

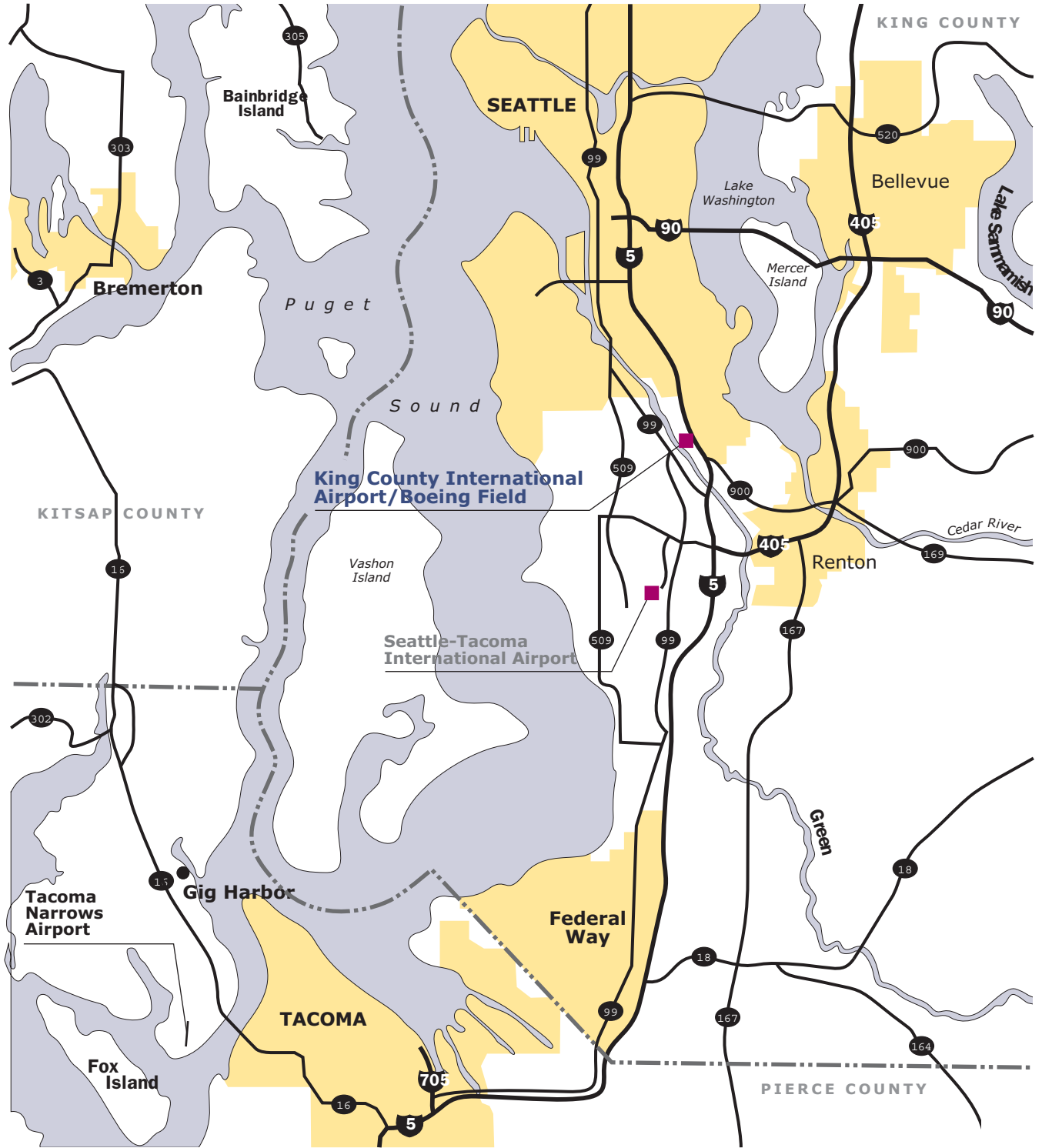
Inventory

Introduction

King County International Airport/Boeing Field (KCIA) is a primary reliever airport for Seattle-Tacoma International Airport, as well as a diversionary airport for commercial service operations at Sea-Tac during periods of poor weather. It is located within King County, and the City of Seattle adjacent to the City of Tukwila. The Airport is approximately five miles south of downtown Seattle. In 1999, the Airport was served by two airlines, West Isle Air and Helijet Airways. In addition to the general aviation aircraft, the Airport also serves cargo, military and aerospace aircraft. The Boeing Company is located on the west side of the airport and conducts a variety of activities at facilities on and near the Airport. These include engineering, administration, flight test and aircraft delivery. The primary use of the facilities at KCIA by The Boeing Company is for flight test and customer delivery. They also maintain the world's fleet of AWACS (Airborne Warning and Control System) aircraft at the Airport. In terms of operations, the Airport is one of the busier airports in the United States. The generalized airport location is illustrated on Figure A1, *AIRPORT LOCATION MAP*.

King County International Airport is owned and operated by King County, which is composed of a thirteen member governing body, the King County Council, and a County Executive. The Council is elected by districts to direct County policy. The Airport Manager is responsible for the day-to-day operations of the Airport. The Airport has a full-time professional staff to assist the Manager in running the airport on a daily basis. The County has land use authority over portions the Airport. The area surrounding the Airport is within the jurisdiction of the Cities of Seattle and Tukwila.

The Airport is in the process of completing the Airport Master Plan. The major element of the Master Plan is the recommendation to shift the main runway (Runway 13L/31R) approximately 800 feet to the north in order to meet FAA dimensional requirements on the southern end of the runway. In addition to the Airport Master Plan, the King County Council approved a Noise Reduction Work Plan for the Airport, in October 1998. The purpose of this Work Plan was to identify noise abatement/mitigation issues to be addressed either as part of this FAR Part 150 Study or as separate issues outside of this Study. A copy of the Work Plan is contained in the Appendix. The Work Plan directed that the Airport consider many issues beyond the scope of a traditional FAR Part 150 Study, including the development of DNL



n Not to Scale

Figure A1 Airport Location Map

noise contours beyond the 65 DNL contour, evaluation of a run-up enclosure and the evaluation of combined noise contours with Seattle-Tacoma International Airport.

Airport Physical Facilities

The Airport currently consists of two parallel runways, Runway 13L/31R and Runway 13R/31L. Runway 13R/31L is the longest runway, 10,000 feet in length and 200 feet in width. The southern landing threshold has been displaced 800 feet to accommodate an instrument landing system. The runway is equipped with High Intensity Runway lights, an Instrument Landing System (ILS) on both runway ends, Precision Approach Path Indicator (PAPI) lights serve Runway 13R, while Runway 13L has Visual Approach Slope Indicator (VASI) light, which are being upgraded to PAPIs.

Runway 13L/31R is the secondary runway at the airport and is 3,710 feet in length and 100 feet in width. The runway's northern threshold (Runway 13L is displaced 240 feet and the runway's southern threshold (Runway 31R) is displaced 365 feet. It is equipped with Medium Intensity Runway lights and VASI lights serving both runway ends.

Both runways have full parallel taxiways systems. The parallel taxiway is located on the west side of the main runway and on the east side of the secondary runway. Various connector taxiways connect the parallel taxiway to the runway and the landside development areas. Most ancillary landside facilities are located on the east side of the Airport, with the passenger terminal complex located approximately in the center of the Airport east of Runway 13L/31R. Existing cargo, general aviation and other support facilities are located on both sides of the terminal complex. Washington State Department of Aeronautics and the Museum of Flight are located on the west side of the airport, along with The Boeing Company and some general aviation hangars.

Perimeter Road provides automobile access to and from all facilities on the east side of the airport. Perimeter Road is connected to Airport Way South through four separate entrances: north, main, Portland Street, and south. In addition to businesses having direct access onto Ellis Avenue South, the northwest portion of airport property is provided access via South Warsaw Street, South Myrtle Street and South Willis Street. On the west side of the airport, individual airport tenants are accessed directly off of East Marginal Way South. These areas are graphically presented in Figure A2, *EXISTING AIRPORT LAYOUT PLAN*.



Not to Scale

Figure A2 Existing Airport Layout

Air Traffic Operations Activity

King County International Airport has maintained a high level of operations over the past several years. As shown in the following table, overall operations (an operation is either a take-off or a landing) have fluctuated from approximately 426,000 in 1990 to approximately 345,000 in 1998. As can be seen, a significant increase in air taxi (commuter) operations occurred throughout the period with an accompanying increase in air carrier operations in 1997 and 1998. The air carrier operations are defined as aircraft types and are associated with The Boeing Company and cargo operations. There are no air carrier aircraft operations in scheduled passenger service.

Table A1
SUMMARY OF HISTORICAL OPERATIONS, 1990-1999
King County International Airport FAR Part 150 Study

Year	Air Carrier	Air Taxi	General Aviation	Military	Total
1990	5,691	18,726	396,778	4,352	425,548
1991	6,176	21,373	338,047	3,686	369,282
1992	5,918	28,017	376,324	4,082	414,341
1993	4,701	30,873	320,322	2,939	358,835
1994	5,452	35,564	375,826	3,273	422,804
1995	8,336	38,655	307,660	2,615	357,266
1996	8,877	40,727	287,522	2,195	339,321
1997	10,709	46,803	311,313	2,243	371,068
1998	11,659	44,299	286,933	2,269	345,160
1999*	9,221	38,426	231,656	1,191	281,286

* As of October, 1999

Source: Airport Activity Reports

In terms of overall operations, general aviation aircraft represent the largest number of operations, with air taxi being the next highest. Air carrier operations account for less than five percent of the overall operations. Military operations account for less than one percent of all the operations.

In terms of passenger enplanements, since 1990 there have been minimal passenger enplanements at the airport, less than 10,000 per year with only 2,300 enplaning in 1998. All enplanements are associated with air taxi operations carried out by turboprop and rotorcraft aircraft. There are two such operations on the airport, West Isle Air and Helijet Airways. West Isle Air operates turboprop aircraft and Helijet

Airways operates rotorcraft. West Isle Air flies to the San Juan Islands and Helijet Airways flies to Victoria and Vancouver.

The air carrier operations are associated, for the most part, with The Boeing Company, and their manufacturing and associated aircraft services. Air cargo operators also fly air carrier designated aircraft, although for cargo purposes. The military operations are also associated with The Boeing Company's aircraft services.

Airspace/Air Traffic Control

The Federal Aviation Administration is responsible for the safe and efficient use of the national air space. This airspace is divided into three specific types; enroute, terminal and tower. When an aircraft departs an airport it is located in the airspace being handled by air traffic controllers working in an air traffic control tower. When the aircraft is approximately one mile away from the Airport, the aircraft is handed off to controllers working the Terminal Radar Approach Control Facility (TRACON). These controllers are responsible for the airspace extending out twenty-five to thirty miles from the Airport in all directions. The aircraft then enters the third type of airspace and becomes the responsibility of enroute controllers working in an Air Route Traffic Control Center (ARTCC). The enroute controllers retain control until the aircraft nears its intended destination. The process is then reversed for landings. For aircraft operating at Sea-Tac Airport, the controlling facilities responsible for the terminal and tower airspace are located in the main terminal building.

There are several airports located in the Seattle area and under the control of Seattle TRACON. Although Sea-Tac accounts for a significant percentage of all area aircraft operations, the cumulative number of aircraft operations at the other airports, including KCIA, also adds a significant workload for controllers in the Seattle TRACON. There are also other general aviation airports without operational control towers or published instrument procedures that contribute to the total number of area wide aircraft operations. While aircraft using these other general aviation airports operate under visual flight rules (VFR), they utilize the terminal airspace and aircraft using KCIA must be separated from them. Seattle TRACON provides full arrival and departure services for King County International Airport/Boeing Field airport, as well as for Sea-Tac, Gray Army Air Field, McChord Air Force Base, Olympia Airport, Renton Municipal, Tacoma Narrows, Bremerton National Airport and Shelton/Sanderson Field.

BFI has a twenty-four hour, continuously operating Air Traffic Control Tower (ATCT) that has an associated Class D Airspace area. Aircraft that operate within Class D Airspace must be in contact, at all times, with the tower controllers, especially to receive approval for take-offs and landings. Standard ATAs are designated to include all airspace within five miles of the Airport from the surface of the ground up to (but not including) 3,000 feet. Because of the close proximity to other airports in the

area, especially Sea-Tac, the King County International Airport ATA is not completely circular. Airspace operational activities are explained in greater detail in the following paragraphs.

Air Space Configuration King County International Airport is located within the Seattle-Tacoma Terminal area airspace as shown in Figure A3. This airspace has been delegated to the Sea-Tac TRACON facility by the Seattle ARTCC or Center. The Center provides Air Traffic Control (ATC) services to aircraft between terminal areas. The Seattle TRACON provides approach/departure control services within its delegated airspace. Eight of the busiest airports within the Seattle TRACON's airspace have Air Traffic Control Towers (ATCT) or "towers". These towers provide control within the TRACON's airspace. Airports that have control towers are listed below:

Boeing Field/King County International
Gray Army Air Field
McChord Air Force Base
Olympia Airport
Renton Municipal
Seattle-Tacoma International
Tacoma Narrows

The Center and TRACON provide control primarily to aircraft operating under instrument flight rules (IFR). In addition, TRACON provides control or service to aircraft operating under visual flight rules (VFR) within the Seattle Class B Airspace, (Formerly TCA). An ATC clearance and control is mandatory for VFR aircraft operating within Class B airspace. The Seattle Class B Airspace Area is depicted on Figure A3.

Published instrument approach procedures exist for eight airports within the Seattle TRACON airspace as listed in Table A2.

Table A2 differentiates between precision and non-precision approaches. A precision approach, by definition, provides electronic vertical guidance to the pilot as well as horizontal (azimuth) guidance. A non-precision approach provides horizontal guidance only. Generally, the azimuth guidance for a precision approach is more precise. For an Instrument Landing System (ILS) approach procedure, a localizer transmitter provides the azimuth guidance and a glide slope transmitter provides the vertical guidance.



Not to Scale

Figure A3 Airspace/NAVAIDS Summary

Table A2
PUBLISHED IFR APPROACH PROCEDURES
King County International Airport FAR Part 150 Study

Airport Name	Runway	Procedure
King County Int./Boeing Field	13R	ILS (CAT I)
	31L	ILS (CAT I)
Bremerton National	1	NDB
	19	ILS (CAT I)
Gray Army Field	15	ILS, NDB
	33	VOR, NDB
McChord Air Force Base	34	ILS, HI-TACAN
	16	ILS, TACAN
Olympia	17	ILS (CAT I)
	34	VOR/DME
	To airport	VOR-A
Renton Municipal	15	NDB
Seattle-Tacoma International	16R	ILS (CAT IIIB), NDB
	34L	ILS (CAT I)
	34R	ILS (CAT I), NDB
	16L/R	VOR
	34L/R	VOR
Shelton/Sanderson Field	To airport	NDB-A
Tacoma Narrows	17	ILS (CAT I)
	35	NDB

Abbreviations: DME-Distance Measuring Equipment; ILS-Instrument Landing System; LOC BC-Localizer Back Course; NDB-Nondirectional (radio) Beacon; TACAN-Tactical Air Navigation; VOR-Very High Frequency Omnidirectional Range.

Air Space Usage

All aircraft flights are governed by either visual flight rules (VFR) or instrument flight rules (IFR). Definitions are contained in FAR Part 91 and summarized below. The basic difference between VFR and IFR is that the pilot maintains spatial orientation of an aircraft by reference to the earth's surface for VFR and by reference to aircraft instruments for IFR. Under IFR rules, the pilot can operate in poor visibility conditions when operating in controlled airspace. Flight under VFR rules requires good visibility and maintenance of specified distances from clouds.

The Seattle Terminal Airspace area includes nine IFR airports and approximately thirty VFR airports. Two of the IFR airports are military - McChord AFB and Gray

AAF - and ten of the VFR airports are private or restricted and generally not available to the public.

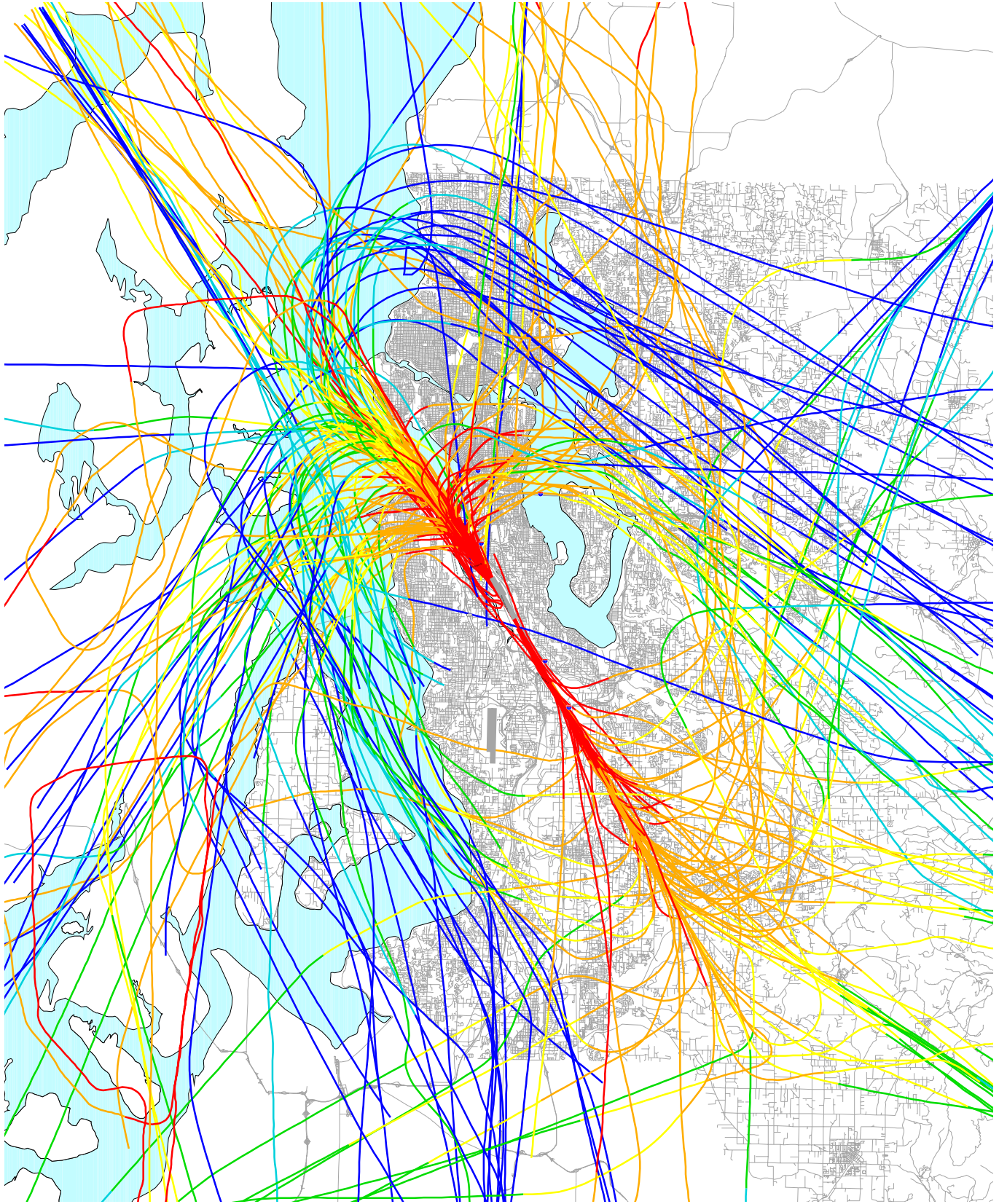
IFR Operations

Air carrier and many turbojet general aviation and military aircraft operating to or from the Airport under IFR, are reassigned coded flight routes and procedures referred to as Departure Procedure (DPs) and Standard Arrival Routes (STARs). These DP and STAR routes are depicted on Figure A4 for north flow and on Figure A5 for south flow. These figures also depict arrival and departure gates. Navigation of IFR aircraft within the Seattle TRACON airspace is generally provided by radar vectors to achieve efficient sequencing, spacing, and separation between aircraft. Therefore, actual aircraft flight tracks, particularly closer in to the Airport, will not conform exactly with the gates, DPs, and STARs depicted.

In general, however, IFR arrival aircraft are cleared to the Airport by the Seattle Center via these STARs while descending from enroute altitudes. These aircraft arrivals are "handed off" via radar from the Seattle Center to the Seattle TRACON at various entry points referred to as "gates". In other words, there are established arrival routes that aircraft utilize and the pilots are in contact with different controllers as they approach the Airport.







In April, 1990 the Federal Aviation Administration standardized the air traffic patterns for jet aircraft flying in and out of BFL. The new air traffic plan referred to as the "4-Post Plan", changed the arrival and departure procedures used by the air traffic controllers to transfer the aircraft from the enroute to the terminal environment. The FAA determined that safety and efficiency could be improved if the procedures used to route air traffic to the terminal airspace area were designed to be the same regardless of the direction of traffic flow. Depending on the city of origin, aircraft enter the terminal airspace from one of the four "posts", or corners of the terminal airspace area. These procedures helped to alleviate difficulties associated with having two different sets of patterns that were wind dependent.

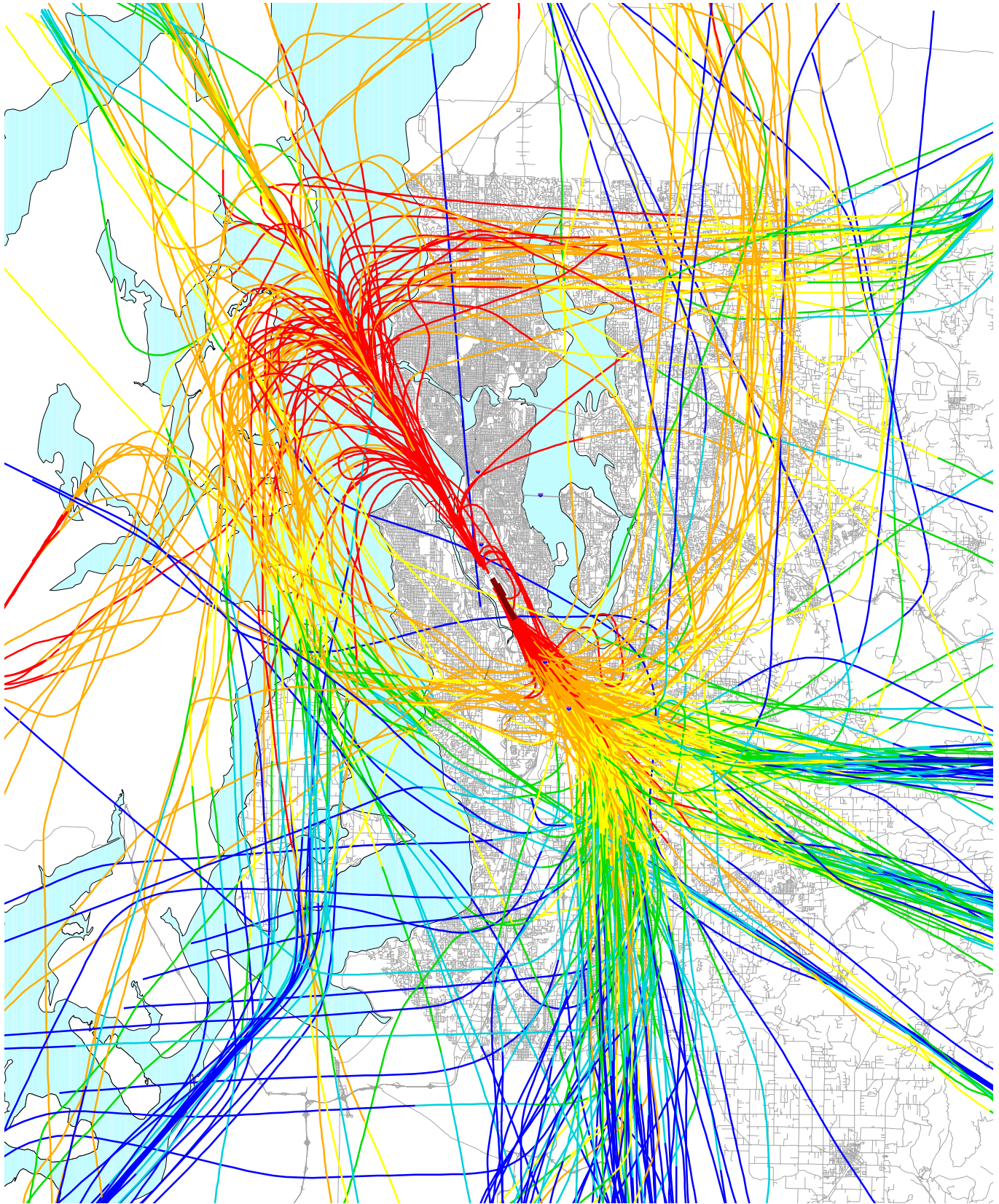
The TRACON assumes responsibility for guiding the arrival aircraft to the final approach course at the destination airport and separating it from other aircraft. Lower performance aircraft, and some commuter/air taxi aircraft, operate at lower altitudes



n Scale 1"=15,000'







Figure A4 North Flow Radar FlightTracks

-  0-2000 AGL
-  2000 - 4000 AGL
-  4000 - 6000 AGL
-  6000 - 8000 AGL
-  8000 - 10000
-  >10,000 AGL



n Scale 1"=15,000'

Figure A5 South Flow Radar Flight Tracks

-  0-2000 AGL
-  2000 - 4000 AGL
-  4000 - 6000 AGL
-  6000 - 8000 AGL
-  8000 - 10000
-  >10,000 AGL

below or clear of the jet aircraft routes. The lower performance aircraft are "laced" into the arrival routes closer in to the Airport to minimize the effects of the speed differentials.

When arrival aircraft are in the vicinity of their destination airport they are given descent instructions by TRACON. When the aircraft is approximately 10 nautical miles from the airport, they are given approach approval and at between 5 and 7 miles out, TRACON instructs the pilot to contact the destination airport's tower.

Similarly, departing IFR aircraft are guided by the Seattle TRACON through its delegated airspace and separated from other aircraft. Shortly after departure aircraft are airborne, the tower clears the aircraft to contact the TRACON for departure control. The TRACON then directs departing aircraft toward the departure gates. Similar to arrivals, most departing low performance aircraft are turned immediately after take-off to separate them from the jet departure stream and are kept at lower altitudes. As soon as departing aircraft either pass the departure gate or climb out of the TRACON airspace, they are transferred to ARTCC for enroute control.

Unless visual or divergence separation is applied, TRACON provides all IFR aircraft with a radar separation of at least three nautical miles longitudinally or 1,000 feet of vertical separation throughout their terminal airspace. Additional longitudinal separation to avoid wake turbulence is provided for various combinations of aircraft sizes. The minimum longitudinal separation in terminal airspace is listed below:

In general, however, IFR arrival aircraft are cleared to the Airport by the Seattle Center via these STARs while descending from enroute altitudes. These aircraft arrivals are "handed off" via radar from the Seattle Center to the Seattle TRACON at various entry points referred to as "gates". In other words, there are established arrival routes that aircraft utilize and the pilots are in contact with different controllers as they approach the Airport.

Aircraft Longitudinal Separations [1]

<u>Lead Aircraft Classification</u>	<u>Aircraft Classification</u>	<u>Separation (Nautical Miles)</u>
Heavy	Heavy	4
Heavy	Large	5
Large	Small	4
Heavy	Small	6

[1] Source: FAA Handbook 7110.65L, "Air Traffic Control" with changes.

For the purpose of wake turbulence separation minima, FAA classifies aircraft as Heavy, Large and Small as follows:

Heavy Aircraft capable of takeoff weights of 300,000 pounds or more whether or not they are operating at this weight during a particular phase of flight (Ex. B-747, B-777, DC-10).

Large Aircraft of more than 12,500 pounds, maximum certified takeoff weight, up to 300,000 pounds (Ex. B-737, MD-80, Business jets).

Small Aircraft of 12,500 pounds or less maximum certified takeoff weight (Twin and single piston/turboprops).

Within the Seattle Class B airspace, the Seattle TRACON provides all VFR aircraft a radar separation of 1/2 nautical mile longitudinally or 500 feet of vertical separation from all IFR and VFR aircraft.

VFR Operations

Flights conducted under VFR, unlike IFR flights, are not always under ATC jurisdiction. Under VFR, pilots may normally operate without an ATC clearance except when operating within Class B airspace. When operating in visual meteorological conditions, all pilots, regardless of type of airspace flight plan or ATC clearance, are ultimately responsible to see and avoid other aircraft.

The lower altitudes of airspace to the east and west of the Seattle area are restricted by the Cascade and Olympic Mountains. These mountains and the Class B Airspace tend to channel north/south VFR traffic. One north/south channel or VFR flyway exists at approximately five to six miles east of BFI and below 4,000 or 5,000 feet above mean sea level (MSL). The other north/south VFR flyway is somewhat wider and close to the Olympic Mountains. Those transiting under Class B Airspace in the vicinity of BFI and over the Puget Sound are below 3,000 feet. Some VFR aircraft fly through or over the top of the Class B Airspace. The top of the Class B Airspace is at 10,000 feet above MSL.

Existing Conditions. The term interaction as used in this section refers to a situation requiring special controller and/or pilot attention to ensure adequate separation or sequencing is accomplished. Although this broad definition could include random occurrences that do not affect capacity, there are two interactions which affect BFI capacity that occur regularly during IFR weather conditions and one that occurs regularly when visual approaches are in progress.

These three interactions occur during: (1) IFR south flow conditions; (2) IFR north flow conditions; and (3) visual approaches in south flow conditions.

IFR Weather Conditions-South Flow

During IFR weather conditions, when BFI and Sea-Tac are both operating with south flows, interactions exist between the arrivals to the two airports. Although a minimum of 1,000 feet of altitude separation exists between the published Instrument Landing System (ILS) approaches, a need exists to protect BFI missed approach possibility. In weather conditions which allow BFI Tower controllers to see the Sea-Tac arriving aircraft, visual separation is provided by the controllers and no loss in capacity is experienced. This operating arrangement is known as Plan Alpha. Cloud ceilings at BFI must be at least 2,500 feet for BFI Tower personnel to see Sea-Tac arrivals. The yearly frequency of occurrence of south flow conditions, with ceilings below 2,500 (no Plan Alpha) feet is approximately 17 percent.

Weather statistics indicate this interaction should occur approximately 15 percent of the time. However, the actual time of this impact on capacity is less because of special ATC procedures. Under these procedures, during certain weather conditions and with pilots familiar with BFI, aircraft approaching Sea-Tac will be advised to maintain 3,000 feet MSL until BFI Tower advises TRACON that the landing of the other aircraft at BFI is assured. At this point the Sea-Tac approaching aircraft pilot is given his final approach clearance and authorization to land. If the BFI approaching pilot executes a missed approach, TRACON will vector the Sea-Tac approach back into the arrival stream.

IFR Weather Conditions - North Flow

During north flow IFR conditions, interactions exist between the arrivals to BFI and departures from Sea-Tac. Sea-Tac departures are held on the ground from the time a BFI arrival nears the final approach fix located just east of Sea-Tac until BFI Tower reports the landing is assured or until visual separation can be provided.

Visual Approaches - South Flow

Visual approaches can normally be conducted when the cloud ceiling is at least 5,000 feet over the Puget Sound and pilots have visual contact with the preceding aircraft or airport.

When visual approaches are being conducted, the TRACON will radar vector aircraft on three arrival routes and sequence them into a common arrival stream over Elliott Bay, for Sea-Tac arrivals. This activity takes place over the top of straight-in arrivals to BFI.

Radar Data

The King County Noise Abatement Office has a noise and flight track data collection and analysis program called TAMIS. This program collects and processes radar data from the FAA's ARTS radar system. Once collected, the TAMIS program performs a number of post analysis processes, including track smoothing, determining if the track is a departure or arrival and assigning a runway to the track. With this system the airport is able to analyze compliance with the noise abatement program and investigate particular incidents concerning aircraft operations.

Flight track data from the TAMIS system has been exported to our Bridge Reports program that will be used in the Part 150 Study in order to further analyze flight tracks at King County International Airport. The TAMIS program exports a file that consists of flight information about the aircraft that is operating on each track and position information as to the location of the flight. The flight information includes data such as the ARTS aircraft type, ARTS airline code, flight number, and type of operation and runway. The position information includes the X and Y position of each radar strike for the flight track for every 4 seconds of the flight as well as the altitude of the aircraft at each point and the time that the aircraft was at that point. The position information is given in distance relative to the ARTS radar antenna that is on the airport property.

Files from the TAMIS system have been successfully exported to our Bridge Reports program for analysis on the Part 150 Study. Note that the data that will be used is based upon the information from TAMIS, which is derived from the FAA's radar system. There is always some missing data in these radar systems. Where there may be lost data or gaps in the data, this information is not recoverable. In addition it is important to note that there is not radar data available for all aircraft. Typically there are not tracks for the small propeller aircraft operating under visual flight rules.

The Port of Seattle Noise Abatement Office has a flight track data collection and analysis program called GEMS. This program collects and processes radar data from the FAA's ARTS (Aircraft Radar Tracking System). Once collected, the GEMS program performs a number of processes, including determining if the track is a departure or arrival and assigning a runway to the track. With this system, the Port is able to analyze compliance with the Port's noise abatement program and investigate particular incidents concerning aircraft operations.

The GEMS program also collects KCIA operations data that can be used for this Study. The program exports a file that consists of flight information about the aircraft that is operating on each track and position information as to the location of the flight. The flight information includes data such as the ARTS aircraft type, ARTS airline code, flight number, and type of operation and runway. The position information includes the X and Y position of each radar strike for the flight track for every four seconds of

the flight as well as the altitude of the aircraft at each point and the time that the aircraft was at that point. The position information is given in distance relative to the ARTS radar antenna that is on Sea-Tac property.

These files have been successfully exported to the Bridge Reports programs for analysis in the FAR Part 150 Study. Note that the data used is based upon the information from GEMS, which is derived from the FAA's radar system. There is always the possibility that some loss of data in these radar systems; however, every step possible is taken to insure this does not occur. Where there may be lost data or gaps in the data, this information is typically not recoverable.

Current Noise Abatement Program

King County International Airport (KCIA) has a history of implementing noise abatement programs. However, this is the first FAR Part 150 Study that the airport has undertaken. The airport has implemented several noise abatement procedures. These include; no "touch and go" operations between 10:00 p.m. and 7:00 a.m., intersection departures for jet aircraft are restricted, the short runway (13L/31R) is closed between 10:00 p.m. and 7:00 a.m., engine run-ups for maintenance purposes are prohibited between 10:00 p.m. and 7:00 a.m. (The Boeing Company maintains a self-imposed restriction on maintenance run-ups between 5:30 p.m. and 8:00 a.m. and all day Sunday or holidays), run-up area is designated on the west taxiway to mitigate noise, and Visual Approach Slope Indicators (VASI) have been installed on the general aviation runway to ensure proper altitude when on final landing approach. In addition, the airport worked with the FAA to develop a charted visual approach to Runway 13 Right, which was published in July, 1999. The approach will be available when the ceiling is at least 3,100 feet and visibility is at least four miles. This approach will utilize Elliot Bay to Harbor Island and then a straight-in visual approach to the airport. This will help approaching aircraft avoid noise sensitive areas.

Noise Complaint History

The King County International Airport Noise Abatement Office has been operating a noise complaint hotline since 1996. The purpose of the complaint hotline is to provide the public with a means of contacting the Airport concerning aircraft noise and giving staff insight into the issues that are important to the community. Citizens may call concerning particular incidents or about aircraft noise in general.

A recent sampling of the noise complaint database, which has been developed since 1996, will be reviewed to help identify current issues that are important to citizens that have contacted the hotline.

Airport Environs

King County International Airport is within the city limits of the City of Seattle. This is a recent change, in that the City limits of Seattle and Tukwila have been adjusted to reflect this. The City of Seattle has jurisdiction over property to the east, northeast and north of the airport, and the City of Tukwila has jurisdiction to the east and south. It appears that the 65 DNL noise contour will encompass these jurisdictions. FAR Part 150 specifies that the 65 DNL noise contour is the threshold contour for land use compatibility purposes and that the official Noise Exposure Maps reflect that contour. In addition, as part of this Study, we will also look at the 55 and 60 DNL noise contours. However, detailed land use evaluation will be limited to the 65 DNL contour, with generalized land use and population data presented for the 55 and 60 contours.

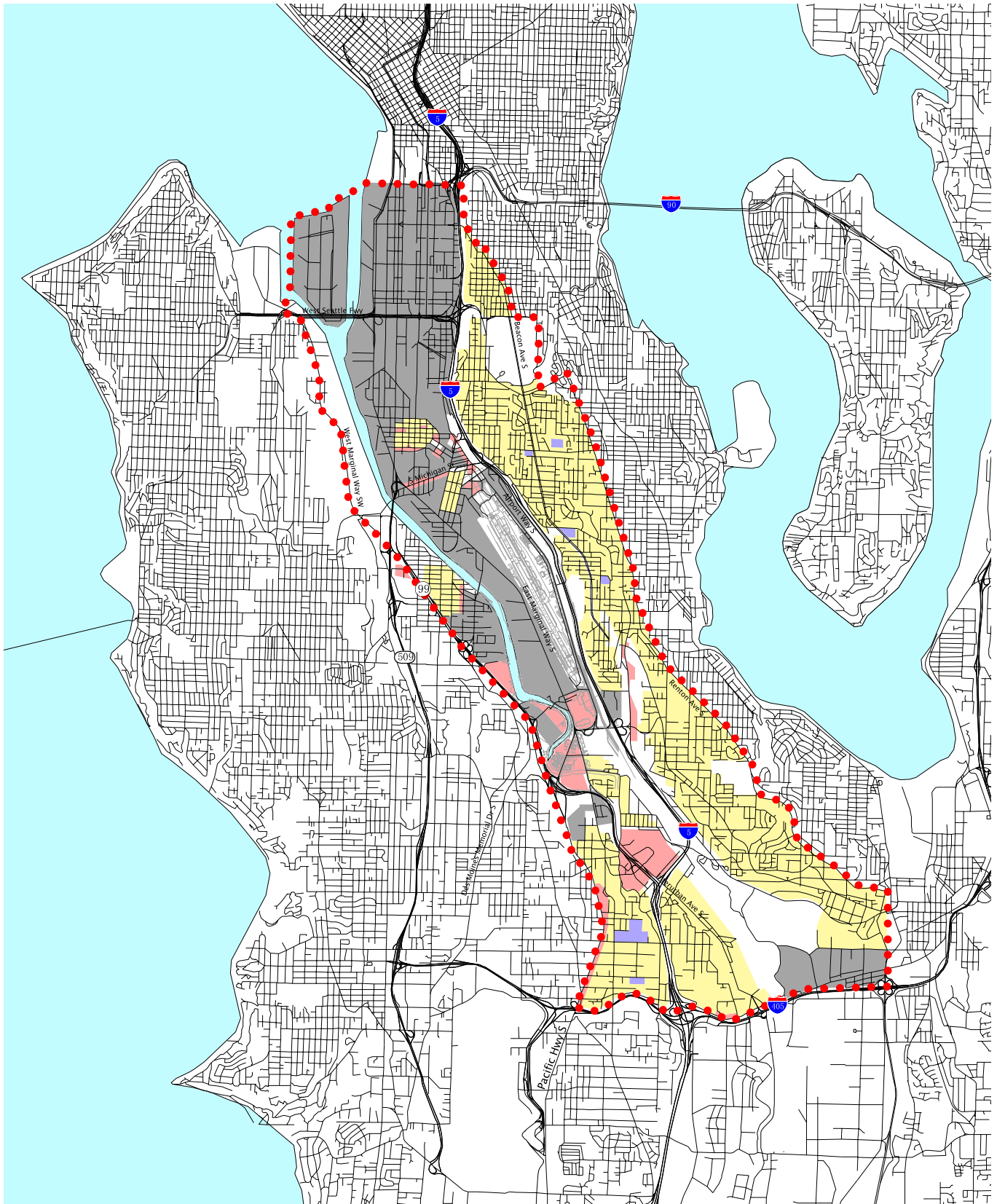
Existing Land Use. To present generalized existing land uses for the area surrounding the Airport, information was gathered from the recently completed Environmental Impact Statement for the proposed new runway at Seattle–Tacoma International Airport, the FAR Part 150 Study for SeaTac, data and aerial photographs from the Puget Sound Regional Council, and field updates. Preliminary existing land use is presented in Figure A6, *GENERALIZED EXISTING LAND USE*. The area beyond the 65 DNL contour will be evaluated to a more generalized extent.

Existing land use to the north/northwest of the Airport is a mixture of residential development and commercial uses associated with the community of Georgetown. The Steam Plant is a designated historic structure, listed on the National Register of Historic Places, and is just north of the airport’s main runway. There are other state-designated historic structures in the Georgetown community.

The Burlington Northern/Santa Fe Railroad Company maintains a switching yard north of the Georgetown community and has several tracks east of the airport. Farther to the north are industrial and commercial uses.

The area south of the airport is mostly commercial and industrial uses, with residential development in the Allentown neighborhood of Tukwila. To the east of the airport, across Interstate 5 and on the bluff, is the Beacon Hill neighborhood of Seattle. Directly west of the airport is The Boeing Company complex and associated or similar uses. The Duwamish River and associated industrial uses are farther to the west. A more detailed evaluation of land use and population will be presented as they relate to the noise contours once the contours are developed.

In summary, there are areas of existing non-compatible land uses within the immediate airport environs. These include, for the most part, residential development and occur off the ends of the existing runways.



n Scale 1"=8000'

Figure A6 Generalized Existing Land Use Map

- Preliminary Study Area Boundary
- Commercial
- Industrial
- Residential
- Government

Future Land Use. Each of the jurisdictions within the vicinity of King County International Airport/Boeing Field has adopted future land use plans or guidelines, pursuant to the Washington State Growth Management Act. The adopted Future Land Use Plans are illustrated in Figure A7, *GENERALIZED FUTURE LAND USE*.

City of Tukwila

The City of Tukwila adopted a Comprehensive Land Use Plan in December 1995. The Plan contains a Comprehensive Land Use Plan that depicts future land uses, which is illustrated on Figure A7. The City has adopted several Policies addressing aircraft noise, addressing both Sea-Tac and KCIA.

Policy 7.2.5: Encourage the reduction of noise from Seattle-Tacoma International Airport and King County Airport, by promoting the development of new or the retrofit and modification of existing aircraft engines which are quieter, and operational procedures that help reduce aircraft noise emission levels.

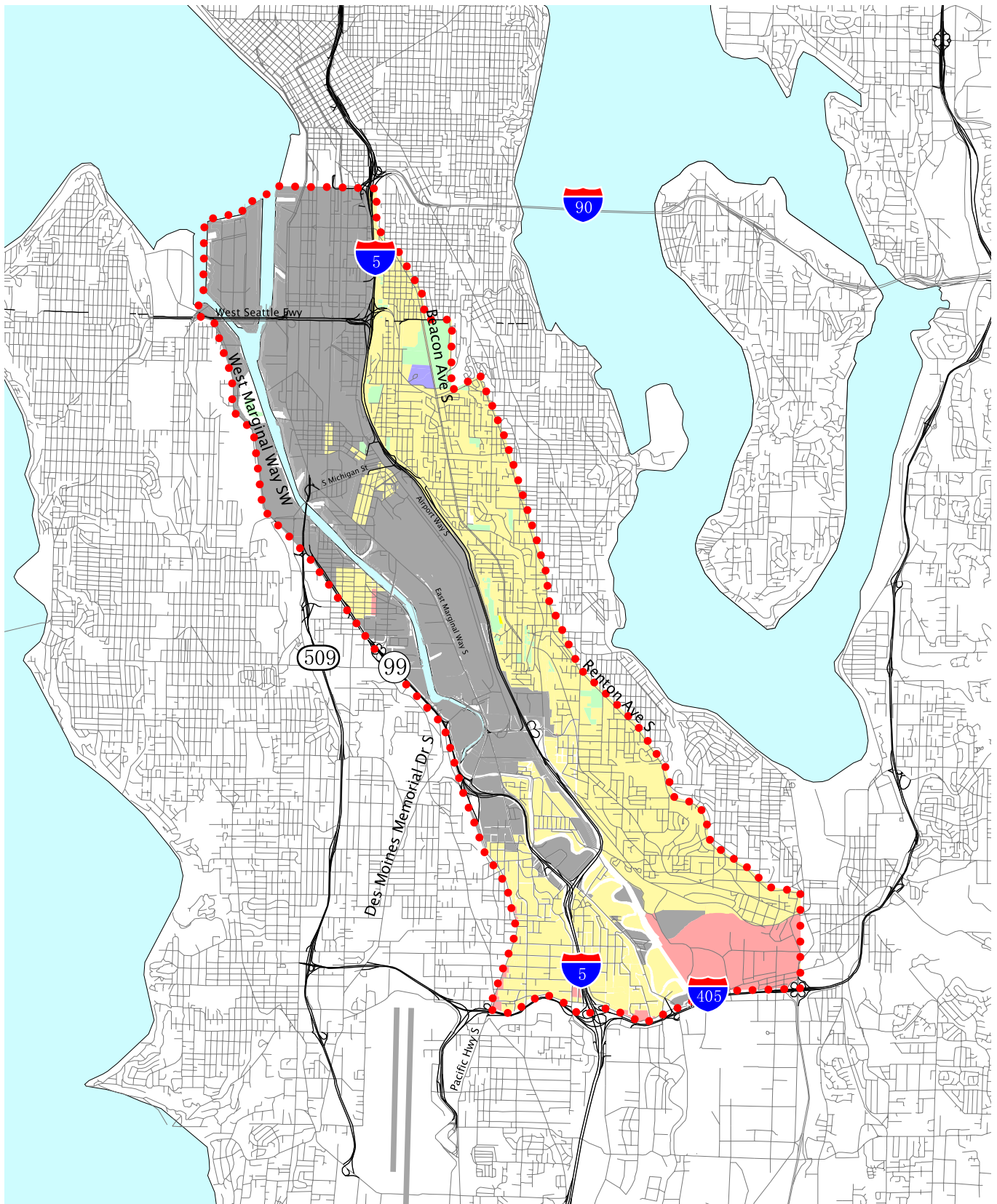
Policy 7.2.6: Work with the Port of Seattle, King County Airport and the Federal Aviation Administration to promote the development and implementation of airport operational procedures that will decrease the adverse noise effects of airport operations on Tukwila and its residents.

City of Seattle

The City of Seattle has adopted a comprehensive plan; Seattle's Comprehensive Plan, Toward a Sustainable Seattle in July 1994 and amended it in November 1997. The Plan contains a future land use plan. The Plan is a goals and policy plan with an accompanying map. The Transportation Element contains two Policies on air transportation:

Policy T5: Work with the state Department of Transportation, public transportation providers, and the public to identify, design, and incorporate noise mitigation measures into existing and planned traffic and transit operations and capital improvements. Encourage air and rail transport operations to reduce and mitigate their noise impact.

Policy T53: Promote a multi-modal commercial transportation strategy, including rail, trucks, and air and water transport, and advocate for improved freight and goods movement. Work toward improved multi-modal connections among rail yards, the waterfront, the Duwamish, Lake Union, Portage Bay, the ship canal, airports, and regional roadways.



n Scale 1"=8000'

Figure A7 Future Land Use

- Preliminary Study Area Boundary
- Commercial
- Industrial
- Public/Open Space
- Residential
- Government

The Future Land Use Map shows King County International Airport/Boeing Field as being an Industrial Area, as well as most of the surrounding area within the Seattle city limits. However, the Plan indicates the community of Georgetown as being residential and commercial with a Neighborhood Anchor designation at 13th Avenue South and South Albro Place.

King County

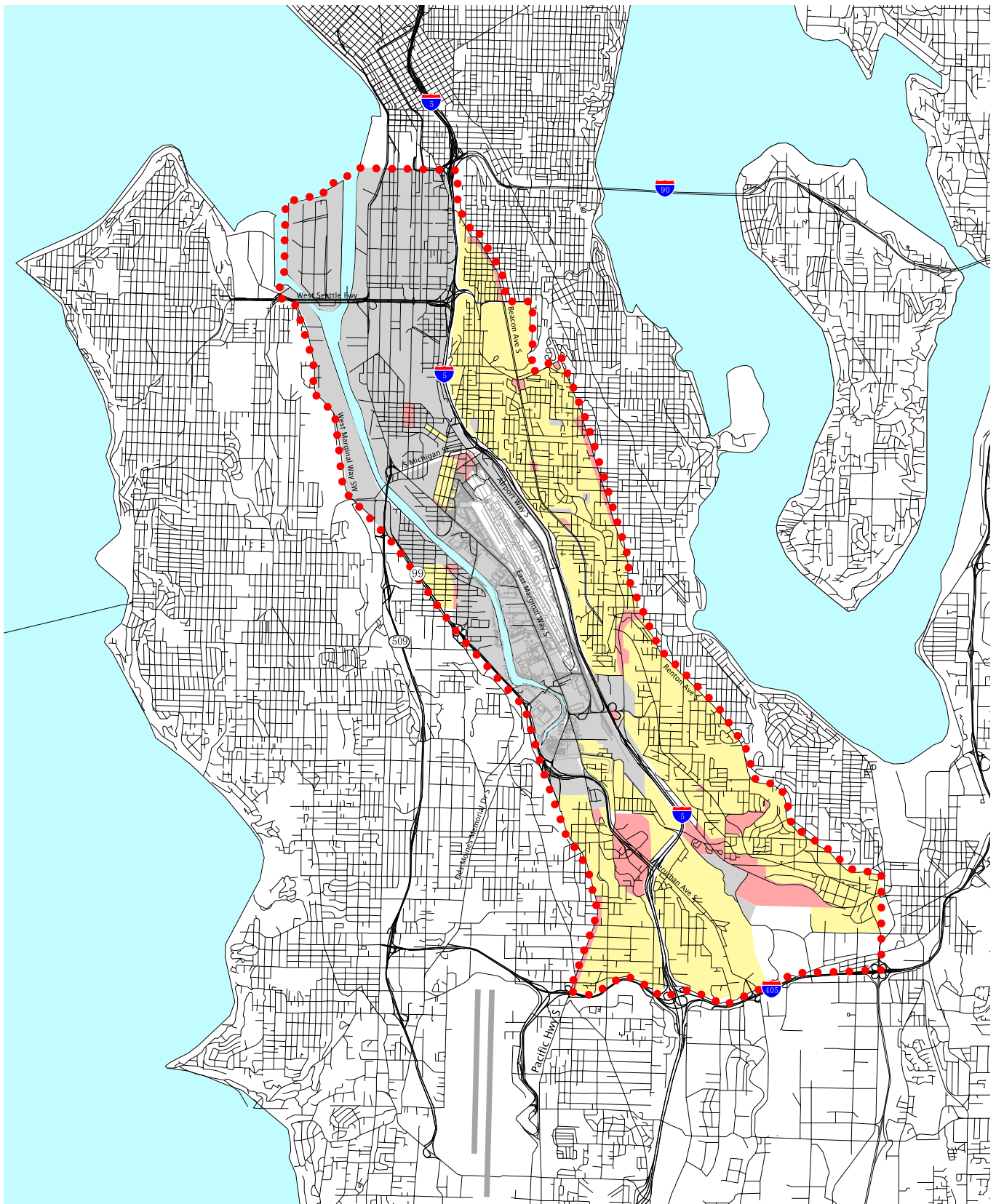
King County adopted the King County Comprehensive Plan in November 1994 and updated in 1997. The Plan contains several policies pertaining to new essential public facilities or the expansion of existing essential public facilities. However, the Plan does not address aircraft related noise issues or how such noise affects land use development in the county. The Plan contains one policy addressing aviation under Chapter Nine, Transportation, Section H Aviation, Freight, and Ferries;

Policy T-540: Regional aviation facilities play a foundational role in promoting a strong regional economy as well as providing significant direct and indirect employment opportunities to residents of the County and Puget Sound region. Consistent with this plan's policies concerning the siting of essential public facilities, King County should work with the Puget Sound Regional Council and its members to ensure that any regional projected capacity problems, and the air transportation needs of the region's residents and economy are addressed in a timely manner. Siting decisions must be consistent with the Regional Airport System Plan, the Countywide Planning Policies and this Plan.

Zoning. All of the jurisdictions in the vicinity of King County International Airport have adopted traditional land use zoning ordinances to control the types of land uses on specific parcels. The ordinances divide a jurisdiction into districts and prescribe certain requirements for allowable uses within those districts. The various zoning codes pertaining to airport-related activities are presented in the following paragraphs. Figure A8, *GENERALIZED EXISTING ZONING*, presents the zoning districts for the various jurisdictions.

The area immediately surrounding the Airport within the jurisdiction of the City of Seattle between the Interstate and West Marginal Way is generally zoned Industrial. The Georgetown community is generally zoned as Commercial and Residential. There are additional areas of Commercial zoning to the north of Georgetown. There is an additional area of Residential and Commercial zoning southwest of the airport, west of the Duwamish adjacent to the City of Tukwila and King County.

Tukwila has zoned the area directly south of the Airport and west of the Interstate is zoned Manufacturing Industrial Center/Heavy Industrial up to South 112th Street, where Low Density Residential zoning occurs. Farther south and west of the Airport are areas of mixed zoning until the Tukwila Urban Center south of Interstate 405. There is an area of Low Density Residential and Commercial zoning just east of Interstate 5 and the South Boeing Access Road.



n Scale 1"=8000'

Figure A8 Generalized Existing Zoning

- Preliminary Study Area Boundary
- Retail/Commercial
- Residential
- Industrial

King County zoning appears southwest of the airport west of the Duwamish River. There is industrial zoning between SR 99 and the river, with residential and commercial mixed zoning west of SR 99.

City of Tukwila

The City of Tukwila has adopted a zoning ordinance that does not address aircraft related noise issues in relationship to land uses.

City Seattle

The City of Seattle has adopted a zoning ordinance that does not address aircraft related noise issues in relationship to land uses.

King County

King County has an adopted zoning ordinance that addresses land use development within King County, the King County Zoning Code, Title 21A. The Code was last amended in March 1998. The Code contains provisions for Special District Overlay Zones.

21A.38.160. Special District Overlay-Aviation Facilities. A. The purpose of the aviation facilities special district overlay is to protect existing non-commercial airports from encroaching residential development. Aviation facilities special district overlay shall only be established in the area up to ¼ mile around airports and shall be zoned UR or RA.

B. The following development standards shall apply to uses locating in aviation facilities special overlay districts: On the title of all properties within pending short subdivisions or subdivisions and binding site plans, the following statement shall be recorded and be shown to all prospective buyers of lots or homes: “This property is located near the (name of airport) which is recognized as a legitimate land use by King County. Air traffic in this area, whether at current or increased levels, is consistent with King County land use policies provided it confirms to all applicable state and federal laws.”

Land Use Controls Evaluation

Land use planning and development controls offer ways through which the county, cities, and the Airport may achieve certain objectives. These measures involve the various opportunities and options that are available for influencing, directing, managing, and controlling the type and sequence of development within the Airport environs. The various techniques and mechanisms range from fee simple land acquisition programs to more advanced regulatory mechanisms and advisory programs. Each different mechanism is useful in accomplishing desired objectives and can be used separately or in concert with others as the situation dictates. The following is a discussion of the land use planning and control measures available for consideration.

Fee Simple Land Acquisition. Fee simple land acquisition is often the most effective means that is available to an airport or community for controlling land use development and ensuring compatibility; it is also the most expensive. Land acquisition can be accomplished through negotiation and purchase from the owner or through condemnation proceedings. Although it is the most expensive, resale for a compatible use or joint purchase with another government agency for a compatible public use may help reduce the net cost of the property.

Condemnation of property is available to the County as a means of acquiring property. Condemnation is subject to the legal finding that it is for a public purpose, although this has traditionally been broadly defined by the courts. In fact, the acquisition of airspace by eminent domain is a proper use (*Port of Olympia v. Deschutes Animal Clinic, Inc.*, 1978, 19 Wash. App. 317). Washington Statutes specifically state that land for airports can be acquired by eminent domain (RCWA 14.08.030). If condemnation is used or outright purchase is made with the assistance of federal funds, provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (URARPAPA, P.L. 91-646) would apply. The Act stipulates that homeowners be granted a payment of up to \$22,500 to compensate for any differential between the value of the condemnation unit and the cost of comparable replacement housing. Renters are granted up to 3-1/2 years of rent differential. Renters and owners alike are eligible for moving expenses. The federal assistance portion of relocation costs is in the same proportion as whatever grant is involved with the condemnation procedure.

The acquisition of property affected or potentially affected by airport operations is the most effective and efficient means of controlling land use in noise impacted areas. It is possible that compatible public use could compensate for the direct expenditure of purchasing the property. It should be noted that the acquisition of property is used more often than not in circumstances where the noise situation is critical for the continuation of existing uses or where such preventive measures as comprehensive planning and zoning are not working.

Zoning. Zoning is the most traditional approach, and the most common and widely used legal device to control land use development. It can be defined as “the division of a city (*or county*) by legislative regulation into districts and the prescription and application in each district of regulations having to do with structural and architectural design of buildings and of regulations prescribing use to which buildings within designated districts may be put.” This is accomplished through the adoption of a zoning ordinance, which specifies the use, size, height, and bulk of structures within each district. The regulation of land through a zoning ordinance is premised as part of the police power inherent in the state and delegated to the local jurisdiction through state enabling legislation. The county and various communities surrounding the Airport do have the statutory authority to adopt zoning ordinances and maps (RCWA 36.70.010, 36.70A.040 and 35.63.080, and Washington State Constitution, Article 11, §11). As stated earlier, the communities surrounding King County International Airport have adopted such zoning ordinances, and do control land use within their respective boundaries.

Zoning is a useful tool for controlling land use development and promoting compatibility while supporting private land ownership. Zoning cannot be relied upon as a “corrective measure” as it can only be applied prospectively and not retroactively. Also, since zoning is a creature of a political body and subject to changing conditions and situations, the zoning classification of any particular tract of land is always subject to change.

Zoning can also be used to regulate the height of objects around airports to prevent hazards to navigation. Washington Statutes specifically allow airport sponsors to implement height hazard zoning in certain designated areas within an airport’s environs to prevent the establishment of hazards (RCWA 14.12) and the Attorney General has stated that zoning of building heights near an airport is a proper use of police power (Op. Att. Gen. 1953-55, No. 298). The State of Washington has no specific enabling legislation to allow airports or airport sponsors to enact zoning ordinances based on aircraft noise or noise contours. Several states (Texas, California) have enacted such enabling legislation, which prevents the encroachment of non-compatible land uses within the Airport environs.

In summary, zoning is the most widely used land use control mechanism and offers an acceptable tool for implementing a land use compatibility plan. There are several state statutes that grant zoning authority, which can have an effect on the area around King County International Airport, RCWA 36.70.10, 36.70A.040, 14.12 and 35.63.060. Zoning can be a time-consuming effort in that the designation of zoning classifications and their implementation must be closely monitored to ensure continuing compatibility.

Comprehensive Planning. A comprehensive plan is an expression of the community’s policies and goals toward land use and development, and serves as a guide for policy implementation. As stated earlier, the county and the communities

surrounding the Airport have adopted future land use plans to guide development based on Washington Statutes.

In 1990, Washington State enacted the Growth Management Act to address problems caused by rapid population growth and uncoordinated planning efforts throughout the state. The legislation seeks to ensure that population growth and planning for transportation, housing open space and other essential services and infrastructure make sense and are compatible. The Act provides a process for siting “Essential Public Facilities” such as an airport. Two principles of the Act are “consistency” and “concurrency”. This means that not only consistent planning policies are required among various county and regional jurisdictions, but that the timing of such planning must occur in a manner that promotes the policies. The King County Growth Management Policy Council has been established to facilitate coordination of land use and transportation planning.

A comprehensive plan by itself does little good and cannot control development or relieve noise impacts/incompatibilities without implementing a development plan, but there are other tools available, which will be discussed subsequently.

Subdivision Regulations. The county and various communities have adopted subdivision regulations pursuant to the statutes outlined above, which govern the process of changing raw undeveloped land into subdivisions. This is an exercise of the police power by the local unit of government, as is the enactment of a zoning ordinance. To be most effective, subdivision regulations must be coordinated with the comprehensive plan and the zoning ordinance for proper implementation and goal achievement. Subdivision regulations can be used to ensure the granting of an aviation easement as part of the building permit process. In addition, the regulations can be utilized to control utility size and placement, street design, and the timing of the installation of these facilities when coupled with a capital improvements program. It appears that the subdividing of land must be in conformance with the adopted comprehensive plan of a jurisdiction.

Subdivision regulations for the various jurisdictions within the Airport environs were examined. None of the jurisdictions requires notice of any kind on subdivision plats that the subdivision is within the vicinity of an airport and may experience aircraft noise. In addition, there is no requirement to grant an aviation easement to the jurisdiction for aircraft over flights in any of the subdivision regulations.

Easements. An easement is the right of the owner of land to make lawful and beneficial use of the land of another. It is a limited right, not an estate, or fee, in the land of another. Easements are probably the second most desirable, after the fee simple acquisition, as a means of land use control. Easements can be classified as one of two types, depending on what type of interest is involved. A *positive* easement is one in which the owner of the easement has the right to do something with the land, where a *negative* easement is one where the landowner gives up his right to do something. The right to construct an access road across someone’s property is an

example of a positive easement, compared to a landowner who gives up his right to build a tower, which is a negative easement. Many times both positive and negative easements are acquired in the same piece of property.

Easements may be acquired through grant, gift, devise, acquisition, or condemnation. The purchase of an easement in some cases can be as expensive as outright fee simple purchase. Easement acquisition by condemnation is usually restricted to certain types outlined in state enabling legislation and many times noise easements are not specifically mentioned in the legislation. Washington State case law specifically mentions that the acquisition of airspace by eminent domain is a proper use (*Port of Olympia v. Deschutes Animal Clinic, Inc.*, 1978, 19 Wash. App. 317).

Avigation easements are a prime and common example of the type of easement commonly required within the Airport environs. An avigation easement allows aircraft to fly over the property, make noise, and may limit the height of objects on the burdened property within approach areas.

Building Codes. Building codes are regulations that govern the construction practices in any given jurisdiction and which must be followed in order to obtain a building permit from the governing body. Adoption of a building code can provide suitable noise attenuation of new construction throughout the city or county, but sound attenuation for *site-specific* noise exposure areas is not easily accomplished through the building code. However, certain sound attenuation measures can be included in the building code and referred to for specific areas through the zoning ordinance and subdivision regulations. The code is most easily enforced through the building permit procedure. As stated previously, King County has specific building code provisions addressing sound attenuation.

Capital Improvements Program. The implementation of capital improvements often encourages growth and development in those areas. To avoid incompatible land uses, capital improvements should be programmed to encourage compatible development and discourage incompatible development. Any programs, which might discourage noise sensitive uses, should be undertaken in the identified noise zone. This can be particularly effective in directing industrial/commercial development to areas, which would be incompatible for residential development.

State Legislation. The following are State of Washington statutes that may effect land use planning and compatibility with aircraft operations and airports.

State of Washington, Chapter 173-60 WAC

Maximum Permissible Environmental Noise Levels

Land use Noise Source	Land Use of Receiving Property		
	Residential	Commercial	Industrial
Residential	55 dBA	57 dBA	60 dBA
Commercial	57	60	65
Industrial	60	65	70

The maximum permissible levels are:

Reduced by 10 decibels at night (10 pm to 7 am) when the receiving land use is residential.

Increased by 15 dBA for up to 1.5 minutes, 10 dBA for up to 5 minutes and 5 dBA for up to 15 minutes.

Sounds created by aircraft in flight are exempt.

Sounds from engine testing and maintenance are exempt between the hours of 7 am and 10 pm, PROVIDED that aircraft testing and maintenance shall be conducted at remote sites whenever possible.

State of Washington WAC 248-64-240 “Site Approval (Schools)”

This administrative code establishes noise level conditions for proposed new or expanded school sites. It is a Permanent Rule of the Board of Health. The Rule established an hourly LEQ limit of 55 dBA, and an hourly AL limit of 75 dBA during hours when school is in session, except sites exceeding these sound levels are acceptable if a plan for sound reduction has been submitted and approved. Also, interior levels are not to exceed 45 dBA.

County Legislation. The following King County Ordinance addresses non-aircraft and aircraft related noise.

King County Ordinance, Chapter 12.87, Environmental Noise

The Ordinance essentially mirrors the State Statute for sound sources located within King County or the City of Seattle. The Ordinance specifically exempts at all times “Sounds originating from aircraft in flight and sounds which originate at airports and are directly related to flight operations”.

“Sounds exempt during daytime hours-Aircraft testing and maintenance. Subject to the conditions of subsections A. through B. of this section, sounds created by the testing and maintenance of aircraft, or components of aircraft, are exempt from the maximum permissible sound levels between the hours of seven a.m. and ten p.m. daily; provided, that aircraft which are regularly scheduled to depart between the hours of seven a.m. and eight-thirty a.m. shall, subject to the same conditions, be exempt between the hours of six a.m. and ten p.m.” The ordinance then describes the conditions under which such operations can occur and describes areas specific to King County International Airport as designated on the Airport Layout Plan prepared December 1, 1976, revised October 10, 1978. These areas are entirely within the ultimate airport property line as described and designated on that Airport Layout Plan.

City of Seattle Ordinance, Chapter 25.08, Noise Control

The City of Seattle ordinance generally is the same as the King County noise ordinance, with the same exemptions and restrictions. The ordinance specifically addresses such operations at King County International Airport.



Figure A9 Land Use Decision Matrix

- Positive
- ▲ Negative
- Neutral