System are to:

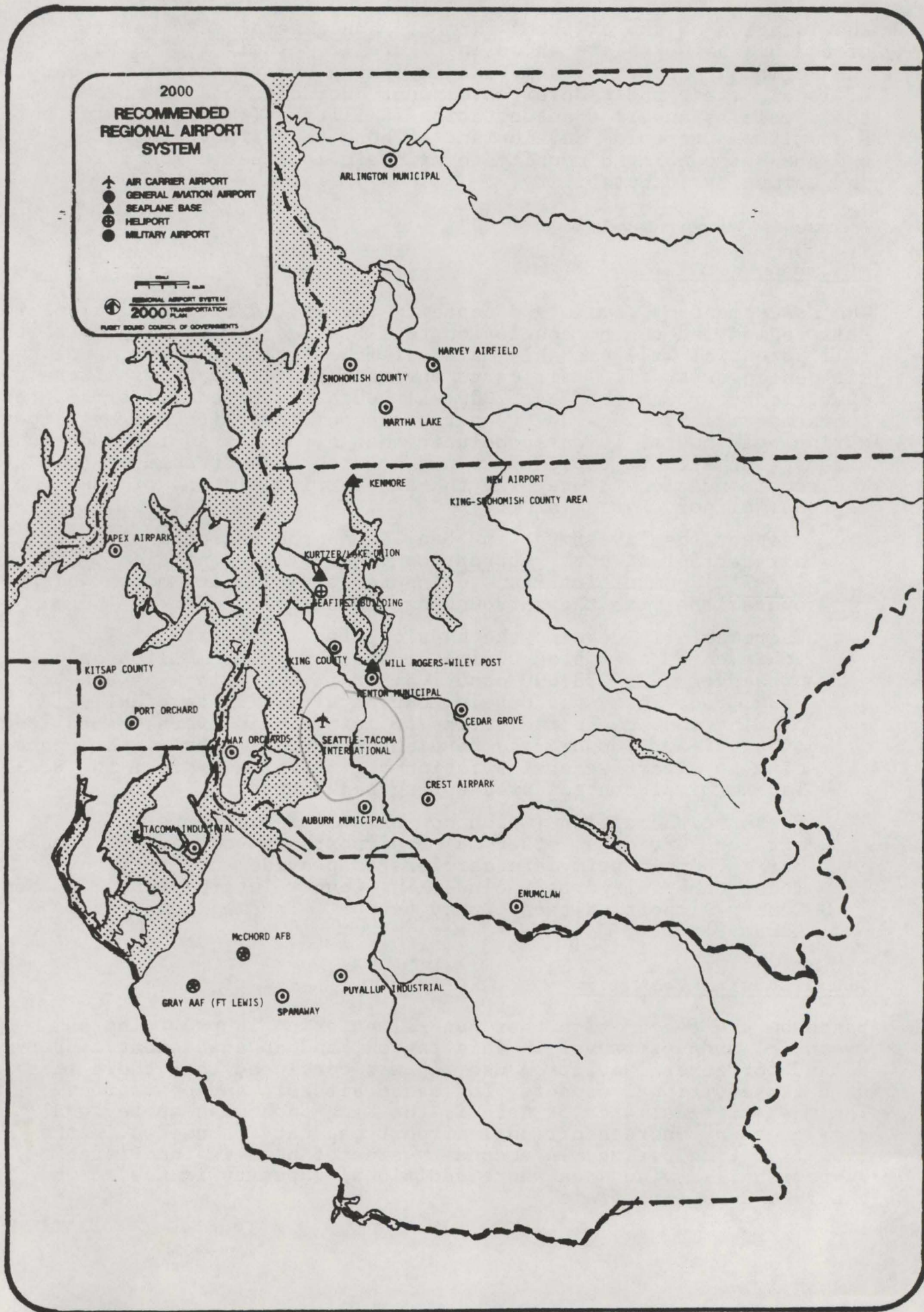
- o Protect the investment in Sea-Tac as the region's principal air carrier airport; support continued implementation of the Sea-Tac Communities Plan to insure compatibility of the airport operations with the surrounding community.
- o Incrementally develop the physical facilities at Sea-Tac to achieve the estimated ultimate capacity of 20 million annual passengers and 278,000 annual aircraft operations by the year 2000; coordinate the development of airfield, terminal, parking and access facilities to maintain an overall good level of service. Support the development of reliever airport capacity to divert general aviation operations away from the Sea-Tac terminal control area during peak hours.
- o Preserve the option (which now exists) for commuter airline service at other major airports in the region, should market demand stimulate carriers to provide such services. These other airports include King County International, Snohomish County Airport, Kitsap County Airport, Tacoma Industrial Airport.

##### General Aviation Facilities

Based on the recognition that general aviation is providing an essential mode of travel in this region, and an assessment of future demand for general aviation use, it was concluded that there is a need for additional capacity for based aircraft and operations. The most critical area of need is the King-Snohomish subregional service area, where additional airport capacity is needed in the 1980-1990 time period. A secondary area of need is the Pierce subregional service area where additional capacity is needed in the 1990-2000 time frame.



FIGURE 12





From the evaluation of facility alternatives for providing additional airport capacity, it was concluded that the alternative which best served transportation and community development objectives with the least overall adverse impact on existing communities is the development of a new industrial/commuter class airport in the King-Snohomish service area. The principal reasons for selection of this alternative are:

- o It would accommodate the projected growth in general aviation demand well beyond 1990.
- o It could provide a facility which would significantly reduce the air space conflict in the vicinity of Sea-Tac Airport, and thereby improve the safety of operation for both air carrier and general aviation traffic.
- o The development of an industrial/commuter class airport would stress and support those functions of general aviation which produce economic benefits for the community-at-large.
- o It would reduce (or even eliminate) for some time pressures to expand some existing airports and thereby avoid adverse local impacts in the vicinity of these existing airports.
- o An industrial/commuter airport would be eligible for a broader range of funding support than a limited function airport.

Along with the development of a new airport, as described above, the plan depends on the preservation of privately owned airports which have been designated as regional system airports. While the privately owned airports individually have a limited role in the regional airport system their combined capacity is substantial and their preservation essential to the airport system of the region.

The recommendations for staged development of individual general aviation airports, both existing and new, is summarized in Table 9. They state the needed capability of each airport in terms of capacity for based aircraft. The development or improvement of the airfield and support facilities for the operation of the based aircraft and transient aircraft is inherently contained in the recommendations but is not addressed specifically here.

An additional area of need that has been identified is that of support facilities for certain types of helicopter operations. Helicopter service operators in the region have indicated that there is currently unmet demand for air taxi services to and from major activity centers. The three primary areas of need have been identified as downtown Seattle, downtown Bellevue, and Sea-Tac airport. While the Recommended Plan contained herein cannot at this time substantiate the level of demand which will exist in the future or recommend specific sites it is recommended that this element of the Regional Airport System be investigated further to develop the data base for a future decision on facility needs.



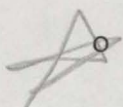
TABLE 9 GENERAL AVIATION AIRPORT DEVELOPMENT  
RECOMMENDATIONS

GENERAL AVIATION SERVICE AREA	AIRPORT	EXISTING (1979) BASED AIRCRAFT CAPACITY	ADDITIONAL BASED AIRCRAFT CAPACITY RECOMMENDED	
			1980 - 1990	1990 - 2000
King- Snohomish	<u>MAJOR</u>			
	King Co. Int'l.	650	Maintain at existing level	Maintain at exi- sting level
	Snoh. Co.	371	141	164
	<u>INDUST. / COMMUTER</u>			
	Renton Mun.	252	23	Maintain at 1990 level
	New Air- port	0	400	200
	<u>BASIC</u>			
	Auburn Mun.	185	160	67
	Cedar Grove Airpark	26	17	57
	Crest Airpark	106	91	63
	Enumclaw	17	15	53
	Kenmore SpB	90	31	29
	Kurtzer/Lake Union SpB's	9	3	4
	Wax Orchard	10	6	14
	Rogers/Post SpB	20	6	8
Arlington Mun.	195	66	127	
Harvey Airfld.	199	116	29	
Martha Lake	74	48	39	
Pierce	<u>INDUST. / COMMUTER</u>			
	Tacoma Indust.	118	76	62
	<u>BASIC</u>			
Puyallup Industrial	205	5	67	
Spanaway	84	16	32	
Kitsap	<u>INDUST. / COMMUTER</u>			
	Kitsap Co.	95	41	44
	<u>BASIC</u>			
Apex Airpark	26	11	12	
Port Orchard	33	14	15	

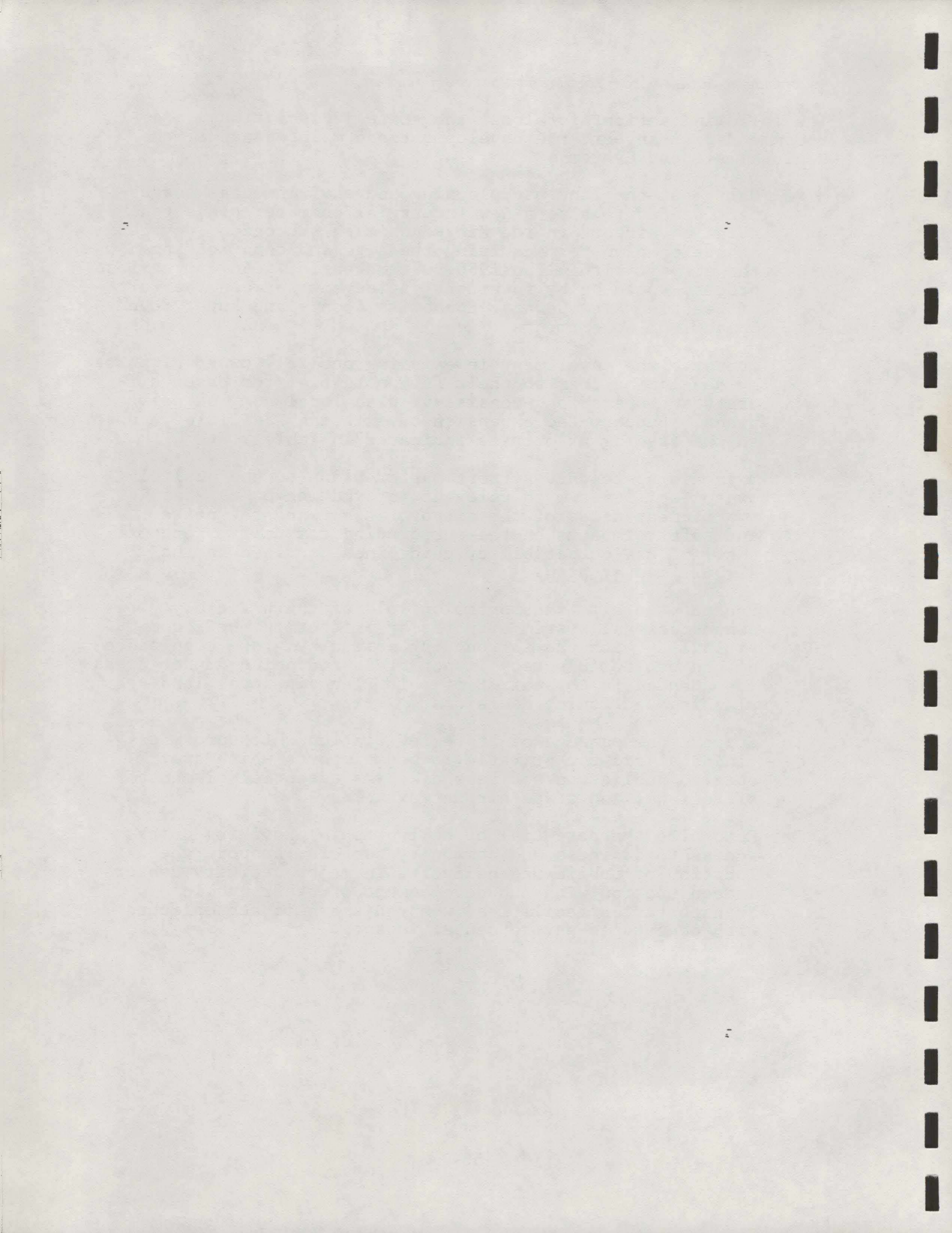


*Recommended Actions for Local and State Government*

The following actions for local and state jurisdictions are recommended to support the development and maintenance of the Regional Airport System:

- o Carry out the land use planning and environmental assessment needed to site a new industrial/commuter class general aviation airport in the King-Snohomish subregion; develop an action plan for acquiring the site and constructing the airport within the 1980-90 time period. An appropriate process would be by interlocal agreement between the Port of Seattle, King County, Snohomish County and Puget Sound Council of Governments.
- o Preserve the investment in existing publicly owned airports by developing them to their full potential for based aircraft and operations consistent with local comprehensive plans. Support the expansion of existing facilities according to the staging priorities indicated in Table 9.
- o Maintain up-to-date airport master plans on the publicly owned facilities with relevant information on capital improvement needs of the airport itself and the noise and safety impacts on the surrounding community. Support the land use compatibility guidelines provided in the airport master plans.
-  o Protect the air transportation role of the privately owned regional system airports by protecting their compatibility with the surrounding community; take cognizance of the projected safety impact areas and noise impact areas (documented in Appendix B of this Plan) in local land use planning and zoning decisions.
- o Support the passage of state legislation which provides financial aid for privately owned airports which are open to public use and recognized as essential elements of regional and state airport systems.
- o Recognize the potential of heliports in providing quick access to business and community centers; support the location of public use heliports in major activity centers in conjunction with the development of other public transportation facilities, when this can be accomplished with acceptable environmental impacts.



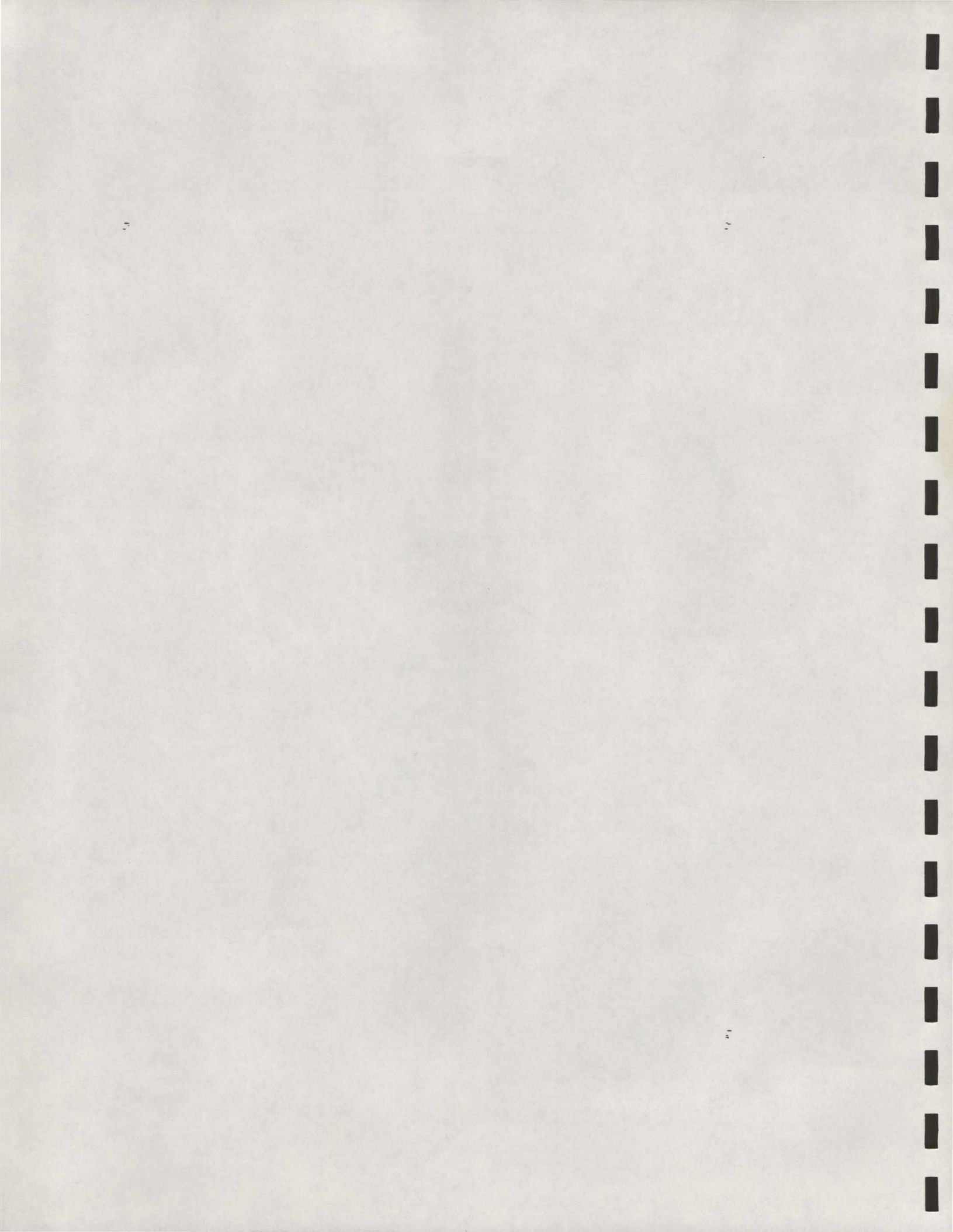




APPENDIX A

SUMMARY OF RESPONSES TO  
AIRCRAFT OWNERS SURVEY







June 9, 1980

TO: Air Transportation Advisory Committee  
FROM: Puget Sound Council of Governments Staff  
SUBJECT: Task Report - General Aviation Aircraft Owner Survey

### Purpose of the Survey

To obtain information related to the uses of general aviation facilities and aircraft in the Central Puget Sound Region; to develop a data file with information on trip origins (place of business or residence), destinations, purpose and frequency; to use the information for updating the general aviation demand forecasts for the region including based aircraft and operations, relating demand to capacity.

### Survey Population

The survey population was a 25% random sample of the registered aircraft owners in the Central Puget Sound Region (King, Kitsap, Pierce and Snohomish counties). This amounted to a total of 970 owners, including both single aircraft and fleet owners. The sample was taken from the F.A.A. aircraft registration file, as updated in May 1979.

### Method:

A questionnaire with an introductory letter and postage paid return mailer was mailed out in late February 1979, with return requested by March 15. A copy of the letter and questionnaire are included in this Appendix. Endorsement of the survey was obtained from the Washington Pilots Association and the Washington Airport Managers Association. Copies of the correspondence are included in the Appendix.

Approximately 290 questionnaires were returned. The representation from the four counties was similar to the distribution of based aircraft among the four counties. After review and editing, the results were processed using the computer program series Statistical Package for the Social Sciences (SPSS).



SUMMARY OF RESPONSES

Question 1: (Aircraft registration number)

Question 2: Number of Aircraft Owned

<u>Number</u>	<u>Frequency</u>	<u>%</u>	<u>Number</u>	<u>Frequency</u>	<u>%</u>
1	191	65.6	9	0	-
2	45	15.5	10	1	.3
3	11	3.8	11	0	-
4	11	3.8	12	3	1.0
5	2	.7	13	3	1.0
6	11	3.8	14	1	.3
7	0	-	15	7	2.4
8	5	1.7	No Answer	8	

Total Responses	= 291
No Response	= 8
Fleet Owners (2 or more) as a percent of total responses	= 34.4
Total Number of Aircraft owned by those who responded to Question 2	= 678



Question 3: Airport at Which Aircraft Currently Based

<u>Airport</u>	<u>Frequency</u>	<u>%</u>	<u>Airport</u>	<u>Frequency</u>	<u>%</u>
1 Auburn Municipal	12	4	16 Kitsap Co.	13	5
2 Bellevue	17	6	17 Port Orchard	3	1
3 Cedar Grove	5	2	18 Other	1	0
4 Crest Airpark	15	5	Kitsap Co. Subtotal	22	(8%)
5 Enumclaw	-	-	19 American Lake (Spb)	-	-
6 King Co. Intl. (Boeing Field)	61	21	20 McChord AFB	-	-
7 Renton Municipal	20	7	21 Puyallup Indust.	12	4
8 Seatac Intl.	-	-	22 Spanaway	5	2
9 Wax Orchards	2	1	23 Tacoma Industrial	11	4
10 Issaquah	7	2	24 Gray AAF (Ft. Lewis)	1	0
11 Kenmore	7	2	25 Other	9	3
12 Kurtzer/L. Union	3	1	Pierce Co. Subtotal	38	(13%)
13 W. Rogers/W. Post (Spb)	-	-	26 Arlington Municipal	11	4
14 Other	12	4	27 Harvey Airfield	12	4
King Co. Subtotal	161	(56%)	28 Martha Lake	7	2
15 Apex Airpark	5	2	29 Snoh. Co. (Paine Field)	35	12
			30 Other	2	1
			Snoh. Co. Subtotal	67	(23%)

Total Responses = 288

No Response = 11



Question 4a: Number of Reasons Given for Choice of Airport

<u>Number of Reasons</u>	<u>Frequency</u>	<u>%</u>
1	54	18.7
2	101	34.9
3	75	26.0
4	37	12.8
5	15	5.2
6	4	1.4
7	3	1.0

Total Responses = 289

No Response = 10



Question 4b: Reasons for Choosing Airport

<u>Reason</u>	<u>Frequency</u>	<u>% of Reasons Mentioned</u>
1. Proximity to Home	201	28.0
2. Proximity to Business	128	17.8
3. Operational Requirements	89	12.4
4. Quality of Airport	129	17.9
5. Cost Considerations	84	11.7
6. Purchased at Airport	15	2.1
7. Other	73	10.1
	<hr/>	<hr/>
Total Reasons Mentioned	719	100.0
Total Responses	= 291	
No Response	= 8	



Question 5: Primary Reason for Location

	<u>Reason</u>	<u>Frequency</u>	<u>%</u>
1.	Proximity to Home	91	35.5
2.	Proximity to Business	45	17.6
3.	Operational Requirements	32	12.5
4.	Quality of Airport	32	12.5
5.	Cost Consideration	24	9.4
6.	Purchased at Airport	0	-
7.	Other	32	12.5

Total Responses = 256

No Response = 43



Question 6: Closest Proximity to Airport

	<u>Location</u>	<u>Frequency</u>	<u>%</u>
1.	Residence	148	52.9
2.	Business	111	39.6
3.	Both	21	7.5

Total Responses = 280

No Response = 19

Question 7: Most Frequent Trip Origin

	<u>Origin</u>	<u>Frequency</u>	<u>%</u>
	Residence	193	67.0
	Business	78	27.1
	Both	17	5.9

Total Responses = 288

No Response = 11



Question 8a: Travel Time From Residence

<u>Travel Time</u> (Min.)	<u>Frequency</u>	<u>%</u>
1-5	42	15.8
6-10	32	12.0
11-15	43	16.2
16-20	46	17.3
21-25	28	10.5
26-30	46	17.3
31-40	15	5.6
41-50	9	3.4
51-60	3	1.1
Over 60	2	.8

Total Responses = 266

No Response = 33

Mean Travel Time from Residence = 20 minutes



Question 8 b: Travel Time From Business

<u>Travel Time</u> Min.	<u>Frequency</u>	<u>%</u>
1-5	51	25.5
6-10	19	9.5
11-15	25	12.5
16-20	28	14.0
21-25	14	7.0
26-30	30	15.0
31-40	14	7.0
41-50	10	5.0
51-60	4	2.0
Over 60	5	2.5

Total Responses = 200

No Responses = 99

Mean Travel Time From Business = 20 minutes

Question 9: Aircraft Model and Year of Manufacture

No summary prepared.



Question 10: Number of Seats Per Aircraft

<u>Number</u>	<u>Frequency</u>	<u>%</u>
1	8	2.7
2	71	24.3
3	6	2.1
4	162	55.5
5	14	4.8
6	23	7.9
7	4	1.4
8	1	0.3
9	1	0.3
10.	1	0.3
11.	-	-
12.	-	-
13.	1	0.3

Number of Responses = 292

No Response = 7

Mean Number of Seats = 3.7



Question 11: Maximum Cargo Payload (Excluding Passengers)

Minimum	10 lbs
Maximum	5200 lbs
Mean	615 lbs

Total Responses = 269

No Response = 30

Question 12: Number of Aircraft Which are Seaplanes

<u>Category of Aircraft</u>	<u>Frequency</u>	<u>%</u>
1. Seaplane	19	6.5
2. Not a seaplane	273	93.2
3. Both	1	0.3

Total Responses = 293

No Response = 6



Question 13: Type of Aircraft

<u>Type</u>	<u>Frequency</u>	<u>%</u>
1. Single Engine Piston	260	88.4
2. Twin Engine Piston	17	5.8
3. Multi Engine Piston Greater than Twin	-	-
4. Turboprop	2	0.7
5. Turbojet	1	0.3
6. Helicopter	7	2.4
7. Glider	7	2.4

Total Responses = 294

No Response = 5

Question 14: Operational Status of Aircraft

<u>Status</u>	<u>Frequency</u>	<u>%</u>
Flyable	271	91.9
Not flyable	24	8.1

Total Responses = 295

No Response = 4



Question 15a: Number of Aircraft Leased to Second Party

<u>Aircraft Leased</u>	<u>Frequency</u>	<u>%</u>
Yes	52	17.8
No	240	82.8

Total Responses = 292

No Response = 7

Question 15b: Percent of the Time Aircraft is Leased to Second Party

<u>Percent of the Time</u>	<u>Frequency</u>	<u>% Of Those Leased</u>
20	2	4.1
25	1	2.1
30	1	2.1
50	5	10.4
65	1	2.1
70	2	4.2
90	7	14.6
95	1	2.1
100	28	58.3

Total Responses = 48

No Response = 4



Question 16: Number of Hours Flown During 1979

Minimum            0 hours

Maximum          1000 hours

Mean              190 hours

Total Responses    = 291

No Response        = 8



Question 17: Number of Round Trips By Purpose

PURPOSE	CROSS COUNTRY		LOCAL		TOTAL	
	NUMBER OF TRIPS	%	NUMBER OF TRIPS	%	NUMBER OF TRIPS	%
Executive Transportation	866	6.3	1049	4.2	1915	5.0
Business Transportation	3375	24.4	948	3.8	4323	11.2
Personal Travel/ Recreation	5251	38.0	6626	26.8	11877	30.8
Air Taxi	1238	9.0	778	3.1	2016	5.2
Industrial or Special Use	229	1.7	831	3.4	1060	2.7
Aerial Application	35	.3	502	2.0	537	1.4
Flying Instruction/ Proficiency	2119	15.3	8121	32.8	10240	26.5
Touch & Go Practice	403	2.9	4898	19.7	5301	13.7
Other	292	2.1	1051	4.2	1343	3.5
TOTAL	13,808	100.0	24,804	100.0	38,612	100.0

Total Responses = 245  
 No Response = 54

A-15



Question 18: Average Number of Persons Carried per Trip By Purpose

PURPOSE	CROSS COUNTRY AVERAGE # OF PERSONS CARRIED	LOCAL AVERAGE # OF PERSON CARRIED
Executive Transportation	2.7	2.7
Business Transportation	2.0	2.1
Personal Travel/ Recreation	2.6	2.2
Air Taxi	2.9	2.6
Industrial or Special Use	2.3	2.4
Aerial Application	2.0	1.3
Flying Instruction/ or Proficiency	1.9	1.9
Touch and Go Practice	1.6	1.4
Other	1.8	2.0

Total Responses = 261

No Response = 38



Question 19: Primary Use of the Aircraft

<u>Use</u>	<u>Frequency</u>	<u>%</u>
1. Executive Transportation	10	3.8
2. Business Transportation	51	19.6
3. Personal Travel/Recreation	139	53.5
4. Air Taxi	7	2.7
5. Industrial or Special Use	5	1.9
6. Aerial Application	1	.4
7. Flying Instruction/Proficiency	35	13.5
8. Touch & Go Practice	-	-
9. Other	12	4.6

Total Responses = 260

No Response = 39



Question 20: Number of Trips by Distance Category

Category	Number of Trips	%
Less than 100 miles	13,865	66.0
101 Thru 300 miles	4,047	19.3
301 Thru 500 miles	1,973	9.4
Over 500 miles	1,109	5.3
	<u>20,994</u>	
TOTAL	20,994	

Total Responses = 235

No Response = 64

Question 21: Total Annual Family Income

<u>Range</u>	<u>Frequency</u>	<u>%</u>
Under \$15,000	7	3.1
\$15,000 - 24,999	34	14.9
\$25,000 - 49,999	112	49.1
\$50,000 - 79,999	51	22.4
\$100,000 or More	24	10.5

Total Responses = 228

No Response = 71



QUESTIONNAIRE AND CORRESPONDENCE



February 26, 1980

Dear Aircraft Owner:

The Puget Sound Council of Governments is currently updating the airport system plan for the Central Puget Sound Region. As an aircraft owner and user, you can provide valuable information to help us assess both current and future needs for airport facilities. The findings of this survey will be used in making recommendations for the improvement of existing airports and the development of new ones.

We hope you will assist us by filling out the attached questionnaire. You have been selected in a 25% random sampling of aircraft registrations in King, Kitsap, Pierce and Snohomish Counties. If you own more than one aircraft, please answer the questions for the aircraft with the registration number printed on the mailing label. If your aircraft is leased to another party, please forward the questionnaire to the person who is familiar with the aircraft's use during 1979.

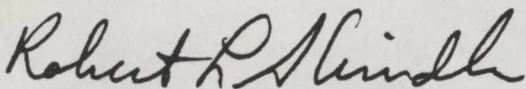
The Washington Pilots Association and the Washington Airport Managers Association support the need for the survey and encourage your cooperation in answering the questionnaire.

This survey and the airport system planning program are funded under a grant from the Federal Aviation Administration and the Division of Aeronautics of the Washington State Department of Transportation.

To insure that your input is received in time to include in the survey findings, we need your completed questionnaire by March 15.

We greatly appreciate your assistance in this activity. If you have questions concerning the questionnaire, please call Jack Meijsen or Don Secrist at 464-6172.

Sincerely,



Robert L. Shindler, Director  
Transportation Planning Division



AIRCRAFT OWNER SURVEY QUESTIONNAIRE  
CENTRAL PUGET SOUND REGION

1. Please enter the registration number of your aircraft. If you own more than one aircraft, enter the number printed on the mailing label. \_\_\_\_\_
2. How many aircraft do you currently own? \_\_\_\_\_
3. At which airport is your aircraft currently parked or hangared?  
\_\_\_\_\_
4. What are the reasons for choosing the airport at which the aircraft is currently based (Indicate as many as applicable.)?
 

1 _____ Proximity to home	4 _____ Quality of airport - facilities, weather, administration
2 _____ Proximity to business	5 _____ Cost considerations
3 _____ Operational requirements - due to type of aircraft and/or navigation equipment	6 _____ Purchased aircraft at the airport
	7 _____ Other (specify)
5. Which of the above reasons would you consider the primary reason for utilizing the airport?  
Indicate one number only \_\_\_\_\_
6. Is the aircraft based nearer your
 

1 _____ Residence?	2 _____ Place of business?
--------------------	----------------------------
7. When you use your aircraft where do you usually come from?
 

1 _____ Residence	2 _____ Place of business
-------------------	---------------------------
8. What is the approximate travel time in minutes to this airport from your
 

1 Residence? _____	2 Place of business? _____
--------------------	----------------------------
9. What is the model and year of manufacturing of your aircraft?  
Model: \_\_\_\_\_ Year: \_\_\_\_\_
10. What is the total number of seats in your aircraft? \_\_\_\_\_
11. What is the maximum cargo payload (excluding passengers)?  
\_\_\_\_\_ lbs.
12. Is your aircraft a seaplane?
 

1 _____ Yes	2 _____ No
-------------	------------

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3	4
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9	10
<input type="checkbox"/>	<input type="checkbox"/>

11	12
<input type="checkbox"/>	<input type="checkbox"/>

13	14
<input type="checkbox"/>	<input type="checkbox"/>

15	16
<input type="checkbox"/>	<input type="checkbox"/>

17	18	19
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

20
<input type="checkbox"/>







AIRCRAFT OWNER SURVEY QUESTIONNAIRE  
Page Three

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18. Indicate the average number of persons carried per trip for each category.

	<u>Cross Country</u>	<u>Local</u>
1 Executive transportation (aircraft flown by professional pilot)	_____	_____
2 Business transportation (aircraft flown by businessman himself for business purpose)	_____	_____
3 Personal travel/recreation	_____	_____
4 Air taxi	_____	_____
5 Industrial or special purpose	_____	_____
6 Aerial application (e.g. crop dusting)	_____	_____
7 Flying instruction/proficiency	_____	_____
8 Touch-and-go practice (without leaving traffic pattern)	_____	_____
9 Any other purpose	_____	_____

19. Which of the above categories do you consider the primary use of the aircraft? Indicate one number only \_\_\_\_\_

29

20. Indicate the number of trips during 1979 in each distance category.

1 Less than 100 miles one way	_____
2 101-300 miles one way	_____
3 301-500 miles one way	_____
4 Over 500 miles one way	_____

30	31	32
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
33	34	35
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
36	37	38
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
39	40	41
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

21. Which of the following categories represents your total combined family income in 1979? (Optional)

1 Under \$15,000	_____
2 \$15,000 - \$24,999	_____
3 \$25,000 - \$49,999	_____
4 \$50,000 - \$99,999	_____
5 \$100,000 or more	_____

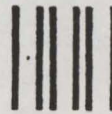
42

22. If the aircraft is owned by a business, indicate the approximate gross income in 1979 (Optional) \_\_\_\_\_



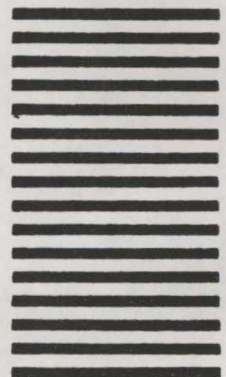
COMMENTS :

Please fold and mail. No envelope necessary.



NO POSTAGE  
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IN THE  
UNITED STATES

**BUSINESS REPLY MAIL**  
FIRST CLASS PERMIT NO. 2<sup>0</sup>286 SEATTLE, U.S.A.  
POSTAGE WILL BE PAID BY ADDRESSEE



**Puget Sound Council of Governments**  
**216 First Avenue South**  
**Seattle, WA 98104**



January 31, 1980

Ms. Della Koss, President  
Washington Pilots Association  
1119 S.W. 174th St.  
Seattle, Washington 98166

Dear Ms. Koss:

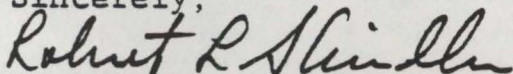
We appreciate your interest in our proposed survey of general aviation aircraft owners in the Central Puget Sound Region. As you discussed with Don Secrist on Monday, the survey is part of PSCOG's regional air transportation planning program, which is addressing long range needs for general aviation airport facilities in the four-county region. This work will lead to the adoption of a Regional Airport System Plan by the collective local governments of the region. The Plan establishes the role of individual airports in serving both existing and future demand for general aviation operations, and recommends improvements to existing facilities and development of new ones where there is a need.

The survey is intended to help us clarify the role of general aviation and the utilization of airport facilities particularly those serving the urban areas. It will also assist us in the allocation of future demand to individual airports. I have enclosed a copy of the questionnaire for your review. It will be mailed out to registered aircraft owners in the four-county area. We feel that it would be very beneficial to have the survey endorsed by the Washington Pilots Association, as many of the potential respondents are members. The endorsement could be in the form of a letter pointing out the need for the survey and its value in furthering the interests of General Aviation or simply your permission to include a statement on the questionnaire citing the support of the WPA.

If possible we would like to have your response in about one week. You indicated to Don that the WPA Board does not meet until February 16. We would like to discuss an alternative means of getting the endorsement if that is possible. We will contact you by phone in about a week.

Again, thank you for your interest.

Sincerely,



Robert L. Shindler, Director  
Transportation Planning Division



February 6, 1980

Mr. Floyd R. Creasman, President  
Washington Airport Management Association  
8600 Perimeter Road, Boeing Field  
Seattle, Washington 98108

Dear Mr. Creasman:

The Puget Sound Council of Governments is currently engaged in a program to update the airport systems plan for the Puget Sound Region. One of the tasks included in this program is a survey of general aviation aircraft owners to provide information for assessing needs and benefits. At the suggestion of Don Bakken who is a member of our Air Transportation Advisory Committee I am contacting you to request your support for the survey. An endorsement by you personally or on behalf of the Washington Airport Managers' Association would help to improve the response to the questionnaire.

As you know, there are a number of local issues which affect airport facility planning and implementation in this urban region. The survey is intended to help us clarify the role of general aviation, the community benefits derived therefrom, and the utilization of airport facilities particularly those serving the urban areas. It will also assist us in the allocation of future demand to individual airports. I have enclosed a copy of the questionnaire for your review. It will be mailed out to registered aircraft owners in the four-county area.

An expression of interest in and support for the objectives of the survey by the Washington Airport Managers' Association will be beneficial because of the day-to-day contacts your members have with aircraft owners and pilots. The endorsement could be in the form of a letter which we would enclose with the questionnaire or simply permission to indicate the endorsement of the WAMA by name on the questionnaire.

The survey is part of PSCOG's regional air transportation planning program, which is addressing long range needs for general aviation airport facilities in the four-county region. This work will lead to the adoption of a Regional Airport System Plan by the collective local governments of the region. The Plan establishes the role of individual airports in serving both existing and future demand for

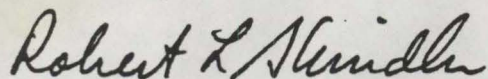


Mr. Floyd R. Creasman  
Page Two  
February 6, 1980

general aviation operations, and recommends improvements to existing facilities and development of new ones where there is a need.

We are planning to mail the questionnaire to a sample of about 40 percent of the registered aircraft owners about mid-February, and would appreciate having your response as soon as possible.

Sincerely,



Robert L. Shindler, Director  
Transportation Planning Division

Enclosure



# SPOKANE AIRPORTS

P.O. Box 19186, Spokane, Washington 99219 SPOKANE INTERNATIONAL & FELTS FIELD AIRPORTS (509) 624-3218

RECEIVED

FEB 25 1980

PUGET SOUND COUNCIL  
OF GOVERNMENTS

February 22, 1980

Mr. Robert L. Shindler, Director  
Transportation Planning Division  
PSCOG  
216 First Avenue South  
Seattle, WA 98104

Dear Mr. Shindler:

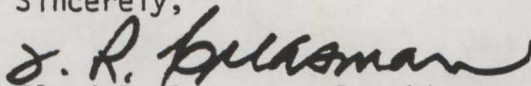
You have requested endorsement of your proposed Aircraft Owner Survey Questionnaire as a part of your update program of the airport systems plan for the Puget Sound Region.

There has been insufficient time available to allow me to refer this matter to the Board of the Washington Airport Management Association for action. However, after reviewing the proposed questionnaire, it is my opinion that WAMA would indeed endorse it as a bonafide effort to obtain valuable and necessary information as to the needs of the users of our airports.

I would also endorse the questionnaire personally, as an Airport Manager.

I believe that the members of WAMA would be interested in the results of the survey, and would ask that we be furnished a summary of the results when completed.

Sincerely,



Floyd R. Creasman, President  
Washington Airport Management Assoc.

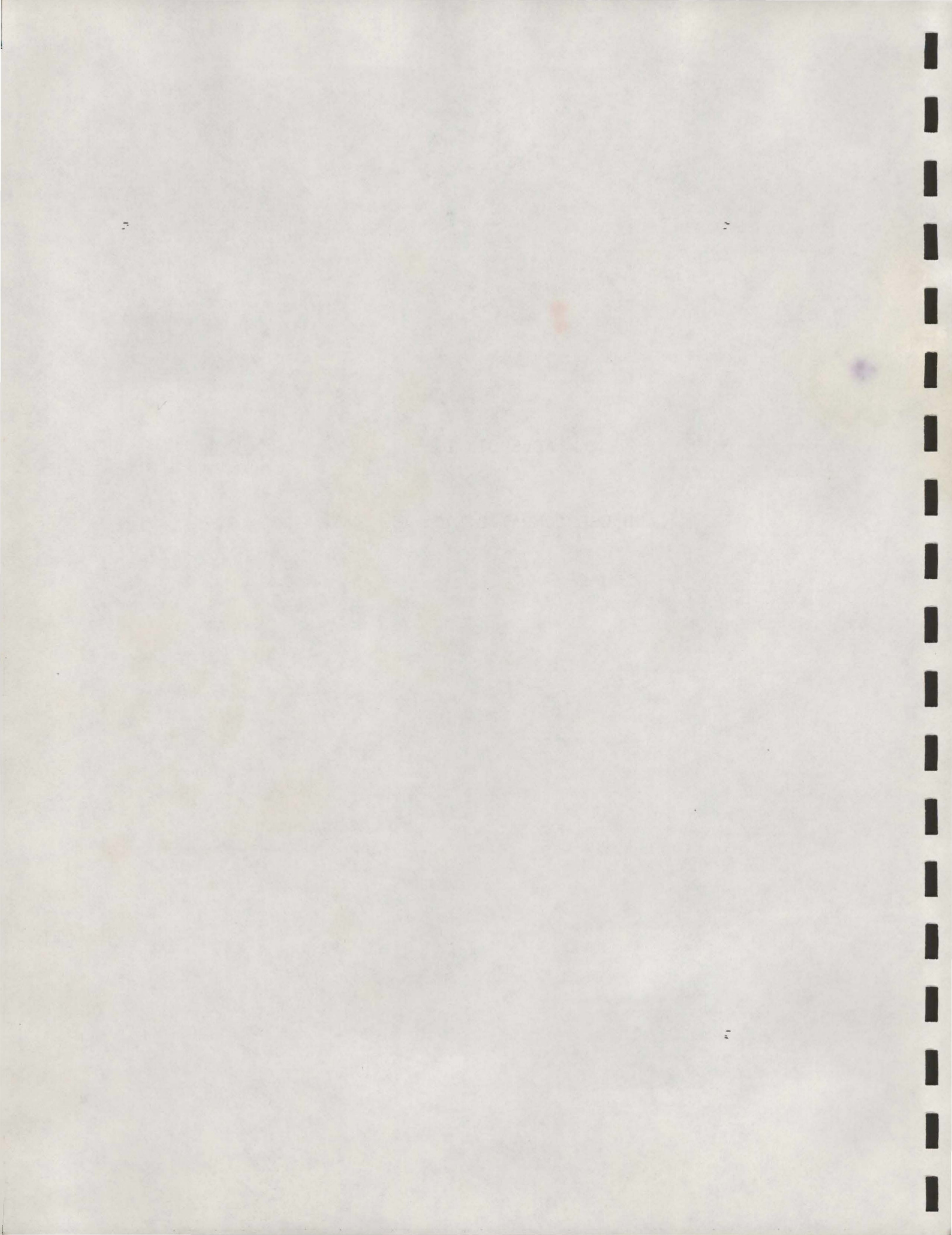
FRC:mn



APPENDIX B

LAND USE COMPATIBILITY CRITERIA







## LAND USE COMPATIBILITY CRITERIA

The two dominant land use compatibility issues related to airports are noise impact and safety. In both cases the area of concern usually extends beyond the boundaries of the airport property. Therefore the viability of the airport and its acceptance in the community depend in part on the land use and zoning decisions made for adjacent areas. It is essential to develop criteria by which to identify the noise impacted areas and areas of primary concern for safety of aircraft operations. Recognition of these areas and the potentially incompatible uses can then enter the land use decisions made within the community comprehensive planning process.

### Noise Impact Criteria

It has been well established that the severity of noise impact due to airport operations is primarily dependent on (1) proximity to the noise source, (2) the type of aircraft powerplant (propeller vs. jet, single-engine vs. multi-engine), (3) the number of operations (take-offs or landings) and (4) the time of day (greater community sensitivity to night-time operations). Over the years, the Federal Aviation Administration and acoustical researchers have developed several methods of evaluating aircraft noise impact. Those most commonly in use are:

#### Composite Noise Rating (CNR):

CNR is a noise exposure value which is based on aircraft noise levels as perceived by the human ear and weighted by the number of operations in day vs. night-time periods. It is the oldest of the methodologies now in use. CNR values are calculated and cannot be directly measured; the values range from 90 CNR for minimally impacted areas to 115 CNR for heavily impacted areas; they are usually calculated at several locations and placed on a map as contours. CNR ranges have traditionally been expressed as "zone 1", "zone 2" or "zone 3" delineating varying severity of noise exposure for land use planning purposes.

#### Noise Exposure Forecast (NEF):

NEF was developed in 1967 as a refinement of the CNR methodology which takes into account the additional factors of duration of aircraft fly-overs and the presence of discreet pure tones such as the turbine whine characteristic of jet engines. It is also a calculated noise exposure value which cannot be measured directly. It is a complex procedure usually requiring a computer to develop contours. NEF values range from 20 for lightly impacted areas to 40 for heavily impacted areas.



### Day-Night Average Sound Level (Ldn):

Ldn was developed in 1973-4 for general use by the Environmental Protection Agency and has since been receiving widespread use in airport planning. The FAA recommends its use for noise impact analyses of general aviation airports. Like CNR and NEF, Ldn accounts for the accumulation of noise over a period of time and it is weighted to account for the greater sensitivity to noise during night-time periods. Unlike CNR and NEF, however, it has the advantage of being a measurable quantity which can be recorded directly with portable monitoring equipment. Contour values usually range from 55 Ldn for lightly impacted areas to 75 Ldn for heavily impacted areas.

The application of the CNR, NEF, and Ldn noise rating criteria to land use planning is summarized in Figure B-1. Ranges of the three indices and their relative acceptability are related to specific land uses. These general guidelines, developed jointly by HUD and the FAA are widely used in airport master planning. It has been used as a general guide in the assessment of privately owned airports as part of this study.

### Application of Noise Criteria to Publicly Owned Airports

Publicly owned airports are eligible for planning and capital improvement assistance under the Airport Development Air Program administered by the FAA. One of the activities eligible for federal funds is the development and maintenance of an Airport Master Plan. Noise impact and land use compatibility related to the surrounding community are a part of the master plan scope. In the Central Puget Sound Region there is a master plan on record for all of the publicly owned airports being considered for inclusion in the Regional Airport System. In most cases noise contours have been developed, a land use inventory has been prepared with noise sensitive uses identified, and recommendations to guide future land use and zoning decisions have been formulated. The status of airport master plans in this region is summarized in Table B1. Protection of the viability of publicly owned airports in their respective communities requires that the noise impact and land use planning guidelines developed in the master planning process be fully recognized in the development and implementation of community comprehensive plans.



Application of Noise Criteria to Privately Owned Airports

There is no master planning process for privately owned airports. However, they are subject to the same community compatibility issues and land use pressures that face the publicly owned airports. The privately owned airports in this region provide a significant share of the capacity for general aviation based aircraft and operations; therefore their continued availability as airports is essential to the maintenance of adequate air transportation services.

One of the objectives of this study is to develop land use guidelines and provide noise impact criteria for the privately owned airports recommended for inclusion in the regional airport system. To do this the following procedure was carried out for each airport:

- 1) A land use inventory map was prepared for the vicinity surrounding the airport. The inventory was adapted to each airport community depending on the current status of planning and land use control. The intent was to represent how the land could be developed. If a community comprehensive plan had been adopted then the "adopted" land use was used. If the plan had reached a draft stage of completion and review, then the "proposed" land use was used. If there was no plan or it was in the early stages of development, the "existing zoning" was used.
- 2) Based on the forecast number of annual operations at the airport in the year 2000, a noise contour was developed representing an Ldn value of 65. As shown in Figure B1, this represents the dividing line between normally acceptable and normally unacceptable for most residential and community facility land uses. It corresponds to NEF 30 and the dividing line between CNR Zone 1 and Zone 2. The method for estimating the contours was based on FAA Report No. FAA-AS-75-1, Developing Noise Exposure Contours for General Aviation Airports, Dec. 1975.
- 3) The Ldn 65 contour was overlaid on the land use inventory map to identify those potential land uses, according to current local jurisdiction policy, which fall within the area of an Ldn 65 noise rating.

This procedure was carried out for 9 airports and 2 seaplane bases. The results are shown in Figures B2-B12.



### Airport Safety Criteria

An equally important land use compatibility issue is related to safety of aircraft operations - including safety of those on the ground and safety of those operating aircraft. As is the case with noise impact the area of concern usually extends beyond the boundaries of the airport. Certain land uses which generate smoke, attract birds, or physically obstruct the airspace, may be hazardous to aircraft operations. Conversely, the parts of the take-off and landing paths immediately adjacent to the runway are recognized as areas where the accident potential is the highest, creating potential hazards for people on the ground.

Part 77 of the Federal Aviation Regulations specifies the dimensions of imaginary surfaces around the airport within which aircraft normally operate. The dimensions vary according to the size of the runway and the type of navigation aids. Of concern here are the runway clear zone and the approach clearance surface. The clear zone extends from 1000 feet (general utility airports) to 2500 feet (larger transport airports) from the end of the primary surface (runway area). Within this area, height restrictions and fairly rigorous control of land uses is needed. The approach surface is a larger area extending up to 2 miles from the end of the runway. This is the area in which the extended climb-outs and landing approaches occur. (There is less concern for land uses under the approach surface outside the clear zone, however, some limitations on uses which involve large congregations of people are advisable and have been enforced in many communities.)

#### Application of Safety Criteria to Publicly Owned Airports

The master plans listed in Table B1 each contain an airport layout plan which defines the dimensions of the runway clear zone and the approach surface. This information provides a clear statement of land use guidelines for reference by the responsible local jurisdiction in development of zoning ordinances and building codes.

#### Application of Safety Criteria to Privately Owned Airports

The clear zone and approach surface criteria of FAR Part 77 were applied to the privately owned airports and seaplane bases. The results are shown on Figures B2-B12. The area outlined on the maps is a combination of the clear zone and a portion of the approach surface. The approach surface for a general utility airport runway extends outward from runway at a slope of 20:1. The outer limit was established at the distance where the 20:1 slope intersects the horizontal plane for obstruction clearance 150 feet above the airport elevation.



Figure B-1

LAND USE COMPATIBILITY GUIDELINES  
FOR AIRCRAFT NOISE ENVIRONMENTS

LAND USE	CNR ZONE <sup>1</sup>					
	1		2		3	
	55	60	65	70	75	80
Residential- Single Family, Duplex, Mobile Homes						
Residential- Multiple Family						
Transient Lodging						
School Classrooms, Libraries, Churches						
Hospitals, Nursing Homes						
Auditoriums, Concert Halls, Music Shells						
Sports Arenas, Outdoor Spectator Sports						
Playgrounds, Neighborhood Parks						
Golf Courses, Riding Stables, Water Recreation, Cemeteries						
Office Buildings, Personal, Business and Professional						
Commercial- Retail, Movie Theaters, Restaurants						
Commercial- Wholesale, Some Retail, Ind., Mfg., Utilities						
Livestock Farming, Animal Breeding						
Agriculture (Except Livestock), Mining, Fishing						
Public Right-of-way						
Extensive Natural Recreation Areas						

*Composite Noise Rating*  
CNEL<sup>2</sup> & Ldn<sup>4</sup>  
NEF<sup>3</sup> *Noise Exposure Forecast.*  
INTERPRETATION

**CLEARLY ACCEPTABLE**  
The noise exposure is such that the activities associated with the land use may be carried out with essentially no interference from aircraft noise. (Residential areas: both indoor and outdoor noise environments are pleasant.)

**NORMALLY ACCEPTABLE**  
The noise exposure is great enough to be of some concern, but common building construction will make the indoor environment acceptable, even for sleeping quarters.

**NORMALLY UNACCEPTABLE**  
The noise exposure is significantly more severe so that unusual and costly building construction is necessary to insure adequate performance of activities. (Residential areas: barriers must be erected between the site and prominent noise sources to make the outdoor environment tolerable.)

**CLEARLY UNACCEPTABLE**  
The noise exposure is so severe that construction costs to make the indoor environment acceptable for performance of activities would be prohibitive. (Residential areas: the outdoor environment would be intolerable for normal residential use.)

→  
→  
→

←  
←

<sup>1</sup> Composite Noise Rating  
<sup>2</sup> Community Noise Equivalent Level  
<sup>3</sup> Noise Exposure Forecast  
<sup>4</sup> Day-Night Average Sound Level

SOURCE: HUD, "Aircraft Noise Impact: Planning Guidelines for Local Agencies", by Wilsey & Ham and Bolt, Beranek and Newman, 1972. Adapted to incorporate CNEL and CNR measures.

Ldn 75  
NEF 40  
35



Table B1

STATUS OF GENERAL AVIATION AIRPORT MASTER PLAN AND NOISE CRITERIA  
PUBLICLY OWNED AIRPORTS

Airport	Responsible Jurisdiction	Date of Master Plan Completion or Update	Noise Impact Criteria		
			Land Use Plan Included	Noise Impact Contours Included	Index Used
Auburn Municipal	City of Auburn	May 1978	Yes	Yes	NEF
King Co. Int'l (Boeing Field)	King County	May 1971	Yes	No*	-
Renton Municipal	City of Renton	February 1978	Yes	Yes	NEF
Kitsap Co.	Port of Bremerton	Environmental Assessment - February 1973 Terminal Area Plan - Nov. 1979	Yes	Yes	CNR
Tacoma Industrial	City of Tacoma	September 1978	Yes	Yes	NEF
Arlington Municipal	City of Arlington	Master Plan in Progress	Yes	Yes	Ldn
Snohomish Co. (Paine Field)	Snohomish Co.	Conceptual and Environmental Study - 1974 Airport Master Plan and Community Plan in Progress	Yes	Yes	CNR Updated to Ldn in 1979/80
Puyallup Industrial	Pierce County	September 1978	Yes	Yes	NEF

\* Noise contours for Boeing Field, although not documented as part of the Master Plan, have been developed by FAA staff analysis for in-house use.

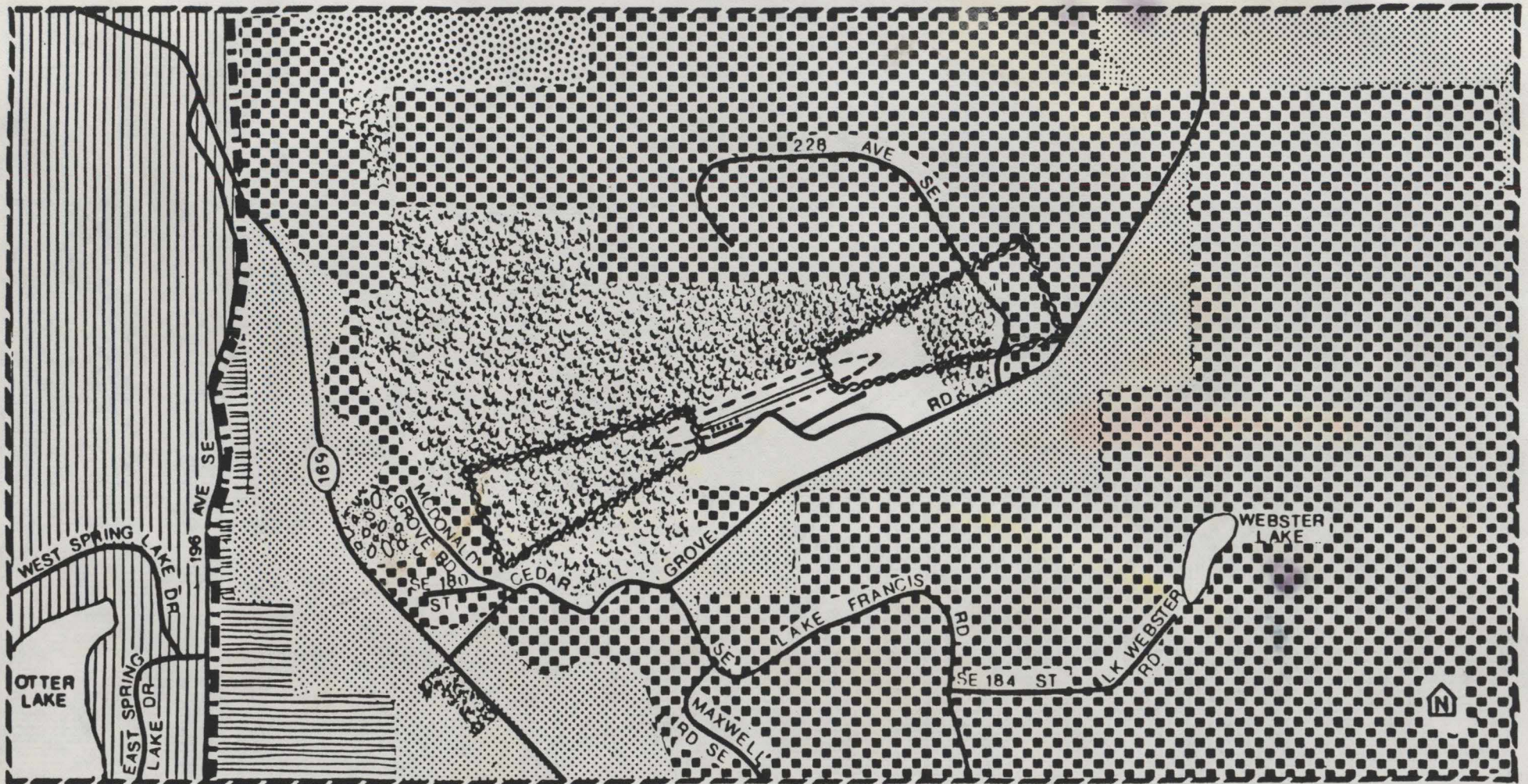
B-6

Noise Exposure Forecast













Figure B2



B-7

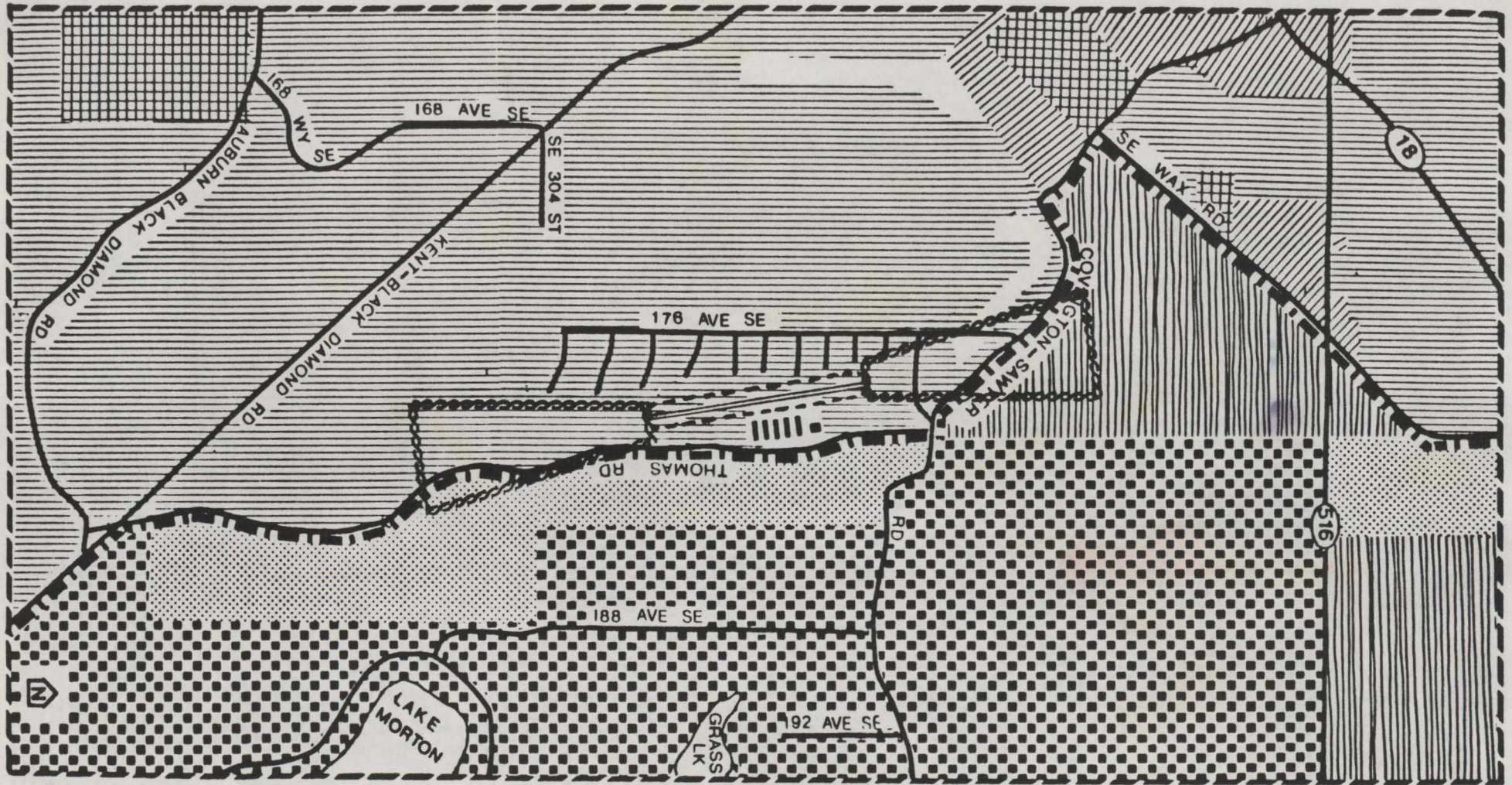
**CEDAR GROVE AIRPARK**

- |   |   |   |
|---|---|---|
|  Single family*          |  RS - Single family        |  SR - Suburban residential |
|  SE - Suburban estate    |  RM - Multiple dwelling    |  G - General               |
|  CG - General commercial |  QM - Quarrying and Mining |   |

Source: King County zoning and \* Soos Creek Community Plan










Figure B3



B-8

**CREST AIRPARK**

- |   |                           |   |                      |   |   |
|---|---------------------------|---|----------------------|---|---|
|  | Single family*            |  | Community facility*  |  | Neighborhood business, light manufacturing* |
|  | SR - Suburban residential |  | SE - Suburban estate |  | General                                     |
|  | Open space                |   |                      |   |   |

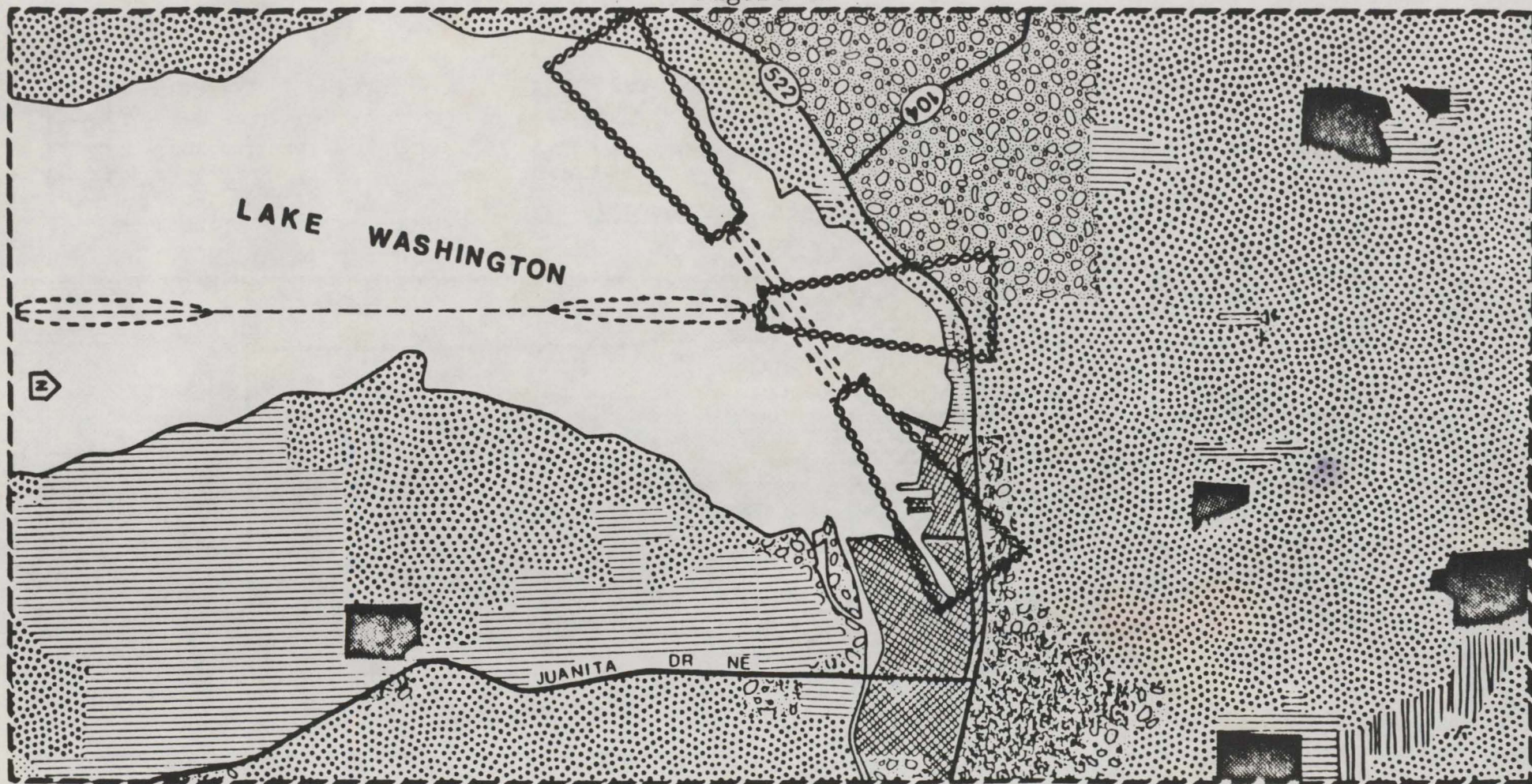
Source: King County zoning and \* Soos Creek Community Plan














Figure B5



**KENMORE AIR HARBOR**

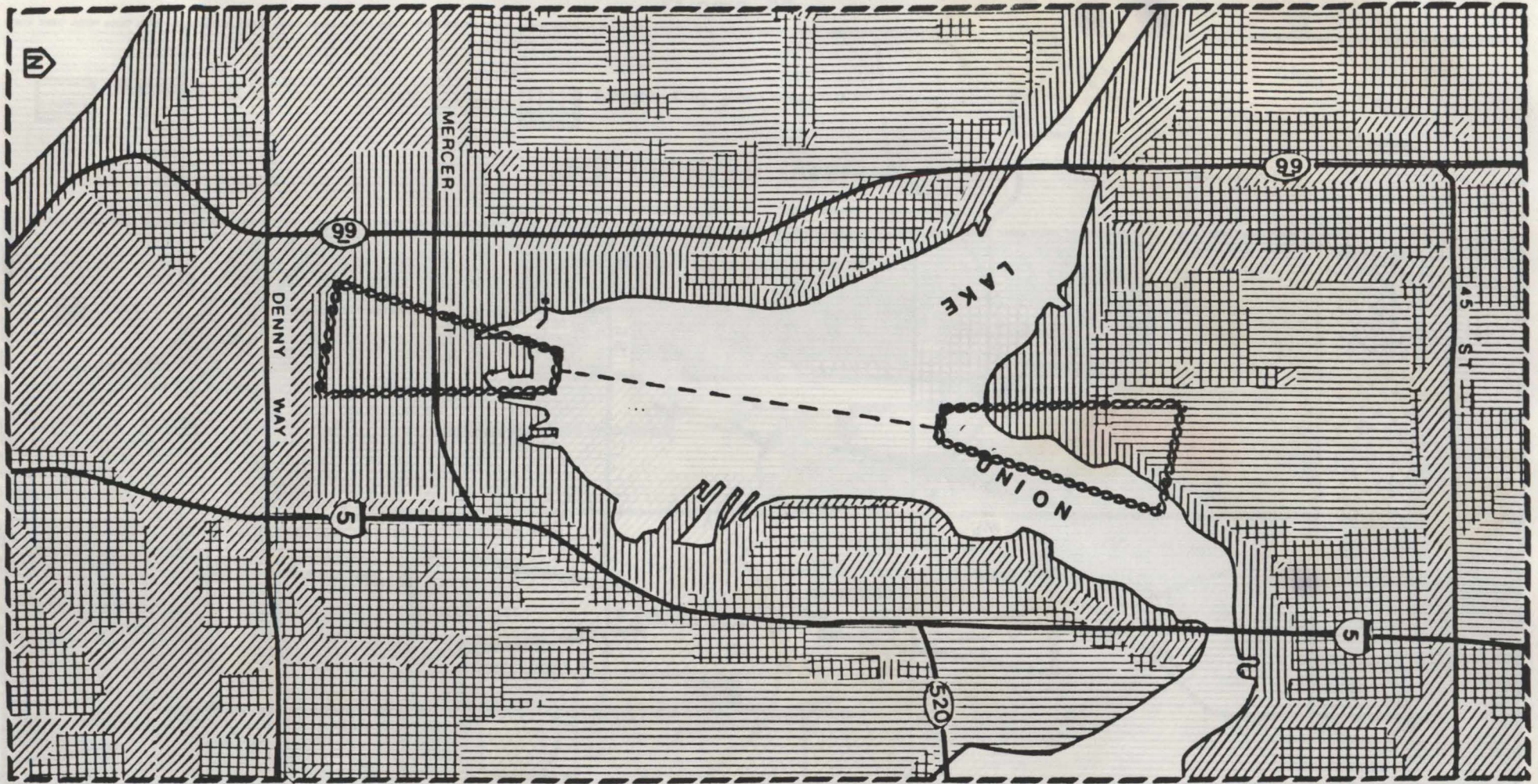
- |   |                     |   |                      |   |                   |
|---|---------------------|---|----------------------|---|-------------------|
|  | Residential         |  | Suburban Residential |  | Suburban Estate   |
|  | Business/Commercial |  | Manufacturing        |  | Schools/Reservoir |
|  | Parks               |   |                      |   |                   |

Source: Northshore Community Plan, Shoreline Community Plan, Comprehensive Plan for Lake Forest Park.

B-10







Figure B6



B-11

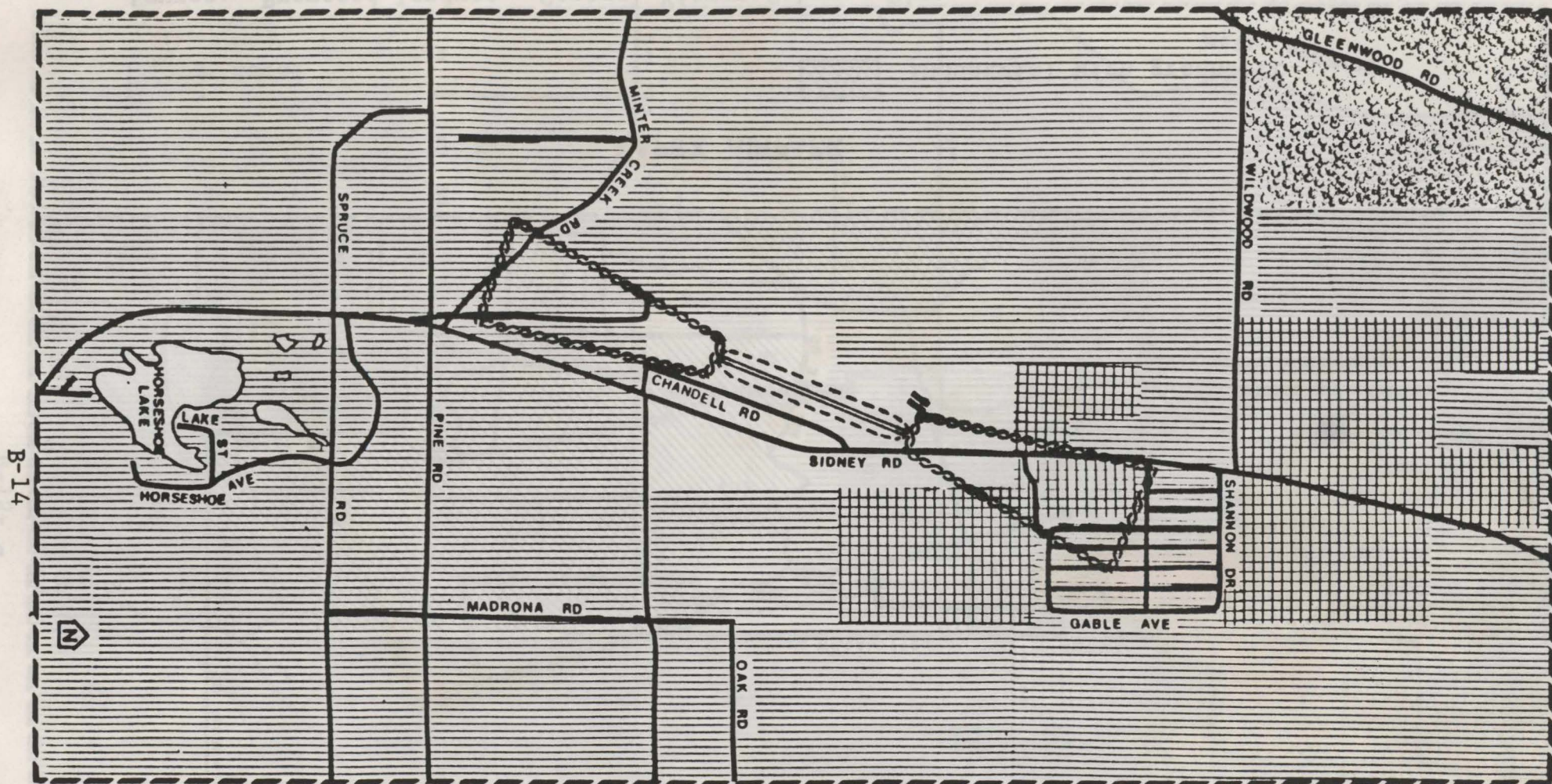
### KURTZER/LAKE UNION SEAPLANE BASE

-  Single Family Residential
-  Duplex and Multiple Residential
-  Business/Commercial
-  Manufacturing/Industrial

Source: City of Seattle Zoning Map (Department of Construction and Land Use)




Figure B9



**PORT ORCHARD AIRPORT**

 Rural

 Public

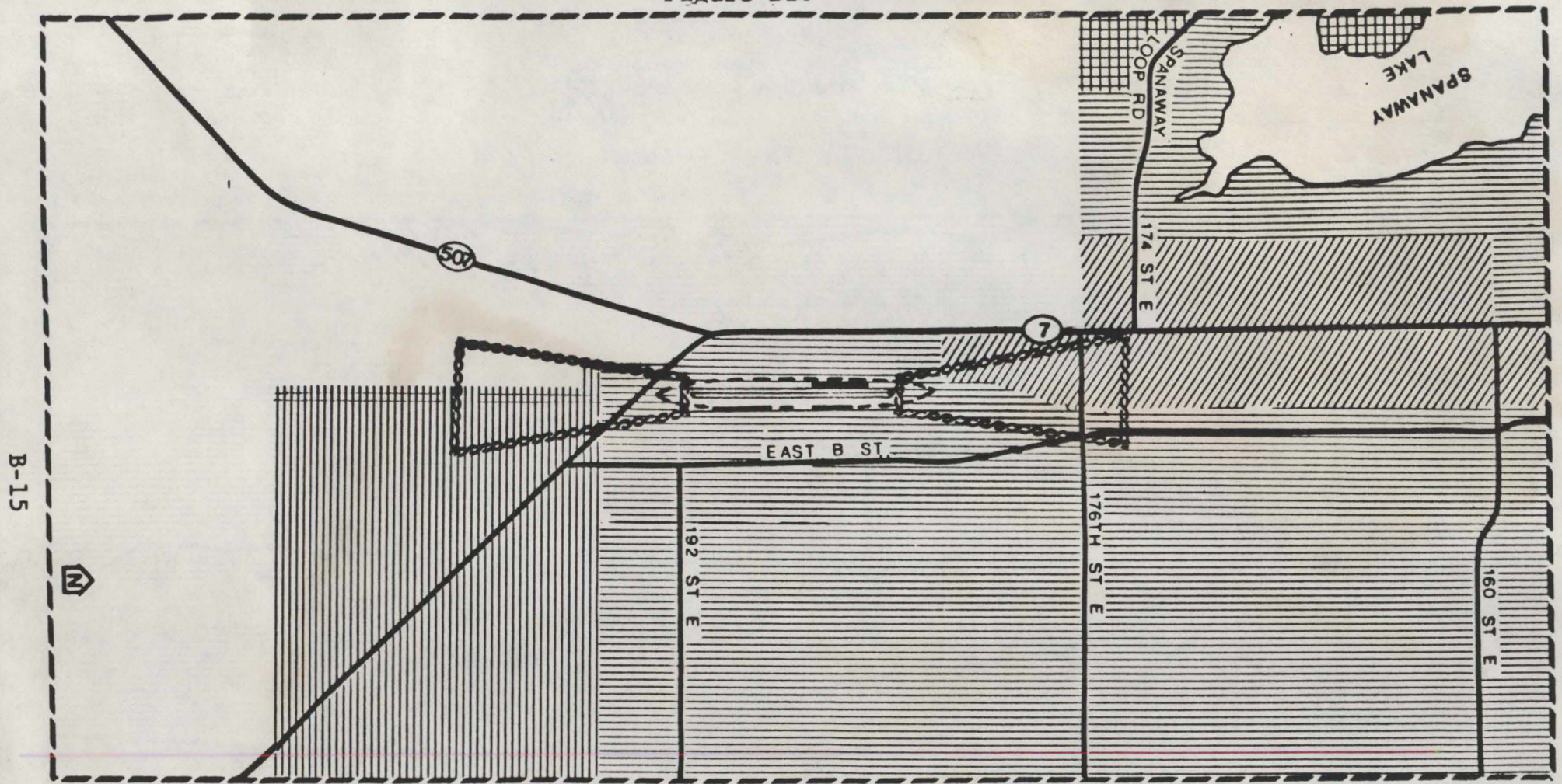
 Forestry

Source: Proposed Landuse-South Kitsap Subarea Plan

Source: Vashon Community Plan



Figure B10



**SPANAWAY AIRPORT**



Urban



Suburban



Rural Estates



Military



Semi-Rural

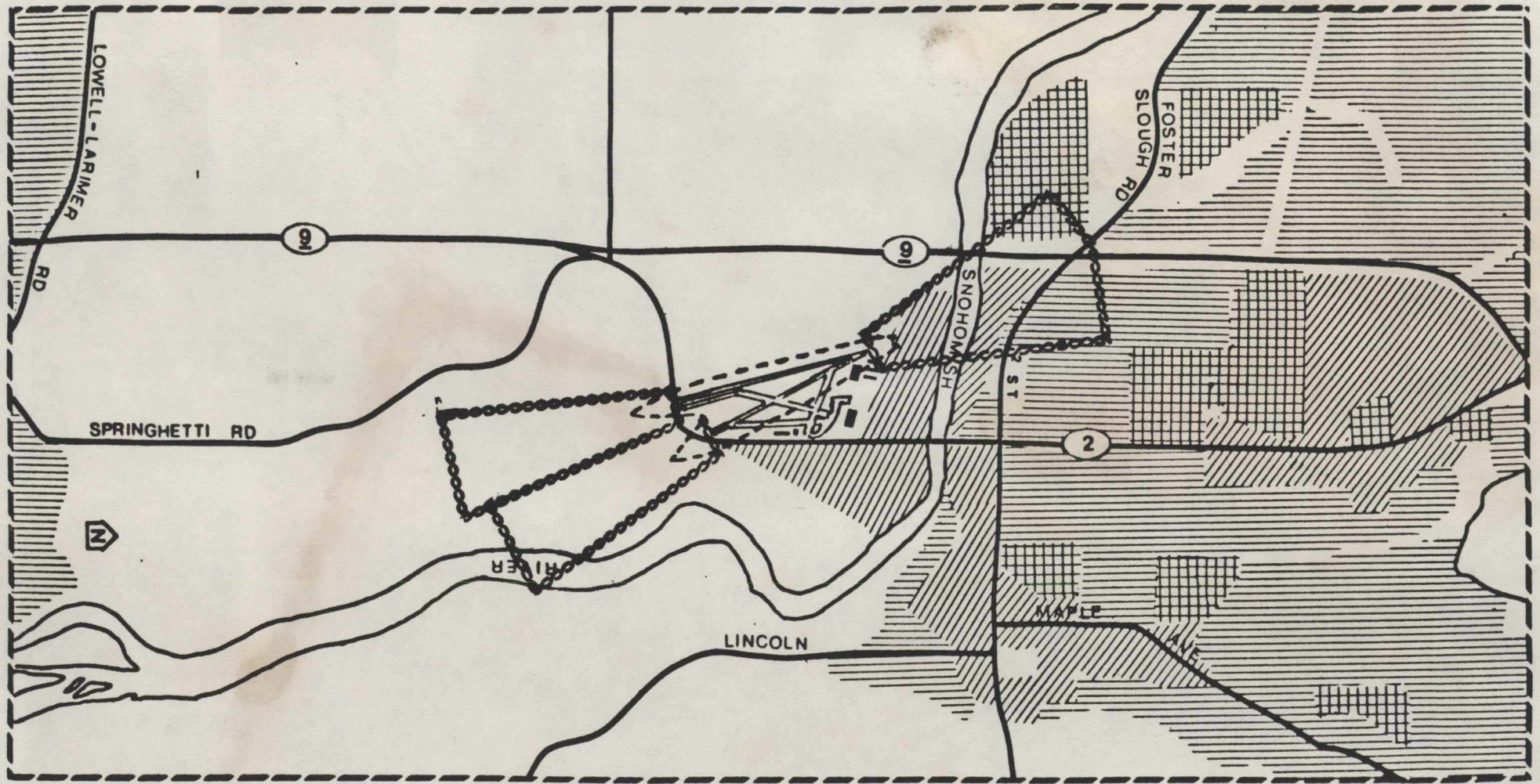
Source: Comprehensive Plan for Parkland - Spanaway










Figure B12




**HARVEY AIRFIELD**

 Residential

 Commercial and Industrial

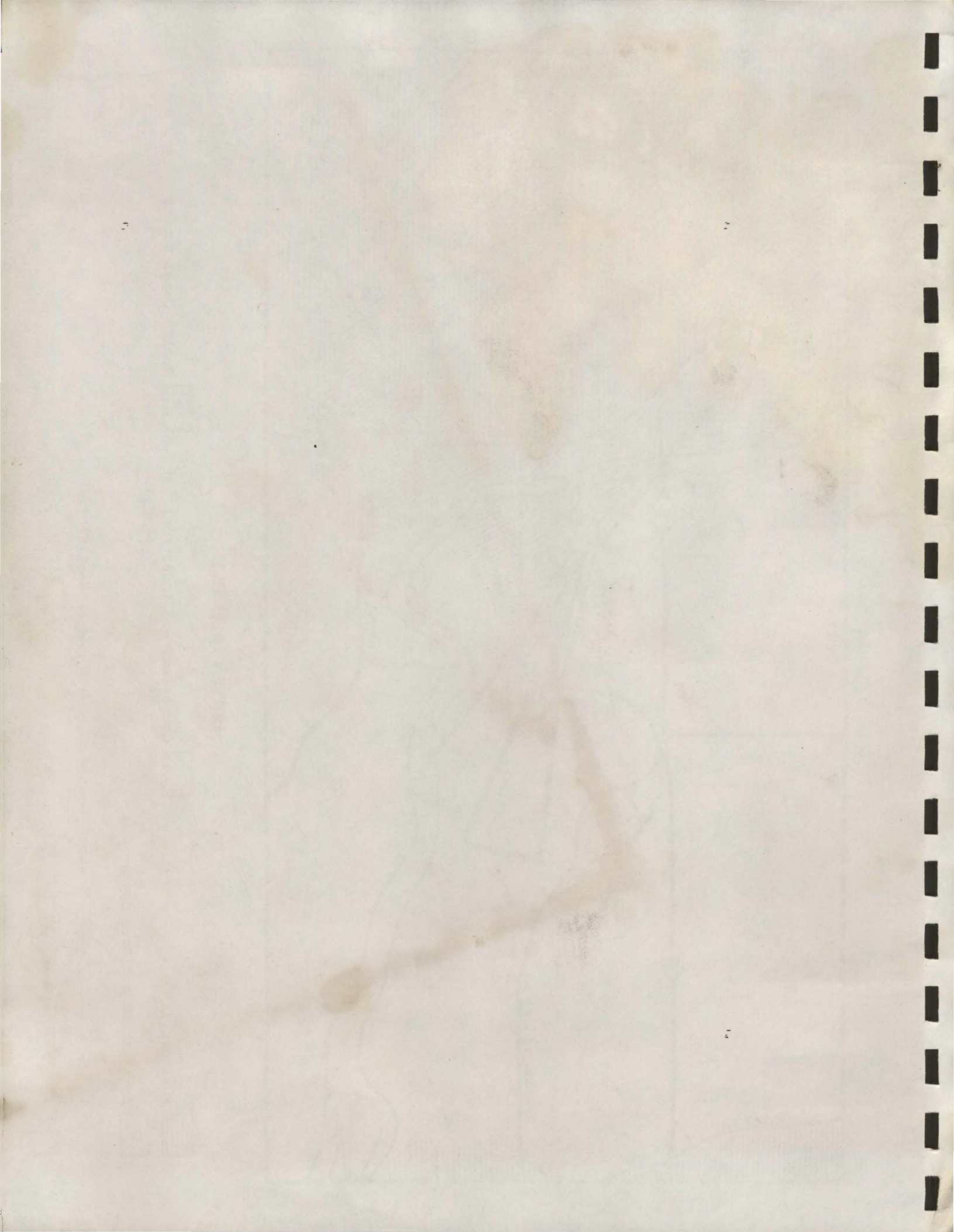
 Public/Quasi Public

 Agriculture and Open Space

Source: 1977 City of Snohomish Comprehensive Plan

B-17







PUGET SOUND COUNCIL OF GOVERNMENTS

1980 Membership

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Councilman Patrick Parker

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Councilwoman Mab Tocher

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Councilwoman Sue Kienast

Clyde Hill

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Mayor Lorraine Hine

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Enumclaw

Councilwoman Gaye Veenhuizen

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Councilman Michael Hildt  
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Councilman Norm Rice  
Councilman Jack Richards  
Councilwoman Jeanette Williams

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Commissioner Tom Swanson

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Commissioner Gene Lobe  
Commissioner William H. Mahan

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Councilman Larry Countryman

Snohomish County

Councilman Don Britton  
Councilman Jim Haines  
Councilman Donald Moa

Stanwood

Councilwoman Vicki Tanner  
The Tulalip Tribes

Stanley G. Jones Sr., Chairman

\* \* \*



