AIRPORT MASTER PLAN

BELLINGHAM INTERNATIONAL AIRPORT

PORT OF BELLINGHAM
Washington State

URS

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BELLINGHAM INTERNATIONAL AIRPORT

MAY 2015

Courtesy of Magnusson Klemencic Associates – Michael Dickter

Prepared For:

PORT OF BELLINGHAM
Washington State

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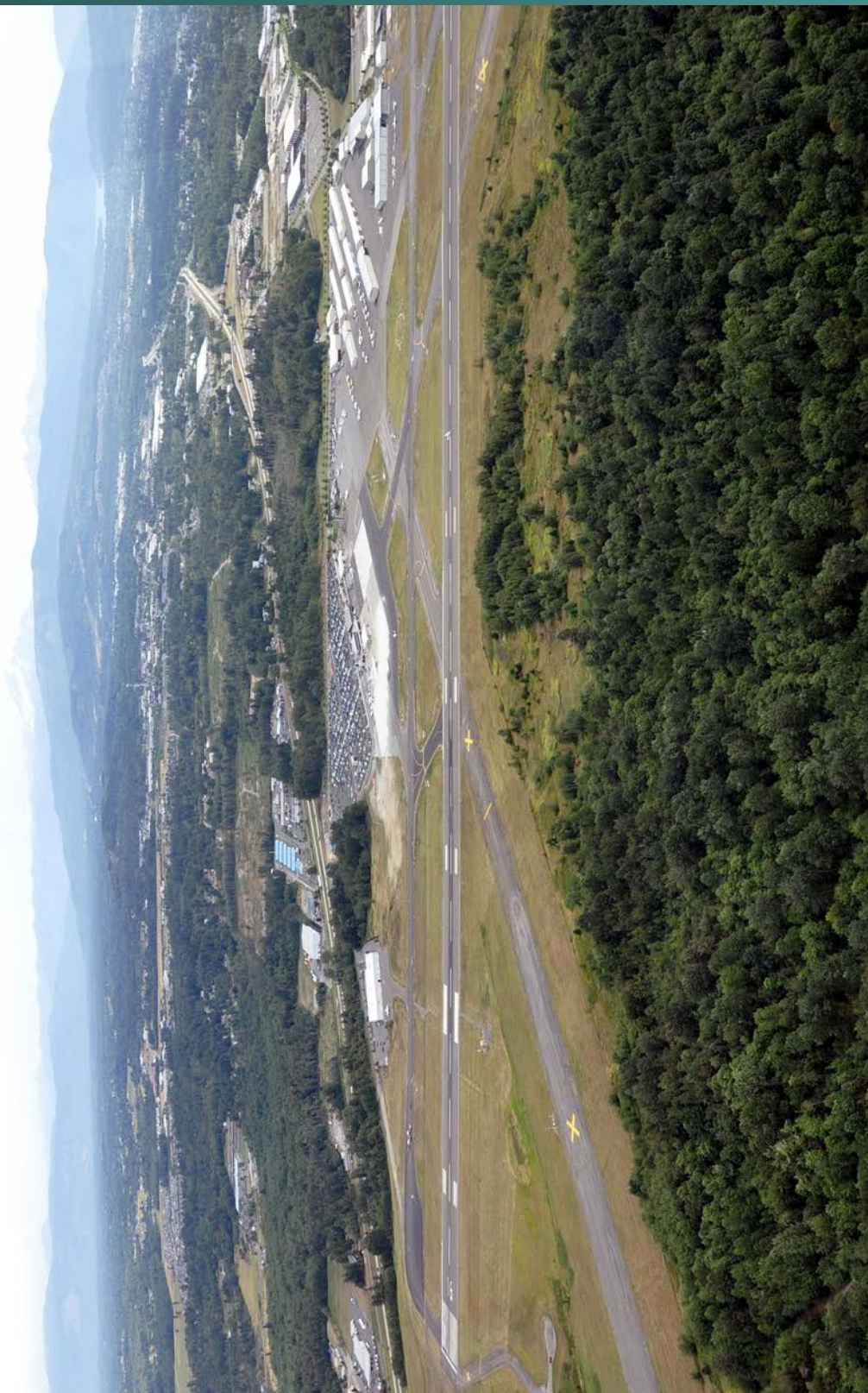
APPENDICES

Appendix A **Glossary of Terms**

Appendix B **Airport Layout Plan Checklist**

Appendix C **SEPA Checklist**



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EXECUTIVE SUMMARY

1.1 INTRODUCTION

The purpose of the Bellingham International Airport (BLI) Master Plan Update is to review, revise and reprioritize development options associated with BLI. The Master Plan Update was prepared by the Port of Bellingham, the owner of the airport, as a means of assuring that BLI will continue to contribute to the Port's ability to meet their mission in the community as stated.

> ***"To fulfill the essential transportation and economic development needs of the region, while providing leadership and maintaining Whatcom County's overall economic vitality through the development of comprehensive facilities, programs, and services.***
>
> ***In doing so, the Port pledges to work cooperatively with other entities – within the framework of community standards – and to be a responsible trustee of our publicly owned assets."***

1.2 PLANNING BACKGROUND

Since the previous master plan was completed in 2003, the introduction of low-cost commercial service combined with an increase in the number of destinations being served out of Bellingham has led to the development of a substantial passenger market ranging from southern British Columbia to the northern Puget Sound Region. Figure 1-1 and Table 1-1 show the growth in enplaned passengers (passengers boarding an airplane in BLI) that occurred. These air service developments led to a growth in passengers from 75,096 in 2004 to 573,714 in 2013 with growth rates of approximately 33 percent per year from 2006 through 2012. Since 2012 the growth has leveled off with annual increases less than 2 percent.

Figure 1-1: Historical Enplaned Passenger Growth

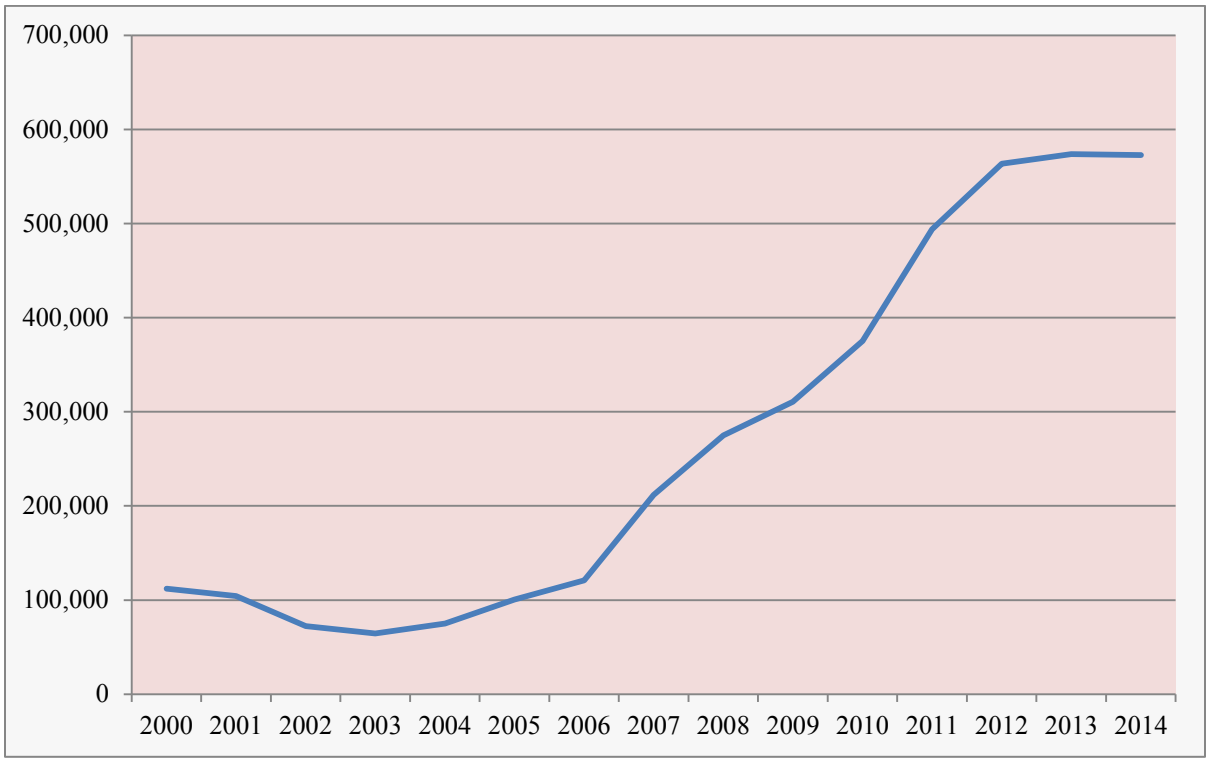


Table 1-1: Historical Enplaned Passengers

Year	Enplanements	Explanation
2000	111,945	Two airlines, Horizon and United Express offering service to/from Seattle (SEA) using 35-seat aircraft.
2001	104,278	9/11 attacks impact service during the last quarter. United Express ceases service.
2002	72,422	Horizon Airlines is the sole carrier. They offer daily flights to SEA using Q-200 aircraft (37 seats).
2003	64,365	Horizon Airlines is the sole carrier. They offer daily flights to SEA using Q-200 aircraft (37 seats).
2004	75,096	Horizon Airlines is the sole carrier for most of the year. They offer daily flights to SEA using Q-200 aircraft (37 seats). In August Allegiant initiates service offering four flights each week to Las Vegas (LAS) using MD-80 aircraft.
2005	100,660	Allegiant announces major service increases at BLI including additional flights and destinations. All flights are conducted using MD-80 aircraft.
2006	120,961	In addition to Horizon and Allegiant, Delta initiates service from BLI to Salt Lake City (SLC) using 55-passenger CRJ aircraft.
2007	211,660	A reconstituted Western Airlines initiates service to destinations in California. Due to financial instability Western ceases operation in short order. However, Allegiant adds flights to Palm Springs and Phoenix to their schedule. Also in 2007 Skybus begins to offer low-cost service from BLI through their Columbus, Ohio, hub. Skybus also succumbs to financial problems.
2008	274,820	Horizon and Allegiant continue to offer service from BLI with the Horizon flights transitioning from Q-200 aircraft to the higher capacity Q-400s. In August Allegiant adds direct service to San Diego to their schedule.
2009	310,577	Alaska Airlines begins service from BLI to LAS using 737-800 aircraft. Allegiant adds flights to the Bay Area and Los Angeles.
2010	380,916	Allegiant adds flights to Long Beach to their schedule. The airport is closed for 21 days during September for runway rehabilitation.
2011	511,756	Alaska Airlines adds direct flights from BLI to Hawaii using 737-700 aircraft.
2012	563,428	Alaska and Allegiant continue to attract passengers and Frontier initiates daily service to Denver.
2013	573,714	Commercial service growth begins to level off with no new airlines or destinations added.

During the same period the number of general aviation operations experienced a steady decrease, mostly in training and touch-and-go activity. The military has remained a minor portion of the total activity consisting of approximately 1,200 annual operations, most of which are itinerant.

1.3 BACKGROUND

The Bellingham International Airport (BLI), owned and operated by the Port of Bellingham, is located on approximately 1,080 acres of land in Whatcom County three miles northwest of the City of Bellingham. It is bordered by Interstate 5 to the north, Marine Drive to the south, Mitchell Way to the east, and Wynn Road to the west. The airport is classified as a commercial service primary airport by the Federal Aviation Administration (FAA) and the Washington State Department of Transportation (WSDOT) - Aviation Division.

1.4 WHAT IS THE GOAL OR PURPOSE OF AN AIRPORT MASTER PLAN?

The goal of the master plan is to provide a framework to help guide future airport development that will effectively satisfy aviation demand, while giving full consideration to any potential environmental and socioeconomic impacts. The master plan provides tools to react to uncertainties by examining key trends in the aviation industry, such as changing airline business models, improvements in technology, and local/regional economics that affect airport activity.

1.5 WHAT ARE THE COMPONENTS OF AN AIRPORT MASTER PLAN?

Developing the master plan followed a phased process that included:

- Collection and analysis of data regarding existing facilities, current activity and operations.
- Development of aviation activity forecasts for a 20-year time period (through 2031).
- Determination of future requirements for facility expansion or upgrade needed to accommodate the forecast activity growth.
- Development of alternative concepts for airport development and analysis of the best course for future development. The decisions considered a broad range of considerations including cost, environmental factors, land use compatibility and other factors.
- Preparation of an environmental review/analysis.
- Development of a phased implementation plan.
- Preparation of an Airport Layout Plan (ALP) in accordance with federal airport operating and design standards.

Figure 1-2 shows the process used over the course of plan development.

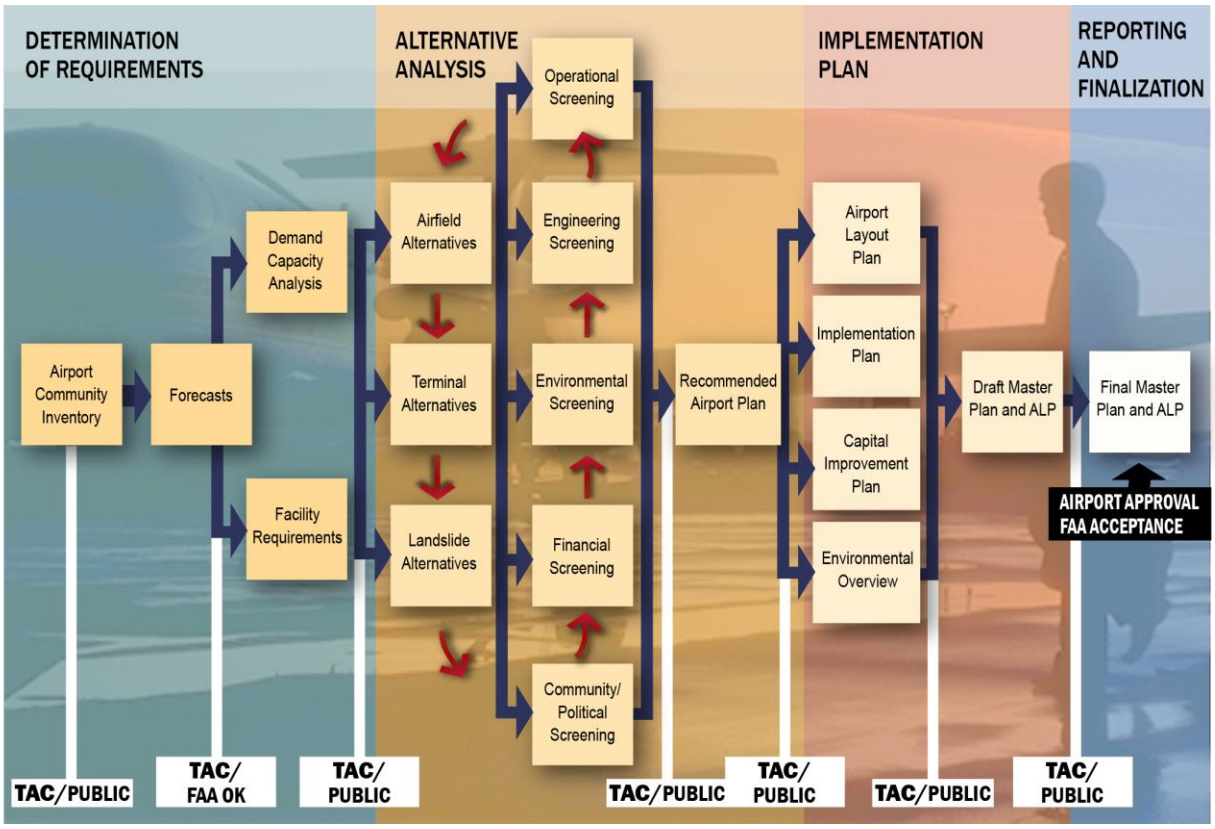


Figure 1-2: Airport Master Plan Components

1.6 WHAT IS THE APPROVAL PROCESS FOR THE MASTER PLAN?

Airport master plans are approved by the legal sponsor, or "owner," of the airport, in this case the Port of Bellingham. FAA will accept the master plan once it is approved by the Port. The FAA's acceptance of the plan represents acceptance of the general location of future facilities with respect to the safety, efficiency, and utility of the airport. Additional environmental approvals and project definition steps are needed before the FAA will move a planned project into the design and construction phase.

Once formal approval of the master plan is complete, the local jurisdictions (Whatcom County and the City of Bellingham) are encouraged to adopt the plan's recommendations into their Comprehensive Planning process.

1.7 STUDY PARAMETERS

This master plan will help the Port to focus on the best course of action for continued development of BLI by identifying key issues the airport faces in the short-term (next 5 years), intermediate-term (6 to 10 years) and long-term (11 to 20 years) future.

All recommendations of the master plan considered impacts on the binding site plan that the Port has established for the airport and its neighboring industrial areas. In addition the plan recognized the following:

- Airport users, agencies responsible for decision-making, and members of the community were included in the planning process through seven Technical Advisory Committee meetings, six Port Commission briefings, and five Open Public Meetings.
- Since passenger growth at BLI is partially driven by the Canadian market, continued economic parity and border security conditions were examined, as these are vital to the forecast of growth.
- Another area where BLI passengers are being drawn from is the northern Puget Sound Region. These customers could be influenced by the introduction of low-cost commercial service at Paine Field. The forecast presented in this master plan considered the impacts of this potentially competitive service and concluded that any service at Paine Field was unlikely in the short-term and was likely to have minimal impact on service at BLI due to the differences in the markets being served.
- The environment was considered before making any recommendations. The project costs, schedules, and approvals all include the need to ensure environmental processes, approvals, permits, and other requirements.
- WSDOT is studying the long-term development of the I-5 Corridor through Bellingham—including the Bakerview Drive interchange. This interchange is one of the keys to the airport's continued ability to serve the increasing passenger levels.

1.7.1 Aviation Demand Forecasts

Development of forecasts of future activity for BLI followed the process described by FAA and included in Advisory Circular (AC) 150/5070-6B, Airport Master Plans. The following is a summary of the forecasts.

1. The rapid growth in the number of enplaned passengers continued through 2012 as new airlines instituted service and existing airlines expanded their destinations providing additional attractants for passengers to use BLI. Growth between 2012 and 2013 was much slower. While commercial service is expected to continue to grow, the rate of growth will be driven by overall economic and population growth rather than by decisions regarding new airlines or destinations.
2. Air cargo/air taxi operations consist primarily of air cargo flights by the three carriers offering service to BLI using small turboprop aircraft such as the Cessna Caravan, the Beech 1900 or Cessna 340.
3. Although the number of general aviation operations at BLI has declined over the past decade, the number of aircraft based at the airport has been constant. In the future it is anticipated that the number of based aircraft will increase as land becomes available for development of aircraft hangars and other GA facilities. The level of general aviation activity will also increase as pilots and aircraft owners who use their aircraft for business purposes seek the services and facilities offered at BLI.
4. Future use by the military is unpredictable, but this forecast assumes the military will continue to use the airport in the future as it has in the past.

Table 1-2 shows the anticipated growth in activity levels forecast for BLI.

Table 1-2: Forecast Summary

	Actual	Forecast			
	2011	**2016**	**2021**	**2026**	**2031**
Enplaned Passengers	511,756	710,000	855,330	1,000,659	1,145,989
Operations					
Commercial	8,449	10,638	11,842	13,595	15,855
Air Cargo/Air Taxi	4,184	4,510	4,854	5,188	5,507
General Aviation	48,057	49,163	52,016	55,072	58,324
Military	1,000	1,000	1,000	1,000	1,000
Total Operations	61,680	65,311	69,712	74,855	80,686
Based Aircraft	209	226	243	261	275

Source: Actual - Airport Records
Forecast - URS

1.7.2 Airport Requirements

Determining the need for future facilities was approached by comparing the capacity of the existing facility with the demand from the forecast activity levels. Any identified deficits were addressed by recommending facility improvements or expansion. Table 1-3 and Figure 1-3 summarize the conclusions of this facility requirement analysis.

Table 1-3: Summary of Facility Requirements

Facilities	Conclusions
Airfield System	Runway 16-34, at 6,701 feet, provides sufficient take-off length for all aircraft forecast to use the airport. At the present time there are no shoulders on the runway. These should be added. The taxiway system, particularly Taxiways E and H, need to be upgraded to eliminate opportunities for runway incursions by realigning or truncating Taxiways F, E, D, and C. To control the impacts of engine run-up operations, both operationally and in terms of community compatibility, a designated area for engine run-ups should be developed. A helicopter landing area should be designated to separate this activity from that of fixed wing aircraft. A new Snow Removal Equipment (SRE) Building should be constructed to protect the Port's investments and allow for airfield access by the snow removal equipment. The airport's perimeter road should be completed.
Passenger Terminal	At the time of this master plan (2013), the passenger terminal building is being expanded to accommodate 750,000 to 800,000 annual enplaned passengers. Based on the forecasts, this should serve the airport until the 2020 to 2025 period, at which time an expansion will be needed to serve increasing demand with an acceptable level of service. In addition, seven Remain Over Night (RON) parking spaces need to be developed to accommodate the airlines' needs. Two of these positions are required immediately, with five more needed before 2031.
Terminal Area Support	The fuel truck storage/ready area, Ground Service Equipment (GSE) storage, charging and maintenance areas, de-icing storage and application, waste disposal facilities, commissary and stores buildings, and delivery facilities are all part of the terminal complex. Additional area for these will need to be accounted for as the terminal area is expanded.
Airport Access	Providing access to the airport with an acceptable level of service will require continued improvements to area roadways. The intersection of I-5 with Bakerview Road was recently improved to increase capacity overall and included consideration of the projected growth in airport related traffic through 2030. The Airport Drive/Airport Way interchange will need to be upgraded to address airport related traffic in the next few years. Airport growth beyond that forecast or traffic from regional development could trigger the need for additional regional traffic improvements. Other regional roadway improvements that merit further study include the extension of Wynn Road or Kope Road from the north to provide an alternate access route to the airport.

Table 1-3: Summary of Facility Requirements (Continued)

Facilities	Conclusions
Automobile Parking	The current public parking lots provide space for 2,941 vehicles in six individually designated lots. This includes 2,867 public spaces, 41 Americans with Disabilities Act (ADA) compliant spaces, 3 recreational vehicle (RV) stalls, 16 drop-off/pick-up (30 minutes free) spaces, and a 14-space cell phone lot (free). Forecasts show that additional expansion may be needed as passenger levels continue to grow although off-site parking could reduce the demand for on-airport facilities. The employee parking area includes 500 spaces with 138 spaces in the main parking lot reserved for rent-a-car ready and return. These areas will also need to be expanded in the future.
Air Cargo	The new passenger terminal contains facilities for processing cargo shipped on the commercial airlines. This area will suffice through the period covered in the master plan. All-cargo activity is forecast to continue to consist of feeder service using small regional aircraft but additional space will need to be provided to handle the increased usage. This will be done either by re-marking existing pavement or by constructing new air cargo apron areas.
Based Aircraft Hangar Storage	With the forecasted growth in based aircraft, as well as the existing unmet demand for hangar space, additional area for hangar development is needed. In addition, relocation of general aviation hangars and tiedown areas will be needed as the passenger terminal is expanded and congestion increases within the existing apron area. Additionally some of the existing T-hangars do not meet FAA design criteria for taxiway clearance between the buildings. Upon relocation, these issues will be corrected in their new location.
FBO and Support	Expanded or new fixed base operator (FBO) facilities are required to provide support for the growing general aviation community. These facilities will provide not only aircraft maintenance hangars but also pilot lounge areas, aircraft fueling, and space for transient aircraft parking.
Fueling	The current fuel storage facility provides less than two days of fueling capacity. The fuel farm needs to be expanded to increase the capacity to match the increase in aviation activity.
Other	The possibility of adding a new Instrument Landing System (ILS) on Runway 34 to provide for better all-weather operations as well as to increase operational flexibility should be considered. FAA will review the need for the facility as demand increases. The Airport Traffic Control Tower (ATCT) is too short to provide an unimpeded line-of-sight to all portions of the active aircraft movement area. A Safety Risk Management Study should be initiated by FAA to assess whether the increased activity levels at BLI will be impacted by the tower's location. If FAA determines that the situation needs to be remedied, the tower will need to be either raised, relocated, or otherwise modified. Any changes in the tower height or location will be scheduled by FAA as part of their facility improvement program. An Airport Surveillance Radar System (ASR) should be considered to increase safety and efficiency in operations. This decision will be made by FAA outside the master plan process.

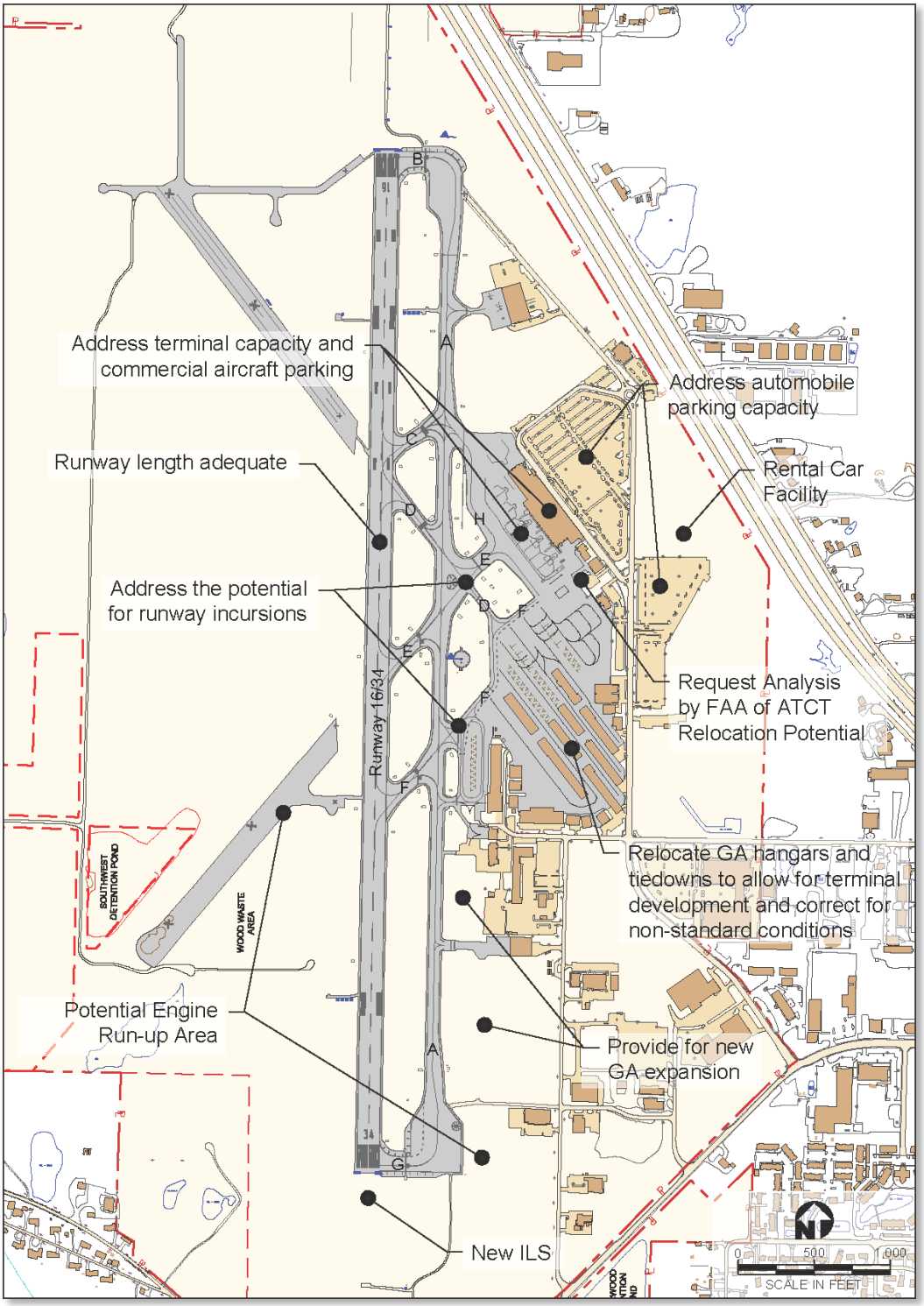


Figure 1-3: Summary of Airport Facility Requirements

1.8 AIRPORT LAYOUT PLAN

The Airport Layout Plan (Figure 1-4, Sheet 2 of 11) depicts both existing airport facilities and the airside and landside projects that have been recommended for the 20-year planning period. Specifically shown are the following:

Airfield Recommendations

1. Construct four new 90 degree exit taxiways on Runway 16/32 and decommission the pavement on the existing angled exits.
2. Realign the terminal and general aviation access taxiways and taxilanes to eliminate apron confusion and congestion issues in response to the Runway Safety Action Team (RSAT) recommendations.
3. Construct a Jet Engine Run-up Area south of the runway, near the by-pass taxiway on Runway 16.
4. Install designated Helicopter Landing Areas.
5. Construct a new Snow Removal Equipment (SRE) Building.

Terminal Recommendations

1. Expand the passenger terminal to the south and add new gate positions, as demand dictates.
2. Construct seven new Remain Over Night (RON) positions for commercial aircraft. (Two RON positions are required immediately, with 5 additional required by 2031.)
3. Continue to expand automobile parking facilities, as demand dictates.
4. Consolidate Rental Car facilities outside the terminal area.

Surface Access Recommendations

1. Monitor access improvement proposals being considered by other agencies. The Federal Aviation Administration has expressed the position that they will not approve any surface extension of Kope Road that passed through either the Runway Safety Area (RSA) or Runway Protection Zone (RPZ).

General Aviation (GA) Recommendations

1. Relocate hangars and ties-downs from the terminal apron area.
2. Expand GA to the south of the terminal.

3. Relocate the GA Terminal.
4. Relocate the Federal Inspection Facility (FIS) that serves the GA area.

Other Recommendations

1. Develop an on-airport hotel complex.
2. Reserve land on the airport's west side for future development of aviation facilities should demand develop over time and environmental approvals allow.
3. Designate the following land for Aeronautical or Light Industrial/Commercial Use:
   a. Land not identified as required for specific facility development or expansion.
   b. Land that has been determined to not be needed for aviation in the future.
   c. Land that does not have direct access to the airfield.

   Activities accommodated under this category include, but are not limited to, restaurants, auto parking, rental car facilities, hotels, retail commercial offices, light industrial facilities, warehousing, or similar uses.

FAA Projects Outside the Master Plan

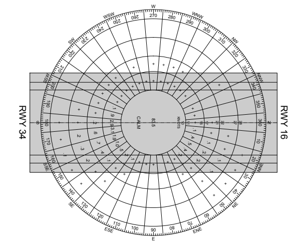
1. Relocate the Air Traffic Control Tower (ATCT) to the north of the terminal building.
2. Install Airport Surveillance Radar (ASR) on the west side of the airport.
3. Install a new Instrument Landing System (ILS) on Runway 34.

AIRPORT FACILITIES

#	DESCRIPTION	HEIGHT*
1	HUMANE SOCIETY AND SPCA (TO BE REMOVED)	183.1'
2	CURRENT INDUSTRIES	195.6'
3	AVIATION COMPONENTS	207.2'
4	CURRENT INDUSTRIES	211.5'
5	LIGHT MANUFACTURING (YAMATO BLDG.)	220.4'
6	PUGET SOUND TRUCK LINES	213.8'
7	LAND LEASE (REESERS)	NA
8	AIRPORT BUILDING	204.7'
9	MANUFACTURING (POB FTZ)	214.2'
10	SOUND BEVERAGE	213.6'
11	WOODSTONE	221.3'
12	FUEL FARM STORAGE TANKS	187.1'
13	CORPORATE HANGAR (OAKLEY)	209.0'
14	FUTURE SNOW REMOVAL EQUIPMENT (SRE) BLD.	TBD
15	AIR NATIONAL GUARD (TO BE REMOVED)	185.2'
16	AIR NATIONAL GUARD (TO BE REMOVED)	183.3'
17	LAND LEASE (HELIPRO)	NA
18	PRIVATE HANGAR	178.3'
19	ELECTRICAL VAULT	166.2'
20	CORPORATE HANGARS (ICE)	178.2'
21	SELF FUELER	162.0'
22	CORPORATE HANGAR	189.9'
23	CORPORATE HANGAR	178.1'
24	PRIVATE HANGAR	182.5'
25	PRIVATE HANGAR	195.7'
26	CORPORATE HANGAR/AIRCRAFT MAINTENANCE	178.8'
27	CORPORATE HANGAR (ALLSOP)	180.3'
28	CORPORATE HANGAR (HAGGEN)	180.6'
29	STRATOS T-HANGARS	179.3'
30	CONDOMINIUM HANGARS	183.7'
31	PORT HE T-HANGARS	180.5'
32	CIRRUS T-HANGARS	174.9'
33	PORT HD T-HANGARS	175.3'
34	NIMBUS T-HANGARS	175.6'
35	ALTO T-HANGARS	178.9'
36	SOLAR HANGARS	174.3'
37	CORPORATE HANGAR	177.9'
38	CORPORATE HANGAR (VISION MICRO)	182.6'
39	HANGAR	179.6'
40	AUTOMOBILE REPAIR (TO BE REMOVED)	168.0'
41	GA TERMINAL	174.4'
42	AIRPORT TRAFFIC CONTROL TOWER (ATCT)	231.0'
43	AIRCRAFT RESCUE FIRE FIGHTING (ARFF)	179.9'
44	U.S. CUSTOMS	172.3'
45	TERMINAL BUILDING	196.0'
46	PACIFIC CATARACT AND LASER INSTITUTE	176.4'
47	FUTURE ATCT (SEE NOTE #2)	TBD
48	ALLEGIANT COMMISSARY	183.2'
49	-	-
50	AIR CARGO (FEDEX)	181.8'
51	-	-
52	-	-
53	-	-
54	-	-

*ABOVE MEAN SEA LEVEL (MSL)

ALL-WEATHER WIND ROSE

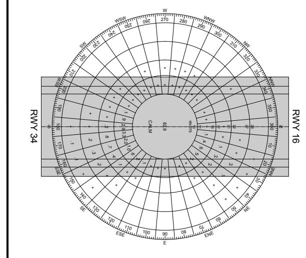


ALL-WEATHER (79,472 OBSERVATIONS)

CROSSWIND	RWY 16/34
10.5 KNOTS	98.45 %
13 KNOTS	99.41 %
16 KNOTS	99.86 %
20 KNOTS	99.99 %

NOAA WEATHER REPORTING STATION: 72797 BELLINGHAM, WA
OBSERVATION PERIOD: 2000 - 2009

VISUAL FLIGHT RULES WIND ROSE

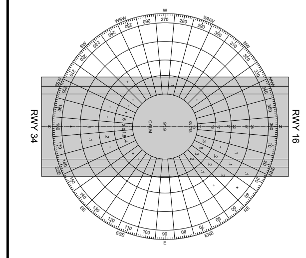


VFR (74,891 OBSERVATIONS)

CROSSWIND	RWY 16/34
10.5 KNOTS	98.41 %
13 KNOTS	99.41 %
16 KNOTS	99.86 %
20 KNOTS	99.99 %

NOAA WEATHER REPORTING STATION: 72797 BELLINGHAM, WA
OBSERVATION PERIOD: 2000 - 2009

INSTRUMENT FLIGHT RULES WIND ROSE



IFR (3,253 OBSERVATIONS)

CROSSWIND	RWY 16/34
10.5 KNOTS	98.91 %
13 KNOTS	99.35 %
16 KNOTS	99.77 %
20 KNOTS	99.98 %

NOAA WEATHER REPORTING STATION: 72797 BELLINGHAM, WA
OBSERVATION PERIOD: 2000 - 2009

ABBREVIATIONS

ITEM	DEFINITION
ARFF	AIRCRAFT RESCUE FIRE FIGHTING
ARP	AIRPORT REFERENCE POINT
ASOS	AUTOMATED SURFACE OBSERVING SYSTEM
ASR	AIRPORT SURVEILLANCE RADAR
ATCT	AIRPORT TRAFFIC CONTROL TOWER
BRL	BUILDING RESTRICTION LINE
IFR	INSTRUMENT FLIGHT RULES
ILS	INSTRUMENT LANDING SYSTEM
HIRL	HIGH INTENSITY RUNWAY LIGHTS
MITL	MEDIUM INTENSITY TAXIWAY LIGHTS
MSL	MEAN SEA LEVEL
NDB	NON-DIRECTIONAL BEACON
NPI	NON-PRECISION INSTRUMENT APPROACH
NPIAS	NATL. PLAN OF INTEGRATED AIRPORT SYSTEMS
OFA	RUNWAY OBJECT FREE AREA
OFZ	RUNWAY OBJECT FREE ZONE
PAPI	PRECISION APPROACH PATH INDICATOR
PIR	PRECISION INSTRUMENT APPROACH
RAC	RENT-A-CAR
REIL	RUNWAY END IDENTIFIER LIGHTS
RNAV	AREA NAVIGATION
RPZ	RUNWAY PROTECTION ZONE
RSA	RUNWAY SAFETY AREA
RVR	RUNWAY VISUAL RANGE
RVZ	RUNWAY VISIBILITY ZONE
SRE	SNOW REMOVAL EQUIPMENT
TOFA	TAXIWAY OBJECT FREE AREA
VFR	VISUAL FLIGHT RULES

AIRPORT VICINITY

AIRPORT LOCATION

NOTES

1. FUTURE GA AREA TO BE DEVELOPED AS INTERIM REMAIN OVERNIGHT (RON) AREA FOR COMMERCIAL AIRCRAFT.
2. RELOCATION OF AIRPORT TRAFFIC CONTROL TOWER (ATCT) IS SUBJECT TO FAA REVIEW, APPROVAL, FUNDING, AND SITE DETERMINATION.
3. SEE SHEETS 7 AND 8 OF 11 FOR DETAILS ON LANDSIDE DEVELOPMENT.
4. THE BUILDING RESTRICTION LINE (BRL) IS BASED ON A MAXIMUM BUILDING HEIGHT OF 36 FEET AT A 250' DISTANCE FROM THE PRIMARY SURFACE. MAXIMUM ALLOWABLE BUILDING HEIGHT FROM THE BRL INCREASES AT A 7:1 HORIZONTAL TO VERTICAL SLOPE UPWARD AND AWAY FROM THE PRIMARY SURFACE IN CONFORMANCE WITH FAR PART 77 SURFACES.
5. THERE ARE NO DECLARED DISTANCES USED OR PROPOSED.
6. THERE ARE NO THRESHOLD SITING SURFACE PENETRATIONS.
7. THERE ARE NO OBSTACLE FREE ZONE OBJECT PENETRATIONS.
8. RUNWAY PROTECTION ZONE CONTROL IS VIA OWNERSHIP AND EASEMENT BOTH RUNWAY ENDS.
9. TAXILANE H IS DESIGNED TO MEET 757-200 OPERATIONAL REQUIREMENTS. IT IS TO BE UPGRADED TO MEET DG-IV REQUIREMENTS.
10. A SMALL PORTION OF THE NORTHEAST CORNER OF RUNWAY 16 RSA IS NOT COMPLIANT AND COVERED BY RWY 16/34 RUNWAY SAFETY AREA DETERMINATION DATED FEBRUARY 25, 2005 ON FILE WITH THE FAA.

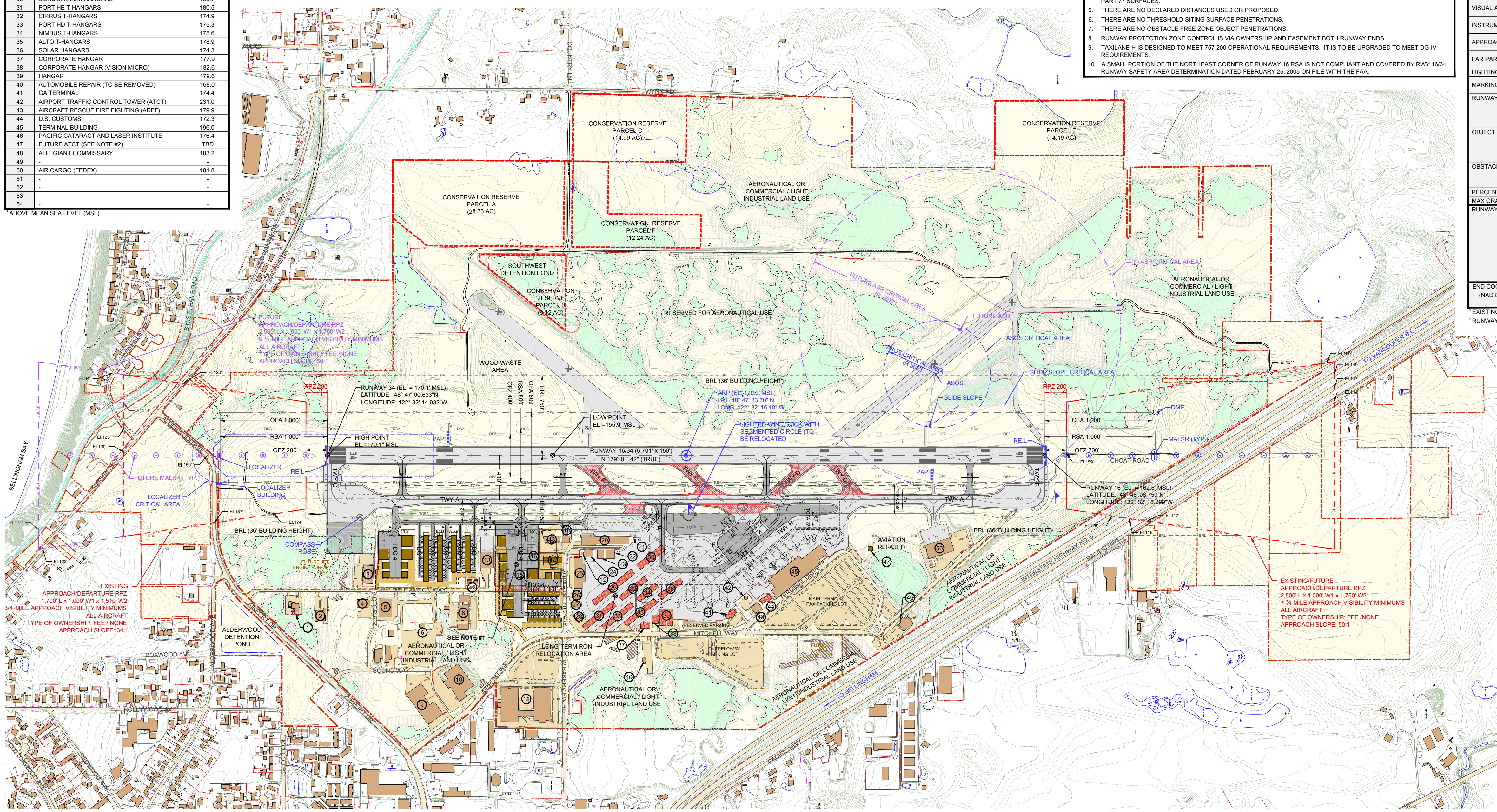
AIRPORT DATA TABLE

ITEM		EXISTING	PROPOSED
AIRPORT TERMINAL CODE		BLI	NO CHANGE
AIRPORT ELEVATION (MSL)		170.0'	NO CHANGE
AIRPORT REFERENCE POINT (ARP)	LAT.	48° 47' 33.70" N (EST.)	NO CHANGE
(NAD 83)	LON.	122° 32' 15.10" W (EST.)	NO CHANGE
MEAN MAX. TEMP. OF HOTTEST MONTH		71° F (AUGUST)	NO CHANGE
COMBINED WIND COVERAGE		99.86% (16 KNOTS)	NO CHANGE
MAGNETIC DECLINATION & YEAR		16°38' 42" E (DEC. 2013)	NO CHANGE
AIRPORT REFERENCE CODE (ARC)		C-IV	NO CHANGE
CRITICAL AIRCRAFT 1,000 MILE STAGE LENGTH		BOEING 757-200	NO CHANGE
NPIAS SERVICE LEVEL		COMMERCIAL SERVICE (CM)	NO CHANGE
TAXIWAY LIGHTING		MITL	NO CHANGE
TAXIWAY MARKING		STANDARD	NO CHANGE
AIRPORT & TERMINAL NAVAIDS		ILS, VOR, NDB, GPS	ASR

RUNWAY DATA TABLE

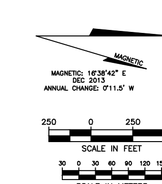
ITEM			RUNWAY 16-34 EXISTING STANDARD	RUNWAY 16-34 EXISTING ACTUAL	PROPOSED	
RUNWAY DESIGN CATEGORY			C-IV		NO CHANGE	
CRITICAL AIRCRAFT			B757-200		NO CHANGE	
RUNWAY DIMENSIONS	LENGTH:		6,701'		NO CHANGE	
	WIDTH:		150'	150'	NO CHANGE	
RUNWAY ORIENTATION			179° 01' 42" (TRUE)		NO CHANGE	
PERCENT WIND COVERAGE (16 KNOT)			95%	99.86%	NO CHANGE	
LINE-OF-SIGHT			NOT OBSTRUCTED		NO CHANGE	
PAVEMENT TYPE			ASPHALT		NO CHANGE	
PAVEMENT DESIGN STRENGTH	SINGLE GEAR:		75,000 LBS		NO CHANGE	
	DUAL GEAR:		160,000 LBS		NO CHANGE	
	DUAL TANDEM GEAR:		250,000 LBS		NO CHANGE	
VISUAL APPROACH AIDS		RW 16:	PAPI, REIL, MALSR		NO CHANGE	
		RW 34:	PAPI, REIL		MALSR	
INSTRUMENT APPROACH AIDS		RW 16:	ILS/DME, RNAV		NO CHANGE	
		RW 34:	RNP, GPS		ILS/DME, RNAV	
APPROACH VISIBILITY MINIMUMS		RW 16:	PRECISION		NO CHANGE	
		RW 34:	NON-PRECISION		PRECISION	
FAR PART 77 APPROACH SLOPE		RW 16:	50:1	50:1	NO CHANGE	
		RW 34:	34:1	34:1	50:1	
LIGHTING			HIRL	HIRL	NO CHANGE	
MARKING		RW 16:	PRECISION		NO CHANGE	
		RW 34:	NON-PRECISION		PRECISION	
RUNWAY SAFETY AREA (RSA) [1]						
	LENGTH BEYOND DEPARTURE END:		1,000'	1,000' [1]	NO CHANGE	
	LENGTH PRIOR TO THRESHOLD:		1,000'	1,000' [1]	NO CHANGE	
	WIDTH:		500'	500'	NO CHANGE	
OBJECT FREE AREA (OFA)						
	LENGTH BEYOND DEPARTURE END:		1,000'	1,000'	NO CHANGE	
	LENGTH PRIOR TO THRESHOLD:		1,000'	1,000'	NO CHANGE	
	WIDTH:		800'	800'	NO CHANGE	
OBSTACLE FREE ZONE (OFZ)			(NO OFZ OBJECT PENETRATIONS)		(NO OFZ OBJECT PENETRATIONS)	
	WIDTH:		400'	400'	NO CHANGE	
	LENGTH BEYOND RW END:		200'	200'	NO CHANGE	
PERCENT EFFECTIVE GRADIENT			1.4%	0.2%	NO CHANGE	
MAX GRADE WITHIN RWY LENGTH (%)			1.4%	0.8%	NO CHANGE	
RUNWAY ELEVATIONS (MSL)	EXISTING END:	RW 16:	162.5'		NO CHANGE	
		RW 34:	170.1'		NO CHANGE	
	DISPLACED THRESHOLD:	RW 16:	NOT APPLICABLE		NO CHANGE	
		RW 34:	NOT APPLICABLE		NO CHANGE	
	TOUCHDOWN ZONE:	RW 16:	162.5'		NO CHANGE	
		RW 34:	170.1'		NO CHANGE	
	RUNWAY INTERSECTIONS:		NOT APPLICABLE		NO CHANGE	
	HIGH & LOW POINTS:	HIGH:	170.1'		NO CHANGE	
		LOW:	155.9'		NO CHANGE	
END COORDINATES: [2] (NAD 83)			RW 16	RW 34	RW 16	RW 34
	LATITUDE:		48°48'06.750" N	48°47'00.633" N	NO CHANGE	NO CHANGE
	LONGITUDE:		122°32'15.199" W	122°32'14.932" W	NO CHANGE	NO CHANGE

[1] EXISTING RSA DIMENSIONS FOR RUNWAY 16: 500' x 1,000' EXCEPT FOR 6,750 S.F. IN NORTHEAST CORNER.
[2] RUNWAY END COORDINATES AS REFLECTED ON AIRPORT 5010 FORM.



LEGEND

DESCRIPTION	EXISTING	PROPOSED
AIRCRAFT TIEDOWN POSITION		
AIRPORT BUILDING		
AIRFIELD PAVEMENT		
AIRPORT PROPERTY		NO CHANGE
AIRPORT REFERENCE POINT (ARP)		NO CHANGE
AUTOMOBILE PARKING		
AVIGATION EASEMENT		
BUILDING RESTRICTION LINE (BRL)	BRL	NO CHANGE
FENCE		NO CHANGE
HOLDING POSITION MARKING		NO CHANGE
PRECISION APPROACH PATH INDICATOR (PAPI)	PAPI	NO CHANGE
ROADWAY		
RUNWAY END IDENTIFIER LIGHTS (REIL)		NO CHANGE
RUNWAY OBJECT FREE AREA (OFA)	OFA	NO CHANGE
RUNWAY OBJECT FREE ZONE (OFZ)	OFZ	NO CHANGE
RUNWAY PROTECTION ZONE (RPZ)	RPZ	(F)RPZ
RUNWAY SAFETY AREA (RSA)	RSA	NO CHANGE
TAXIWAY OBJECT FREE AREA (TOFA)	TOFA	(F)TOFA
TO BE REMOVED	NA	
TOPOGRAPHIC CONTOUR		NO CHANGE
WETLAND		NO CHANGE
WETLAND FILL		NO CHANGE
WIND SOCK		NO CHANGE



ONE INCH
AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

URS
1501 4TH AVENUE, SUITE 1400
SEATTLE, WA 98101
PHONE: (206) 438-2700

PROJECT MANAGER:	JJY	DRAFTED BY:	RLO
DESIGNED BY:	RLO	CHECKED BY:	JJY

#	REVISION	COMPANY	BY	DATE
-	-	---	---	--/--/----

THE PREPARATION OF THIS AIRPORT LAYOUT PLAN (ALP) WAS FINANCED IN PART THROUGH A PLANNING GRANT FROM THE FEDERAL AVIATION ADMINISTRATION (FAA) AS PROVIDED UNDER SECTION 505 OF THE AIRPORT AND AIRWAY IMPROVEMENT ACT OF 1982. THE CONTENTS DO NOT NECESSARILY REFLECT THE OFFICIAL VIEWS OR POLICIES OF THE FAA. ACCEPTANCE OF THIS ALP BY THE FAA DOES NOT IN ANY WAY CONSTITUTE A COMMITMENT ON THE PART OF THE UNITED STATES TO PARTICIPATE IN ANY DEVELOPMENT DEPICTED THEREIN NOR DOES IT IMPLY THAT THE PROPOSED DEVELOPMENT IS ENVIRONMENTALLY ACCEPTABLE IN ACCORDANCE WITH APPROPRIATE PUBLIC LAWS.

FEDERAL AVIATION ADMINISTRATION APPROVAL
SEATTLE AIRPORTS DISTRICT OFFICE

First Middle Last Name
Title
Date

PORT OF BELLINGHAM

First Middle Last Name
Title
Date

PORT OF BELLINGHAM
Washington State

BELLINGHAM INTERNATIONAL AIRPORT
AIRPORT MASTER PLAN

AIRPORT LAYOUT PLAN

SCALE: 1" = 500'
DATE: APRIL 2015

AIP NUMBER: 03-53-0005-046

SHEET NUMBER: 2 OF 11

BLI - Sheet 02 (ALP).dwg

1.9 IMPLEMENTATION PLAN

An estimate of the probable cost was prepared for all projects. These are shown in Table 1-4 through Table 1-6 and Figure 1-5 through Figure 1-7. The tables also include information regarding the possible sources of funding for the projects. As shown, the cost of implementation is approximately $148 million. Of this, the majority of the projects are eligible for funding under the Airport Improvement Program (AIP).

AIP funds are allocated by a formula driven by the number of annual enplaned passengers. The FAA evaluates all airport grant requests using a priority ranking system weighted toward safety, security, airfield pavement, and airfield capacity projects. Other projects, such as terminal building construction and maintenance and construction of main access/entrance roads, are also eligible but receive lower priority rankings. Within the entitlement amount, up to 90 percent of eligible project costs are funded for airports such as BLI with the remaining 10 percent provided from other, local sources. The following tables and figures present a summary of the recommended projects by phase as well as an explanation of the probable funding sources.

Table 1-4: Phase I Capital Improvement Projects

No.	Project Description	Cost	Funding Sources		
			Federal	Local	Private
Airfield Projects					
1	Perimeter Road Extension	$2,829,708	$2,546,737	$282,971	$0
2	SRE Building	$2,172,752	$1,955,477	$217,275	$0
Terminal Projects					
3	Realign Taxilanes H and J	$1,854,066	$1,668,659	$185,407	$0
4	Construct RON Spaces	$7,820,999	$7,038,899	$782,100	$0
5	Expand Fuel Storage Area	$2,758,000	$0	$0	$2,758,000
	Total Phase I CIP Projects	**$17,435,525**	**$13,209,772**	**$1,467,753**	**$2,758,000**

Notes:

1. The extension of the existing Perimeter Road to completely cover the airport's perimeter is eligible for 90 percent AIP funding and is shown as a 90/10 split.
2. The new Snow Removal Equipment (SRE) building will be funded using AIP funds at a 90/10 split.
3. The realignment of Taxiways H and J will be funded using AIP funds at a 90/10 split.
4. The construction of two RON spaces will be funded using AIP funds at a 90/10 split.
5. The expansion of the fuel storage capacity is assumed to be funded by private sources.

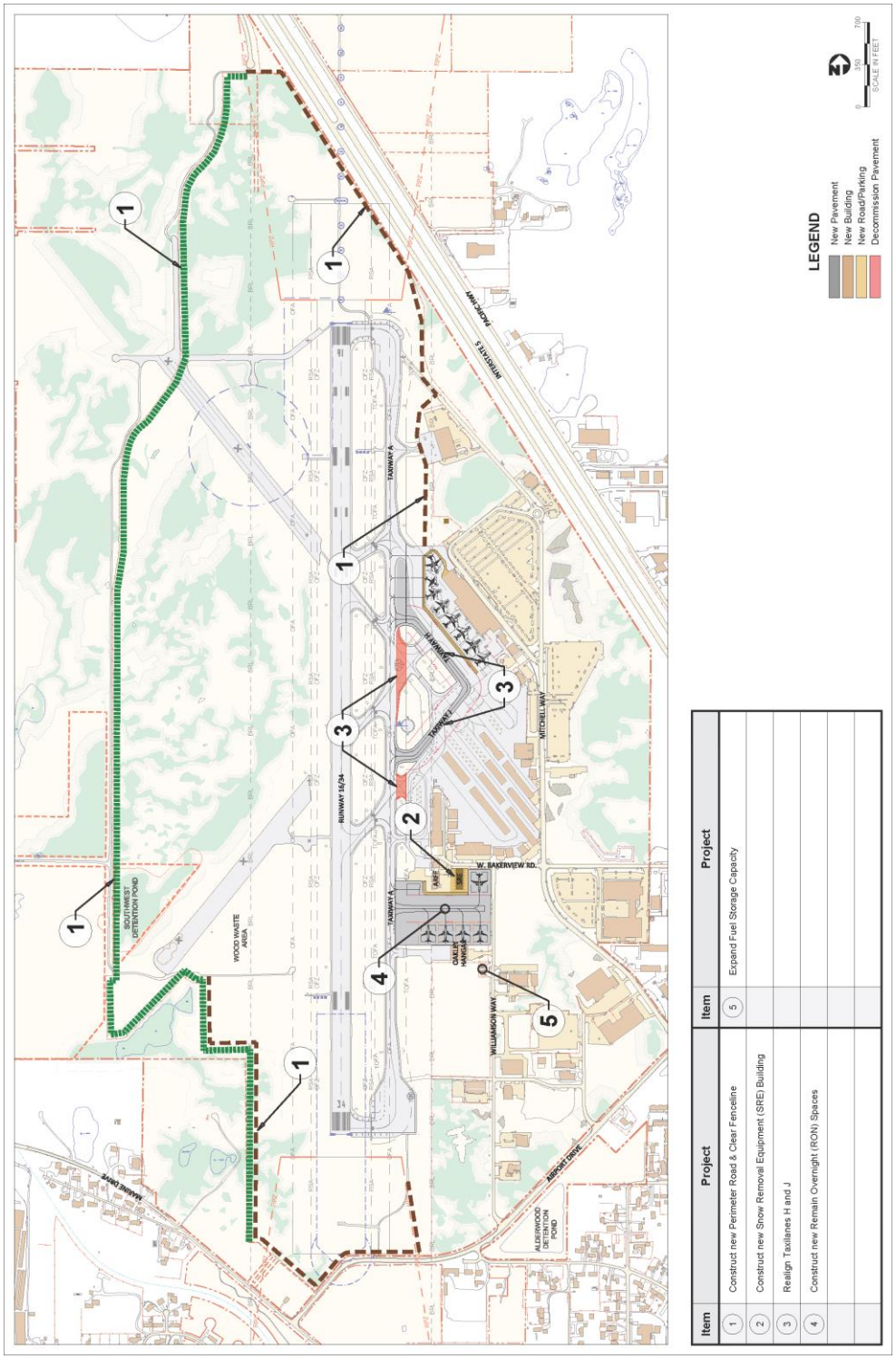


Figure 1-5: Phase I Capital Improvements

Table 1-5: Phase II Capital Improvement Projects

No.	Project Description	Cost	Funding Sources		
			Federal	Local	Private
Airfield Projects					
1	New Right Angle Taxiways	$4,517,880	$4,066,092	$451,788	$0
2	Runway Shoulders	$7,873,401	$7,086,060	$787,340	$0
3	Jet Engine Run-Up Area	$3,292,363	$2,963,126	$329,236	$0
General Aviation Projects					
4	**GA Area Phase 1 Development**				
	- Grading	$501,267	$451,140	$50,127	$0
	- Stabilization	$2,506,333	$2,255,699	$250,633	$0
	- Pavement	$5,012,665	$4,511,399	$501,267	$0
	Relocate the GA terminal	$1,985,760	$0	$1,985,760	$0
	Relocate the GA FIS Building	$1,116,990	$1,005,291	$111,699	$0
	Relocate Existing GA T-Hangars	$6,043,468	$0	$0	$6,043,468
	Relocate Existing GA Corporate Hangars	$4,128,726	$0	$0	$4,128,726
Other Projects					
5	Master Planning	$1,034,250	$930,825	$103,425	$0
6	RAC Facility	$2,758,000	$0	$1,379,000	$1,379,000
7	Noise Study	$689,500	$0	$689,500	$0
	Total Phase II CIP Projects	**$41,460,603**	**$23,269,632**	**$6,639,775**	**$11,551,194**

Notes:

1. The construction of new right angle taxiways and the decommissioning of the existing angled exits is an AIP eligible project with a 90/10 split.
2. The paving of the runway shoulders is also an AIP project with a 90/10 split.
3. Building a jet run-up area will be an AIP project with a 90/10 split.
4. Preparing the GA area will be accomplished with a mixture of funds.
   a. Preparing the site and providing apron and taxiway areas are AIP eligible projects and they are assumed to be a 90/10 split.
   b. During the relocation of facilities, demolition of buildings is AIP eligible and will be funded at the 90/10 split.
   c. Relocating the GA terminal and FIS Facility will be Port funded activities.
   d. When relocating the GA hangars, the Port will negotiate with the owners to "buy out" their leases. After these negotiations are complete, the hangar owners will be offered new leases on which to build new hangar facilities. The actual construction of the hangars is shown to be a private investment.
5. It is assumed that by the mid-range timeframe a new master plan will be needed. This will be an AIP project with a 90/10 split.
6. The construction of a new consolidated Rent-A-Car (RAC) center will be funded by the Port and the RAC companies.
7. The noise study envisioned will be a follow up to the noise contour development included in the master plan. It is assumed that FAA will not support funding for this study so it will be 100% Port funded.

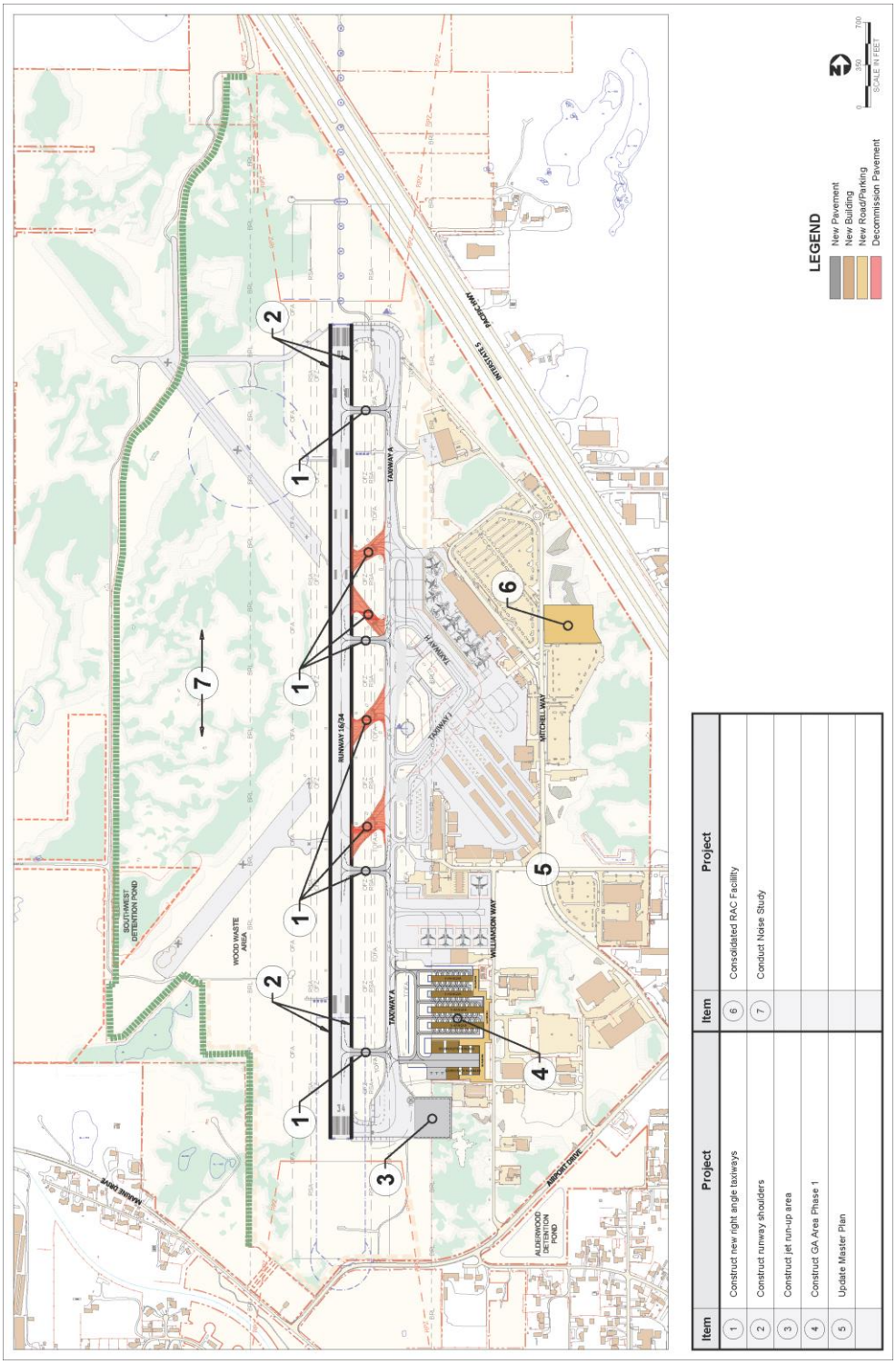


Figure 1-6: Phase II Capital Improvements

Table 1-6: Phase III Capital Improvement Projects

Priority No.	Project	Cost	Funding Sources		
			Federal	Local	Private
Terminal Projects					
1	Expand the Terminal Building	$24,954,384	$0	$24,954,384	$0
2	Expand Terminal Apron	$6,065,532	$5,458,978	$606,553	$0
3	Expand Auto Parking	$7,991,305	$0	$7,991,305	$0
General Aviation Projects					
4	**GA Area Phase 2 Development**				
	Prepare the Site	$6,466,131	$5,819,518	$646,613	$0
	Construct FBO Facility	$620,550	$0	$0	$620,550
	Construct New T-Hangars	$9,397,885	$0	$0	$9,397,885
	Construct New Corporate Hangars	$15,471,925	$0	$0	$15,471,925
Other Projects					
5	Relocate RON Spaces	$15,091,087	$13,581,978	$1,509,109	$0
6	Environmental for Phase 4 GA	$2,068,500	$1,861,650	$206,850	$0
7	Environmental for West Side	$1,379,000	$1,241,100	$137,900	$0
	Total Phase III CIP Projects	**$89,506,298**	**$27,963,224**	**$36,052,714**	**$25,490,360**

Notes:

1. Although portions of the terminal building are eligible for funding under the AIP, they are a low priority under FAA guidance. It is assumed that should expansion be necessary the cost would be financed using PFC and Port funds.
2. The expansion of the terminal apron will be an AIP project with a 90/10 split.
3. Expanding the auto parking areas will be a Port expense.
4. Preparing the GA area will be accomplished with a mixture of funds.
   a. Preparing the site and providing apron and taxiway areas are AIP eligible projects and they are assumed to be a 90/10 split.
5. Relocation of the RON spaces to the terminal apron is an AIP eligible project and will be funded using the 90/10 split.
6. The environmental work for Phase 4 GA development will only be initiated if general aviation demand levels indicate a need. If such a need exists the environmental work will be an AIP project with a 90/10 split.
7. The environmental work for West Side development will only be initiated if general aviation demand levels indicate a need. If such a need exists the environmental work will be an AIP project with a 90/10 split.

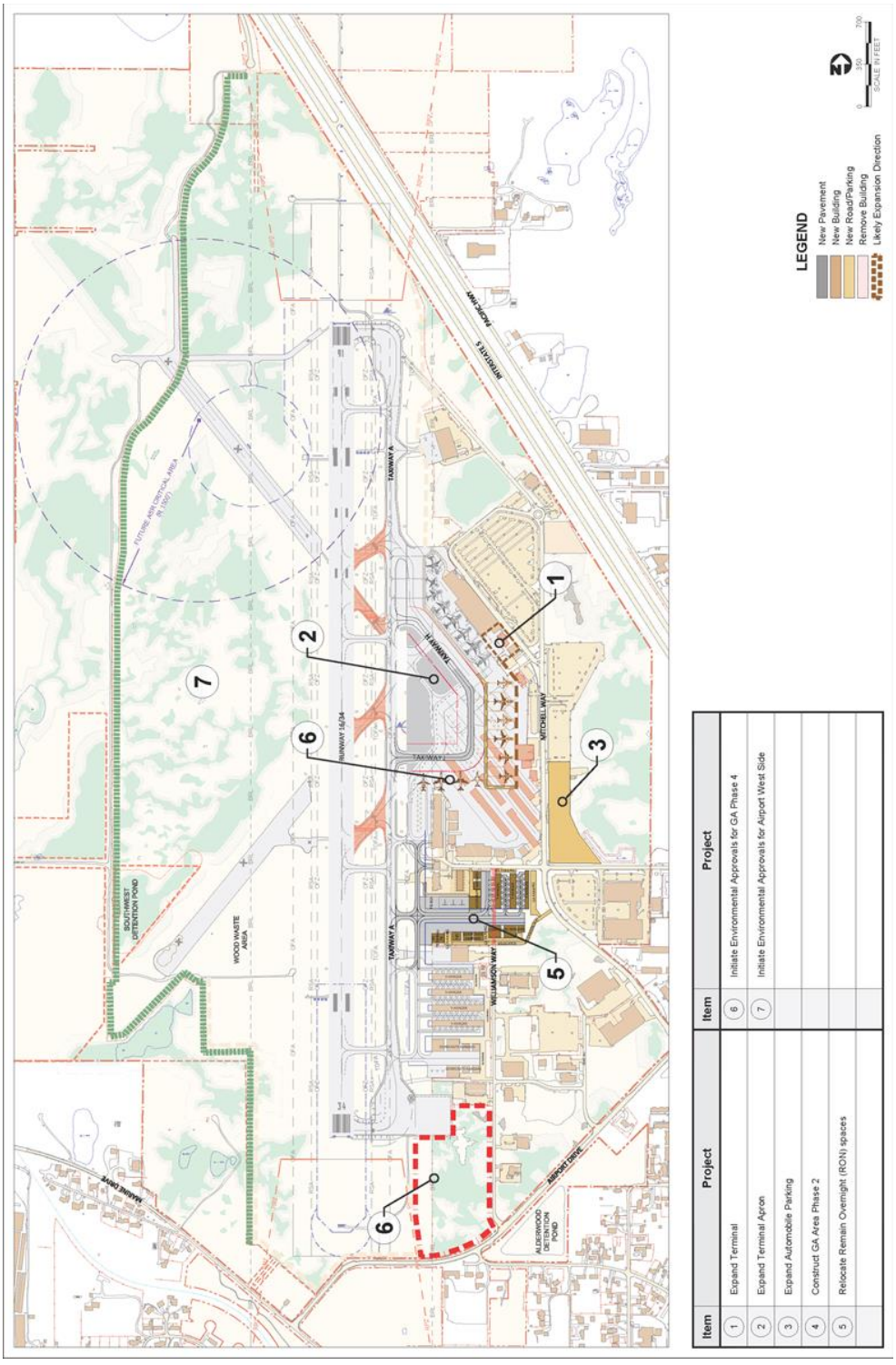
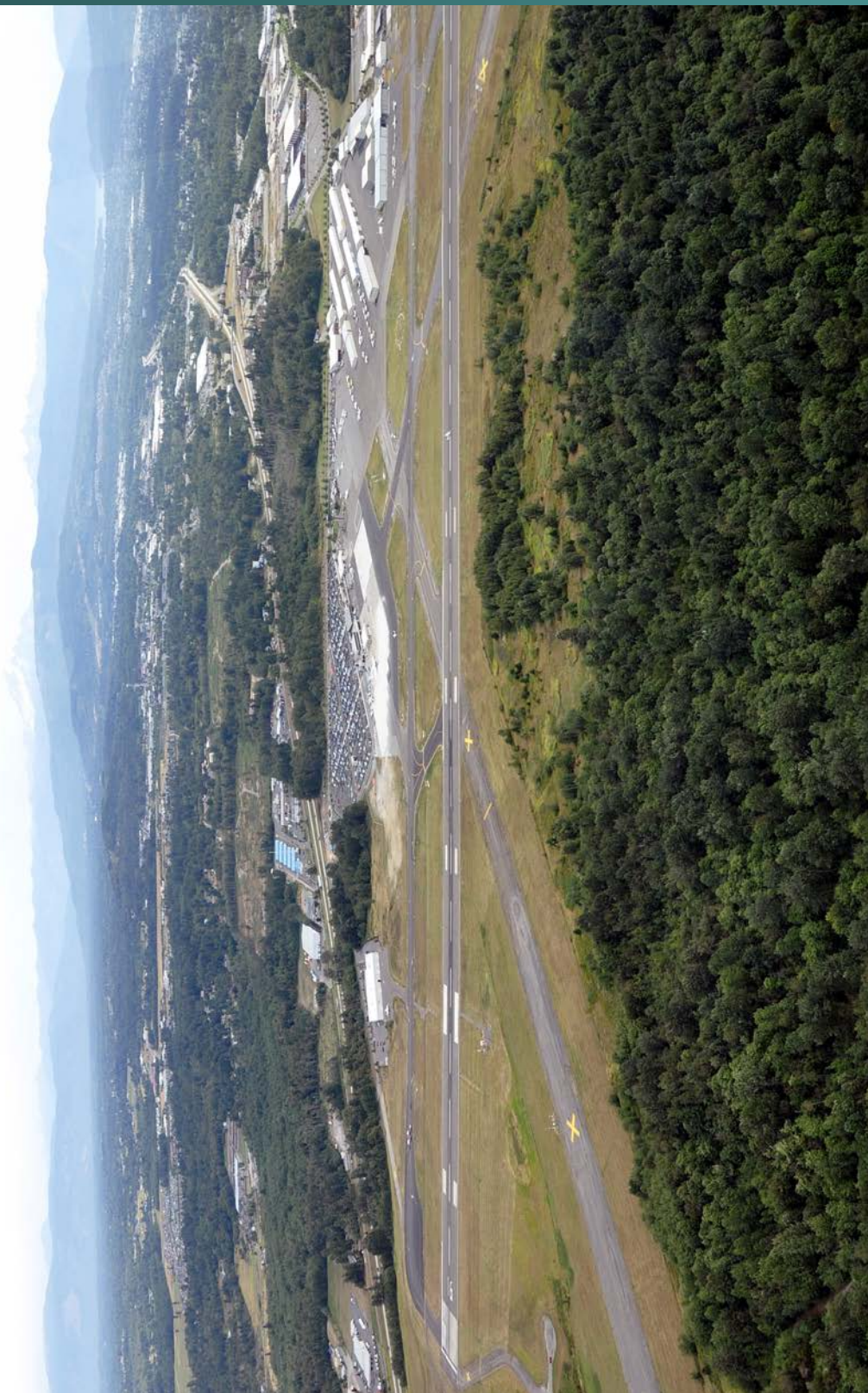


Figure 1-7: Phase III Capital Improvements



2

2 EXISTING CONDITIONS

2.1 INTRODUCTION

Bellingham International Airport (BLI), owned and operated by the Port of Bellingham, is located on approximately 1080 acres of land in Whatcom County three miles northwest of the City of Bellingham. It is bordered by Interstate 5 to the north, Marine Drive to the south, Mitchell Way to the east, and Wynn Road to the west. The airport is classified as a commercial service primary airport by the Federal Aviation Administration (FAA) and the Washington State Department of Transportation (WSDOT) - Aviation Division.

Figure 2-1: Airport Location

The purpose of this chapter is to document conditions at BLI and within the airport's environs as they were found at the commencement of this master plan in February 2012. A thorough effort has been made to provide current information about airport facilities, airspace, airport support services, land use, and the relationship between the airport and the community. Information contained in this chapter has been obtained from various sources including the Bellingham International Airport 2004 Master Plan, the 2010 Airport Layout Plan (ALP), the Washington Department of Transportation Long-Term Air Transportation Study (LATS), the airport 5010 report (effective date 12/15/2011), and the Federal Aviation Administration's National Plan of Integrated Airport Systems (NPIAS). This information has been supplemented and updated through site visits to the airport. Additionally, input has been received from Port, city, and

county personnel, the FAA, WSDOT Aviation Division, members of the Technical Advisory Committee (TAC), and others involved with the airport, its use and operation. The year 2011 serves as the base year from which existing conditions have been documented and all information was collected during the fall of 2011.

2.2 AIRPORT HISTORY

The airport provides primary air transportation access for the City of Bellingham and Whatcom County. The first runway was completed and dedicated on June 1, 1940. It was 3,600 feet long, 150 feet wide, and had a gravel top not yet oiled.

By 1941 with war on the horizon, construction at the airport continued. With National Defense funds and the Army Corps of Engineers, construction was completed on the three paved runways while expanding the property to 350 acres. The original runway was extended to 5,000 feet. The second and third runways were 5,000 and 4,000 feet long respectively. The airport opened to the community on December 7, 1941, the day of the attack on Pearl Harbor, and was subsequently seized by the army for the war effort.

Renamed Bellingham Army Air Field, the airport was utilized extensively throughout the war and by the time it was transferred back to the county in 1946, it had expanded to 910 acres with 38 buildings. In addition, United Airlines had constructed the airport's first terminal building during this time.

In 1957, the county sold the airport to the Port of Bellingham for $1. From then until present time, a variety of airlines made regular stops at the airport. Table 2-1 lists many of these.

Table 2-1: Historical Airlines Serving BLI

Airline	Years in Service at BLI
Pacific Southwest Airlines (became U.S. Air)	1985 - 1987
U.S. Air	1987 - 1991
Horizon Air	1987 - present
Alaska Airlines	1989 - 1992; 2009 - present
United Express	1989 - 2001
San Juan Airlines	1950s - 1989; 2002 - present
Allegiant Air	2004 - present
Delta Airlines	2006 - 2008
Western Airlines	2007
Skybus Airlines	2007-2008

With the arrival of Pacific Southwest Airlines (PSA) in 1985, a new $1 million terminal was constructed to entice commercial jets. However, in 1986, the Port shut down Runway 12/30 due to cost. In the 1990s, Runway 16/34 was lengthened and resurfaced while Runway 2/20 was closed.

In response to unprecedented growth in passenger levels, the Port remodeled and expanded the terminal in 2005 and rehabilitated the runway in 2010 to be able to accommodate Boeing 757 aircraft.

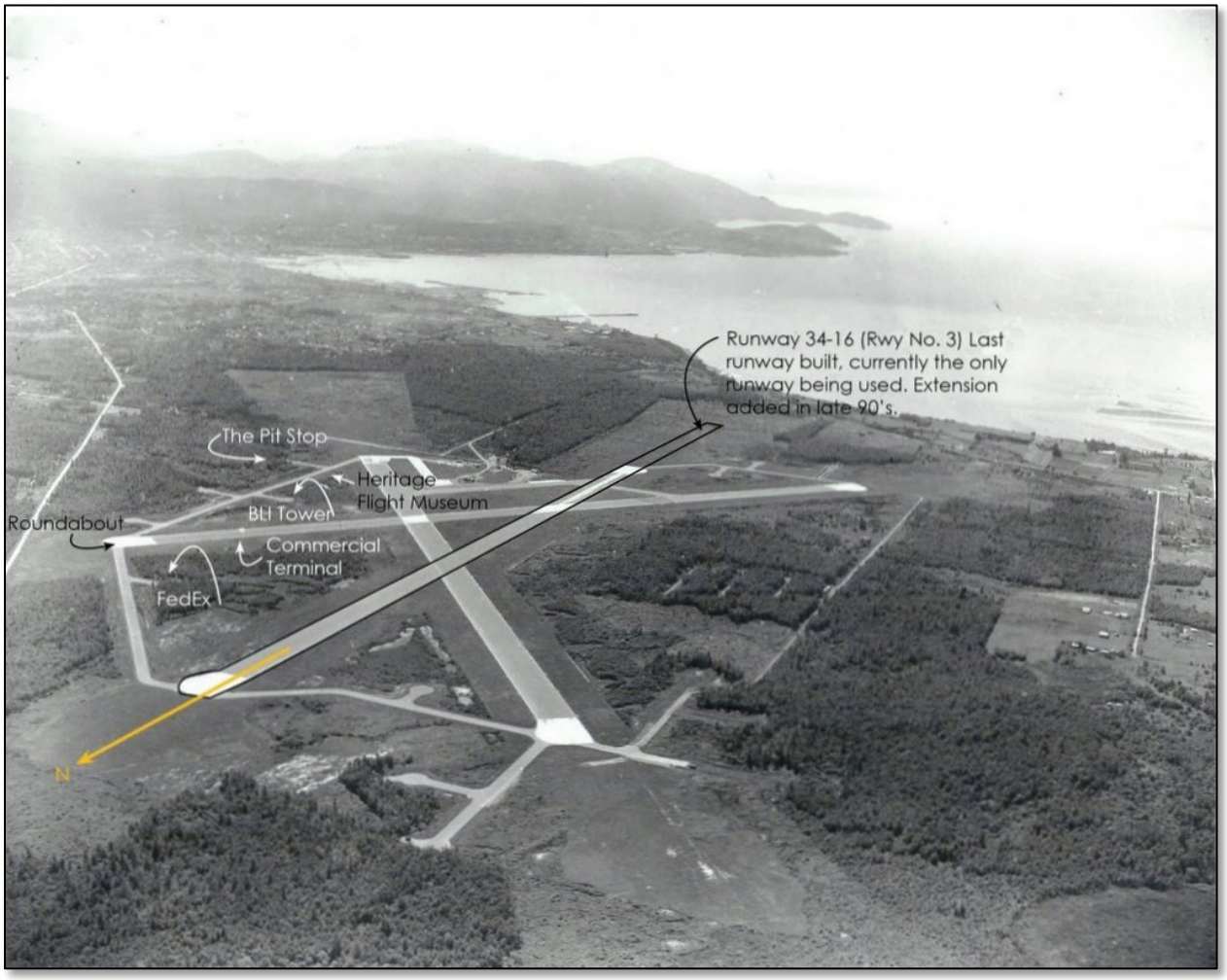


Figure 2-2: 2010 Airport Landmarks Overlaid on 1946 Aerial

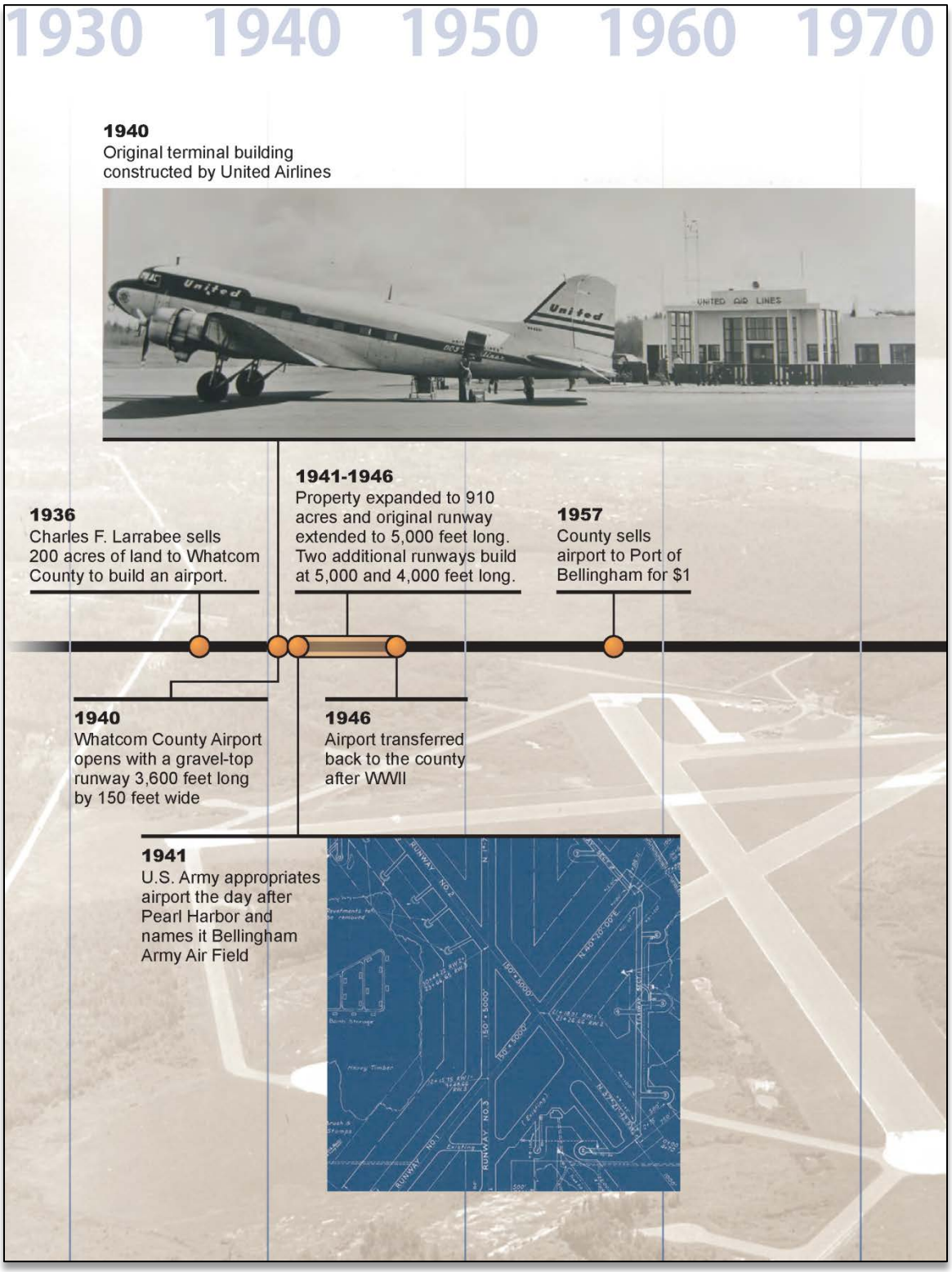


Figure 2-3: Bellingham Aviation Timeline

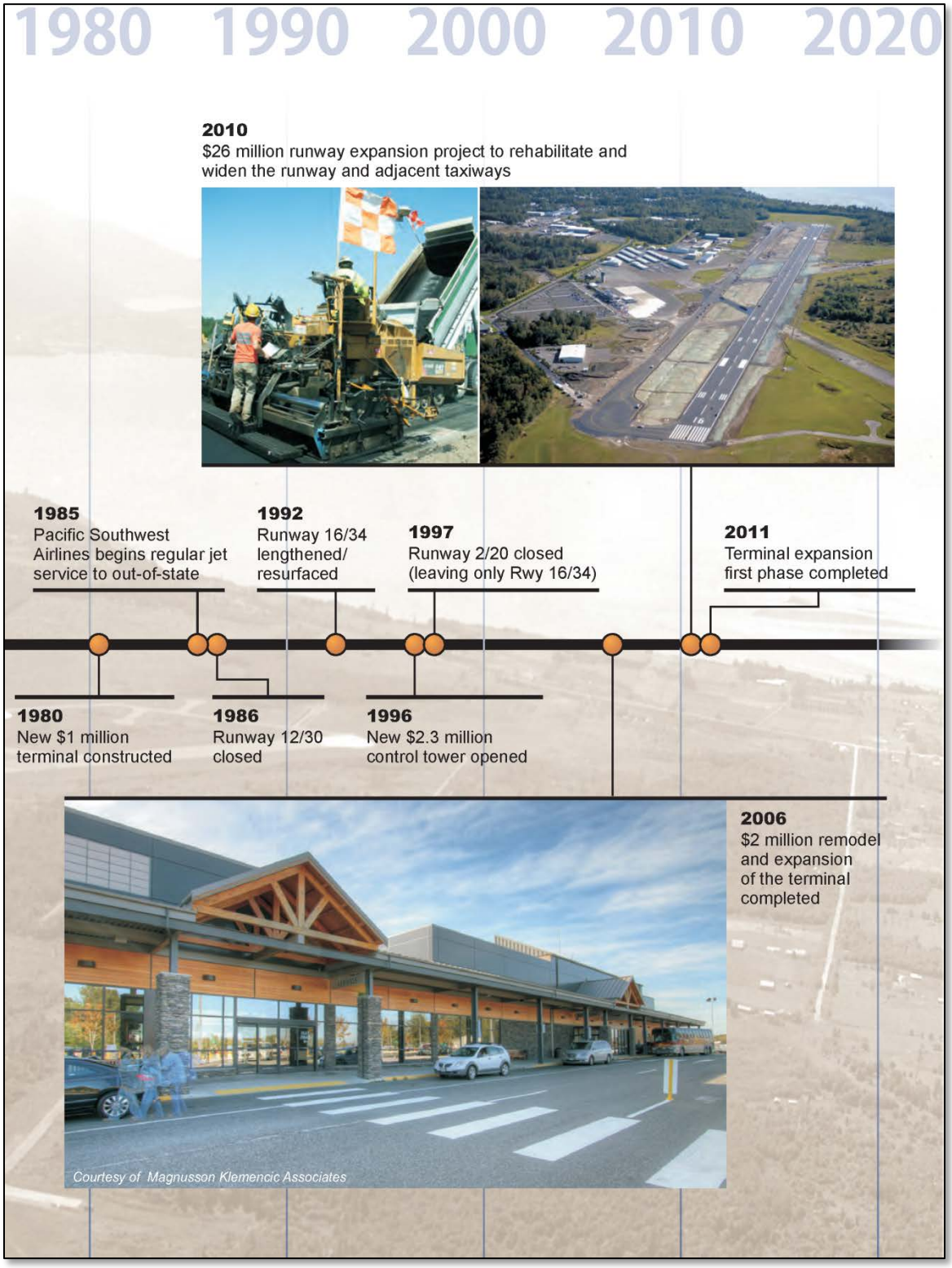


Figure 2-3: Bellingham Aviation Timeline

2.3 EXISTING AIRPORT PLANS

2.3.1 Previous Master Plan Update

The latest BLI Airport Master Plan prepared for the Port of Bellingham was published in 2004 with the forecast updated in 2007 and then again in 2009 due to larger than expected increase in annual passenger levels. The following are the key recommendations of that master plan:

1. Continue pavement management program projects
2. Support landside development projects that expand aeronautical use areas
3. Expand and remodel the passenger terminal building
4. Construct new Aircraft Rescue and Fire Fighting (ARFF) facility

2.4 APPLICABLE FEDERAL/STATE PLANS

2.4.1 FAA National Plan of Integrated Airport Systems (NPIAS)

The National Plan of Integrated Airport Systems (NPIAS) is used by the Federal Aviation Administration (FAA) to identify airports within the United States and its territories that are critical to the nation's air transportation system. Airports listed in the NPIAS are eligible for Federal Development Grants under the Airport Improvement Program (AIP).

Bellingham International Airport is listed as a 'Non-hub Primary Airport' in the NPIAS and is one of nine such airports in Washington State. NPIAS defines a 'Non-hub Primary Airport' as commercial service airports that enplane less than 0.05 percent of all commercial passenger enplanements but have more than 10,000 annual enplanements. There are 244 non-hub primary airports that together account for 3 percent of all enplanements. These airports are heavily used by general aviation aircraft with an average of 95 based aircraft per airport.

2.4.2 Washington State Department of Transportation Long-Term Air Transportation Study (LATS)

The Washington State Department of Transportation's (WSDOT) Long-Term Air Transportation Study (LATS) is a strategic planning effort for the aviation system in Washington. According to the LATS, BLI is classified as a Commercial Service Airport.

Commercial Service Airports provide scheduled passenger air carrier and/or commuter service to in-state, domestic, and (in some cases) international destinations. Some of these airports also

serve regional air cargo demand and many accommodate significant levels of general aviation activity. Commercial Service Airports are mostly located in large population centers. Typically, these airports are classified as *primary* or *commercial service* airports in the NPIAS (WSDOT, 2009).

2.5 AIRPORT FACILITIES

Existing airport facilities at BLI include one active runway and a full parallel taxiway system, runway and taxiway lighting systems, visual and electronic navigational aids, general aviation hangars and tiedown aprons, a passenger terminal building and support facilities, and Airport Traffic Control Tower (ATCT). Figure 2-4 shows the existing facilities at BLI. These are discussed in the following section.

2.5.1 Runways and Taxiways

The airfield at BLI consists of one runway and eight taxiways. Runway 16/34 is 6,701 feet long, 150 feet wide, and has a Category I precision instrument approach available on Runway 16 and non-precision approach on Runway 34. Taxiway A, the full length parallel taxiway, is 75 feet wide and has a runway/taxiway centerline separation distance of 410 feet. The runway has been constructed to meet FAA design standards for safety and operational efficiency. Relevant data for Runway 16/34 is listed in Table 2-2.

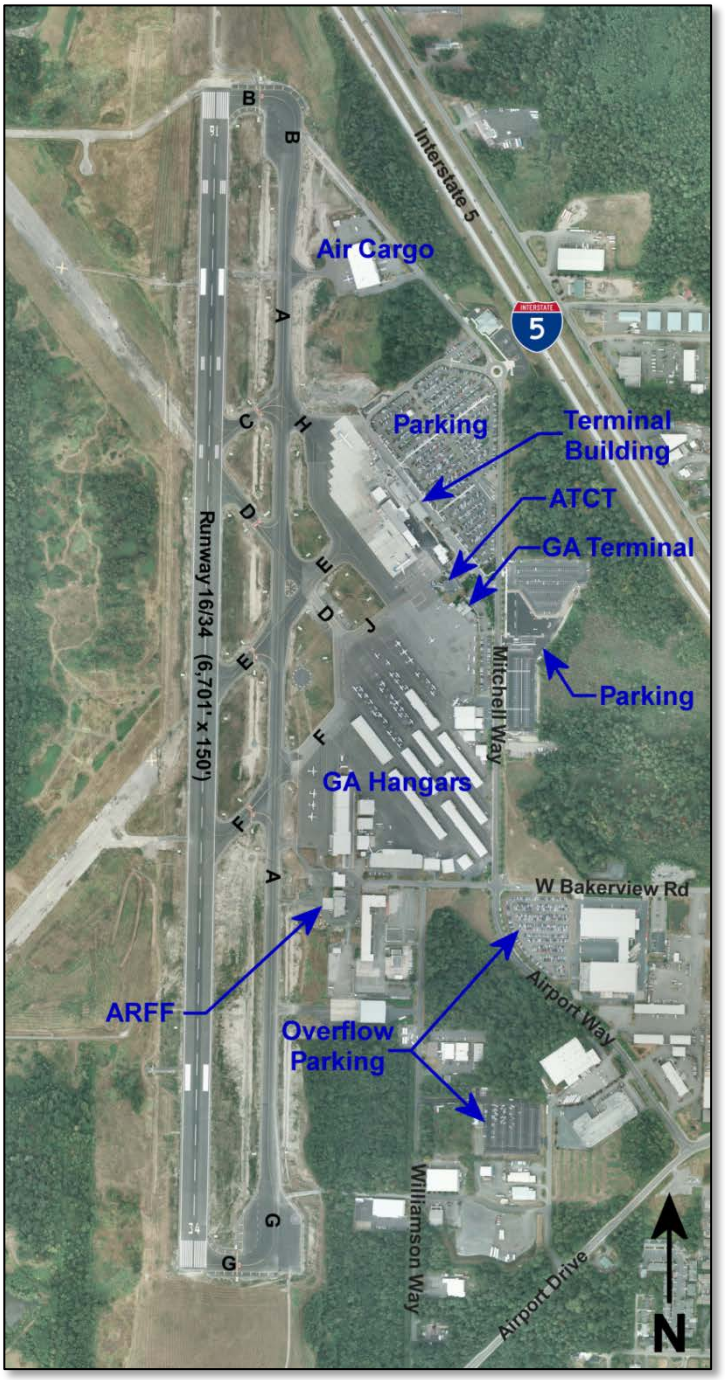


Figure 2-4: Existing Airport Facilities

Table 2-2: Airport Runway Data

		Runway 16/34	
Runway Dimensions	Length:	6,701’	
	Width:	150’	
Pavement Type		Asphalt	
Pavement Strength (in 1,000 lbs.)		75(S), 160(D),250(DT)	
Runway Safety Area (RSA)		8,701’ x 500’	
Object Free Area (OFA)		8,401’ x 800’	
Obstacle Free Zone (OFZ)		7,100’ x 400’	
Runway Lighting		HIRL	
Runway End		**16**	**34**
Runway Approach Category		Precision	Non-Precision
Runway Approach Slope		50:1	34:1
Runway Markings		Precision	Non-Precision
Instrumentation / Approach Aids		ILS/DME, RNAV	RNP, GPS
Visual Aids		PAPI, MALSR	PAPI
Critical Aircraft		Boeing 757-200	
Wingspan:		124.8’	
Weight:		241,000 (Ramp weight)	
Approach Speed:		137 knots	
Airport Reference Code (ARC)		C-IV	

S - Single-wheel Gear
D - Dual-wheel Gear
DT - Dual-tandem Gear
DME - Distance Measuring Equipment
ILS - Instrument Landing System
MIRL - Medium Intensity Runway Lights
HIRL - High Intensity Runway Lights
MALSR - Medium Intensity Approach Lighting System
PAPI - Precision Approach Path Indicator
RNP – Required Navigation Performance

2.5.1.1 Airport Reference Code (ARC)

The Airport Reference Code (ARC) was developed by the FAA to relate airport design criteria to the operational and physical characteristics of the most demanding types of aircraft expected to operate at the airport on a regular basis. The ARC is based on two key characteristics of the Critical Aircraft. The first, denoted by a letter, is the Aircraft Approach Category. This is based on the aircraft’s approach speed in the landing configuration. Generally, aircraft approach speed affects runway length, exit taxiway locations, and runway-related facilities. The ARC approach speed categories are as follows:

- Category A: Speed less than 91 knots;
- Category B: Speed 91 knots or more, but less than 121 knots;
- Category C: Speed 121 knots or more, but less than 141 knots;
- Category D: Speed 141 knots or more, but less than 166 knots; and
- Category E: Speed 166 knots or more.

The second component, depicted by a roman numeral, is the Airplane Design Group. This is based on the aircraft's wingspan and used to determine dimensional standards for the layout of airport facilities, such as separation between runways and taxiways, taxilanes, buildings, or objects potentially hazardous to aircraft movement on the ground. The categories include:

- Design Group I: Wingspan up to but less than 49 feet;
- Design Group II: Wingspan 49 feet up to but less than 79 feet;
- Design Group III: Wingspan 79 feet up to but less than 118 feet;
- Design Group IV: Wingspan 118 feet up to but less than 171 feet;
- Design Group V: Wingspan 171 feet up to but less than 214 feet;
- Design Group VI: Wingspan 214 feet up to but less than 262 feet.

Currently, BLI has an Airport Reference Code (ARC) of C-IV and Runway 16/34 is classified as a C-IV runway based on forecast use by Boeing 757 aircraft. The dimensional design criteria for a C-IV category runway are shown in Table 2-3. This table also provides a comparison of FAA standards with existing conditions on Runway 16-34. As seen in this table, the runway meets FAA standards at the present time except in the area of runway shoulder width and the runway blast pads.

Table 2-3: Existing Conditions vs. C-IV Design Criteria (Runway 16/34)

Design Feature	Existing (ft.)	Standard (ft.)	Difference
Runway			
Width	150	150	Meets Standard
Runway Shoulder Width	0	25	-25 feet
Runway Blast Pad Width	0	200	-200 feet
Runway Blast Pad Length	0	200	-200 feet
Runway Safety Area (RSA) Width	500	500	Meets Standard
Safety Area Length (beyond RWY end)	1,000	1,000	Meets Standard
Object Free Area (OFA) Width	800	800	Meets Standard
Object Free Area Length (beyond RWY end)	1,000	1,000	Meets Standard
Obstacle Free Zone (OFZ) Width	400	400	Meets Standard
Obstacle Free Zone Length (beyond RWY end)	200	200	Meets Standard
Taxiway			
Width	75	75	Meets Standard
Safety Area Width	171	171	Meets Standard
Object Free Area Width	259	259	Meets Standard
Taxilane Object Free Area Width	225	225	Meets Standard
Runway Centerline to:			
Taxiway Centerline	410	400	+10 feet
Aircraft Parking Area	600	500	Meets Standard
Taxiway Centerline to Fixed or Movable Object	129.5	129.5	Meets Standard
Taxilane Centerline to Fixed or Movable Object	112.5	112.5	Meets Standard

Source: FAA Advisory Circular 150/5300-13, Airport Design, Change 6

2.5.1.2 Airfield Lighting and Navigational Aids

The following visual and electronic navigation and landing aids are available at BLI. As indicated in Table 2-4, Runway 16 is equipped with an Instrument Landing System (ILS) including a localizer, glide slope and Medium Intensity Approach Lighting System (MALSR) for a precision instrument approach with a 50:1 slope. The runway end has precision runway markings, a Precision Approach Path Indicator (PAPI), and High Intensity Runway Lights (HIRL).

Runway 34 is equipped for a non-precision approach with a 34:1 slope. This runway end has non-precision markings, a PAPI, and HIRL.

Table 2-4: Navigational Aids

Navigational Aid	Rwy 16	Rwy 34
PAPI	✈	✈
REIL	✈	✈
GPS	✈	✈
Rotating Beacon	✈	✈
MALSR	✈	
ILS – Glideslope Antenna	✈	
Localizer	✈	
Compass Locator	✈	✈
Lighted Windsock	✈	✈

2.5.1.3 Airfield Signage

The airport incorporates standard runway and taxiway signage, and meets all FAA standards.

2.5.1.4 Published Instrument Approaches

Instrument Procedures

Precision Instrument and Non-Precision Approaches are available to Runway 16 and non-precision approaches are available for Runway 34. The pilot approach plates for these are contained in Appendix D to this report and listed in Table 2-5.

Table 2-5: Published Procedures

Instrument Approach Procedures	Departure Procedures
ILS OR LOC RWY 16	KIENO FOUR
RNAV (GPS) RWY 16	
RNAV (GPS) RWY 34	

2.5.1.5 Runway Safety Areas

The Runway Safety Area (RSA) is a critical, two-dimensional area surrounding each active runway. The RSA must be:

- Cleared, graded, and free of potential hazardous surface variations,
- Properly drained,

- Capable of supporting ARFF equipment, maintenance equipment, and aircraft,
- Free of objects, except for those mounted using low-impact supports and whose location is fixed by function.

Based on FAA Criteria from Advisory Circular 150/5300-13 for a C-IV runway, the RSA for Runway 16/34 should be 500 feet wide extending 1,000 feet beyond each runway end. Presently the RSA for Runway 34 is in compliance with these standards but on Runway 16 the northeast corner of the RSA is not in compliance. In this corner 6,750 sf is not owned by the Port. FAA has issued a Memorandum addressing this Safety Area Determination in February 2005.

2.5.1.6 Runway Object Free Areas

The Runway Object Free Area (OFA) is a two-dimensional ground area surrounding each runway. The OFA clearing standard precludes parked aircraft or other objects, except NAVAIDs and other facilities whose locations are fixed by function from this area. For Runway 16/34 OFA is 800 feet wide, centered on the runway centerline, and extends 1,000 feet beyond the end of the runway.

2.5.1.7 Runway Protection Zone

The Runway Protection Zone (RPZ) is trapezoidal in shape and centered on the extended runway centerline for each runway end. Its function is to enhance the protection of people and property on the ground. It begins 200 feet beyond the permanent runway threshold. The RPZ dimensions are based on the type of aircraft using the runway, type of operations (visual or instrument) being conducted, and visibility minimums associated with the most demanding approach available. RPZ dimensional standards are defined in the FAA Advisory Circular 150/5300-13, Airport Design. The dimensions for the RPZs at BLI are shown in Table 2-6.

Table 2-6: Runway Protection Zone (RPZ)

Runway	Aircraft Served	Approved Approach	Zone Length	Inner Width	Outer Width	Acres
16	Large	Precision	2,500’	1,000’	1,750’	78.914
34	Large	Non-Precision	1,700’	1,000’	1,510’	48.978

The airport owns or has easements on all property within the RPZ for each runway end.

2.5.1.8 FAR Part 77 Surfaces

Under Part 77 of the Federal Aviation Regulations (FAR), standards are established for determining obstructions to navigable airspace. The regulation also provides for aeronautical studies of obstructions to determine their effect on the safe and efficient use of airspace.

Local jurisdiction protects FAR Part 77 surfaces and has incorporated the requirements set forth by the FAA into their zoning regulations and practices. The objective is to maintain the surrounding airspace and keep it free of obstacles that impede on aircraft operation. These regulations dictate the type of infrastructure and development allowed adjacent to and near the airport as well as the height of these objects. The five surfaces that together make up the FAR Part 77, Imaginary Surfaces for a civil airport are the Primary, Approach, Transitional, Horizontal and Conical Surfaces.

Figure 2-5 shows each element of the Imaginary Surfaces as they relate to each other and the runways and Figure 2-6 shows the Part 77 Surfaces for BLI.

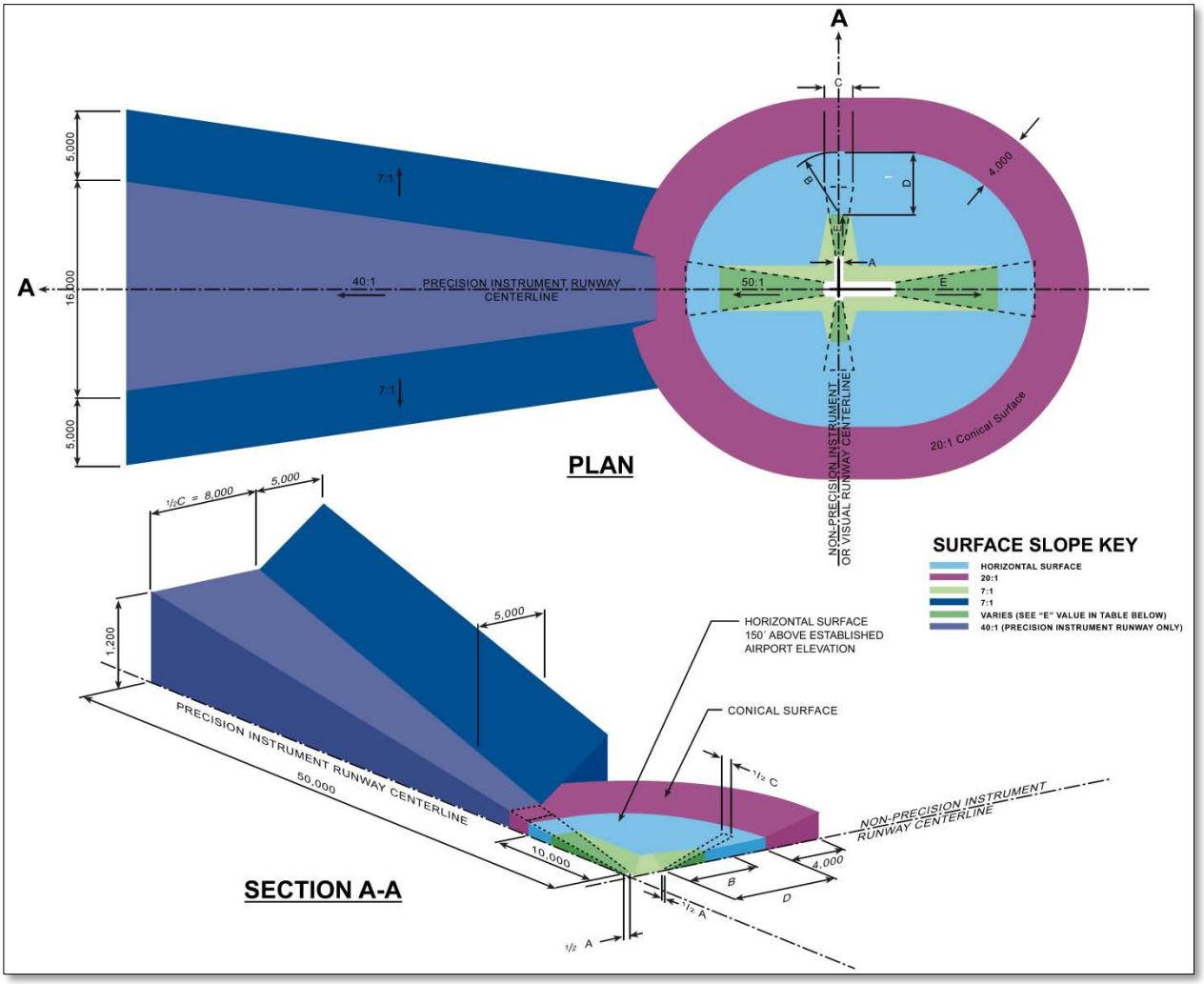
Primary Surface

The primary surface is an imaginary surface that is longitudinally centered on the runway and extends 200 feet beyond the end of each runway. The elevation of any point of that surface is equal to the elevation of the nearest point on the runway centerline. The width varies, depending on the type of approach available to the runway. For BLI, Runway 16 has a precision instrument approach with visibility minimums as low as three-fourths of a statute mile, while Runway 34 has a non-precision instrument approach. As a result, the primary surface is 1,000 feet wide centered on the runway centerline.

Approach Surface

The approach surface is an inclined slope extending outward and upward from each end of the primary surface centered on the extended runway centerline. The inner width of the surface is the same as that of the primary surface. The approach surface is applied to each end of the runway based on the type of approach available or planned for that runway end.

Runway 16 is designated as a precision instrument runway. The approach surface for this runway is 1,000 feet wide where it intersects with the primary surface and expands uniformly for a distance of 10,000 feet at a slope of 50:1. It continues outward and upward for an additional 40,000 feet at a slope of 40:1 where the final width is 16,000 feet. Runway 34 is a non-precision runway with an approach surface starting at the primary surface with a width of 1,000 feet then expanding uniformly for a distance of 10,000 feet at a slope of 34:1 reaching a final width of 3,500 feet.



Source: Washington State Department of Transportation, Aviation Division

Figure 2-5: FAR Part 77, Imaginary Surfaces - Diagram

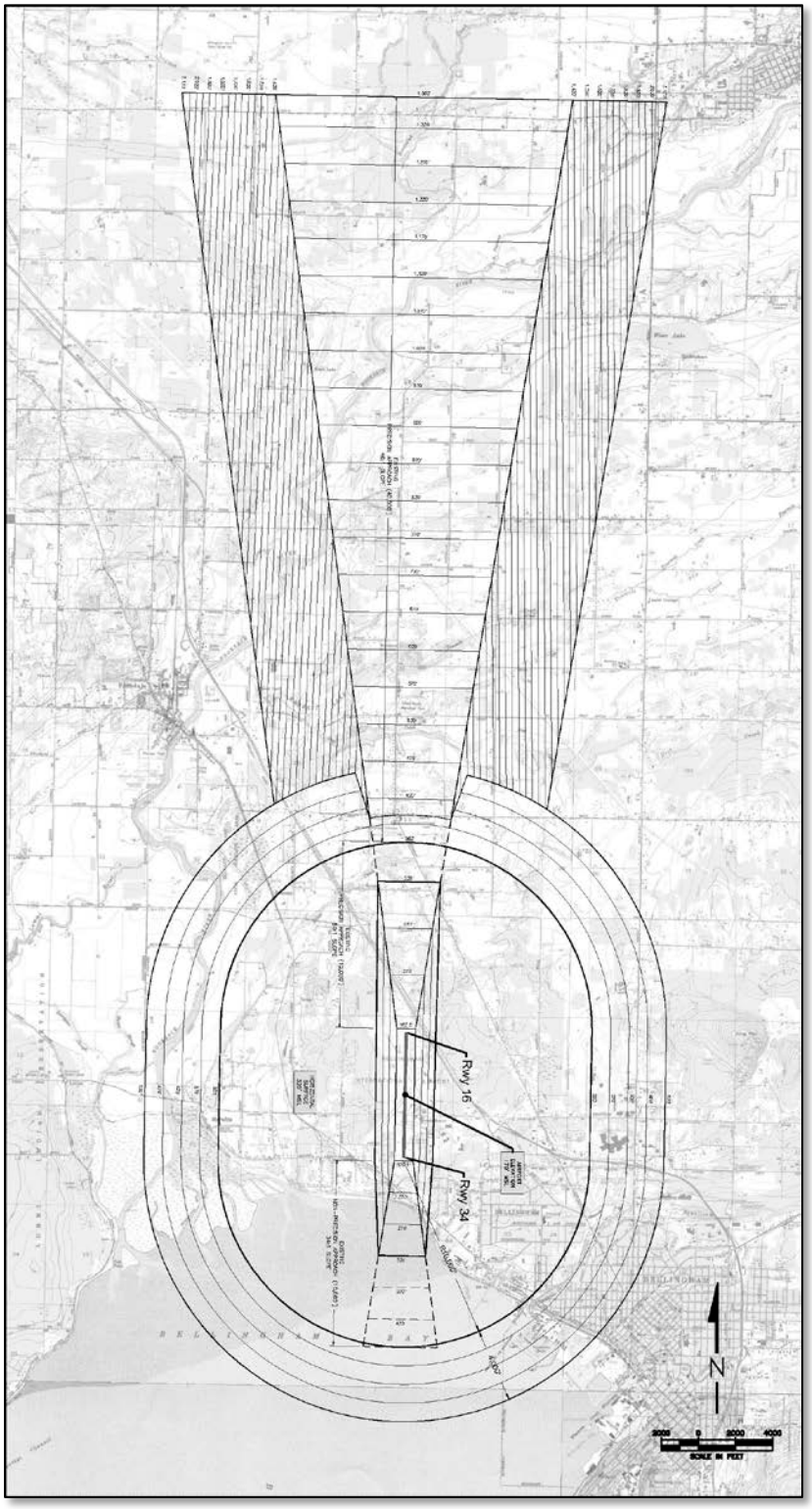


Figure 2-6: FAR Part 77, Imaginary Surfaces for BLI

Horizontal Surface

The horizontal surface is a horizontal plane 150 feet above the established airport elevation. BLI has an established elevation of 170 feet MSL (above Mean Sea Level) so the horizontal surface is 320 feet MSL. The perimeter of the surface is determined by arcs extending from the centerline of the runway and its intersection with the primary surface. The radii of these arcs correspond with the approach surface lengths for each of the runway ends. At BLI, both runway ends use a radius of 10,000 feet.

Transitional Surface

The transitional surface is an inclined plane with a slope of 7:1, extending upward and outward at right angles to the runway centerline from the primary surface and the sides of the approach surfaces. These surfaces terminate where they intersect with the horizontal surface or another surface with more critical restrictions.

Conical Surface

The conical surface is an inclined plane at a slope of 20:1, extending upward and outward from the periphery of the horizontal surface for a distance of 4,000 feet.

2.5.2 Terminal Area

The terminal area at Bellingham International Airport, shown in Figure 2-7, is located along the eastern side of the airport north of the general aviation area. It consists of the passenger terminal building, the commercial aviation aircraft parking apron, the Airport Traffic Control Tower (ATCT), and automobile parking. Access is via Mitchell Way.

2.5.2.1 Passenger Terminal Building

The Passenger Terminal Building opened for service in 1940 and was reconstructed in 1980. In 2005, the terminal was remodeled and expanded to enclose the baggage claim area, install a TSA checkpoint, and add a modular gate lobby building as an interim to address passenger growth. The terminal building was again expanded and remodeled in 2011 as part of a two-phase construction project. This included an additional 20,000 square feet which included an airside gate lobby. The mechanical/electrical infrastructure was also upgraded to meet the needs of a 150,000 square foot building in anticipation of future growth. Phase II of the project will be completed in 2014 and will further expand the terminal to approximately 100,000 square feet. This will expand the ticket lobby and baggage claim lobbies as well as renovate the existing 1980/1987 building. Figure 2-7 and Figure 2-8 show the Phase I and II build-outs, respectively.

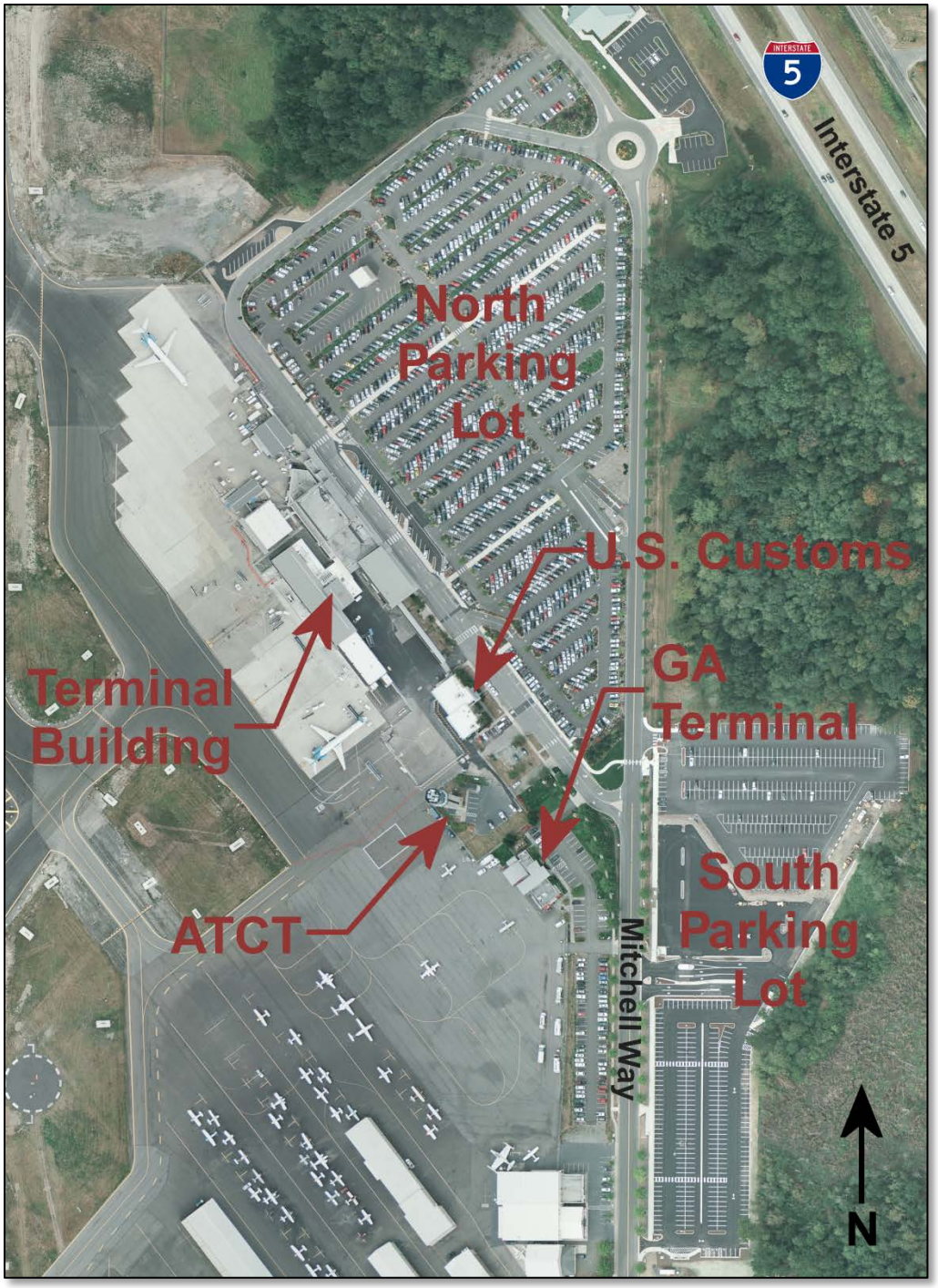


Figure 2-7: Terminal Area

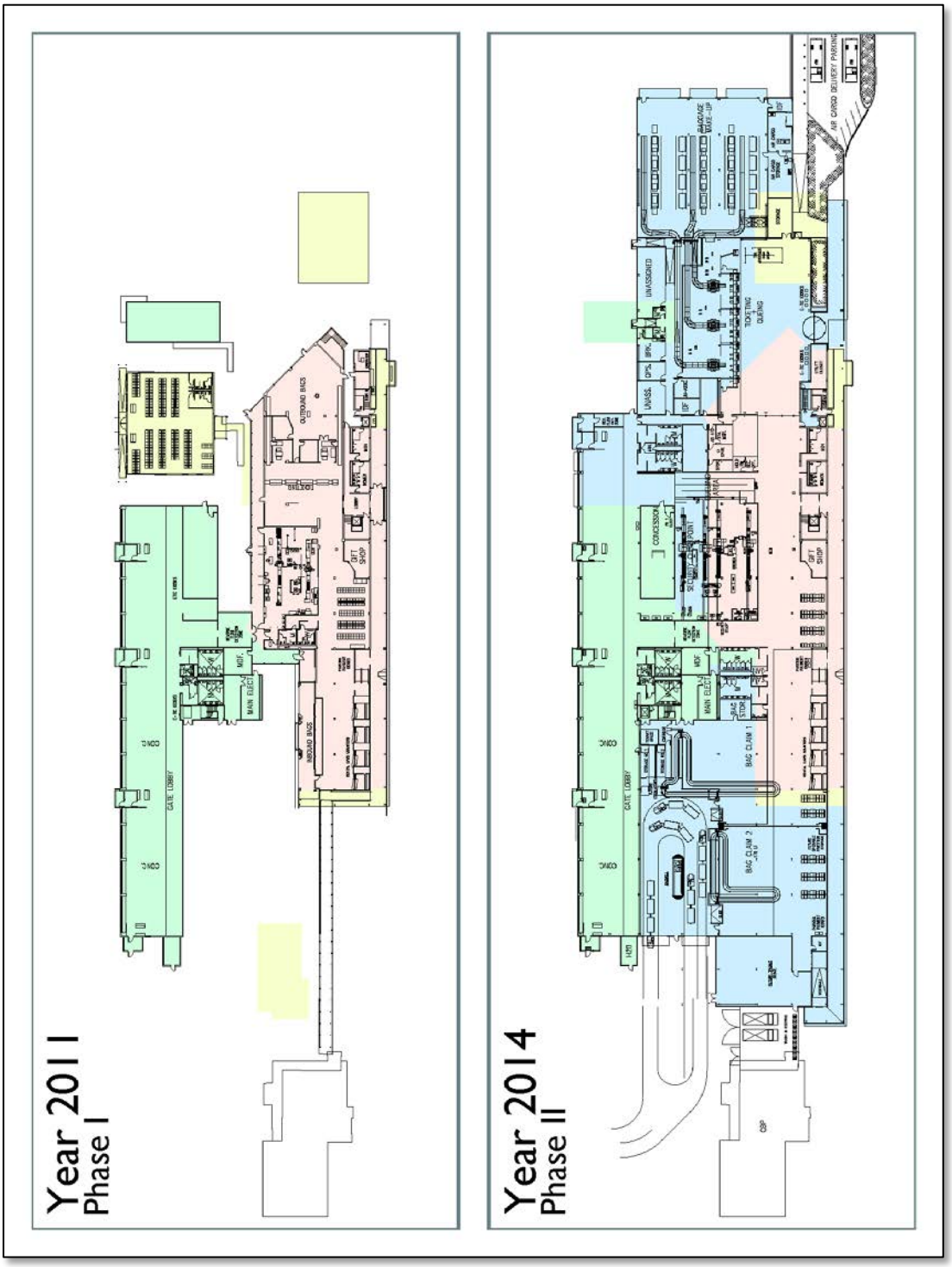


Figure 2-8: Terminal Floor Plan (First Floor) - Phases I and II

2.5.2.2 Terminal Apron Area

Aircraft parking is arranged along the terminal concourse and consists of 8 active gate positions. These positions are reached using Taxiways H, E, and F. All are power-in/push-out positions. There are currently 2 remain overnight (RON) positions provided, two on the north side of the terminal at gate number 1 position.

2.5.2.3 U.S. Customs/Immigration

The U.S. Customs and Immigration Service operate from the International Arrivals facility located adjacent to the terminal. From there, they are available to process international flights at the airport. Their on-airport facilities include office space and approximately 3,375 square feet of apron fronting the ATCT which is reserved for incoming international aircraft parking.

2.5.2.4 Airport Traffic Control Tower (ATCT)

The airport is served by a contract Level 1 ATCT with radar support from NAS Whidbey Island. Hours of operation at the time of this report are from 7:00am to 10:30 pm daily. ATCT personnel have identified a group of trees located north of the terminal that block their line-of-sight for aircraft on the final approach to Runway 16.

2.5.2.5 Aircraft Rescue and Fire Fighting (ARFF)

Bellingham International Airport (BLI) is classified as an Index C airport per Federal Aviation Regulations (FAR) 139.315. The ARFF is located south of the general aviation area at the end of W Bakerview Road. The building was constructed in 2009 and has three truck bays which house an Oshkosh 1500 Striker, E-One 1500, and an Oshkosh T3000.

2.5.2.6 Access

Main access to the airport from Interstate 5 is via the Bakerview Way interchange. Due to increasing economic development in the area, the interchange is increasingly congested. A multi-agency Value Planning Study was completed in May of 2011 and recommended widening and restriping the section between Pacific Highway on the east side of the freeway and Bennett Drive on the west.

2.5.2.7 Automobile Parking

Public parking is provided in the main north parking lot directly opposite the terminal as well as south east of the main lot in Development Area 4 of the Binding Site Plan. The main north lot

contains 1,237 pay parking stalls and 17 Americans with Disabilities Act (ADA) stalls. The Development Area 4 lot contains 791 pay parking stalls, 15 ADA stalls, and 3 Recreational Vehicle (RV) stalls. In addition to the pay lots, there are 16 no-pay 30-minute parking stalls directly across from the terminal and a cell phone parking lot just north of the main lot with 11 stalls. There are two overflow lots located south of the terminal. The first is located at the intersection of W. Bakerview Road and Airport Way in Development Area 7. This is a gravel lot with 448 parking spots. The second lot is located on Williamson Way in Development Area 15. This is a paved lot with 314 parking spots.

Currently, Rent-a-Car (RAC) parking is located in the northern section of the main north lot with employee parking provided by the roundabout as well as south of the general aviation terminal.

2.5.2.8 Air Cargo

Air cargo activity occurs at several locations on the airport. FedEx operates from a facility on the north side of the airfield and UPS operates from the apron fronting the GA Terminal. Alaska/Horizon Air cargo operates from the main passenger terminal.

2.5.3 General Aviation Facilities

Located south of the terminal area is the general aviation (GA) area. The GA area consists of all facilities required to service and support general aviation activity at BLI. The existing facilities are depicted in Figure 2-9. According the airport's form 5010, there are currently 188 aircraft based at the airport including 177 single-engine piston, six multi-engine piston, and five jet engine aircraft as well as four helicopters. The general aviation apron has tiedowns for 86 based aircraft as well as eight for transient aircraft.

2.5.3.1 FBO (Fixed Base Operator) and Support Services

Command Aviation Inc. and Bellingham Aviation Services are full service FBOs offering aircraft services and maintenance, aviation fuel, and flight schools. Both FBOs lease space in the General Aviation Terminal. In addition, Command Aviation provides aviation maintenance from a hangar (Building #2 in Figure 2-9) located next to the ARFF facility as well as a flight school from Building #8.

2.5.3.2 General Aviation Terminal

The airport has a dedicated general aviation terminal located next to the Air Traffic Control Tower. The terminal is approximately 5,300 square feet and includes a conference room. Both Command Aviation Inc. and Bellingham Aviation Services lease space in the terminal.

ID	Tenant	ID	Tenant	ID	Tenant
1	ARFF Station	10	TEK	19	Solar
2	Command Aviation Maintenance	11	Haggen II	20	Alto
3	CBP/Air Marine	12	Haggen	21	Plank
4	Lonetree	13	Strato	22	Definitive Avionics
5	Alpha	14	Strato II	23	Heritage Flight Museum
6	Alpha II	15	Cirrus	24	Northwest Sky Ferry
7	KVAMME	16	Echo	25	General Aviation Terminal
8	Command Aviation Flight School	17	Delta	26	Oakley
9	Exploration Air	18	Nimbus		

Figure 2-9: General Aviation Area

2.5.4 Fuel Storage and Distribution

Jet A and Avgas aircraft fuel is provided by the FBOs. They operate four above-ground storage tanks each with a capacity of 100,000 gallons which is located on Williamson Way across from the Army National Guard. Fuel is distributed by truck. There are two additional above-ground 12,000-gallon tanks for self-fueling of Avgas located in the GA hangar area near the intersection of Taxiways A and F.

Command Aviation and BAS operate the 100LL self-service station located mid-field.

2.5.5 Deicing

The airplane deicing area is located at the north and south portion of the terminal apron. Run-off from this area is captured and diverted to a 16,000-gallon and a 20,000-gallon storage tank.

2.5.6 Airport Maintenance Facilities

Maintenance facilities for the airport are located in the old Air National Guard area.

2.5.7 Utility Systems

Utilities to the airport are routed along Mitchell Way, W. Bakerview Road, and Williamson Way. Water and Sewer mains are owned by City of Bellingham with two lift stations on Mitchell Way. Natural gas is provided by Cascade Natural Gas and electricity by Puget Sound Energy.

2.5.8 Perimeter Fencing

The airport's Airport Operation Area (AOA) is completely enclosed by a perimeter security fence. It is comprised of 7- and 8-foot-high chain link fencing topped with 3-strand barbed wire. There are twenty-one (21) security gates on the perimeter fence that allow access to the AOA at various places around the property.

2.5.9 Perimeter Roadway

The airport maintains a perimeter roadway to provide for emergency response as well as for operational purposes such as security and wildlife control. The current perimeter road is not complete on the west side of the airport.

2.6 ENVIRONMENTAL DATA

2.6.1 Surface Water Management

The airport is divided into 10 basins, each draining to a separate outfall. Based on the Stormwater Management Master Plan completed in 2009 by David Evans and Associates Inc., the current stormwater system contains 2 regional detention ponds (Alderwood and Southwest) which collect runoff from both the airside and ground side of the airport.

2.6.2 Soils and Geology

Data for soils on airport property was obtained from the Soil Survey of Whatcom County Area, Washington (Soil Survey) published by the NRCS as listed in the SEPA Environmental Checklist prepared for the airport's Binding Site Plan. There are four soil types for the site: #172 – Urban Land, Whatcom, and Labounty complex, #178 and #179 – both Whatcom silt loam; and, #182 – Whatcom – Labounty silt loam. The Whatcom silt loams (types 178 and 179) both have a Hydrologic Group "C" classification. The Whatcom and Labounty mixes (types 172 and 182) have a Hydrologic Group "C" and "D" classification.

2.6.3 Wetlands Delineation

Wetlands are defined under the Washington State Wetland Identification and Delineation Manual (1997) or as amended, as those areas inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation adapted for life in saturated soil conditions. Land areas meeting the wetland designation criteria, regardless of any formal identification or designation as wetlands, must be considered critical areas and are subject to provisions and restrictions as formally designated areas.

At BLI, there are approximately 140 on-site wetlands covering approximately 148 acres.

Due to the continuing uncertainty as to whether and where airport lands may meet wetlands criteria, onsite determinations should be performed prior to undertaking any significant projects.

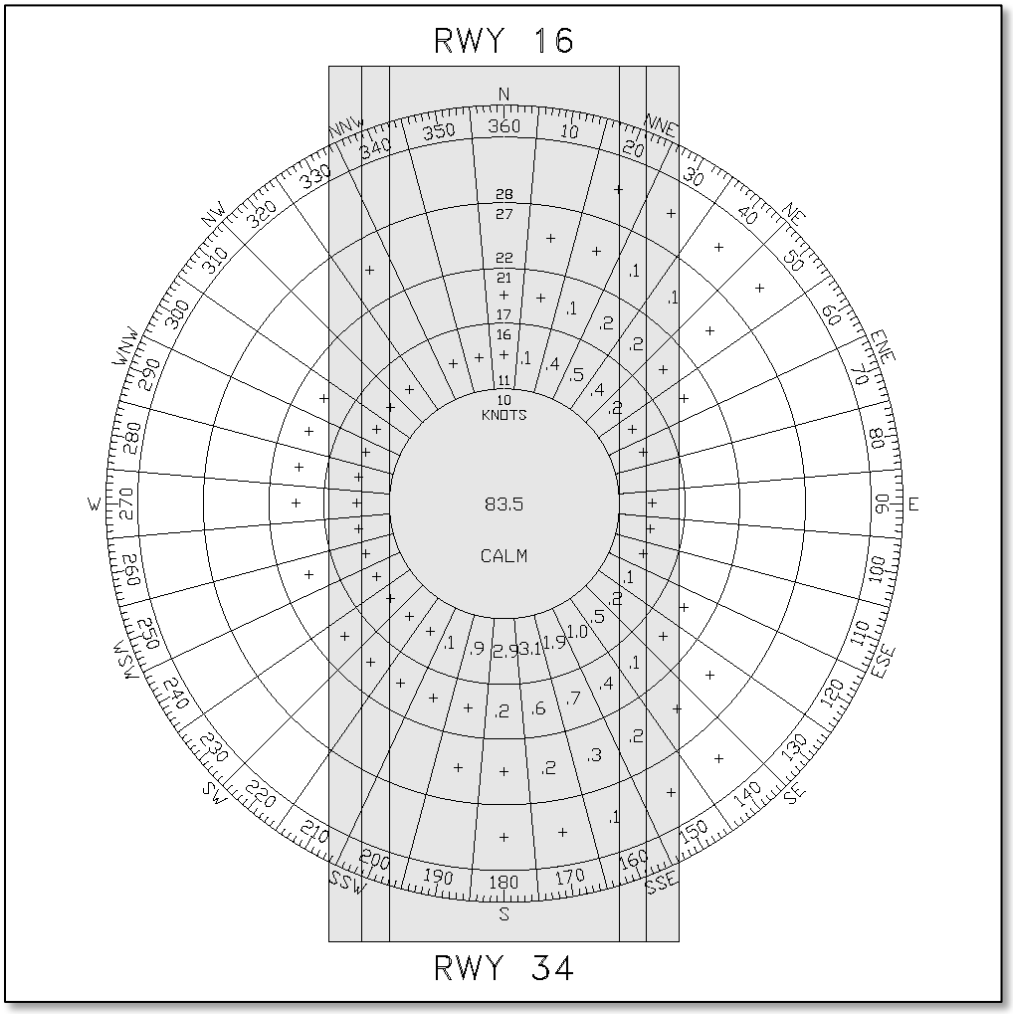
2.6.4 Wind and Weather

Weather conditions such as cloud ceiling, visibility, and wind, are significant factors in the operation of an airport. Weather has a direct impact on aircraft flight, primarily on the equipment needed in the aircraft to navigate to and land at airports, particularly for instrument

flight conditions where less than clear weather exists. Accordingly, a weather condition classification system has been developed. Visual Meteorological Conditions (VMC) occur when visibility is at least three statute miles and the ceiling is a least 1,000 feet. Visual Flight Rules (VFR) are in effect under VMC. Instrument Meteorological Conditions (IMC) occur whenever visibility is at least one statute mile but less than three statute miles and/or the ceiling is at least 500 feet but less than 1,000 feet. Instrument Flight Rules (IFR) are in effect under IMC. Poor Visibility and Ceiling (PVC) conditions exist whenever visibility is less than one statute mile and/or the ceiling is less than 500 feet.

At BLI, VMC conditions occur on average 94.2 percent of the time. Therefore, IFR and PVC conditions occur only 5.8 percent of the year.

Historical wind and weather data for the airport was obtained from the National Climatic Center for the years 2000 through 2009. It shows that, based on all-weather wind coverage with a 16-knot crosswind limitation, Runway 16/34 provides total wind coverage of 99.86 percent of the time. Winds are calm (0 to 10 knots) an average of 83.5 percent of the time. This data is presented in Figure 2-10 as an all-weather wind rose and includes calculations for 10.5-, 13-, 16-, and 20-knot crosswind coverage. Under VFR conditions with a 16-knot crosswind limitation, Runway 16/34 is usable 99.86 percent of the time. Winds are calm an average of 82.9 percent of the time. This is shown as a VFR wind rose in Figure 2-11. Under IFR conditions with a 16-knot crosswind limitation, Runway 16/34 is usable 99.77 percent of the time. Winds are calm an average of 91.9 of the time. This is shown as an IFR wind rose in Figure 2-12.

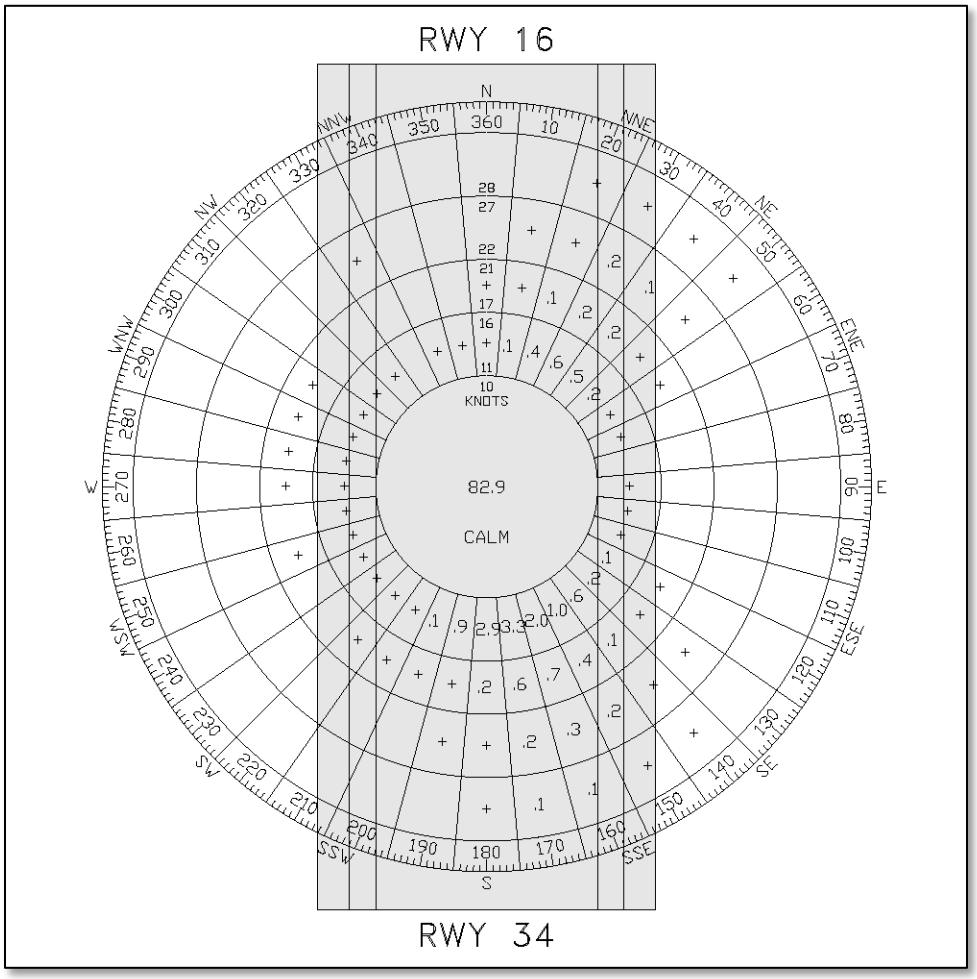


All Weather (79,472 Observations)

CROSSWIND	RUNWAY 16/34
10.5 knots	98.45%
13 knots	99.41%
16 knots	99.86%
20 knots	99.99%

Source: National Oceanic and Atmospheric Administration, National Climatic Data Center.
Station 72797 - Bellingham, Washington. Annual Period Record: 2000-2009

Figure 2-10: All Weather Wind Rose

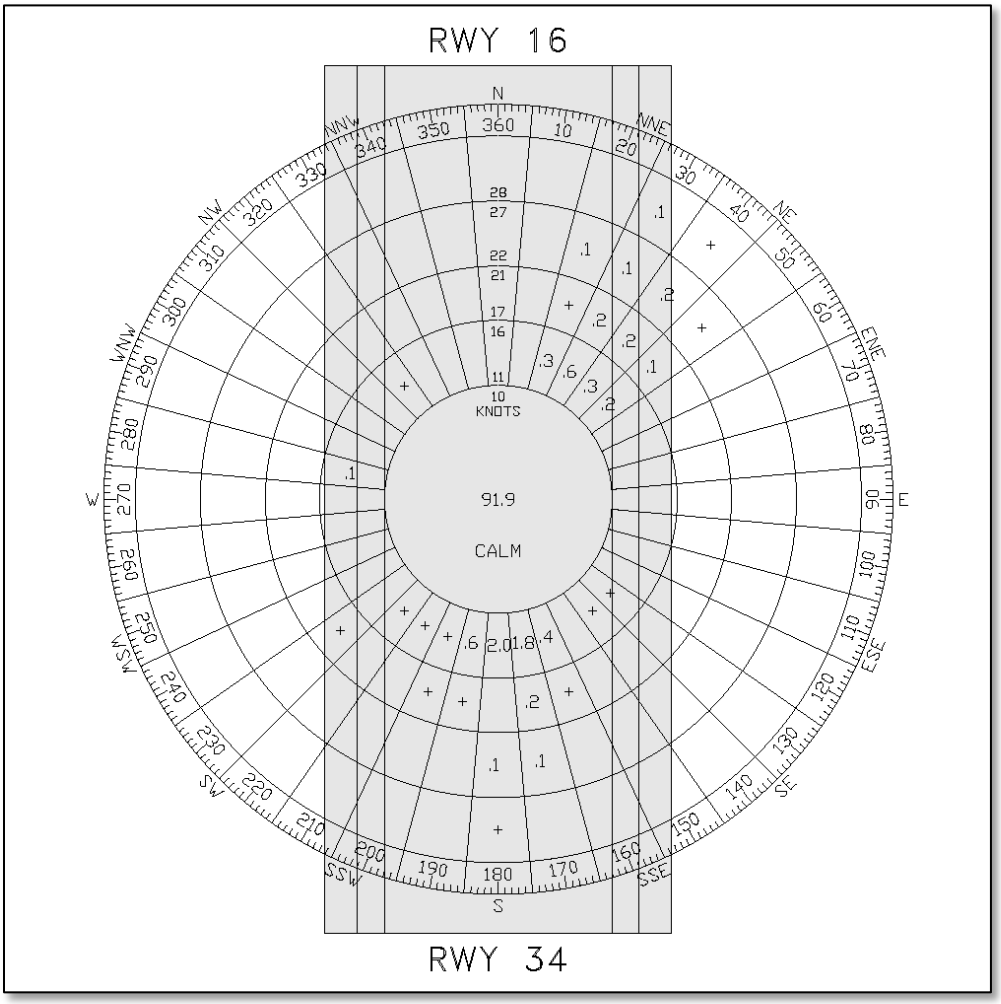


VFR (74,891 Observations)

CROSSWIND	RUNWAY 16/34
10.5 knots	98.41%
13 knots	99.41%
16 knots	99.86%
20 knots	99.99%

Source: National Oceanic and Atmospheric Administration, National Climatic Data Center.
Station 72797 - Bellingham, Washington. Annual Period Record: 2000-2009

Figure 2-11: Visual Flight Rules (VFR) Wind Rose



IFR (3,253 Observations)

CROSSWIND	RUNWAY 16/34
10.5 knots	98.91%
13 knots	99.35%
16 knots	99.77%
20 knots	99.98%

Source: National Oceanic and Atmospheric Administration, National Climatic Data Center.
Station 72797 - Bellingham, Washington. Annual Period Record: 2000-2009

Figure 2-12: Instrument Flight Rules (IFR) Wind Rose

2.6.5 Historical Operations Data

The Bellingham International Airport (BLI) is the fastest growing airport in Washington State in terms of commercial service. Over the past 10 years, the introduction of low-cost service as well as increased destinations have led to the development of a substantial passenger market that ranges from Southern British Columbia to the northern Puget Sound Region. Figure 2-13 and Table 2-7 show the number of enplaned passengers at BLI since 2000. The number of passengers recorded includes both air carrier, (Allegiant and Alaska Airlines), and Air Taxi/Commuter (Horizon Airlines and the Part 135 carriers such as Rite Brothers, West Isle Air [San Juan Air], and Northwest Sky Ferry). Major changes that have occurred over the past 12 years are also shown in the table.

These air service developments led to a growth in passengers from 75,096 in 2004 to 512,000 in 2011 leading to growth rates of approximately 33 percent per year from 2006 through 2011.

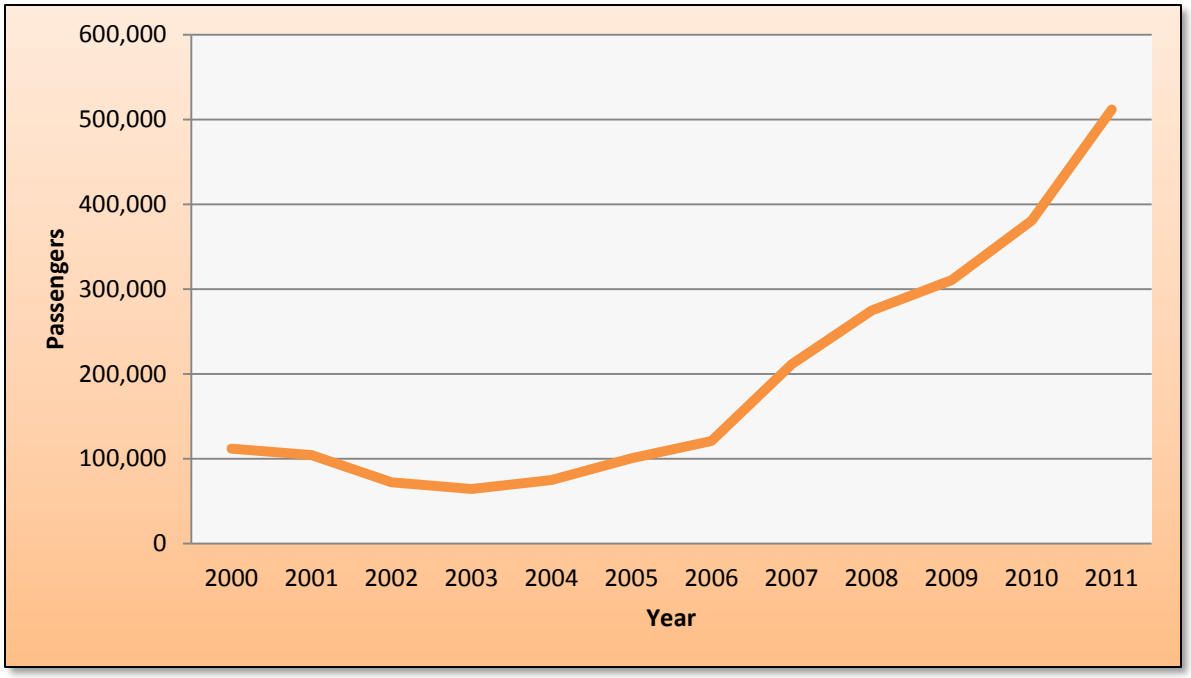


Figure 2-13: Historical Enplaned Passengers

Table 2-7: Historical Enplaned Passengers

Year	Air Carrier	Air Taxi/ Commuter	Total Enplanements	Explanation
2000	19,737	92,208	111,945	Two airlines, Horizon and United Express offering service to/from SEA using 35 seat aircraft
2001	8,933	95,345	104,278	9/11 attacks impact service during the last quarter. United Express ceases service
2002	2,265	70,157	72,422	Horizon Airlines is the sole carrier. They offer daily flights to SEA using Q-200 aircraft (37 seats)
2003	2,946	61,419	64,365	Horizon Airlines is the sole carrier. They offer daily flights to SEA using Q-200 aircraft (37 seats)
2004	5,983	69,113	75,096	Horizon Airlines is the sole carrier for most of the year. They offer daily flights to SEA using Q-200 aircraft (37 seats). In August Allegiant initiates service offering four flights each week to Las Vegas using MD-80 aircraft
2005	29,744	70,916	100,660	Allegiant announces major service increases at BLI including additional flights and destinations. All flights are conducted using MD-80 aircraft.
2006	40,045	80,916	120,961	In addition to Horizon and Allegiant, Delta initiates service from BLI to SLC using 55 passenger CRJ aircraft.
2007	94,399	117,261	211,660	A reconstituted Western Airlines initiates service to destinations in California. Due to financial instability Western ceases operation in short order. However, Allegiant adds flights to Palm Springs and Phoenix to their schedule. Also in 2007 Skybus begins to offer low-cost service from BLI through their Columbus Ohio hub. Skybus also succumbs to financial problems.
2008	162,086	112,734	274,820	Horizon and Allegiant continue to offer service from BLI with the Horizon flights transitioning from Q-200 aircraft to the higher capacity Q-400s. In August Allegiant adds direct service to San Diego to their schedule.
2009	219,212	91,365	310,577	Alaska Airlines begins service from BLI to LAS using 737-800 aircraft. Allegiant adds flights to the Bay Area and Los Angeles.
2010	271,890	109,026	380,916	Allegiant adds flights to Long beach to their schedule. The airport is closed for 21 days during September for runway rehabilitation.
2011			511,756	Alaska Airlines adds direct flights from BLI to Hawaii using 737-700 aircraft.

From 2000 through 2011, the number and types of operations recorded at BLI reflected the change seen in commercial service. As airlines such as Allegiant and Alaska increased service,

the number of annual air carrier flights increased. The air taxi/commuter category reflected the departure of United Express and has stabilized somewhat as Horizon, West Isle Air, Rite Brothers, Northwest Sky ferry and the air cargo flights that make up the base of these that have stabilized.

During the same period the number of annual operations by general aviation showed a steady decrease, mostly in the local operations that are generally associated with training and include all touch-and-go activity. Military activity has remained a minor portion of the activity recorded at BLI consisting of approximately 1,200 annual operations – most of which are itinerant.

Table 2-8: Historical Operations

Year	Itinerant Operations					Local Operations			Total Operations
	Air Carrier	Air Taxi/ Commuter	General Aviation	Military	Total	General Aviation	Military	Total	
2000	510	22,086	36,696	967	60,259	26,636	378	27,014	87,273
2001	308	19,860	36,187	833	57,188	27,466	398	27,864	85,052
2002	146	15,011	36,669	1,015	52,841	18,069	541	18,610	71,451
2003	300	15,359	43,111	1,386	60,156	22,034	575	22,609	82,765
2004	254	16,003	42,379	1,154	59,790	21,348	455	21,803	81,593
2005	603	15,300	42,958	1,198	60,059	21,918	455	22,373	82,432
2006	4,461	13,506	39,844	1,007	58,818	16,011	342	16,353	75,171
2007	3,362	18,151	34,909	927	57,349	17,259	443	17,702	75,051
2008	6,190	15,711	32,819	554	55,274	11,010	151	11,161	66,435
2009	6,357	13,418	32,278	553	52,606	14,531	210	14,741	67,347
2010	6,981	12,246	28,502	971	48,700	12,691	304	12,995	61,695
2011	7,013	12,354	27,148	971	47,486	11,909	304	12,213	59,699

Source: ATCT Records

2.7 EXISTING AIRPORT/COMMUNITY LAND USE COMPATIBILITY PLANNING

2.7.1 WSDOT – Airport Land Use Compatibility Program

The 1996 Washington State Legislature amended the Growth Management Act (GMA) to require cities and counties to protect airports from incompatible development. Senate Bill 6422 was codified to RCW 35.63.250, 35A.63.270, 36.70.547 and 36.70A.510. These provisions apply to GMA and Non-GMA jurisdictions (town, city and county) within Washington State.

RCW 36.70A GMA requires that within a comprehensive plan, maps, descriptive text covering objectives, principals and standards, and inventory of air, water, and ground transportation facilities are to be included. Cities or Counties must take legislative action to review and revise, as needed, its comprehensive plan. Since airports are considered essential public facilities (EPF), local jurisdictions are not allowed to prohibit the siting, expansion or continuation of an EPF; although, enhancing applicable mitigation measures is an allowable action under the GMA.

RCW 36.70.547, 36.70A.510, 35A.63.270, and 35.60.250 were adopted in 1996. Cities and counties must protect airport facilities thru zoning regulations. Incompatible development is prohibited. Plans may not be adopted until formal consultation with Airport Owners, GA pilots, ports, and the WSDOT Aviation Division. Comprehensive Plans must be filed with WSDOT aviation.

WSDOT recommends that three areas be considered when developing comprehensive plans: Building/structure/etc. heights, noise (over-flight noise 65 DNL or greater) and safety (hazardous material). Airport master plans, layout plans, airport documents, aircraft/pilot characteristics, and airport operations should all be considered.

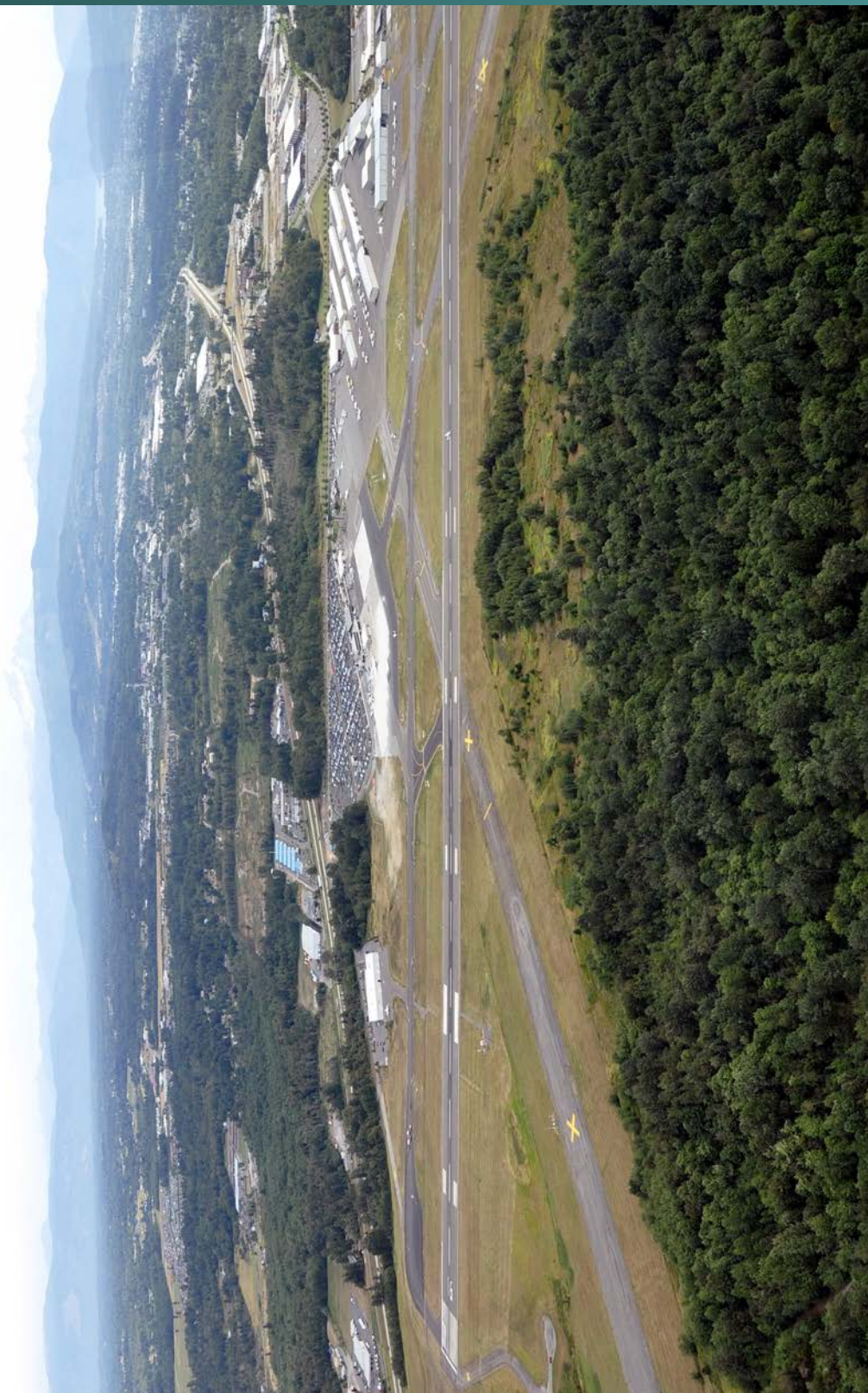
2.7.2 City and County Ordinances

In 2005, the Whatcom County Council adopted amendments to the Whatcom County Comprehensive Plan and Whatcom County Code relating to airport/land use compatibility planning. These discourage incompatible land uses around public use airports and are summarized as:

- Comprehensive Plan policies that address noise, safety compatibility and height hazards;
- Zoning amendments that increase permitting requirements or prohibit certain higher intensity land uses in the vicinity of Bellingham International Airport;

- Zoning amendments that address height limitations surrounding airports;
- Notice requirements that will alert airport operators of a proposal for a subdivision, conditional use permit, or rezone in the vicinity of an airport, so they can submit comments to the hearing examiner or planning commission; and
- A new airport disclosure that would let people know when they are receiving a permit or buying property in proximity to an airport.

The Whatcom County and City of Bellingham zoning ordinances are closely outlined regarding airports and airport facilities. Both mandate that land-use around existing and future airports must be compatible with airport functions. The height of new and existing buildings is limited to the proximity of the imaginary surfaces designated by FAR Part 77 and the relative proximity to the ends and sides of the runway. Height limitations may be ignored if the FAA has not deemed the penetration to be a hazard to airspace and the reviewing official in conjunction with WSDOT or the airport manager deem it as a non-hazard.



3

3 FORECAST OF AVIATION DEMAND

3.1 INTRODUCTION

This section of the master plan presents forecasts of future aviation activity at the Bellingham International Airport (BLI). These forecasts are a key step in the airport planning process and provide the basis for:

- Determining the airport's role in the aviation system;
- Determining the improvements to the airfield, terminal facilities, apron areas, and airside/landside access circulation and parking facilities needed to accommodate growth in demand;
- Estimating the potential environmental effects, such as noise, of the airport's operation on the surrounding community; and,
- Evaluating the financial feasibility of alternative airport development proposals.

The nature and scope of aviation demand forecasts vary from airport to airport depending on the facility's role and level of activity. For BLI, the forecasts address the following elements:

Commercial Activity

- Enplaned passengers
- Commercial aircraft fleet
- Total annual commercial service operations

Commuter/Air Taxi Activity

- Total air cargo tonnage
- Air cargo airlines' fleet
- Annual air cargo operations
- Annual air taxi operations

Key steps in the aviation demand forecast process defined in Advisory Circular 150/5070-6B "Airport Master Plans" include the following:

- Identify aviation activity parameters and measures to forecast,
- Collect and review previous airport forecasts,
- Gather additional data as needed to forecast aviation activity parameters,
- Apply forecast methods and evaluate results; and,
- Compare the results with the Federal Aviation Administration (FAA)

General Aviation Activity

- Total number of based aircraft
- Based aircraft fleet mix
- Annual general aviation operations
- Local and itinerant operations

Military Activity

Operational Characteristics

- Annual instrument operations
- Peak period forecasts for peak month, design day, and design hour

Critical Aircraft and Operations Activity

3.2 SUMMARY OF FORECASTS FOR BLI

Development of forecasts of future activity forecasts for BLI followed the process described by FAA and included in Advisory Circular (AC) 150/5070-6B, Airport Master Plans. Details of historical information, assumptions, and decisions regarding these forecasts are contained in the following section. The following is a summary of the forecasting results.

1. The rapid growth in the number of enplaned passengers will continue over the short-term. New service eastbound has recently been initiated and other service additions are in planning. As new airlines institute service and existing airlines expand their destinations beyond that which is already announced, there will be additional attractants for passengers to use BLI. Commercial service growth will continue with growth rates driven by passenger levels, decisions regarding new destinations, and airline profitability.
2. Air cargo/air taxi operations consist primarily of air cargo flights by the three carriers offering service to BLI using small turboprop aircraft such as the Cessna Caravan, the Beech 1900 or Cessna 340.
3. The number of aircraft based at BLI will continue to grow as the pilots who use their aircraft for business purposes seek the services and facilities offered at BLI.
4. The general aviation community at BLI is healthy and active and these forecasts show a growth in both aircraft and operations over the 20-year forecast period. While this

growth is not "spectacular," it does reflect that the business aviation sector will remain active and that business related operations will increase in the future.

5. Future use by the military is unpredictable, but this forecast assumes the military will continue to use the airport in the future as it has in the past.

Table 3-1 shows the anticipated growth in activity levels forecast for BLI. The remainder of this chapter provides details of the development of these forecasts.

Table 3-1: Forecast Summary

	Actual	Forecast			
	2011	**2016**	**2021**	**2026**	**2031**
Enplaned Passengers	511,756	710,000	855,330	1,000,659	1,145,989
Operations					
Commercial	8,449	10,638	11,842	13,595	15,855
Air Cargo/Air Taxi	4,184	4,510	4,854	5,188	5,507
General Aviation	48,057	49,163	52,016	55,072	58,324
Military	1,000	1,000	1,000	1,000	1,000
Total Operations	61,680	65,311	69,712	74,855	80,686
Based Aircraft	209	226	243	261	275

Source: Actual - Airport Records
Forecast - URS

3.3 FORECASTING PROCESS

The process used to develop aviation demand forecasts is the same regardless of the type or size of the airport. Key steps in the process defined in Advisory Circular 150/5070-6B, Airport Master Plans, include the following:

- Identify aviation activity parameters and measures to forecast;
- Collect and review previous forecasts;
- Gather additional data as needed;
- Select the forecast methods to include;
- Apply the forecast methods and evaluate the results; and,

- Compare the results with the Federal Aviation Administration (FAA) Terminal Area Forecast (TAF).

Subsequent sections of this chapter provide the background information on how the forecasts were developed. Forecasts have been prepared for periods ending 5, 10, and 20 years from the base year of the forecast (year 2011). Forecasts were also prepared for the peak month, design day, and peak hour of each period.

3.4 FORECAST OF COMMERCIAL ACTIVITY

3.4.1 National Background and Trends

The FAA develops annual forecasts of commercial passenger activity. The most recent is the FAA Aerospace Forecasts, Fiscal Years 2011-2031. The FAA continues to forecast long-term aviation growth despite recent setbacks caused by economic downturns in both the global and national economies. By 2010 most of the nation's airlines had returned to profitability, and it is anticipated that this will continue in the near term. It should also be noted that the international market is recovering at an even faster rate than is the U.S. market.

Aviation has proven to be a resilient industry. While the terrorist attacks of 9/11, the SARS scare, the increase in oil prices and the national and global recessions have slowed growth in recent years these factors have not been able to stop growth. In previous Aerospace forecasts, FAA projected that U.S. commercial carriers would carry a billion passengers by 2023. The healthy signs of activity seen in 2010 have caused FAA to move that milestone forward to 2021.

As the economy continues to recover, it is anticipated that passenger and operation totals will also continue to climb. Just as was the case in 2010, FAA has the following expectations:

- International markets will continue to grow faster than domestic markets.
- Large airports will outpace their smaller counterparts.
- The numbers of larger regional jets will increase, while most of the smaller ones are retired from the fleet.

In summary, FAA projects substantial growth in demand and activity. There will be 550 million more passengers on U.S. carriers by 2031 than were recorded in 2010. Traffic, as expressed in revenue passenger miles, will more than double in that same time frame.

3.4.2 Local Factors

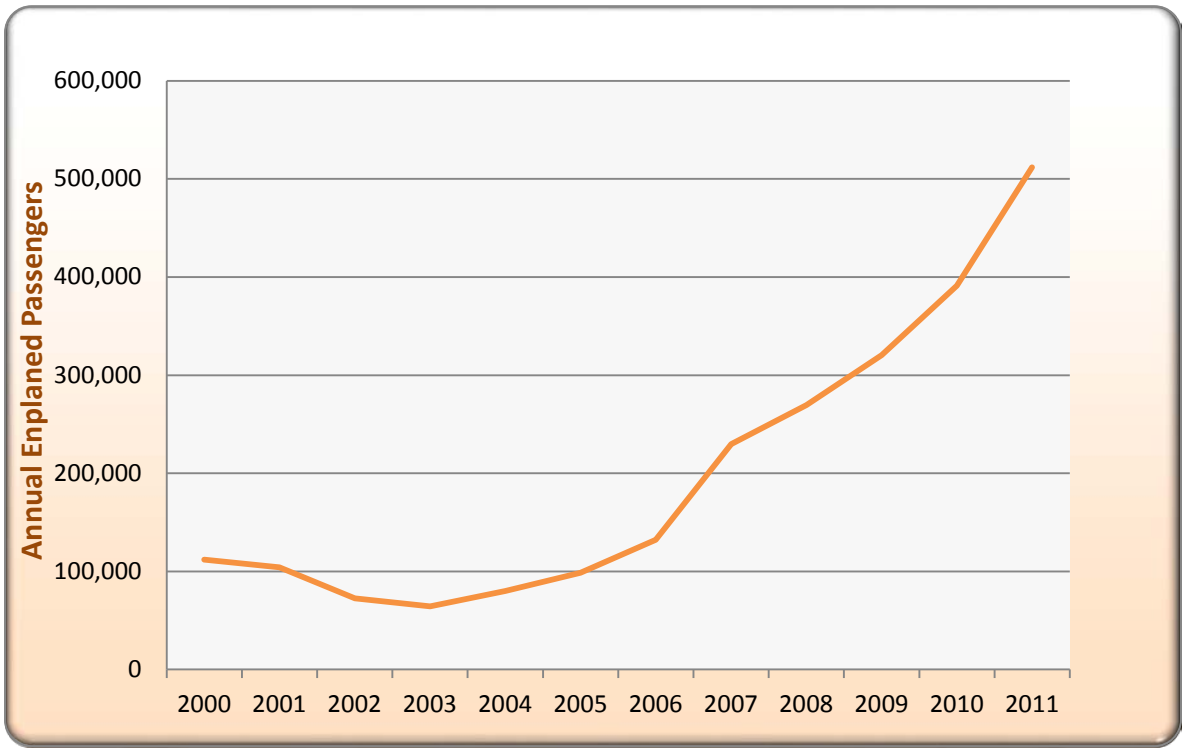
As pointed out in the Existing Conditions chapter, BLI is an airport where commercial activity has been changing rapidly. Since 2000 the airport has moved from a small regional service airport served primarily by commuter aircraft into a facility where the introduction and growth of low-cost service as well as increase in the number of destinations have led to the development of a passenger market that ranges from Southern British Columbia to the northern Puget Sound Region. The following major changes have occurred in the commercial air carrier market at BLI.

- In 2000 and 2001 two airlines, Horizon and United Express offer service to/from SEA using 35 seat aircraft.
- The 9/11 attacks caused immediate service declines during the last quarter of 2001 and United Express ceased service at that time.
- During 2002 and 2003 Horizon Airlines was the sole air carrier at BLI. They offered daily flights to SEA using Q200 aircraft with a seating capacity of 37.
- In August of 2004 Allegiant Airlines initiated service offering four flights per week to Las Vegas using MD-80 aircraft.
- In 2005 Allegiant announced major service increases at BLI including additional flights and destinations. Allegiant uses MD-80 aircraft for all flights.
- Delta initiated service in 2006 from BLI to Salt Lake City (SLC) using 55-passenger regional jet aircraft (CRJ).
- In 2007 a reconstituted Western Airlines initiated service to destinations in California. Due to financial instability Western ceased operation in short order. However, at this time Allegiant expanded their operations by adding flights to Palm Springs and Phoenix to their schedule.

  Also in 2007 Skybus began to offer low-cost service from BLI through their Columbus, Ohio, hub. Skybus also succumbed to financial problems after a short operational period.
- In 2008 Horizon and Allegiant continued to offer service from BLI with the Horizon flights transitioning from Q200 aircraft to the higher capacity Q400s. In August Allegiant added direct service to San Diego to their schedule.
- Alaska Airlines began service from BLI to Las Vegas using 737-800 aircraft in 2009. Allegiant added flights to the San Francisco Bay Area and Los Angeles.

- Growth continued in 2010 with Allegiant adding flights to Long Beach. Passenger growth was affected by the closure of the airport for 21 days during September for runway reconstruction.
- In January of 2011 Alaska Airlines added direct flights from BLI to Hawaii using 737-700 aircraft.
- In February of 2012 Frontier Airlines initiated daily service between BLI and Denver International Airport in March of 2012, using Airbus A319 aircraft.

These air service developments led to a growth in passengers from 75,096 in 2004 to 511,000 in 2011 as shown in Figure 3-1 and Table 3-2. Overall passenger levels have grown at a rate that averages over 30 percent per year since 2006.



Source: Port of Bellingham Records

Figure 3-1: Historical Growth of Enplaned Passengers

On March 8, 2012, a workshop was conducted to identify unique factors likely to influence aviation demand at BLI in both the short and long term. Participating in the workshops were the members of the Master Plan Technical Advisory Committee (TAC), airport staff, and Port of Bellingham representatives. The purpose of the workshop was to gather information about current activity, explore explanations for the current situation and identify possible ways to optimize future service at BLI. Participants in this workshop cited the following opinions as being important considerations when preparing the forecast of aviation demand:

- Airlines in the U.S. will be required to disclose all fees associated with cost of a ticket so the impact of "service fees" could influence passenger choices and potentially decrease demand.
- The likely initiation of commercial service at Paine Field may draw demand away from Bellingham. This would be limited to those customers who are using BLI from northern King County or Snohomish County.
- Border security threats that might change the convenience of crossing the border could dampen demand from Canadian passengers.
- 9/11/2001 occurred and United Air pulled out. Being grounded due to 9/11 caused airlines to recalculate their costs and United pulled out of some markets, including most of the regional markets in Washington State. Another 9/11 type disaster could affect growth again, but the smaller airports like BLI rebounded more quickly after 9/11 due to fewer hassles than the bigger airports like SEA. This is likely to happen again should a new crisis occur.

Table 3-2: Historical Enplaned Passenger Levels

Year	Air Carrier	Air Taxi/ Commuter	Total
2000	19,737	92,208	111,945
2001	8,933	95,345	104,278
2002	2,265	70,157	72,422
2003	2,946	61,419	64,365
2004	5,983	69,113	75,096
2005	29,744	70,916	100,660
2006	40,045	80,916	120,961
2007	94,399	117,261	211,660
2008	162,086	112,734	274,820
2009	219,212	91,365	310,577
2010	271,890	109,026	380,916
2011			511,756

Source: Port of Bellingham Records- Year 2011 estimated based on projected new scheduled flights.

- BLI could turn into a feeder hub for Allegiant as more passengers access flights to prime destinations like Hawaii through Bellingham. This will change the game on how BLI operates.
- Allegiant focused on attracting Canadian passengers to Bellingham while Horizon did not. As part of this attraction, the customs process is easier when driving than at an airport. In addition, there is a U.S. customs fee at US airports versus no fee at the border. Finally, airline ticket prices are cheaper in the United States when compared to Canadian airports.

3.4.2.1 Forecast of Enplaned Passengers

A variety of methods are available for forecasting air carrier passengers and activity. The three most common include regression analysis, time-series analysis, and market share analyses. These share the shortcoming that they assume that relationships which existed in the past will continue unchanged into the future. Consequently, they do not allow for the effects of more aggressive marketing, airline decisions, increased service levels, or other changes independent of past indicators but which have been the key to BLI's traffic growth.

Similarly, these methods do not permit the analysis of the impact of point-in-time activity changes such as shown by the introduction of the new eastbound service by Delta in 2007 or the additional flights added by Allegiant or Alaska over the past five years. These are a vital component of understanding BLI's historical growth patterns and to forecasting its future. To counter this weakness, the second phase of forecasting involves a judgmental analysis. During this phase, decisions are made regarding the growth projections resulting from the analyses. These decisions require that a number of intangible factors, such as service increases, policy and objective changes be considered. The forecast team adds these elements to the process using experience from other airports, industry trends, knowledge of the aviation community, and information gathered from airport users and passengers.

3.4.2.2 Passenger Projections Using Regression Analyses

Regression analysis bases projections of an aviation demand element (the dependent variable) on one or more outside indicators, such as population (the independent variables). Historical values for both the dependent and the independent variables are tested using correlation analyses to determine whether a relationship exists between the variables. If it is determined there is a relationship, projections of the independent variable can be used to project future aviation activity, assuming a continuation of the past relationship into the future. This method requires the use of forecasts of the independent variables as prepared by others.

For this analysis a regression model was prepared comparing the historical annual enplanements at BLI to the population of British Columbia, as forecasted by the Province of British Columbia in 2009 and Whatcom, Skagit, and Snohomish Counties as forecast by the Washington Office of Financial Management in 2010. This analysis resulted in fairly low growth rates over the 20-year forecast period with total enplaned passenger levels gradually growing by 253,883 for a total passenger level of 765,639 in 2031. Although not evident in the analysis conducted, the rate of growth in population levels in the region has had little or no correlation to the growth in enplaned passenger levels. Passengers using Bellingham have been drawn from other regional airports in Seattle and Vancouver to take advantage of the destinations and fares being offered at BLI. Although this model sets a low expectation of future passenger levels considering the rates of growth experienced over the past eight years, it is included for consideration in the selection of the preferred forecast as the growth in population is important in sustaining growth over time.

Table 3-3 shows the growth projections resulting from an analysis of the population and passenger growth. The projections have been based on the population growth rate projected because the correlation between the population and passengers is not strong.

Table 3-3: Population-Based Enplaned Passenger Projections

Year	British Columbia	Washington State			Total Washington & British Columbia	Annual Increase	Passenger Forecast
		Whatcom County	Skagit County	Snohomish County			
2000	4,039.2	166.8	103.0	606.0	4,915.0		111,945
2001	4,076.3	171.8	106.4	623.3	4,977.8	1.28%	104,278
2002	4,098.2	176.9	109.8	640.5	5,025.4	0.96%	72,422
2003	4,122.4	181.9	113.2	657.8	5,075.3	0.99%	64,365
2004	4,155.2	187.0	116.6	675.0	5,133.8	1.15%	79,890
2005	4,196.8	192.0	120.1	692.3	5,201.2	1.31%	98,497
2006	4,243.6	197.0	123.5	709.6	5,273.7	1.39%	132,059
2007	4,309.6	202.1	126.9	726.8	5,365.4	1.74%	229,837
2008	4,383.9	207.1	130.3	744.1	5,465.4	1.86%	269,565
2009	4,460.3	212.2	133.7	761.3	5,567.5	1.87%	320,358
2010	4,531.0	217.2	137.1	778.6	5,663.9	1.73%	391,115
2011	4,584.1	222.4	140.6	795.3	5,742.5	1.39%	511,756
2012	4,639.6	227.7	144.1	812.0	5,823.4	1.41%	569,413
2016	4,902.6	248.8	159.0	878.9	6,189.3	1.55%	605,189
2021	5,242.9	275.8	181.0	962.3	6,661.9	1.43%	651,401
2026	5,570.3	302.9	203.2	1,044.2	7,120.6	1.27%	696,251
2030	5,816.4	324.2	220.9	1,109.2	7,470.7	1.17%	730,484
2031	6805.2	379.3	258.5	1297.8	8740.7		840,056

Source: British Columbia Population Projections from the Government of British Columbia – BCStats.gov.bc.gov, 2012

Washington County Population Projections from State of Washington Office of Financial Management – ofm.wa.gov, 2012

Year 2031 values extrapolated

Forecasts by URS Corporation

3.4.2.3 Passenger Projections Using Time-Series Analysis

The time-series analysis is the simplest and most widely used of forecasting techniques. The time-series analysis is a basic regression fitting growth curves to historical data and using these past growth rates to forecast future activity levels. This type of analysis assumes that, although short-term perturbations may occur from time to time, a consistent overall trend can be identified over an extended period. The time-series analysis for BLI produced forecast passenger growth rates continuing to exceed 20 percent per year. The result was a forecast exceeding 10,000,000 annual enplaned passengers at BLI by 2031. This was rejected from further consideration as the possibility of sustaining this level of growth over the long term was deemed to be doubtful.

3.4.2.4 Passenger Projections Using Market Share Analyses

Market share analysis techniques involve a review of historical activity levels at an individual airport and comparing these to those recorded for a larger area. This comparison is used to determine what share of the larger market area is using BLI. This share can then be applied to forecasts of passengers prepared for the larger market by the FAA in the Terminal Area Forecast to project likely future activity levels at BLI. Market share models tested for these forecasts are as follows:

- BLI enplanements as a percentage of total U.S. enplanement levels as forecast by FAA in the TAF
- BLI enplanements as a percentage of total enplanements for the FAA Northwest Mountain Region (Washington, Oregon, Idaho, Montana, Wyoming, Utah and Colorado)
- BLI enplanements as a percentage of the total enplanements for all commercial service airports in Washington State

Table 3-4: Market Share Based Enplaned Passenger Projections

Year	U.S. Market Share	NW Region Market Share	Washington State Market Share
2000	111,945	111,945	111,945
2001	104,278	104,278	104,278
2002	72,422	72,422	72,422
2003	64,365	64,365	64,365
2004	79,890	79,890	79,890
2005	98,497	98,497	98,497
2006	132,059	132,059	132,059
2007	229,837	229,837	229,837
2008	269,565	269,565	269,565
2009	320,358	320,358	320,358
2010	391,115	391,115	391,115
2011	511,756	511,756	511,756
2012	569,413	569,413	569,413
2016	641,449	642,628	640,447
2021	733,624	731,911	716,426
2026	838,965	834,413	802,153
2030	935,054	927,409	878,666
2031	963,106	955,231	905,026

Source: Port of Bellingham Records

The underlying assumption is that the FAA's overall passenger market projections reflect realistic national and regional growth rates and that, based on historical trends, BLI can be expected to at least retain its demonstrated share of that market. Table 3-4 shows the projections that result from these analyses. Under each scenario, enplaned passenger levels at Bellingham will continue to increase and can be expected to exceed 900,000 by 2031.

3.4.3 Summary of Enplaned Passenger Projections and Preferred Forecast

The projections prepared for this forecast all reflect continued growth over the next 20 years ranging from a conservative level of 840,000 to a high of 1,145,000. In analyzing these projections, the forecast of enplaned passengers recommended for this master plan includes elements of several of the forecasting methods to reflect the following:

- Since 2006 the number of passengers using Bellingham has increased at a rate that exceeded 20 percent per year. In the short-term (2011 through 2016) the forecast must consider the service increases were announced for early 2012. These included daily flights by Frontier Airlines to Denver during the summer using A319 aircraft with 136 seats and the introduction of Allegiant flights twice each week to Hawaii using B757 aircraft with 217 passenger seats. These are expected to match the 80 percent load factors that exist at Bellingham. This additional service resulted in an immediate increase of 57,657 passengers per year, resulting in at least 569,000 annual enplanements in 2012.
- Given the fact that, to date, each new flight at BLI has achieved at least 80 percent sustained loads, there is no reason to believe that the airport has reached the top of its market. In the short term it is assumed that annual service increases will continue to occur as the incumbent airlines add new service destinations to their schedules. New flights have historically added approximately 50,000 new passengers per year. This results in a forecast level in 2016 equal to 710,000 annual enplanements representing an annual growth rate of less than 5 percent per year over the projected 2012 passenger level of 560,000.
- Over the intermediate-term (2016 through 2021) growth at BLI should mature and show a much lower annual growth rate. By this time the Bellingham market for commercial service should be well defined and capturing additional passengers from either Vancouver or Seattle through the introduction of low-fare opportunities will no longer generate high growth rates. During this time period, growth is expected to follow FAA's projected growth rates for the national aviation industry as a whole. This results in a forecasted passenger level of 855,000 by 2021.
- Long-term growth (2022 through 2031) will likely follow the most basic demand indicator, which is the overall growth in population for the service area. This will result in BLI exceeding 1,000,000 annual enplaned passengers before 2026 and more than 1,146,000 by 2031.

Table 3-5 and Figure 3-2 show the range of projections as well as the preferred forecast derived using the preceding methodology.

Table 3-5: Summary of Projections and Preferred Forecast of Enplaned Passengers

Year	U.S. Market Share	Regional Market Share	State Market Share	Population Based	FAA Growth Rates	Time Series	Preferred
2000	111,945	111,945	111,945	111,945	111,945	111,945	111,945
2001	104,278	104,278	104,278	104,278	104,278	104,278	104,278
2002	72,422	72,422	72,422	72,422	72,422	72,422	72,422
2003	64,365	64,365	64,365	64,365	64,365	64,365	64,365
2004	79,890	79,890	79,890	79,890	79,890	79,890	79,890
2005	98,497	98,497	98,497	98,497	98,497	98,497	98,497
2006	132,059	132,059	132,059	132,059	132,059	132,059	132,059
2007	229,837	229,837	229,837	229,837	229,837	229,837	229,837
2008	269,565	269,565	269,565	269,565	269,565	269,565	269,565
2009	320,358	320,358	320,358	320,358	320,358	320,358	320,358
2010	391,115	391,115	391,115	391,115	391,115	391,115	391,115
2011	511,756	511,756	511,756	511,756	511,756	511,756	511,756
2016	641,449	642,628	640,447	605,189	659,682	630,403	710,000
2021	733,624	731,911	716,426	651,401	792,962	831,932	855,330
2026	838,965	834,413	802,153	696,251	953,247	931,709	1,000,659
2031	963,106	955,231	905,026	840,056	1,145,989	1,128,443	1,145,989

Source: 2000 through 2011 – Port of Bellingham records

Years 2012 through 2031 forecast by URS Corporation.

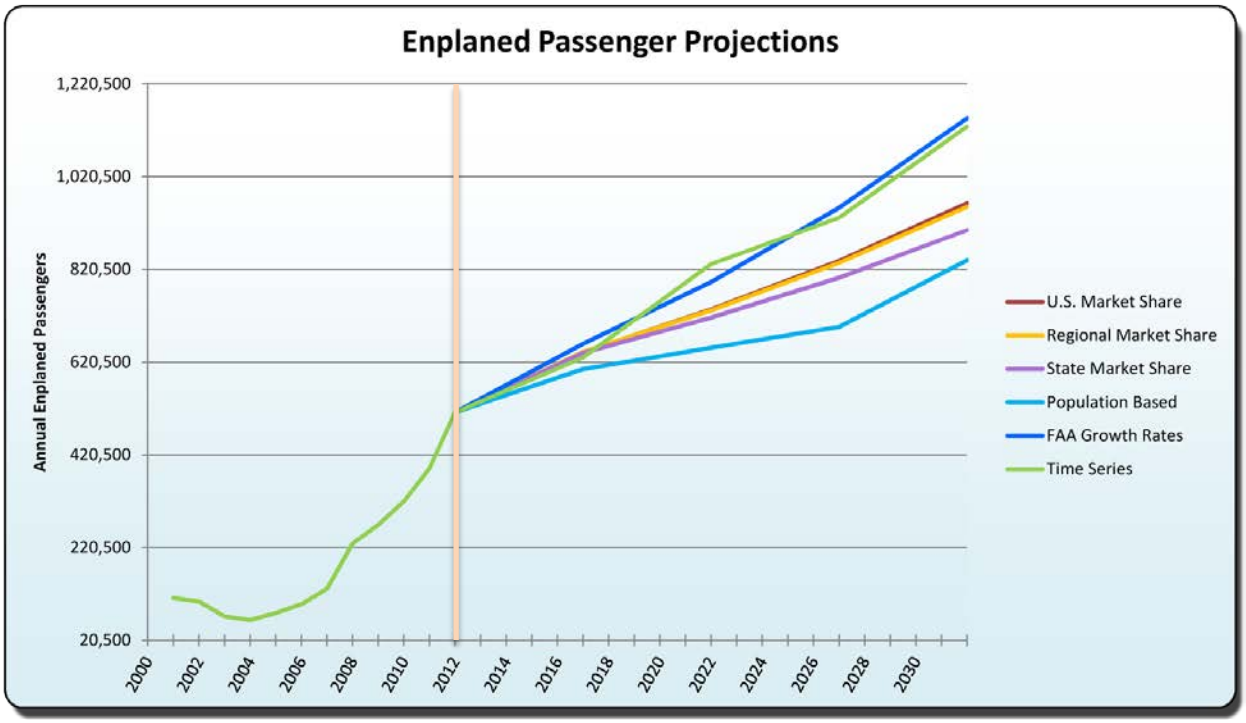


Figure 3-2: Enplaned Passenger Forecast Summary

3.4.4 Forecasts by Others

Since the development of the previous forecast for Bellingham in 2009, two other forecasts of enplaned passengers have been prepared by other agencies. The first of these forecasts is published in the Terminal Area Forecast (TAF) by FAA for the years 2011 through 2040 and the second is from the Washington State Department of Transportation, Aviation Division's Long-range Air Transportation System Plan (LATS) published in 2010 and forecast through 2030. Both of these forecasts employed top-down modeling with the forecast prepared for a larger entity (U.S. or State) with the totals disaggregated to individual airports.

A comparison of the three forecasts is shown in Table 3-6. As can be seen in this table each forecast was developed using different historical information. This explains the variations in the projection numbers.

Table 3-6: Preferred Forecast Compared with TAF and LATS

Year	FAA TAF (Base Year 2010)	WSDOT LATS (Base Year 2006)	Preferred Forecast (Base Year 2011)
Base Year	458,417	120,961	511,756
2016	551,358	184,800	710,000
2021	663,188	208,800	855,330
2026	797,765	232,800	1,000,659
2031	959,718	232,800	1,145,989

Source: FAA TAF from the Terminal Area Forecast – APO TAF Quick Data Summary Report-Facility For National Forecast 2011

Washington State Long-Term Air Transportation Study, June 30, 2007

Preferred Forecast by URS Corporation

3.4.5 Total Passenger Forecast

The preceding section dealt with forecasts of enplaned passengers only. Naturally there will be a complementary number of deplaning passengers at the BLI. Historical records for Bellingham show that deplaning passenger levels are roughly equal to those for enplaning. This is because most flights at Bellingham are destination trips and the load factors for both outbound and inbound flights are similar. Therefore, this forecast assumes deplaning passenger levels will be equal to those for enplanements, and the total passengers using BLI will be twice the enplaned passenger projections. Table 3-7 shows this forecast level for all passengers.

Table 3-7: Forecasts for Total Passengers

Year	Annual Enplaned Passengers	Total Annual Passengers
2011	511,756	1,023,512
2016	710,000	1,420,000
2021	855,330	1,710,659
2026	1,000,659	2,001,319
2031	1,145,989	2,291,978

Source: URS Corporation

3.4.6 Forecast of Air Carrier Operations

An aircraft operation is defined as a take-off or a landing, thus each flight consists of two operations. Forecasting the number of commercial operations relies on a process that includes the historical number of enplaned passengers per airline departure, projects changes in this ratio into the future, and applies these changes to the preferred forecast of enplaned passengers. The

forecast of air carrier operations is based on the derived ratio of passenger enplanements per operation using the following process:

- Determination of the ratio of enplaned passengers to airline departures,
- Projection of changes in the enplaned passenger to departure ratio,
- Application of the projected ratios to the enplaned passenger forecast to determine the number of departures,
- Doubling the number of departures by two to determine the total operations.

At Bellingham a direct relationship exists between the number of air carrier operations and the level of passenger enplanements. The average number of passengers on a departing airplane helps determine the frequency of flights and/or the size of the aircraft being used. This relationship is measured using a boarding load factor, which is expressed as a percentage of seats filled on each departing aircraft. If a carrier has a high boarding load factor it will choose to either increase the number of flights or use an aircraft with greater seating capacity.

To determine the future of airline service at Bellingham, it is necessary to assess the aircraft fleet being operated by the airlines that are serving the airport. The following details the known current and future plans for the airlines serving BLI.

Allegiant Airlines currently operates a fleet of Boeing 757-200, MD82, 83, 87 and 88 aircraft. Over the next ten years it is expected that Allegiant will phase the MD-80 aircraft from the fleet replacing them with newer more fuel efficient aircraft with similar seating capacities. The likely replacement aircraft are the Airbus A319 with the possibility of some Boeing 737 models in the future.

Alaska Airlines has a fleet of Boeing 737 aircraft that includes the 737-400, -400C, -400F, -700, -800, and -900. In the future Alaska is expected to continue to use an all-Boeing fleet with similar seating capacities. Gradual evolution to a more modern, quieter, and fuel-efficient aircraft will occur over the next 20 years.

Alaska/Horizon Airlines uses Bombardier Q400 on all routes throughout their system. There are no known plans to change this fleet.

Frontier Airlines operates a fleet that includes Airbus A318, A319, and A320 aircraft. Future fleet changes are unknown at this time but will likely include similarly sized aircraft.

Given the existing fleet mix and what is known about the plans of the airlines, as well as the current industry trends in service, some assumptions can be made regarding future service at

Bellingham International Airport. Some of the primary assumptions that are used in these forecasts are:

- As the airline fleet evolves, a clear trend is to increase the number of seats available per aircraft. This is evidenced in the newer Boeing 737s, and the Q400. The result of this will be fewer flights accommodating the same number of passengers with higher load factors.
- Bellingham's service growth has resulted from the addition of new service destinations using commercial style aircraft with 120 to 150 seats rather than on the addition of regional service. The regional service to SEA could increase over time but it can be expected to remain a minor percentage of the overall fleet.

Table 3-8 shows the projected percentages for the daily fleet serving BLI and the resultant number of seats per departure (calculated as a weighted average) expected throughout the forecast period. This reflects the fact that Allegiant Airlines is expected to add flights from BLI to Hawaiian destinations using the Boeing 757 in the near future.

Table 3-8: Air Carrier Fleet Mix

Aircraft Type	No. of Seats	2011		2016		2021		2026		2031	
		%	Seats	%	Seats	%	Seats	%	Seats	%	Seats
Airbus A318	132	5%	6.6	2%	2.6	2%	2.6	2%	2.6	1%	1.3
Airbus A319	156	0%	0.0	15%	23.4	20%	31.2	22%	34.3	23%	35.9
Airbus A320	180	0%	0.0	3%	5.4	25%	45.0	34%	61.2	34%	61.2
Boeing 737-800	162	18%	29.2	18%	29.2	20%	32.4	30%	48.6	30%	48.6
Boeing 757	239	0%	0.0	2%	4.8	8%	19.1	7%	16.7	5%	12.0
MD-80	150	72%	108.0	55%	82.5	20%	30.0	0%	0.0	0%	0.0
Q400	76	5%	3.8	5%	3.8	5%	3.8	5%	3.8	7%	5.3
Total		100%	147.6	100%	151.7	100%	164.2	100%	167.3	100%	164.3

Source: 2011 from Port of Bellingham Records

Forecasts by URS Corporation

Using the average seats per departure calculated above, the historical passenger load factors and assumptions regarding changes in the future, and the forecast of annual enplaned passengers, the following forecast of annual air carrier operations has been developed, as shown in Table 3-9.

Table 3-9: Forecast of Air Carrier Operations

Year	Enplaned Passengers	Seats/Dep	Avg Load Factor	Annual Departures	Annual Operations
2011	511,756	147.56	82%	4,224	8,449
2016	710,000	151.68	88%	5,319	10,638
2021	855,330	164.16	88%	5,921	11,842
2026	1,000,659	167.29	88%	6,797	13,595
2031	1,145,989	164.27	88%	7,928	15,855

Source: URS Corporation

3.5 AIR CARGO FORECASTS

Air cargo at BLI is either carried by the scheduled airlines in the same planes used for the passenger service, or is brought in by all-cargo carriers. Examining the historical airport management records the majority of the cargo coming to and from BLI is classified as domestic air freight and is handled by carriers such as AIRPAC, Empire Air, Ameriflight and others who operate under contract with FedEx, UPS, DHL and other national cargo carriers or independent operators who are moving freight From the mainland to the islands and the peninsula. These carriers include Rite Brothers, San Juan, Harbor Air and West Isle Air.

As shown in Table 3-10, the majority of the freight is handled by the all-cargo carriers with more than 1.5 million pounds handled in 2011, down from a high of 2.2 million in 2007. The scheduled carriers haul less than 200,000 pounds each year since 2007.

Table 3-10: Historical Air Cargo Volumes

	2006	2007	2008	2009	2010	2011
Enplaned Cargo						
All-Cargo	1,385,766	1,717,490	1,402,880	1,330,687	1,072,854	835,466
Belly Cargo	112,837	61,685	58,144	61,722	61,394	47,976
Other	627	440	80	0	0	0
Total	1,499,230	1,779,615	1,461,104	1,392,409	1,134,248	883,442
Deplaned Cargo						
All-Cargo	92,869	532,332	549,332	629,031	616,476	629,031
Belly Cargo	550,049	111,012	93,616	81,177	67,300	81,177
Other	30	730	–	–	–	–
Total	642,948	644,074	642,948	710,208	683,776	710,208
Total						
All-Cargo	1,478,635	2,249,822	1,952,212	1,959,718	1,689,330	1,464,497
Belly Cargo	662,886	172,697	151,760	142,899	128,694	129,153
Other	657	1,170	80	–	–	–
Total	2,142,178	2,423,689	2,104,052	2,102,617	1,818,024	1,593,650

Source: Port of Bellingham Records

3.5.1 Forecast of Air Cargo

Forecasts of the volume of freight being processed in Bellingham are the first step in determining the air cargo needs. In forecasting future demand the following factors have been considered.

1. The cargo being carried by the scheduled passenger carriers is not likely to show dramatic growth in the future. The primary airline serving BLI, Allegiant, does not carry significant volumes of cargo. Most cargo will continue to be tied to Alaska Airlines and the regional carriers and growth will depend on their schedules. For this segment, cargo volumes will be forecast but no operations considered since these were forecast in the preceding section.

2. For the all-cargo business there are two primary sectors that can be identified. The first involves carriers such as FedEx and UPS that move traditional small packages on a time critical basis. It is felt that this sector's growth potential is tied to regional economic conditions. For forecasting, the population and demographic conditions for population growth as used in the forecast of enplaned passengers.

3. The second segment of the all-cargo business consists of the movement of goods to and from the San Juan Islands. Most of this activity is tied to population and economic conditions in the Islands; specifically the population and demographics for both Whatcom and San Juan Counties.

Given these factors air cargo forecasts were prepared for BLI to represent the range of potential future levels. The projections showed high, medium and low growth scenarios based on State of Washington demographic projections for Whatcom and San Juan Counties. These were compared with the forecast comparing BLI growth at the rate that Boeing has projected for cargo growth in North America. These projections are shown in Table 3-11.

Table 3-11: Forecast of Air Freight Volumes – Scheduled Carriers and All Cargo

Year	Passenger Airlines	All-Cargo Carriers	Total
2006	662,886	1,478,635	2,141,521
2007	172,697	2,249,822	2,422,519
2008	151,760	1,952,212	2,103,972
2009	142,899	1,959,718	2,102,617
2010	128,694	1,689,330	1,818,024
2011	129,153	1,464,497	1,593,650
2016	139,203	1,578,454	1,717,657
2021	149,832	1,698,986	1,848,819
2026	160,149	1,815,963	1,976,112
2031	169,989	1,927,541	2,097,529

Source: 2006 through 2011 from Port of Bellingham Records

Forecasts by URS Corporation

3.5.1.1 Forecast of Air Cargo Activity

The next step in preparing the air carrier forecast is to determine the number of airplane flights needed to move the cargo. At present all cargo is hauled on relatively small aircraft such as the Cessna Caravan and the Beech 18 or Swearengen Metroliner. Given that the market being served consists of short haul flights to the islands by carriers like Rite Brothers, Harbor Air or San Juan or flights from BLI to Seattle for Federal Express, UPS or DHL it is doubtful whether this situation will change much over the years.

From 2007 to present the all-cargo carriers have carried approximately 350 pounds per operation to and from BLI. The types of aircraft being used have the capacity for 1.6 to 2 tons per operation and it is reasonable to assume that over time the average loads will increase. However, it is doubtful whether the increase will result in aircraft operating at full capacity. Table 3-12 shows the forecast of air cargo operations for BLI.

Table 3-12: Forecast of Air Cargo Operations

Year	Annual Air Cargo Operations
2006	4,225
2007	6,428
2008	5,578
2009	5,599
2010	4,827
2011	4,184
2016	4,510
2021	4,854
2026	5,188
2031	5,507

Source: URS Corporation

3.6 GENERAL AVIATION FORECASTS

3.6.1 Regional and Local Factors

In preparing forecasts of general aviation at BLI, regional aviation trends and local aviation and demographic factors need to be identified. As a first step, the March 8, 2012 forecast workshop was held to discuss the current general aviation market at BLI. Participants in this workshop offered a range of opinions as to the direction of the GA market in Bellingham. These included the opinion that corporate demand was growing steadily while training and other traditional GA activities were not. Some felt that the lack of growth was directly related to the limited area available for hangar development and that should more land become available, more aircraft owners would choose to base their airplanes at BLI.

3.6.2 Current Demand

At the present time there are no vacant hangars or tiedown spaces available at BLI. However, demand for these facilities continues to grow, as witnessed by the number of aircraft owners who have placed their name on the Port's hangar waiting list. In early 2011 there were 35 individuals seeking hangar space at BLI. These people are willing to pay an annual fee to be placed on the waiting list and are therefore seen as legitimate demand indicators. However, it is known that some of the individuals who are waiting for hangar space are currently tied down on the apron, so the number of based aircraft will not necessarily increase when hangar space becomes available.

3.6.2.1 LATS Forecast

Phase II of the Washington State Long-Term Air Transportation Study (LATS) completed in June 2007 reviewed and forecast GA activity throughout the State of Washington. LATS identified four airports in Whatcom County; Blaine Municipal, Lynden Municipal, Bellingham International, and Floathaven Seaplane Base. Tables 3-13 and 3-14 list the forecasts developed the Whatcom County Regional Transportation Organization (RTPO) in comparison to those for the state as a whole. As is shown in tables the LATS analysis expects growth in general aviation in Whatcom County to proceed at a higher rate than that for the state as a whole. The average annual growth rate for Whatcom County based aircraft is projected to be 2.19% while it will be 1.8% statewide. Clearly this reflects the state's high growth expectations for the region.

Table 3-13: Washington State RTPO GA Operations Forecast

	2005	2015	Average Annual Growth (2005-2015)
Whatcom Council of Governments	80,026	101,107	2.37%
Total Washington State	2,968,784	3,603,154	1.96%

Source: Washington State Long-Term Air Transportation Study, June 30, 2007

Table 3-14: Washington State RTPO Based Aircraft Growth

	2005	2010	2015	Average Annual Growth (2005-2015)
Whatcom Council of Governments	248	276	308	2.19%
Total Washington State	8,115	8,855	9,712	1.81%

Source: Washington State Long-Term Air Transportation Study, June 30, 2007

3.7 FORECASTS OF BASED AIRCRAFT DEMAND

The number of based aircraft at BLI has grown over the ten-year period from 2001 through 2011. In 2001 there were 177 based aircraft with this number increasing to 200 today. This indicates demand for based aircraft at BLI has remained strong over the past ten years and given the trends shown in the first portion of this discussion, is likely to continue to increase into the future. In making this forecast the following methodologies were used.

Regression analysis – This forecast technique ties aviation demand, in this case based aircraft (the dependent variable), to economic measures (the independent variable). In this analysis, the population forecasts prepared by the Washington State Office of Financial Management were used.

This technique allows for consideration of the local factors that contribute to the use of aircraft at an airport. Increasing population in a community has been shown to lead to increasing numbers of aircraft needing to base at the local airport. By examining the State's low, medium and high forecasts for population growth the scope of the possibilities were defined. In this case, the number of based aircraft at BLI was compared with historic and projected population of Whatcom County. As shown, extending the current rate of 1.08 aircraft per 1,000 population into the future shows the potential for based aircraft growth to range from 232 (an additional 36 over the current number) under the low population growth scenario to 339 (an additional 143) if the high growth is realized.

Trend analysis and extrapolation – This technique used the ten year historical pattern of based aircraft and created a simple trend analysis to measure the rate of growth and extend this growth rate into the future. This method does not account for changes in either national trends or local conditions. In fact it assumes that the relationships that existed in the past will continue unchanged into the future. As stated throughout the report, this is highly unlikely at BLI. Therefore, the forecast produced using this method is best used as a baseline number for comparing the other forecasts.

Market share analysis or ratio analysis – This technique assumes a top-down relationship between national, regional, and local forecasts of based aircraft. In this analysis, the number of based general aviation aircraft at BLI were compared with the overall number of general aviation aircraft in the nation at large, as forecast in the FAA "*Aerospace Forecasts for Fiscal Years 2006 through 2017*". Historical market shares were calculated based on FAAs forecast and used as the basis for projecting the number of aircraft at BLI. In our analysis we assumed that an average of the market share for the past ten years was indicative of the future share.

The second market share method analyzed the historical share of the national general aviation fleet that is based at BLI. In this technique, the total number of general aviation aircraft registered in the United States was compared to the historical number of aircraft based at BLI from 2000 through 2008. The market share for BLI has increased from approximately 0.06% in 2000 to 0.10% in 2005, the last year that national figures were available. The analysis shows an average of 0.09% during this time frame. Using forecasts of the growth in general aviation nationally, taken from the Federal Aviation Administration's Office of Policy and Plans publication, FAA Aerospace Forecasts for Fiscal Years 2006 through 2017, the future growth of based aircraft at BLI has been projected. As is seen, if the average ratio of BLI based aircraft to the national fleet holds steady, the number of aircraft based at BLI will increase by 69 aircraft over the next twenty years.

A forecast produced by this method represents away that the national general aviation trends could affect the number of based aircraft at BLI but does not account for changes in local conditions.

3.7.1 Preferred Forecast

The three methodologies used to make projections represent the broad range of possible futures for general aviation growth at BLI. In order to identify the forecast to be used as the basis for planning the new general aviation area several factors were considered;

1. Neither the most optimistic (the trend analysis) nor the least (the aircraft per 1,000 people projection using the low population growth) should be used as the basis for long term planning.
2. Although the market share of the nation's aircraft and the natural growth of based aircraft related to population growth have been increasing in recent years, our forecast shows future growth occurring as an average of the past rather than as a continual rising share of the marketplace.

Even though Blaine Airport closed in 2008 and BLI has a waiting list of 35 aircraft, neither of these should be used as the basis for forecasts as their impacts are not predictable. They can however be used to influence the choice of projection techniques preferred for the forecast.

Table 3-15 shows the range of projections as well as the preferred forecast for this report. The preferred forecast was selected to represent a higher growth rate in the initial five year period. In this case we are using the forecast from the high population growth scenario through the year 2031. Given the recent census data, it is anticipated that Whatcom County and the city of

Bellingham will continue to grow, in the short term at least, and this growth in economic vitality and population will drive the demand for based aircraft.

Table 3-15: Summary of Forecast Methodologies and Preferred Forecast

Year	TAF	Population	Market Shares			LATS	Preferred Forecast
			US	NWM	WA		
2001	177	177	177	177	177	177	177
2002	189	189	189	189	189	189	189
2003	189	189	189	189	189	189	189
2004	203	203	203	203	203	203	203
2005	203	203	203	203	203	203	203
2006	190	190	190	190	190	190	190
2007	191	191	191	191	191	191	191
2008	196	196	196	196	196	196	196
2009	200	200	200	200	200	200	200
2010	192	203	201	202	202	226	206
2011*	196	207	203	204	204	231	209
2012*	201	212	205	207	206	236	213
2016*	217	231	212	216	215	256	226
2021*	241	256	221	227	227	274	243
2026*	266	282	232	239	240	294	261
2031	294	302	240	249	250	309	275

Source: 2001 through 2010 – Terminal Area Forecasts (TAF, APO TAF Quick Data Summary Report – Facility. For National Forecast 2011

2016 through 2031 Forecast by URS Corporation

For the intermediate and long range periods, however, it is expected that the fast short-term growth will slow, with growth rates in based aircraft being influenced by the slowed growth in population and the national market. This was projected by averaging the growth rates for these two factors and applying the rate of growth to the 2013 forecast number. Figure 3-3 graphically depicts the growth associated with each of the methodologies and shows the preferred forecast line by comparison.

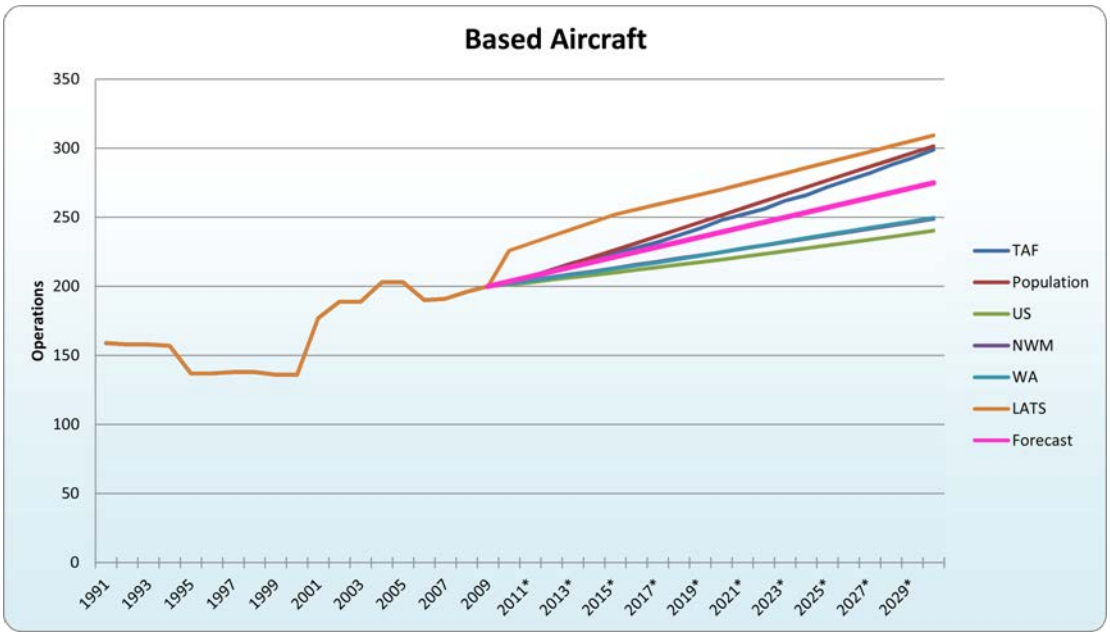


Figure 3-3: Summary of Based Aircraft Forecasts

This preferred forecast will serve as the basis for projecting the based aircraft fleet mix at BLI. This projection was made based on the current fleet mix and an analysis of the likely direction that growth will take at BLI as detailed in the preceding. As shown in Table 3-16, the percentage of aircraft based at BLI that are higher end turboprop or turbojet powered is expected to increase over the next 20 years. While single and multi-engine piston aircraft will continue to dominate the total, most of the growth will be in the higher end. This is in keeping with the national trends discussed earlier as well as with the changes in local conditions. As the population grows and economic conditions get better, it is a natural by-product that corporate aviation will become a growth sector.

Table 3-16: Based Aircraft Fleet Mix

Aircraft Type	2011		2016		2021		2026		2031	
	No	%	No	%	No	%	No	%	No	%
Single Engine Piston	184	87.76%	199	88.00%	207	85.00%	216	83.00%	222	80.00%
Multi-Engine Piston	6	3.06%	7	3.00%	10	4.00%	12	4.50%	14	5.00%
Turbo Prop	7	3.57%	8	3.50%	9	3.50%	9	3.50%	10	3.50%
Turbo Jet	2	1.02%	3	1.50%	9	3.50%	13	5.00%	21	7.50%
Rotary	6	3.06%	7	3.00%	7	3.00%	8	3.00%	8	3.00%
Other	3	1.53%	2	1.00%	2	1.00%	3	1.00%	3	1.00%
Total	209	100.00%	226	100.00%	243	100.00%	261	100.00%	278	100.00%

Source: URS Corporation

3.7.2 General Aviation Operations

In preparing forecasts of general aviation operations there are two primary operational types that must be considered. By definition general aviation includes all operations by civil aviation aircraft not classified as commercial or military. This includes traditional general aviation activities as well as operations that the tower registers as Air Taxi. Air taxi operations include takeoffs and landings by aircraft with 60 or fewer seats conducted on non-scheduled or for-hire flights. Again, operations by aircraft that meet the size requirements defined are recorded as air taxi operations, even if the aircraft is being used for air cargo. Based on records kept by the Port of Bellingham, there are numerous for-hire operations that do not qualify as either commercial service or air cargo. We have included these under the general aviation category.

General aviation operations fall into two categories: local, defined as aircraft that operate in the local traffic pattern or within sight of the airport, or are known to be departing for or arriving from a local practice area; and itinerant, which are all others. In projecting general aviation operations at BLI, total numbers were developed with a distribution made afterward. Three separate projections of operations were produced as follows:

- **Operations per Based Aircraft (OPBA).** In this methodology, the number of annual general aviation operations for 2008 was compared with the number of based aircraft during that year to determine how many operations each aircraft was responsible for. It is recognized that not all GA operations at the airport were performed by airplanes that were based there, but this relationship serves as a good indicator/predictor for future operations. At BLI, there were 223 operations per based aircraft. This ratio was applied to the forecast of based aircraft to arrive at a forecast of operations.

- **Trend Analysis.** In this analysis, the number of operations recorded since 2000 were examined, and projections were made that assumed the trend exhibited would continue into the future. This resulted in a steady decline in the number of annual operations. This reflects the decreased levels of general aviation activity that have been recorded at BLI since 2000. While this historical record would indicate that there will not be rapid growth in this category, it's doubtful whether there will be a continued erosion of this segment.
- **FAA Forecast.** The forecast that the FAA prepared for the Bellingham International Airport in the 2008 Terminal Area Forecast is presented with the year 2028 values extrapolated.

In selecting the preferred forecast, the trend analysis shows a gradual elimination of general aviation activity. This concept was rejected since it is widely felt that, although future growth will not match the levels of the late 1990s/early 2000s, the declines seen in recent years are not indicative of the future either. The preferred forecast tempers the FAA's projections, which are based on a market share of a larger area with the OPBA forecast which reflects the influence of local population and demographic shifts. By averaging these, a hybrid forecast is developed as shown in Table 3-17.

Table 3-17: Forecast of General Aviation Operations

Year	TAF	Market Shares			LATS	OPBA	Preferred Forecast
		U.S.	Region	State			
2000	63,332	63,332	63,332	63,332	63,332	63,332	NA
2001	63,653	63,653	63,653	63,653	63,653	63,653	NA
2002	54,738	54,738	54,738	54,738	54,738	54,738	NA
2003	65,145	65,145	65,145	65,145	65,145	65,145	NA
2004	63,727	63,727	63,727	63,727	63,727	63,727	NA
2005	64,876	64,876	64,876	64,876	64,876	64,876	NA
2006	55,855	55,855	55,855	55,855	55,855	55,855	NA
2007	52,168	52,168	52,168	52,168	52,168	52,168	NA
2008	43,829	43,829	43,829	43,829	43,829	43,829	NA
2009	46,809	46,809	46,809	46,809	46,809	46,809	NA
2010	41,193	41,193	41,193	41,193	41,193	41,193	NA
2011	48,137	48,057	48,057	48,057	48,057	48,057	48,057
2016	49,714	49,757	50,845	51,016	83,395	53,018	49,163
2021	50,094	51,577	53,812	54,091	90,536	57,183	52,016
2026	50,479	53,538	57,045	57,476	97,676	61,521	55,072
2031	50,859	55,629	60,562	61,158	104,816	66,013	58,324

Source: 2000 through 2011 Airport Traffic Control Tower (ATCT) Records

TAF Forecast shown from APO TAF Quick Data Summary Report – Facility For National Forecast 2011

2016 through 2031 Forecast by URS Corporation

Records of general aviation activity at Bellingham Airport show that, on average 28 percent of all operations are local and 72 percent are itinerant. Future levels were forecast using this distribution as shown in Table 3-18.

Table 3-18: Forecast of Local and Itinerant Activity

Year	GA Itinerant	GA Local	Total GA
2000	36,696	26,636	63,332
2001	36,187	27,466	63,653
2002	36,669	18,069	54,738
2003	43,111	22,034	65,145
2004	42,379	21,348	63,727
2005	42,958	21,918	64,876
2006	39,844	16,011	55,855
2007	34,909	17,259	52,168
2008	32,819	11,010	43,829
2009	32,278	14,531	46,809
2010	28,502	12,691	41,193
2011	28,427	19,630	48,057
2016	34,414	14,749	49,163
2021	36,411	15,605	52,016
2026	38,550	16,521	55,072
2031	40,827	17,497	58,324

Source2000 through 2011 Airport Traffic Control Tower (ATCT) Records

2016 through 2031 Forecast by URS Corporation

3.8 MILITARY OPERATIONS

Military operations at BLI have ranged from 750 to 1,300 annually. In forecasting future military operations levels, it has been assumed that they would remain a low percentage of total airport activity. Therefore, the forecast for military operations assumes that the average annual level of 1,000 total annual military operations will remain steady throughout the planning period.

3.9 PEAKING

In order to calculate facility requirements in the next section forecasts of peak future aircraft and passenger activity levels will be needed. Peak levels of activity closely correlate with the need for facilities, such as runways, taxiways, aircraft apron and passenger terminal facilities. Three primary descriptors are used as indicators of peak aviation activity:

Peak Month: Defined as the month in the calendar year when the highest overall activity levels occur.

Average Day/Peak Month (AD/PM): Defined as the average day within the peak month. This indicator is developed by dividing the peak month activity by 30 or 31, depending on which month is the peak.

Design Hour: Also referred to as the peak hour within the average day, typically ranging between 10 and 20 percent of the average day activity. According to FAA Advisory Circular 150/5360-13, design hour operations may reach levels as high as 12 to 20 percent of the average day operations and drop to as low as 6.25 percent.

It is important to note that neither the average day nor the design hour is the absolute peak occurring within a given year. By definition, average day activity will be exceeded at least fifteen days during the peak month. Likewise, design hour activity will be exceeded numerous times due to the calculation methodology used.

Peaking forecasts are prepared to determine the maximum number of passengers needing to use the terminal facilities and the hourly operations demand the runway system. In this regard, we have estimated peak period operations based on the following observations and assumptions;

3.9.1 Enplaned Passenger Peaking

Peak month: Records show that 10 percent of total annual enplaned passengers occur during the peak month at BLI. This peak month is typically July and August.

Average day: The average day calculation divides the peak month by 31 days to yield an average daily operations figure.

Peak hour: The peak hour calculation is used to determine the maximum number of passengers during the busiest one hour period of the average day. With three daily departures this number will be relatively high as a percentage. The peak hour enplaned passenger forecast is estimated to be 35 percent of average day.

Table 3-19: Forecast Enplaned Passenger Peaking

Year	Annual	Peak Month	ADPM	Peak Hour
2000	111,945	11,195	361	72
2001	104,278	10,428	336	67
2002	72,422	7,242	234	47
2003	64,365	6,437	208	42
2004	75,096	7,510	242	48
2005	100,660	10,066	325	65
2006	120,961	12,096	390	78
2007	211,660	21,166	683	137
2008	274,820	27,482	887	177
2009	310,577	31,058	1,002	200
2010	380,916	38,092	1,229	246
2011	511,756	51,100	1,648	330
2016	710,000	71,000	2,290	458
2021	855,330	85,533	2,759	552
2026	1,000,659	100,066	3,228	646
2031	1,145,989	114,599	3,697	739

Source: URS Corporation

3.9.2 Commercial Operations Peaking

Peak month: This category includes scheduled service where the peak month is about 10 percent of the annual and occurs during the summer months. This is a function of the destination based service that is offered at BLI.

Average day: The average day calculation divides the peak month by 31 days to yield an average daily operations figure.

Peak hour: With three scheduled departures per day, there are two peak hour operations (one take off and one landing). This number will increase as flights are added.

Table 3-20: Forecast Commercial Activity Peaking

Year	Annual	Peak Month	ADPM	Peak Hour
2000	510	41	3	1
2001	308	25	3	1
2002	146	12	3	1
2003	300	24	3	1
2004	254	20	3	1
2005	603	48	3	1
2006	4,461	357	12	2
2007	3,362	269	9	2
2008	6,190	495	16	3
2009	6,357	509	16	3
2010	6,981	558	18	3
2011	8,449	676	22	4
2016	10,638	851	27	5
2021	11,842	947	31	6
2026	13,596	1,088	35	6
2031	15,855	1,268	41	7

Source: URS Corporation

3.9.3 General Aviation Peaking

Peak month: General aviation activity is assumed to peak during the summertime when the days are longer and the weather suited for training activity. A peaking factor of eleven percent of the total annual operations is used in this analysis.

Average day: The average day calculation divides the peak month levels by 31 days to yield an average daily operations figure.

Peak hour: Peak hour operations are assumed to occur during the early summer evening periods when general aviation pilots are conducting training activity. During this time levels as high as 25 percent of the average day are expected to occur.

Table 3-21: Forecast General Aviation Peaking

Year	Annual	Peak Month	ADPM	Peak Hour
2000	63,332	9,500	306	61
2001	63,653	9,548	308	62
2002	54,738	8,211	265	53
2003	65,145	9,772	315	63
2004	63,727	9,559	308	62
2005	64,876	9,731	314	63
2006	55,855	8,378	270	54
2007	52,168	7,825	252	50
2008	43,829	6,574	212	42
2009	46,809	7,021	226	45
2010	41,193	6,179	199	40
2011	48,057	5,286	171	43
2016	49,163	7,374	238	48
2021	52,016	7,802	252	50
2026	55,072	8,261	266	53
2031	58,324	8,749	282	56

Source: URS Corporation

3.9.4 Total Activity Peaking

Peak month: Since the peak periods for each category are not likely to occur simultaneously, the peaks for total will not consist of the total for the other categories. Total activity levels are assumed to peak during the summertime with a peaking factor of eleven percent of the total annual operations is used in this analysis.

Average day: The average day calculation divides the peak month levels by 31 days to yield an average daily operations figure.

Peak hour: Like general aviation, total peak hour operations are assumed to occur during the early summer evening periods when general aviation pilots are conducting training activity. During this time levels as high as 25 percent of the average day are expected to occur.

The forecast peak period operations for Bellingham are shown in Table 3-22.

Table 3-22: Forecast Total Operations Peaking

Year	Annual	Peak Month	ADPM	Peak Hour
2000	87,273	13,091	422	84
2001	85,052	12,758	412	82
2002	71,451	10,718	346	69
2003	82,765	12,415	400	80
2004	81,593	12,239	395	79
2005	82,432	12,365	399	80
2006	75,171	11,276	364	73
2007	75,051	11,258	363	73
2008	66,435	9,965	321	64
2009	67,347	10,102	326	65
2010	61,695	9,254	299	60
2011	61,680	6,784	219	54
2016	65,311	9,797	316	63
2021	69,712	10,457	337	67
2026	74,855	11,228	362	72
2031	80,686	12,103	390	78

Source: URS Corporation

3.10 CRITICAL AIRCRAFT

An airport's critical (or design) aircraft reflects the operating requirements of the most demanding aircraft expected to generate 500 or more itinerant operations per year at the facility. The critical aircraft is used to determine which FAA planning and design criteria, as defined by the FAA's Airport Reference Code (ARC), should apply to the airport.

The FAA's Airport Reference Code is a classification system developed to relate airport design criteria to the operational and physical characteristics of the airplanes expected to operate at the airport. The ARC is based on two key characteristics of the designated critical aircraft. The first characteristic, denoted in the ARC by a letter code, is the Aircraft Approach Category as determined by the aircraft's approach speed in the landing configuration. Generally, aircraft approach speed affects runway length, exit taxiway locations, and runway-related facilities. The ARC approach speed categories are as follows:

- Category A: Speed less than 91 knots;
- Category B: Speed 91 knots or more, but less than 121 knots;
- Category C: Speed 121 knots or more, but less than 141 knots;
- Category D: Speed 141 knots or more, but less than 166 knots; and
- Category E: Speed 166 knots or more.

The second ARC component, depicted by a roman numeral, is the Airplane Design Group. The Airplane Design Group is defined by the aircraft's wingspan and determines dimensional standards for the layout of airport facilities, such as separation criteria between runways and taxiways, taxilanes, buildings, or objects potentially hazardous to aircraft movement on the ground. The Airplane Design Group categories include:

- Design Group I: Wingspan up to but not including 49 feet;
- Design Group II: Wingspan 49 feet up to but not including 79 feet;
- Design Group III: Wingspan 79 feet up to but not including 118 feet;
- Design Group IV: Wingspan 118 feet up to but not including 171 feet;
- Design Group V: Wingspan 171 feet up to but not including 214 feet;
- Design Group VI: Wingspan 214 feet up to but not including 262 feet.

The 2009 forecast for BLI recommended an ARC of C-IV for the airport based on use by the Boeing 757 aircraft. This was based on the fact that, Allegiant Airlines began to incorporate Boeing 757 into their fleet with the dual purpose of replacing the MD-80's on high volume routes as well as using the higher capacity aircraft to initiate new service from Bellingham to a destination in Hawaii. The information contained in this forecast, and shown on Table 3-23 shows these changes will occur in the short-term period during which time the 757 will enter the airline fleet for approximately 300 annual operations. Therefore the future critical aircraft designation will remain the C-IV class of aircraft. Of course the uncertainty of the airline's plans could cause revision to the critical aircraft assumptions in the future.

Table 3-23: Forecast of Operations by Aircraft Type

Category/ Aircraft	ADG	2011		2016		2021		2026		2031	
		%	Ops	%	Ops	%	Ops	%	Ops	%	Ops
Commercial Air Carrier											
Q400, CRJ	C-III	8%	676	8%	851	8%	947	8%	1,088	9%	1,427
Airbus A-300 series	C-III	5%	422	15%	1,596	50%	5,921	62%	8,429	46%	7,293
MD-80 Series	C-III	72%	6,083	60%	6,383	20%	2,368	0%	0	0%	0
Boeing 737 Series	C-III	15%	1,267	15%	1,596	20%	2,368	27%	3,671	40%	6,342
Boeing 757	C-IV	0%	0	2%	213	2%	237	3%	408	5%	793
Total		100%	8,449	100%	10,638	100%	11,842	100%	13,595	100%	15,855
Air Cargo											
Cessna Caravan	A-II	50%	2,092	50%	2,255	50%	2,427	50%	2,594	50%	2,754
Metroliner	B-I	30%	1,255	30%	1,353	30%	1,456	30%	1,556	30%	1,652
ATR-72	B-III	20%	837	20%	902	20%	971	20%	1,038	20%	1,101
Total		100%	4,184	100%	4,510	100%	4,854	100%	5,188	100%	5,507
General Aviation											
Corporate Jets - Heavy	C-II	2%	971	2%	983	4%	2,081	6%	3,304	8%	4,666
Corporate Jets - Light	B-II	4%	1,922	4%	1,967	4%	2,081	4%	2,203	4%	2,333
Multi-Engine Piston	B-II	3%	1,441	3%	1,475	4%	2,081	4%	2,203	5%	2,916
Single- Engine Piston	A-I	88%	42,281	88%	43,264	85%	44,214	82%	45,159	80%	46,659
Rotorcraft	N/A	3%	1,441	3%	1,475	3%	1,560	4%	2,203	3%	1,750
Total		100%	48,057	100%	49,163	100%	52,016	100%	55,072	100%	58,324
Military											
Jet	C-II	50%	500	50%	500	50%	500	50%	500	50%	500
Piston	B-II	50%	500	50%	500	50%	500	50%	500	50%	500
Total		100%	1000	100%	1000	100%	1000	100%	1000	100%	1000
TOTAL		**100%**	**61,680**	**100%**	**65,311**	**100%**	**69,712**	**100%**	**74,855**	**100%**	**80,686**

Source: URS

3.11 SUMMARY OF FORECASTS

The forecasts for BLI show that the airport is likely to continue to grow in a manner that exceeds local economic and population growth as forecast by the State of Washington in the short term with intermediate and long range growth stabilizing and likely slowing down after the airline service additions are completed. Commercial service will continue to expand during the short

term period (0 to 5 years) with more moderate growth occurring after that point. With the expansion of commercial service it is anticipated that the airlines will increase their aircraft seating capacity by adding 757 aircraft to the mix by 2013.

Cargo activity at the airport will also continue to grow at a rate equivalent to increases in population and economic activity (two factors that commonly drive the need for air freight and small packages) for not only Whatcom County but also San Juan County. Aircraft that are used for transport will continue to be the smaller haul type given short haul nature of the market. This will continue to be single-engine piston aircraft such as the Cessna Caravan with eventual introduction of aircraft such as the F27 or ATR 72.

Through the foreseeable future however, BLI will remain an airport where the primary activity will be performed by general aviation aircraft. The mix of aircraft will likely continue to be dominated by single-engine piston airplanes with a gradual conversion from traditional small aircraft to the emerging Light Sport Aircraft (LSA). These will increasingly be used by the local pilots in the conduct of their business and pleasure flying.

However, the fastest growing segment of GA activity will continue to be operations by corporate aircraft. Businesses in Bellingham and Whatcom County are increasingly attracting a customer base that is able to travel by private jet and there are no other regional airports where jets can be easily accommodated.

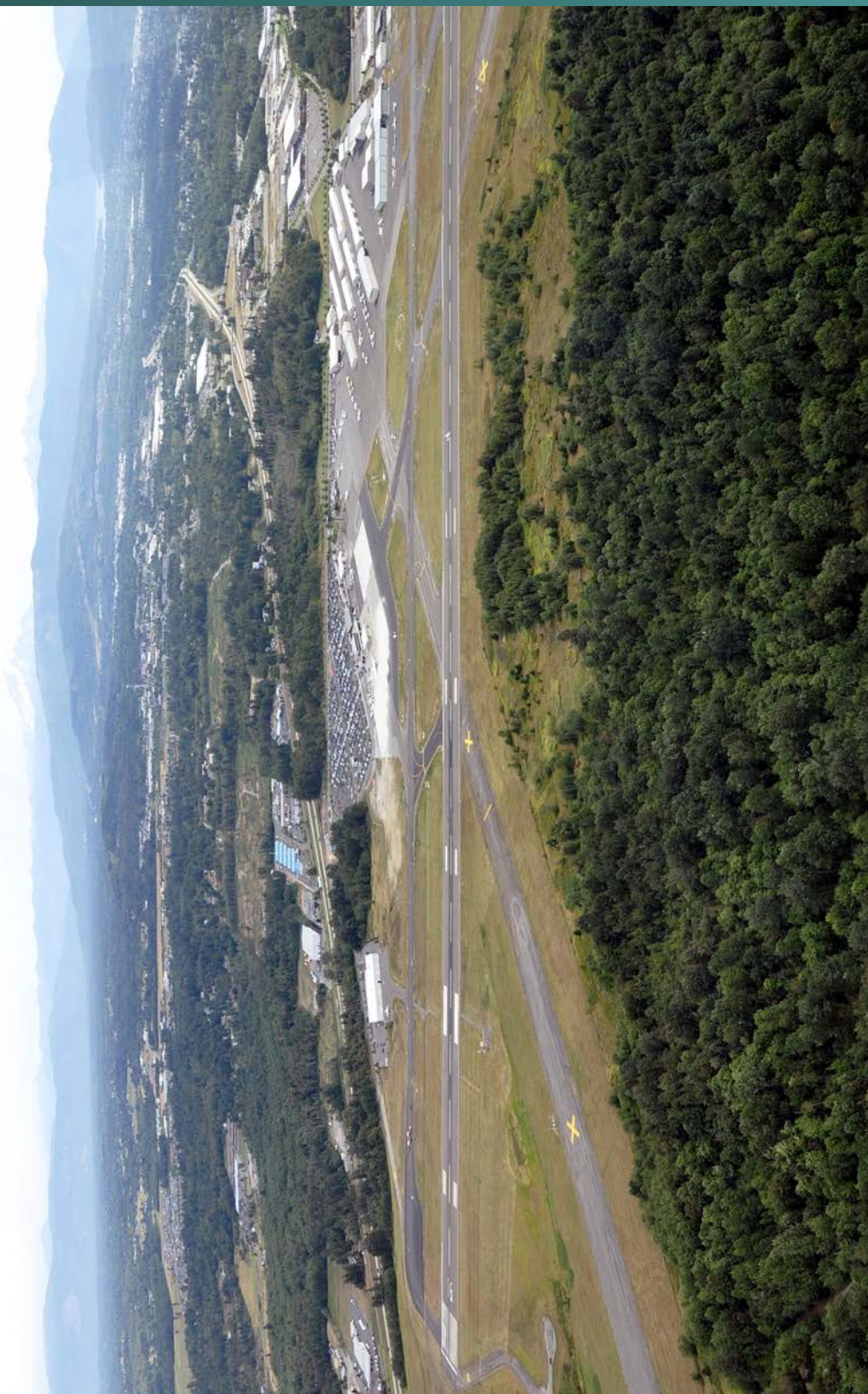
Table 3-24 shows a summary of the forecasts prepared in this document for quick review. These will be used in subsequent sections of this plan to:

1. Allow for safe operation by the critical aircraft.
2. Permit facility expansion to handle anticipated increases in demand
3. Assess the potential changes in community impacts associated with improvements at the airport, and
4. Develop a Capital Improvement Program.

Table 3-24: Forecast Summary

	Actual	Forecast			
	2011	**2016**	**2021**	**2026**	**2031**
Enplaned Passengers	511,756	710,000	855,330	1,000,659	1,145,989
Operations					
Commercial	8,449	10,638	11,842	13,595	15,855
Air Cargo/Air Taxi	4,184	4,510	4,854	5,188	5,507
General Aviation	48,057	49,163	52,016	55,072	58,324
Military	1,000	1,000	1,000	1,000	1,000
Total Operations	61,680	65,311	69,712	74,855	80,686
Based Aircraft	209	226	243	261	275

Source: Actual - Airport Records
Forecast - URS



4

4 FACILITY REQUIREMENTS

4.1 INTRODUCTION

The purpose of this chapter is to present an assessment of existing facilities at Bellingham International Airport (BLI) and determine their ability to accommodate the increased activity levels developed in the Aviation Demand Forecasts. Facility requirement discussions will center on the following areas;

Airfield – including the runway and taxiway system, navigation aids, instrumentation and air traffic control.

Terminal Area – including the passenger terminal, commercial aircraft parking apron (both terminal gate positions and remain overnight (RON) positions), surface access and parking, and terminal support services.

General Aviation – including aircraft storage, Fixed Base Operations (FBO), auto parking and access.

Other – including fuel storage and distribution, security, and support services.

Facility requirements are identified by determining the capacity of the existing facility and comparing that with the demand from forecast activity levels. Any deficit is addressed by recommending facility improvements or expansion.

Table 4-1 and Figure 4-1 summarizes the conclusions of this chapter and shows the location of some of the recommendations.

This task focuses on the ability of existing airport facilities to meet forecast demand levels. When demand exceeds capacity, additional facilities needed to accommodate the unmet demand are identified. The requirements for new or expanded facilities consider the following:

1) Capacity shortfalls
2) Enhanced security requirements
3) Updated FAA Design Standards
4) Actions necessary to achieve the Port's strategic vision

Table 4-1: Existing Facilities Assessment

Facilities	Conclusions
Airfield System	Runway 16-34, at 6,701 feet, provides sufficient take-off length for all aircraft forecast to use the airport. At the present time there are no shoulders on the runway. These should be added. The taxiway system, particularly Taxiways E and H, need to be upgraded to eliminate opportunities for runway incursions by realigning or truncating Taxiways F, E, D, and C. To control the impacts of engine run-up operations, both operationally and in terms of community compatibility, a designated area for engine run-ups should be developed. A helicopter landing area should be designated to separate this activity from that of fixed wing aircraft. A new Snow Removal Equipment (SRE) Building should be constructed to protect the Port's investments and allow for airfield access by the snow removal equipment. The airport's perimeter road should be completed.
Passenger Terminal	At the time of this master plan (2013), the passenger terminal building is being expanded to accommodate 750,000 to 800,000 annual enplaned passengers. Based on the forecasts, this should serve the airport until the 2020 to 2025 period, at which time an expansion will be needed to serve increasing demand with an acceptable level of service. In addition, seven Remain Over Night (RON) parking spaces need to be developed to accommodate the airlines' needs. Two of these positions are required immediately, with five more needed before 2031.
Terminal Area Support	The fuel truck storage/ready area, Ground Service Equipment (GSE) storage, charging and maintenance areas, de-icing storage and application, waste disposal facilities, commissary and stores buildings, and delivery facilities are all part of the terminal complex. Additional area for these will need to be accounted for as the terminal area is expanded.
Airport Access	Providing access to the airport with an acceptable level of service will require continued improvements to area roadways. The intersection of I-5 with Bakerview Road was recently improved to increase capacity overall and included consideration of the projected growth in airport related traffic through 2030. The Airport Drive/Airport Way interchange will need to be upgraded to address airport related traffic in the next few years. Airport growth beyond that forecast or traffic from regional development could trigger the need for additional regional traffic improvements. Other regional roadway improvements that merit further study include the extension of Wynn Road or Kope Road from the north to provide an alternate access route to the airport.

Table 4 1: Existing Facilities Assessment (Continued)

Facilities	Conclusions
Automobile Parking	The current public parking lots provide space for 2,941 vehicles in six individually designated lots. This includes 2,867 public spaces, 41 Americans with Disabilities Act (ADA) compliant spaces, 3 recreational vehicle (RV) stalls, 16 drop-off/pick-up (30 minutes free) spaces, and a 14-space cell phone lot (free). Forecasts show that additional expansion may be needed as passenger levels continue to grow although off-site parking could reduce the demand for on-airport facilities. The employee parking area includes 500 spaces with 138 spaces in the main parking lot reserved for rent-a-car ready and return. These areas will also need to be expanded in the future.
Air Cargo	The new passenger terminal contains facilities for processing cargo shipped on the commercial airlines. This area will suffice through the period covered in the master plan. All-cargo activity is forecast to continue to consist of feeder service using small regional aircraft but additional space will need to be provided to handle the increased usage. This will be done either by re-marking existing pavement or by constructing new air cargo apron areas.
Based Aircraft Hangar Storage	With the forecasted growth in based aircraft, as well as the existing unmet demand for hangar space, additional area for hangar development is needed. In addition, relocation of general aviation hangars and tiedown areas will be needed as the passenger terminal is expanded and congestion increases within the existing apron area. Additionally some of the existing T-hangars do not meet FAA design criteria for taxiway clearance between the buildings. Upon relocation, these issues will be corrected in their new location.
FBO and Support	Expanded or new fixed base operator (FBO) facilities are required to provide support for the growing general aviation community. These facilities will provide not only aircraft maintenance hangars but also pilot lounge areas, aircraft fueling, and space for transient aircraft parking.
Fueling	The current fuel storage facility provides less than two days of fueling capacity. The fuel farm needs to be expanded to increase the capacity to match the increase in aviation activity.
Other	The possibility of adding a new Instrument Landing System (ILS) on Runway 34 to provide for better all-weather operations as well as to increase operational flexibility should be considered. FAA will review the need for the facility as demand increases. The Airport Traffic Control Tower (ATCT) is too short to provide an unimpeded line-of-sight to all portions of the active aircraft movement area. A Safety Risk Management Study should be initiated by FAA to assess whether the increased activity levels at BLI will be impacted by the tower's location. If FAA determines that the situation needs to be remedied, the tower will need to be either raised, relocated, or otherwise modified. Any changes in the tower height or location will be scheduled by FAA as part of their facility improvement program. An Airport Surveillance Radar System (ASR) should be considered to increase safety and efficiency in operations. This decision will be made by FAA outside the master plan process.

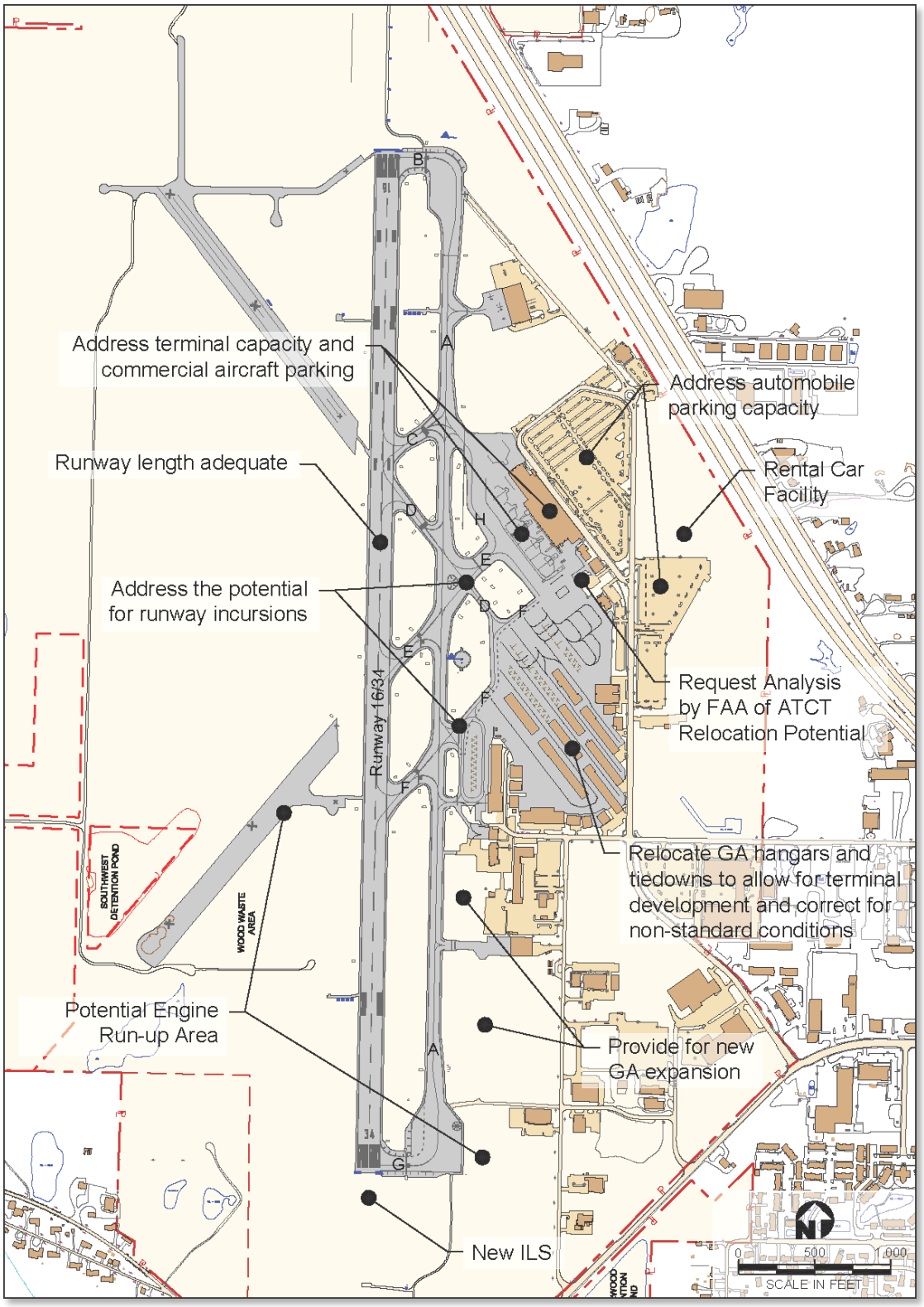


Figure 4-1: Summary of Airport Facility Requirements

4.2 AIRFIELD REQUIREMENTS

BLI operates with a single runway (16-34) that is 6,701 feet long and 150 feet wide. It has a full parallel taxiway, Taxiway A, which is 75 feet wide. Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5300-13A, Airport Design, requires that the future classification of the airport be used as the basis for airfield design. In the forecast chapter, the critical aircraft at BLI was determined to be the Boeing 757-200 operated by Allegiant Airlines. The B757 has an Airport Reference Code (ARC) of D-IV.

4.2.1 Runway Length Requirements

At 6,701 feet, Runway 16-34 is long enough to serve the airline operations that are occurring now. Determining the ultimate runway length requires that we identify the types of aircraft using the airport, their destinations (stage length), the airport elevation, and the mean maximum temperature.

For this analysis, Bellingham's elevation of 171 feet and a mean maximum temperature of 71 degrees Fahrenheit were used. The daily flight schedule was used to establish the commercial fleet mix and the stage length of the scheduled commercial flights. Stage lengths for general aviation flights were assumed to be less than 1,500 miles. Take-off lengths were calculated using the aircraft operations manuals for the commercial aircraft, the website Jetadvisors.com for the general aviation jets, as well as conversations with aircraft manufacturers' representatives.

Figure 4-2 shows the length of runway required for the aircraft forecast to be in the fleet at BLI over the next 20-years. The lengths shown were calculated at Maximum Take-Off Weight (MTOW).

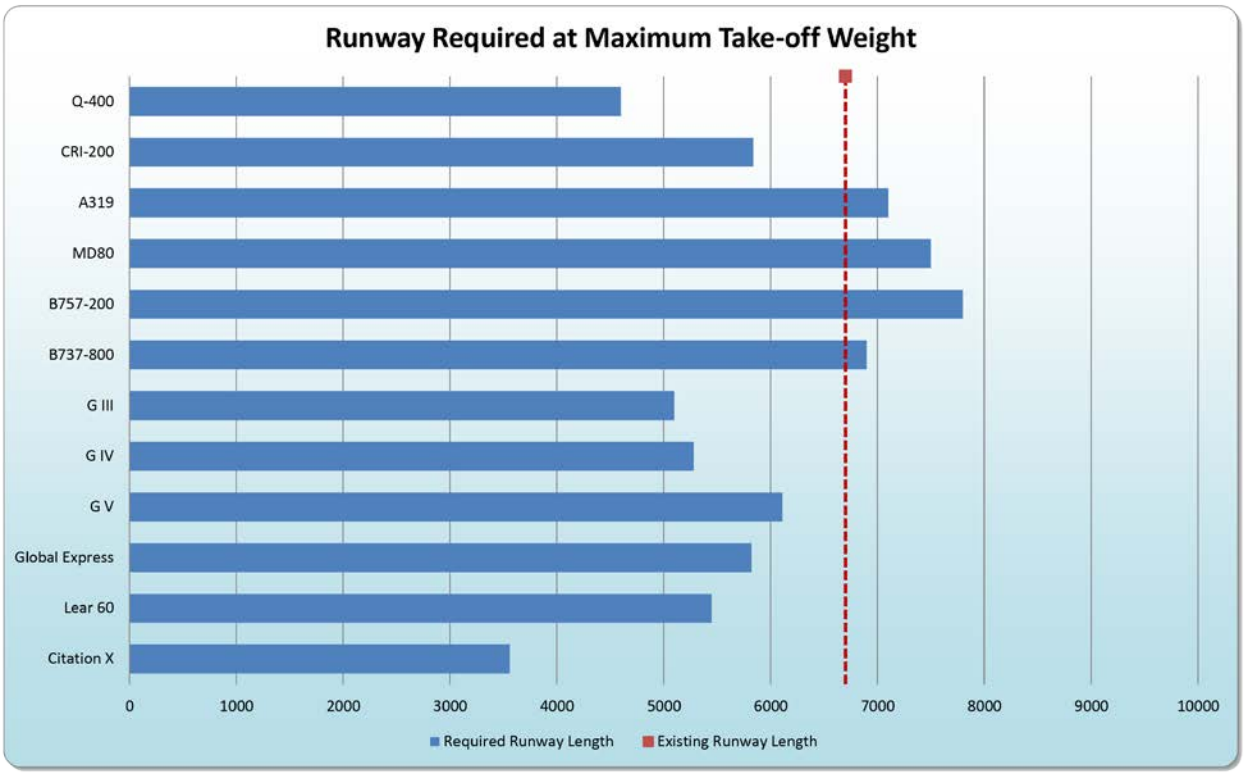


Figure 4-2: Aircraft Runway Length Requirements

As shown, the take-off requirements vary from 4,500 feet for the Q400 to 7,800 feet for the Boeing 757-200. While some of the commercial aircraft would require a longer runway if operating fully loaded they can use the existing 6,701 feet to serve their markets out of Bellingham since their use of BLI is on flights that do not require operations at Maximum Take-Off Weight. As can be seen on Table 4-2, at 90 percent take-off weight all can operate on the existing runway. Given the projected fleet this length will be adequate for the 20-year planning period.

Table 4-2: Runway Length Requirements for Commercial Aircraft

				Take-off Length Required		
Destination	**Length (miles)**	**Airline**	**Aircraft**	**At MTOW (feet)**	**90% MTOW (feet)**	**80% MTOW (feet)**
Phoenix/Mesa (IWA)	1,178	G4	MD-80	7,500	5,500	4,800
Honolulu (HNL)	2,712	AS	737-800	6,900	6,700	5,500
	2,712	G4	757-200	7,400	6,100	4,900
Maui (OGG)	2,684	G4	757-200	7,800	5,900	4,800
	2,684	AS	737-800	8,300	7,000	5,300
Las Vegas (LAS)	940	G4	MD-80	7,500	5,500	4,800
	940	AS	737-800	8,300	7,000	5,300
Denver (DEN)	1,066	FQ	A319	6,400	5,400	4,200
Los Angeles (LAX)	1,031	G4	MD-80	7,500	5,500	4,800
Oakland/San Francisco (OAK)	758	G4	MD-80	7,500	5,500	4,800
Palm Springs (PSP)	1,077	G4	MD-80	7,500	5,500	4,800
San Diego (SAN)	1,133	G4	MD-80	7,500	5,500	4,800
Seattle (SEA)	78	AS	Q400	4,500	4,500	4,500
Portland (PDX)	222	AS	Q400	4,500	4,500	4,500

Notes: AS – Alaska Airlines
F9 – Frontier Airlines
G4 – Allegiant Air

Guidance included in the FAA AC 150/5325-4B, Runway Length Requirements for Airport Design, was also used in calculating the required runway length for BLI. The AC attests that the existing runway length at BLI is adequate for the airport as shown in Table 4-3.

Table 4-3: FAA Runway Design Program Output Airport and Runway Data

Airport and Runway Data	
Airport elevation (mean sea level)	171 feet
Mean daily maximum temperature of the hottest month	71°F
Maximum difference in runway centerline elevation	7.6 feet
Length of haul for airplanes of more than 60,000 pounds	2,700 miles
Runway Length Recommended for Airport Design	
Small airplanes with less than 10 passenger seats:	
95 percent of these small airplanes	2,900 feet
100 percent of these small airplanes	3,400 feet
Large airplanes of 60,000 pounds or less:	
75 percent of these large airplanes at 60 percent useful load	4,500 feet
75 percent of these large airplanes at 90 percent useful load	5,700 feet
100 percent of these large airplanes at 60 percent useful load	4,800 feet
100 percent of these large airplanes at 90 percent useful load	6,900 feet

Source: FAA AC 150/5325-4B, Runway Length Requirements for Airport Design

4.2.2 Runway Orientation and Wind Coverage

Weather conditions such as cloud ceiling, visibility, and wind speed and direction, are significant factors in operations at an airport. Weather conditions have a direct impact on aircraft flight, primarily on the equipment needed in the aircraft to navigate to and land at airports, particularly during instrument flight conditions where weather conditions are less than optimal. Accordingly, a weather condition classification system has been developed. Visual Meteorological Conditions (VMC) occur when visibility is at least three statute miles and the ceiling is a least 1,000 feet. Visual Flight Rules (VFR) are in effect under VMC. Instrument Meteorological Conditions (IMC) occur when visibility is at least one statute mile but less than three statute miles and/or the ceiling is at least 500 feet but less than 1,000 feet. Instrument Flight Rules (IFR) are in effect under IMC. Poor Visibility and Ceiling (PVC) conditions exist whenever visibility is less than one statute mile and/or the ceiling is less than 500 feet.

At BLI, VMC conditions occur 94.2 percent of the time on average. IFR and PVC conditions occur the remaining 5.8 percent.

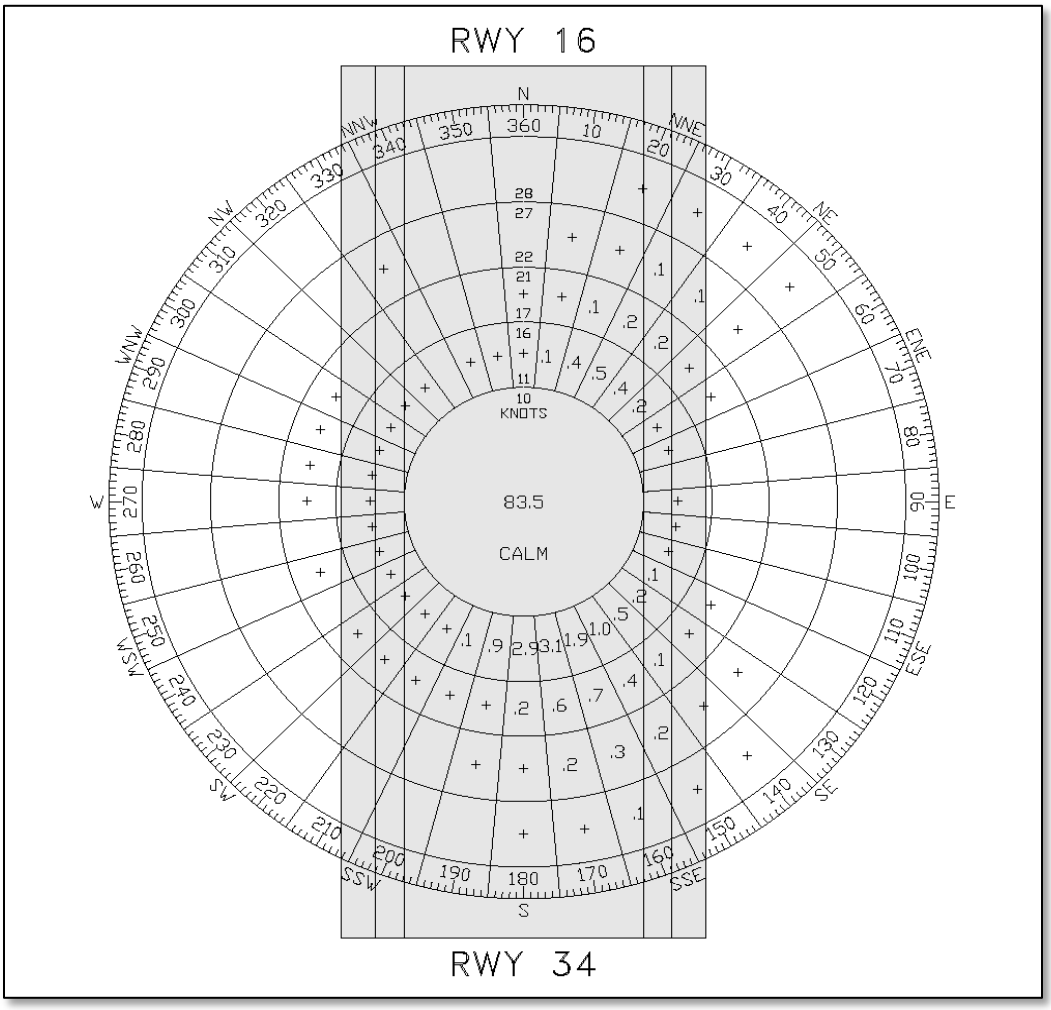
Historical wind and weather data for BLI was obtained from the National Climatic Center for the years 2000 thought 2009. It shows that, based on all-weather wind coverage with a 16-knot crosswind, Runway 16-34 provides coverage of 99.86 percent. During all-weather conditions winds

are calm (0 to 10 knots) an average of 83.5 percent of the time. These data are presented in Figure 4-3 in the form of an all-weather wind rose. The figure includes calculations for 10.5-, 13-, 16-, and 20-knot crosswind coverage.

Under VFR conditions with a 16-knot crosswind limitation, Runway 16-34 is usable 99.86 percent of the time and winds are calm an average of 82.9 percent of the time. This is shown as a VFR wind rose in Figure 4-4.

Under IFR conditions with a 16-knot crosswind limitation, Runway 16-34 is usable 99.77 percent of the time. Winds are calm an average of 91.9 of the time. This is shown as an IFR wind rose in Figure 4-5.

Based on the analysis of these wind conditions, Runway 16-34 provides wind coverage exceeding 95 percent of the time under any weather conditions. This is adequate to serve existing as well as future needs.

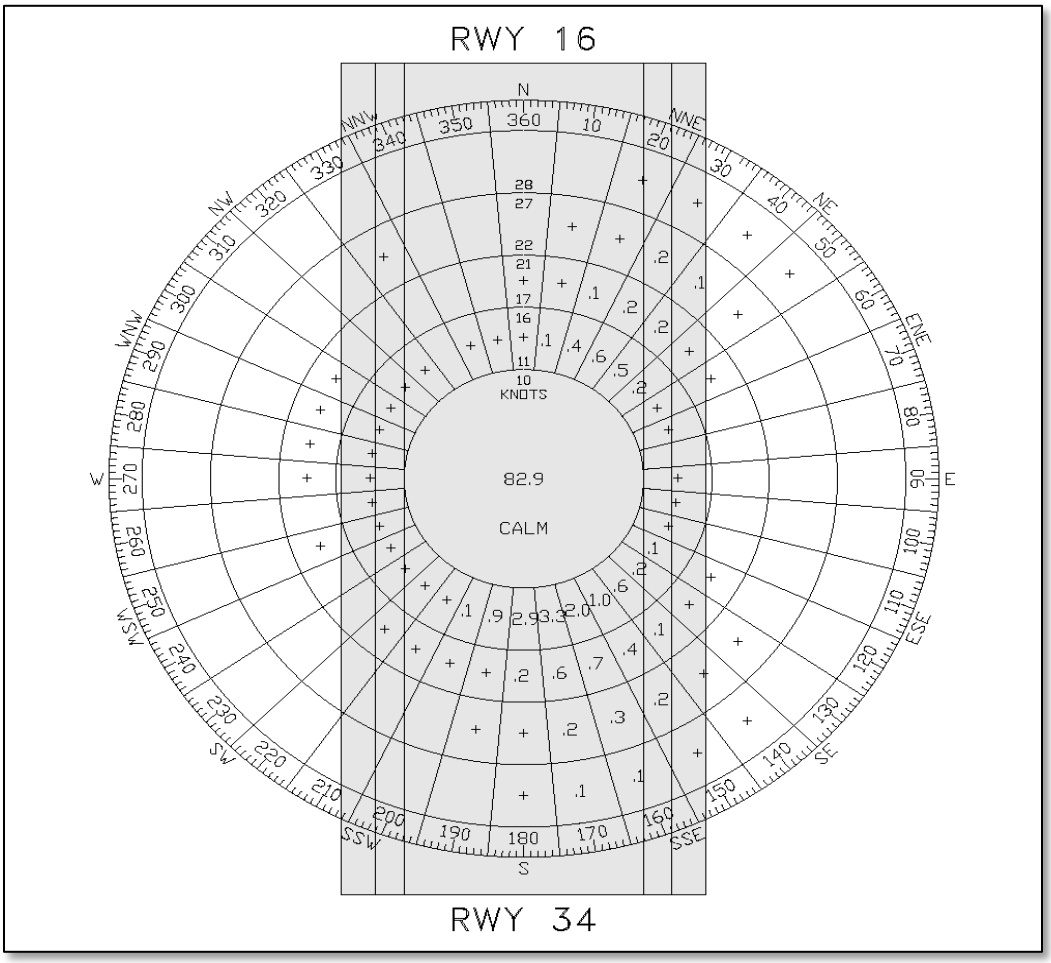


All Weather (79,472 Observations)

Crosswind	Runway 16-34
10.5 knots	98.45%
13 knots	99.41%
16 knots	99.86%
20 knots	99.99%

Source: National Oceanic and Atmospheric Administration, National Climatic Data Center. Station 72797 - Bellingham, Washington. Annual Period Record: 2000-2009

Figure 4-3: All Weather Wind Rose

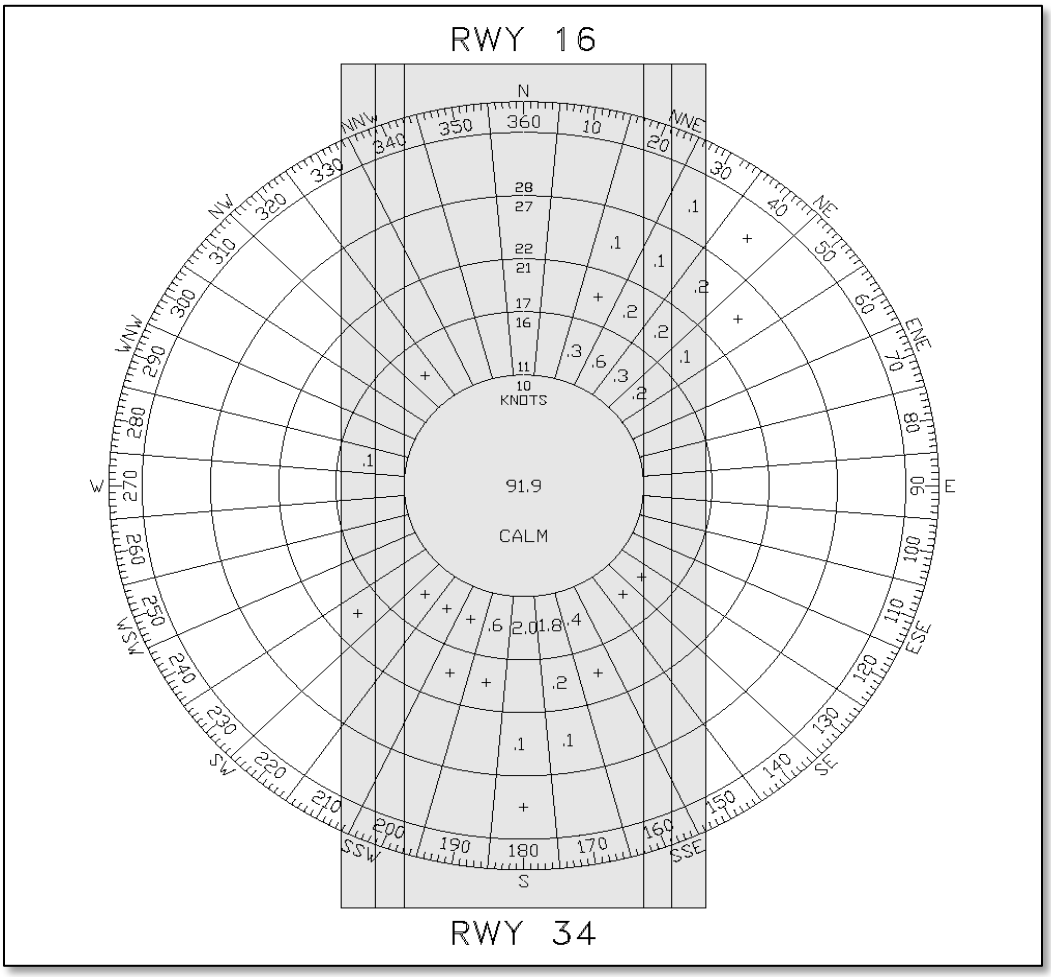


VFR (74,891 Observations)

Crosswind	Runway 16-34
10.5 knots	98.41%
13 knots	99.41%
16 knots	99.86%
20 knots	99.99%

Source: National Oceanic and Atmospheric Administration, National Climatic Data Center. Station 72797 - Bellingham, Washington. Annual Period Record: 2000-2009

Figure 4-4: Visual Flight Rules (VFR) Wind Rose



IFR (3,253 Observations)

Crosswind	Runway 16-34
10.5 knots	98.91%
13 knots	99.35%
16 knots	99.77%
20 knots	99.98%

Source: National Oceanic and Atmospheric Administration, National Climatic Data Center. Station 72797 - Bellingham, Washington. Annual Period Record: 2000-2009

Figure 4-5: Instrument Flight Rules (IFR) Wind Rose

As shown under VMC conditions, which occur 94.2 percent of the time, Runway 16-34 is usable 99.86 percent of the time and winds are calm an average of 82.9 percent of the time. Under IFR conditions Runway 16-34 is usable 99.77 percent of the time. Winds are calm an average of 91.9 of the time. Based on these analyses, Runway 16-34 provides wind coverage exceeding 95 percent of the time under any weather conditions. This is adequate to serve existing as well as future needs.

4.2.3 Runway Capacity

Runway capacity measures the theoretical maximum number of aircraft operations that can operate on the runway system over a specified time. An operation is counted each time an aircraft lands or takes off. A variety of techniques are available for determining airfield capacity, with the most widely accepted method described in FAA AC 150/5060-5, Airport Capacity and Delay. The analysis shown on the following pages uses the methods detailed in this publication. Airfield capacity at BLI is evaluated in two ways:

Annual Service Volume (ASV): This is an estimate of the airport's annual capacity. The ASV accounts for differences in runway use, aircraft fleet mix, weather conditions, and other factors that occur at the airport over a year's time.

Hourly Capacity: This is an estimate of the number of operations that can take place on the runway system during a one-hour period. Hourly VFR and IFR capacities are based on the runway configuration, percent arrivals, percent touch-and-go, taxiway locations, airspace limitations, and runway instrumentation.

Table 4-4 shows the results of the capacity analysis for BLI compared with the forecast operations levels from the preceding chapter.

The analysis of capacity shows that demand levels forecast for BLI will not exceed the annual capacity of the runway system within the 20-year planning period. By 2031, hourly demand levels during VFR conditions could equal 80 percent of the capacity of the runway. Under IFR conditions the demand levels will be less than 33 percent of the runway capacity.

Table 4-4: Runway Capacity/Demand Comparison

	Annual Capacity				
	2011	**2016**	**2021**	**2026**	**2031**
Annual Service Volume (ASV)	230,000	230,000	230,000	230,000	230,000
Annual Demand	61,680	65,311	69,712	74,855	80,686
Percent Capacity	26.8%	28.4%	30.3%	32.5%	35.1%
	Hourly Capacity				
VFR Operations					
Peak Hour Capacity	98	98	98	98	98
Peak Hour Demand	54	63	67	72	78
Percent Capacity	55.1%	64.3%	68.4%	73.5%	79.6%
IFR Operations					
Peak Hour Capacity	59	59	59	59	59
Peak Hour Demand	13	14	14	16	19
Percent Capacity	22.0%	23.7%	23.7%	27.1%	32.2%

Source: URS Corporation
Capacity for ASV and peak hour conditions derived from Sketch 9 - AC 150/5060-5
Notes: ASV – Annual Service Volume
VFR – Visual Flight Rules
IFR – Instrument Flight Rules

4.2.4 Design Standards

Based on the determination that the Boeing 757-200 represents the critical aircraft at BLI, the airfield is classified as ARC D-IV. The information in Table 4-5 shows the standards for this category compared with the current layout of the airport.

Table 4-5: Existing Conditions versus C-IV Design Criteria

Design Feature	Existing (ft.)	Standard (ft.)	Difference
Runway			
Width	150	150	Meets Standard
Shoulder Width	10	25	-15 feet
Blast Pad Width	0	200	-200 feet
Blast Pad Length	0	200	-200 feet
Safety Area (RSA) Width	500	500	Meets Standard
Safety Area Length (beyond runway end)	1,000	1,000	Meets Standard
Object Free Area (OFA) Width	800	800	Meets Standard
Object Free Area Length (beyond runway end)	1,000	1,000	Meets Standard
Obstacle Free Zone (OFZ) Width	400	400	Meets Standard
Obstacle Free Zone Length (beyond runway end)	200	200	Meets Standard
Taxiway			
Width	75	75	Meets Standard
Safety Area Width	171	171	Meets Standard
Object Free Area Width	259	259	Meets Standard
Taxilane Object Free Area Width	225	225	Meets Standard
Runway Centerline to:			
Taxiway Centerline	410	400	+10 feet
Aircraft Parking Area	600	500	Meets Standard
Taxiway Centerline to Fixed or Movable Object	129.5	129.5	Meets Standard
Taxilane Centerline to Fixed or Movable Object	112.5	112.5	Meets Standard

Source: FAA Advisory Circular 150/5300-13, Airport Design, Change 6

As seen, the geometry of the airfield meets or exceeds FAA design standards most areas except;

1. Taxiways C, D, E and F do not meet the taxiway width standards for C-IV.
2. Although Taxiways F and E are not currently marked to take advantage of the full pavement width they are 75 feet wide and in compliance.
3. The runway shoulder width is 10 feet narrower than standard.
4. There are no blast pads on the runway ends.

These should be brought to standard within the timeframe of this master plan at such time as they can be included with a larger project.

4.3 TAXIWAYS

The taxiway system at BLI consists of a full parallel taxiway (TW Alpha) and four angled exits (TWs Bravo, Charlie, Delta, Echo, Foxtrot, Golf, and Juliet). In November of 2012, the FAA completed the Local Runway Safety Action Plan (RSAT) for BLI. The purpose of the RSAT was to review conditions at BLI and identify any issues or concerns that could affect runway safety. The review found that while there were zero surface incidents and no runway incursions recorded at BLI in 2011 or 2012, the design of the exit taxiways was no longer valid for the traffic using BLI. It was recommended that the existing angled exits at Taxiways Delta and Echo be replaced with new 90 degree exits.

In addition to the above taxiway system, there are a series of taxilanes that serve the general aviation and terminal areas that were designed to varying standards depending on the aircraft expected to use them. In this area several design issues need to be dealt with. These are shown on Figure 4-6 and described in the following;

1. The standard distance for Taxiway to Taxilane separation is 215 feet based on C-IV standards. Advisory Circular 150/5300-13A introduces the concept of Taxiway Design Groups (TDG) that for BLI airport is TDG-5, using the 757-200 as the critical aircraft. For TDG-5 the taxiway/taxilane centerline to taxiway/taxilane centerline separation on aircraft that make 180° turns is 240 feet. The minimum taxiway centerline to taxiway/taxilane centerline separation is 1.2 times the wingspan of the largest aircraft that will use the taxiway/taxilane - plus 10 feet. In the case of a B757-200W, this minimum distance is 172 feet. At BLI, the separation between Taxiway Alpha and Taxilane Hotel is 182 feet. This does not meet the standard but exceeds the calculation based on the specific characteristics of the critical aircraft.

   For the long term, this situation will need to be addressed, either through a modification to standards that allows use by the 757-200 or through a reconfiguration that allows the facility to fully comply with TDG-5 standards.

2. The existing Taxiway Alpha Object Free Area (OFA) is 259 feet based on DG IV standards. In addition, the Taxilane Hotel OFA is 91 feet based on the calculation for the B757-200W. In this calculation, the taxilane centerline to object separation is calculated as 0.6 times the wingspan (135 feet) plus 10 feet which equals 91 feet. This separation creates a non-standard condition on a portion of the South Commercial Apron. This will need to be addressed through a Modification to Standard in the short-term with a longer-term project designed to correct the issue.

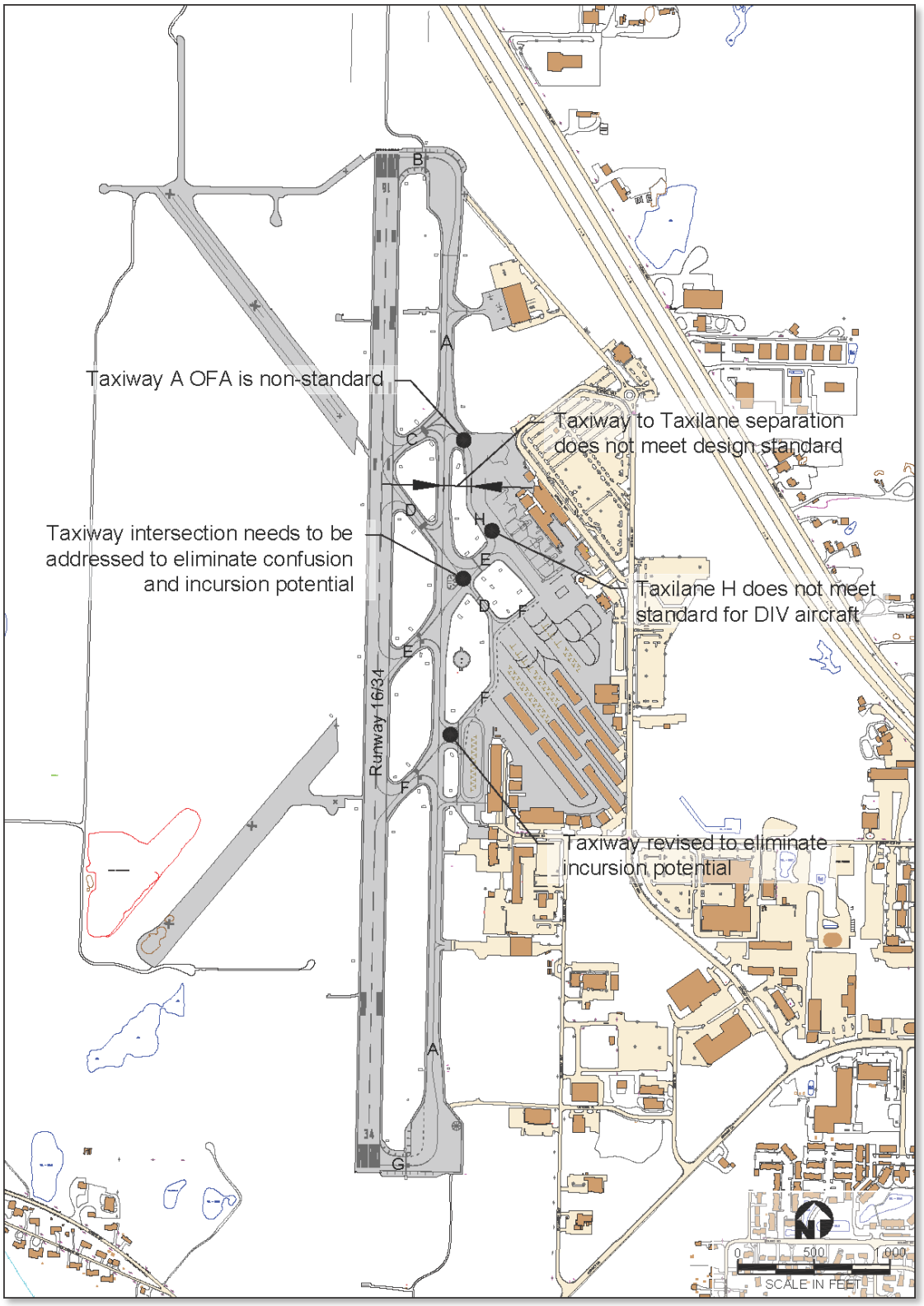


Figure 4-6: Taxiway Improvement Requirements

3. Taxiways Delta and Echo are aligned in a manner that allows for direct taxi routes from the apron to the runway. In addition, the intersection of Echo, Delta and Alpha can be very confusing to users. These factors raised safety concerns from the BLI Local Runway Safety Action Team as detailed in a November 2012 report.

4.3.1 Airfield Requirement Recommendation

The preceding analyses show the current runway length of 6,701 feet is sufficient for future operations by all aircraft types given the destination markets served from Bellingham. The critical aircraft for the airport, the Boeing 757, may require 7,800 feet at maximum take-off weight but operations from BLI do not require that they operate at maximum weight. The existing length permits operation at more than 90 percent loads. The use of the 757-200 allows it to operate safely within this 90 percent window. Likewise, the MD-80 fleet operated by Allegiant would require 7,500 feet if they were to operate at maximum take-off weight. Their actual daily flight profile has them operating to destinations that require less than a 90 percent load, requiring 5,500 feet of available runway for take-off.

The lone requirement for the Runway is the addition of paved shoulders measuring 25 feet on each side. These should be added in the future.

Additionally, no wind coverage or airfield capacity constraints have been identified. Therefore, no improvements are recommended for the airport's runway.

For the taxiways, the parallel and exit taxiway system meets all standards but the current angled exit taxiways should be replaced by properly spaced 90 degree exits. On the apron area, a realignment of several taxilanes in the terminal area needs to be considered to meet design and safety standards.

A final change that needs to be made is the redesignation or construction of an area for engine run-up activities. Currently these take place on the taxiways during off-hours. This results in a need to restrict use of the taxiway for normal operations. Further, conducting engine run-ups in this area can have adverse impacts on the neighboring noise exposure.

4.3.2 Runway Safety Areas (RSA)

The RSA is a critical, two-dimensional area surrounding the active runway that must be:

- Cleared, graded, and free of potential hazardous surface variations,
- Properly drained,
- Capable of supporting Aircraft Rescue and Fire Fighting (ARFF) equipment, maintenance equipment, and aircraft under normal weather conditions, and

- Free of objects, except for those mounted using low-impact supports and whose location is fixed by function.

Based on FAA criteria from AC 150/5300-13 for a C-IV runway, the RSA needs to be 500 feet wide and extend 1,000 feet beyond each runway end. At BLI the RSA for Runway 34 is in compliance with FAA standards. On the 16 end an area measuring approximately 6,750 SF is not owned by the Port and is not in compliance with the standard. A Runway Safety Area Determination was prepared by FAA in February 2005 to address this issue. This determination stated the following:

> *"Determination that RSA for Runway 16 meets 98.65% of the required standards is based on 2004 closeout documentation for AIP 3-53-0005-29, a grant issued to bring this safety area into compliance. While 100% compliance with safety area standards is physically feasible, the sponsor does not own 1,200 sf of the northeast corner of the safety area. The sponsor spent many months attempting to secure a lease for this area, Interstate 5 Right-of-Way (ROW) property, from the Washington State Department of Transportation (WSDOT). WSDOT was agreeable to the lease, which would have entailed filling a depression in the 1-5 ROW, however the Federal Highway Administration (FHA) objected. Despite calculations that showed the proposed lease area was outside future widening of 1-5, FHA would not agree to any airport use of the ROW. Shortening or shifting the runway to the south was considered and rejected by the sponsor due to certain operational and environmental opposition. Therefore, 1.35%, or 6,750 sf of the northeast corner of the required runway safety area is steeper than current standards allow to match into the existing topography of the 1-5 ROW. Airport security fencing along the property line is frangible."*

4.3.3 Runway Object Free Areas (OFA)

The OFA is a two-dimensional ground area surrounding each runway. The OFA clearing standard precludes parked aircraft or other objects except Navigational Aids (NAVAIDs) and facilities whose locations are fixed by function. The current OFA is 800 feet wide and extends 1,000 feet beyond the end of the runway in accordance with standards. As with the RSAs, the OFA dimensions fall entirely on airport property and meet all FAA criteria.

4.3.4 Runway Protection Zones (RPZs)

The RPZ is trapezoidal in shape and centered on the extended runway centerline for each runway end. The function of the RPZ is to enhance the protection of people and property on the ground. It begins 200 feet beyond the permanent runway threshold (at the end of the primary surface). The RPZ dimensions are based on the type of aircraft using the runway, the type of operations (visual or instrument) being conducted, and the visibility minimums associated with the most demanding

approach available. Table 4-6 shows the RPZ dimensions for Runways 16 and 34. On the 16 end the RPZ contains portions of Interstate 5 and two local roads. While these are not desirable, they have in the past been viewed as acceptable. A small portion of the RPZ to the south is not owned by the Port of Bellingham at this time. This parcel is undeveloped. Like the 16 end, several local roads are within the RSA but are seen as acceptable at present.

Table 4-6: Runway Protection Zone (RPZ)

Runway	Aircraft Served	Approved Approach	Zone Length (feet)	Inner Width (feet)	Outer Width (feet)	Acres
34	Large	Non-Precision	1,700	1,000	1,510	48.9
16	Large	Precision	2,500	1,000	1,750	78.9

4.4 AIRPORT TRAFFIC CONTROL TOWER (ATCT)

The ATCT at BLI is a contract Level 1 ATCT with radar support from NAS Whidbey Island. Hours of operation at the time of this report are from 7:00 a.m. to 10:30 p.m. daily. The ATCT is located immediately south of the passenger terminal building and has a cab height of approximately 215 feet mean sea level (MSL). Given the tower height and location, it is a limiting factor to full development of both terminal and general aviation facilities. Figure 4-7 shows the tower line-of-sight requirements and height limitations, emphasizing the impact that it has on development of all land on the east side of the airport. As shown, to maintain the line of sight approximately 50 acres of airport property that would otherwise be available for aviation related development, including 10 critical acres where new GA development is recommended, are not usable for either parking aircraft or developing hangars. Additionally the location of the tower is a limiting factor on gate flexibility at the terminal. To maintain line-of-sight criteria gates need to be managed in a manner that limits use based on tail heights. To remedy this situation either the existing tower cab needs to be raised or a new location should be found for the tower.

Additionally, with BLI traffic increasing the possibility of delays and the potential safety issues associated with congestion will need to be addressed. At present the ATCT coordinates with Whidbey Island for radar coverage and therefore the tower operates as a manual control ATCT without the ability to track and guide aircraft efficiently. The only way to improve on this capability is to add Airport Surveillance Radar (ASR) to the airport at the time that the tower is either raised or relocated. The primary benefits of the ASR are the reduction of delays during IFR conditions and

increased operational safety. Having ASR on the airport can reduce the in-trail separation between aircraft from 7 miles to 3 miles, enabling more hourly operations, as well as controlling the flight tracks of the aircraft more accurately, which increases safety.

Determining whether an airport qualifies for ASR installation is a two-phased process. Phase 1 involves analysis of a set of simple, generalized criteria. Under Phase 1 an airport's ratio value is computed by summing the benefits of ASR. If the ratio of the benefits exceeds 1 then the airport needs to proceed into a Phase 2 analysis, a computerized analytical technique commonly performed by FAA.

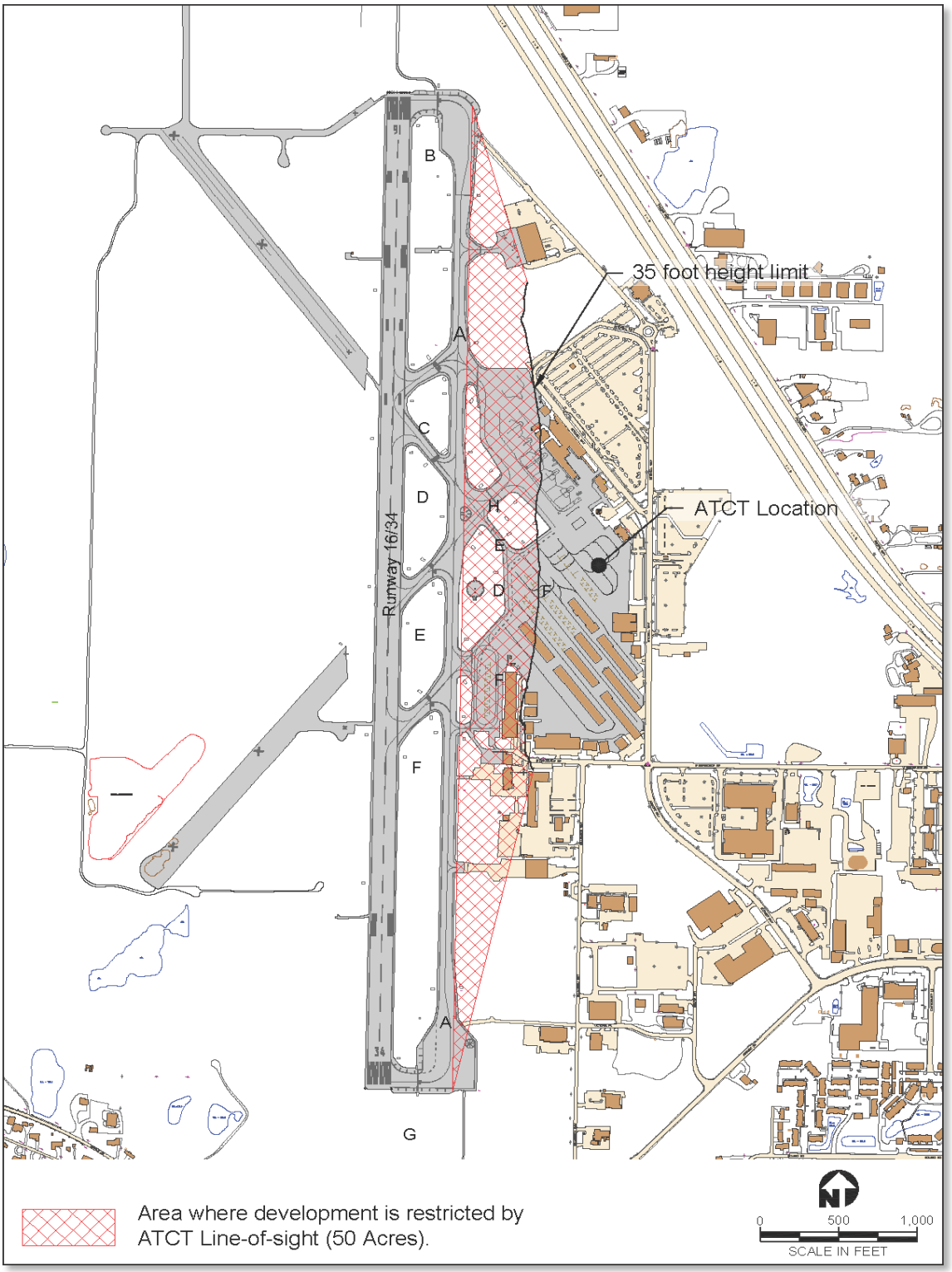


Figure 4-7: ATCT Limitations Map

The phase 1 analysis measures the ratio between the instrument approaches at the primary airport by category with an adjusted total of the instrument operations at the airport by all classes. The formulas used are as follows:

Table 4-7: ASR Analysis

Delay Reduction	
ACPRIM	Where ACPRIM is equal to the number of instrument operations by air carrier
3,400 - (.0013XPRIM)	Where PRIM is the total number of instrument operations
ATPRIM	Where ATPRIM is equal to the number of instrument operations by air taxi or commuter
23,000 - (.0096X PRIM)	Where PRIM is the total number of instrument operations
GAPRIM	Where GAPRIM is equal to the number of instrument operations by general aviation
53,300 - (.0196XPRIM)	Where PRIM is the total number of instrument operations
MLPRIM	Where MLPRIM is equal to the number of instrument operations by military
8,600 - (.0032XPRIM)	Where PRIM is the total number of instrument operations
Safety	
ACITN = 107,400	Where ACITN is equal to the number of Air Carrier Itinerant Operations
ATITN = 539,600	Where ATITN is equal to the number of Air Taxi Itinerant Operations
GAITN+GALCL	Where GAITN is equal to the number of GA Itinerant Operations
847,200	Where GALCL is equal to the number of GA Local Operations
MLITN+MLLCL	Where MLITN is equal to the number of Military Itinerant Operations
376,200	Where MLLCL is equal to the number of Military Local Operations

These are applied to the traffic numbers recorded at the airport and if the ratio value is greater than 1 then the airport qualifies for consideration of an ASR Installation. In the Bellingham case, the numbers resulting from these calculations show the airport is a candidate for an ASR installation now. The calculated Ratio Values are as shown on the table.

Table 4-8 shows that the primary benefit of the ASR installation is related to decreasing delay and delay costs. An additional benefit to be gained from the ASR includes the ability to better monitor and direct flight tracks to help minimize the noise impacts on the community should additional study show this to have benefit.

Table 4-8: ASR Benefits

Year	Delay Reduction	Safety	Total
2011	3.12	0.14	3.26
2016	3.50	0.17	3.66
2021	3.86	0.18	4.04
2026	4.40	0.20	4.61
2031	5.09	0.23	5.32

4.5 TERMINAL REQUIREMENTS

The Terminal Building at BLI first opened for service in 1940 and served the airport until it was reconstructed in 1980. In 2006, the terminal was again remodeled and expanded to respond to increased passenger levels and changes in security requirements. During the project the outdoor baggage claim area was enclosed, a Transportation Security Administration (TSA) checkpoint was added, and a modular gate lobby building was added. The terminal building was further expanded and remodeled in 2011 as part of a two-phase construction project, which included removing the modular gate lobby and adding a permanent gate lobby. The mechanical/electrical infrastructure was also upgraded. Phase II of the project, which opened in 2014 expanded the ticket and baggage claim lobbies.

4.5.1 Passenger Terminal Building Requirements

Within the passenger terminal building, services are required for processing passengers arriving and departing on commercial flights. Enplaning services include ticketing, baggage check-in, airline offices and baggage screening. Processing services include passenger screening facilities operated by the Transportation Security Administration (TSA). Deplaning services include baggage claim, rental car facilities, and parking prepay facilities. Other services necessary in a terminal building include concessions (restaurants and gift shops), restrooms, advertising and display areas, mechanical and utility rooms, and janitorial service and storage areas.

The future of the passenger terminal needs to be planned to ensure that additional airlines and larger aircraft are not precluded from serving Bellingham should demand arise, as well as ensuring that the current and projected peak passenger and aircraft parking loads are accommodated. The following discussion provides details on the facility requirements for the passenger terminal. Included are the base line (2011) conditions as well as the improved conditions resulting from the terminal expansion in 2014. Future requirements are summarized in 5-year increments in Table 4-9.

Table 4-9: Terminal Building Requirements

		2011	2014	2016	2021	2026	2031
Annual enplanements		511,000	595,074	710,000	855,330	1,000,659	1,145,989
Peak hour enplanements		330	345	458	552	646	739
Peak hour airline operations		3	4	4	5	5	6
Facility Requirements	**Unit**						
Enplaning							
Ticket counter length	l.f	32	85	85	85	85	85
Ticket lobby	s.f.	1,760	7,353	7,353	7,353	7,353	7,353
Airline offices	s.f.	480	2,179	2,179	2,179	2,179	2,179
Airline baggage make-up/operations space	s.f.	4,000	8,470	8,470	8,470	8,470	8,470
TSA baggage screening	s.f.	4,000	5,421	5,421	5,421	5,421	5,421
Total enplaning requirement	**s.f.**	**10,240**	**23,423**	**23,423**	**23,423**	**23,423**	**23,423**
Security/Screening							
Passenger security lanes	no.	3	3	5	6	6	7
Screening area	s.f.	6,435	8,123	8,931	10,764	12,597	14,411
TSA administration	s.f.	1,000	1,651	1,651	1,651	1,651	1,651
Total security requirement	**s.f.**	**7,435**	**9,774**	**10,582**	**12,415**	**14,248**	**16,062**
Gate Areas							
Number of gates		4	5	5	7	8	10
Gate lobby	s.f.	10,400	14,707	14,707	18,200	20,800	26,000
Restrooms	s.f.	900	2,674	2,674	3,921	3,921	5,228
Concessions	s.f.	1,600	2,192	2,192	2,192	3,200	3,200
Total gate area requirement	**s.f.**	**12,900**	**19,573**	**19,573**	**24,313**	**27,921**	**34,428**
Deplaning							
Bag claim devices	units	2	2	2	3	3	3
Bag Claim lobby	s.f.	6,468	10,477	10,477	10,477	10,477	10,477
Inbound baggage area	s.f.	1,500	5,427	5,427	5,427	5,427	5,427
Rental car area		1,120	2,607	2,607	2,607	2,607	2,607
Total deplaning requirement	**s.f.**	**9,088**	**18,511**	**18,511**	**18,511**	**18,511**	**18,511**
Offices							
Airport management	s.f.	5,000	1,104	5,000	5,000	5,000	5,000
Other	s.f.	1,500	2,138	2,138	2,138	2,138	2,138
Total office requirement	**s.f.**	**6,500**	**3,242**	**7,138**	**7,138**	**7,138**	**7,138**
Other Needs							
Concessions	s.f.	2,500	402	2,500	2,981	3,488	3,991
Restrooms	s.f.	450	2,137	2,137	2,137	2,137	2,137
Storage	s.f.	1,350	3,500	3,500	3,500	3,500	3,500
Air Cargo	s.f.	-	965	965	965	965	965
Utility	s.f.	2,025	4,407	4,407	4,407	6,200	6,200
General circulation	s.f.	923	10,964	10,964	10,964	10,964	10,964
Unfinished	s.f.	-	2,820	-	-	-	-
Total other requirement	**s.f.**	**7,248**	**25,195**	**24,473**	**24,954**	**27,254**	**27,757**
Total Requirement	**s.f.**	**53,411**	**99,718**	**103,700**	**110,754**	**118,495**	**127,319**

4.5.1.1 Passenger Enplaning Facilities

Phase II of the passenger terminal expansion, completed in 2014, provided ticket counter space and check-in kiosks for five to six airlines. URS calculated the requirements at the ticket counter assuming that each airline would require area for four to six agents with space to process enplaning passengers, separated by a bag well between the agent positions to accommodate checked baggage.

Each airline will also require office space for administrative staff, employee break/locker areas, and air cargo offices. Additionally each airline needs baggage make-up space. This space includes the area to move bags from the counters to the make-up area, where they are loaded onto carts to be transported to the aircraft. Prior to, but adjacent to the bag make-up spaces, bag screening needs to occur. The bag screening facility, operated by TSA, needs to be sufficient to accommodate the equipment and personnel necessary to screen peak-hour baggage.

Passenger Screening Checkpoint Facilities

Once passengers are ticketed, they proceed to a passenger-screening checkpoint. There are currently two processing lanes at BLI with a theoretical capacity of accommodating 100 to 120 passengers per hour per lane. Based on forecast growth and a processing rate of 100 to 120 passengers per hour, the terminal building should allow for six screening lanes, with Advanced Imaging Technology (AIT) machines and/or magnetometers and one carry-on screening machine per lane. TSA design standards require an average of 1,050 square feet of space per screening lane, including a seating-composure area, response corridor, law enforcement officer, and a private search room. For passengers waiting to access security screening, a queuing area is calculated assuming that no more than 75 percent of the peak-hour enplaning passengers will be in line at any given time and each will require roughly 16 square feet of space.

TSA may also desire ancillary operations support space for employee break room and/or training room functions. These are not necessarily required to be adjacent to the checkpoint and at BLI they are located on the second floor of the terminal..

Gate Area

Once ticketed and through security, passengers proceed to the hold room/gate area to await aircraft boarding. This area requires sufficient seating for 90 percent of the peak-hour passengers. An estimated 20 square feet is required for each seat and includes associated circulation space. In addition to seating, a departure podium, queuing area, and exit corridor add approximately 300 square feet total per airline gate.

Space must also be provided for restrooms and concessions, since this area is located behind the security checkpoint and passengers can no longer access nonsecure facilities.

4.5.1.2 Deplaning Services

When passengers deplane, they proceed from the aircraft through the hold room to the baggage claim area. The future baggage claim area should include space for three automated baggage claim devices. Assuming a 25-foot-long device with a 12-foot-wide retrieval zone in front, the area for each baggage claim device will need to be approximately 300 square feet. Additionally, the area needs to accommodate people who are meeting incoming passengers.

This area also needs to provide for rental car agencies with customer service areas, queuing space, and parking prepay kiosks.

4.5.1.3 Other Services

In addition to facilities used for processing passengers, the terminal must also provide public services such as restaurant/concessions (minimum of 1,000 square feet), restrooms in the nonsecure zones, a display area for advertising, and building systems and janitorial rooms.

4.5.1.4 Airport Management Space

Space requirements include an office for Airport Administration. This space should include a security badging workstation, conference/meeting area, kitchen/support area, circulation space, and restroom.

4.5.1.5 Terminal Apron

Aircraft parking is arranged along the terminal concourse and currently consists of eight active gate positions, all of which are power-in/push-out positions. Gate 1 on the north side of the terminal is also used for two RON positions when needed.

The exact size of any future terminal apron will depend on the final footprint and layout of the terminal building. However, an area equal to 14 aircraft gates should be planned for in the future. In addition, five RON locations should be provided. The RON spaces should be in the terminal area in a location where they do not interfere with aircraft circulation or safety and where they can park without affecting the ATCT line-of-sight. Currently the tower height and location limits these spaces to the southern portion of the apron area

4.5.1.6 Automobile Parking and Surface Access

Automobile parking is provided in paved surface lots located adjacent to the terminal building and in remote lots accessed with shuttle bus service. There are 2,941 spaces available for public parking, 134 for rental cars, and 500 for employees. In the main parking lot, there are 1,436 parking spaces,

17 Americans with Disabilities Act (ADA) stalls16 pick-up/drop-off (30-minutes free) spaces, 14 cell phone lot spaces and 134 rental car spaces. Parking is also available east of the terminal building where an additional 791 parking spaces are available (772 public, 16 ADA, and 3 RV stalls). At present, these lots are being used at approximately 60 percent of capacity, with those closest to the terminal receiving higher use.

To supplement these lots there are two overflow lots located south of the terminal. The first, at the intersection of W. Bakerview Road and Airport Way is a gravel lot with 396 spaces and the second is off Williamson Way where 318 spaces are available. Both of these lots are served through shuttle buses. Prior to the opening of the new lots near the terminal, these lots were heavily utilized. With the opening of the new lots, these remote areas are receiving less use. Like the terminal, auto parking has been expanded several times in recent years to keep pace with the high level of demand.

Projecting demand for public parking is based on an airport's annual enplaned passengers. According to FAA Advisory Circular 150/5360-13, Planning and Design Guidelines for Airport Terminal Facilities, there is a range from 1,000 to 3,500 public parking spaces required for each million annual enplanements, depending on the type of use at the specific airport. In addition, it is typical to provide for 15 percent more space than the calculated need to minimize the amount of time required to find an available space. Currently at BLI, there are approximately 4,400 spaces per million annual passengers. This reflects the fact that a high percentage of the passengers using BLI are traveling for vacation purposes. These passengers typically park for a longer time than do business flyers. The projections shown in Table 4-10 support growth in passengers with similar use patterns. The assumptions made include that there will be an increase in business travel at BLI as new destinations are added, and that some of the parking demand will continue to be accommodated through the private, off-site parking lots.

Table 4-10: Parking Projections

Year	Annual Enplaned Passengers	Short Term Public	Long Term Public	Total Public	R-A-C Ready/Return Area	Employee
2011	511,000	558	2,232	2,790	134	250
2014		589	2,352	2,941	134	500
2016	710,000	775	3,101	3,877	355	500
2021	855,330	934	3,736	4,670	428	500
2026	1,000,659	1,093	4,371	5,463	500	500
2031	1,145,989	1,251	5,006	6,257	573	500

Rental car parking projections were made using the assumption that the ready and return lots would continue to be located near the terminal building. Currently there are 134 rental car spaces located in the terminal area with long-term storage being supplied at off-site locations. The ratio of rental car spaces to passengers equals roughly one space per 2,000 arriving passengers. This represents low usage when compared to national averages that show that one space per every 750 arriving passengers should be provided. This lower than average use is consistent with the recreational nature of the passengers and airlines using BLI.

Employee parking demand depends on the number of employees associated with the airlines, airport administration and terminal tenants. Currently the airport has 250 spaces reserved for employee parking south of the terminal at the former Air National Guard site. In the future, this number will change as additional airlines are added or service levels increase. Any expansion of the terminal building will also require a revalidation of the area allocated for employee parking. In Table 4-10, employee parking is shown as remaining static for the short term with additional spaces required in the future.

The primary route used to access the airport includes the use of the Bakerview Road/I-5 Interchange. WSDOT and other surrounding jurisdictions are aware of capacity constraints at this interchange and have identified the issue in the "Fairhaven to Slater Interstate 5 Master Plan." This master plan has recommended a single point urban interchange (SPUI) to improve overall operation of this interchange. Currently there is no funding for this interchange improvement. Recently completed regional traffic studies have included trip generation models for airport use as forecast through the year 2030. These show that the airport-generated traffic represents from two to five percent of the total 2030 traffic at the Bakerview Road/I-5 Interchange.

4.5.2 Air Cargo

There are two distinct types of cargo operation at BLI. There is the cargo being processed and shipped by the commercial air carriers using the same planes that they use to transport passengers (commonly referred to as belly-cargo) and the cargo carried by the all-cargo carriers such as Federal Express and United Parcel Service (UPS). These two types of cargo require different facilities for processing, as explained in the following.

4.5.2.1 Airline Cargo (Belly Cargo)

The volume of belly cargo being shipped into and out of BLI is minimal, as the market does not support large volumes and the airlines that operate do not emphasize this market. All belly cargo is currently processed in space provided on the north end of the passenger terminal. The space provided is expected to be adequate for future needs.

With the initiation of direct flights to the Hawaiian Islands, there could be an increase in the demand for cargo since the Hawaii market is air cargo intensive. Any increase should be accommodated through existing facilities or be processed off-site by third-party shippers.

4.5.2.2 All-Cargo Carriers

Forecasts of the volume of all-cargo carriers in Bellingham have been based on two assumptions regarding the marketplace;

1. Carriers such as FedEx and UPS that move small packages on a time-critical basis will continue to operate feeder service out of BLI connecting with their hub operations in the Puget Sound Region.
2. The movement of goods to and from the San Juan Islands will continue by air. Most of the growth in this activity will be tied to population and economic conditions in the Islands, specifically the population and demographics for Whatcom and San Juan Counties.

At present, all of this cargo is accommodated in privately owned and operated facilities or processed off-site and loaded onto the aircraft on the apron. Given that the rate of growth for air cargo is not projected to be steep, the need for additional facilities at BLI is expected to be limited. We assume that the FedEx facility will be sufficient for their operations through the planning horizon. Other carriers will continue to operate either on the apron area or at private hangar facilities. The need for these will consist of additional apron area on which to load and unload the cargo.

4.6 AIRCRAFT STORAGE REQUIREMENTS

In 2011 there are 209 general aviation aircraft based at BLI. Of these, 110 are stored in T-hangars, 15 in corporate hangars and the remaining 86 on tiedowns. The long-term forecast for based aircraft at BLI anticipated that 275 aircraft would need to be accommodated by 2031. This is an increase of 66 aircraft. The majority of these aircraft will require hangars or some form of indoor storage. The forecast shows that future based aircraft will consist of an increasingly higher percentage of high-performance twin and turbine aircraft whose owners prefer to shelter them indoors. The number and type of aircraft storage facilities needed over the course of the 20-year planning period is detailed in the sections below.

4.6.1 Hangar Storage Requirements

Aircraft hangar storage is in demand at BLI at present but land available for hangar development is limited. Although current storage rates show that 59 percent of all based aircraft are stored in hangars and 41 percent in tie-downs, this distribution is heavily influenced by the fact that the supply of hangars is limited. Additional consideration must be given to the fact that the existing hangars do meet FAA design criteria. The taxilane width between structures does not meet the setback standards for the types of aircraft being housed in the hangars. Table 4-11 lists the assumed storage preferences for based aircraft if adequate facilities were available. Combining these with the based aircraft forecast produced the requirements for hangar space as shown in Table 4-12. As shown, demand for open-air tiedowns is relatively low and the largest growth in demand expected to be in corporate hangars.

It should be remembered that the demand for aircraft hangars is based on forecasts that can change. Consequently, while

Table 4-11: Hangar Requirements

Year	T-Hangars	Corporate Hangars	Total
2011	110	15	200
2016	166	50	216
2021	177	56	233
2026	189	61	250
2031	197	67	264

Table 4-12: Conceptual Based Aircraft Storage Distribution

Aircraft Type	T-hangars	Corporate Hangars	Tiedown	Total
Single Engine Piston	80%	15%	5%	100%
Multi-Engine Piston	50%	50%	0%	100%
Turbine	0%	100%	0%	100%
Rotor	0%	100%	0%	100%

URS recommends that these larger hangar facilities be reflected in the airport's long-term plans, we also recommend that hangars only be constructed as specific demand arises.

4.6.2 Based Aircraft Tiedown Storage Requirements

Based aircraft that do not have hangar space are stored outside on tiedown aprons. Tiedowns are generally used by small single engine piston aircraft. Space planning for these aircraft is based on an area of 360 square yards of apron for each aircraft parking space. This provides space for both aircraft parking and circulation between the rows of aircraft. This space allowance assumes that pilots who are based at BLI have a high degree of familiarity with the aircraft parking situation and, therefore represents a minimum that should be provided.

Table 4-13: Based Aircraft Tiedown Requirements

Year	Tiedown Spaces	Tiedown Area (s.y.)
2011	86	-
2016	10	3,458
2021	10	3,683
2026	11	3,932
2031	11	4,104

4.6.3 Transient Aircraft Tiedown Requirements

Tiedown space is also needed for transient aircraft parking. It is best to provide this space at or adjacent to FBO hangars where the aircraft owners can have access to fueling and other services. In calculating the area required for transient tiedowns, an allowance equal to 700 square yards per aircraft is used. This area is larger than that applied to spaces for based aircraft tiedowns for two reasons. First, the user of the transient space may not be as familiar with the airport's ground movement patterns, and thus providing a greater margin of safety is prudent. Second, all types and sizes of aircraft are parked in the transient tiedown area, and a greater apron allowance provides more flexibility in how individual tiedowns can be used. URS employed the following method to calculate the number of aircraft that will require transient aircraft parking spaces.

- Determine the number of itinerant aircraft operations that occur on the average day.
- Convert the average day itinerant operations to the number of daily transient arrival aircraft by dividing by two.
- Divide the number of aircraft performing itinerant operations by two to account for the fact that based aircraft perform some itinerant operations.

- Assume that no more than 50 percent of the resulting daily transient aircraft will require storage at any one period.

Based on the Aviation Demand Forecasts, itinerant operations will be 45 percent of overall operations, or 139 daily operations by 2031. Using the methodology cited above, nine itinerant aircraft tiedown positions will be required as shown in Table 4-14.

Table 4-14: Transient Tiedown Requirements

Year	Itinerant Operations				Transient Tiedowns Required
	Annual	Average day	Daily Arrivals	Transient Arrivals	
2011	27,148	95	48	24	12
2016	33,526	117	30	15	8
2021	35,479	124	32	16	8
2026	37,570	131	34	17	8
2031	39,805	139	36	18	9

4.6.4 Summary of Aircraft Storage Requirements

The preceding analyses show that the focus for future aircraft storage should be on hangars (either corporate or T-hangars) instead of tiedowns. Table 4-15 shows the amount of space needed for aircraft storage throughout the forecast period.

Table 4-15: Aircraft Storage Requirements

Facility		2011	2016	2021	2026	2031
Small T-hangars	Number	142	154	164	175	182
	s.f.	840,335	906,712	965,740	1,031,117	1,076,042
Medium T-hangars	Number	3	3	4	4	4
	s.f.	24,383	24,383	26,103	28,322	29,871
Corporate Hangars	Number	46	50	56	61	67
	s.f.	345,431	377,138	416,988	458,153	500,878
Based Tiedowns	Number	9	10	10	11	11
	s.f.	8,012	9,000	9,000	9,900	9,900
Transient Tiedowns	Number	6	8	8	8	9
	s.f.	15,000	20,000	20,000	20,000	22,500
Total Requirement	s.f.	1,233,160	1,337,233	1,437,831	1,547,492	1,639,192
	acres	28	31	33	36	38

4.6.5 Fixed Base Operator Facilities

As the number of based aircraft increases and the level of operations continue to rise, the airport needs to ensure that adequate land is set aside for FBO facilities. In this report, the space needed is calculated at 15 percent of the total area designated for based aircraft storage and transient tiedowns. Table 4-16 shows the space that should be dedicated to FBO facilities. The area set aside for the FBO expansion should include the transient aircraft parking spaces discussed previously.

Table 4-16: FBO Facility Need

	2010	2015	2020	2025	2030
GA Needs					
Square feet	1,233,160	1,337,233	1,437,831	1,547,492	1,639,192
Acres	28.31	30.70	33.01	35.53	37.63
FBO Needs					
Square feet	184,974	200,585	215,675	232,124	245,879
Acres	4.24	4.60	4.95	5.33	5.64

4.7 GENERAL AVIATION AUTOMOBILE PARKING AND ACCESS

Security regulations for general aviation are under review by both FAA and TSA. It is clear that access to the airfield will become more limited in the future, especially in environments where commercial air carriers are operating, such as BLI. Vehicle access gates at BLI currently limit automobile access to the operations and hangar areas to the owners and operators of aircraft. The aircraft owners commonly park their cars in the hangars.

4.8 UTILITIES AND DRAINAGE

Existing utility services at BLI are discussed in Chapter 2, Existing Conditions. There are two utility issues involved with the airport. The first is the treatment of airport de-icing fluids in the existing City sewage treatment facility. Given capacity issues in the treatment facility the release of glycol products has to be scheduled in advance and timed for non-peak hours. Even with these precautions, there are release and treatment issues that need to be addressed. The Port has initiated a system improvement project to correct not only this issue but to increase overall system capacity to allow for future development.

A second issue is the lack of utilities on the airport's west side. This creates a situation that makes development of any airport facilities on this side more expensive and time consuming. As new facilities are developed in new areas, utilities will need to be extended or expanded to provide the necessary services. For the terminal and general aviation areas, utility services typically include electricity, water, data cables, and the collection of storm water treatment.

4.9 SUPPORT FACILITIES

In support of the commercial and general aviation activity and development at BLI there are several support facilities that need to be developed for continued operations including:

4.9.1 Federal Inspection Services (FIS) Facilities

At present the U.S. Customs and Immigration Service operates from facilities adjacent to the terminal building. From these, they are available to process general aviation international flights at the airport. Their on-airport facilities include office space and approximately 3,375 square feet of apron fronting the ATCT, which is reserved for incoming international aircraft parking. In the future, a FIS facility will need to be expanded to provide for increased operations by GA aircraft.

Within the passenger terminal a new FIS facility is currently under construction to provide for the needs of commercial service.

4.9.1.1 Aircraft Rescue and Fire Fighting (ARFF)

BLI is classified as an Index C airport per Federal Aviation Regulations (FAR) 139.315. The ARFF Station is located south of the general aviation area at the end of W. Bakerview Road. The building was constructed in 2009 and has three truck bays that house an Oshkosh 1500 Striker, E-One 1500, and an Oshkosh T3000. No improvements to this facility will be required over the 20-year planning timeframe. However, the equipment will need to be upgraded over time beginning with the replacement of the Oshkosh T3000 in the short-term period.

4.9.2 Aircraft Fueling

Aircraft fueling facilities currently include both Jet-A and Avgas. Four 25,000-gallon aboveground storage tanks provide fuel for the air carrier and general aviation jets at BLI. These tanks provide for less than a 2-day supply. Avgas is available from two 12,000-gallon aboveground tanks located mid-field.

In calculating the need for additional storage capacity a 7-day supply of Jet-A fuel is preferred in order to assure an uninterrupted supply to the scheduled carriers. Therefore, our calculation includes a factor to bring the current capacity up to standards and then grow it based on the increase in the number of jet operations anticipated.

Avgas demand is lower than that for Jet-A and new capacity is expected to be added by the Fixed Base Operators as they relocate their facilities.

Table 4-17 shows the need for fuel storage over the 20-year planning period.

Table 4-17: Jet-A Supply

Year	Annual Operations	Capacity (gallons)	Day's Supply	Tanks
2011	11,197	150,000	2	2
2016	12,555	196,224	7	8
2021	14,776	230,937	7	9
2026	16,953	264,962	7	11
2031	19,264	301,081	7	12

4.10 FACILITY REQUIREMENTS SUMMARY

The preceding analyses covered the full range of facilities required to maintain service levels and safe operations at Bellingham International Airport. In general, the focus was on the ability of existing airport facilities to meet forecast demand levels but the requirements for new or expanded facilities also consider enhanced or updated security or FAA design standards and actions that are necessary to achieve the Port's strategic vision for the airport. The facility requirements are summarized in the following table.

Table 4-18: Facility Requirement Summary

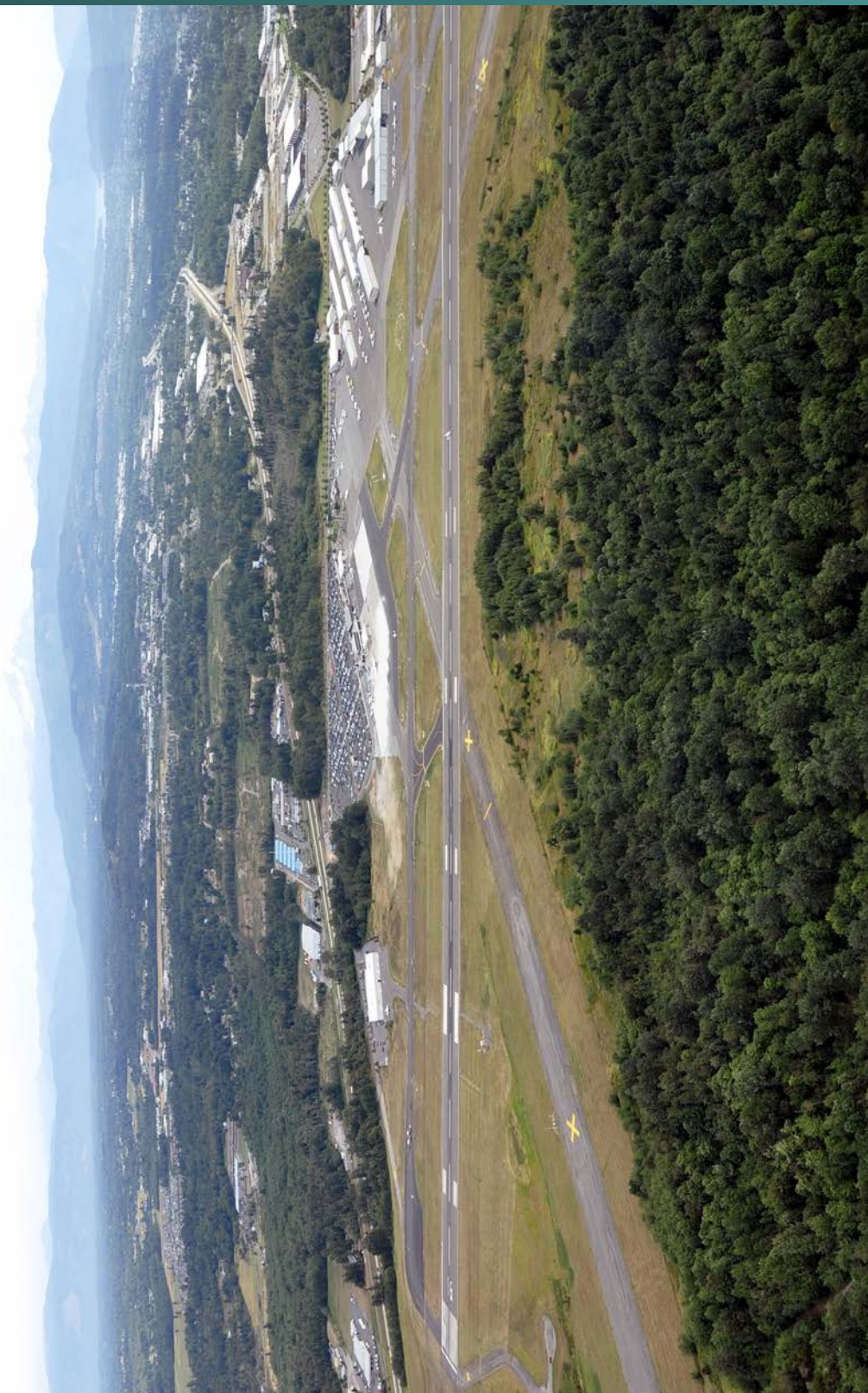
Facilities	Conclusions
Airfield System	Runway 16-34, at 6,701 feet, provides sufficient take-off length for all aircraft forecast to use the airport. At the present time there are no shoulders on the runway. These should be added. The taxiway system, particularly Taxiways E and H, need to be upgraded to eliminate opportunities for runway incursions by realigning or truncating Taxiways F, E, D, and C. To control the impacts of engine run-up operations, both operationally and in terms of community compatibility, a designated area for engine run-ups should be developed. A helicopter landing area should be designated to separate this activity from that of fixed wing aircraft. A new Snow Removal Equipment (SRE) Building should be constructed to protect the Port's investments and allow for airfield access by the snow removal equipment. The airport's perimeter road should be completed.
Passenger Terminal	At the time of this master plan (2013), the passenger terminal building is being expanded to accommodate 750,000 to 800,000 annual enplaned passengers. Based on the forecasts, this should serve the airport until the 2020 to 2025 period, at which time an expansion will be needed to serve increasing demand with an acceptable level of service. In addition, seven Remain Over Night (RON) parking spaces need to be developed to accommodate the airlines' needs. Two of these positions are required immediately, with five more needed before 2031.
Terminal Area Support	The fuel truck storage/ready area, Ground Service Equipment (GSE) storage, charging and maintenance areas, de-icing storage and application, waste disposal facilities, commissary and stores buildings, and delivery facilities are all part of the terminal complex. Additional area for these will need to be accounted for as the terminal area is expanded.

Table 4-18: Facility Requirement Summary (Continued)

Facilities	Conclusions
Airport Access	Providing access to the airport with an acceptable level of service will require continued improvements to area roadways. The intersection of I-5 with Bakerview Road was recently improved to increase capacity overall and included consideration of the projected growth in airport related traffic through 2030. The Airport Drive/Airport Way interchange will need to be upgraded to address airport related traffic in the next few years. Airport growth beyond that forecast or traffic from regional development could trigger the need for additional regional traffic improvements. Other regional roadway improvements that merit further study include the extension of Wynn Road or Kope Road from the north to provide an alternate access route to the airport.
Automobile Parking	The current public parking lots provide space for 2,941 vehicles in six individually designated lots. This includes 2,867 public spaces, 41 Americans with Disabilities Act (ADA) compliant spaces, 3 recreational vehicle (RV) stalls, 16 drop-off/pick-up (30 minutes free) spaces, and a 14-space cell phone lot (free). Forecasts show that additional expansion may be needed as passenger levels continue to grow although off-site parking could reduce the demand for on-airport facilities. The employee parking area includes 500 spaces with 138 spaces in the main parking lot reserved for rent-a-car ready and return. These areas will also need to be expanded in the future.
Air Cargo	The new passenger terminal contains facilities for processing cargo shipped on the commercial airlines. This area will suffice through the period covered in the master plan. All-cargo activity is forecast to continue to consist of feeder service using small regional aircraft but additional space will need to be provided to handle the increased usage. This will be done either by re-marking existing pavement or by constructing new air cargo apron areas.
Based Aircraft Hangar Storage	With the forecasted growth in based aircraft, as well as the existing unmet demand for hangar space, additional area for hangar development is needed. In addition, relocation of general aviation hangars and tiedown areas will be needed as the passenger terminal is expanded and congestion increases within the existing apron area. Additionally some of the existing T-hangars do not meet FAA design criteria for taxiway clearance between the buildings. Upon relocation, these issues will be corrected in their new location.
FBO and Support	Expanded or new fixed base operator (FBO) facilities are required to provide support for the growing general aviation community. These facilities will provide not only aircraft maintenance hangars but also pilot lounge areas, aircraft fueling, and space for transient aircraft parking.
Fueling	The current fuel storage facility provides less than two days of fueling capacity. The fuel farm needs to be expanded to increase the capacity to match the increase in aviation activity.

Table 4-18: Facility Requirement Summary (Continued)

Facilities	Conclusions
Other	The possibility of adding a new Instrument Landing System (ILS) on Runway 34 to provide for better all-weather operations as well as to increase operational flexibility should be considered. FAA will review the need for the facility as demand increases. The Airport Traffic Control Tower (ATCT) is too short to provide an unimpeded line-of-sight to all portions of the active aircraft movement area. A Safety Risk Management Study should be initiated by FAA to assess whether the increased activity levels at BLI will be impacted by the tower's location. If FAA determines that the situation needs to be remedied, the tower will need to be either raised, relocated, or otherwise modified. Any changes in the tower height or location will be scheduled by FAA as part of their facility improvement program. An Airport Surveillance Radar System (ASR) should be considered to increase safety and efficiency in operations. This decision will be made by FAA outside the master plan process.



5

5 ANALYSIS OF ALTERNATIVES

5.1 INTRODUCTION

The purpose of this chapter is to identify and evaluate alternative strategies for the development of the Bellingham International Airport (BLI). Developing alternatives is the best way to ascertain how to meet the facility needs established in the previous chapter (Chapter 4, Facility Requirements). In this chapter, those facilities that have been determined to require physical improvements are identified, alternative ways to meet those requirements are developed, compared and ranked, and a preferred development plan is selected to serve as the basis for the development of the Airport Layout Plan (ALP). The following are the areas where facility improvements have been analyzed for the ALP at BLI.

1. The airfield (runways, taxiways, and other facilities)
2. The passenger terminal area (terminal building, aircraft apron, airport access, and auto parking)
3. General aviation areas (fixed base operator [FBO] facilities, hangars, and tiedowns)
4. Other projects related to air traffic control and Navigational Aids.

The Table 5-1 shows a summary of the decisions that result from the alternative evaluation process. Details of the methodologies employed, recommendations made, and final analyses are contained in the remainder of this chapter.

Table 5-1: Summary of Alternative Recommendations

Area/Facility	Recommendations	Summary
Airfield Projects		
FAA ARC Classification	C-IV for all airfield facilities.	No alternatives were considered.
Taxiways	The parallel taxiway system will be reconstructed to replace the existing angled exits with four new 90 degree exits. Taxiways E, F, and D currently provide direct access from the runway to the terminal area and the intersection of Taxiways D and E has been identified as confusing. It is recommended that portions of these be taken out of operation and portions relocated to assure that direct runway access is no longer an issue and the confusion created by the pavement marking be eliminated. Terminal apron Taxilanes J and H are recommended to be relocated and restriped to meet the dimensional criteria for the Boeing 757-200 aircraft. These taxilanes provide access to the commercial parking positions at the terminal building.	The alternatives studied included doing-nothing or constructing new exits at locations better suited to meet the needs of the aircraft fleet. Doing nothing was rejected because the current exit taxiways do not meet design standards and are not located to serve the needs of the users. Angled exits were not selected because the number of annual commercial operations do not justify them and the separation distance between Runway 16/34 and parallel Taxiway A is not sufficient to meet the design criteria for angled exits. Further, location of the terminal and general aviation aprons make it necessary for aircraft using angled exits to maneuver through acute angles, negating the advantage of the angled exits as well as creating stress on the pavements.
Runway	Current runway length is sufficient for the long-term needs of the airport and airlines. The shoulders of the runway need to be paved to meet standards.	No alternatives were considered.
Jet Engine Run-up Area	It is recommended that the Port construct an area outside the airfield to serve as a jet engine run-up area. The site selected is on the south end of the airport near the hold taxiway for Runway 34. Details on the run-up area such as noise suppression features and final location and orientation will be developed prior to construction.	Alternative locations were examined, including continuing these operations at their existing location on Taxiway A or moving them to the west side. Continuing to use Taxiway A was eliminated from consideration due to the impacts on the use of the airfield during the run-ups. The west side location was also eliminated since the ability to develop in this area is questionable in the short-term timeframe.

Table 5-1: Summary of Alternative Recommendations (Continued)

Area/Facility	Recommendations	Summary
Airfield Projects (Continued)		
Jet Engine Run-up Area (Continued)		It is recognized that prior to final construction of any run-up facility a detailed analysis of the noise impacts associated with the site will need to be conducted to mitigate noise impacts on the community.
Airfield Pavements	Continue with the annual pavement maintenance program for all pavements.	No alternatives were considered.
Terminal Projects		
Passenger Terminal Building	The continued development of the terminal in a southerly direction is recommended when demand merits expansion. This allows for staged improvements to the facility while maintaining the investment in the terminal building that has been made to date.	The analysis demonstrated that to do nothing at the terminal would result in a lowering of customer service levels if the demand increases as forecast and additional facilities are not provided. Expanding the building in a northerly direction was rejected from consideration because aircraft parking spaces cannot be positioned outside the Federal Aviation Regulation (FAR) Part 77 Transitional Surfaces.
Remain Over Night (RON) Aircraft Parking	The recommendation for providing seven RON positions at BLI is to develop the Air National Guard (ANG) site to meet the short-term requirements with the eventual relocation of the RONs to the commercial terminal apron. This relocation will require the relocation and reconstruction of existing general aviation (GA) facilities.	Alternatives considered included doing nothing, constructing RON positions to the south of the terminal in the current general aviation area, constructing the seven positions on the west side of the airport, and constructing the seven positions on the existing terminal apron on the infield area between the terminal parking positions and Taxiway A. These were eliminated from consideration for a variety of environmental, operational, or other reasons.
Support Facilities	Space for terminal area support facilities has been provided in the terminal area.	No alternatives were considered.

Table 5-1: Summary of Alternative Recommendations (Continued)

Area/Facility	Recommendations	Summary
Terminal Projects (Continued)		
Access	The analyses include consideration of a possible improvement of airport access from the north. Two possible alternatives were identified including an extension of Kope Road along I-5 or a new routing that includes using existing roadways to the west of the airport.	No recommendations have been made regarding these routes. The airport's contribution to the potential traffic has been estimated to be very low and the ultimate decision on where and when to build will be made by others including Washington State Department of Transportation (WSDOT), Whatcom County, and the City of Bellingham with input from the City of Ferndale, the Port of Bellingham, FAA, the Department of Ecology, the U.S. Army Corps of Engineers, and the Lummi Nation. FAA will not permit any extension of Kope Road that infringes on either the Runway Safety Area (RSA) or the Runway Protection Zone (RPZ) for Runway 16.
General Aviation Projects		
General Aviation Facilities	It is recommended that the Port continue the development of general aviation facilities—both relocation and expansion—in the southeastern area. Longer term, the Port should monitor demand and be prepared to initiate development of the west side should that be required.	Doing nothing was rejected since that alternative would not adequately serve the long-range needs for either the terminal development or the GA users.
Helicopter Landing Areas	It is recommended that helicopter landing areas be designated at both the existing south hangar area and a new helipad be designated as part of the new GA area.	No additional alternatives were considered beyond the do-nothing.
Fueling	It is recommended that additional fueling capacity be provided at the existing fuel farm area.	No alternative locations were considered.

Table 5-1: Summary of Alternative Recommendations (Continued)

Area/Facility	Recommendations	Summary
Other Projects		
Air Traffic Control Tower (ATCT)	It is requested that the Federal Aviation Administration (FAA) conduct an independent analysis to determine whether the ATCT relocation is justified. If it is determined that relocation is justified, FAA will then conduct a tower siting study to decide the location. For master planning purposes it is recommended that the ATCT be moved from its current location to a new site north of the terminal area, near the FedEx facility.	The existing ATCT is not located in a position to provide clear lines-of-sight to all areas of the active airfield. Raising the tower cab to allow this was deemed impractical as the construction activities would likely exceed the cost of building a new tower. Although FAA will make the final determination regarding the tower, this master plan examined alternative locations to the south, which would conflict with general aviation development and to the west where utilities and roads are not available. These alternatives are not recommended.
Airport Surveillance Radar (ASR)	It is recommended that FAA install an ASR to improve traffic control.	No alternatives beyond the do-nothing were considered. The location of the ASR, should FAA determine that it is justified, will be decided at the time of installation.
Instrument Landing System on Runway 34	It is recommended that a new ILS system be installed on Runway 34.	No alternatives were considered.

5.2 AIRFIELD PROJECTS

The airfield at Bellingham International consists of a single runway, 16/34; the parallel taxiway system (Taxiways A, B, C, D, E, F, and G); the connector taxiways that link the parallel taxiway to the terminal and general aviation (GA) areas (Taxiways E, D, F, and J); and the taxilane that provides access from taxiways to airplane parking positions and other terminal areas (Taxilane H). Figure 5-1 shows the BLI airfield layout.

In November of 2012, the FAA completed the Local Runway Safety Action Plan (RSAT) for BLI. The purpose of the RSAT was to review conditions at BLI and identify any issues or concerns that could affect runway safety. The review found that while there were zero surface incidents and no runway incursions recorded at BLI in 2011 or 2012, there were some issues and concerns that needed to be addressed as follows:

1. The design of the exit taxiways was no longer valid for the traffic using BLI. It was recommended that the existing angled exits at Taxiways Delta and Echo be replaced with new 90 degree exits.
2. The intersection of Taxiways Delta, Echo and Alpha was confusing and the master plan should address this confusion.

In addition, the RSAT report recorded comments from the committee members and other participants. These included a statement that there should be a designated helipad at the airport and that two new Remain Over Night (RON) positions were being proposed for the infield adjacent to Taxiways D and F. These issues are addressed in the following analyses.

5.2.1 Taxiways

The taxiway system at BLI consists of a full parallel taxiway with six exit taxiways connecting to the runway. As shown in Figure 5-1, this system includes two right-angled exits at the ends of the runway and four high-speed (angled) exits. The RSAT, conducted in 2012, recommended that the existing angled exit taxiways (C, D, E, and F) be replaced with 90 degree exits.

The analysis of the taxiway system concentrates on assuring that the layout enables safe and efficient taxiing by aircraft and enhances safety by minimizing the potential for runway incursions.

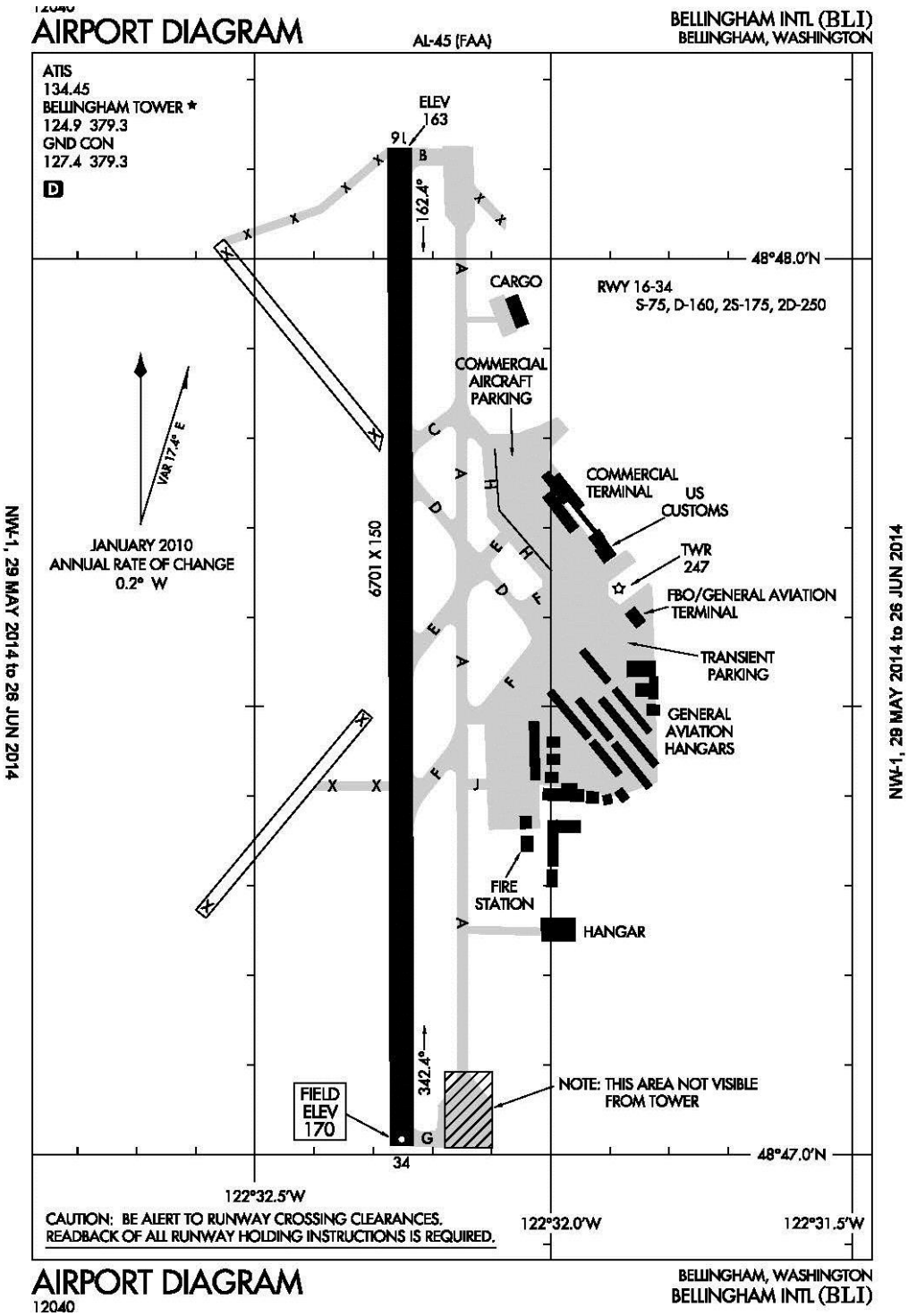


Figure 5-1: BLI Airfield Layout

5.2.1.1 Taxiway Layout Alternatives

Safe and effective taxiing requires that exit taxiways be located in a position that allows for efficient exiting from the runway and to assure that the exits meet the design criteria for the critical aircraft, as contained in Advisory Circular 150/5300-13A. In this AC, taxiway design criteria are expressed in terms of Taxiway Design Groups (TDG). The TDG is based on the critical aircraft's wingspan, tail height, and the overall main gear width and the cockpit to main gear (CMG) distance. At BLI, with the designated critical aircraft being the B757-200 the taxiway design standard is TDG-4.

Ideally, exit taxiways are located at distances that best serve the specific aircraft fleet operating at the airport. At BLI the exits need to be spaced based on the following:

1. Allow the small GA fleet with short landing length requirements to exit the runway as soon as practical, to minimize runway occupancy times.
2. Provide exit taxiways at points where the turbo-prop (including the Q400 used by Alaska for commercial service) and small jet aircraft can exit efficiently.
3. Provide exits at the point where the Boeing 737 series and Airbus A319 aircraft can exit without needing to proceed to the runway end.

Based on observations of airport operations, analysis of the aircraft fleet and considerations of weather conditions (wet versus dry runway) in Bellingham, and discussions with airport users, the first exit at BLI should be located approximately 2,000 feet from the runway threshold. This location will be used by the single- and twin-engine piston general aviation aircraft. A second exit at approximately 4,000 feet will allow the larger corporate turbo-prop and jet aircraft to exit as well as all of the Q400 commercial flights. An exit at 6,000 feet accommodates the Boeing 737 and A319 operations. Locating exits at these distances will facilitate runway efficiency by allowing for quick, but safe exiting. Proper locations also cut down taxi distances, saving time and money during each operation.

Right angle taxiways are the standard for all runway/taxiway intersections except when a need for high-speed exits is justified. At BLI, the existing system consists of right angle exits at each runway end and four angled exits along the runway. These locations and angles of the existing exits were based on the existence of pavement that dated from the time when BLI had three active runways rather than need.

In making decisions regarding an optimum exit taxiway layout, three alternatives were examined:

Taxiway Alternative 1 – Do-Nothing.

Taxiway Alternative 2 – Revise the positions and use 90 degree angled exits.

Taxiway Alternative 3 – Revise the positions and use 30 degree angled exits.

These are shown in the following Figure 5-2 through Figure 5-4.

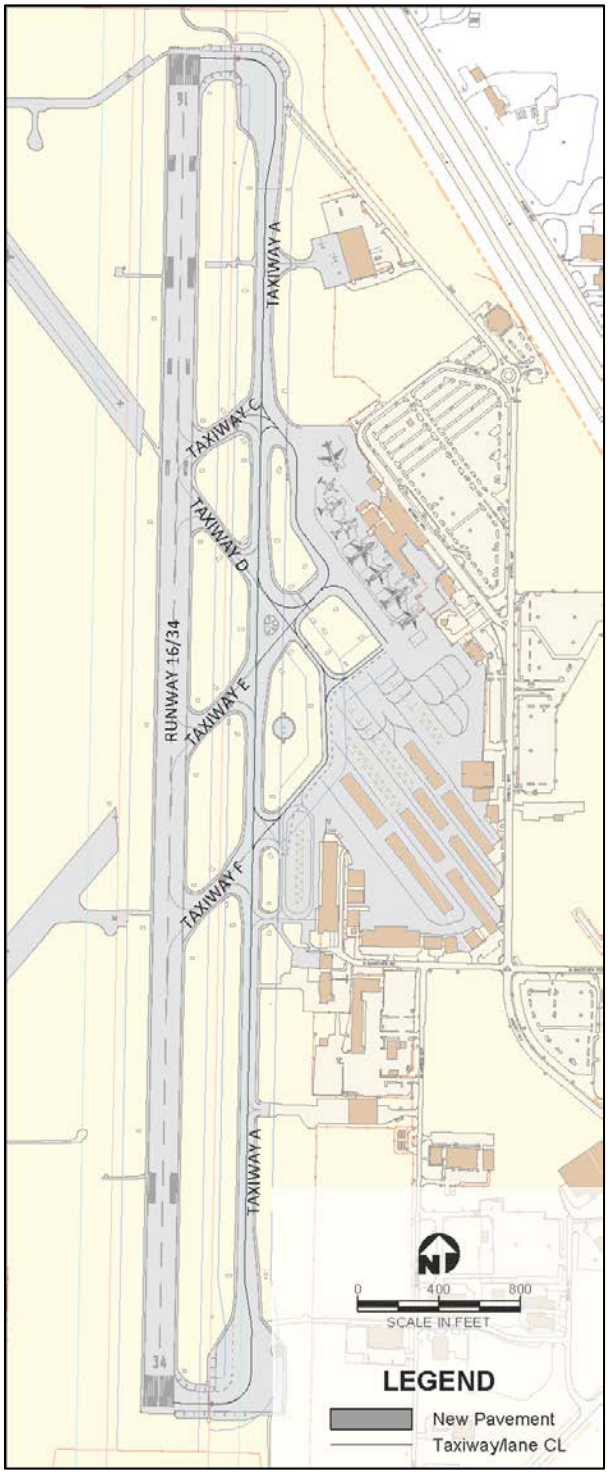


Figure 5-2: Taxiway Alternative 1 – Do Nothing

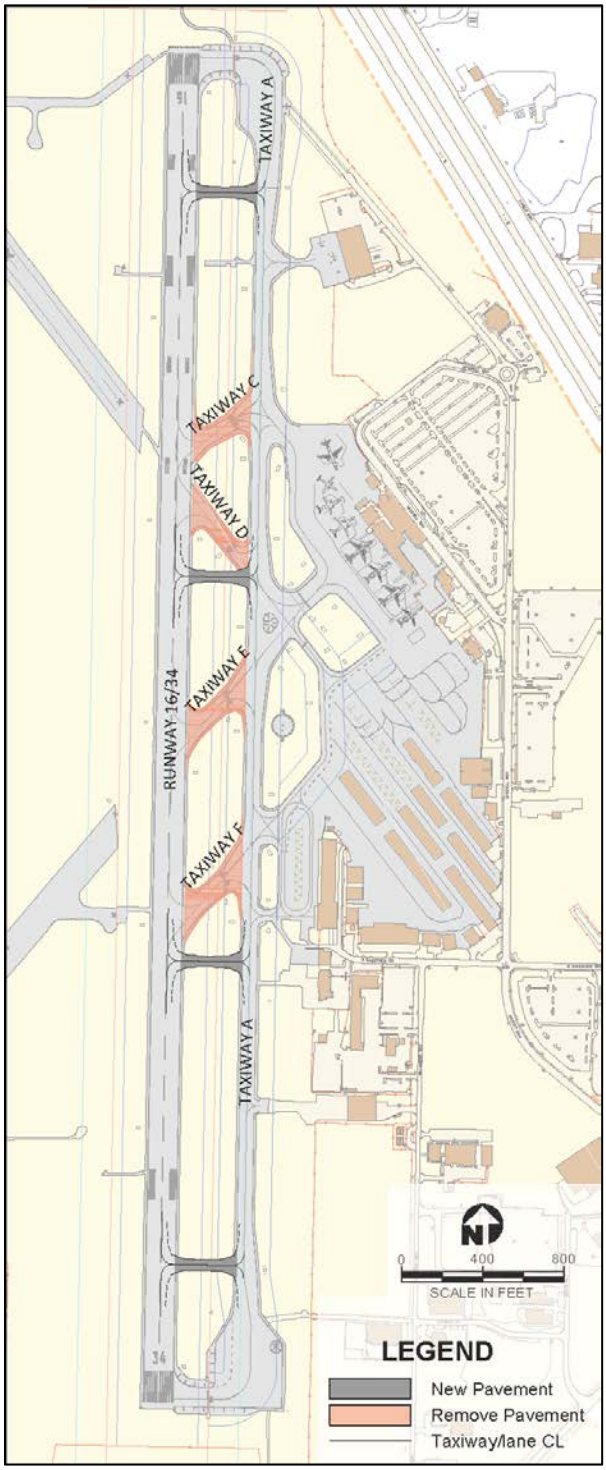


Figure 5-3: Taxiway Alternative 2 – Revise Position and Use 90 Degree Angle Exits

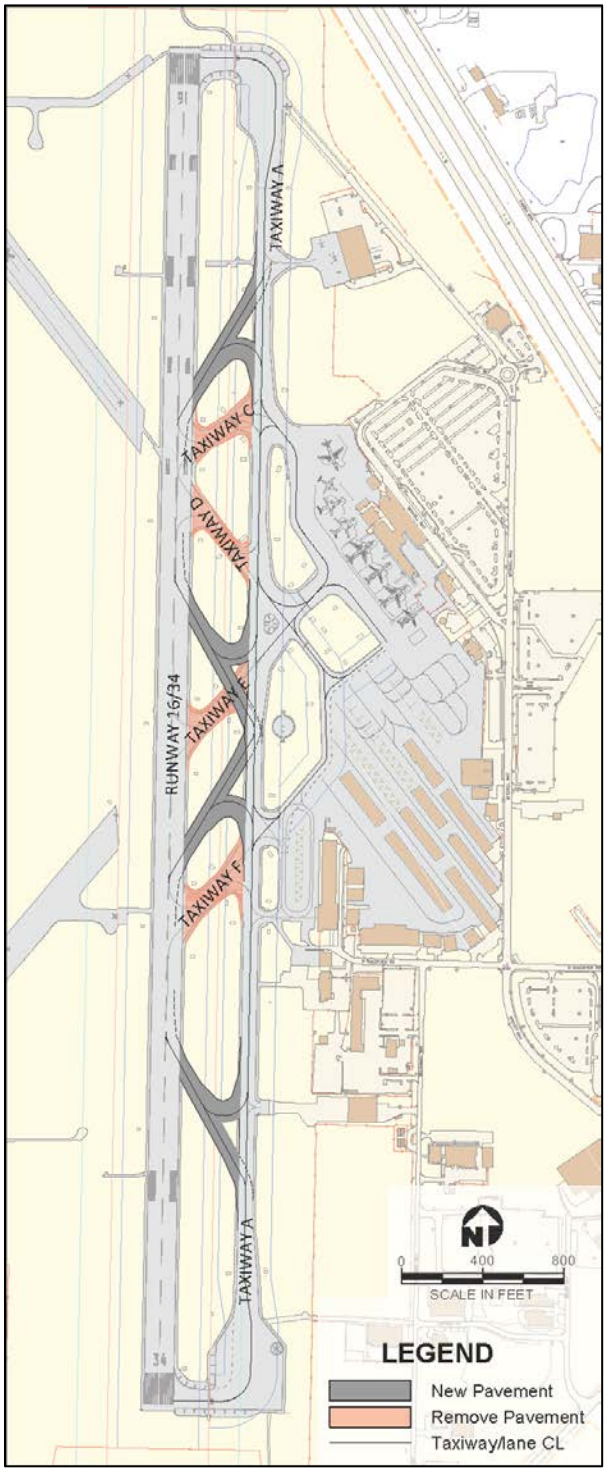


Figure 5-4: Taxiway Alternative 3 – Revise Position and Use 30 Degree Angle Exits

5.2.1.2 Taxiway Layout Evaluation

The decision on the layout of the taxiway system will be based on these factors:

- Adherence to FAA design criteria for TDG-4 Aircraft and the RSAT action item
- Operational Efficiency
- Safety Considerations as detailed in AC 150/5300-13A
- Construction Cost

Adherence to FAA Criteria: The do-nothing alternative maintains the current connecting taxiway system without improvements. During the 2010 reconstruction of Runway 16/34 actions were taken to assure that parallel Taxiway A and exit Taxiways B and G were reconstructed to meet the C-IV design criteria that was in effect at the time of the project. The angled exits (C, D, E, and F) were not reconstructed at that time.

Alternative 2 contemplates rebuilding the connecting taxiway system and reconstructing them in an optimal layout for operations in both directions using 90 degree exits. Under this alternative, the design criteria for TDG-4 aircraft will be adhered to during the design of two of the exits and TDG-3 will be applied to the others to allow the larger corporate turbo-prop and jet aircraft to exit, as well as all of the Q400 commercial flights.

Alternative 3's layout is similar to Alternative 2 with the primary difference being the use of 30 degree angled exits to allow for faster exiting of the runway. This alternative does not meet the FAA Design Criteria for angled exits serving TDG-4 aircraft. The separation between the runway centerline and the centerline of Taxiway A is 400 feet while the standard for angled exits serving TDG-4 aircraft is 450. This alternative is eliminated from further consideration.

Operational Considerations: As stated, the existing exit taxiway layout (Alternative 1) was developed to take advantage of existing pavement from two abandoned crosswind runways. The location and angles of these are not optimal for daily operations. Any use of Taxiways F, E, and D during landings on Runway 16 requires an acute angled turn to access the terminal/general aviation area. Further, the angled exits (F and E) are oriented in a direction that supports landings on Runway 34 more so than on 16.

Alternative 2 removes the existing exit taxiways and constructs new ones at locations that are optimal. The 90 degree angles allow for efficient access to the terminal/GA apron.

Safety Considerations: Doing nothing neither improves nor diminishes the current level of operational safety at BLI.

Alternative 2 improves the safety margins by providing right-angle exits that meet standards and increase visibility and recognition during operations. The design of the exits in Alternative 2 meets the criteria established in FAA AC 150/5300-13A.

Cost: The cost of any of the alternatives relates to the amount of new pavement required for construction. For the remaining two alternatives, the costs have been estimated as follows.

- Alternative 1 – $0
- Alternative 2 – $2,077,800

5.2.1.3 Taxiway Layout Recommendation

It is recommended that Alternative 2 be adopted as the ultimate parallel and exit taxiway layout for the Bellingham International Airport. The layout in Figure 5-5 addresses the issues identified in the RSAT report and meets the requirements of the forecast fleet, as well as FAA design and safety criteria. While the exact location of the individual exits will need to be established prior to final design, the locations shown in Figure 5-5 have been calculated to assure maximum runway efficiency while being located to avoid potential conflicts with either access taxiways or aircraft parking positions. The placement reflects the RSAT recommendation to minimize congestion and confusing traffic paths in the apron area. Table 5-2 shows the locations of the taxiways relative to the runway landing thresholds. In this table, the recommended new exits are referred to as Future C, Future D, Future E, and Future F to avoid confusion with the existing taxiways.

Table 5-2: Taxiways Relative to the Runway Landing Thresholds

Exit	Distance from Landing Threshold		Taxiway Design Standard
	Runway 16 (feet)	Runway 34 (feet)	
B	0	6,701	TDG-4
Future C	1,700	6,000	TDG-4
Future D	2,600	4,101	TDG-3
Future E	4,501	2,200	TDG-3
Future F	6,000	1,700	TDG-4
G	6,701	0	TDG-4

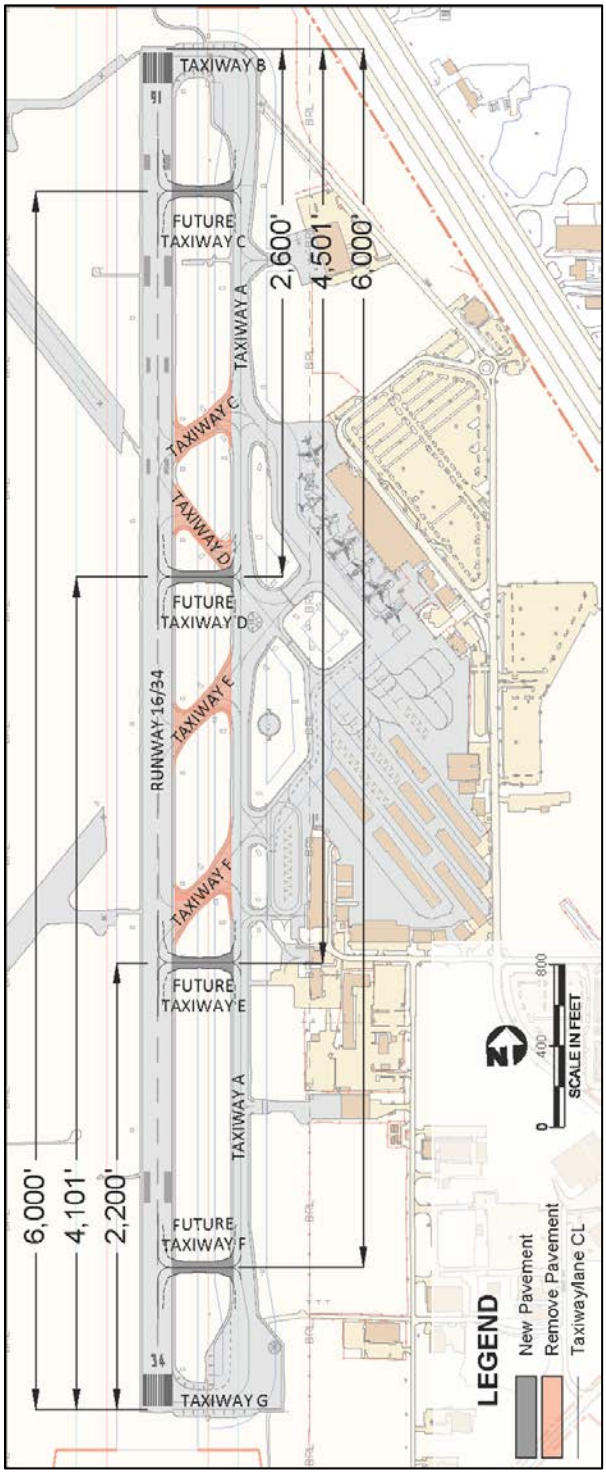


Figure 5-5: Exit Taxiway Recommendation

Table 5-3 was prepared to show the cumulative percentage of the various aircraft classifications that would be able to use the newly located exits under both wet and dry conditions as calculated in FAA AC 150/5300-13. In Table 5-3, the following aircraft classifications are used.

A – Small single-engine aircraft weighing 12,500 pounds or less. This includes all of the single-engine general aviation aircraft at BLI.

B – Small twin-engine aircraft weighing 12,500 pounds or less. This includes all of the small twin engine general aviation aircraft at BLI.

C – Large aircraft weighing from 12,500 to 300,000 pounds. Included in this category are the general aviation turbo-prop and jet aircraft as well as the Q400 aircraft used by Alaska Airlines for five daily flights to Seattle.

D – Heavy aircraft weighing more than 300,000 pounds. All of the Boeing 737 aircraft, the A319 and A320, MD-80 and 757-200 flights are in this category.

As the data in Table 5-3 shows, with the taxiways spaced as shown, all of the aircraft can operate efficiently in either direction. The Boeing 737 and A319 flights would be able to exit by the fourth exit and the 757-200 would be the only aircraft that required the full runway length.

In addition to the realignment of the exit taxiways, it is necessary to assure that the terminal and general aviation access taxiways (H, D, E, F, and J) meet standards, eliminate confusion, reduce congestion, and are complementary to the parallel taxiway and exits. Of primary concern is the need to address the recommendations from the RSAT regarding confusion and congestion on the terminal apron, as follows:

1. Reduce the potential for direct taxiing from the ramp to the runway, thereby reducing the potential for runway incursions on Taxiways Delta and Echo.
2. Eliminate the potential for confusion at the intersection of Delta, Echo, and Alpha.

Additionally, the introduction of the Boeing 757-200 into the commercial fleet changed the taxiway design criteria and a section of Taxilane H at the terminal building is operating under less than perfect conditions. Figure 5-6 shows the areas and issues identified as being important to address.

Table 5-3: Exit Taxiway Usage

Exit	Distance[1] (feet)	Cumulative Percentage of the Fleet[2]			
		A	B	C	D
Landing on Runway 16 - Wet					
Future C	1,700	37%	0%	0%	0%
Future D	2,600	70%	0%	0%	0%
Future E	4,501	100%	83%	1%	0%
Future F	6,000	100%	100%	48%	10%
G	6,701	100%	100%	77%	47%
Landing on Runway 34 - Wet					
Future F	1,700	37%	0%	0%	0%
Future E	2,200	86%	100%	0%	0%
Future D	4,101	100%	97%	4%	0%
Future C	6,000	100%	100%	48%	10%
B	6,701	100%	100%	77%	47%
Landing on Runway 16 - Dry					
Future C	1,700	57%	0%	0%	0%
Future D	2,600	90%	4%	0%	0%
Future E	4,501	100%	98%	15%	0%
Future F	6,000	100%	100%	92%	71%
G	6,701	100%	100%	100%	97%
Landing on Runway 34 - Dry					
Future F	1,700	57	0%	0%	0%
Future E	2,200	99	18%	0%	0%
Future D	4,101	100	100%	24%	2%
Future C	6,000	100	100%	92%	71%
B	6,701	100	100%	100%	97%

Source: FAA Advisory Circular 150/5300-13

[1] The distance shown is measured in feet from the Runway Threshold.

[2] The fleet designators are:

A - Small single-engine aircraft 12,500 pounds or less

B - Small twin-engine aircraft 12,500 pounds or less

C - Large aircraft from 12,500 to 300,000 pounds

D - Heavy aircraft weighing more than 300,000 pounds

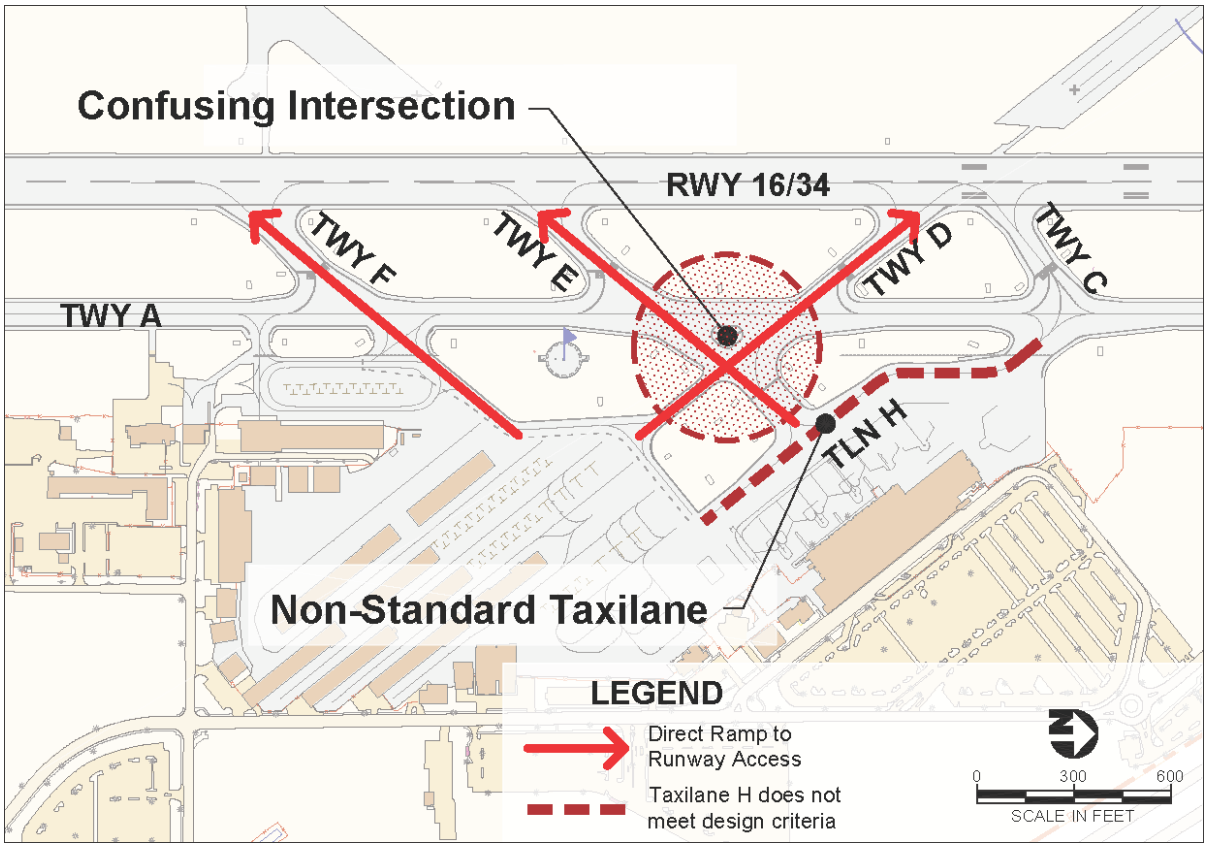


Figure 5-6: Terminal Apron Taxilane Issues

The terminal apron layout in Figure 5-7 shows how these issues will be addressed as part of the total airport taxiway system reconfiguration.

1. Direct taxiway access from the apron to the runway will be eliminated when the new exits are constructed and the existing pavement removed from service. By reconstructing 90 degree angled taxiways, the direct access from Taxiway F is eliminated.
2. For Taxiways D and E the new 90 degree exit will solve the issue but the pavement associated with the existing angled exits will need to either removed or marked as closed to operations.
3. Complementing the removal of the angled exits D and E, the pavement section east of Taxiway A that was cited as being confusing and therefore a safety concern will no

longer be connected directly to the taxiways. It is recommended that this section be removed or otherwise closed to operations.

4. In the short-term, that portion of Taxilane H that has been operating with non-standard conditions will be reconstructed to assure that it is in full compliance with the current design standards for TDG-4 aircraft. This will require that the apron pavement be expanded into the current infield area west of the terminal building.

Figure 5-7 shows the new terminal apron layout relative to the overall taxiway system changes being recommended.

5.2.2 Runway

The critical aircraft for BLI has been determined to be the Boeing 757-200 in the forecast of aviation demand (included as Chapter 3 in this master plan). The B757-200 is classified in Advisory Circular 150/5300-13A as a Category C-IV aircraft. The single runway at BLI meets all of the FAA's Design Standards for the critical aircraft as shown in the Facility Requirements chapter, aside from paved runway shoulders. In addition, in the Facility Requirements, it was shown that the single runway has adequate length to support the future activity forecast and that the capacity of the single runway is sufficient to accommodate the forecast traffic increases for the next 20 years. This master plan does not recommend any changes to the runway.

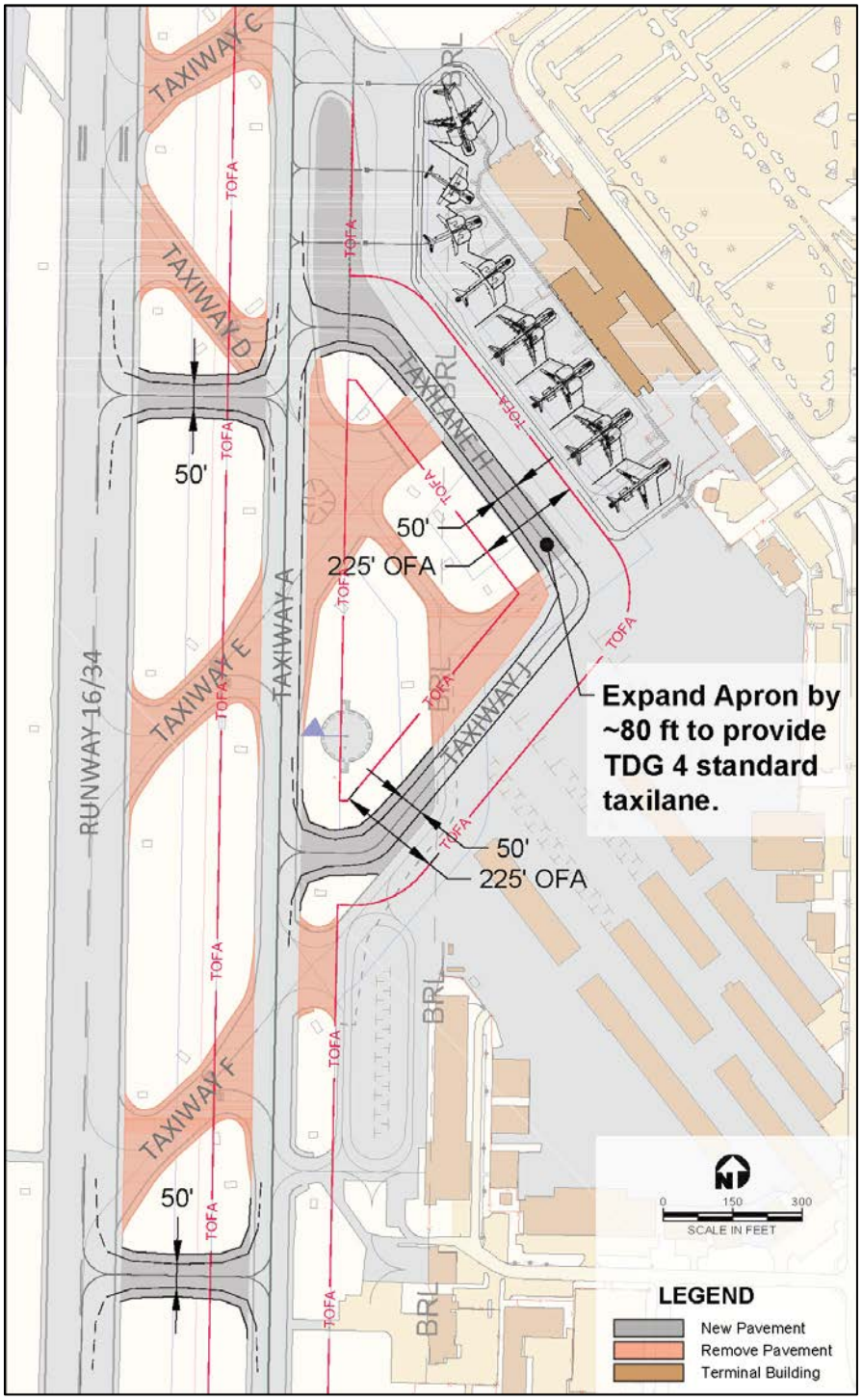


Figure 5-7: Terminal Area Apron Layout

5.2.3 Jet Engine Run-Up Area

At present the commercial airlines and FBOs use a portion of Taxiway A when they have a need to perform engine run-ups related to aircraft repair and maintenance. This practice requires the closure of the taxiway for the duration of the run-up activities and thereby limits use of the runway during this time. To eliminate this situation a designated run-up area must be identified to allow this vital activity to continue without affecting airfield operations.

5.2.3.1 Jet Engine Run-Up Area Alternatives

In designating an area for jet engine run-ups it should be noted that the objective is not to locate a Ground Run-up Enclosure (GRE) or other structural solution at this time. Rather the emphasis is on designating an area on the airport (or creating a new area) that can be used for these activities without interfering with aircraft operations. A decision as to the design of the area will be made at the time of implementation. Alternative locations for engine run-ups are shown in Figure 5-8 and as follows:

Alternative 1 – Do-Nothing.

Alternative 2 – Designate an area on the east side near the south end of Taxiway A.

Alternative 3 – Construct a new run-up area on the west side of the airport on portions of the pavement remaining from the abandoned runways.

5.2.3.2 Jet Engine Run-Up Area Evaluation

In determining the best location for the run-up activities, several factors need to be considered, as follows:

1. The location must have airfield access.
2. The location should be usable by both the FBO and the Airlines.
3. The location needs to be in a position where there are no environmental issues.
4. The location and orientation of the run-up area should not increase the noise footprint of the airport.
5. The development cost must be considered.

This analysis includes a preliminary comparison of the available sites vis-a-vis these evaluation criteria.

Airfield Access: All of the alternatives are accessible from the runway and taxiway system.

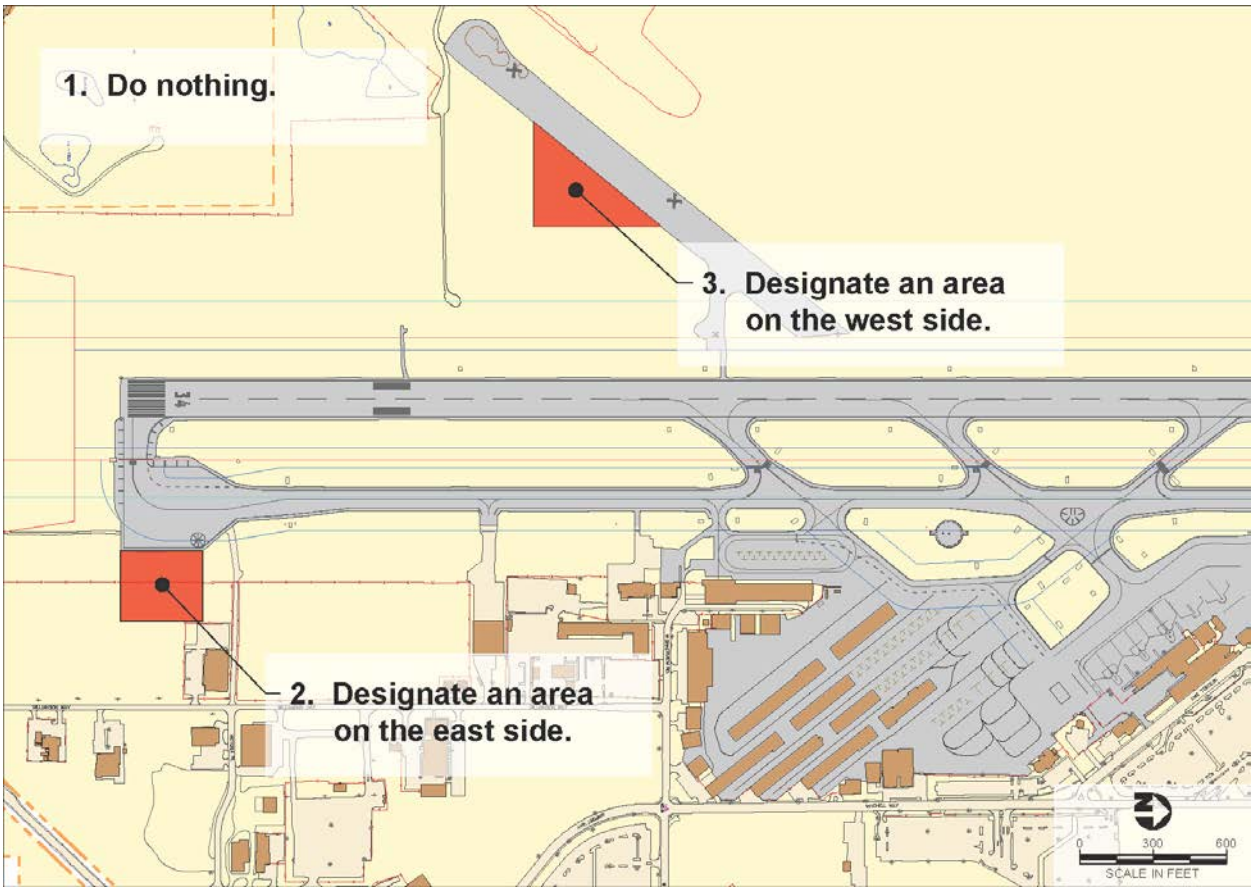


Figure 5-8: Alternate Jet Engine Run-Up Area Locations

Access to FBO and Airlines: All three alternatives will be accessible from the FBO and airline areas. However, Alternative 3, located on the west side, will require that both aircraft and surface vehicles cross the active runway. Further, surface vehicles would need to either operate on the airfield (drive on taxiways and runways) or new access roads (either public or non-public) will need to be built.

Environmental Issues: None of the alternative locations have known issues related to environmental conditions. Developing Alternative 3 could be complicated if the run-up area extends beyond the area where the previous runway was located since the Port does not have environmental clearances to build on this side of the airport. The proposed site abuts an adjacent designated wetland and part of the site contains an old wood waste spoils pile. Providing access

roads and landside facilities may require environmental approvals, which would be time consuming.

Noise Impacts: Noise associated with engine run-ups is complex and depends on the type of aircraft, direction that the engines are pointed and the distance to the nearest noise receptor. In the context of this comparative analysis, the impacts will be represented by the distance to the nearest noise receptor. In this case the distance to the nearest residence, school, church, library, or nursing home.

Prior to development of the run-up area, detailed noise analyses will need to be conducted to assure that impacts are minimal. These studies will include design considerations to assure that the noise is contained on airport property.

Development Cost: The cost of developing an area to serve as the location for the jet engine run-up area is estimated for the two sites. In this case, the cost of the run-up area is limited to the cost of the pavement needed for the aircraft position. At Alternative 3, it is assumed that new pavement would be required, as the condition of the abandoned runway pavement would require substantial reconstruction. Again, noise containment structures (whether natural or man-made) will be determined during the design phase of this action. If an enclosed run-up area is determined to be necessary, the cost would increase by $1 to $2 million.

Table 5-4: Jet Engine Run-Up Area Alternatives Comparison

Criteria	Alternative 1: Do-Nothing	Alternative 2: East Side	Alternative 3: West Side
Airfield Access	●	●	●
Airline/FBO Access	●	●	●
Environmental Issues	●	●	❍
Noise Impacts	TBD	TBD	TBD
Development Cost	$0	$500,000	$700,000

● = Meets criteria

❍ = Does not meet criteria

TBD = To be determined

5.2.3.3 Jet Engine Run-up Area Recommendation

Based on the preceding factors it is recommended that the jet engine run-up area be constructed at the Alternative 2 site.

5.2.4 Snow Removal Equipment (SRE)

To maintain airport operations in adverse weather conditions, airport operators must use costly pieces of complex and technologically advanced equipment for the control of snow, slush, and ice. To protect and service this expensive investment, Snow Removal Equipment (SRE) Buildings are needed. These buildings, in addition to providing a protective environment for equipment, generally include space for the storage of materials, such as de-icing materials and sand, and for equipment parts inventories. Generally, the buildings are designed with consideration for space to store non-winter equipment, such as airfield lighting equipment, grass cutting equipment, rubber removal devices, or bird patrol vehicles.

The Port of Bellingham currently provides for Snow Removal and Maintenance Equipment storage in the former Air National Guard facility located south of the terminal/general aviation apron. This building is very old and no longer meets the Port's needs for SRE storage.

5.2.4.1 SRE Building Location Alternatives

Two potential locations for the construction of the new SRE building have been identified. In this instance, because the new building is necessitated by the planned demolition of the existing structure, the Do-Nothing Alternative has not been included. The alternatives identified are shown on Figure 5-9 and defined as follows:

Alternative 1 – Construct a new SRE adjacent to the Aircraft Rescue and Fire Fighting (ARFF) Facility

Alternative 2 – Construct a new SRE at the site of the Army National Guard facility

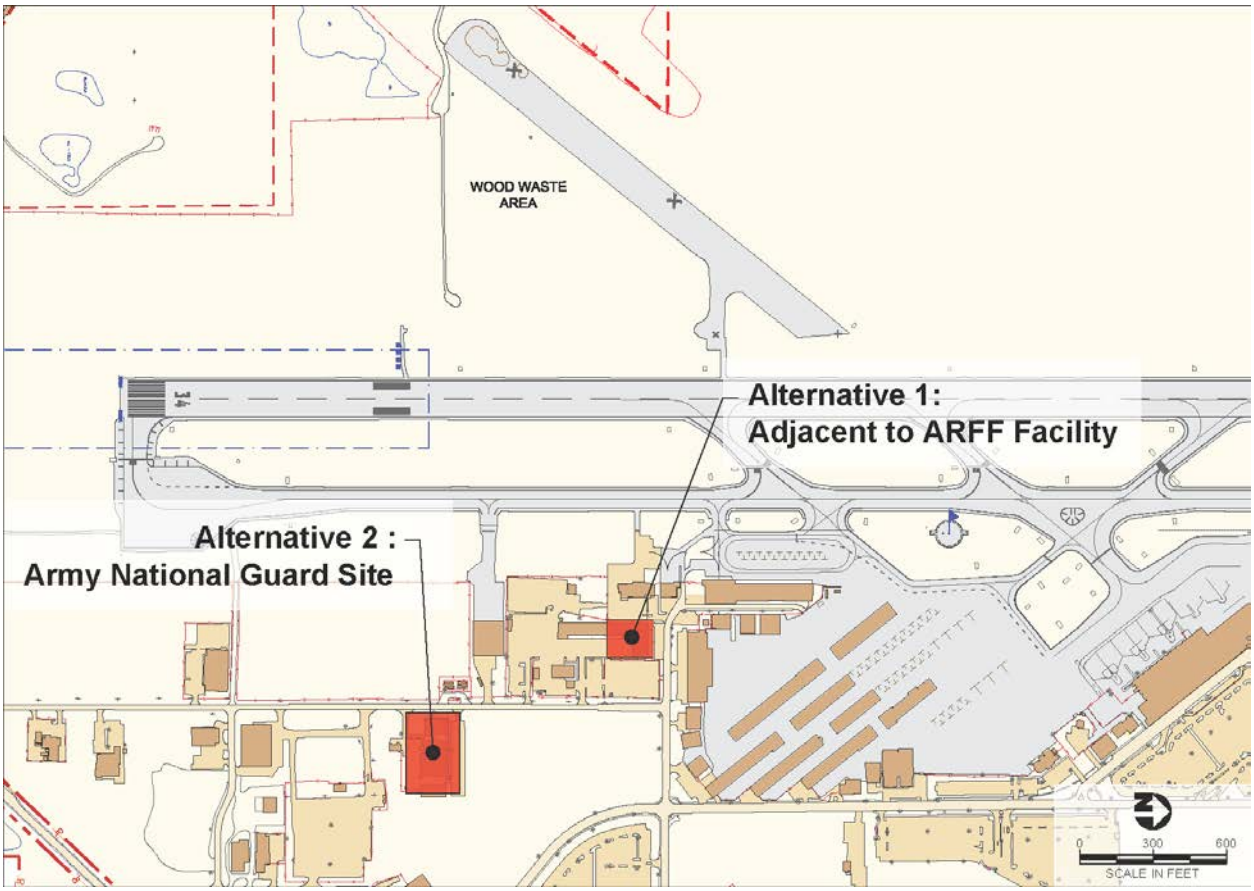


Figure 5-9: SRE Storage Building Alternatives

5.2.4.2 SRE Building Location Evaluation

In determining which of these alternatives is the optimum location for the new SRE, siting criteria contained in the FAA's Advisory Circular 150/5220-18A, Buildings for Storage and Maintenance of Airport Snow and Ice Control Equipment and Materials, were used as follows:

1. The building should be located so as not to interfere with fire lanes or hamper aircraft taxiing.
2. The building should be located to allow for direct access to the airfield by the snow removal equipment without circuitous routing.

3. Personnel requiring access to the SRE should not cross the runways or taxiways to reach the facility.
4. The site should allow for future expansion.
5. Any new building should not interfere with FAR Part 77 Surfaces or interfere with navigational or surveillance aids.
6. The SRE Building should not interfere with ARFF access.

Based on the above criteria both of the potential sites generally meet the requirements:

- Either site can be developed in a manner that does not interfere with aircraft taxiing or fire lanes.
- Neither site will cause personnel to cross active runways or taxiways for access.
- Both sites allow for future expansion.
- Neither site violates FAR Part 77 nor creates interference with NAVAIDS.
- Neither site blocks access to the ARFF.

The primary difference between the two alternatives is that while Alternative 1 allows for direct access to the airfield facilities, Alternative 2 requires snow removal equipment to travel on public roadways for a portion of the trip to the airfield. Due to the size of the equipment, this use of the public roads will restrict use of the roadway during the travel period.

5.2.4.3 SRE Building Location Recommendation

Based on the preceding factors it is recommended that the SRE Building be constructed at the Alternative 1 site. An additional factor in favor of Alternative 1 is that many of the same personnel who are based at the ARFF facility also operate the snow removal equipment. By locating at the recommended site (Alternative 1) the use by personnel is more efficient. Figure 5-10 shows the recommended SRE building location.

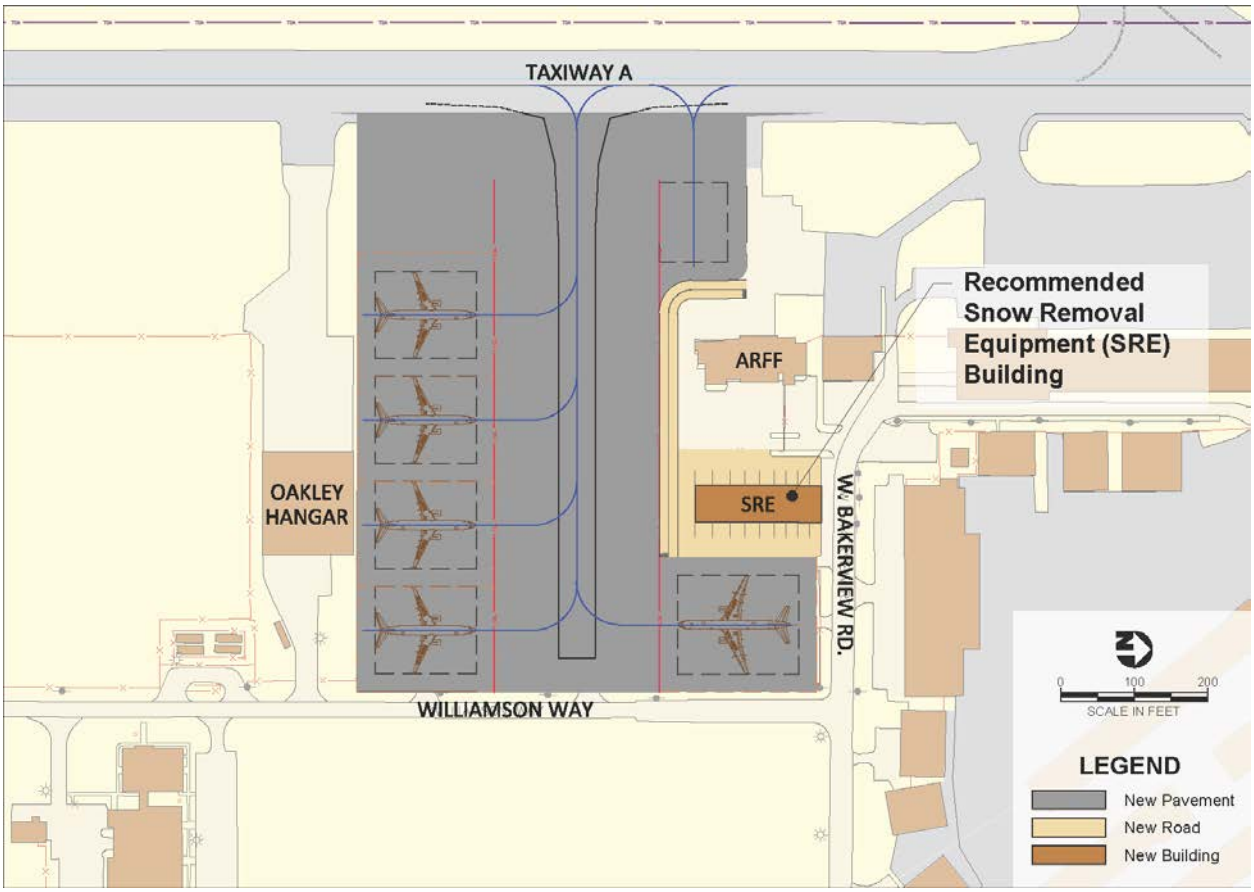


Figure 5-10: Recommended SRE Storage Building Location

5.2.5 Airport Perimeter Roadway

A final recommendation is to complete the airport's perimeter roadway system to connect in the west side of the airport. This improvement is required to support airport operations personnel in both security and wildlife management. Since the perimeter road should follow the airport perimeter, no alternative locations are available.

5.3 TERMINAL PROJECTS

In 2014, the expanded Bellingham International Airport passenger terminal building was opened. The expansion project included all functional areas (ticketing, gate areas, bag claim, etc.) and is expected to serve the traveling public for years to come. Once the capacity of the building has been reached (approximately 2028), the terminal will need to be further expanded, or passenger service levels will erode.

5.3.1 Terminal Expansion

5.3.1.1 Terminal Expansion Alternatives

Prior to the terminal expansion and reconstruction project, the Port considered alternatives to the reconstruction of the existing building on the existing site and rejected these based on time and expense considerations. Consequently, no alternative terminal locations have been considered in the development of this master plan. The alternatives examined involve the direction that the terminal building will take. The alternatives include the following.

Alternative 1 – Do-Nothing. This alternative does not assume that the passenger demand will end if the terminal is not expanded, rather that the Port will not take the step necessary to accommodate it. The result is likely to be increasing congestion and service level deterioration for the passengers.

Alternative 2 – Expand the terminal building to the north as depicted in Figure 5-11.

Alternative 3 – Expand the terminal building to the south as depicted in Figure 5-12.

5.3.1.2 Terminal Expansion Analytical Criteria

The terminal building expansion concepts for beyond 800,000 annual enplaned passengers (anticipated by 2028) will need to address the following.

1. Meet forecast passenger demand
2. Accommodate aircraft parking and maintain FAR Part 77 Transitional Surface clearances
3. Environmental factors
4. Facility adjacencies

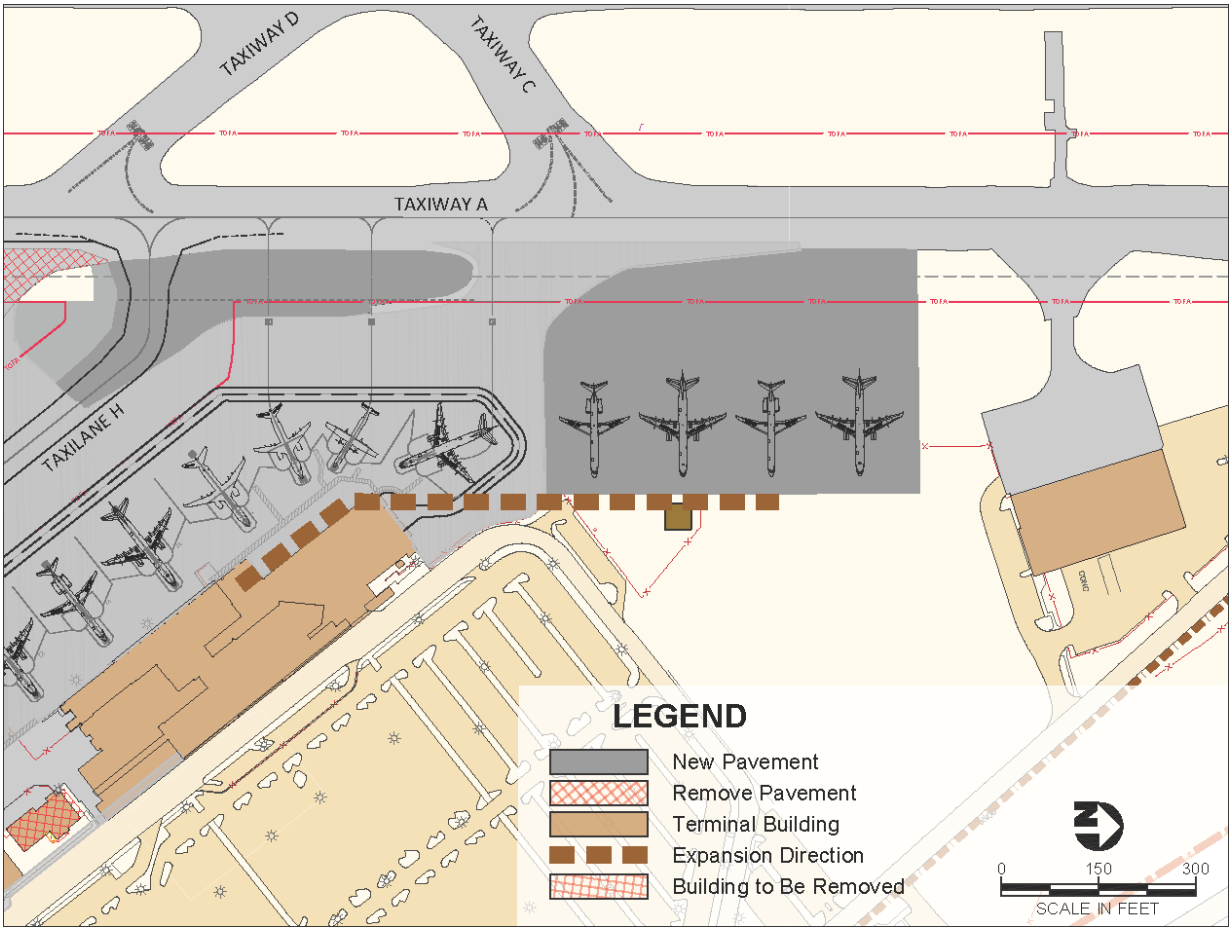


Figure 5-11: Terminal Expansion Alternative 2 – Expand to the North

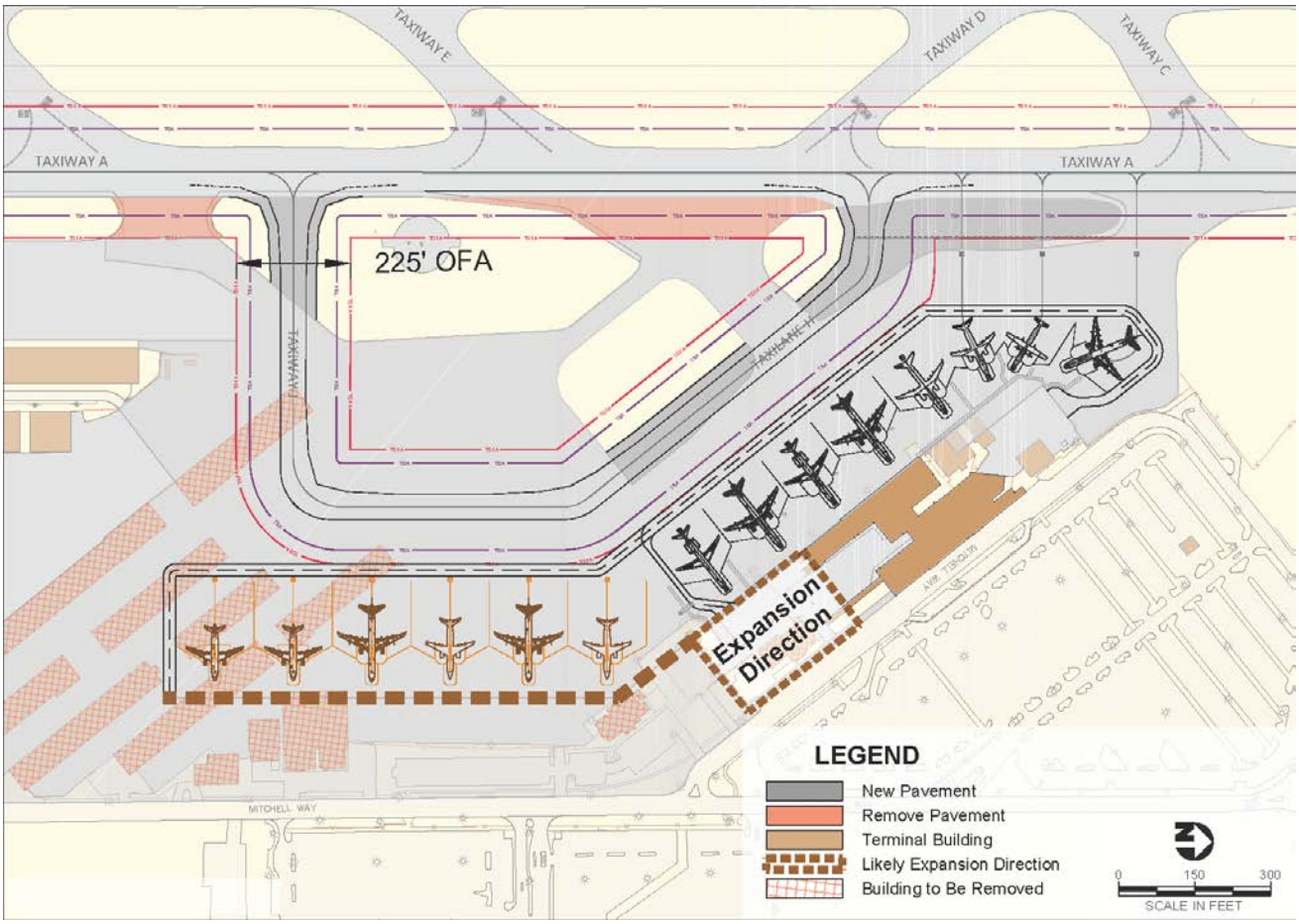


Figure 5-12: Terminal Expansion Alternative 3 – Expand to the South

5.3.1.3 Terminal Expansion Evaluation

Ability to Meet Forecast Demand Levels

The following table shows the activity levels associated with each of the alternatives. These numbers are derived from the forecast of aviation demand presented in Chapter 3.

Table 5-5: Level of Demand Accommodated

	Alternative 1: Do-Nothing	Alternative 2: Expand to the North	Alternative 3: Expand to the South
Enplaned Passengers			
Forecast	1,145,989	1,145,989	1,145,989
Level Accommodated	800,000	1,145,989	1,145,989
Difference	(345,989)	0	0
Commercial Operations			
Forecast	13,757	13,757	13,757
Level Accommodated	9,036	13,757	13,757
Difference	(4,721)	0	0

As is seen, doing nothing will not meet the demand forecast over the next 20 years. Either of the other alternatives will satisfy demand. The numbers shown on the exhibit do not imply that demand will not materialize, only that the terminal building will operate over capacity.

Part 77 Surfaces Analysis

To function as a passenger terminal facility, the building layout must be able to include commercial aircraft parking outside the FAR Part 77 Surfaces. Figure 5-13 shows these surfaces relative to the northward expansion while Figure 5-14 depicts the FAR Part 77 Transitional Surface relative to the southern expansion. The figures show the transitional surface elevations in the terminal area as well as the tail height dimensions for the aircraft serving, and forecast to serve, BLI.

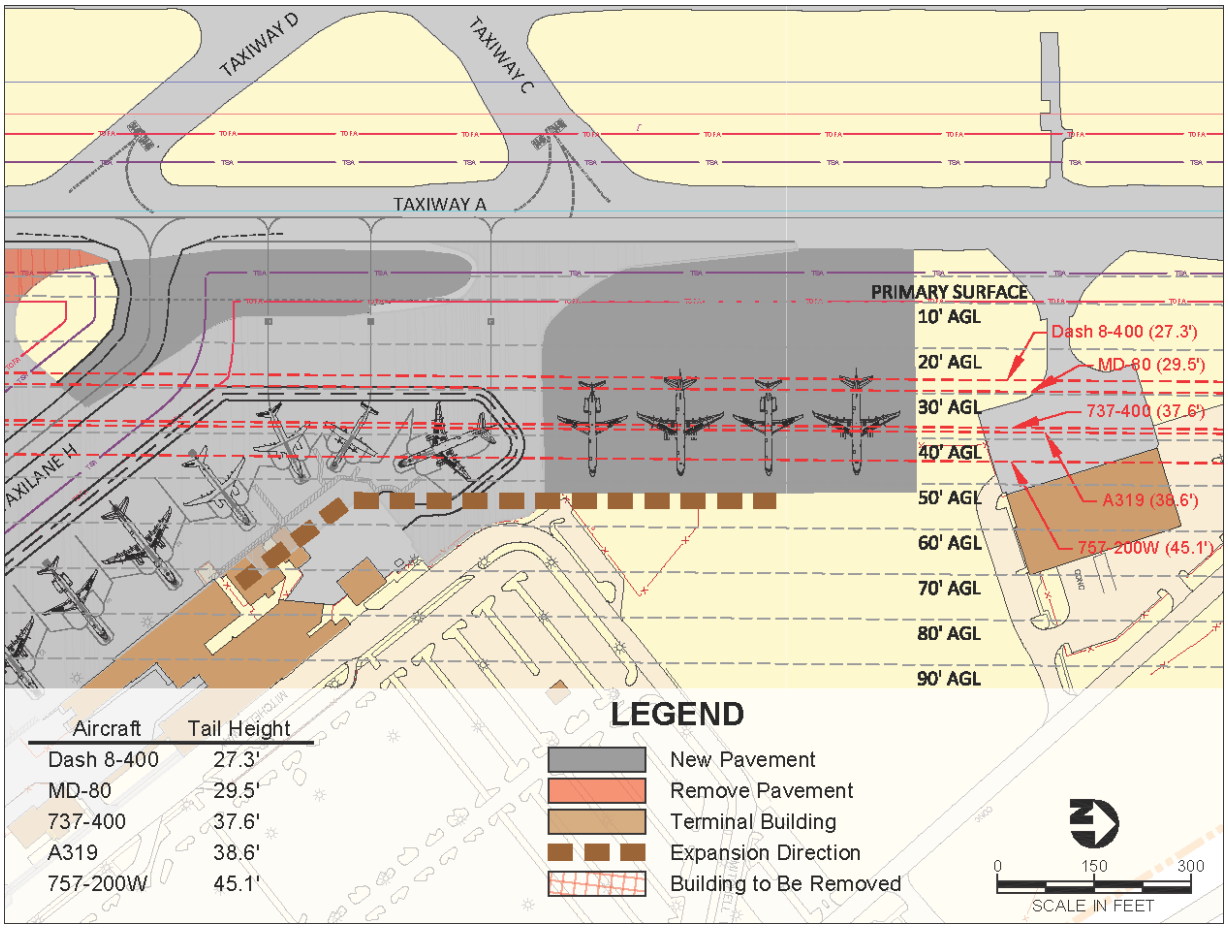


Figure 5-13: FAR Part 77 Transitional Surfaces – Terminal Alternative 2

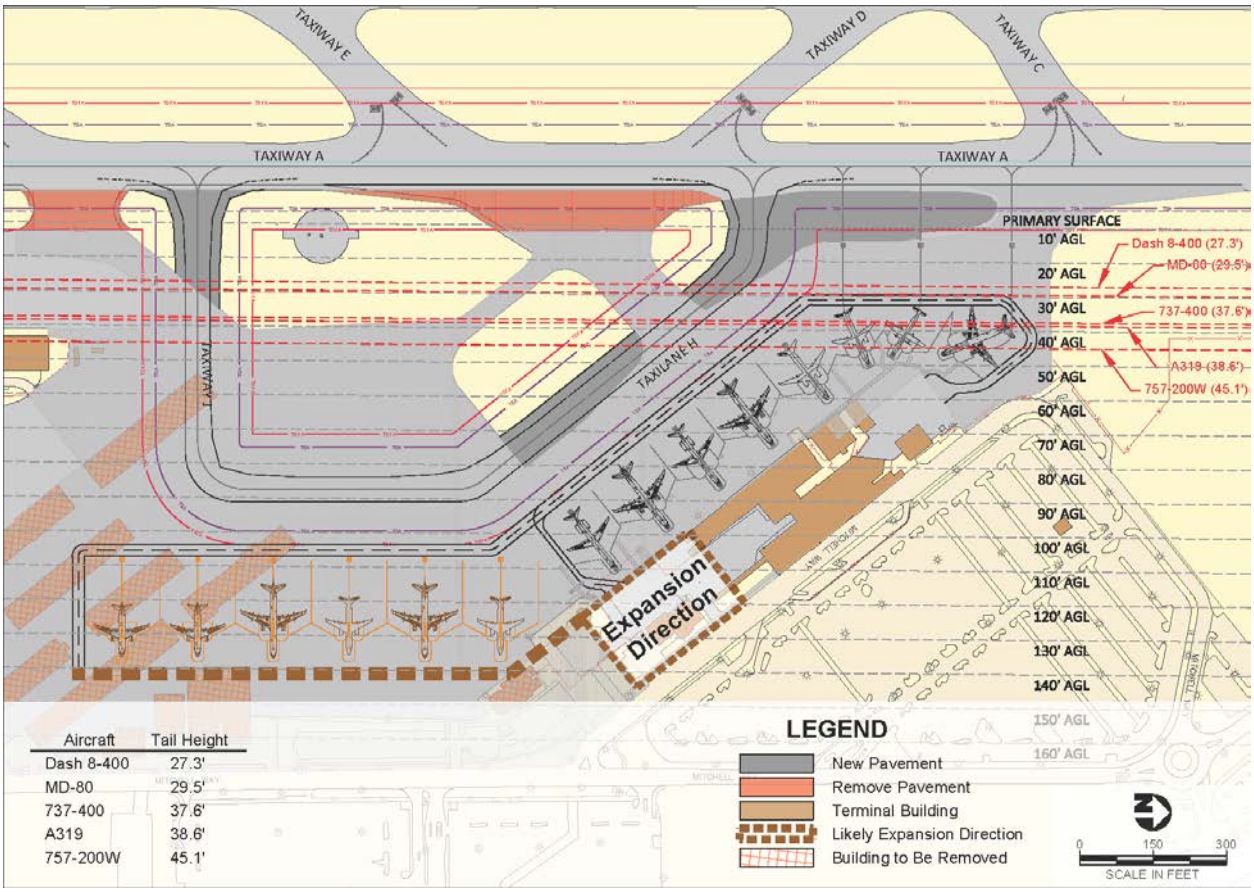


Figure 5-14: FAR Part 77 Transitional Surfaces – Terminal Alternative 3

As shown, doing nothing results in having demand levels that exceed capacity. The expected result will be congestion and inefficiency in use as well as an eventual lowering of service at BLI. This alternative likely leads to ad hoc decisions being made at the time that demand materializes.

Any terminal expansion northward is limited by the inability to park aircraft at the terminal without violating the Part 77 Surfaces.

Alternative 3 provides clear access to additional jet parking positions without Part 77 interference.

Environmental Factors

The Do-Nothing Alternative will result in minor environmental impacts resulting from inefficiencies in the terminal area.

Alternative 2 expansion to the north moves toward an area where wetlands have been identified. The Port has not begun the process of attaining clearance to develop this area. This makes expansion in this direction more complex.

Alternative 3 can be accommodated on the existing terminal apron.

Support Facility Adjacencies

Expanding the terminal requires consideration of other, non-building related needs that should be located adjacent to the building. These include the Remain-Over-Night (RON) parking positions, the terminal taxilanes, the automobile parking areas, and Ground Service Equipment (GSE) storage. Under this criterion, Alternative 1 will be lacking. When deciding to do-nothing with the terminal building the decision will carry over into the adjacent areas. Should this alternative be adopted it is assumed that it translates to a decision to do-nothing in these other areas as well.

Alternative 2 would expand the terminal in a direction where the lack of available land will limit the ability to assure that these adjacent uses are positioned in a logical fashion.

Alternative 3, when implemented, is positioned so all of the support facilities can be accommodated in the terminal area.

5.3.1.4 Terminal Expansion Recommendation

Based on this analysis it is recommended that the master plan adopt the continued development of the passenger terminal in the southern direction as shown in Figure 5-15. This can accommodate the growth forecast in a logical manner and represents a continuation of the previous planning and development decisions.

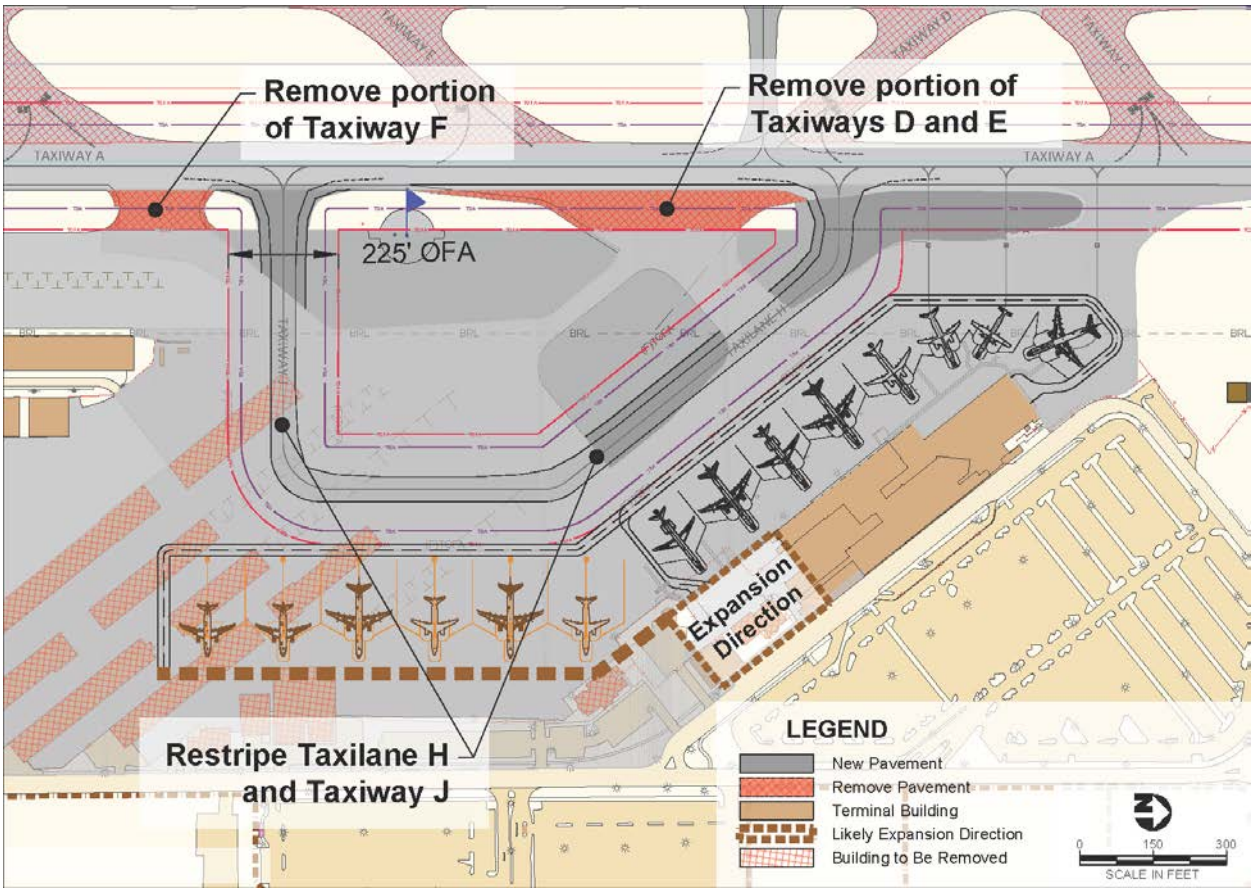


Figure 5-15: Terminal Expansion Recommendation

5.3.2 Remain Over Night (RON) Positions

The facility requirements chapter recognized a need for seven new RON positions by 2031. At least two of these are needed immediately. These positions are required to accommodate the needs of the commercial airlines to maintain their flight schedules without creating a need to construct additional terminal facilities.

The criteria for identifying potential RON positions are:

1. Meet both immediate needs and the forecast long-range demand.
2. Be conveniently located in relation to the passenger terminal to reduce operational impacts.
3. All parking positions need to comply with FAR Part 77 Transitional Surface requirements.
4. Comply with all FAA Design Criteria, particularly related to taxiway setbacks and other criteria.
5. Provide the utilities and access required to support ground service operations.
6. Development costs.

5.3.2.1 Remain Over Night Position Alternatives

Four alternative RON locations have been identified at BLI. These are shown on Figure 5-16 through Figure 5-19 and described as follows.

Alternative 1 – Do-Nothing

Alternative 2 – RON positions south of Taxilane H

Alternative 3 – RON positions on the west side of Runway 16/34

Alternative 4 – RON positions on the western portion of the terminal apron opposite the existing gate positions

Alternative 5 – RON positions at the current Air National Guard site

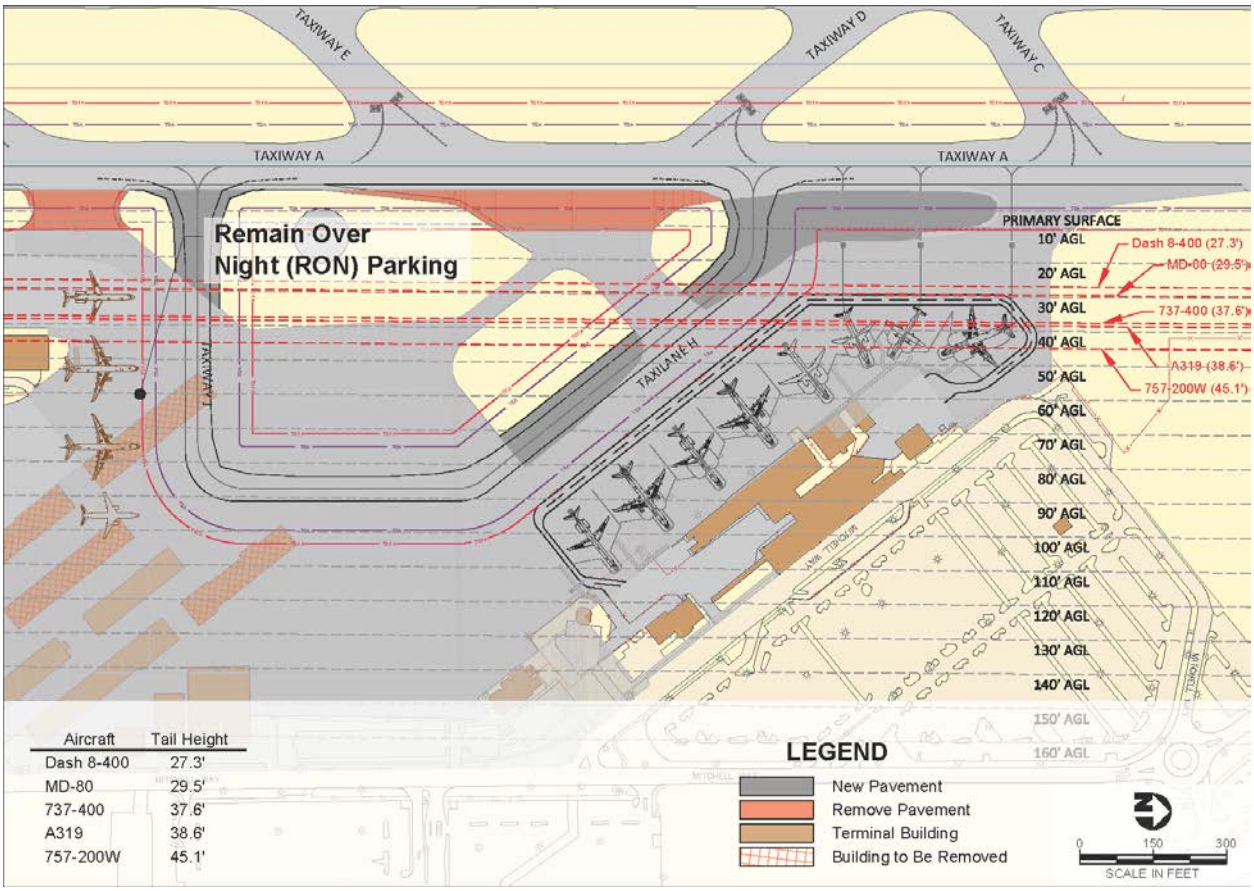


Figure 5-16: Remain Over-Night (RON) Alternate 2 – Relocate GA Hangars

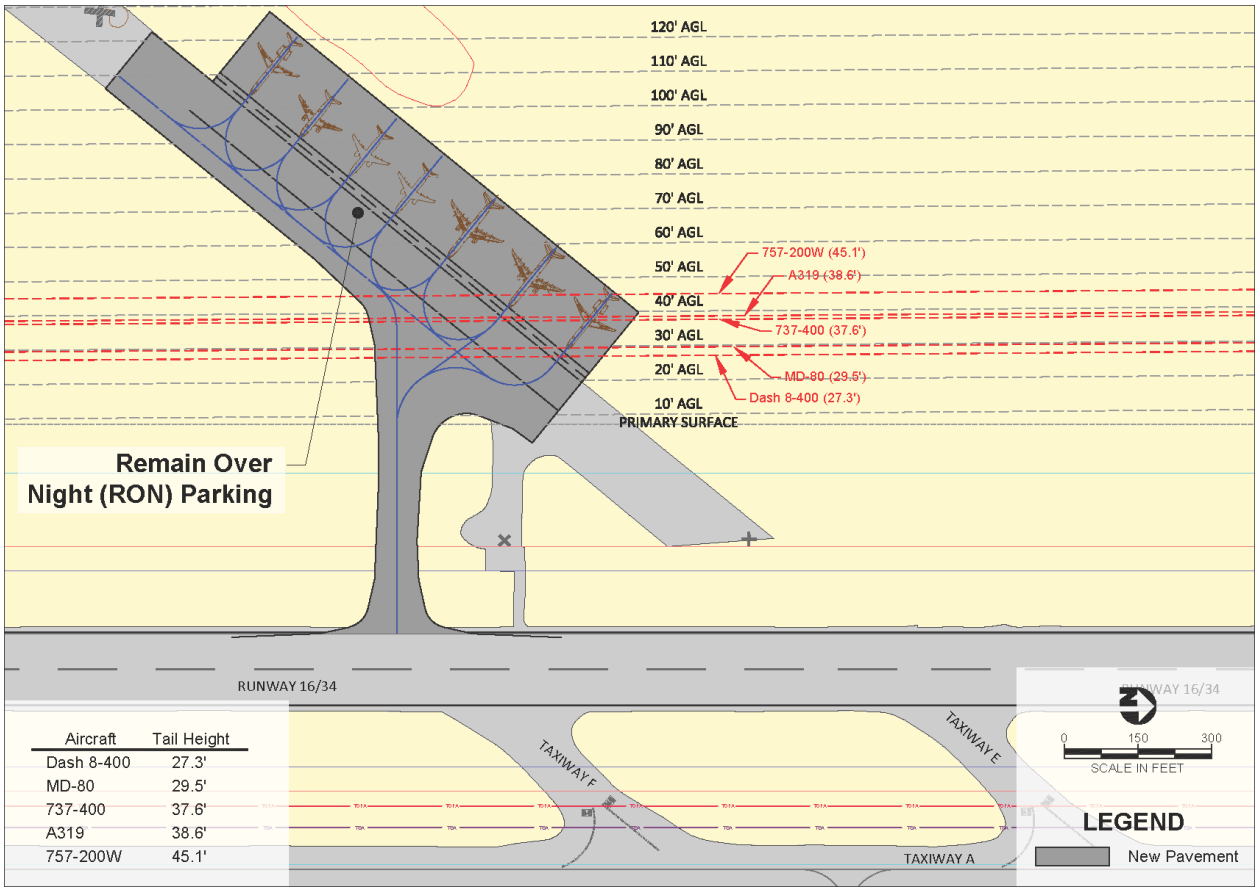


Figure 5-17: Remain Over-Night (RON) Alternate 3 – Develop on West Side

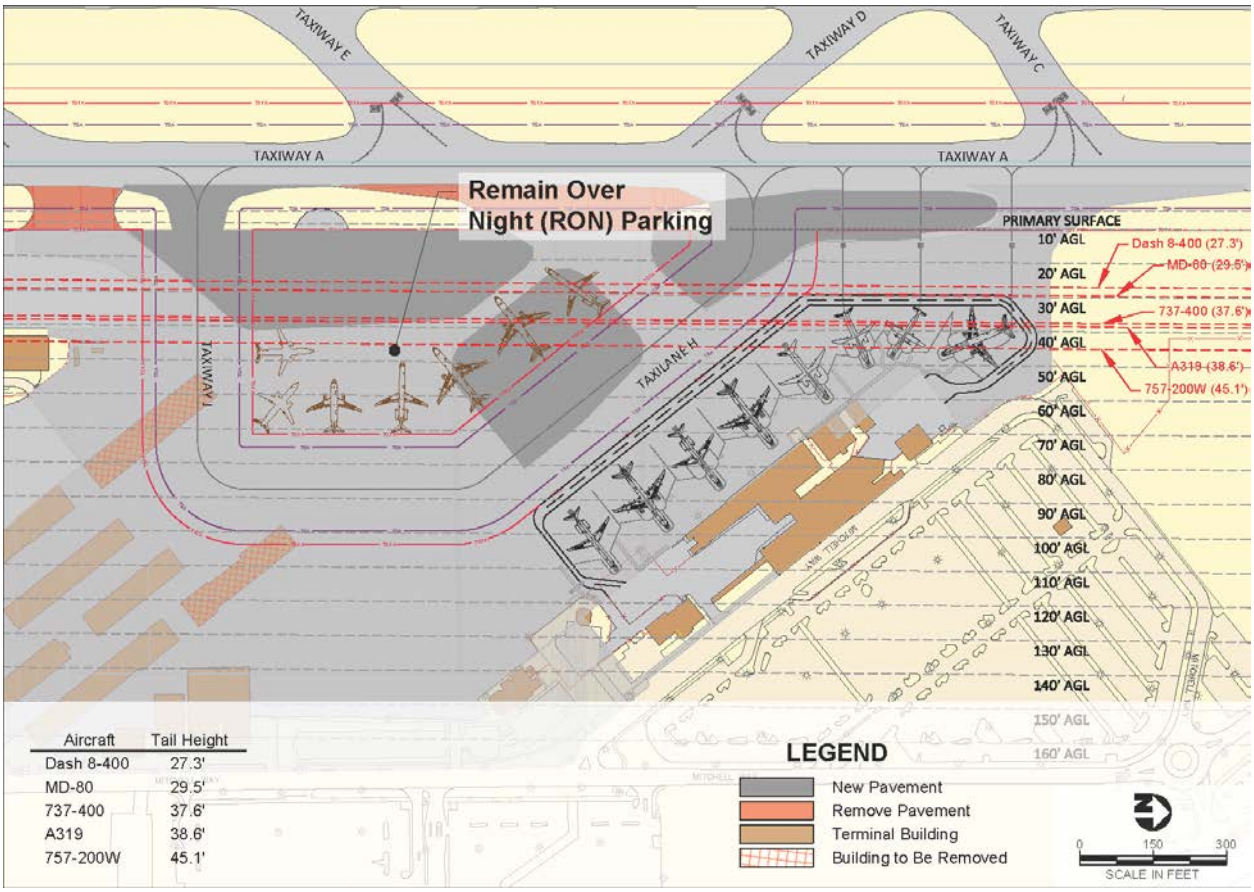


Figure 5-18: Remain Over-Night (RON) Alternate 4 – Develop on the Terminal Apron Area

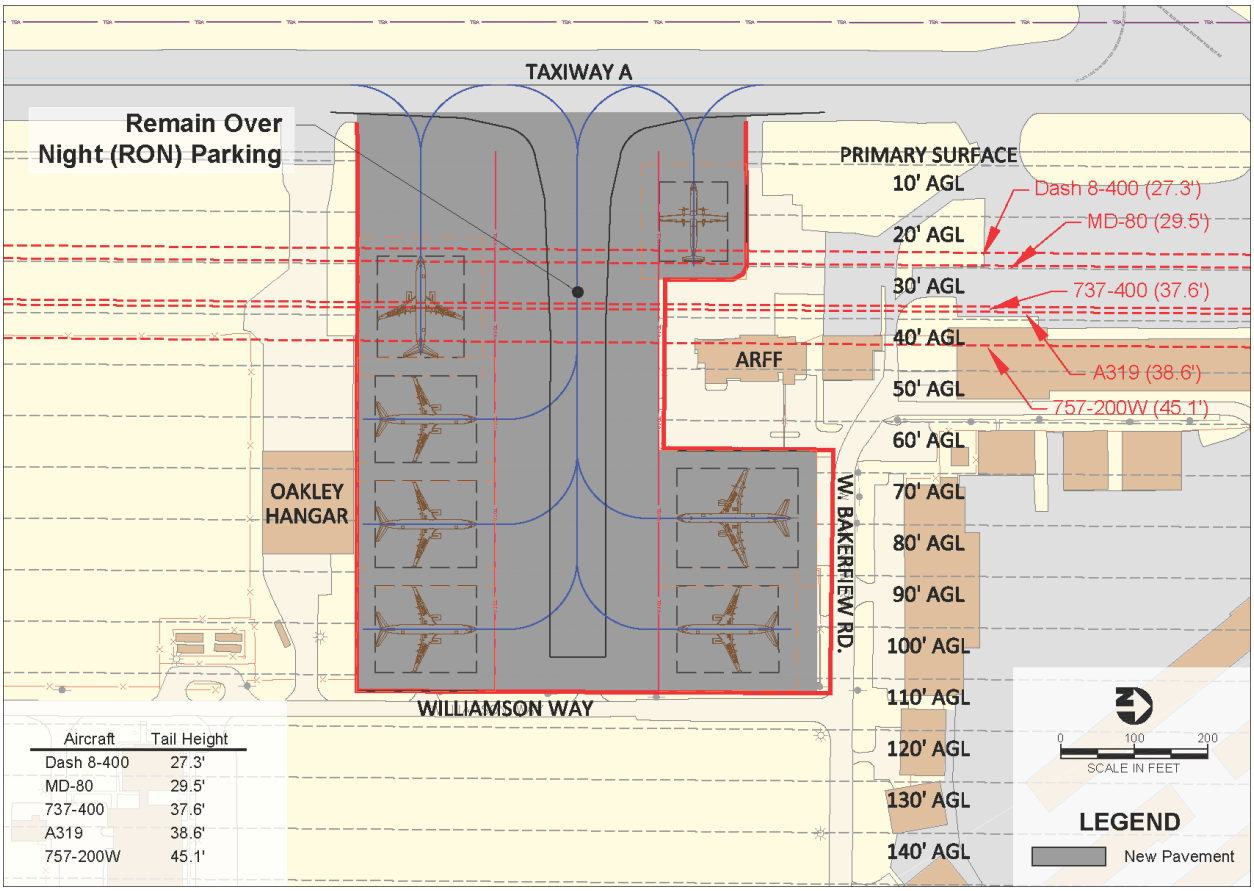


Figure 5-19: Remain Over-Night (RON) Alternate 5 – Develop on the ANG Site

5.3.2.2 Remain Over Night Position Evaluation

Accommodate Demand: Alternative 1 – Do-Nothing will not meet the demand for RON positions in either the short or the long term. At the present time, all non-commercial service paved area at BLI is being used for GA or other purposes. The consequences of the Do-Nothing Alternative are that RON positions will not be provided.

Alternative 2 provides space for five of the seven forecast positions but for these to be usable a minimum of five general aviation hangars will need to be relocated. While GA relocation is scheduled to begin within five years, this will not meet the immediate demand for two active spaces, nor is the area provided sufficient to meet the long-term demand for seven spaces.

Alternative 3 does provide for all seven spaces but development of the two spaces to fill the immediate need may not be possible. Development of the west side of the airport will require a new connector taxiway to be built off Runway 16/34 and the existing pavement is in need of reconstruction and expansion if it is to be used for RON purposes. Further, if the area is to function as RON parking, electrical power will need to be extended to the site. The Port currently has no permits to develop on the airport's west side but, if the RON positions are entirely situated outside wetland areas on the upland site that had previously served as runway and runway safety area, development may be possible. Otherwise, it is unlikely that development of RON positions at this location will be possible within the short-term period.

Alternative 4 provides for both the immediate need for two spaces as well as for the long-term need for seven.

Alternative 5 also provides the immediate need for two spaces as well as for the long-term need for seven.

Terminal Adjacency: Alternative 1 represents the do-nothing condition. This does not provide for the required demand for the positions.

Alternative 2 provides for RON positions adjacent to the terminal. However, the area available will ultimately only allow four RON positions.

Alternative 3 provides the RON positions on the airport's west side. This area is sufficient to provide for all seven RON positions but they are not immediately adjacent to the terminal. Locating the RONs here will require that the aircraft either taxi or be towed at least 2,600 feet to the parking position. The location also requires that both aircraft and support vehicles cross the active runway. This will be particularly disruptive during the morning hours when the aircraft need to be positioned at the gates. The repositioning will involve seven runway crossings during the peak morning take-off period increasing the risk of runway incursion as well as reducing operational efficiency.

Alternative 4 provides the space for all seven positions directly adjacent to the existing aircraft gate positions.

Alternative 5 provides the RON spaces on the same side of the runway as the terminal, thus eliminating the need for runway crossings. The site does require that the aircraft be either towed or taxied approximately 2,700 feet to reach the site. This activity will occur on parallel Taxiway A and will require close coordination with the ATCT when the overall traffic flow at the airport is in the northerly direction (landings on Runway 34).

FAR Part 77 Surface Penetration: All alternatives have been developed to ensure that all of the aircraft are able to park without having the aircraft tails penetrate the Part 77 Transitional Surfaces.

FAA Design Criteria: Each alternative location and layout being proposed was developed with consideration of the FAA design criteria regarding taxiway clearance and setback criteria.

Ability to Support Ground Service Operations: To function properly as RON positions, the aircraft will need to be serviced, and perhaps fueled at the RON location. This will require that both electricity and water service be available at the site and that surface traffic to shuttle crews and supplies have access. Alternative locations 1, 2, 4, and 5 have utility access and both electricity and water service as well as the ability to provide service vehicle access.

Development of Alternative 3 on the west side of the airport will require a new connector taxiway to be built off Runway 16/34 and the existing pavement is in need of reconstruction and expansion if it is to be used for RON purposes. The Port currently has no permits to develop wetlands or wetland buffer areas on the airport's west side but, if the RON positions are entirely situated outside wetland areas on the upland site that had previously served as runway and runway safety area, development may be possible. Otherwise, it is unlikely that development of RON positions at this location will be possible within the short-term period.

Further, electrical power and water service will need to be extended to the site. There is currently no water or sewer service on the west side of the runway, and future water or sewer service without annexation is limited to accommodating the operational needs of the airport, State of Washington, or United States Government (as opposed to commercial or industrial use.) Fueling, repair facilities, or other services could not be located on the west side of the runway without a modification to the May 2011 Interlocal Agreement between the Port and the City of Bellingham regarding annexation and utility service at BLI. Vehicle access to the west side of the runway is also limited. Fueling, servicing, and repair of RON planes would need to take place on the east side of the runway, or service vehicles would need access across or around the runway.

Development Costs: Development of the RON spaces varies from location to location. The total cost of the alternatives is estimated as follows:

Alternative 1: $0

Alternative 2: $25,780,000. This cost estimate includes the cost of hangar demolition and reconstruction in another area. The cost of site preparation for the designated hangar area south of the terminal is not included. The cost of the site preparation element has previously been estimated to be $5,600,000.

Alternative 3: $4,120,000. The estimate includes the cost of providing the paved RON parking spaces as well as the construction of an access taxiway to the west side. The cost estimate includes extension of the electrical lines to the site and provides both ramp lighting and electrical service to each position. No utilities or other services are provided for in the estimate.

Alternative 4: $2,728,000. This estimate includes paving the infield within the terminal area.

Alternative 5: $5,700,000. This cost estimate includes demolition of the existing structures in the ANG area as well as grading and paving activities associated with the site.

5.3.2.3 Remain Over Night Positions Recommendation

Providing seven RON positions at BLI is complicated by the fact that the terminal and general aviation areas are co-located within the central portion of the airport and the rapid growth that has been experienced in the commercial sector has created congested conditions throughout the apron. Therefore, the optimum area for RONs on the terminal apron is not currently available without a series of preparatory projects, mainly the relocation of GA hangars. The recommendation for providing RON positions at BLI is to develop the ANG site to meet the short-term RON requirements with the eventual relocation of the RONs in the terminal area after the relocation of the GA hangars.

5.3.3 Other Terminal Improvements

In addition to the passenger and aircraft parking facilities that will need to be expanded to accommodate increases in demand levels, there are some terminal area improvements that are being driven by private business. One of these, the construction of an on-airport hotel, has been located in the terminal area, north of the expanded auto parking lot. The site will house a hotel and associated parking and will provide the airport with revenue from the rental of the land.

A second privately driven airport support facility is the new Rent-A-Car (RAC) Service Facility proposed for the land adjacent to the hotel. This is also a privately funded project that will provide a revenue stream for the airport.

5.3.4 Surface Access

Primary access to the airport is through the Bakerview Road/I-5 Interchange to Airport Way and Mitchell Way to the terminal building. WSDOT and other surrounding jurisdictions have identified capacity constraints at the interchange and included the issue in the "Fairhaven to Slater Interstate 5 Master Plan." This master plan has recommended construction of a single point urban interchange (SPUI) to improve overall operation of the interchange. Currently there

is no funding for this improvement. Recently completed regional traffic studies have included trip generation models for airport use as forecast through the year 2030. These show that the airport-generated traffic represents from two to five percent of the total 2030 traffic at the Bakerview Road/I-5 Interchange. The Port contributed $500,000 toward an interim project to expand the capacity of this interchange while funding for a longer term solution is found.

Some regional officials have suggested that secondary access to the airport be provided through a new airport access route from the north. Two possibilities have been suggested. The first is an extension of Kope Road from where it currently ends north of airport property to connect with the airport drives near the FedEx facility north of the terminal. The exact alignment of the proposal has not been refined but roughly follows the alignment sketched on the attached Figure 5-20.

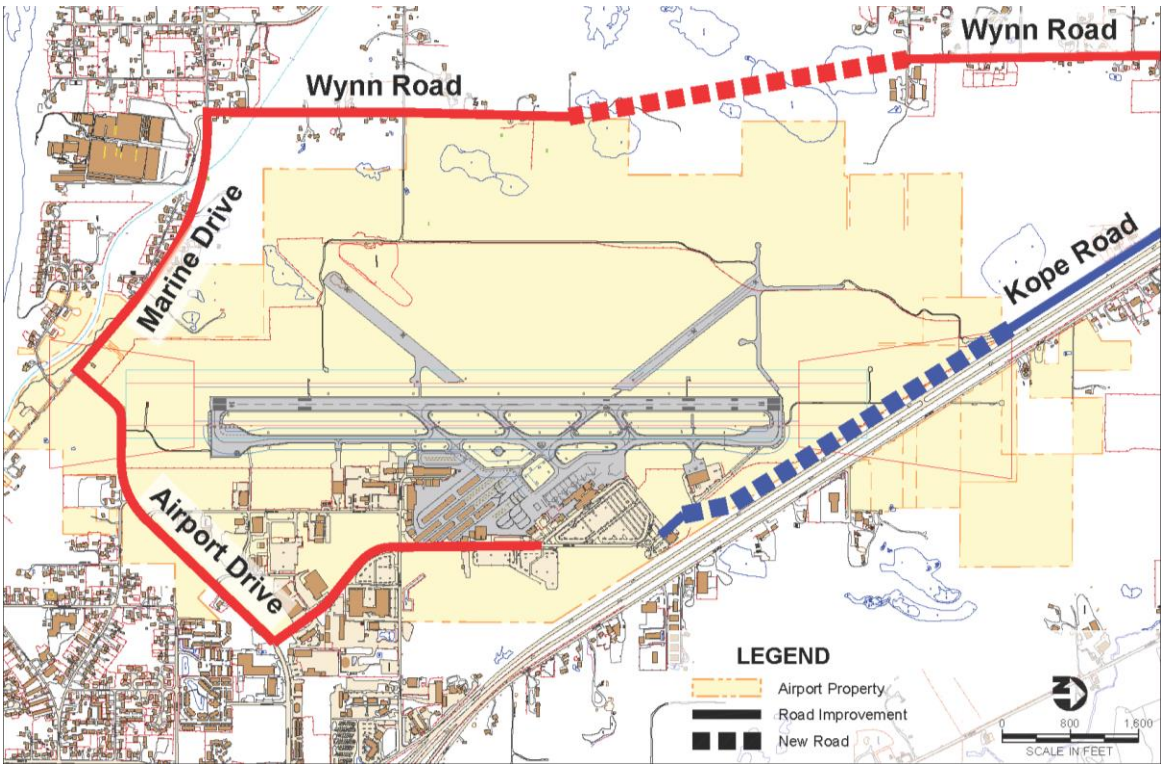


Figure 5-20: Potential Alternate Airport Access Routes

A second suggestion has been made to improve existing roads and signage to direct traffic to the airport from the north. This could include improving and connecting Wynn Road to Marine Drive and using Airport Drive and Airport Way to access the terminal.

Extending Kope Road would require that the road be constructed within the existing Interstate-5 right-of-way or through the Runway Safety Area (RSA) and the Runway Protection Zone (RPZ) for Runway 16. The Federal Aviation Administration has indicated they will not approve a surface extension of Kope Road through the RSA or RPZ. FAA could consider approval of a tunnel under the RSA or RPZ if no other feasible alternatives are available and the tunnel does not adversely impact either. The following issues also affect this decision:

- The distance from the I-5/Slater Road Interchange to the terminal is approximately 2.5 miles.
- The level of environmental work that will be required is unknown at this time.
- Coordination would be required to include WSDOT, the City of Ferndale, Whatcom County, the City of Bellingham, FAA, the Port of Bellingham, Department of Ecology, U.S. Army Corps of Engineers, and the Lummi Nation.

When examining the possibility of extending Wynn Road to connect and provide a more direct route to the terminal the following issues need to be considered:

- The distance from the I-5/Slater Road Interchange to the terminal is approximately 5.5 miles.
- There is a section of Wynn Road (approximately 3,650 feet) that would need to be constructed. This most direct route for this section would run directly through a designated wetland area.

Neither of these alternatives is rated in this report as they need to be assessed and agreed to by other governmental agencies.

5.4 GENERAL AVIATION PROJECTS

The future needs of general aviation include both expansion to accommodate increasing demand and relocation of hangars and other facilities displaced due to the future terminal expansion. In the previous master plan it was recommended that GA development be directed to the southeastern portion of the airport property. The Port has been actively pursuing this direction in the years since, having completed all environmental studies required and securing approvals for development. The areas where these approvals are in place are shown in Figure 5-21.

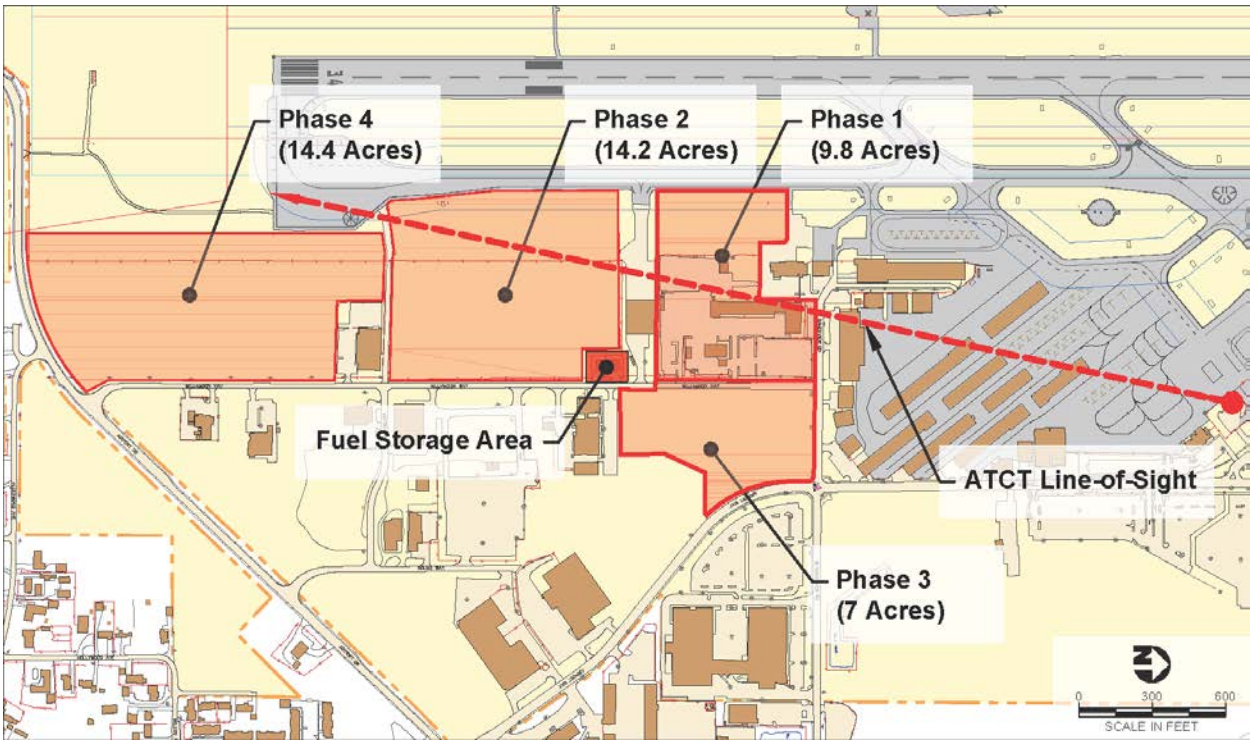


Figure 5-21: General Aviation Development Plan

As shown, a total of 45.4 acres have been designated for future GA development. Phases 1, 2, and 3 are ready for implementation as soon as the Port begins the approved wetland mitigation plan. Phase 4 has not been included in the approvals.

5.4.1 General Aviation Area

5.4.1.1 General Aviation Area Alternatives

In this master plan the alternative actions considered include:

Alternative 1 – Do-Nothing

Alternative 2 – Continue phased development in the southeast area

Alternative 3 – Move the general aviation to the west side

5.4.1.2 General Aviation Area Evaluation

In examining the three actions, it is clear that the Do-Nothing Alternative is not feasible. The need for GA facility relocation as part of the long-range terminal plan necessitates a short-term action, even if the demand for new facilities does not materialize as forecast. For this reason, Alternative 1 will not serve the future of the airport.

Alternative 2 represents the continuation of 10 years of effort by the Port to secure a site for GA expansion. The area available is large enough to accommodate both relocation of existing facilities and the development of new ones. It is essential that the area be developed before the next terminal expansion need is realized (2028).

Alternative 3 represents a good long-term option when demand for GA exceeds the ability to be accommodated in the southeastern area. This level of demand is outside the master plan timeframe. Best estimates are that the environmental processes required to allow development will involve five to ten years of work that can only be started when demand is imminent. It is also noted that development of this area will need to include utilities and access roads as well as major improvements to the airfield—notably the addition of a westside parallel taxiway system to eliminate the requirement for GA aircraft to cross the active runway.

5.4.1.3 General Aviation Area Recommendation

It is recommended that the Port of Bellingham continue with on-going plans for expansion of general aviation in the southeastern area. The Port should designate the west side of the airport as an aviation reserve area to accommodate future demand. One of the potential uses of this land would be for general aviation expansion beyond the 20-year period covered in this master plan. The Port should continue to monitor the growth in general aviation demand and be prepared to initiate development on the west side should that be deemed necessary.

5.4.2 Helicopter Landing Area

At present helicopter operations at BLI access the airport in the same manner as do fixed-wing aircraft. They approach the runway and hover-taxi to their destinations on the airfield. These procedures cause a slight inefficiency in the use of the runway's airspace and capacity, particularly during busy times. Alternatively, during these busy times, the helicopter operators will often leave the traffic pattern and fly directly to their destination.

5.4.2.1 Helicopter Landing Area Alternatives

Three alternative locations have been identified for helicopter landing areas as shown in Figure 5-22 and as follows:

Alternative 1 – Do-Nothing

Alternative 2 – Locate near users

Alternative 3 – Centralize location in new GA area

5.4.2.2 Helicopter Landing Area Evaluation

In assessing the alternatives, user needs and the ultimate destination of the helicopters on the airport are considered. It is clear that two distinct user groups exist at BLI. The first is the governmental group associated with the existing south hangar area. This group operates on a 24-hour-per-day schedule. Implementing Alternative 2 will allow these operations to be controlled and directed away from both the operations area as well as to direct their operations away from residential areas. The result will be more efficient use of the airfield as well as a savings in operations time and expenses.

On the civil side, helicopter operators can be directed to the FBO facilities as the new GA area is developed. This further simplifies operational issues at BLI and provides benefit to the users by reducing the amount of time required for taxi operations.

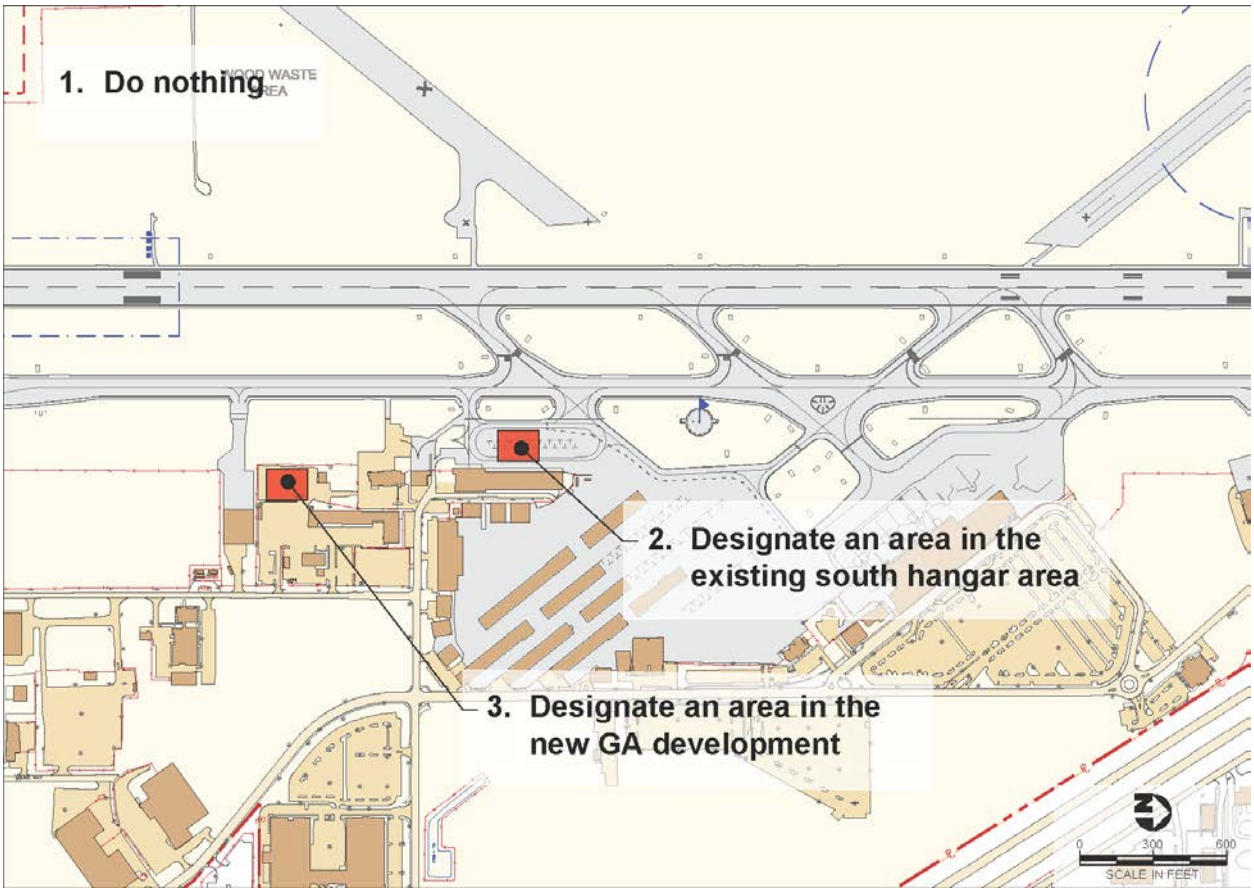


Figure 5-22: Helicopter Landing Area Alternatives

5.4.2.3 Helicopter Landing Area Recommendation

Reviewing the need at BLI, it is recommended that helicopter-landing areas be designated at both the existing south hangar area and an area created as part of the development of the new GA area to the south of the terminal.

5.5 OTHER AIRFIELD PROJECTS

In support of the recommendations made for improved airfield safety and operational efficiency, the master plan has also identified issues related to navigational aids that should be considered by FAA during the period covered in this master plan. While any decisions on the installation of these facilities will be made at the sole discretion of the FAA, the master plan has included them in the interest of providing for the long-term future of BLI.

5.5.1 Air Traffic Control Tower (ATCT)

The current position and height of the ATCT is such that the line-of-sight to the southern end of Taxiway A is obstructed. As the airport continues to develop both terminal and general aviation facilities, the location and height of the tower will continue to be the primary factor limiting development. To maintain the tower line-of-sight, development of both terminal and general aviation facilities are restricted. Therefore, the tower will need to either be relocated or have the height increased to facilitate operational safety and long-term development opportunities. All decisions for changes to or relocation of an ATCT are ultimately made by FAA and the final analyses and siting studies will be conducted based on their specific criteria.

However, because the ultimate height and/or location of the ATCT is a major factor in the development of the master plan it is necessary to address the issue. Given the need to begin to relocate GA hangars and other facilities in the short-term, decisions regarding the tower have immediate impact on the layout of the areas available for development.

In this analysis, the ultimate location of the ATCT has been approached as follows.

5.5.1.1 ATCT Alternatives

Five alternatives have been identified when considering the ATCT.

Alternative 1 – Do-nothing.

Alternative 2 – Maintain the ATCT at current site but raise the cab height.

Alternative 3 – Relocate the tower to the southeast at the current Air National Guard (ANG) site, within the future GA development area.

Alternative 4 – Relocate the tower to the northeast near the current FedEx cargo facility.

Alternative 5 – Relocate to the west side of the airport.

These locations are shown in Figure 5-23.

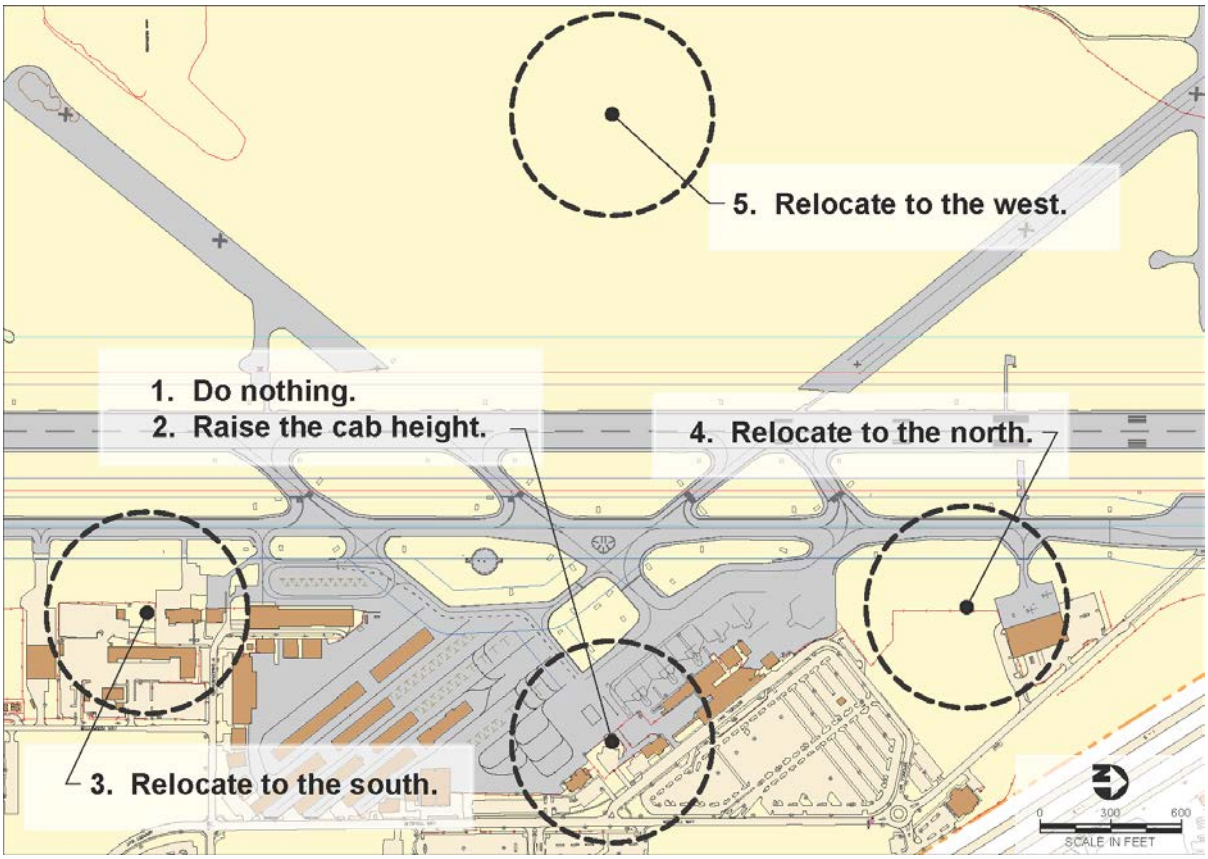


Figure 5-23: Potential ATCT Locations

5.5.1.2 ATCT Evaluation

Although FAA will make the final decision regarding the future ATCT, they will base their decision on a range of critical factors. The criteria they will use include the following:

1. **Visibility**: The height of the tower cab must provide controllers with an unobstructed view of the entire controlled movement area as well as of the airspace surrounding the airport, and the traffic pattern.
2. **Recognition**: The location and height of the tower need to be such that tower personnel maintain the ability to recognize the class of aircraft conducting an operation on all portions of the airfield.

3. **Airspace**: The ATCT must not be located in a way that creates an obstruction to FAR Part 77 or terminal instrument procedures (TERPS) surfaces.
4. **Utilities**: The ATCT requires access to standard public utilities as well as the ability to link with dedicated FAA utilities.
5. **Public Access**: The tower needs to have access from public roadways.
6. **Environmental Factors**: The environmental effects of construction at each site need to be considered.
7. **Construction Cost**: The cost of site preparation and tower construction must be considered.

The following analysis includes a preliminary comparison of the available sites based on these evaluation criteria. The purpose is to select a preferred option to integrate the needs of FAA into the long range planning for the airport as represented by the ALP.

Visibility: All of the alternatives, except the do-nothing, can be constructed in a manner that maintains line-of-sight visibility over the airport movement area. When considering Alternative 5, the site on the west side of the airport, it is noted that the ability of tower personnel to monitor the traffic pattern will be compromised, as the primary pattern will be on the backside of the tower. To change the traffic pattern to the front would mean moving traffic over more populated areas.

Recognition: The ability of tower personnel to maintain recognition of the aircraft type is a function of the distance between the tower and the aircraft operating area. This issue is associated with tower locations at the far end of long runways. In the case of the tower at BLI, all of the sites are adjacent to the runway and this issue will not be a problem.

Airspace: All of the sites can be developed without creating airspace issues.

Utilities: Utilities are readily available at the existing tower site as well as at alternative sites 3 and 4. Alternative 5 is located on the airport's west side and public utilities are not currently available. These would need to be provided prior to construction and would represent an additional cost.

Public access: Alternatives 1 through 4 are accessible from the existing public roadway network. Alternative 5 is not currently accessible and new public access roads would need to be constructed. Adequate security can be provided at any of the sites.

Environmental Factors: Adding height to the existing tower or constructing a new facility at Alternative 3 could begin immediately, as both have no environmental factors that complicate

development. Alternative 4 is near a wetland area so wetland buffers would need to be carefully considered during design. Since Alternative 5 is located on the airport's undeveloped west side, wetland evaluation and permits would need to be obtained prior to consideration.

Construction Costs: The cost of constructing a new ATCT has been estimated to be approximately $2,500,000 to $5,000,000, depending on ultimate height and site conditions. Any variation in the cost of the alternatives is caused by site conditions and other factors directly related to the alternative.

For the existing tower location, records of construction indicate that the planned height of the facility was revised prior to construction when it was discovered that soil conditions would not support the recommended height without major revisions to the foundations. Since this required additional funding, it was decided that the overall height of the tower would be lowered and the line-of-sight to the south would be compromised in order to remain on budget. In this analysis, the assumption was made that raising the height of the tower would require that the foundations be strengthened prior to any action being undertaken. As a result, the estimated cost of raising the tower height is equal to or exceeds the cost of new tower construction. Additionally, work on raising the existing tower would require either that a temporary tower be brought on site or that the airport operate without a tower during construction.

The costs for all other alternatives were based on a standard tower construction cost with variations being the result of known site conditions such as utility extensions, roadway construction, or environmental issues that need to be addressed.

Table 5-6: ATCT Alternative Comparison

Criteria	Alternative 1: Do-Nothing	Alternative 2: Raise the Cab Height	Alternative 3: Relocate to the South	Alternative 4: Relocate to the North	Alternative 5: Relocate to the West
Line-of-Sight Visibility	❍	●	●	●	●
Aircraft Recognition Ability	●	●	●	●	●
Airspace Compatibility	●	●	●	●	●
Utility Availability	●	●	●	●	❍
Public Access	●	●	●	●	❍
Environmental Factors	●	●	●	❍	❍
Construction Costs	$0	$3,500,000	$2,500,000	$4,000,000	$5,000,000

● = Meets criteria

❍ = Does not meet criteria

5.5.1.3 ATCT Recommendation

Based on this comparison, it is recommended that the master plan include the relocation of the ATCT to the Alternative 4 site, pending validation by FAA.

5.5.2 Airport Surveillance Radar (ASR)

An ASR system detects aircraft positions and weather conditions near the airport. At present there is no ASR available at BLI and ATCT personnel coordinate with Whidbey Island and/or Victoria, B.C., for radar coverage. Therefore, the tower operates as a manual control ATCT and lacks the ability to track and guide aircraft in and out of the airport independently. In the Facility Requirements chapter, it was determined that the only way to improve on this capability is to add an ASR. The primary benefits of ASR are a reduction in weather related delays and increased operational safety. Having ASR on the airport can reduce the in-trail separation between aircraft from 7 miles to 3 miles, enabling more hourly operations, as well as controlling the flight tracks of the aircraft more accurately.

Like the ATCT discussion, decisions regarding installation of a new ASR at BLI will be made by FAA since the ASR is a federally owned and operated facility.

5.5.2.1 ASR Alternatives

There are no alternatives for the ASR that can be identified, since the facility will be located in conjunction with the ATCT.

5.5.2.2 ASR Evaluation

FAA AC 150/5300-13A identifies the following criteria for determining a site for an ASR:

1. An ASR needs to be located near enough to the ATCT to allow access to power and communication duct banks.
2. The ASR antenna should be located at least 1,500 feet from buildings or any objects that might cause signal reflections.
3. Antennas should be located at least one-half mile (2,640 feet) from other electronic equipment to eliminate signal degradation.
4. The antenna heights range from 17 to 77 feet above ground level; these should be positioned to avoid FAR Part 77 penetration.

5.5.2.3 ASR Recommendation

Although the final siting for the ASR will be determined by FAA, the recommendation in this master plan is to have the ASR located on the airport's west side, which is the only area where it could be positioned without interference from other facilities. This location allows for a direct

connection to the ATCT should the relocation occur. Figure 5-24 shows the recommended location for the ASR.

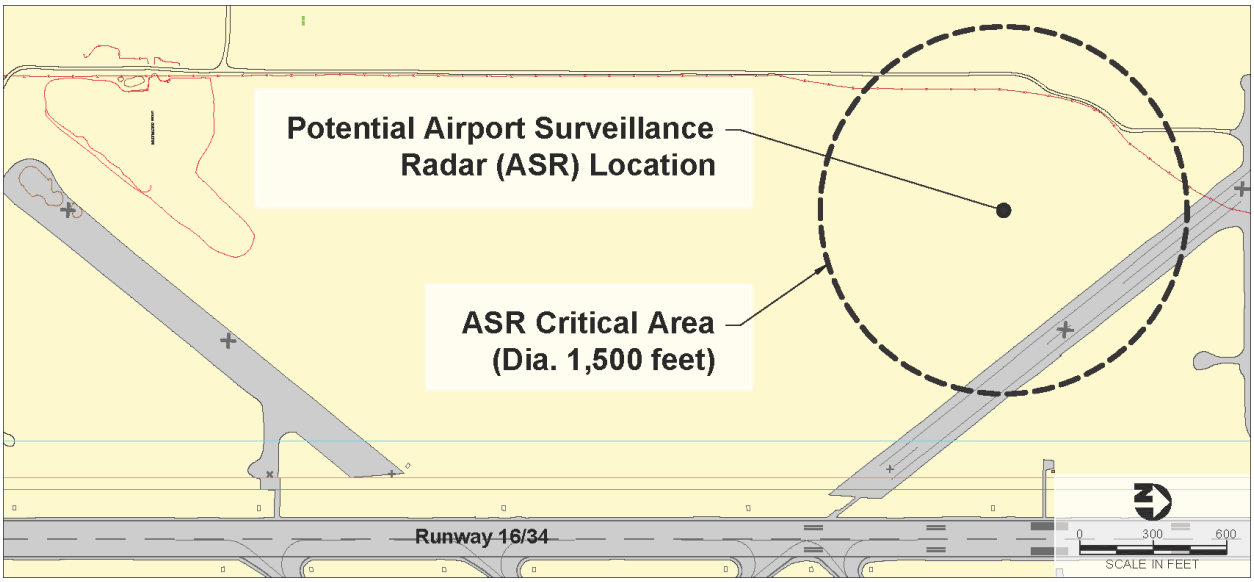


Figure 5-24: Potential ASR Location

5.5.3 Instrument Landing System (ILS) on Runway 34

In the facility requirements discussion it is recommended that a new ILS be considered for Runway 34 to increase operational efficiency and reduce delays due to weather. The determination of need for the ILS will be the result of an FAA needs assessment. If FAA approves an ILS, there are no alternative locations to be studied. The ALP will reflect the installation of the equipment on Runway 34 as shown on Figure 5-25.

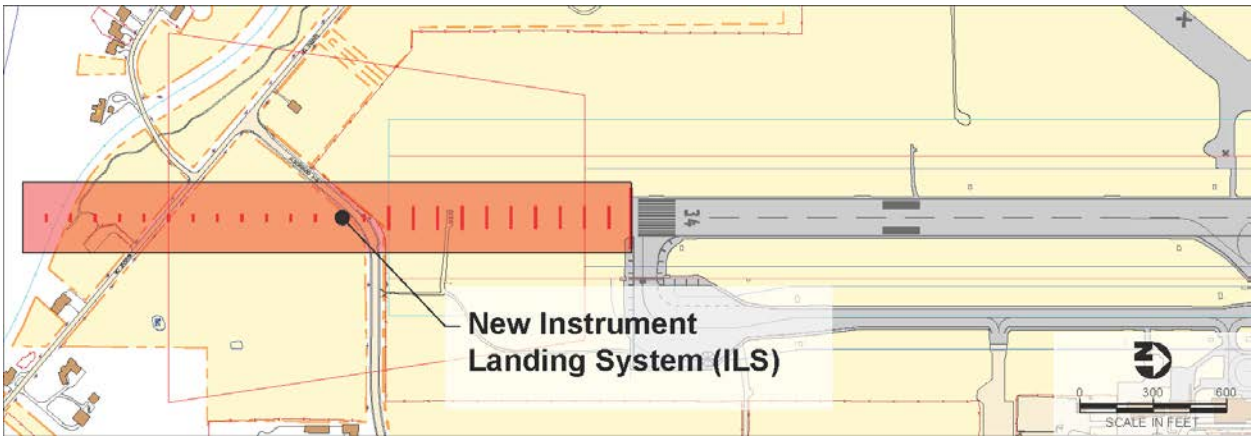


Figure 5-25: Instrument Landing System on Runway 34

5.6 CONCLUSION

The preceding analyses and recommendations, when combined, will be the basis for the Bellingham International Airport Layout Plan. A summary of the recommendations includes

Airfield Recommendations

1. Construct new right-angled exit taxiways.
2. Construct runway shoulders.
3. Realign terminal access taxiways and taxilanes to eliminate apron confusion and congestion issues in response to the RSAT recommendations.
4. Relocate the Air Traffic Control Tower to the north of the terminal building.
5. Install an Airport Surveillance Radar on the west side of the airport.
6. Install a new Instrument Landing System (ILS) on Runway 34.
7. Construct a Jet Engine Run-up Area east of the runway, near the by-pass taxiway on Runway 34.
8. Install designated Helicopter Landing Areas at both the south hangar area as well as in the new GA area.
9. Construct the missing portion of the Perimeter Road.

Terminal Recommendations

1. Expand the passenger terminal to the south, as demand dictates.
2. Realign Taxilanes J and H to meet FAA standards.
3. Relocate portions of connector taxiways D, E, and F to reduce the potential for runway incursions.
4. Construct seven new RON parking positions.
5. New on-airport hotel construction.
6. New RAC Service Facility.

Surface Access Recommendations

1. Monitor access improvement proposals being considered by other agencies.

General Aviation Recommendations

1. Relocate and expand GA to the south of the terminal.
2. Relocate the GA Terminal
3. Relocate the GA FIS Facility

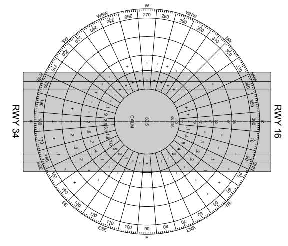
Figure 5-26 (Sheet 2 of 11) shows the long-term airport development plan proposed for Bellingham.

AIRPORT FACILITIES

#	DESCRIPTION	HEIGHT*
1	HUMANE SOCIETY AND SPCA (TO BE REMOVED)	183.1'
2	CURRENT INDUSTRIES	195.6'
3	AVIATION COMPONENTS	207.2'
4	CURRENT INDUSTRIES	211.5'
5	LIGHT MANUFACTURING (YAMATO BLDG.)	220.4'
6	PUGET SOUND TRUCK LINES	213.8'
7	LAND LEASE (REESERS)	NA
8	AIRPORT BUILDING	204.7'
9	MANUFACTURING (POB FTZ)	214.2'
10	SOUND BEVERAGE	213.6'
11	WOODSTONE	221.3'
12	FUEL FARM STORAGE TANKS	187.1'
13	CORPORATE HANGAR (OAKLEY)	209.0'
14	FUTURE SNOW REMOVAL EQUIPMENT (SRE) BLD.	TBD
15	AIR NATIONAL GUARD (TO BE REMOVED)	185.2'
16	AIR NATIONAL GUARD (TO BE REMOVED)	183.3'
17	LAND LEASE (HELIPRO)	NA
18	PRIVATE HANGAR	178.3'
19	ELECTRICAL VAULT	166.2'
20	CORPORATE HANGARS (ICE)	178.2'
21	SELF FUELER	162.0'
22	CORPORATE HANGAR	189.9'
23	CORPORATE HANGAR	178.1'
24	PRIVATE HANGAR	182.5'
25	PRIVATE HANGAR	195.7'
26	CORPORATE HANGAR/AIRCRAFT MAINTENANCE	178.8'
27	CORPORATE HANGAR (ALLSOP)	180.3'
28	CORPORATE HANGAR (HAGGEN)	180.6'
29	STRATOS T-HANGARS	179.3'
30	CONDOMINIUM HANGARS	183.7'
31	PORT HE T-HANGARS	180.5'
32	CIRRUS T-HANGARS	174.9'
33	PORT HD T-HANGARS	175.3'
34	NIMBUS T-HANGARS	175.6'
35	ALTO T-HANGARS	178.9'
36	SOLAR HANGARS	174.3'
37	CORPORATE HANGAR	177.9'
38	CORPORATE HANGAR (VISION MICRO)	182.6'
39	HANGAR	179.6'
40	AUTOMOBILE REPAIR (TO BE REMOVED)	168.0'
41	GA TERMINAL	174.4'
42	AIRPORT TRAFFIC CONTROL TOWER (ATCT)	231.0'
43	AIRCRAFT RESCUE FIRE FIGHTING (ARFF)	179.9'
44	U.S. CUSTOMS	172.3'
45	TERMINAL BUILDING	196.0'
46	PACIFIC CATARACT AND LASER INSTITUTE	176.4'
47	FUTURE ATCT (SEE NOTE #2)	TBD
48	ALLEGIANT COMMISSARY	183.2'
49	-	-
50	AIR CARGO (FEDEX)	181.8'
51	-	-
52	-	-
53	-	-
54	-	-

*ABOVE MEAN SEA LEVEL (MSL)

ALL-WEATHER WIND ROSE

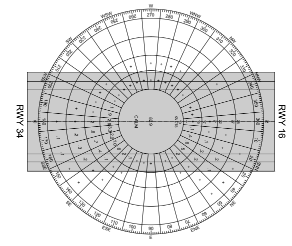


ALL-WEATHER (79,472 OBSERVATIONS)

CROSSWIND	RWY 16/34
10.5 KNOTS	98.45 %
13 KNOTS	99.41 %
16 KNOTS	99.86 %
20 KNOTS	99.99 %

NOAA WEATHER REPORTING STATION: 72797 BELLINGHAM, WA
OBSERVATION PERIOD: 2000 - 2009

VISUAL FLIGHT RULES WIND ROSE

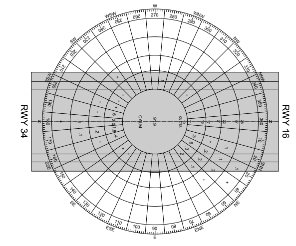


VFR (74,891 OBSERVATIONS)

CROSSWIND	RWY 16/34
10.5 KNOTS	98.41 %
13 KNOTS	99.41 %
16 KNOTS	99.86 %
20 KNOTS	99.99 %

NOAA WEATHER REPORTING STATION: 72797 BELLINGHAM, WA
OBSERVATION PERIOD: 2000 - 2009

INSTRUMENT FLIGHT RULES WIND ROSE



IFR (3,253 OBSERVATIONS)

CROSSWIND	RWY 16/34
10.5 KNOTS	98.91 %
13 KNOTS	99.35 %
16 KNOTS	99.77 %
20 KNOTS	99.98 %

NOAA WEATHER REPORTING STATION: 72797 BELLINGHAM, WA
OBSERVATION PERIOD: 2000 - 2009

ABBREVIATIONS

ITEM	DEFINITION
ARFF	AIRCRAFT RESCUE FIRE FIGHTING
ARP	AIRPORT REFERENCE POINT
ASOS	AUTOMATED SURFACE OBSERVING SYSTEM
ASR	AIRPORT SURVEILLANCE RADAR
ATCT	AIRPORT TRAFFIC CONTROL TOWER
BRL	BUILDING RESTRICTION LINE
IFR	INSTRUMENT FLIGHT RULES
ILS	INSTRUMENT LANDING SYSTEM
HIRL	HIGH INTENSITY RUNWAY LIGHTS
MITL	MEDIUM INTENSITY TAXIWAY LIGHTS
MSL	MEAN SEA LEVEL
NDB	NON-DIRECTIONAL BEACON
NPI	NON-PRECISION INSTRUMENT APPROACH
NPIAS	NATL. PLAN OF INTEGRATED AIRPORT SYSTEMS
OFA	RUNWAY OBJECT FREE AREA
OFZ	RUNWAY OBJECT FREE ZONE
PAPI	PRECISION APPROACH PATH INDICATOR
PIR	PRECISION INSTRUMENT APPROACH
RAC	RENT-A-CAR
REIL	RUNWAY END IDENTIFIER LIGHTS
RNAV	AREA NAVIGATION
RPZ	RUNWAY PROTECTION ZONE
RSA	RUNWAY SAFETY AREA
RVR	RUNWAY VISUAL RANGE
RVZ	RUNWAY VISIBILITY ZONE
SRE	SNOW REMOVAL EQUIPMENT
TOFA	TAXIWAY OBJECT FREE AREA
VFR	VISUAL FLIGHT RULES

AIRPORT VICINITY

AIRPORT LOCATION

NOTES

1. FUTURE GA AREA TO BE DEVELOPED AS INTERIM REMAIN OVERNIGHT (RON) AREA FOR COMMERCIAL AIRCRAFT.
2. RELOCATION OF AIRPORT TRAFFIC CONTROL TOWER (ATCT) IS SUBJECT TO FAA REVIEW, APPROVAL, FUNDING, AND SITE DETERMINATION.
3. SEE SHEETS 7 AND 8 OF 11 FOR DETAILS ON LANDSIDE DEVELOPMENT.
4. THE BUILDING RESTRICTION LINE (BRL) IS BASED ON A MAXIMUM BUILDING HEIGHT OF 36 FEET AT A 250' DISTANCE FROM THE PRIMARY SURFACE. MAXIMUM ALLOWABLE BUILDING HEIGHT FROM THE BRL INCREASES AT A 7:1 HORIZONTAL TO VERTICAL SLOPE UPWARD AND AWAY FROM THE PRIMARY SURFACE IN CONFORMANCE WITH FAR PART 77 SURFACES.
5. THERE ARE NO DECLARED DISTANCES USED OR PROPOSED.
6. THERE ARE NO THRESHOLD SITING SURFACE PENETRATIONS.
7. THERE ARE NO OBSTACLE FREE ZONE OBJECT PENETRATIONS.
8. RUNWAY PROTECTION ZONE CONTROL IS VIA OWNERSHIP AND EASEMENT BOTH RUNWAY ENDS.
9. TAXILANE H IS DESIGNED TO MEET 757-200 OPERATIONAL REQUIREMENTS. IT IS TO BE UPGRADED TO MEET DG-IV REQUIREMENTS.
10. A SMALL PORTION OF THE NORTHEAST CORNER OF RUNWAY 16 RSA IS NOT COMPLIANT AND COVERED BY RWY 16/34 RUNWAY SAFETY AREA DETERMINATION DATED FEBRUARY 25, 2005 ON FILE WITH THE FAA.

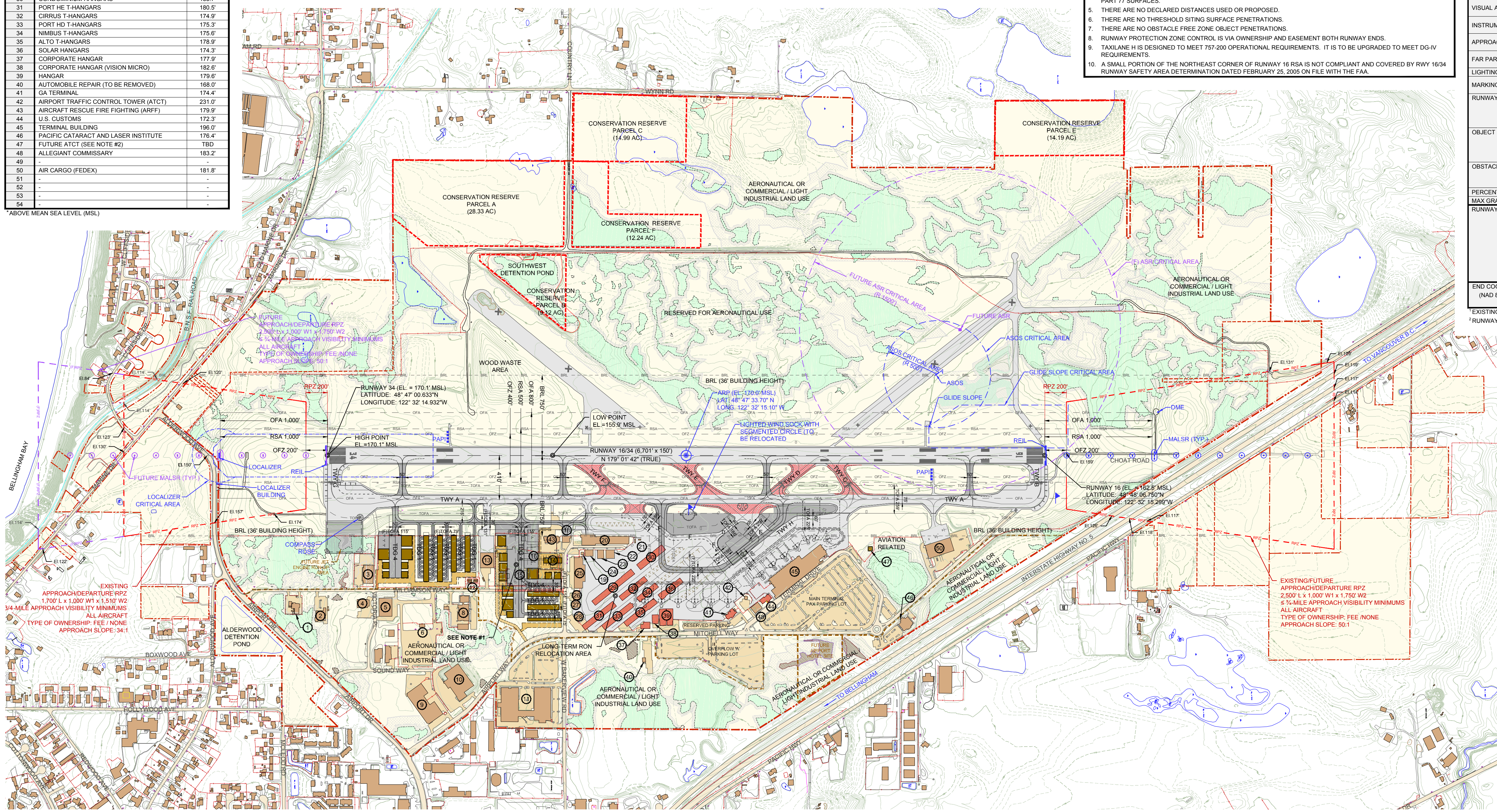
AIRPORT DATA TABLE

ITEM		EXISTING	PROPOSED
AIRPORT TERMINAL CODE		BLI	NO CHANGE
AIRPORT ELEVATION (MSL)		170.0'	NO CHANGE
AIRPORT REFERENCE POINT (ARP)	LAT.	48° 47' 33.70" N (EST.)	NO CHANGE
(NAD 83)	LON.	122° 32' 15.10" W (EST.)	NO CHANGE
MEAN MAX. TEMP. OF HOTTEST MONTH		71° F (AUGUST)	NO CHANGE
COMBINED WIND COVERAGE		99.86% (16 KNOTS)	NO CHANGE
MAGNETIC DECLINATION & YEAR		16°38' 42" E (DEC. 2013)	NO CHANGE
AIRPORT REFERENCE CODE (ARC)		C-IV	NO CHANGE
CRITICAL AIRCRAFT 1,000 MILE STAGE LENGTH		BOEING 757-200	NO CHANGE
NPIAS SERVICE LEVEL		COMMERCIAL SERVICE (CM)	NO CHANGE
TAXIWAY LIGHTING		MITL	NO CHANGE
TAXIWAY MARKING		STANDARD	NO CHANGE
AIRPORT & TERMINAL NAVAIDS		ILS, VOR, NDB, GPS	ASR

RUNWAY DATA TABLE

ITEM		RUNWAY 16-34 EXISTING STANDARD	EXISTING ACTUAL	PROPOSED	
RUNWAY DESIGN CATEGORY		C-IV		NO CHANGE	
CRITICAL AIRCRAFT		B757-200		NO CHANGE	
RUNWAY DIMENSIONS LENGTH:		6,701'		NO CHANGE	
WIDTH:		150'	150'	NO CHANGE	
RUNWAY ORIENTATION		179° 01' 42" (TRUE)		NO CHANGE	
PERCENT WIND COVERAGE (16 KNOT)		95%	99.86%	NO CHANGE	
LINE-OF-SIGHT		NOT OBSTRUCTED		NO CHANGE	
PAVEMENT TYPE		ASPHALT		NO CHANGE	
PAVEMENT DESIGN STRENGTH SINGLE GEAR:		75,000 LBS		NO CHANGE	
DUAL GEAR:		160,000 LBS		NO CHANGE	
DUAL TANDEM GEAR:		250,000 LBS		NO CHANGE	
VISUAL APPROACH AIDS	RW 16:	PAPI, REIL, MALSR		NO CHANGE	
	RW 34:	PAPI, REIL		MALSR	
INSTRUMENT APPROACH AIDS	RW 16:	ILS/DME, RNAV		NO CHANGE	
	RW 34:	RNP, GPS		ILS/DME, RNAV	
APPROACH VISIBILITY MINIMUMS	RW 16:	PRECISION		NO CHANGE	
	RW 34:	NON-PRECISION		PRECISION	
FAR PART 77 APPROACH SLOPE	RW 16:	50:1	50:1	NO CHANGE	
	RW 34:	34:1	34:1	50:1	
LIGHTING		HIRL	HIRL	NO CHANGE	
MARKING	RW 16:	PRECISION		NO CHANGE	
	RW 34:	NON-PRECISION		PRECISION	
RUNWAY SAFETY AREA (RSA) [1]					
LENGTH BEYOND DEPARTURE END:		1,000'	1,000' [1]	NO CHANGE	
LENGTH PRIOR TO THRESHOLD:		1,000'	1,000' [1]	NO CHANGE	
WIDTH:		500'	500'	NO CHANGE	
OBJECT FREE AREA (OFA)					
LENGTH BEYOND DEPARTURE END:		1,000'	1,000'	NO CHANGE	
LENGTH PRIOR TO THRESHOLD:		1,000'	1,000'	NO CHANGE	
WIDTH:		800'	800'	NO CHANGE	
OBSTACLE FREE ZONE (OFZ)		(NO OFZ OBJECT PENETRATIONS)		(NO OFZ OBJECT PENETRATIONS)	
WIDTH:		400'	400'	NO CHANGE	
LENGTH BEYOND RW END:		200'	200'	NO CHANGE	
PERCENT EFFECTIVE GRADIENT		1.4%	0.2%	NO CHANGE	
MAX GRADE WITHIN RWY LENGTH (%)		1.4%	0.8%	NO CHANGE	
RUNWAY ELEVATIONS (MSL) EXISTING END:	RW 16:	162.5'		NO CHANGE	
	RW 34:	170.1'		NO CHANGE	
DISPLACED THRESHOLD:	RW 16:	NOT APPLICABLE		NO CHANGE	
	RW 34:	NOT APPLICABLE		NO CHANGE	
TOUCHDOWN ZONE:	RW 16:	162.5'		NO CHANGE	
	RW 34:	170.1'		NO CHANGE	
RUNWAY INTERSECTIONS:		NOT APPLICABLE		NO CHANGE	
HIGH & LOW POINTS:	HIGH:	170.1'		NO CHANGE	
	LOW:	155.9'		NO CHANGE	
END COORDINATES: [2]		RW 16	RW 34	RW 16	RW 34
(NAD 83) LATITUDE:		48°48'06.750" N	48°47'00.633" N	NO CHANGE	NO CHANGE
LONGITUDE:		122°32'15.199" W	122°32'14.932" W	NO CHANGE	NO CHANGE

[1] EXISTING RSA DIMENSIONS FOR RUNWAY 16: 500' x 1,000' EXCEPT FOR 6,750 S.F. IN NORTHEAST CORNER.
[2] RUNWAY END COORDINATES AS REFLECTED ON AIRPORT 5010 FORM.



LEGEND

DESCRIPTION	EXISTING	PROPOSED
AIRCRAFT TIEDOWN POSITION		
AIRPORT BUILDING		
AIRFIELD PAVEMENT		
AIRPORT PROPERTY		NO CHANGE
AIRPORT REFERENCE POINT (ARP)		NO CHANGE
AUTOMOBILE PARKING		
AVIGATION EASEMENT		
BUILDING RESTRICTION LINE (BRL)	BRL	NO CHANGE
FENCE		NO CHANGE
HOLDING POSITION MARKING		NO CHANGE
PRECISION APPROACH PATH INDICATOR (PAPI)	PAPI	NO CHANGE
ROADWAY		
RUNWAY END IDENTIFIER LIGHTS (REIL)		NO CHANGE
RUNWAY OBJECT FREE AREA (OFA)	OFA	NO CHANGE
RUNWAY OBJECT FREE ZONE (OFZ)	OFZ	NO CHANGE
RUNWAY PROTECTION ZONE (RPZ)	RPZ	(F)RPZ
RUNWAY SAFETY AREA (RSA)	RSA	NO CHANGE
TAXIWAY OBJECT FREE AREA (TOFA)	TOFA	(F)TOFA
TO BE REMOVED	NA	
TOPOGRAPHIC CONTOUR		NO CHANGE
WETLAND		NO CHANGE
WETLAND FILL		NO CHANGE
WIND SOCK		NO CHANGE

N
MAGNETIC
MAGNETIC: 16°38'42" E
DEC 2013
ANNUAL CHANGE: 0°11.5' W

250 0 250 500
SCALE IN FEET
30 0 30 60 90 120 150
SCALE IN METERS

ONE INCH
AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

URS
1501 4TH AVENUE, SUITE 1400
SEATTLE, WA 98101
PHONE: (206) 438-2700

PROJECT MANAGER:	JJY	DRAFTED BY:	RLO
DESIGNED BY:	RLO	CHECKED BY:	JJY

#	REVISION	COMPANY	BY	DATE
-	-	---	---	--/--/----

THE PREPARATION OF THIS AIRPORT LAYOUT PLAN (ALP) WAS FINANCED IN PART THROUGH A PLANNING GRANT FROM THE FEDERAL AVIATION ADMINISTRATION (FAA) AS PROVIDED UNDER SECTION 505 OF THE AIRPORT AND AIRWAY IMPROVEMENT ACT OF 1982. THE CONTENTS DO NOT NECESSARILY REFLECT THE OFFICIAL VIEWS OR POLICIES OF THE FAA. ACCEPTANCE OF THIS ALP BY THE FAA DOES NOT IN ANY WAY CONSTITUTE A COMMITMENT ON THE PART OF THE UNITED STATES TO PARTICIPATE IN ANY DEVELOPMENT DEPICTED THEREIN NOR DOES IT IMPLY THAT THE PROPOSED DEVELOPMENT IS ENVIRONMENTALLY ACCEPTABLE IN ACCORDANCE WITH APPROPRIATE PUBLIC LAWS.

FEDERAL AVIATION ADMINISTRATION APPROVAL
SEATTLE AIRPORTS DISTRICT OFFICE

First Middle Last Name Date
Title

PORT OF BELLINGHAM

First Middle Last Name Date
Title

PORT OF BELLINGHAM
Washington State

BELLINGHAM INTERNATIONAL AIRPORT
AIRPORT MASTER PLAN

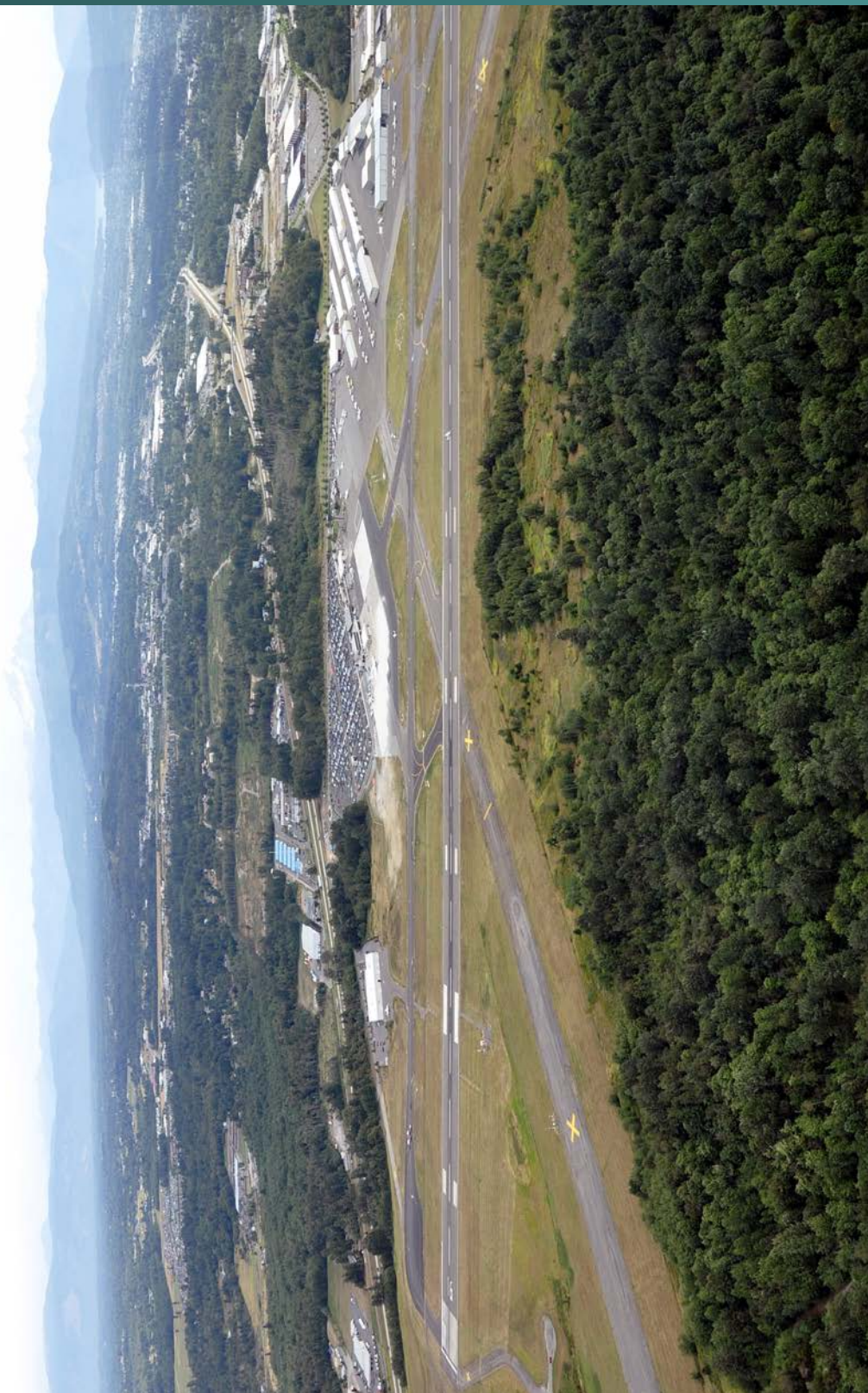
AIRPORT LAYOUT PLAN

SCALE: 1" = 500'
DATE: APRIL 2015

AIP NUMBER: 03-53-0005-046

SHEET NUMBER: 2 OF 11

BLI - Sheet 02 (ALP).dwg



6

6 ENVIRONMENTAL REVIEW

6.1 INTRODUCTION

This chapter presents a review of the potential environmental impacts of the various improvements recommended in this master plan. Guidance for this analysis was taken from Federal Aviation Administration (FAA) Order 5050.4B, Airport Environmental Handbook, and the State of Washington's State Environmental Policy Act (SEPA) Checklist.

The purpose of considering environmental factors in airport master planning is to help the sponsor identify potential airport development impacts and to provide information that will assist with subsequent environmental review and processing. By using existing maps of the airport area and prior environmental documents, an overview of sensitive environmental resources in and around the airport was compiled. Consideration of environmental factors resulted in this overview of the airport's environmental setting, and the identification of potential environmental impacts of airport development and related permits which may be required for recommended development projects.

The recommendations from this master plan recognize the need to achieve a balance between the manmade and the natural environment. Although every proposed development project will have some impact on the natural environment, the use of prudent planning criteria, along with sound environmental data and analysis, will help minimize unavoidable environmental impacts and the delay of project design and construction.

6.2 CURRENT ENVIRONMENTAL SETTING

Development at BLI is regulated under a General Binding Site Plan (BSP) and Planned Unit Development (PUD) administered by Whatcom County, Washington. The Port submitted these applications in 2008 and received Whatcom County preliminary approval in 2010 and final approval in February 2014. The Port's objective in completing the BSP, PUD, and associated Joint Aquatic Resource Permits Application (JARPA) permits was to establish a long-term development plan and "shovel-ready" sites for airport-related services and facilities to meet the needs of a growing airport. The Comprehensive Wetland Strategy, BSP, and PUD also recognized the need for compatible light industrial development on airport property to stimulate economic development and generate revenue to help the Port fund airport facilities and

operations. The General BSP, PUD, and associated Comprehensive Wetland Strategy JARPA application and SEPA review process evaluated wetland impacts, wildlife, stormwater management, water quality, traffic impacts, parking, landscaping, sidewalks, archaeology, and utility service based on projected development square footage and the latest FAA approved commercial passenger enplanement projections through 2031 to ensure that all impacts, conditions, permits, and mitigation requirements were identified and evaluated in a comprehensive way in advance. The term of the BSP and PUD is 20 years from preliminary approval and divided into two 10-year phases. Should any portions of the Port's Bellingham International Airport (BLI) property be annexed into the City of Bellingham, the City of Bellingham will regulate those annexed portions under the same BSP and PUD requirements approved by Whatcom County through the term of the permit. Implementation of mitigation measures is also tied to the development projection thresholds identified in the phasing plan of the BSP and PUD.

The BSP and PUD established the requirements for the creation or subdivision of up to 21 additional development parcels within the general boundary of the Port's BLI property as an alternative to seeking approvals for lot creation on a project-by-project basis. The BSP and PUD provide that the approval for specific individual lot creation for airport related commercial services such as car rentals or overnight lodging serving the traveling public, or airport operation lots such as lots for privately developed hangars or lots for industrial use is done by administrative approval. Port-owned improvement projects would not require a subdivision or the creation of a new lot of record as the Port is the landowner. However, it should be noted that each construction project, whether Port or privately owned, is required to go under a separate environmental review and determination process under appropriate regulatory authority and lead agency status at the time of implementation.

In 2010 the Port received authorization from the U.S. Army Corps of Engineers (Corps) to fill certain wetlands for development purposes within certain areas on airport property based on the Comprehensive Wetland Strategy, for the BSP and PUD project. The work authorized by this permit included the filling of wetlands and tributaries for airport operations and airport related commercial services on the properties designated as Development Areas 4, 9, and 14 on the attached Figure 6-1 over a period of 10 years.

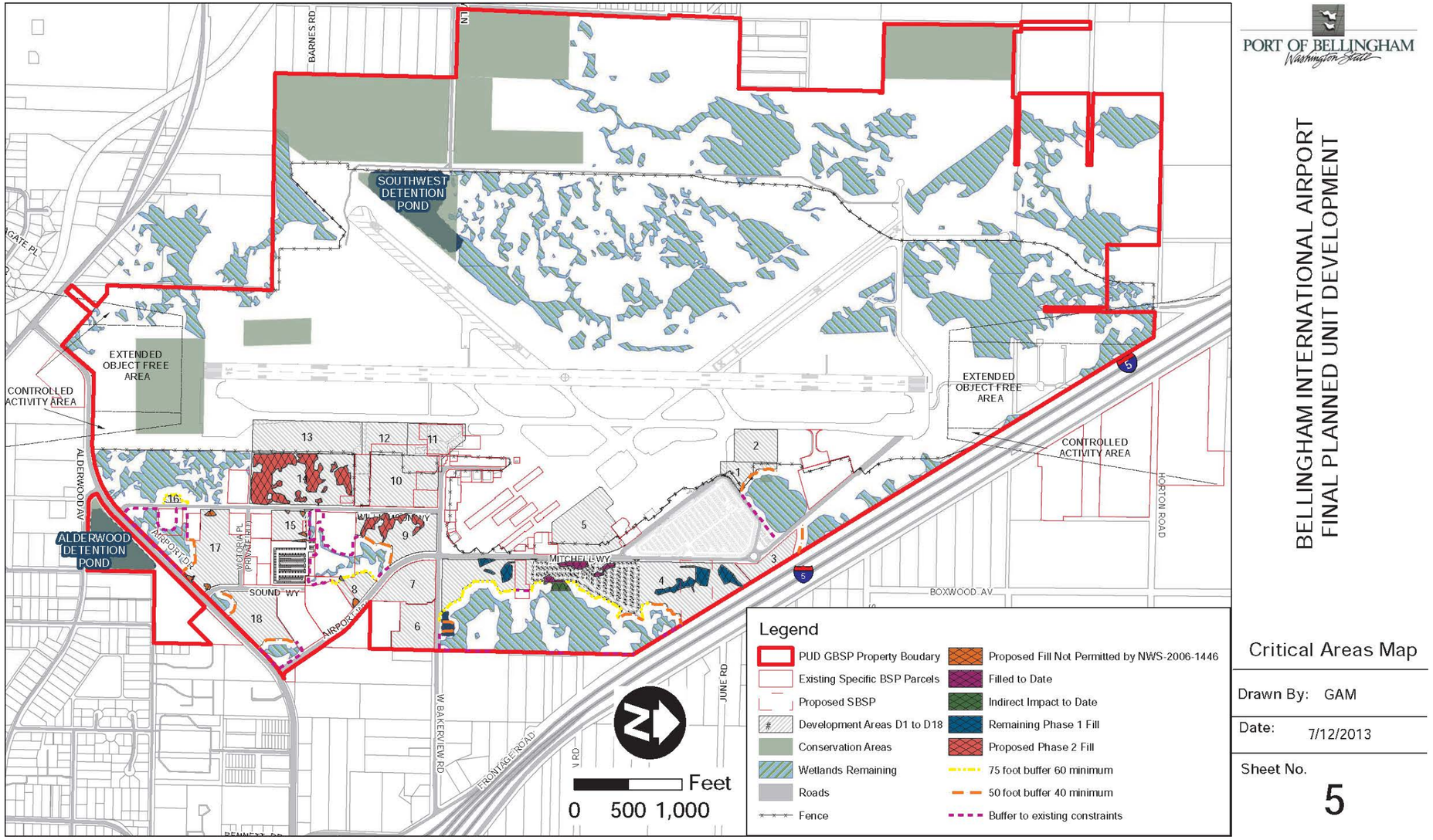


Figure 6-1: Binding Site Plan and Planned Unit Development

The permit requires that prior to placing fill in wetlands or tributaries in Development Areas 4 (north end), 9, and 14 the Port will submit information on the proposed use of the site, specific development plans, and site design criteria. No fill of these areas may occur until the Corps provides the Port with written approval, verifying that the proposed use is consistent with the provisions of this permit. Filling of wetlands for industrial use in Development Areas 8, 15, and 17 is not authorized under the current BLI Corps 404 permit. However, once a specific industrial use, plans, and design criteria are known and submitted to the Corps for evaluation, it's possible that the current Corps permit could be amended to authorize the filling in of these wetlands or, in the alternative, permission given to fill the wetlands for industrial purposes in Areas 8, 15, and 17 on a project-by-project basis under a nationwide general permit, provided the project's impact on wetlands is less than a half-acre. The Port of Bellingham's Slater Road Wetland Mitigation project pre-mitigates for the impacts to wetlands based on proposed wetland fill identified in the BLI Comprehensive Wetland Strategy for all development areas based on proposed uses whether airport operations, airport-related commercial services, or industrial uses.

Additionally, as a condition of the Corps permit the Port has agreed to implement and abide by:

- "Stormwater Pollution Prevention Plan," revision dated June 2010
- "Bellingham International Airport Comprehensive Wetland Strategy," dated 2012
- "Off-Site Wetland Mitigation Design Report Addendum," dated May 2012
- "Archaeological Survey and Cultural Resource Evaluation for Developments Proposed in Areas 4, 9, and 14, Bellingham International Airport, Whatcom County, Washington, Appendix H," dated December 28, 2009. Additional investigation and monitoring is required for several historic or cultural features within Development Areas 4, 9, and 14.

6.3 IMPACT CATEGORY REVIEW

In assessing the potential environmental issues, the following resource categories will be addressed. Greater emphasis of analysis was applied to areas where issues were known to exist. These include noise and land use, wetlands, water quality, and threatened and endangered species. Review of all categories is provided below.

- Airport Noise
    - Day-Night Sound Level
    - Physical Characteristics
    - Operational Characteristics

- Land Use Compatibility
- Noise Impacts

- Air Quality
- Aquatic
  - Coastal Zone Management
  - Coastal Barriers
  - Floodplains
  - Water Quality
  - Wetlands
  - Wild and Scenic Rivers
- Biotic Communities
  - Endangered and Threatened Species of Flora and Fauna
  - Essential Fish Habitat
  - Migratory Bird Act
- Social and Cultural
- Historic, Architectural, Archaeological and Cultural Resources
- Public Lands
- Environmental Justice
- Induced Socioeconomic Impacts
- Social Impacts
- Terrestrial Concerns
  - Energy Supply and Natural Resources
  - Farmland
  - Hazardous Material
  - Solid Waste
- Other
  - Construction
  - Light Emissions

6.4 AIRPORT NOISE

Aircraft-generated noise impacts are the primary source of incompatibility between airports and surrounding land uses. Preparing and implementing plans for compatible land uses in the vicinity of an airport is strongly encouraged by the FAA. In determining how best to achieve compatibility the Federal Interagency Committee on Noise (FICON) was formed to review Federal policies that govern the assessment of airport noise impacts. The agencies that participated in the FICON included the Department of Defense (DoD), the Department of Housing and Urban Development (HUD), the Environmental Protection Agency (EPA), the Department of Transportation (DOT), and the Department of Veterans Affairs (VA). In addition to these FICON agencies, the Council on Environmental Quality (CEQ) and the Department of Justice (DOJ) were added to the working group because of their roles on National Environmental Policy Act (NEPA) issues. FICON policies and programs share a common goal of protecting the public health and welfare with regard to noise. In measuring noise impacts FICON and FAA have recognized that the Day-Night Average Sound Level (DNL) is the appropriate noise measurement metric and that the threshold of significance is DNL 65 dBA (A-weighted decibels). FAA Advisory Circular 150/5020-1, Noise Control and Compatibility Planning for Airports, provides guidance in determining land uses that are compatible or incompatible with noise levels of various magnitudes around airports. The following discussion provides details on the methods used to model noise impacts in the vicinity of BLI as well as a discussion of the impacts that this noise has on the area.

6.4.1 Day-Night Sound Level

Noise is defined as unwanted sound, and as such the determination of what constitutes an acceptable level of noise to an individual is subjective. As stated, when analyzing noise impacts from airports both FICON and FAA have determined that the DNL methodology is most appropriate to determine the noise levels being experienced.

The Integrated Noise Model (INM) has been developed by the FAA to plot noise contours surrounding airports. The original version of the INM was released in 1977, and the present Version 7.0.d was released in May 2013. The program is provided with standard aircraft noise and performance data that can be tailored to the characteristics of individual airports. Based on aircraft operations, the INM program uses a mathematical algorithm to calculate the DNL level in the vicinity of an airport by taking the average noise generated by all aircraft operations that occur within a 24-hour period, with a 10 dB penalty added to nighttime sound levels (between 10:00 p.m. and 7:00 a.m.). Sound is measured on a logarithmic scale because human hearing is

not “linear” and human hearing is very broad in amplitude. Therefore, the DNL exposure cannot be projected on a linear scale. Figure 6-2 gives an example of single event levels (SEL) by a range of common activities as measured in decibels.

The SEL levels included in the INM were computed by FAA by adding the decibel (dBA) level for each second of a standard aircraft operation that is above a certain threshold. An A-weighted decibel is the sound level which is weighted in a manner that more closely matches the human ear's response. Such weighting reduces the influence of lower and higher frequencies relative to the middle frequencies and is usually expressed in dBA units. To determine the basis for SEL’s the operation of an individual aircraft was monitored in a test environment and the highest dBA reading for each second of the event as an aircraft approached and departed was recorded. Each of these one-second readings was then added logarithmically to compute the SEL for that aircraft type.

SEL levels of aircraft operations are used to the calculate DNL levels. In the INM, the total number of operational SELs are averaged to achieve an overall depiction of the noise environment. A DNL 65 dBA describes an area as having a constant noise level of DNL 65 dBA, the approximate average of single noise events. It is recognized that the area impacted would experience noise events much higher than DNL 65 dBA as a result of an individual aircraft operation but that they would have periods of quiet as well. DNL is constructed because it has been found that the total noise energy in an area is a good predictor of community response.

DNL levels are depicted as noise contours. These contours are interpolations of noise levels based on the centroid of a grid cell and drawn to connect all points of similar noise levels. Contours appear similar to topographical contours and form concentric “noise footprints.” The footprints of DNL contours as calculated by the INM are drawn about the airport and used to predict community response to the noise from aircraft using that airport.

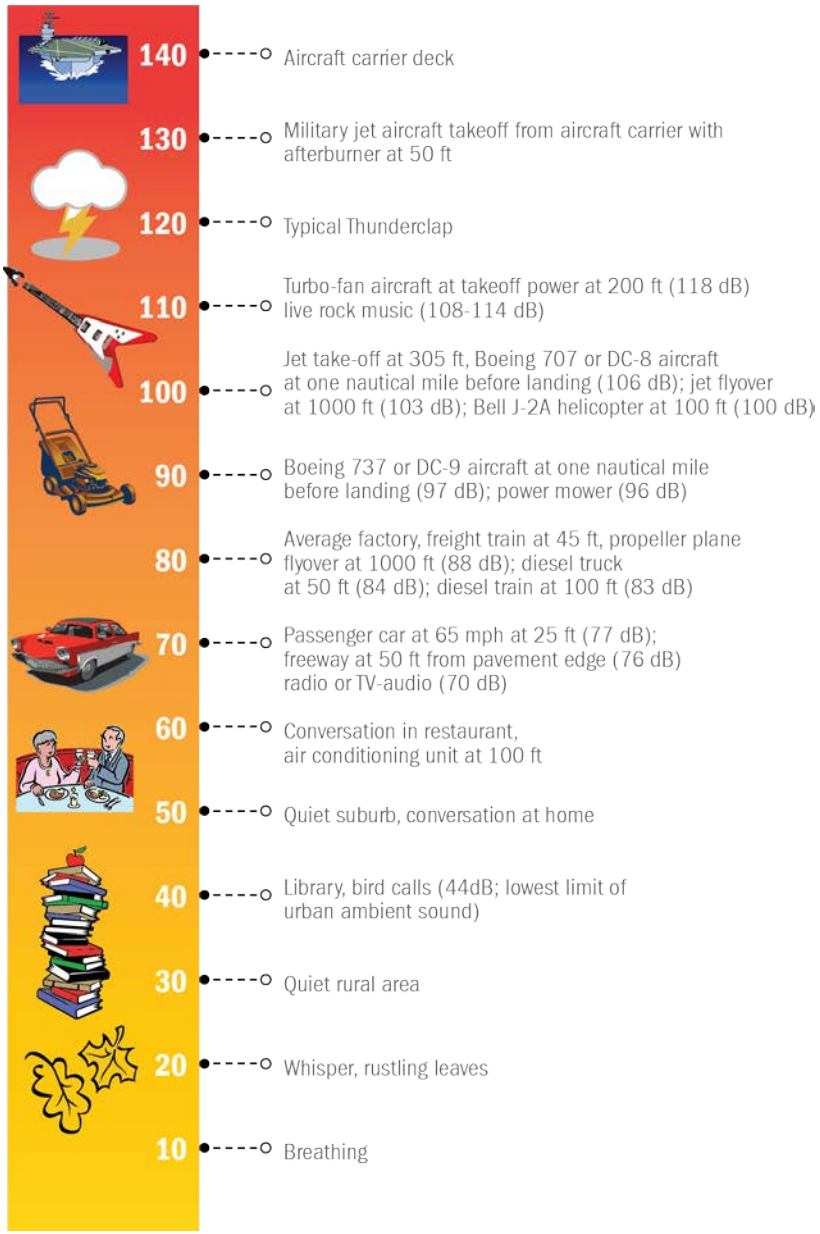


Figure 6-2: A Comparison of SEL Noise Levels

6.4.2 Physical Characteristics

Runway Layout and Use Percentages - The physical configuration of the runway has an obvious impact on the noise environment. Likewise, the type of flight operation is a factor in noise exposure (take-offs generate more noise than landings), so defining the percentage of time that operations occur in each direction is key to understanding noise impacts. At BLI there is a single runway, 16-34, and no changes are expected to the orientation or runway length. Aircraft use the ends of this runway for operations based on wind direction and speed and air traffic control guidance. The percentage of time that operations occur on each end was determined through wind analysis and discussions with Airport Traffic Control Tower (ATCT) personnel. Approximately 80 to 90 percent of all arrivals are on Runway 34 with departures on Runway 16.

6.4.3 Operational Characteristics

Airport Activity Levels - To model the existing and predicted noise impacts at BLI, the actual recorded activity levels obtained from ATCT and the airport for 2011 and the forecast operations levels from the approved aviation demand forecasts were used. These are shown in Table 6-1.

Table 6-1: Existing and Forecast Operations

Operations	Base Year 2011	Forecast Year			
		2016	2021	2026	2031
Commercial	8,449	10,638	11,842	13,595	15,855
Air Cargo/Air Taxi	4,184	4,510	4,854	5,188	5,507
General Aviation	48,057	49,163	52,016	55,072	58,324
Military	1,000	1,000	1,000	1,000	1,000
Total Operations	**61,680**	**65,311**	**69,712**	**74,855**	**80,686**

Source: Aviation Demand Forecasts approved by FAA in April 2013.

Aircraft fleet mix - Different aircraft types generate different noise profiles so it is important to define the types of aircraft that use the airport today and project those likely to use it in the future.

The forecast of aviation demand includes a detailed breakdown of annual activity by aircraft type. This is shown in Table 6-2.

Table 6-2: Existing and Projected Fleet Mix

Aircraft	Base Year Annual Operations 2011	Forecast Annual Operations			
		2016	2021	2026	2031
Commercial Air Carrier					
Q400, CRJ	676	851	947	1,088	1,427
Airbus A300 series	422	1,596	5,921	8,429	7,293
MD-80 Series	6,083	6,383	2,368	0	0
Boeing 737 Series	1,267	1,596	2,368	3,671	6,342
Boeing 757	0	213	237	408	793
Total	8,449	10,638	11,842	13,595	15,855
Air Cargo					
Cessna Caravan	2,092	2,255	2,427	2,594	2,754
Metroliner	1,255	1,353	1,456	1,556	1,652
ATR-72	837	902	971	1,038	1,101
Total	4,184	4,510	4,854	5,188	5,507
General Aviation					
Corporate Jets - Heavy	971	983	2,081	3,304	4,666
Corporate Jets - Light	1,922	1,967	2,081	2,203	2,333
Multi-Engine Piston	1,441	1,475	2,081	2,203	2,916
Single- Engine Piston	42,281	43,264	44,214	45,159	46,659
Rotorcraft	1,441	1,475	1,560	2,203	1,750
Total	48,057	49,163	52,016	55,072	58,324
Military					
Jet	500	500	500	500	500
Piston	500	500	500	500	500
Total	1000	1000	1000	1000	1000
TOTAL	61,680	65,311	69,712	74,855	80,686

Source: Aviation Demand Forecasts approved by FAA in April 2013.

Flight tracks - The noise generated by different aircraft types is one factor that affects how noise is heard by people on the ground. Jets in general need more runway length to take off than do propeller planes, but they climb much quicker. Another key factor in modeling noise is the altitude at which the aircraft fly.

In general, aircraft noise impacts are greater below the takeoff paths than at the arrival end of the runway. When landing, all fixed wing aircraft follow roughly the same approach angle and path,

thus noise differences depend mostly on the aircraft size and engine types. Also, because engines are set to low power levels on approach, the noise produced by the airframe from features such as wing flap and extended landing gear may be greater than the actual engine noise.

When taking off, fixed wing aircraft do not typically follow the same departure angle and path. Within a couple of miles of the runway end, jets reach a higher altitude than do the more slowly climbing propeller aircraft and the noise level on the ground diminishes as they climb. Helicopters on the other hand don't need a runway and they climb more steeply than airplanes. However, they generally cruise at lower altitudes than airplanes and fly different routes and therefore, several miles from an airport, helicopters may be perceived as the loudest aircraft.

With this in mind, the path of the approach to (or departure from) a runway helps to define where noise impacts are experienced. The INM input includes flight paths for straight-in approaches that are common to commercial aircraft, circling approaches for other aircraft, and touch-and-go paths for general aviation in training using both runway ends. These are based on both approaches and departure plates, tower descriptions, and the Port's policies.

Day/Night Traffic - The time of day when an operation occurs is important in determining the impact that the noise will have on a community. In the INM, night operations, defined as all operations that occur between 10 p.m. and 7 a.m., are assigned a 10 dB penalty to reflect the impact that noise has during these hours. Determination of the day/night traffic split for BLI was based on the current airline flight schedule and activity records from the tower. It is estimated that 95% of all operations at BLI occur during the day.

6.4.4 Land Use Compatibility

The Port of Bellingham has undertaken and accomplished significant land use compatibility planning and programming that has positively affected the environs surrounding the airport. It has worked extensively with the City of Bellingham, Whatcom County, and the FAA to reduce existing incompatibilities through property acquisition, and has helped prevent future incompatibilities through land use and zoning coordination with the local jurisdictions. In 1991, the Port completed a Federal Aviation Regulations (FAR) Part 150 Noise Compatibility Program, which defined the noise exposure at that time and set in place a program of mitigation and abatement of noise generated from airport operations. Part 150 noise mitigation measures included the acquisition of incompatible properties to the north and south of the airport (completed during the 1990s). The Port continues to implement aircraft operation techniques consisting of a preferential runway departure, standard noise abatement flight procedures, and flight patterns that direct the majority of arrival and departure flight tracks to the west over low density and commercial and industrial land area.

The local jurisdictions consisting of the City of Bellingham and Whatcom County also have significantly contributed to land use compatibility success within the airport's environs. Whatcom County currently has an adopted Land Use Compatibility Ordinance. The Port is currently working with the City of Bellingham to adopt an airport land use compatibility ordinance now that it has begun to annex property within 10,000 feet of the airport, and will work with the City of Ferndale in the future as land north of the airport is annexed into the City of Ferndale. Each jurisdiction has contributed to the development of appropriate compatible land use controls as contained in the respective land use components of their comprehensive plans. The combined efforts of the FAA, Port, and jurisdictions should continue to implement measures to ensure land use compatibility.

Land Use Compatibility Analysis

The Land Use Compatibility Matrix, presented in Table 6-3, indicates those land uses that are compatible within the DNL 65 dBA or greater noise contours. It identifies land uses as being compatible, incompatible, or compatible if sound is attenuated. The matrix reflects the fact that 65 DNL is generally recognized as the threshold of concern by FAA. The matrix acts as a guide for local land use planning and control and a tool to compare relative land use impacts. It must be remembered that the DNL noise contours do not delineate areas that are either free from noise impacts or areas that are subjected to noise impacts. In other words, it cannot be expected that a person living on one side of a DNL noise contour will have a markedly different reaction to the noise event than a person living nearby, but on the other side of the contour line. For this reason, when implementing noise compatibility programs the contours are used as a guide but any attenuation programs are adjusted to include neighborhoods rather than individual properties.

What can be expected from analyzing the noise contours is that the general aggregate community response to noise within the DNL 65 dBA noise contour, for example, will be less than the public response within the DNL 75 dBA noise contour.

For this master plan DNL 65, 70, and 75 dBA noise contours were generated to help determine land use impacts and compare the existing condition with conditions projected for the future years. The area between the DNL 65 and 70 dBA contours is where many types of land uses are normally unacceptable and where land use compatibility controls are recommended. The area located inside the DNL 70 and 75 dBA noise contours is subjected to a significant level of noise and the sensitivity of various uses to noise is increased.

Table 6-3: Land Use Compatibility Matrix

Land Uses	Yearly Day-Night Noise Level (DNL) In Decibels					
	Below 65	65-70	70-75	75-80	80-85	Over 85
Residential						
Residential other than mobile homes and transient lodgings	Y	N(1)	N(1)	N	N	N
Mobile Homes	Y	N	N	N	N	N
Transient Lodgings	Y	N(1)	N(1)	N(1)	N	N
Public Use						
Schools	Y	N(1)	N(1)	N	N	N
Hospitals and nursing homes	Y	25	30	N	N	N
Churches, auditoriums and concert halls	Y	25	30	N	N	N
Government services	Y	Y	25	30	N	N
Transportation	Y	Y	Y(2)	Y(3)	Y(4)	Y(4)
Parking	Y	Y	Y(2)	Y(3)	Y(4)	N
Commercial Use						
Offices, business and professional	Y	Y	25	30	N	N
Wholesale and retail - building materials, hardware and farm equipment	Y	Y	Y(2)	Y(3)	Y(4)	N
Retail trade - general	Y	Y	25	30	N	N
Utilities	Y	Y	Y(2)	Y(3)	Y(4)	N
Communications	Y	Y	25	30	N	N
Manufacturing and Production						
Manufacturing - general	Y	Y	Y(2)	Y(3)	Y(4)	N
Photographic and optical	Y	Y	25	30	N	N
Agricultural (except livestock) and forestry	Y	Y(6)	Y(7)	Y(8)	Y(8)	Y(8)
Livestock farming and breeding	Y	Y(6)	Y(7)	N	N	N
Mining and fishing resource production and extraction	Y	Y	Y	Y	Y	Y
Recreational						
Outdoor sports arenas and spectator sports	Y	Y(5)	Y(5)	N	N	N
Outdoor music shells, amphitheaters	Y	N	N	N	N	N
Nature exhibits and zoos	Y	Y	N	N	N	N
Amusements, parks, resorts and camps	Y	Y	Y	N	N	N
Golf courses, riding stables and water recreation	Y	Y	25	N	N	N

Source: Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5020-1, Noise Control and Compatibility Planning for Airports

Numbers in Parentheses refer to the notes.

Table 6-3: Land Use Compatibility Matrix (Continued)

The designations in this table do not constitute a Federal determination that any land use covered by the program is acceptable or unacceptable under federal, state or local law. The responsibility for determining acceptable and permissible land uses and the relationship between specific properties and specific noise contours rests with local authorities in response to locally determined needs and values in achieving noise compatible land uses.

Key to table

Y = Land use and related structures compatible without restriction

N = Land use and related structures incompatible without restrictions

25, 30, or 35 = Land use and related structures generally compatible when measures to achieve 25, 30, or 35 dB attenuation incorporated into the design of structures

Notes:

1. Where the community determines that residential or school uses must be allowed, measures to achieve outdoor to indoor noise level reduction of at least 25 dB to 30 dB should be incorporated into building codes and be considered in individual approvals. Normal residential construction can be expected to provide 20 dB, thus the reduction requirements are often stated as 5, 10, or 15 dB over standard construction and normally assume mechanical ventilation and closed windows year round. However the use of NLR criteria will not eliminate outdoor noise problems.
2. Measures to achieve NLR of 25 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, and noise sensitive areas where noise levels are typically low.
3. Measures to achieve NLR of 30 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.
4. Measures to achieve NLR of 35 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.
5. Land uses are compatible provided that special sound reinforcement systems are installed.
6. Residential buildings required a NLR of 25.
7. Residential buildings required a NLR of 30.
8. Residential buildings not permitted.

6.4.5 Noise Impacts

The figures that follow show three INM contours that were generated for the baseline conditions 2011 (Figure 6-3), 5 years hence conditions in 2016 (Figure 6-4) and the 20 years hence conditions in 2031 (Figure 6-5) as well as a compilation of the land uses that exist within each contour. In assessing the impacts of the noise contours the land uses are compared with the information contained in Table 6-3. This assessment involved two steps. First the Zoning designations from Whatcom County were overlaid with the noise contours to ascertain what land development regulations exist on these lands. This allowed an assessment of the potential for noise compatibility issues. Then, the number of residences and other incompatible uses within the contours was estimated using analysis of recent aerial photography (dated 2011) and a "windshield survey" of the neighboring properties conducted in 2014. The results of these analyses are shown in Table 6-4 and discussed in the following paragraphs.

Table 6-4: Existing (2011) Baseline Conditions Compared to Future (2016 and 2031) Noise Sensitive Facility Incompatibilities

Decibels	Base Year 2011	2016	Difference Between 2011 and 2016	2031	Difference Between 2011 and 2031
Housing Units (no. of units)					
65-70	13	28	15	19	6
70-75	0	0	0	0	0
75	0	0	0	0	0
Noise Sensitive Facilities (Churches, Schools, Libraries and Nursing Homes) (no. of Units)					
65-70	0	0	0	0	0
70-75	0	0	0	0	0
75	0	0	0	0	0
R5A - Rural Residential Land (acres)					
65-70	21	84	63	59	38
70-75	0	0	0	0	0
75	0	0	0	0	0
UR3 - Urban Residential Land (acres)					
65-70	13	21	8	12	-1
70-75	0	0	0	0	0
75	0	0	0	0	0
LII - Light Impact Industrial Land (acres)					
65-70	52	85	33	70	18
70-75	0.04	5.6	5.56	2	1.96
75	0	0	0	0	0
GC - General Commercial Land (acres)					
65-70	3	6	3	5	2
70-75	0	0	0	0	0
75	0	0	0	0	0

Baseline Conditions (2011)

The 2011 analysis shows that to the north there are 13 acres of Rural Residential development (R5A) within the DNL 65 dBA contour. The R5A designation allows 1 residential unit per 5 acres without water and sewer but 3 units per acre if water and sewer is available. Within this area there are 5 residential buildings as well as numerous out-buildings.

On the south end the land within the DNL 65 dBA contour is either vacant or zoned for Urban Residential (UR3). Eight residential units are located within this area.

No additional noise sensitive uses such as schools, churches, hospitals or nursing homes were identified within the DNL 65 dBA noise impacted areas.

The analysis also shows that 52 acres of land that is zoned for Light Impact Industrial (LII) is located within the DNL 65 dBA contour and a small parcel (3 acres) zoned for General Commercial (GC) is located to the north of the airport. These land uses are generally compatible with DNL 65 dBA noise levels.

5 Years Hence Conditions (2016)

The increase in the number of flights coupled by the continued use of the MD-80 aircraft in the fleet shows that by 2016 the residential areas impacted by the DNL 65 dBA contour to the north will increase to 84 acres of R5A. A total of 28 residential units are currently located in the area that will be impacted by the projected DNL 65 dBA contour.

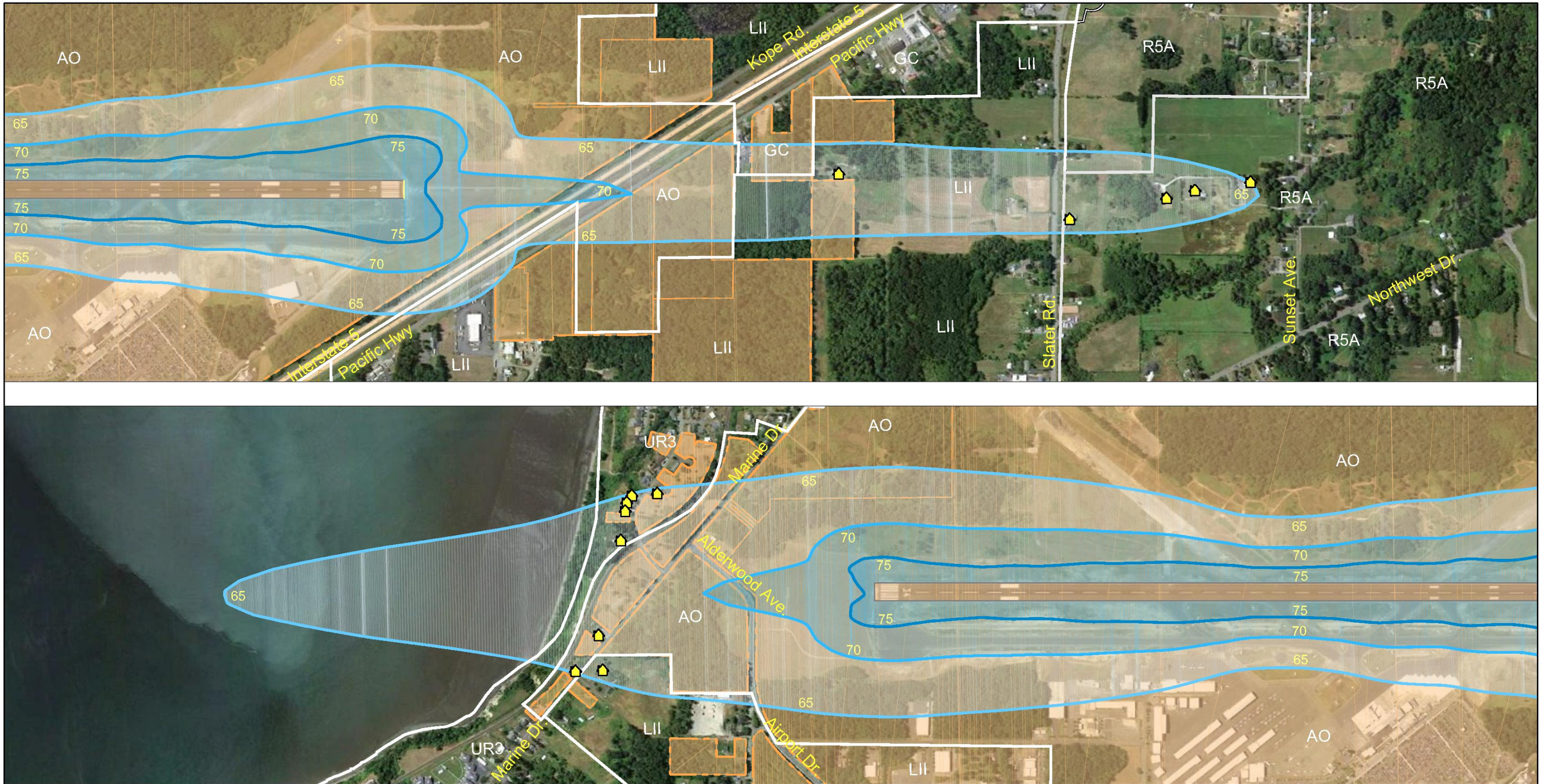
The exposure to the south is similar to that being currently experienced since the majority of the increase occurs over Bellingham Bay. However there will be 4 additional residences (total of 12) that will be within the DNL 65 dBA contour as it widens in this area. No additional noise sensitive uses such as schools, churches, hospitals or nursing homes were identified within the noise impacted areas.

To the north about 91 acres of LII land, 6 acres of GC will be within the DNL 65 dBA contour. These are generally compatible with DNL 65 dBA noise levels.

20 Years Hence Conditions (2031)

The 2031 contour reflects the changes in the aircraft fleet as the MD-80 has been removed from the fleet and replaced by the Airbus 300 series as well as the overall increase in operations forecast to occur. As shown the DNL 65 dBA contour covers approximately 59 acres of R5A. Thus even though there will be more activity, each operation will make less noise. Nonetheless there are 13 residential units within the projected DNL 65 dBA contour to the north and 6 in the southern area. No additional noise sensitive uses such as schools, churches, hospitals or nursing homes were identified within the noise impacted areas.

During this same timeframe there will be 70 acres of LII property and 5 of GC within the DNL 65 dBA contour. In addition, by 2031 there will be 59 acres within the DNL 65 dBA noise contour that is undeveloped and zoned for residential use—a use that is incompatible with the levels of noise that is experienced.



0 400 800
SCALE IN FEET

LEGEND

- Airport Property
- Residential Units within the 65 DNL

INM Contours

- 65 DNL Contour
- 70 DNL Contour
- 75 DNL Contour

Title 20 Zoning Designations

Urban Residential
UR3 Urban Res. - 3 Units/Acre

Rural
R5A Rural - 1 Unit/2 Acres

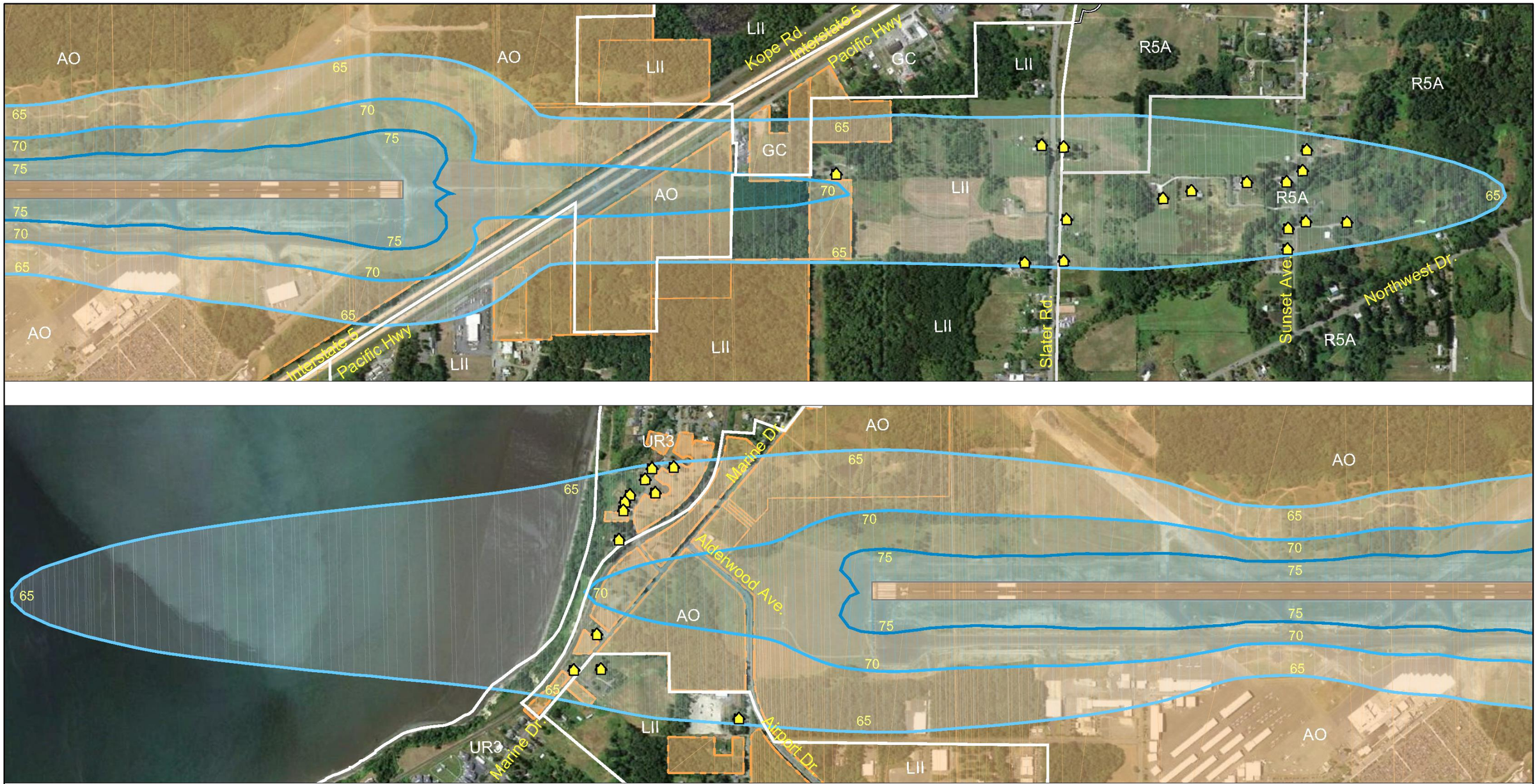
Commercial
GC General Commercial

Industrial
AO Airport Operations
LII Light Impact Industrial

Noise Sensitive Facilities Identification

Item	65-70 DNL	70-75 DNL	>75 DNL
Housing Units	13 units	0 units	0 units
Noise Sensitive Facilities (Churches, Schools, Libraries, Nursing Homes)	0 units	0 units	0 units
LII - Light Impact Industrial Land	52 acres	0.04 acres	0 acres
GC - General Commercial Land	3 acres	0 acres	0 acres
R5A - Rural Residential Land	21 acres	0 acres	0 acres
UR3 - Urban Residential Land	13 acres	0 acres	0 acres

Figure 6-3
Bellingham International Airport
Integrated Noise Model (INM) - Year 2011



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SCALE IN FEET

LEGEND

- Airport Property
- Residential Units within the 65 DNL

INM Contours

- 65 DNL Contour
- 70 DNL Contour
- 75 DNL Contour

Title 20 Zoning Designations

Urban Residential
- UR3 Urban Res. - 3 Units/Acre

Rural
- R5A Rural - 1 Unit/2 Acres

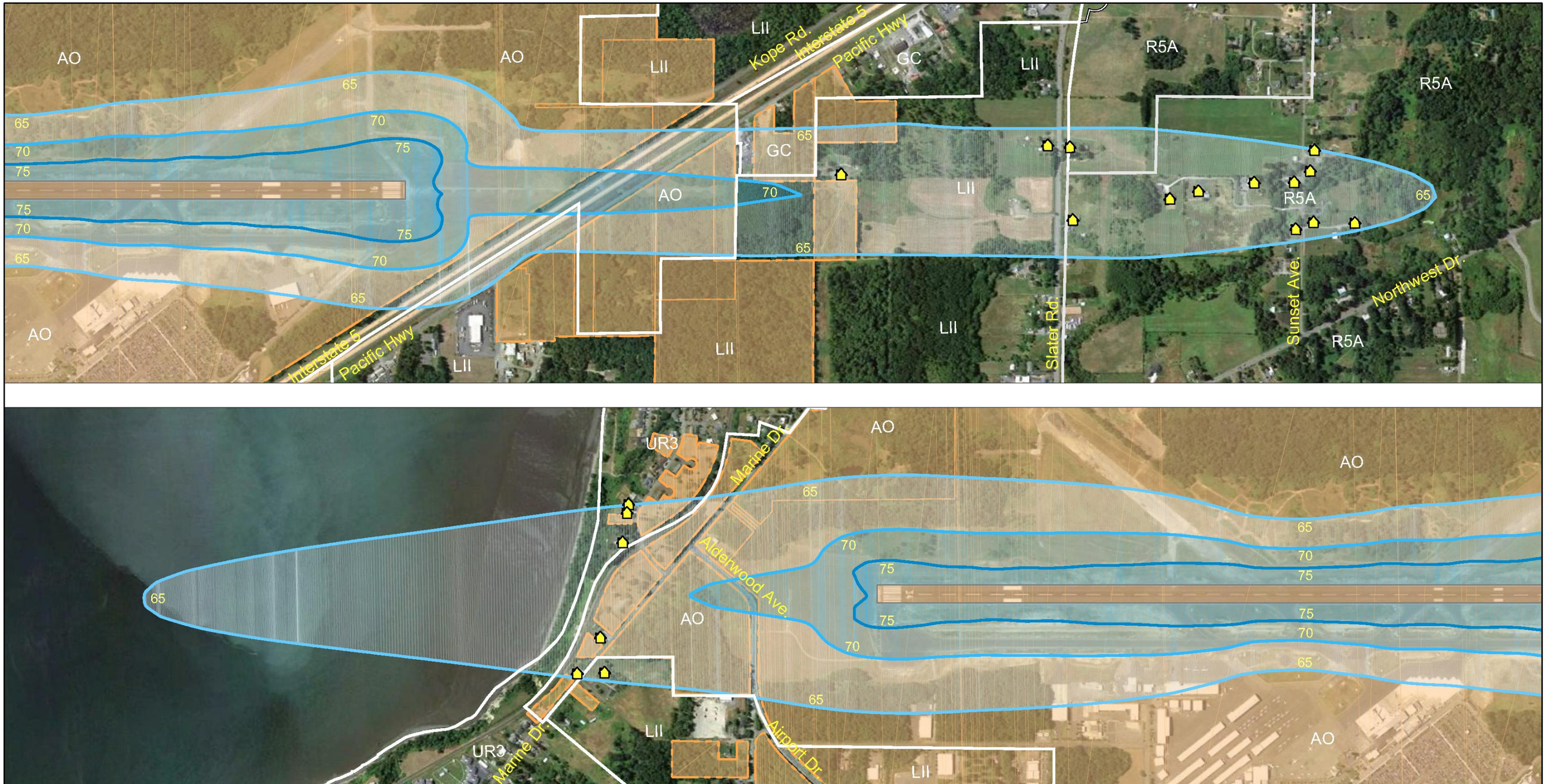
Commercial
- GC General Commercial

Industrial
- AO Airport Operations
- LII Light Impact Industrial

Noise Sensitive Facilities Identification

Item	65-70 DNL	70-75 DNL	>75 DNL
Housing Units	28 units	0 units	0 units
Noise Sensitive Facilities (Churches, Schools, Libraries, Nursing Homes)	0 units	0 units	0 units
LII - Light Impact Industrial Land	85 acres	5.6 acres	0 acres
GC - General Commercial Land	6 acres	0 acres	0 acres
R5A - Rural Residential Land	84 acres	0 acres	0 acres
UR3 - Urban Residential Land	21 acres	0 acres	0 acres

Figure 6-4
Bellingham International Airport
Integrated Noise Model (INM) - Year 2016



0 400 800
SCALE IN FEET

LEGEND

Airport Property

Residential Units within the 65 DNL

INM Contours

65 DNL Contour

70 DNL Contour

75 DNL Contour

Title 20 Zoning Designations

Urban Residential

UR3 Urban Res. - 3 Units/Acre

Rural

R5A Rural - 1 Unit/2 Acres

Commercial

GC General Commercial

Industrial

AO Airport Operations

LII Light Impact Industrial

Noise Sensitive Facilities Identification

Item	65-70 DNL	70-75 DNL	>75 DNL
Housing Units	19 units	0 units	0 units
Noise Sensitive Facilities (Churches, Schools, Libraries, Nursing Homes)	0 units	0 units	0 units
LII - Light Impact Industrial Land	70 acres	2 acres	0 acres
GC - General Commercial Land	5 acres	0 acres	0 acres
R5A - Rural Residential Land	59 acres	0 acres	0 acres
UR3 - Urban Residential Land	12 acres	0 acres	0 acres

Figure 6-5
Bellingham International Airport
Integrated Noise Model (INM) - Year 2031

6.5 AIR QUALITY

Adoption of the Master Plan Update and implementation of the associated CIP Program will not necessitate an air quality analysis.

The Environmental Protection Agency web site was queried and the air quality database was accessed to identify whether the considerations of this impact category involve Whatcom County. Results of this investigation reveal that Whatcom County is not a nonattainment area for criteria pollutants including ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, particulate matter, or lead. Therefore, no impacts are anticipated from actions directly related to implementation of the Airport Capital Improvement Program (ACIP) as defined in the Airport Master Plan Update. Project specific review will further evaluate potential impacts.

6.6 AQUATIC

The following six subsections discuss aquatic environmental features. Only two of the six would potentially require additional analysis: wetlands and water quality.

6.6.1 Coastal Zone Management

Consistency with coastal zone regulations falls under the auspices of the National Oceanic and Atmospheric Administration (NOAA) regulations, and state regulations under Washington's Coastal Zone Management Program.

Washington was the first state to establish an approved Coastal Zone Management Program as part of the federal Coastal Zone Management Act. Washington's Coastal Zone comprises the state's fifteen coastal counties that have shoreline either along the Pacific Ocean or Puget Sound.

Whatcom County and Bellingham are part of the Puget Sound Basin. Consequently, local jurisdictions, such as the Port of Bellingham, must obtain permits for certain actions with federal implication, such as the adoption of an Airport Layout Plan and Airport Capital Improvement Program that seeks federal funding assistance. In this regard the primary areas of concern for Bellingham International Airport involve water quality and storm water issues under the federal Clean Water Act, and hydraulic project approvals under the state JARPA process. See Section 6.2 for information and requirements related to the issues of these two categories.

6.6.2 Coastal Barriers

This category involves the undeveloped coastal barriers along the Atlantic and Gulf coasts and therefore is not applicable to the BLI program.

6.6.3 Floodplains

Review of FIRM (Flood Insurance Rate Map) identifies the entire airport planning area as being located in Zone C and outside any 100-year flood plain.

6.6.4 Water Quality

Comprehensive federal, state, and local permits related to water quality issues and the airport have been obtained as summarized in Section 6.2. The Port will continue to take appropriate design considerations and impact controls (primarily water quality, erosion, and air pollution) during the implementation or construction of all projects.

6.6.5 Wetlands

In 2010 the Port received authorization from the U.S. Army Corps of Engineers to fill certain wetlands for development within certain areas on airport property based on the Comprehensive Wetland Strategy, for the General Binding Site Plan and Planned Unit Development project. The work authorized by this permit included the filling of wetlands and tributaries for airport operations and airport related commercial services on the properties designated as Development Areas 4, 9, and 14. All of the master plan's recommended improvements are in these areas. See Section 6.2 for further information concerning this category.

6.6.6 Wild and Scenic Rivers

Since passage of the Wild and Scenic Rivers Act in 1968, three rivers (segments) in the state of Washington have been designated as part of the National System, although a fourth, the Snake River was nominated but not recommended. These include segments of the Klickitat River, the Skagit River, and the White Salmon River.

There are no System Rivers on, near, or of similar drainage confluence downstream from Bellingham International Airport. Therefore, there is no impact relative to this category.

6.7 BIOTIC COMMUNITIES

Proposed projects at BLI have the potential to impact plant communities and displace wildlife. A query of the Washington Natural Heritage Program database, maintained by the Washington Department of Natural Resources, did not produce any records of high quality ecosystems in the vicinity of the project. However, forested wetlands do occur within the project area.

6.7.1 Endangered and Threatened Species of Flora and Fauna

The Port of Bellingham conducted a Biological Assessment in 2003 as a part of the Port's Comprehensive Wetland Strategy JARPA application. As part of that Biological Assessment, requests for records of listed, proposed, and candidate species were sent to the United States Fish and Wildlife Service (USFWS), the National Marine Fisheries Service (NMFS), Washington State Department of Natural Resources (Natural Heritage Program), and Washington State Department of Fish and Wildlife (WDFW). According to these agencies, there is no record of rare plants of high quality ecosystems on or in the vicinity of the site, and none were found during two field evaluations conducted for the Biological Assessment. Each project will require re-evaluation upon implementation.

6.7.2 Essential Fish Habitat

Silver Creek is a 7.5-mile stream that winds around the northern two-thirds of BLI property and is a tributary to the lower Nooksack River that enters its easternmost slough on the left bank at river mile 0.7 near Marietta, Washington. Ten tributaries associated with Silver Creek originate from on-site wetlands or are immediately adjacent to BLI property. Three tributaries that are associated with north Bellingham Bay also originate from on-site wetlands. On-site streams are typically not contained within a defined channel, but are hydrologically connected through a network of wetlands. Because of their relatively low elevation, these streams are all charged primarily by groundwater or surface runoff. Access to on-site wetlands by anadromous salmonids is not probable due to the lack of continuous defined channels, physical barriers, and the complexity of the wetland drainage network. The Bellingham Airport is located within the Strait of Georgia Hydrologic Unit 17110002, which is designated as Essential Fish Habitat (EFH) for Chinook, Coho, and Pink salmon. The NMFS stated that threatened Puget Sound Chinook salmon and candidate Coho salmon might occur in the vicinity of the Bellingham Airport. Silver Creek is a Coho and Chum salmon stream not typically associated with Chinook salmon or Bull Trout. The closest Coho salmon get to BLI property is where tributaries connect with the lower main stem of Silver Creek. Implementation of projects could

potentially impact juvenile Coho salmon in Silver Creek through degradation of water quality and the alteration of the hydrologic regime. The three tributaries discharging to north Bellingham Bay were also investigated. The presence of the bluff along the shoreline of north Bellingham Bay, tidally deposited logs, and the presence of beach berms greatly reduces the likelihood of salmonid use of these streams. Federal agencies are required to consult with NOAA Fisheries if their projects may affect EFH. Each project will require re-evaluation and water quality protection measures upon implementation.

6.7.3 Migratory Bird Act

The USFWS indicates that no listed species occur on the site, although wintering bald eagles may occur in the vicinity from October 31 through March 31. Proposed projects have the potential to adversely impact birds protected by the migratory bird treaty act. As per the Migratory Bird Permit Memorandum issued by the USFWS on April 15, 2003, clearing and grading of the forested areas will likely occur outside of the breeding season for most migratory birds. The project area is within the Pacific Flyway bird migration route, which encompasses most of western Washington. Many common migratory bird species nest and breed along this flyway route. Much of the forested habitat proposed for development is likely habitat for migratory bird species. The land anticipated to be developed is forested wetland, for which mitigation is being programmed off site on the Nooksack River. Each project will require re-evaluation upon implementation.

6.8 SOCIAL AND CULTURAL

6.8.1 Historic, Architectural, Archaeological and Cultural Resources

A report prepared for the Port of Bellingham entitled “Archaeological Survey and Cultural Resource Evaluation for Developments Proposed in Areas 4, 9, and 14, Bellingham International Airport, Whatcom County, Washington” in 2009 identified one historic property of unknown importance. This is a rock feature, discovered in Area 9 and designated as site 45WH839. Archaeological testing of the feature was recommended, prior to project ground disturbing activities, in order to determine the nature of deposits and to provide a basis for appropriate management recommendations. Additional investigation and monitoring is also recommended for several historic or cultural features within Development Areas 4, 9, and 14.

Further research of the Washington State Office of Archaeology and Historic Preservation records of archaeological site inventory, historic property inventory, and state and national

register listed properties was conducted. These records revealed no documented cultural resource lands or sites on the airport property.

6.8.2 Public Lands

The Port has created a scenic trail on airport property in the Cliffside area to the south of the airport runway outside the fence and across Marine Drive. The property upon which the trail was constructed is noncontiguous with the main property of the airport, is not required for active airport operations aside for it needing to be compatible with airport operations use, and is not likely to be needed in the future for reasons other than its present use. There is additional forested land located outside of the airport fence on the west side of the airport that could be further evaluated for passive recreation or aircraft viewing. This land is heavily impacted by wetlands, which could restrict active recreational use.

6.8.3 Environmental Justice

No significant impact under this category is anticipated due to the adoption of the Airport Layout Plan and the development proposed in the Airport Capital Improvement Program. Projects associated with the ACIP will all be on airport property with little to no temporary or ongoing off-airport impact.

6.8.4 Induced Socioeconomic Impacts

Adoption of the Master Plan Update and implementation of the associated ACIP will not necessitate or cause shifts in patterns of population movement and growth, place significant demands on public services, or cause changes in business and economic activity on the surrounding communities.

6.8.5 Social Impacts

Adoption of the BLI Master Plan and implementation of the associated ACIP will not require the relocation of residences or businesses; alter surface transportation patterns; divide or disrupt established communities; disrupt nearby city or county planned development; or create an appreciable change in employment.

6.9 TERRESTRIAL

6.9.1 Energy Supply and Natural Resources

The energy impacts related to the projects in the ACIP involve the use of aviation fuel and electricity. Both can be expected to increase over the timeframe covered in the plan, although consumption will not involve unusual materials, materials in short supply, nor will their consumption have a measurable effect on the local economy. The increased energy demand will be partially offset by an increase in fuel efficiency of airplanes, automobiles, and heating and lighting systems. Each project will be further evaluated prior to implementation.

6.9.2 Farmland

Approval of the Bellingham International Airport, Airport Layout Plan and adoption of the associated ACIP by the Port does not involve the acquisition or use of farmland, prime farmland, unique farmland, or land of state or local significance.

6.9.3 Hazardous Material

The Port has conducted and documented an extensive history of hazardous material investigation of the airport property. Being a former military base, there was the potential for the presence of Underground Storage Tanks (USTs), polychlorinated biphenyls (PCBs), petroleum hydrocarbon deposits, orphan wastes, landfills, fire training areas, and shooting ranges. Extensive site investigations since 1989 have not revealed the presence of USTs, unhealthy levels of PCBs, landfills, fire training areas, or shooting ranges. Orphan wastes that were found were removed and properly disposed. More recent property acquisition was completed with the removal USTs where they were present. Locations where petroleum residuals were found near fueling stations were excavated and contaminated soils removed or remediated on site.

Port records indicated that Georgia-Pacific Corporation operated a wood waste landfill on the airport property from 1984 until 1992 under permit #37401, which was issued annually by the Whatcom County Health Department. The landfill is located in the southwest quadrant of the airport and covers an area of 16.4 acres (Purnell 1993). This area is within the airport master plan planning area designated as Area 8. Contents of the site consist of a mixture of rejected wood pulp fiber and wood ash. An on-going program has been in place for groundwater, surface water, leachate, and gas monitoring.

The extensive investigation of potential legacy hazardous materials on the airport from past military operations and the documentation and management of the existing waste site provides a

good base of information for construction avoidance, although the potential still exists for discovery of hazardous materials during construction because of the military legacy. Additionally, any hazardous materials present on the Air National Guard lease area should be removed as part of the lease buy-out and return of property to the Port. No ACIP construction projects are proposed where hazardous materials were identified and removed. Should hazardous materials be discovered during construction, the Port has in place an adequate program of response, management, and coordination with local, state, and federal agencies.

6.9.4 Solid Waste

Increased passenger levels accommodated within the airport terminal and related facilities are not expected to create a significant increase in building area, or over the course of the 20 year ACIP. The construction of additional aircraft tiedown and hangar facilities will add to solid waste quantities; however, there are no near-term concerns within the county system of waste disposal. The growth in based aircraft is likely to increase the amount of waste engine oil, which will be disposed of in accordance with applicable Port and county hazardous waste methods.

6.10 OTHER

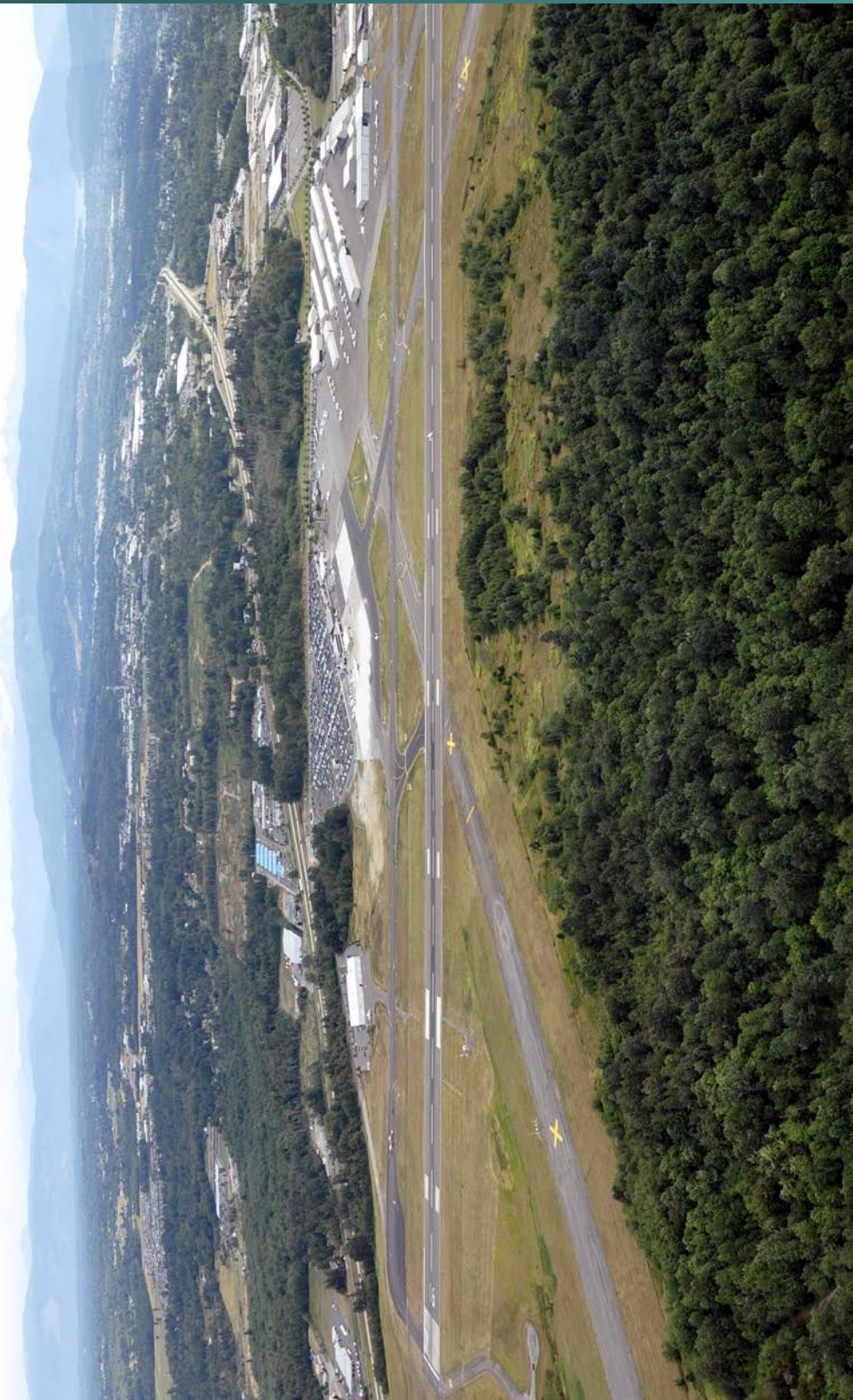
6.10.1 Construction

Construction of many of the projects will incur noise and dust upon the immediate environs on the airport. However, it will not be necessary to transport equipment or materials through residential areas since land use within the airport environs is commercial or industrial. No borrow pits or significant disposal of spoil is anticipated. Cut materials are often stored on the airport for use (where appropriate) as fill material for future projects. No burning of materials is anticipated to be a component of projects. Additionally, control measures for air and water pollution, erosion, and siltation are included as part of all Port project specifications. Further, of benefit to the airport relative to this impact category is that land use adjacent to BLI is either commercial or light industrial, both being compatible with the operation and development of the airport.

6.10.2 Light Emissions

Several of the airport capital improvement projects will include the addition of lighting to the landside and airside portions of the airport. Projects include possible taxiway lighting, apron edge or area lighting, and landside vehicle parking lot lighting. Of benefit to the airport relative to this impact category is that adjacent land use surrounding and in proximity to the airport is

either commercial or light industrial, both being compatible with the daily (and nightly) operation of the airport. The proposed lighting additions do not represent significant additions to light emissions, separately or cumulatively.



7

7 AIRPORT LAYOUT PLAN

7.1 INTRODUCTION

The material contained in this chapter describes and graphically depicts existing conditions and the recommended Development Program for Bellingham International Airport. The program covers a period of 20 years (2011 through 2031). The future development reflects input received over the course of the planning process from the airport, FAA, and stakeholders concerned with the operation and development of the airport and from the community at large. Analyses and findings from the other chapters of the plan are reflected in the recommendations described herein.

In the following sections of the chapter, the various drawings of the Airport Layout Plan (ALP) set are shown with accompanying text synopses describing the associated information. The ALP depicts existing airport facilities and proposed developments as determined from a review of the aviation activity forecasts, facility requirements, and alternatives analysis.

The five primary functions of the ALP that define its purpose are:

1. An approved plan is necessary for the airport to receive financial assistance under the terms of the Airport and Airway Improvement Act of 1982 (AIP), as amended, and to be able to receive specific Passenger Facility Charge funding. An airport must keep its ALP current and follow that plan, since those are grant assurance requirements of the AIP and previous airport development programs, including the 1970 Airport Development Aid Program (ADAP) and Federal Aid Airports Program (FAAP) of 1946, as amended.
2. The ALP is the blueprint for airport development. The ALP provides the guideline by which the Port of Bellingham can ensure that future development projects maintain airport design standards, meets all safety requirements, and is consistent with airport and community land use plans.
3. The ALP is a public document that serves as a record of aeronautical requirements, both present and future, and as a reference for community deliberations on land use proposals and budget resource planning.
4. The approved ALP enables the airport sponsor and the FAA to plan for facility improvements at the airport. It also allows the FAA to anticipate budgetary and

procedural needs. The approved ALP allows the FAA to protect the airspace required for facility or approach procedure improvements.

5. The ALP is intended to be a working tool for the Port.

The ALP drawing set contains several inter-related planning drawings but it is not intended to provide design engineering accuracy. The following individual plans make up the ALP set:

Sheet 1 of 11: Title Sheet

Sheet 2 of 11: Airport Layout Plan

Sheet 3 of 11: Airspace Plan - Runway 16/34

Sheet 4 of 11: Airspace Plan - Outer Approach, Runway 16

Sheet 5 of 11: Airspace Plan - Outer Approach, Runway 34

Sheet 6 of 11: Inner Approach Surfaces, Runway 16/34

Sheet 7 of 11: Terminal Area Plan

Sheet 8 of 11: General Aviation Plan

Sheet 9 of 11: On-Airport Land Use Plan

Sheet 10 of 11: Airport Community Land Use Plan

Sheet 11 of 11: Airport Property Map (Exhibit 'A')

These plan sheets are found at the end of this chapter, their content is summarized in the following subsections.

7.2 TITLE SHEET

The Title Sheet, Sheet 1, serves as an introduction to the Airport Layout Plan (ALP) drawing set, providing an index of the drawings.

7.3 AIRPORT LAYOUT PLAN

The Airport Layout Plan, Sheet 2 graphically depicts both existing airport facilities and the airside and landside projects that have been recommended for the 20-year planning period. Specifically the following items are shown:

Airfield Recommendations

1. Construct four new 90 degree exit taxiways on Runway 16/32.
2. Construct paved shoulders on Runway 16/34.
3. Complete construction of Airport Perimeter Road.
4. Realign the terminal and general aviation access taxiways and taxilanes to eliminate apron confusion and congestion issues in response to the Runway Safety Action Team (RSAT) recommendations.
5. Construct a Jet Engine Run-up Area south of the runway, near the by-pass taxiway on Runway 16.
6. Install designated Helicopter Landing Areas.
7. Construct a new Snow Removal Equipment (SRE) Building.

FAA ATO Recommendations

Three projects were identified as desirable where decisions regarding need, timing, location and funding are outside the Master Planning Process. These projects have been included in the ALP with recognition that they are not part of the airport's Capital Improvement Program (CIP). These include

1. Relocate the Air Traffic Control Tower (ATCT) to the north of the terminal building.
2. Install Airport Surveillance Radar (ASR) on the west side of the airport.
3. Install a new Instrument Landing System (ILS) on Runway 34.

Terminal Recommendations

1. Expand the passenger terminal to the south and add new gate positions, as demand dictates.
2. Construct seven new Remain Over Night (RON) positions for commercial aircraft. Two RON's are needed immediately, 5 more are projected to be required over the planning period.
3. Continue to expand automobile parking facilities, as demand dictates.
4. Consolidate Rental Car facilities outside the terminal area.

Surface Access Recommendations

1. Monitor access improvement proposals being considered by other agencies.

General Aviation (GA) Recommendations

1. Relocate hangars and ties-downs from the terminal apron area
2. Expand GA to the south of the terminal.
3. Relocate the GA Terminal
4. Relocate the Federal Inspection Facility (FIS) that currently serves the GA area.

Other Recommendations

1. Develop an on-airport hotel complex.
2. Reserve developable land on the airport's west side for future development of aviation facilities should demand develop over time and environmental approvals allow.
3. Land that has not been identified as required for specific facility development or expansion has been designated for Light Industrial/Commercial Use. Activities accommodated under this category include, but are not limited to, restaurants, auto parking, rental car facilities, hotels, retail establishments, commercial offices, light industrial facilities, warehousing, or similar uses.

7.4 FAR PART 77 AIRSPACE PLAN

The airspace requirements are depicted on Sheets 3, 4, 5, and 6. These illustrate the imaginary surfaces defined in Federal Aviation BLI regulation Part 77 as described in the following.

7.4.1 Primary Surface

The primary surface is an imaginary surface centered on the runway centerline and extending 200 feet beyond each end of the runway. The primary surface width is based on the type of approach procedure available. The primary surface width for Runway 16/34 is 1,000 feet based on the current precision instrument approach procedure to Runway 16 as well as for the proposed instrument approach to Runway 34. This dimension is applicable for both current and future conditions.

7.4.2 Approach Surface

The approach surface is an imaginary inclined plane beginning at the end of the primary surface and extending outward to a distance based on the type of approach procedure available to the

runway end. The width and slope of the approach surface also depends on the type of approach procedure available on the runway.

The approach slope to Runway 16 is based on the existing precision instrument approach. It begins 200 feet from the physical end of the runway and is 1,000 feet wide at that point. It extends outward and upward for 10,000 feet and upward at a slope of 50:1 then continues for an additional 40,000 feet at a slope of 40:1 at which point it is 16,000 feet wide.

The approach slope to Runway 34 is currently based on the non-precision approach procedure available. It begins 200 feet from the physical end of the runway and is 1,000 feet wide at that point. It extends outward for 10,000 feet and upward at a slope of 34:1 at which point it is 3,500 feet wide. In the future the approach to Runway 34 will be improved to meet precision approach criteria. At this point the approach surface will be revised to match that for Runway 16.

7.4.3 Horizontal Surface

The horizontal surface is the imaginary plane 150 feet above the established airport elevation. The shape of the plane is determined by striking arcs from the end of each primary surface. The radius of each arc is based on the most demanding approach procedure planned for the runway. The individual arcs are connected by lines tangent to the arcs. At BLI, the airport elevation is 170 feet above mean sea level (MSL), so the Horizontal Surface is 320 feet MSL.

7.4.4 Conical Surface

The conical surface is an imaginary inclined plane beginning at the edge of the horizontal surface and extending outward at a 20:1 slope for a distance of 4,000 feet. At BLI the conical surface begins at 320 feet and extends outward and upward to 520 feet.

7.4.5 Transitional Surface

Transitional surfaces are the inclined planes extending outward from the primary surface, at a 7:1 slope until they intersect with the horizontal surface. They extend upward from the approach surface to the intersection with the horizontal surface.

7.4.6 Inner Runway Approach Surfaces

The existing and future Inner Approach Plans and Profiles for the runway ends are shown on Sheet 6. These drawings depict the critical inner portions of the approach zones for the runway end. On the sheet, existing and potential obstructions to the approaches have been identified and are noted and the obstruction removal plan is provided.

7.5 TERMINAL AREA PLAN

The focus of Sheet 7 is the passenger terminal and aircraft parking positions, terminal access roadways and curbfrontage, and the automobile parking areas. As shown on the plan, several improvements and additions are recommended for these facilities:

In 2014, the expanded Bellingham International Airport passenger terminal building was opened. The expansion project included all functional areas (ticketing, gate, bag claim, etc.) and is expected to serve the travelling public for years to come.

Once the capacity of this building has been reached (estimated to be approximately 2028 based on the forecast of aviation demand), the terminal will need to be further expanded. The Terminal Area Plan shows the continued development of the terminal in the southern direction. This expansion will include area for six new aircraft parking positions. In addition, Taxilane H will be widened to meet FAA standards for the Boeing 757-200 aircraft (TDG-4).

Other terminal support facilities that are shown on the TAP include areas for expansion of the public parking lots, a consolidated rental car facility and an on-airport hotel.

To accommodate these improvements will require the relocation of much of the existing general aviation area that is currently on the apron. The required relocation could include the Air Traffic Control Tower (ATCT) if FAA concurs, the GA Terminal Building, the GA FIS Facility, 66 aircraft tiedown positions and at least 11 privately owned general aviation hangars. Details on the relocated facilities are shown on Sheet 8, General Aviation Plan.

7.6 GENERAL AVIATION AREA PLAN

The General Aviation Plan is shown on Sheet 8. Existing general aviation facilities that are located on the existing apron are depicted on the drawing. As seen many of the existing facilities will need to be relocated when demand for expanded terminal facilities occur. The recommended facility development for general aviation functions and services consists of the following:

1. Area for the relocation of the GA Terminal Building, the GA FIS Facility, 66 aircraft tiedown positions and at least 11 privately owned general aviation hangars that are presently located on the existing apron area.
2. Area sufficient to provide for new FBO facilities.
3. Sufficient space for future GA development.

4. Designated area for a GA helicopter landing area near the FBO.
5. Construction of a new Snow Removal Equipment (SRE) storage building.

The development of the general aviation area will need to be completed in several stages to facilitate other projects. Stage one will be the development of the northern-most area for immediate use for short-term RON parking and development of the SRE facility. After this is complete the area further south will be developed to accommodate Phase 1 of the hangar and tie down relocation as well as providing area for growth. The final stage will be the relocation of the RON positions out of the GA area to the terminal area and a development of the former RON apron to accommodate longer term GA expansion.

7.7 ON AIRPORT LAND USE PLAN

The historical development of the airport defines the current land uses. The pattern of development has not been random, but has occurred in accordance with a general land use strategy managed by the Port. The land uses shown on Sheet 9 are general in character and broad in definition in order to provide flexibility in development opportunities for the airport and potential tenants while maintaining the primary mission of the airport to continue to function as a safe and efficient air transportation facility. Four general land use classifications have been developed. These are identified and described in the sections below.

7.7.1 Airport Operations Area (AOA)

Purpose: The Airport Operations area consists of the physical spaces required for aircraft operations to, from, and on the airport surfaces. It is an area whose definition is assisted by FAA airfield design guidelines.

Characteristics: The Airport Operations area is defined by a combination of requirements and recommendations promulgated by the FAA in AC 150/5300-13A, Airport Design, and FAR Part 77, Objects Affecting Navigable Surfaces. Conditions bearing on the definition of the required area for the AOA include:

- Airport Reference Code of C-IV for the runway and parallel taxiway system.
- Taxiway Designation Group of TDG-4 for taxiway and taxilane classification and design.
- Precision instrument approach minimums for both ends of the runway.
- Protection of the area that is critical to the function of the navigation aids at the airport.

Land within the Airport Operations area is required for the safe and efficient operation of aircraft and should not be modified for any reason.

The Airport Operations area includes the following:

- Primary surfaces widths – 1,000 feet for the runway.
- Approach slopes – 50:1 for Runways 16 and 34.
- Building restriction limit of 750 feet from the runway centerline on both sides of the runway.
- Runway Protection Zones (RPZs), both runway ends – 1,000 feet x 2,500 feet x 1,750 feet.
- All navigational aid clear and critical areas.

No structures except those required for the operation of aircraft should be present within the Airport Operations area unless they are determined to be non-hazardous to navigation by FAA.

7.7.2 Aeronautical Use Area

Purpose: The purpose of the Aeronautical Use Area is to reserve land for the range of facilities and services that are directly related to serving aviation activities. These uses require access to the AOA in the normal conduct of activity.

Characteristics: Activities accommodated under this land use category include the following:

- Terminal building complex (terminal building, air cargo, and terminal support activities.)
- Support areas (ARFF, SRE Building, fuel farm, airport maintenance facilities, and FBO facilities.)
- Covered aircraft storage areas (T-hangars, corporate hangars, and similar permanent structures.)
- Uncovered aircraft storage areas (based and transient aircraft tiedown apron, transient apron, airline.)

7.7.3 Commercial/Light Industrial Area

Purpose: The purpose of the Commercial/Light Industrial area is to reserve land for facilities that, while not directly or exclusively related to facilities and services for pilots, passengers, airlines, or aircraft operators, nor requiring access to the AOA, do contribute to the daily operations at the airport either operationally or financially. Airport land included in this category

are the southeast portion of airport property and the existing Airport Industrial Park, as well as some of the land located along the airport's western side.

Characteristics: Activities accommodated under this category include, but are not limited to, restaurants, automobile parking, rental cars, hotels, commercial offices, light industrial facilities, warehousing, retail, or similar uses.

7.8 OFF-AIRPORT LAND USE

The Bellingham International Airport is located in Whatcom County and the county has established a framework for growth and development of land in the areas surrounding the airport (and throughout the county), as documented in the Land Use Element of the county's Comprehensive Plan. In 2005, the Whatcom County Council adopted amendments to the Comprehensive Plan and Whatcom County Code relating to airport/land use compatibility planning. These discourage incompatible land uses around public use airports and are summarized as:

- Comprehensive Plan policies that address noise, safety compatibility and height hazards;
- Zoning amendments that increase permitting requirements or prohibits certain higher intensity land uses in the vicinity of Bellingham International Airport;
- Zoning amendments that address height limitations surrounding airports;
- Notice requirements that will alert airport operators of a proposal for a subdivision, conditional use permit, or rezone in the vicinity of an airport, so they can submit comments to the hearing examiner or planning commission; and
- A new airport disclosure that would let people know when they are receiving a permit or buying property in proximity to an airport.

The Whatcom County zoning ordinance mandates that land-use around the airport must be compatible with airport functions. The height of new and existing buildings is limited by the proximity of the imaginary surfaces as designated by FAR Part 77 and the relative proximity to the ends and sides of the runway. Height limitations can only be ignored if the FAA has not deemed the penetration to be a hazard to airspace and the reviewing official in conjunction with WSDOT or the airport manager agree. As property adjacent to the airport is annexed into the City of Bellingham, the Port will work with the City to insure that similar airport compatibility provisions are adopted in the Bellingham zoning code.

Sheet 10 shows that the land surrounding the airport is a mixture of residential, commercial, industrial and undeveloped. To assure that the airport remains compatible with the surrounding land, two critical considerations are shown on the land use map: height hazards, as represented on the FAR Part 77 Imaginary Surfaces Plan (Sheets 3, 4, 5, and 6), and the potential impact of aircraft noise calculated as described on the INM contours that were generated for the 20 years conditions projected for 2031.

7.9 AIRPORT PROPERTY MAP

The Airport Property Map is shown on Sheet 11. The information on the map details the property acquisition history at the airport. The tabular information shows the parcel numbers, type of acquisition (fee simple or avigation easement), and the Federal program under which the property was purchased.

PORT OF BELLINGHAM
Washington State

BELLINGHAM INTERNATIONAL AIRPORT

2015 Airport Layout Plan Drawing Set

AIP NUMBER: 03-53-0005-046

SHEET INDEX

SHEET 1 OF 11: TITLE SHEET
SHEET 2 OF 11: AIRPORT LAYOUT PLAN
SHEET 3 OF 11: AIRSPACE PLAN - RUNWAY 16/34
SHEET 4 OF 11: AIRSPACE PLAN - OUTER APPROACH, RUNWAY 16
SHEET 5 OF 11: AIRSPACE PLAN - OUTER APPROACH, RUNWAY 34
SHEET 6 OF 11: INNER APPROACH SURFACE, RUNWAY 16/34
SHEET 7 OF 11: TERMINAL AREA PLAN
SHEET 8 OF 11: GENERAL AVIATION PLAN
SHEET 9 OF 11: ON-AIRPORT LAND USE PLAN
SHEET 10 OF 11: AIRPORT COMMUNITY LAND USE PLAN
SHEET 11 OF 11: AIRPORT PROPERTY MAP (EXHIBIT 'A')

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DESIGNED BY:	RLO	CHECKED BY:	JJY

#	REVISION	COMPANY	BY	DATE
-	-	---	---	--/--/----

PORT OF BELLINGHAM
Washington State

BELLINGHAM INTERNATIONAL AIRPORT
AIRPORT MASTER PLAN

TITLE SHEET

SCALE:

DATE: APRIL 2015

AIP NUMBER: 03-53-0005-046

SHEET NUMBER: 1 OF 11

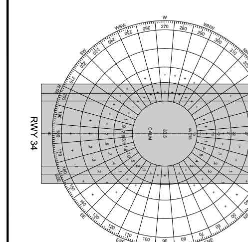
BLI - Sheet 00 (Title Sheet).dwg

AIRPORT FACILITIES

#	DESCRIPTION	HEIGHT*
1	HUMANE SOCIETY AND SPCA (TO BE REMOVED)	183.1'
2	CURRENT INDUSTRIES	195.6'
3	AVIATION COMPONENTS	207.2'
4	CURRENT INDUSTRIES	211.5'
5	LIGHT MANUFACTURING (YAMATO BLDG.)	220.4'
6	PUGET SOUND TRUCK LINES	213.8'
7	LAND LEASE (REESERS)	NA
8	AIRPORT BUILDING	204.7'
9	MANUFACTURING (POB FTZ)	214.2'
10	SOUND BEVERAGE	213.6'
11	WOODSTONE	221.3'
12	FUEL FARM STORAGE TANKS	187.1'
13	CORPORATE HANGAR (OAKLEY)	209.0'
14	FUTURE SNOW REMOVAL EQUIPMENT (SRE) BLD.	TBD
15	AIR NATIONAL GUARD (TO BE REMOVED)	185.2'
16	AIR NATIONAL GUARD (TO BE REMOVED)	183.3'
17	LAND LEASE (HELIPRO)	NA
18	PRIVATE HANGAR	178.3'
19	ELECTRICAL VAULT	166.2'
20	CORPORATE HANGARS (ICE)	178.2'
21	SELF FUELER	162.0'
22	CORPORATE HANGAR	189.9'
23	CORPORATE HANGAR	178.1'
24	PRIVATE HANGAR	182.5'
25	PRIVATE HANGAR	195.7'
26	CORPORATE HANGAR/AIRCRAFT MAINTENANCE	178.8'
27	CORPORATE HANGAR (ALLSOP)	180.3'
28	CORPORATE HANGAR (HAGGEN)	180.6'
29	STRATOS T-HANGARS	179.3'
30	CONDOMINIUM HANGARS	183.7'
31	PORT HE T-HANGARS	180.5'
32	CIRRUS T-HANGARS	174.9'
33	PORT HD T-HANGARS	175.3'
34	NIMBUS T-HANGARS	175.6'
35	ALTO T-HANGARS	178.9'
36	SOLAR HANGARS	174.3'
37	CORPORATE HANGAR	177.9'
38	CORPORATE HANGAR (VISION MICRO)	182.6'
39	HANGAR	179.6'
40	AUTOMOBILE REPAIR (TO BE REMOVED)	168.0'
41	GA TERMINAL	174.4'
42	AIRPORT TRAFFIC CONTROL TOWER (ATCT)	231.0'
43	AIRCRAFT RESCUE FIRE FIGHTING (ARFF)	179.9'
44	U.S. CUSTOMS	172.3'
45	TERMINAL BUILDING	196.0'
46	PACIFIC CATARACT AND LASER INSTITUTE	176.4'
47	FUTURE ATCT (SEE NOTE #2)	TBD
48	ALLEGIANT COMMISSARY	183.2'
49	-	-
50	AIR CARGO (FEDEX)	181.8'
51	-	-
52	-	-
53	-	-
54	-	-

*ABOVE MEAN SEA LEVEL (MSL)

ALL-WEATHER WIND ROSE

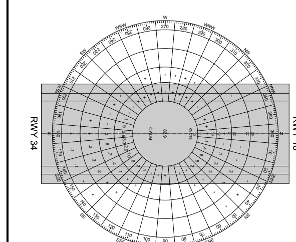


ALL-WEATHER (79,472 OBSERVATIONS)

CROSSWIND	RWY 16/34
10.5 KNOTS	98.45 %
13 KNOTS	99.41 %
16 KNOTS	99.86 %
20 KNOTS	99.99 %

NOAA WEATHER REPORTING STATION: 72797 BELLINGHAM, WA
OBSERVATION PERIOD: 2000 - 2009

VISUAL FLIGHT RULES WIND ROSE

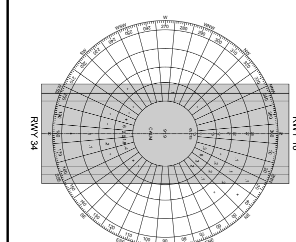


VFR (74,891 OBSERVATIONS)

CROSSWIND	RWY 16/34
10.5 KNOTS	98.41 %
13 KNOTS	99.41 %
16 KNOTS	99.86 %
20 KNOTS	99.99 %

NOAA WEATHER REPORTING STATION: 72797 BELLINGHAM, WA
OBSERVATION PERIOD: 2000 - 2009

INSTRUMENT FLIGHT RULES WIND ROSE



IFR (3,253 OBSERVATIONS)

CROSSWIND	RWY 16/34
10.5 KNOTS	98.91 %
13 KNOTS	99.35 %
16 KNOTS	99.77 %
20 KNOTS	99.98 %

NOAA WEATHER REPORTING STATION: 72797 BELLINGHAM, WA
OBSERVATION PERIOD: 2000 - 2009

ABBREVIATIONS

ITEM	DEFINITION
ARFF	AIRCRAFT RESCUE FIRE FIGHTING
ARP	AIRPORT REFERENCE POINT
ASOS	AUTOMATED SURFACE OBSERVING SYSTEM
ASR	AIRPORT SURVEILLANCE RADAR
ATCT	AIRPORT TRAFFIC CONTROL TOWER
BRL	BUILDING RESTRICTION LINE
IFR	INSTRUMENT FLIGHT RULES
ILS	INSTRUMENT LANDING SYSTEM
HIRL	HIGH INTENSITY RUNWAY LIGHTS
MITL	MEDIUM INTENSITY TAXIWAY LIGHTS
MSL	MEAN SEA LEVEL
NDB	NON-DIRECTIONAL BEACON
NPI	NON-PRECISION INSTRUMENT APPROACH
NPIAS	NATL. PLAN OF INTEGRATED AIRPORT SYSTEMS
OFA	RUNWAY OBJECT FREE AREA
OFZ	RUNWAY OBJECT FREE ZONE
PAPI	PRECISION APPROACH PATH INDICATOR
PIR	PRECISION INSTRUMENT APPROACH
RAC	RENT-A-CAR
REIL	RUNWAY END IDENTIFIER LIGHTS
RNAV	AREA NAVIGATION
RPZ	RUNWAY PROTECTION ZONE
RSA	RUNWAY SAFETY AREA
RVR	RUNWAY VISUAL RANGE
RVZ	RUNWAY VISIBILITY ZONE
SRE	SNOW REMOVAL EQUIPMENT
TOFA	TAXIWAY OBJECT FREE AREA
VFR	VISUAL FLIGHT RULES

AIRPORT VICINITY

AIRPORT LOCATION

NOTES

1. FUTURE GA AREA TO BE DEVELOPED AS INTERIM REMAIN OVERNIGHT (RON) AREA FOR COMMERCIAL AIRCRAFT.
2. RELOCATION OF AIRPORT TRAFFIC CONTROL TOWER (ATCT) IS SUBJECT TO FAA REVIEW, APPROVAL, FUNDING, AND SITE DETERMINATION.
3. SEE SHEETS 7 AND 8 OF 11 FOR DETAILS ON LANDSIDE DEVELOPMENT.
4. THE BUILDING RESTRICTION LINE (BRL) IS BASED ON A MAXIMUM BUILDING HEIGHT OF 36 FEET AT A 250' DISTANCE FROM THE PRIMARY SURFACE. MAXIMUM ALLOWABLE BUILDING HEIGHT FROM THE BRL INCREASES AT A 7:1 HORIZONTAL TO VERTICAL SLOPE UPWARD AND AWAY FROM THE PRIMARY SURFACE IN CONFORMANCE WITH FAR PART 77 SURFACES.
5. THERE ARE NO DECLARED DISTANCES USED OR PROPOSED.
6. THERE ARE NO THRESHOLD SITING SURFACE PENETRATIONS.
7. THERE ARE NO OBSTACLE FREE ZONE OBJECT PENETRATIONS.
8. RUNWAY PROTECTION ZONE CONTROL IS VIA OWNERSHIP AND EASEMENT BOTH RUNWAY ENDS.
9. TAXILANE H IS DESIGNED TO MEET 757-200 OPERATIONAL REQUIREMENTS. IT IS TO BE UPGRADED TO MEET DG-IV REQUIREMENTS.
10. A SMALL PORTION OF THE NORTHEAST CORNER OF RUNWAY 16 RSA IS NOT COMPLIANT AND COVERED BY RWY 16/34 RUNWAY SAFETY AREA DETERMINATION DATED FEBRUARY 25, 2005 ON FILE WITH THE FAA.

AIRPORT DATA TABLE

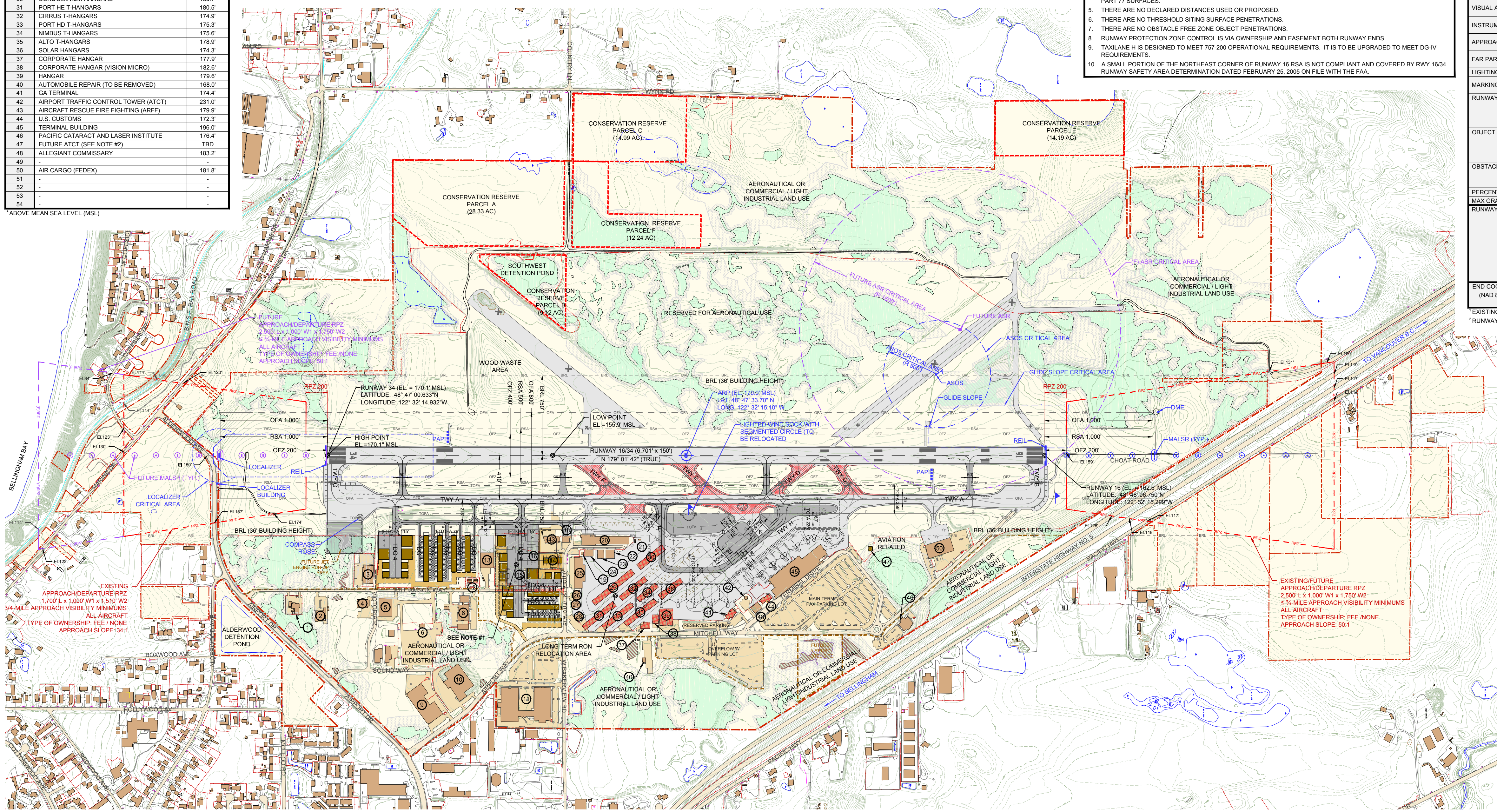
ITEM		EXISTING	PROPOSED
AIRPORT TERMINAL CODE		BLI	NO CHANGE
AIRPORT ELEVATION (MSL)		170.0'	NO CHANGE
AIRPORT REFERENCE POINT (ARP)	LAT.	48° 47' 33.70" N (EST.)	NO CHANGE
(NAD 83)	LON.	122° 32' 15.10" W (EST.)	NO CHANGE
MEAN MAX. TEMP. OF HOTTEST MONTH		71° F (AUGUST)	NO CHANGE
COMBINED WIND COVERAGE		99.86% (16 KNOTS)	NO CHANGE
MAGNETIC DECLINATION & YEAR		16°38' 42" E (DEC. 2013)	NO CHANGE
AIRPORT REFERENCE CODE (ARC)		C-IV	NO CHANGE
CRITICAL AIRCRAFT 1,000 MILE STAGE LENGTH		BOEING 757-200	NO CHANGE
NPIAS SERVICE LEVEL		COMMERCIAL SERVICE (CM)	NO CHANGE
TAXIWAY LIGHTING		MITL	NO CHANGE
TAXIWAY MARKING		STANDARD	NO CHANGE
AIRPORT & TERMINAL NAVAIDS		ILS, VOR, NDB, GPS	ASR

RUNWAY DATA TABLE

ITEM			RUNWAY 16-34 EXISTING STANDARD	EXISTING ACTUAL	PROPOSED
RUNWAY DESIGN CATEGORY			C-IV		NO CHANGE
CRITICAL AIRCRAFT			B757-200		NO CHANGE
RUNWAY DIMENSIONS	LENGTH:		6,701'		NO CHANGE
	WIDTH:		150'	150'	NO CHANGE
RUNWAY ORIENTATION			179° 01' 42" (TRUE)		NO CHANGE
PERCENT WIND COVERAGE (16 KNOT)			95%	99.86%	NO CHANGE
LINE-OF-SIGHT			NOT OBSTRUCTED		NO CHANGE
PAVEMENT TYPE			ASPHALT		NO CHANGE
PAVEMENT DESIGN STRENGTH	SINGLE GEAR:		75,000 LBS		NO CHANGE
	DUAL GEAR:		160,000 LBS		NO CHANGE
	DUAL TANDEM GEAR:		250,000 LBS		NO CHANGE
VISUAL APPROACH AIDS		RW 16:	PAPI, REIL, MALSR		NO CHANGE
		RW 34:	PAPI, REIL		MALSR
INSTRUMENT APPROACH AIDS		RW 16:	ILS/DME, RNAV		NO CHANGE
		RW 34:	RNP, GPS		ILS/DME, RNAV
APPROACH VISIBILITY MINIMUMS		RW 16:	PRECISION		NO CHANGE
		RW 34:	NON-PRECISION		PRECISION
FAR PART 77 APPROACH SLOPE		RW 16:	50:1	50:1	NO CHANGE
		RW 34:	34:1	34:1	50:1
LIGHTING			HIRL	HIRL	NO CHANGE
MARKING		RW 16:	PRECISION		NO CHANGE
		RW 34:	NON-PRECISION		PRECISION
RUNWAY SAFETY AREA (RSA) [1]					
	LENGTH BEYOND DEPARTURE END:		1,000'	1,000' [1]	NO CHANGE
	LENGTH PRIOR TO THRESHOLD:		1,000'	1,000' [1]	NO CHANGE
	WIDTH:		500'	500'	NO CHANGE
OBJECT FREE AREA (OFA)					
	LENGTH BEYOND DEPARTURE END:		1,000'	1,000'	NO CHANGE
	LENGTH PRIOR TO THRESHOLD:		1,000'	1,000'	NO CHANGE
	WIDTH:		800'	800'	NO CHANGE
OBSTACLE FREE ZONE (OFZ)			(NO OFZ OBJECT PENETRATIONS)		(NO OFZ OBJECT PENETRATIONS)
	WIDTH:		400'	400'	NO CHANGE
	LENGTH BEYOND RW END:		200'	200'	NO CHANGE
PERCENT EFFECTIVE GRADIENT			1.4%	0.2%	NO CHANGE
MAX GRADE WITHIN RWY LENGTH (%)			1.4%	0.8%	NO CHANGE
RUNWAY ELEVATIONS (MSL)	EXISTING END:	RW 16:	162.5'		NO CHANGE
		RW 34:	170.1'		NO CHANGE
	DISPLACED THRESHOLD:	RW 16:	NOT APPLICABLE		NO CHANGE
		RW 34:	NOT APPLICABLE		NO CHANGE
	TOUCHDOWN ZONE:	RW 16:	162.5'		NO CHANGE
		RW 34:	170.1'		NO CHANGE
	RUNWAY INTERSECTIONS:		NOT APPLICABLE		NO CHANGE
	HIGH & LOW POINTS:	HIGH:	170.1'		NO CHANGE
		LOW:	155.9'		NO CHANGE

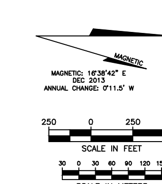
END COORDINATES: [2] (NAD 83)		EXISTING RW 16	EXISTING RW 34	PROPOSED RW 16	PROPOSED RW 34
	LATITUDE:	48°48'06.750" N	48°47'00.633" N	NO CHANGE	NO CHANGE
	LONGITUDE:	122°32'15.199" W	122°32'14.932" W	NO CHANGE	NO CHANGE

[1] EXISTING RSA DIMENSIONS FOR RUNWAY 16: 500' x 1,000' EXCEPT FOR 6,750 S.F. IN NORTHEAST CORNER.
[2] RUNWAY END COORDINATES AS REFLECTED ON AIRPORT 5010 FORM.



LEGEND

DESCRIPTION	EXISTING	PROPOSED
AIRCRAFT TIEDOWN POSITION		
AIRPORT BUILDING		
AIRFIELD PAVEMENT		
AIRPORT PROPERTY		NO CHANGE
AIRPORT REFERENCE POINT (ARP)		NO CHANGE
AUTOMOBILE PARKING		
AVIGATION EASEMENT		
BUILDING RESTRICTION LINE (BRL)	BRL	NO CHANGE
FENCE		NO CHANGE
HOLDING POSITION MARKING		NO CHANGE
PRECISION APPROACH PATH INDICATOR (PAPI)	PAPI	NO CHANGE
ROADWAY		
RUNWAY END IDENTIFIER LIGHTS (REIL)		NO CHANGE
RUNWAY OBJECT FREE AREA (OFA)	OFA	NO CHANGE
RUNWAY OBJECT FREE ZONE (OFZ)	OFZ	NO CHANGE
RUNWAY PROTECTION ZONE (RPZ)	RPZ	(F)RPZ
RUNWAY SAFETY AREA (RSA)	RSA	NO CHANGE
TAXIWAY OBJECT FREE AREA (TOFA)	TOFA	(F)TOFA
TO BE REMOVED	NA	
TOPOGRAPHIC CONTOUR		NO CHANGE
WETLAND		NO CHANGE
WETLAND FILL		NO CHANGE
WIND SOCK		NO CHANGE



ONE INCH
AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

#	REVISION	COMPANY	BY	DATE
-	-	---	---	--/--/----

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PROJECT MANAGER: JJY DRAFTED BY: RLO
DESIGNED BY: RLO CHECKED BY: JJY

BLI - Sheet 02 (ALP).dwg

THE PREPARATION OF THIS AIRPORT LAYOUT PLAN (ALP) WAS FINANCED IN PART THROUGH A PLANNING GRANT FROM THE FEDERAL AVIATION ADMINISTRATION (FAA) AS PROVIDED UNDER SECTION 505 OF THE AIRPORT AND AIRWAY IMPROVEMENT ACT OF 1982. THE CONTENTS DO NOT NECESSARILY REFLECT THE OFFICIAL VIEWS OR POLICIES OF THE FAA. ACCEPTANCE OF THIS ALP BY THE FAA DOES NOT IN ANY WAY CONSTITUTE A COMMITMENT ON THE PART OF THE UNITED STATES TO PARTICIPATE IN ANY DEVELOPMENT DEPICTED THEREIN NOR DOES IT IMPLY THAT THE PROPOSED DEVELOPMENT IS ENVIRONMENTALLY ACCEPTABLE IN ACCORDANCE WITH APPROPRIATE PUBLIC LAWS.

FEDERAL AVIATION ADMINISTRATION APPROVAL
SEATTLE AIRPORTS DISTRICT OFFICE

First Middle Last Name Date
Title

PORT OF BELLINGHAM

First Middle Last Name Date
Title

PORT OF BELLINGHAM
Washington State

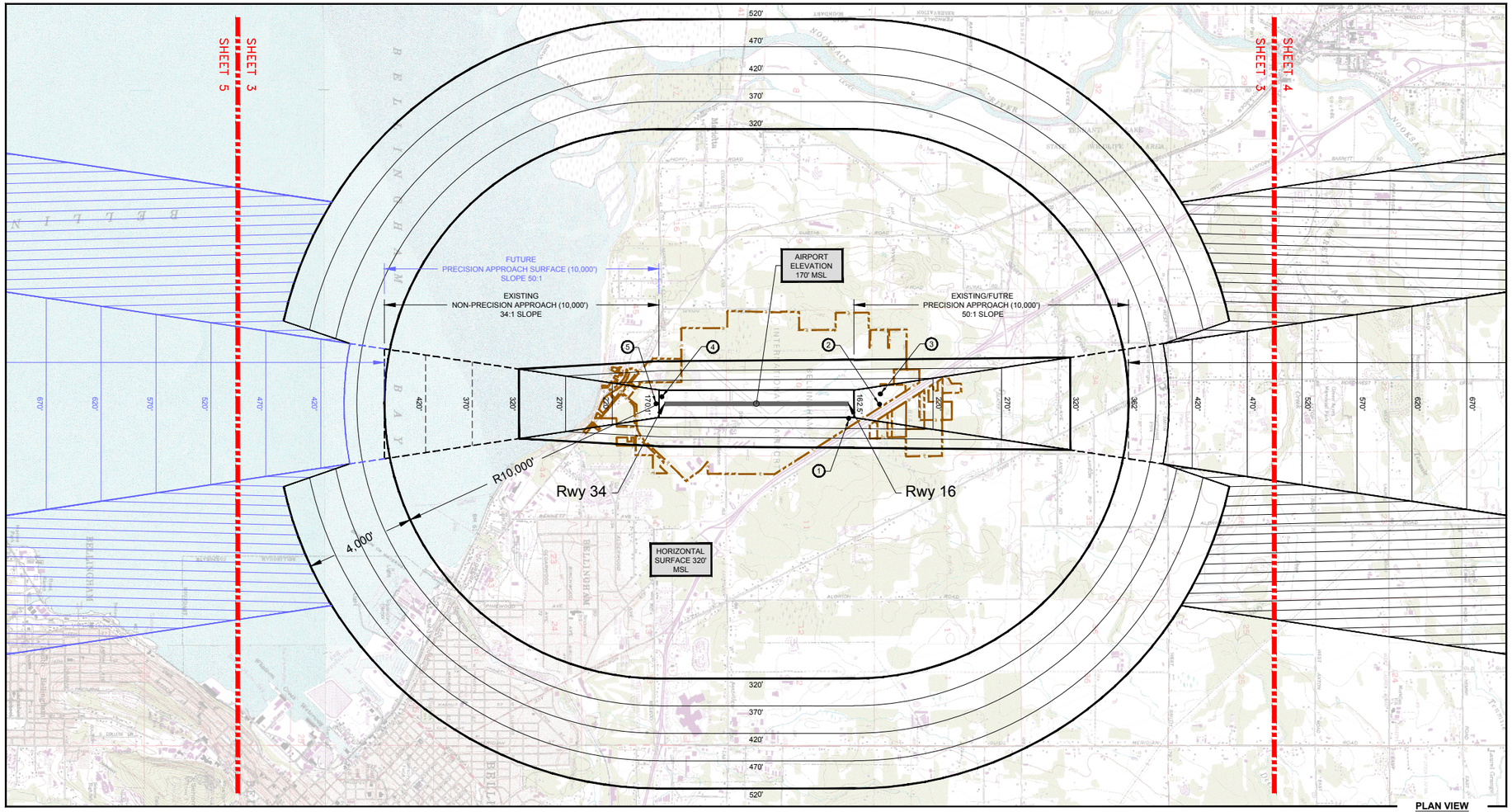
BELLINGHAM INTERNATIONAL AIRPORT
AIRPORT MASTER PLAN

AIRPORT LAYOUT PLAN

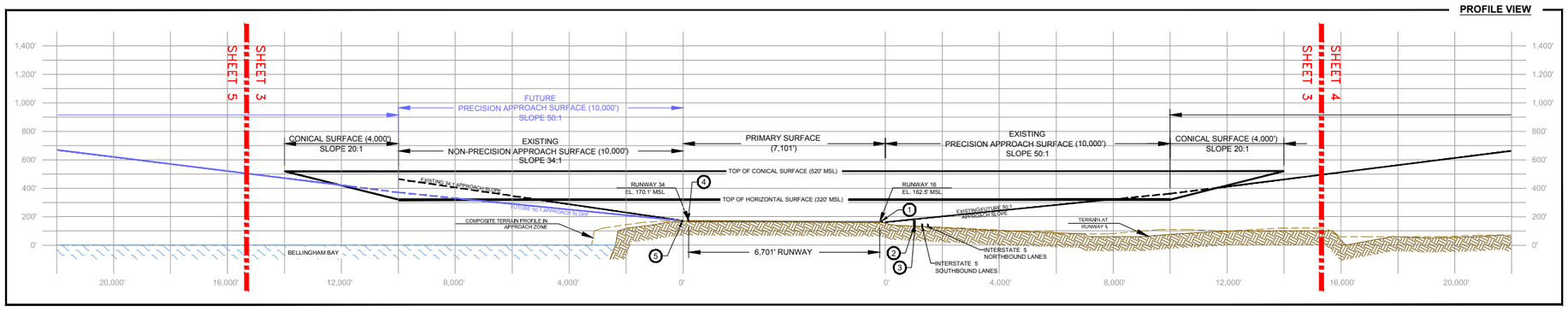
SCALE: 1" = 500'
DATE: APRIL 2015

AIP NUMBER: 03-53-0005-046

SHEET NUMBER: 2 OF 11



PLAN VIEW



PROFILE VIEW

EXISTING - FAR PART 77 DIMENSIONAL STANDARDS

ITEM	RUNWAY 16	RUNWAY 34
RUNWAY TYPE	PRECISION INSTRUMENT, VISIBILITY MINIMUMS LESS THAN 3/4-MILE	NON-PRECISION INSTRUMENT OTHER THAN UTILITY, VISIBILITY MINIMUMS LESS THAN 3/4-MILE
APPROACH SLOPE	50:1	34:1
APPROACH SURFACE - INNER WIDTH	1,000'	1,000'
APPROACH SURFACE - OUTER WIDTH	16,000'	4,000'
APPROACH SURFACE - LENGTH	50,000'	10,000'
PRIMARY SURFACE - WIDTH	1,000'	
RADIUS OF HORIZONTAL SURFACE	10,000'	

FUTURE - FAR PART 77 DIMENSIONAL STANDARDS

ITEM	RUNWAY 16	RUNWAY 34
RUNWAY TYPE	PRECISION INSTRUMENT, VISIBILITY MINIMUMS LESS THAN 3/4-MILE	PRECISION INSTRUMENT, VISIBILITY MINIMUMS LESS THAN 3/4-MILE
APPROACH SLOPE	50:1	50:1
APPROACH SURFACE - INNER WIDTH	1,000'	1,000'
APPROACH SURFACE - OUTER WIDTH	16,000'	16,000'
APPROACH SURFACE - LENGTH	50,000'	50,000'
PRIMARY SURFACE - WIDTH	1,000'	
RADIUS OF HORIZONTAL SURFACE	10,000'	

OBSTRUCTION DATA TABLE - RUNWAY 16

#	DESCRIPTION	EL.	SURFACE	PNTR.	CORRECTIVE ACTION
1	OL ON LTD WSK	169'	50:1 APPROACH	7'	TO REMAIN
2	MALSR	169'	50:1 APPROACH	-12'	TO REMAIN
3	OL ON DME	171'	50:1 APPROACH	-11'	TO REMAIN

* OL = OBSTRUCTION LIGHT

OBSTRUCTION DATA TABLE - RUNWAY 34

#	DESCRIPTION	EL.	SURFACE	PNTR.	CORRECTIVE ACTION
4	OL ON LTD WSK	181'	34:1 APPROACH	11'	TO REMAIN
5	GROUND	222'	34:1 APPROACH	0'	TO REMAIN

* OL = OBSTRUCTION LIGHT

NOTES

1. SOURCE OF DATA: 2004 BELLINGHAM INTERNATIONAL AIRPORT ALP SET (NATIONAL OCEAN SERVICE (NOS) OBSTRUCTION CHART (OC) 45, 11TH EDITION, FIELD SURVEY DATED DECEMBER 1999, OC PUBLISHED JUNE 2001. HORIZONTAL DATUM FOR OBSTRUCTIONS IS NORTH AMERICAN DATUM (NAD) 1983, VERTICAL DATUM IS NATIONAL GEODETIC VERTICAL DATUM 1988.).
2. REFER TO SHEET 6, INNER APPROACH SURFACE, RUNWAY 16/34 FOR OBSTRUCTION INFORMATION AND CLOSE-IN DETAILS.
3. US GEOLOGICAL SURVEY (USGS) DIGITAL RASTER GRAPHIC (DRG) PROJECTED IN STATE PLANE NAD83, 7.5 MINUTE QUAD. USGS MAPS DATED 1989, PHOTOREVISED 1994-1995.
4. GROUND PROFILE REPRESENTS THE COMPOSITE PROFILE BASED ON HIGHEST TERRAIN ACROSS WIDTH AND ALONG LENGTH OF THE APPROACH SURFACE.
5. AIRPORT OPERATIONS HEIGHT PROTECTION IS CONTAINED IN WHATCOM COUNTY ZONING ORDINANCE UNDER TITLE 20, SUPPLEMENTARY REQUIREMENTS, SECTION 20.80.675, WHICH SPECIFIES DEVELOPMENT HEIGHT RESTRICTIONS AND PROTECTION OF AIRPORT OPERATIONS USING GUIDANCE PROVIDED IN FAR PART 77, OBSTRUCTIONS TO NAVIGABLE AIRSPACE.

LEGEND

DESCRIPTION	SYMBOL
ELEVATION ABOVE MEAN SEA LEVEL (MSL)	EL.
AMOUNT OF OBJECT PENETRATION INTO PART 77 SURFACE	PNTR.
AIRPORT PROPERTY	

N
MAGNETIC
MAGNETIC: 16°36'42" E
DEC: 2013
ANNUAL CHANGE: 0°11.5' W

1,000 0 1,000 2,000
HORIZONTAL SCALE IN FEET

200 0 200 400
VERTICAL SCALE IN FEET

ONE INCH
AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

URS
1501 4TH AVENUE, SUITE 1400
SEATTLE, WA 98101
PHONE: (206) 438-2700

PROJECT MANAGER:	JJY	DRAFTED BY:	RLO
DESIGNED BY:	RLO	CHECKED BY:	JJY

#	REVISION	COMPANY	BY	DATE
-	-	---	--	--/--/--

THE PREPARATION OF THIS AIRPORT LAYOUT PLAN (ALP) WAS FINANCED IN PART THROUGH A PLANNING GRANT FROM THE FEDERAL AVIATION ADMINISTRATION (FAA) AS PROVIDED UNDER SECTION 505 OF THE AIRPORT AND AIRWAY IMPROVEMENT ACT OF 1982. THE CONTENTS DO NOT NECESSARILY REFLECT THE OFFICIAL VIEWS OR POLICIES OF THE FAA. ACCEPTANCE OF THIS ALP BY THE FAA DOES NOT IN ANY WAY CONSTITUTE A COMMITMENT ON THE PART OF THE UNITED STATES TO PARTICIPATE IN ANY DEVELOPMENT DEPICTED THEREIN NOR DOES IT IMPLY THAT THE PROPOSED DEVELOPMENT IS ENVIRONMENTALLY ACCEPTABLE IN ACCORDANCE WITH APPROPRIATE PUBLIC LAWS.

PORT OF BELLINGHAM
Washington State

BELLINGHAM INTERNATIONAL AIRPORT
AIRPORT MASTER PLAN

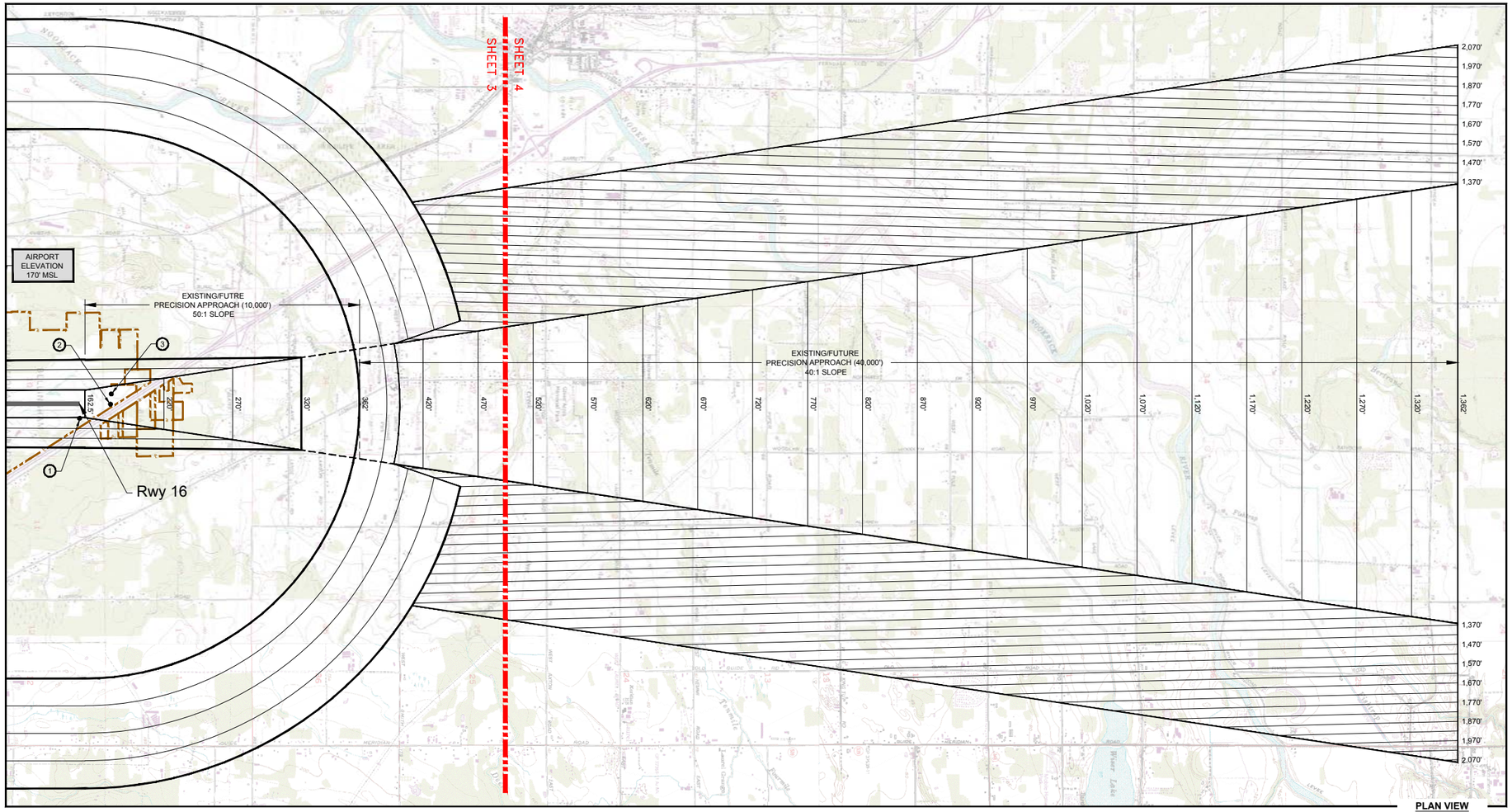
AIRSPACE PLAN
RUNWAY 16/34

SCALE: H: 1" = 2,000' V: 1" = 400'
DATE: APRIL 2015

AIP NUMBER: 03-53-0005-046

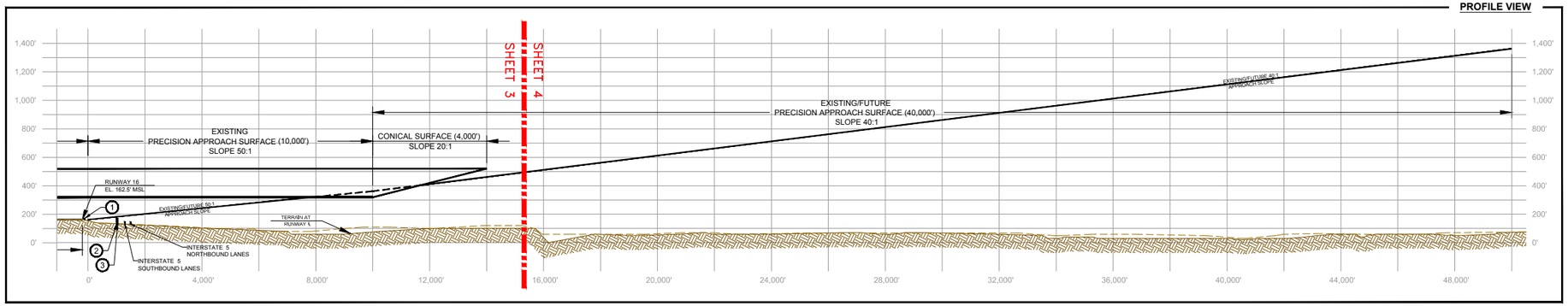
SHEET NUMBER: 3 OF 11

RLJ - Sheet 03 (Airspace Plan, Runway 16-34).dwg



PLAN VIEW

PROFILE VIEW



EXISTING - FAR PART 77 DIMENSIONAL STANDARDS

ITEM	RUNWAY 16	RUNWAY 34
RUNWAY TYPE	PRECISION INSTRUMENT, VISIBILITY MINIMUMS LESS THAN 3/4-MILE	NON-PRECISION INSTRUMENT OTHER THAN UTILITY, VISIBILITY MINIMUMS LESS THAN 3/4-MILE
APPROACH SLOPE	50:1	34:1
APPROACH SURFACE - INNER WIDTH	1,000'	1,000'
APPROACH SURFACE - OUTER WIDTH	16,000'	4,000'
APPROACH SURFACE - LENGTH	50,000'	10,000'
PRIMARY SURFACE - WIDTH	1,000'	
RADIUS OF HORIZONTAL SURFACE	10,000'	

FUTURE - FAR PART 77 DIMENSIONAL STANDARDS

ITEM	RUNWAY 16	RUNWAY 34
RUNWAY TYPE	PRECISION INSTRUMENT, VISIBILITY MINIMUMS LESS THAN 3/4-MILE	PRECISION INSTRUMENT, VISIBILITY MINIMUMS LESS THAN 3/4-MILE
APPROACH SLOPE	50:1	50:1
APPROACH SURFACE - INNER WIDTH	1,000'	1,000'
APPROACH SURFACE - OUTER WIDTH	16,000'	16,000'
APPROACH SURFACE - LENGTH	50,000'	50,000'
PRIMARY SURFACE - WIDTH	1,000'	
RADIUS OF HORIZONTAL SURFACE	10,000'	

OBSTRUCTION DATA TABLE - RUNWAY 16

#	DESCRIPTION	EL.	SURFACE	PNTR.	CORRECTIVE ACTION
1	OL ON LTD WSK	169'	50:1 APPROACH	7'	TO REMAIN
2	MALSR	169'	50:1 APPROACH	-12'	TO REMAIN
3	OL ON DME	171'	50:1 APPROACH	-11'	TO REMAIN

* OL = OBSTRUCTION LIGHT

NOTES

1. SOURCE OF DATA: 2004 BELLINGHAM INTERNATIONAL AIRPORT ALP SET (NATIONAL OCEAN SERVICE (NOS) OBSTRUCTION CHART (OC) 45, 11TH EDITION, FIELD SURVEY DATED DECEMBER 1999, OC PUBLISHED JUNE 2001. HORIZONTAL DATUM FOR OBSTRUCTIONS IS NORTH AMERICAN DATUM (NAD) 1983, VERTICAL DATUM IS NATIONAL GEODETIC VERTICAL DATUM 1988.).
2. REFER TO SHEET 6, INNER APPROACH SURFACE, RUNWAY 16/34 FOR OBSTRUCTION INFORMATION AND CLOSE-IN DETAILS.
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LEGEND

DESCRIPTION	SYMBOL
ELEVATION ABOVE MEAN SEA LEVEL (MSL)	EL.
AMOUNT OF OBJECT PENETRATION INTO PART 77 SURFACE	PNTR.
AIRPORT PROPERTY	

N

MAGNETIC
MAGNETIC 18°38'43" E
DEC 2013
ANNUAL CHANGE: 0°11.5' W

1,000 0 1,000 2,000
HORIZONTAL SCALE IN FEET

200 0 200 400
VERTICAL SCALE IN FEET

ONE INCH
AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

URS
1501 4TH AVENUE, SUITE 1400
SEATTLE, WA 98101
PHONE: (206) 438-2700

PROJECT MANAGER:	JJY	DRAFTED BY:	RLO
DESIGNED BY:	RLO	CHECKED BY:	JJY

#	REVISION	COMPANY	BY	DATE
-	-	---	---	--/--/----

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PORT OF BELLINGHAM
Washington State

BELLINGHAM INTERNATIONAL AIRPORT
AIRPORT MASTER PLAN

AIRSPACE PLAN
OUTER APPROACH, RUNWAY 16

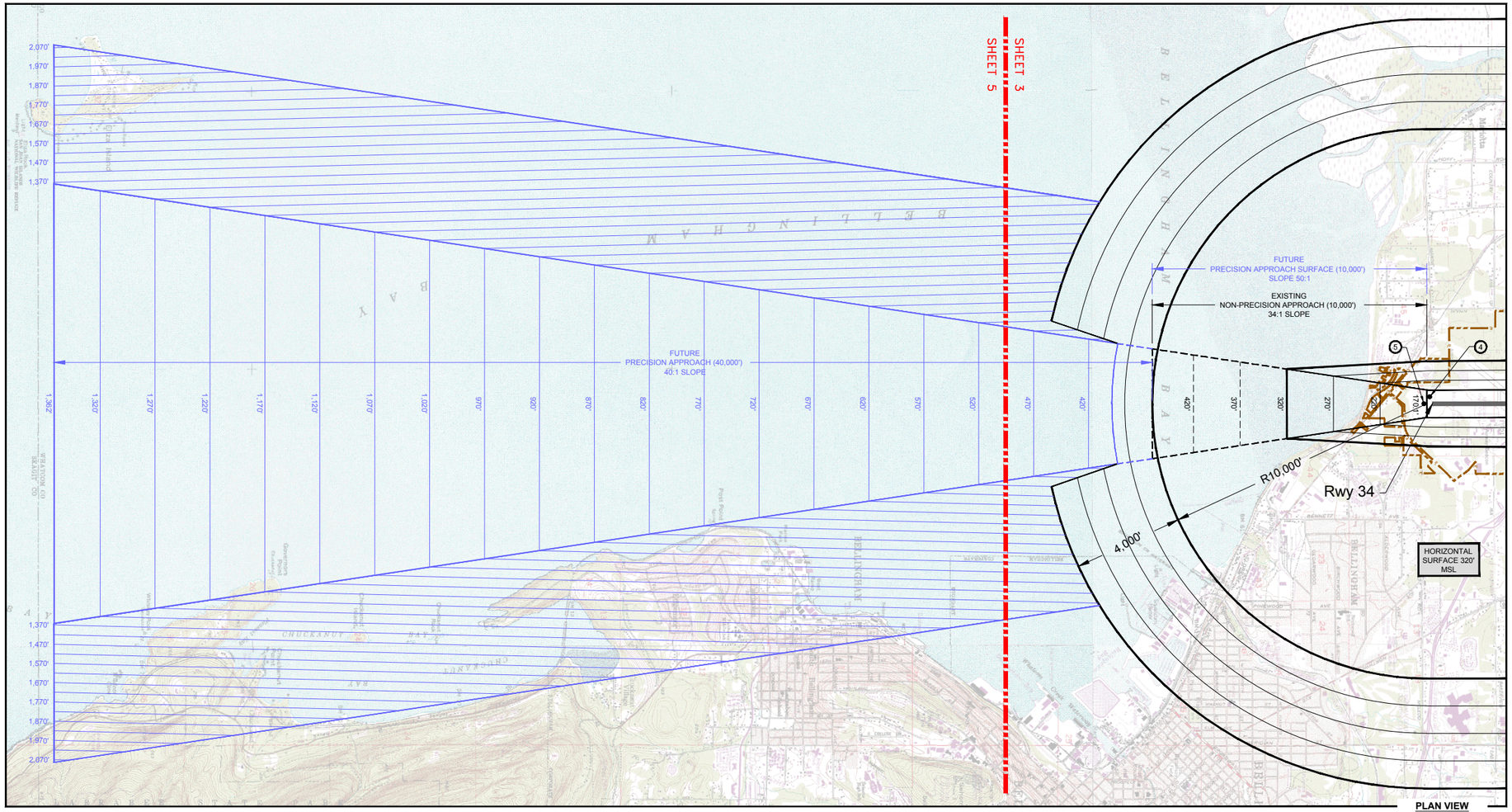
SCALE: H: 1" = 2,000' V: 1" = 400'

DATE: APRIL 2015

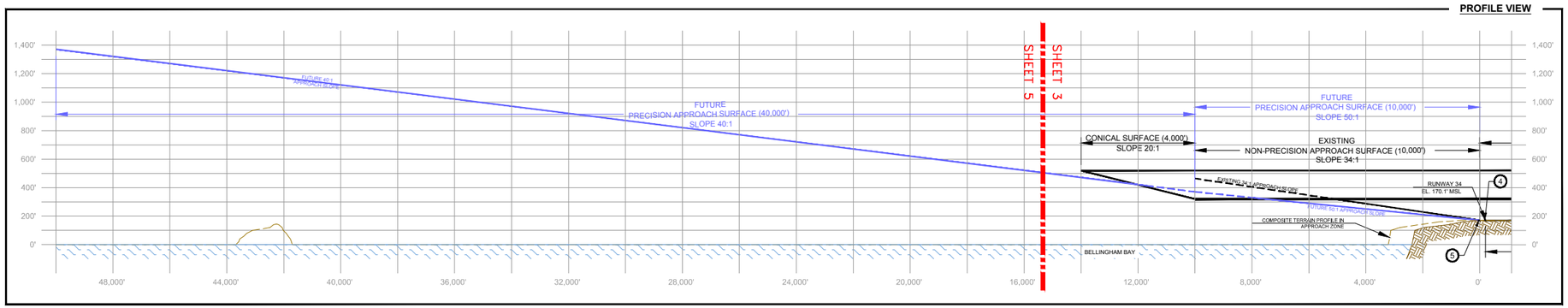
AIP NUMBER: 03-53-0005-046

SHEET NUMBER: 4 OF 11

BLI - Sheet 04 Airspace Plan - Outer Approach - Runway 16.dwg



PLAN VIEW



PROFILE VIEW

EXISTING - FAR PART 77 DIMENSIONAL STANDARDS

ITEM	RUNWAY 16	RUNWAY 34
RUNWAY TYPE	PRECISION INSTRUMENT, VISIBILITY MINIMUMS LESS THAN 3/4-MILE	NON-PRECISION INSTRUMENT OTHER THAN UTILITY, VISIBILITY MINIMUMS LESS THAN 3/4-MILE
APPROACH SLOPE	50:1	34:1
APPROACH SURFACE - INNER WIDTH	1,000'	1,000'
APPROACH SURFACE - OUTER WIDTH	16,000'	4,000'
APPROACH SURFACE - LENGTH	50,000'	10,000'
PRIMARY SURFACE - WIDTH	1,000'	
RADIUS OF HORIZONTAL SURFACE	10,000'	

FUTURE - FAR PART 77 DIMENSIONAL STANDARDS

ITEM	RUNWAY 16	RUNWAY 34
RUNWAY TYPE	PRECISION INSTRUMENT, VISIBILITY MINIMUMS LESS THAN 3/4-MILE	PRECISION INSTRUMENT, VISIBILITY MINIMUMS LESS THAN 3/4-MILE
APPROACH SLOPE	50:1	50:1
APPROACH SURFACE - INNER WIDTH	1,000'	1,000'
APPROACH SURFACE - OUTER WIDTH	16,000'	16,000'
APPROACH SURFACE - LENGTH	50,000'	50,000'
PRIMARY SURFACE - WIDTH	1,000'	
RADIUS OF HORIZONTAL SURFACE	10,000'	

OBSTRUCTION DATA TABLE - RUNWAY 34

#	DESCRIPTION	EL.	SURFACE	PNTR.	CORRECTIVE ACTION
4	OL ON LTD WSK	181'	34:1 APPROACH	11'	TO REMAIN
5	GROUND	222'	34:1 APPROACH	0'	TO REMAIN

* OL = OBSTRUCTION LIGHT

NOTES

1. SOURCE OF DATA: 2004 BELLINGHAM INTERNATIONAL AIRPORT ALP SET (NATIONAL OCEAN SERVICE (NOS) OBSTRUCTION CHART (OC) 45, 11TH EDITION, FIELD SURVEY DATED DECEMBER 1999, OC PUBLISHED JUNE 2001. HORIZONTAL DATUM FOR OBSTRUCTIONS IS NORTH AMERICAN DATUM (NAD) 1983, VERTICAL DATUM IS NATIONAL GEODETIC VERTICAL DATUM 1988.).
2. REFER TO SHEET 6, INNER APPROACH SURFACE, RUNWAY 16/34 FOR OBSTRUCTION INFORMATION AND CLOSE-IN DETAILS.
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LEGEND

DESCRIPTION	SYMBOL
ELEVATION ABOVE MEAN SEA LEVEL (MSL)	EL.
AMOUNT OF OBJECT PENETRATION INTO PART 77 SURFACE	PNTR.
AIRPORT PROPERTY	

N
MAGNETIC
MAGNETIC: 16°38'43" E
DEC 2013
ANNUAL CHANGE: 0°11.5' W

1,000 0 1,000 2,000
HORIZONTAL SCALE IN FEET

200 0 200 400
VERTICAL SCALE IN FEET

ONE INCH
AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

URS
1501 4TH AVENUE, SUITE 1400
SEATTLE, WA 98101
PHONE: (206) 438-2700

PROJECT MANAGER: JJY	DRAFTED BY: RLO
DESIGNED BY: RLO	CHECKED BY: JJY

#	REVISION	COMPANY	BY	DATE
-	-	---	---	--/--/----

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PORT OF BELLINGHAM
Washington State

BELLINGHAM INTERNATIONAL AIRPORT
AIRPORT MASTER PLAN

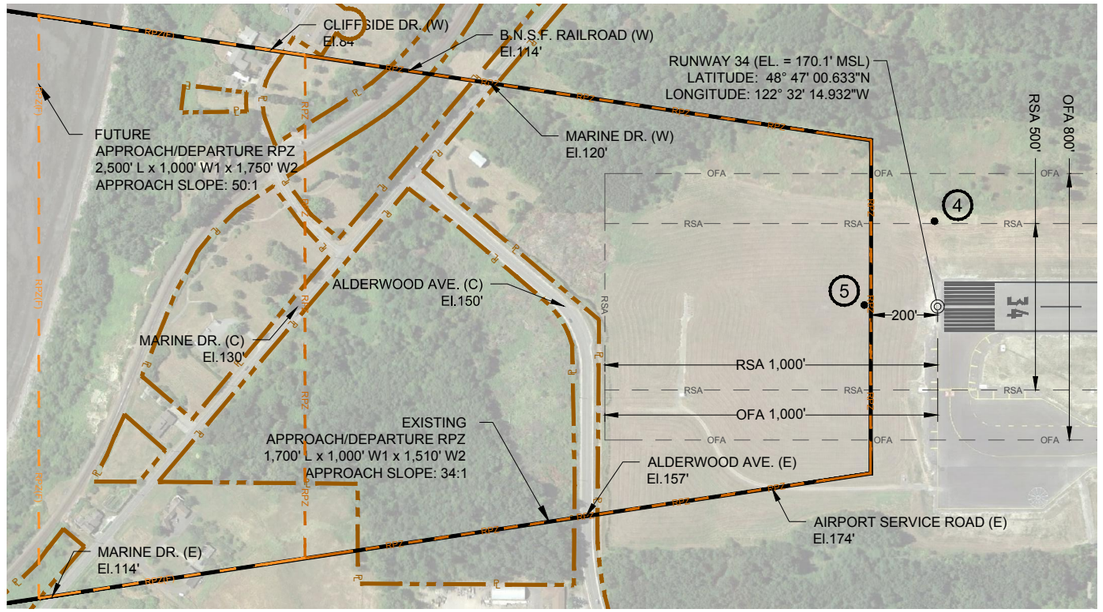
AIRSPACE PLAN
OUTER APPROACH, RUNWAY 34

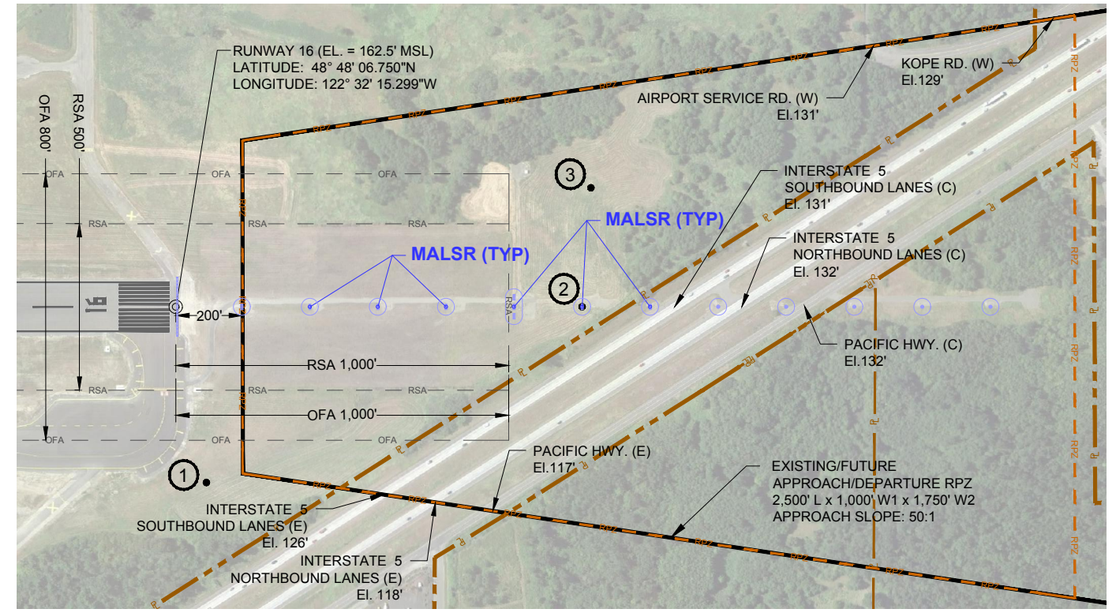
SCALE: H: 1" = 2,000' V: 1" = 400'
DATE: APRIL 2015

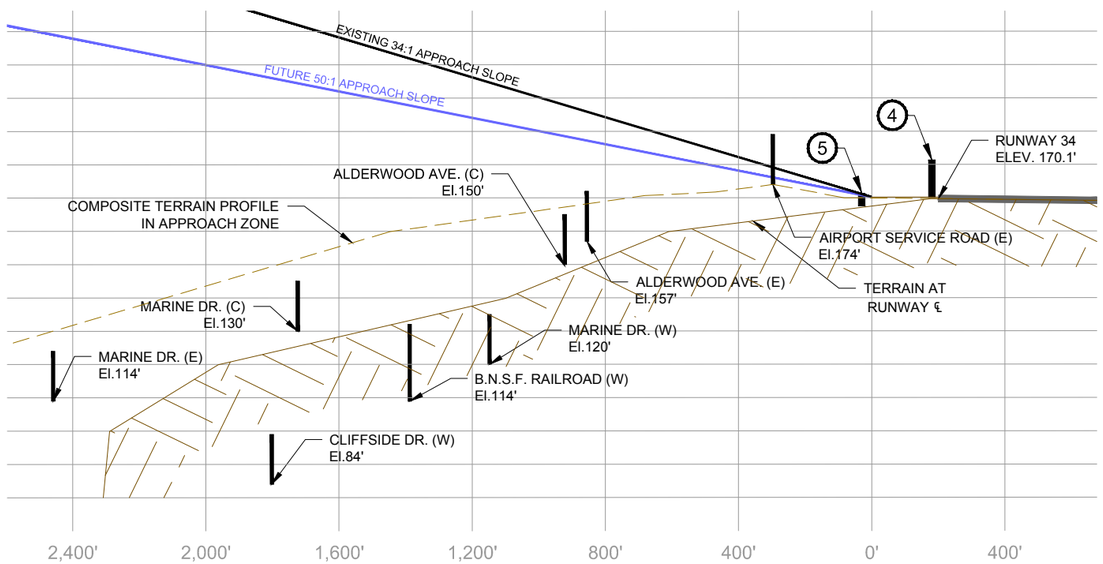
AIP NUMBER: 03-53-0005-046

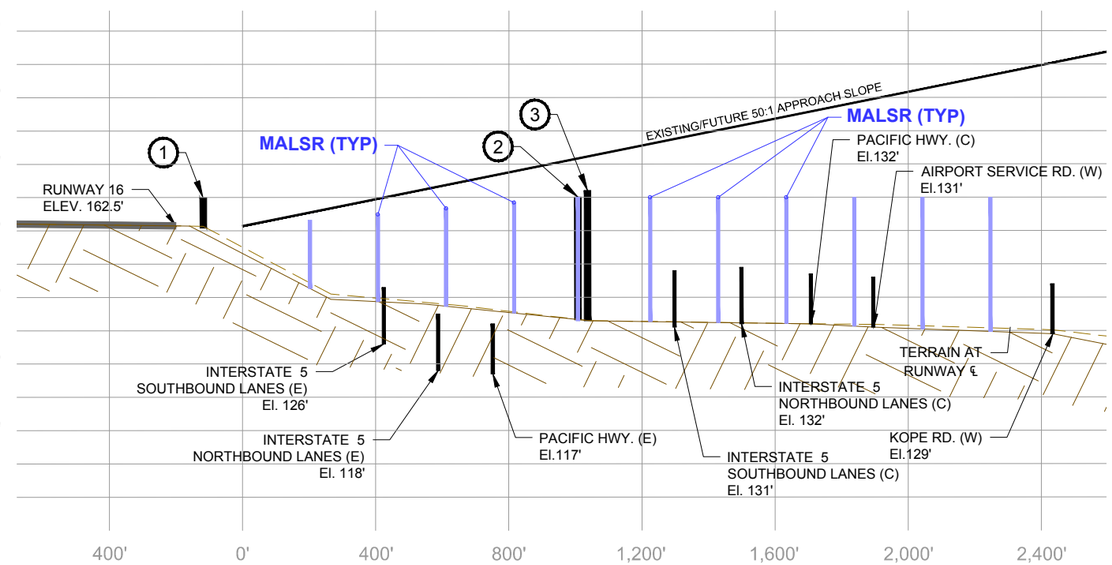
SHEET NUMBER: 5 OF 11

BLI - Sheet 05 Airspace Plan - Outer Approach - Runway 34.dwg









OBSTRUCTION DATA TABLE - RUNWAY 16

#	DESCRIPTION	EL.	SURFACE	PNTR.	CORRECTIVE ACTION
1	OL ON LTD WSK	169'	50:1 APPROACH	7'	TO REMAIN
2	MALSR	169'	50:1 APPROACH	-12'	TO REMAIN
3	OL ON DME	171'	50:1 APPROACH	-11'	TO REMAIN

* OL = OBSTRUCTION LIGHT

OBSTRUCTION DATA TABLE - RUNWAY 34

#	DESCRIPTION	EL.	SURFACE	PNTR.	CORRECTIVE ACTION
4	OL ON LTD WSK	181'	34:1 APPROACH	11'	TO REMAIN
5	GROUND	222'	34:1 APPROACH	0'	TO REMAIN

* OL = OBSTRUCTION LIGHT

NOTES

1. ELEVATION IN FEET ABOVE MEAN SEA LEVEL (MSL) AT TOP OF OBJECT. THIS VALUE INCLUDES 15 FEET ADDED TO NON-INTERSTATE ROADWAYS, 17 FEET ADDED TO INTERSTATE ROADWAYS, AND 23 FEET ADDED TO RAILROAD TRACKS.
2. THERE ARE NO THRESHOLD SITING SURFACE OBJECT PENETRATIONS.
3. GROUND PROFILE REPRESENTS THE COMPOSITE PROFILE BASED ON HIGHEST TERRAIN ACROSS WIDTH AND ALONG LENGTH OF THE APPROACH SURFACE.
4. SOURCE OF DATA: NATIONAL OCEAN SERVICE (NOS) OBSTRUCTION CHART (OC) 45, 11TH EDITION, FIELD SURVEY DATED DECEMBER 1999, OC PUBLISHED JUNE 2001. HORIZONTAL DATUM FOR OBSTRUCTIONS IS NORTH AMERICAN DATUM (NAD) 1983, VERTICAL DATUM IS NATIONAL GEODETIC VERTICAL DATUM 1988.

LEGEND

DESCRIPTION	
AIRPORT PROPERTY	
RUNWAY OBJECT FREE AREA (OFA)	
RUNWAY PROTECTION ZONE (RPZ)	
RUNWAY SAFETY AREA (RSA)	

N
MAGNETIC: 16°38'42" E
DEC: 20°19'
ANNUAL CHANGE: 0°11.0' W

HORIZONTAL SCALE IN FEET: 100 0 100 200
VERTICAL SCALE IN FEET: 10 0 10 20

ONE INCH
AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

URS
1501 4TH AVENUE, SUITE 1400
SEATTLE, WA 98101
PHONE: (206) 438-2700

PROJECT MANAGER:	JJY	DRAFTED BY:	RLO
DESIGNED BY:	RLO	CHECKED BY:	JJY

#	REVISION	COMPANY	BY	DATE
-	-	---	---	--/--/----

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PORT OF BELLINGHAM
Washington State

BELLINGHAM INTERNATIONAL AIRPORT
AIRPORT MASTER PLAN

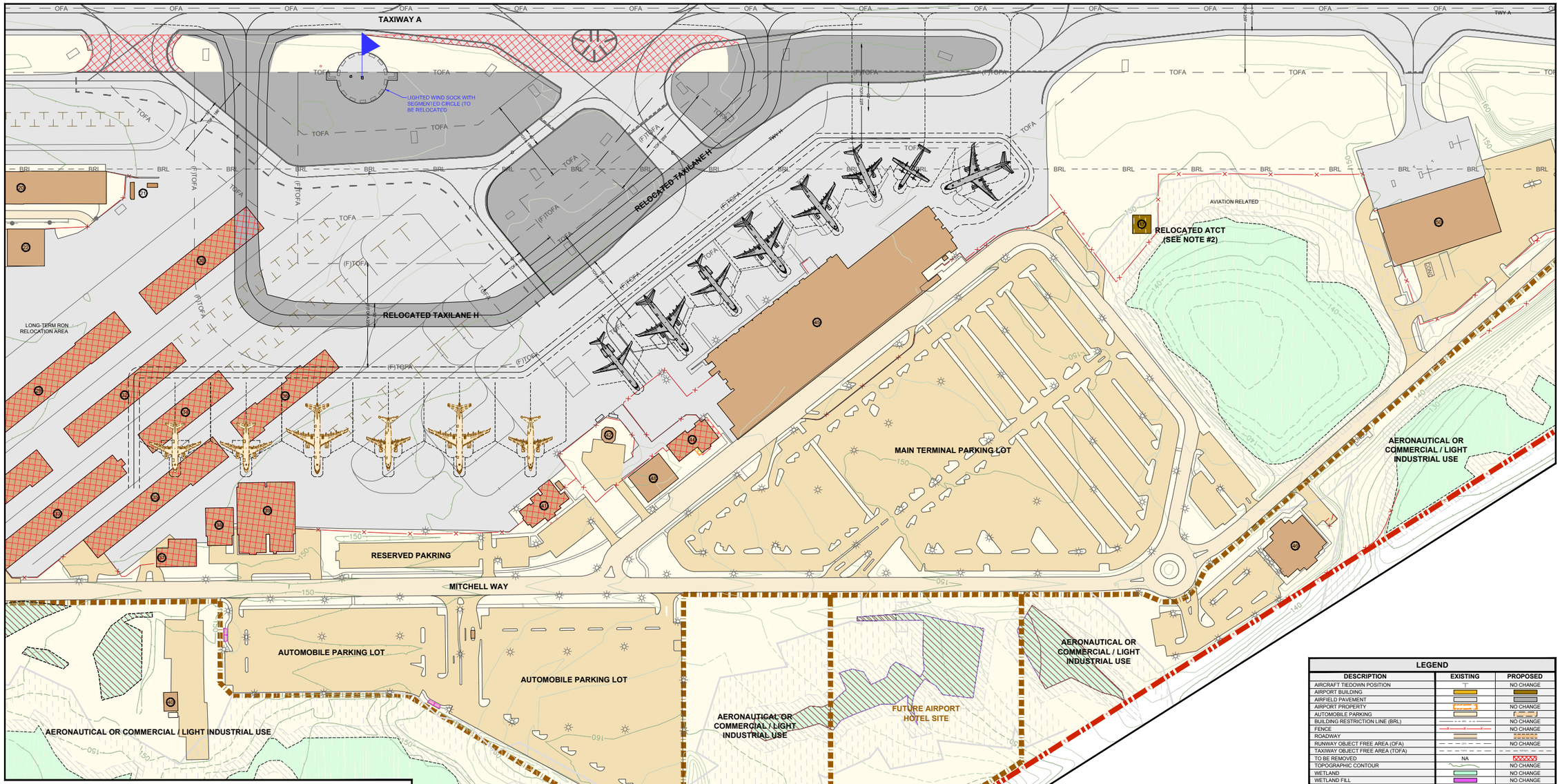
INNER APPROACH SURFACE RUNWAY 16/34

SCALE: H: 1" = 200' V: 1" = 20'
DATE: APRIL 2015

AIP NUMBER: 03-53-0005-046

SHEET NUMBER: 6 OF 11

BLL - Sheet 06 Inner Approach Surface Runway 16-34.dwg



LEGEND

DESCRIPTION	EXISTING	PROPOSED
AIRCRAFT TIEDOWN POSITION	T	NO CHANGE
AIRPORT BUILDING		
AIRFIELD PAVEMENT		
AIRPORT PROPERTY		NO CHANGE
AUTOMOBILE PARKING		
BUILDING RESTRICTION LINE (BRL)		NO CHANGE
FENCE		NO CHANGE
ROADWAY		
RUNWAY OBJECT FREE AREA (OFA)		NO CHANGE
TAXIWAY OBJECT FREE AREA (TOFA)		
TO BE REMOVED	NA	
TOPOGRAPHIC CONTOUR		NO CHANGE
WETLAND		NO CHANGE
WETLAND FILL		NO CHANGE
WIND SOCK		NO CHANGE

AIRPORT FACILITIES

#	DESCRIPTION	HEIGHT*
20	CORPORATE HANGARS (ICE)	178.2'
21	SELF FUELER	162.0'
22	CORPORATE HANGAR	189.9'
23	CORPORATE HANGAR	178.1'
24	PRIVATE HANGAR	182.5'
25	PRIVATE HANGAR	195.7'
26	CORPORATE HANGAR/AIRCRAFT MAINTENANCE	178.8'
27	CORPORATE HANGAR (ALLSOP)	180.3'
28	CORPORATE HANGAR (HAGGEN)	180.6'
29	STRATOS T-HANGARS	179.3'
30	CONDOMINIUM HANGARS	183.7'
31	PORT HE T-HANGARS	180.6'
32	CIRRUS T-HANGARS	174.9'
33	PORT HD T-HANGARS	175.3'
34	NIMBUS T-HANGARS	175.6'
35	ALTO T-HANGARS	178.9'
36	SOLAR HANGARS	174.3'

AIRPORT FACILITIES

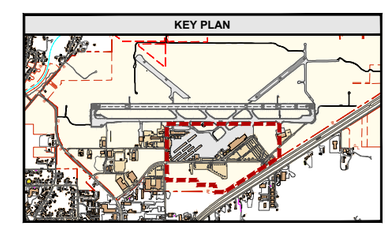
#	DESCRIPTION	HEIGHT*
37	CORPORATE HANGAR	177.9'
38	CORPORATE HANGAR (VISION MICRO)	182.6'
39	HANGAR	179.6'
40	AUTOMOBILE REPAIR (TO BE REMOVED)	168.0'
41	GA TERMINAL	174.4'
42	AIRPORT TRAFFIC CONTROL TOWER (ATCT)	231.0'
44	U.S. CUSTOMS	172.3'
45	TERMINAL BUILDING	196.0'
46	PACIFIC CATARACT AND LASER INSTITUTE	176.4'
47	FUTURE ATCT (SEE NOTE #2)	TBD
48	ALLEGIANT COMMISSARY	183.2'
50	AIR CARGO (FEDEX)	181.8'

* ABOVE MEAN SEA LEVEL (MSL)

NOTES

1. THE BUILDING RESTRICTION LINE (BRL) IS BASED ON A MAXIMUM BUILDING HEIGHT OF 35 FEET AT A 250' DISTANCE FROM THE PRIMARY SURFACE. MAXIMUM ALLOWABLE BUILDING HEIGHT FROM THE BRL INCREASES AT A 7:1 HORIZONTAL TO VERTICAL SLOPE UPWARD AND AWAY FROM THE PRIMARY SURFACE IN CONFORMANCE WITH FAR PART 77 SURFACES.
2. RELOCATION OF AIRPORT TRAFFIC CONTROL TOWER (ATCT) IS SUBJECT TO FAA REVIEW, APPROVAL, FUNDING, AND SITE DETERMINATION.
3. TERMINAL BUILDING AND AIRCRAFT PARKING ARE SHOWN TO PROVIDE FOR THE NEEDS OF FUTURE PASSENGERS WHILE MAXIMIZING THE USE OF EXISTING CONCRETE AIRCRAFT PARKING POSITIONS. SPECIFIC SITING AND LAYOUT DECISIONS WILL BE MADE DURING TERMINAL DEVELOPMENT PHASE.

KEY PLAN



N
MAGNETIC
MAGNETIC: 16°38'42" E
DEC: 2013
ANNUAL CHANGE: 0°11.5' W

50 0 50 100
SCALE IN FEET

ONE INCH
AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

URS
1501 4TH AVENUE, SUITE 1400
SEATTLE, WA 98101
PHONE: (206) 438-2700

PROJECT MANAGER:	JJY	DRAFTED BY:	RLO
DESIGNED BY:	RLO	CHECKED BY:	JJY

#	REVISION	COMPANY	BY	DATE
-	-	---	---	--/--/----

THE PREPARATION OF THIS AIRPORT LAYOUT PLAN (ALP) WAS FINANCED IN PART THROUGH A PLANNING GRANT FROM THE FEDERAL AVIATION ADMINISTRATION (FAA) AS PROVIDED UNDER SECTION 505 OF THE AIRPORT AND AIRWAY IMPROVEMENT ACT OF 1982. THE CONTENTS DO NOT NECESSARILY REFLECT THE OFFICIAL VIEWS OR POLICIES OF THE FAA. ACCEPTANCE OF THIS ALP BY THE FAA DOES NOT IN ANY WAY CONSTITUTE A COMMITMENT ON THE PART OF THE UNITED STATES TO PARTICIPATE IN ANY DEVELOPMENT DEPICTED THEREIN NOR DOES IT IMPLY THAT THE PROPOSED DEVELOPMENT IS ENVIRONMENTALLY ACCEPTABLE IN ACCORDANCE WITH APPROPRIATE PUBLIC LAWS.

PORT OF BELLINGHAM
Washington State

BELLINGHAM INTERNATIONAL AIRPORT
AIRPORT MASTER PLAN

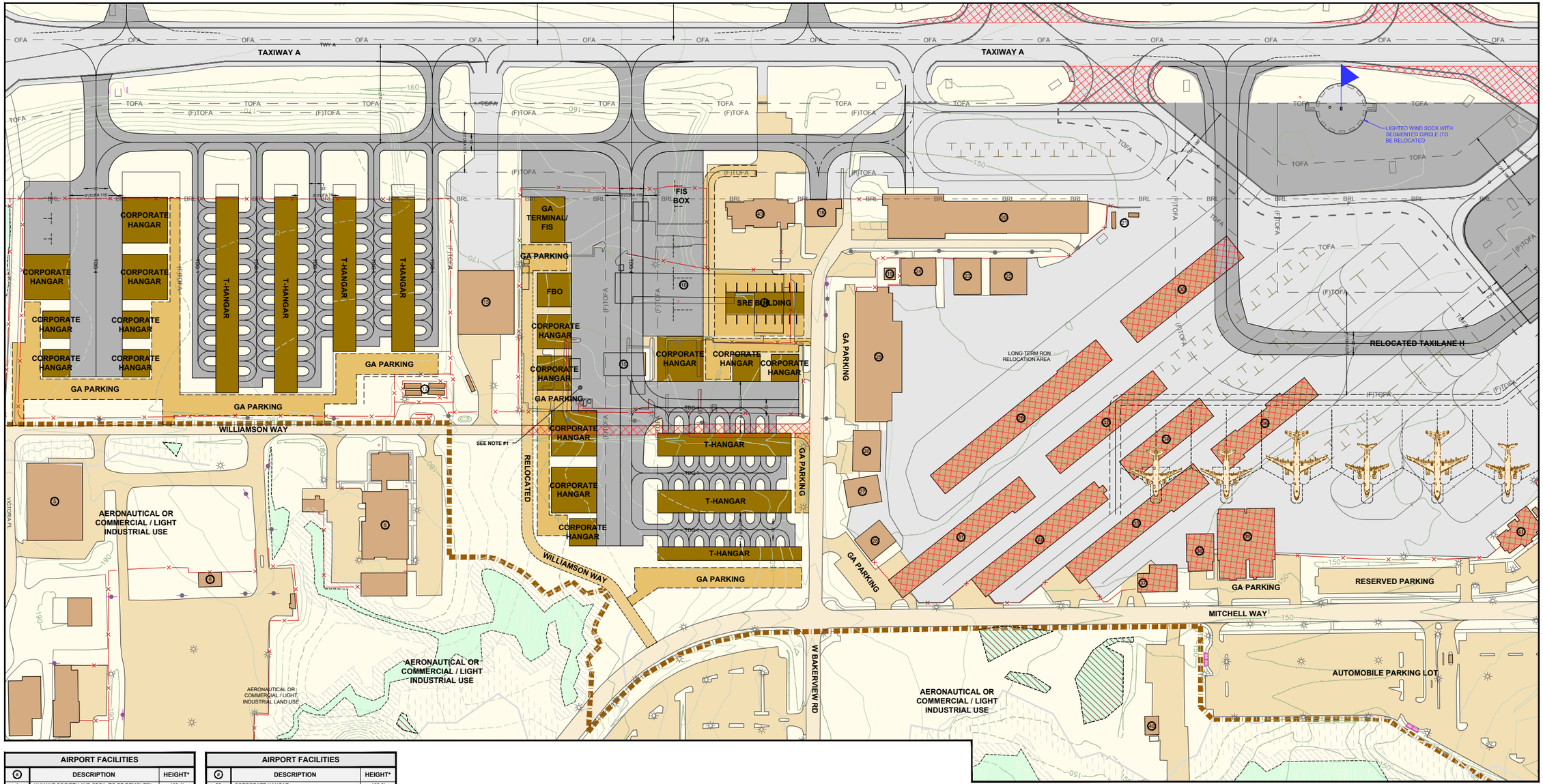
TERMINAL AREA PLAN

SCALE: 1" = 100'
DATE: APRIL 2015

AIP NUMBER: 03-53-0005-046

SHEET NUMBER: 7 OF 11

BLI - Sheet 07 (Terminal Area Plan).dwg



AIRPORT FACILITIES		
#	DESCRIPTION	HEIGHT*
1	HUMANE SOCIETY AND SPCA (TO BE REMOVED)	183.1'
2	CURRENT INDUSTRIES	195.6'
3	AVIATION COMPONENTS	207.2'
4	CURRENT INDUSTRIES	211.5'
5	LIGHT MANUFACTURING (YAMATO BLDG.)	220.4'
6	PUGET SOUND TRUCK LINES	213.8'
7	LAND LEASE (RESERS)	NA
8	AIRPORT BUILDING	204.7'
9	MANUFACTURING (POB FTZ)	214.2'
10	SOUND BEVERAGE	213.6'
11	WOODSTONE	221.3'
12	FUEL FARM STORAGE TANKS	187.1'
13	CORPORATE HANGAR (OAKLEY)	209.0'
14	FUTURE SNOW REMOVAL EQUIPMENT (SRE) BLD.	TBD
15	AIR NATIONAL GUARD (TO BE REMOVED)	185.2'
16	AIR NATIONAL GUARD (TO BE REMOVED)	183.3'
17	LAND LEASE (HELIPRO)	NA
18	PRIVATE HANGAR	178.3'
19	ELECTRICAL VAULT	166.2'
20	CORPORATE HANGARS (ICE)	178.2'
21	SELF FUELER	162.0'

AIRPORT FACILITIES		
#	DESCRIPTION	HEIGHT*
22	CORPORATE HANGAR	189.9'
23	CORPORATE HANGAR	178.1'
24	PRIVATE HANGAR	182.5'
25	PRIVATE HANGAR	195.7'
26	CORPORATE HANGAR/AIRCRAFT MAINTENANCE	178.8'
27	CORPORATE HANGAR (ALLSOP)	180.3'
28	CORPORATE HANGAR (HAGGEN)	180.6'
29	STRATOS T-HANGARS	179.3'
30	CONDOMINIUM HANGARS	183.7'
31	PORT HE T-HANGARS	180.5'
32	CIRRUS T-HANGARS	174.9'
33	PORT HD T-HANGARS	175.3'
34	NIMBUS T-HANGARS	175.6'
35	ALTO T-HANGARS	178.9'
36	SOLAR HANGARS	174.3'
37	CORPORATE HANGAR	177.9'
38	CORPORATE HANGAR (VISION MICRO)	182.6'
39	HANGAR	179.6'
40	AUTOMOBILE REPAIR (TO BE REMOVED)	168.0'
41	GA TERMINAL	174.4'
43	AIRCRAFT RESCUE FIRE FIGHTING (ARFF)	179.9'

*ABOVE MEAN SEA LEVEL (MSL)

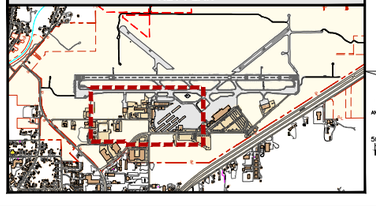
NOTES

1. FUTURE GA AREA IS TO BE DEVELOPED IN THE SHORT-TERM AS A REMAIN OVERNIGHT (RON) AREA FOR COMMERCIAL AIRCRAFT.
2. THE BUILDING RESTRICTION LINE (BRL) IS BASED ON A MAXIMUM BUILDING HEIGHT OF 35 FEET AT A 250' DISTANCE FROM THE PRIMARY SURFACE. MAXIMUM ALLOWABLE BUILDING HEIGHT FROM THE BRL INCREASES AT A 7:1 HORIZONTAL TO VERTICAL SLOPE UPWARD AND AWAY FROM THE PRIMARY SURFACE IN CONFORMANCE WITH FAR PART 77 SURFACES.
3. TERMINAL BUILDING AND AIRCRAFT PARKING ARE SHOWN TO PROVIDE FOR THE NEEDS OF FUTURE PASSENGERS WHILE MAXIMIZING THE USE OF EXISTING CONCRETE AIRCRAFT PARKING POSITIONS. SPECIFIC SITING AND LAYOUT DECISIONS WILL BE MADE DURING TERMINAL DEVELOPMENT PHASE.

LEGEND

DESCRIPTION	EXISTING	PROPOSED
AIRCRAFT TIEDOWN POSITION		
AIRPORT BUILDING		
AIRFIELD PAVEMENT		
AIRPORT PROPERTY		NO CHANGE
AUTOMOBILE PARKING		
BUILDING RESTRICTION LINE (BRL)		NO CHANGE
FENCE		NO CHANGE
ROADWAY		
RUNWAY OBJECT FREE AREA (OFA)		NO CHANGE
TAXIWAY OBJECT FREE AREA (TOFA)		
TO BE REMOVED	NA	
TOPOGRAPHIC CONTOUR		NO CHANGE
WETLAND		NO CHANGE
WETLAND FILL		NO CHANGE
WIND SOCK		NO CHANGE

KEY PLAN



N

MAGNETIC
MAGNETIC: 16°38'42" E
DEC: 2013
ANNUAL CHANGE: 0°11.5' W

50 0 50 100
SCALE IN FEET

ONE INCH
AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

URS
1501 4TH AVENUE, SUITE 1400
SEATTLE, WA 98101
PHONE: (206) 438-2700

PROJECT MANAGER:	JJY	DRAFTED BY:	RLO
DESIGNED BY:	RLO	CHECKED BY:	JJY

#	REVISION	COMPANY	BY	DATE
-	-	---	---	--/--/----

THE PREPARATION OF THIS AIRPORT LAYOUT PLAN (ALP) WAS FINANCED IN PART THROUGH A PLANNING GRANT FROM THE FEDERAL AVIATION ADMINISTRATION (FAA) AS PROVIDED UNDER SECTION 505 OF THE AIRPORT AND AIRWAY IMPROVEMENT ACT OF 1982. THE CONTENTS DO NOT NECESSARILY REFLECT THE OFFICIAL VIEWS OR POLICIES OF THE FAA. ACCEPTANCE OF THIS ALP BY THE FAA DOES NOT IN ANY WAY CONSTITUTE A COMMITMENT ON THE PART OF THE UNITED STATES TO PARTICIPATE IN ANY DEVELOPMENT DEPICTED THEREIN NOR DOES IT IMPLY THAT THE PROPOSED DEVELOPMENT IS ENVIRONMENTALLY ACCEPTABLE IN ACCORDANCE WITH APPROPRIATE PUBLIC LAWS.

PORT OF BELLINGHAM
Washington State

BELLINGHAM INTERNATIONAL AIRPORT
AIRPORT MASTER PLAN

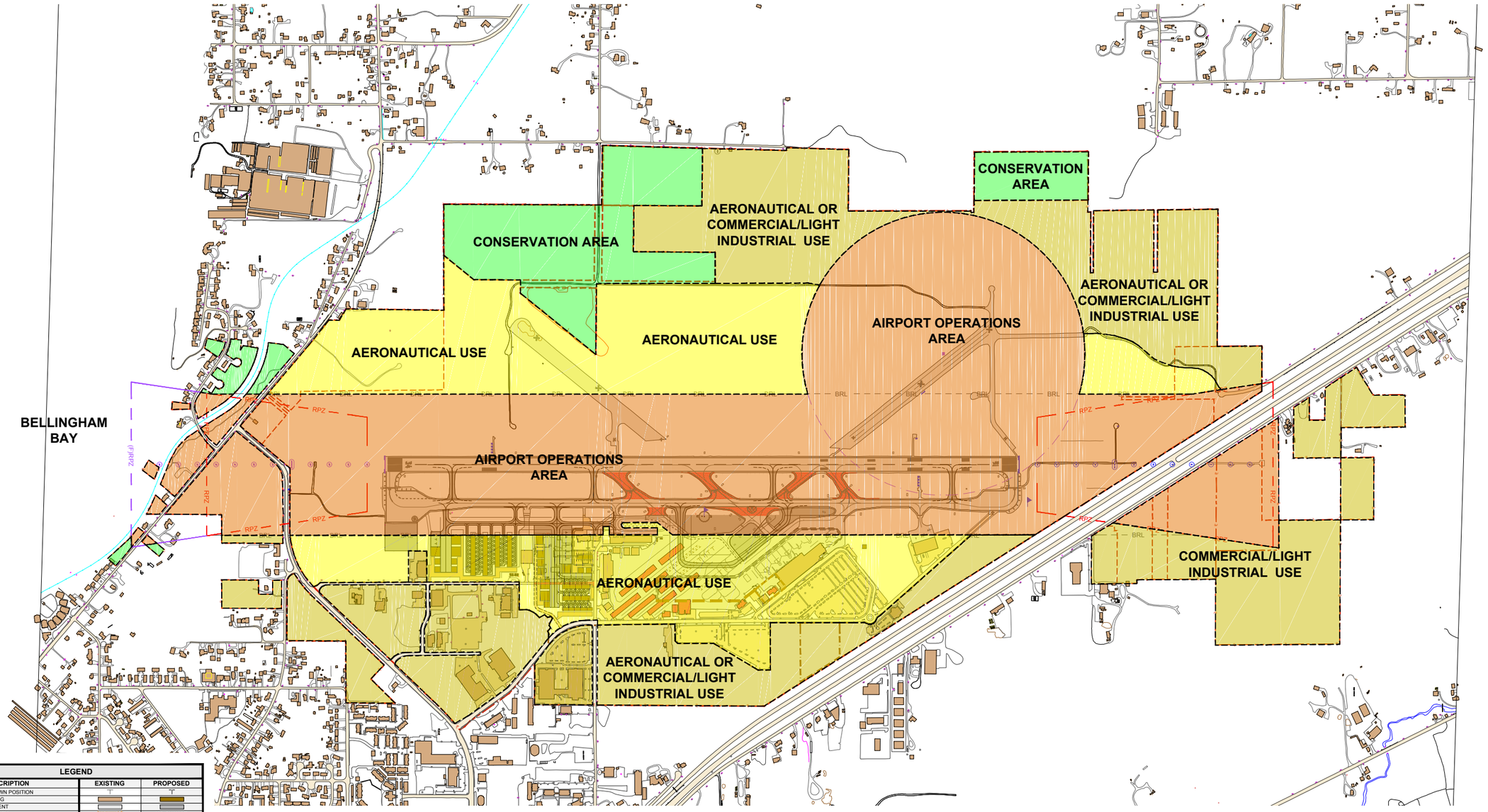
GENERAL AVIATION PLAN

SCALE: 1" = 100'
DATE: APRIL 2015

AIP NUMBER: 03-53-0005-046

SHEET NUMBER: 8 OF 11

BLI - Sheet 08 (General Aviation Plan).dwg



LEGEND

DESCRIPTION	EXISTING	PROPOSED
AIRCRAFT TIEDOWN POSITION		
AIRPORT BUILDING		
AIRFIELD PAVEMENT		
AIRPORT PROPERTY		NO CHANGE
AIRPORT REFERENCE POINT (ARP)		NO CHANGE
AUTOMOBILE PARKING		
BUILDING RESTRICTION LINE (BRL)		NO CHANGE
FENCE		NO CHANGE
HOLDING POSITION MARKING		NO CHANGE
PRECISION APPROACH PATH INDICATOR (PAPI)		NO CHANGE
ROADWAY		
RUNWAY END IDENTIFIER LIGHTS (REIL)		NO CHANGE
RUNWAY PROTECTION ZONE (RPZ)	RPZ	
TO BE REMOVED	NA	
WIND SOCK		NO CHANGE

DESCRIPTION	HATCH
AERONAUTICAL USE	
AIRPORT OPERATIONS AREA	
AERONAUTICAL OR COMMERCIAL/LIGHT INDUSTRIAL USE	
CONSERVATION AREA	

NOTES

1. JURISDICTIONAL RIGHT-OF-WAYS FOR BURLINGTON NORTHERN RAILROAD, CITY AND COUNTY ROADS, AND WASHINGTON STATE DEPARTMENT OF TRANSPORTATION INTERSTATE ROADS (I-5) ARE NOT INCLUDED IN THE RUNWAY PROTECTION ZONE LAND USE CONTROL AREA OF THE PORT OF BELLINGHAM/BELLINGHAM INTERNATIONAL AIRPORT.
2. RUNWAY PROTECTION ZONE CONTROL IS VIA OWNERSHIP AND EASEMENT FOR BOTH RUNWAY ENDS.

N

MAGNETIC
MAGNETIC: 16°38'42" E
DEC: 2013
ANNUAL CHANGE: 0°11.5' W

250 0 250 500
SCALE IN FEET

ONE INCH
AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

URS
1501 4TH AVENUE, SUITE 1400
SEATTLE, WA 98101
PHONE: (206) 438-2700

PROJECT MANAGER:	JJY	DRAFTED BY:	RLO
DESIGNED BY:	RLO	CHECKED BY:	JJY

#	REVISION	COMPANY	BY	DATE
-	-	---	---	--/--/----

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PORT OF BELLINGHAM
Washington State

BELLINGHAM INTERNATIONAL AIRPORT
AIRPORT MASTER PLAN

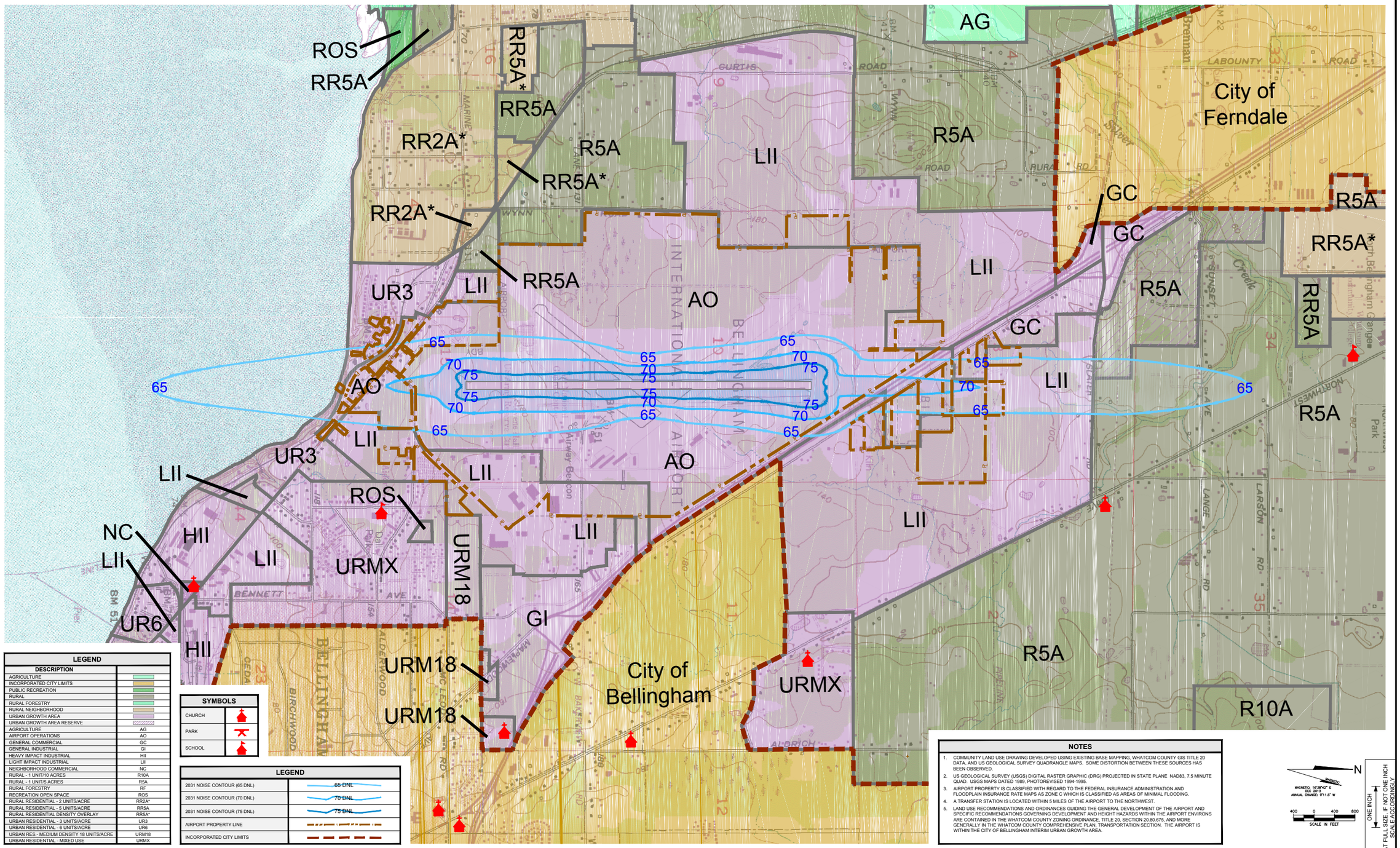
ON-AIRPORT LAND USE PLAN

SCALE: 1" = 400'
DATE: APRIL 2015

AIP NUMBER: 03-53-0005-046

SHEET NUMBER: 9 OF 11

BLI - Sheet 09 (On-Airport Land Use Plan).dwg



LEGEND	
DESCRIPTION	
AGRICULTURE	
INCORPORATED CITY LIMITS	
PUBLIC RECREATION	
RURAL	
RURAL FORESTRY	
RURAL NEIGHBORHOOD	
URBAN GROWTH AREA	
URBAN GROWTH AREA RESERVE	
AGRICULTURE	AG
AIRPORT OPERATIONS	AO
GENERAL COMMERCIAL	GC
GENERAL INDUSTRIAL	GI
HEAVY IMPACT INDUSTRIAL	HII
LIGHT IMPACT INDUSTRIAL	LII
NEIGHBORHOOD COMMERCIAL	NC
RURAL - 1 UNIT/10 ACRES	R10A
RURAL - 1 UNIT/5 ACRES	R5A
RURAL FORESTRY	RF
RECREATION OPEN SPACE	ROS
RURAL RESIDENTIAL - 2 UNITS/ACRE	RR2A*
RURAL RESIDENTIAL - 5 UNITS/ACRE	RR5A
RURAL RESIDENTIAL DENSITY OVERLAY	RR5A*
URBAN RESIDENTIAL - 3 UNITS/ACRE	UR3
URBAN RESIDENTIAL - 6 UNITS/ACRE	UR6
URBAN RES - MEDIUM DENSITY 18 UNITS/ACRE	URM18
URBAN RESIDENTIAL - MIXED USE	URMX

SYMBOLS	
CHURCH	
PARK	
SCHOOL	

LEGEND	
2031 NOISE CONTOUR (65 DNL)	65 DNL
2031 NOISE CONTOUR (70 DNL)	70 DNL
2031 NOISE CONTOUR (75 DNL)	75 DNL
AIRPORT PROPERTY LINE	
INCORPORATED CITY LIMITS	

NOTES

1. COMMUNITY LAND USE DRAWING DEVELOPED USING EXISTING BASE MAPPING, WHATCOM COUNTY GIS TITLE 20 DATA, AND US GEOLOGICAL SURVEY QUADRANGLE MAPS. SOME DISTORTION BETWEEN THESE SOURCES HAS BEEN OBSERVED.
2. US GEOLOGICAL SURVEY (USGS) DIGITAL RASTER GRAPHIC (DRG) PROJECTED IN STATE PLANE NAD83, 7.5 MINUTE QUAD. USGS MAPS DATED 1989. PHOTOREVISED 1994-1995.
3. AIRPORT PROPERTY IS CLASSIFIED WITH REGARD TO THE FEDERAL INSURANCE ADMINISTRATION AND FLOODPLAIN INSURANCE RATE MAPS AS ZONE C WHICH IS CLASSIFIED AS AREAS OF MINIMAL FLOODING.
4. A TRANSFER STATION IS LOCATED WITHIN 5 MILES OF THE AIRPORT TO THE NORTHWEST.
5. LAND USE RECOMMENDATIONS AND ORDINANCES GUIDING THE GENERAL DEVELOPMENT OF THE AIRPORT AND SPECIFIC RECOMMENDATIONS GOVERNING DEVELOPMENT AND HEIGHT HAZARDS WITHIN THE AIRPORT ENVIRONS ARE CONTAINED IN THE WHATCOM COUNTY ZONING ORDINANCE, TITLE 20, SECTION 20.80.675, AND MORE GENERALLY IN THE WHATCOM COUNTY COMPREHENSIVE PLAN, TRANSPORTATION SECTION. THE AIRPORT IS WITHIN THE CITY OF BELLINGHAM INTERIM URBAN GROWTH AREA.

N
MAGNETIC
MAGNETIC: 16°36'42" E
DEC. 2013
ANNUAL CHANGE: 0°11.5' W
400 0 400 800
SCALE IN FEET
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URS
1501 4TH AVENUE, SUITE 1400
SEATTLE, WA 98101
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PROJECT MANAGER:	JJY	DRAFTED BY:	RLO
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#	REVISION	COMPANY	BY	DATE
-	-	---	---	--/--/----

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PORT OF BELLINGHAM
Washington State

BELLINGHAM INTERNATIONAL AIRPORT
AIRPORT MASTER PLAN

AIRPORT COMMUNITY LAND USE PLAN

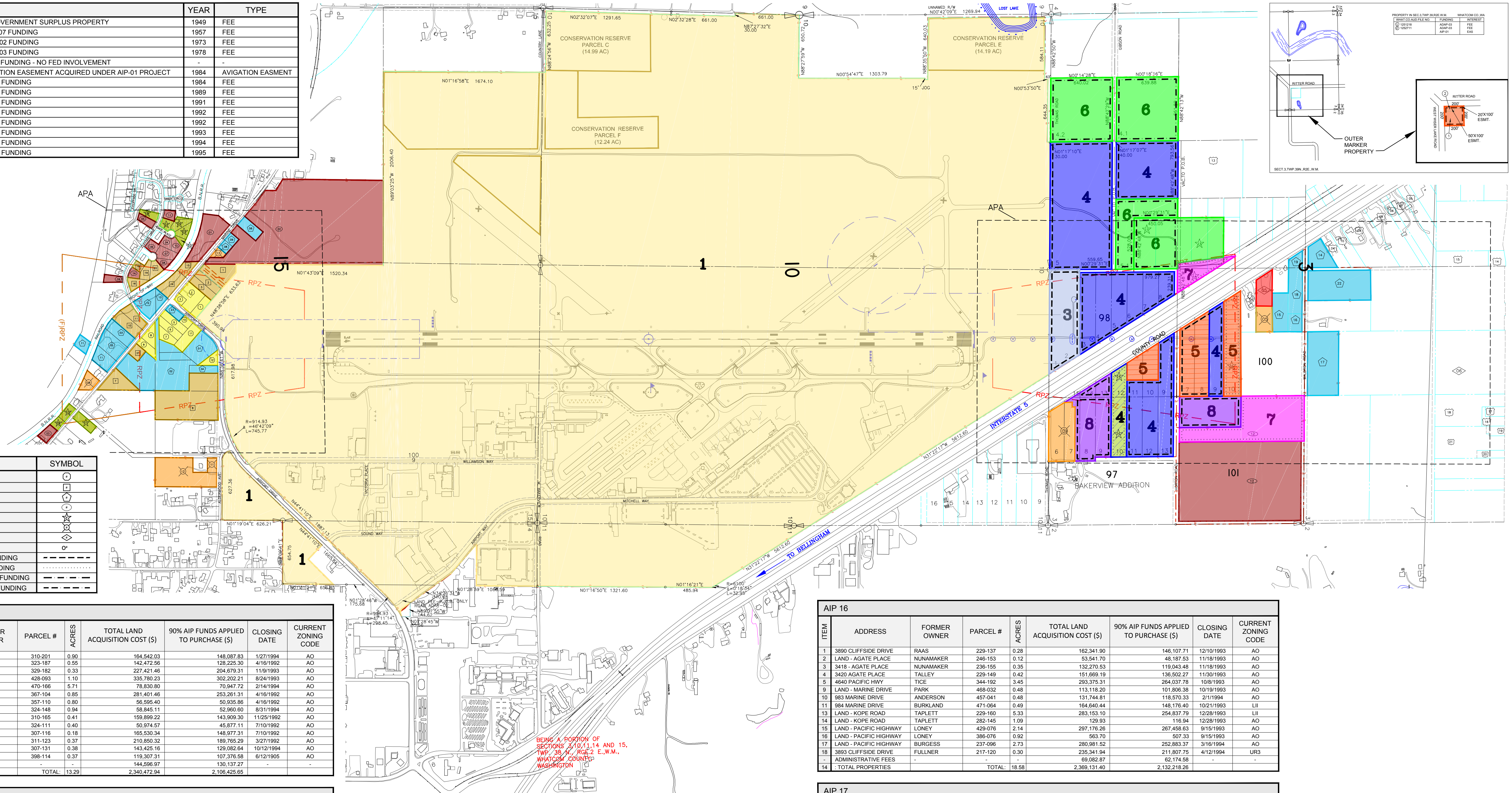
SCALE: 1" = 1,000'
DATE: APRIL 2015

AIP NUMBER: 03-53-0005-046

SHEET NUMBER: 10 OF 11

BLI - Sheet 10 - Airport Community Land Use Plan.dwg

AREA			YEAR	TYPE
	AREA 1	US GOVERNMENT SURPLUS PROPERTY	1949	FEE
	AREA 3	FAAP-07 FUNDING	1957	FEE
	AREA 4	ADAP-02 FUNDING	1973	FEE
	AREA 5	ADAP-03 FUNDING	1978	FEE
	AREA 6	P.O.B. FUNDING - NO FED INVOLVEMENT	-	-
	AREA 7	AVIGATION EASEMENT ACQUIRED UNDER AIP-01 PROJECT	1984	AVIGATION EASMENT
	AREA 8	AIP-01 FUNDING	1984	FEE
	AREA 9	AIP-08 FUNDING	1989	FEE
	AREA 10	AIP-11 FUNDING	1991	FEE
	AREA 11	AIP-12 FUNDING	1992	FEE
	AREA 12	AIP-14 FUNDING	1992	FEE
	AREA 13	AIP-16 FUNDING	1993	FEE
	AREA 14	AIP-17 FUNDING	1994	FEE
	AREA 15	AIP-19 FUNDING	1995	FEE



ITEM	SYMBOL
AIP-08 FUNDING, NOISE PROGRAM	
AIP-11 FUNDING, NOISE PROGRAM	
AIP-12 FUNDING, NOISE PROGRAM	
AIP-14 FUNDING, NOISE PROGRAM	
AIP-16 FUNDING, NOISE PROGRAM	
AIP-17 FUNDING, NOISE PROGRAM	
AIP-19 FUNDING, NOISE PROGRAM	
AIP-20 FUNDING (NOT FUNDED)	O#
FEE SIMPLE OWNERSHIP W/ FED FUNDING	
AVIGATION OWNERSHIP W/ FED FUNDING	
FEE SIMPLE OWNERSHIP W/ NO FED FUNDING	
AVIGATION OWNERSHIP W/ NO FED FUNDING	

AIP 11

ITEM	ADDRESS	FORMER OWNER	PARCEL #	ACRES	TOTAL LAND ACQUISITION COST ($)	90% AIP FUNDS APPLIED TO PURCHASE ($)	CLOSING DATE	CURRENT ZONING CODE
1	1120 MARINE DR.	FRAISER	310-201	0.90	164,542.03	148,087.83	1/27/1994	AO
2	1094 MARINE DR.	ELSBREE	323-187	0.55	142,472.56	128,225.30	4/16/1992	AO
3	1086 MARINE DR.	KNOWLTON	329-182	0.33	227,421.46	204,679.31	11/9/1993	AO
7	1010 MARINE DR.	BEER	428-093	1.10	335,780.23	302,202.21	8/24/1993	AO
8	3627 ALDERWOOD AVE.	GOODMAN	470-166	5.71	78,830.80	70,947.72	2/14/1994	AO
10	1039 MARINE DR.	CROWELL	367-104	0.85	281,401.46	253,261.31	4/16/1992	AO
11	LOT - MARINE DR.	CROWELL	357-110	0.80	56,595.40	50,935.86	4/16/1992	AO
14	MARINE DR. LOT	CLARK, V.	324-148	0.94	58,845.11	52,960.60	8/31/1994	AO
15	1095 MARINE DR.	BENNER	310-165	0.41	159,899.22	143,909.30	11/25/1992	AO
16	CLIFFSIDE ADJ BNRR	REID	324-111	0.40	50,974.57	45,877.11	7/10/1992	AO
18	3870 CLIFFSIDE DR.	REID	307-116	0.18	165,530.34	148,977.31	7/10/1992	AO
19	3402 PEBBLE WAY	MENDOZA	311-123	0.37	210,850.32	189,765.29	3/27/1992	AO
20	3404 PEBBLE WAY	MONACELLI	307-131	0.38	143,425.16	129,082.64	10/12/1994	AO
21	1030 MARINE DR.	LESLIE	398-114	0.37	119,307.31	107,376.58	6/12/1905	AO
-	ADMINISTRATIVE FEES	-	-	-	144,596.97	130,137.27	-	-
14	: TOTAL PROPERTIES		TOTAL:	13.29	2,340,472.94	2,106,425.65		

AIP 12

ITEM	ADDRESS	FORMER OWNER	PARCEL #	ACRES	TOTAL LAND ACQUISITION COST ($)	90% AIP FUNDS APPLIED TO PURCHASE ($)	CLOSING DATE	CURRENT ZONING CODE
1	3853 ALDERWOOD AVE.	TANNER	381-165	1.59	106,664.31	95,997.88	1987	AO
2	1024 MARINE DRIVE	FROBERG	417-151	6.46	295,742.25	266,168.03	1990	AO
3	1033 MARINE DRIVE	WISNER	376-096	0.81	192,609.26	173,348.33	1990	AO
4	3847 ALDERWOOD AVE.	McCONNELL	412-180	0.54	47,742.01	42,967.81	1987	AO
5	1025 MARINE DRIVE	ANGELL	388-066	0.96	348,552.69	313,697.42	1/4/1993	AO
6	1138 MARINE DRIVE	HENIFIN	231-234	0.65	200,285.48	180,256.93	7/30/1992	LII
8	1120 MARINE DRIVE	NORTH	251-210	0.40	171,907.30	154,716.57	9/8/1992	LII
9	1126 MARINE DRIVE	TOWNLEY	243-216	0.40	153,715.07	138,343.56	7/1/1992	LII
11	1013 MARINE DRIVE	BOOKEY	400-072	0.95	316,942.48	285,248.23	4/19/1993	AO
12	1055 MARINE DRIVE	SNYDER	338-137	1.15	300,633.10	270,569.79	3/2/1994	AO
13	ADJACENT LOT CLIFFSIDE	SNYDER	345-123	0.40	554.52	499.07	3/2/1994	AO
14	4694 PACIFIC HWY	RINESMITH	260-285	2.35	135,278.90	121,751.01	2/18/1993	GC
15	4670 PACIFIC HWY	KARTZ	297-245	1.48	102,319.01	92,087.11	9/25/1992	AO
16	1055 WALDRON ROAD	CLARK, M.	327-261	0.58	92,053.72	82,848.35	7/30/1992	AO
17	1046 WALDRON ROAD	MEIERS	367-286	4.03	178,321.74	160,489.57	10/22/1992	LII
18	1069 WALDRON ROAD	NELSON	293-259	1.39	152,886.75	137,598.08	10/21/1992	AO
19	LAND - WALDRON ROAD	NELSON	265-260	0.25	25,049.45	22,544.51	10/21/1992	AO
22	LAND - PACIFIC HWY	RINESMITH	286-309	4.66	102,652.45	92,387.21	7/15/1992	LII
23	1062 MARINE DRIVE	LOCKMAN	354-154	0.31	160,216.62	144,194.96	8/11/1994	AO
	ADMINISTRATIVE FEES	-	-	-	305,754.94	275,179.45	-	-
19	: TOTAL PROPERTIES		TOTAL:	29.36	3,389,882.05	3,050,893.85		

AIP 14

ITEM	ADDRESS	FORMER OWNER	PARCEL #	ACRES	TOTAL LAND ACQUISITION COST ($)	90% AIP FUNDS APPLIED TO PURCHASE ($)	CLOSING DATE	CURRENT ZONING CODE
1	1131 MARINE DRIVE	LIPTON	236-184	2.42	405,056.00	364,550.40	1/4/1994	AO
2	1142 MARINE DRIVE	EVANS	220-311	24.76	277,319.16	249,587.24	10/22/1993	LI
3	963 MARINE DRIVE	MARQUART	478-022	0.32	198,010.49	178,209.44	10/10/1993	AO
4	3406 AGATE PLACE	REHM	246-137	0.27	137,092.60	123,383.34	8/9/1993	AO
5	3887 CLIFFSIDE DRIVE	SINCLAIRE	225-118	0.31	246,658.96	221,993.06	10/27/1993	UR3
6	3880 CLIFFSIDE DRIVE	CROCKER	250-121	0.30	145,101.92	130,591.73	8/12/1993	AO
7	3412 PEBBLE WAY	ANNETTE	257-137	0.49	141,327.34	127,194.61	8/25/1993	AO
8	3408 PEBBLE WAY	WILSON	304-141	0.24	125,803.86	113,223.47	8/20/1993	AO
9	3853 CLIFFSIDE DRIVE	WRIGHT	317-086	0.31	243,227.93	218,905.14	2/25/1994	UR3
10	3410 AGATE PLACE	KAENEMAN	250-143	0.30	119,717.10	107,745.39	2/25/1994	AO
11	3894 CLIFFSIDE DRIVE	CHAVIS	218-140	0.25	139,809.20	125,828.28	7/19/1993	AO
12	LAND - WALDRON ROAD	HARRISON	500-237	23.48	234,712.55	211,241.30	1/26/1994	LI
14	3868 CLIFFSIDE DRIVE	SANDLUND	315-112	0.23	189,320.01	170,388.01	11/22/1995	AO
-	ADMINISTRATIVE FEES	-	-	-	190,941.83	171,847.65	-	-
13	: TOTAL PROPERTIES		TOTAL:	53.68	2,794,098.95	2,514,689.06		

AIP 16

ITEM	ADDRESS	FORMER OWNER	PARCEL #	ACRES	TOTAL LAND ACQUISITION COST ($)	90% AIP FUNDS APPLIED TO PURCHASE ($)	CLOSING DATE	CURRENT ZONING CODE
1	3890 CLIFFSIDE DRIVE	RAAS	229-137	0.28	162,341.90	146,107.71	12/10/1993	AO
2	LAND - AGATE PLACE	NUNAMAKER	246-153	0.12	53,541.70	48,187.53	11/18/1993	AO
3	3418 - AGATE PLACE	NUNAMAKER	236-155	0.35	132,270.53	119,043.48	11/18/1993	AO
4	3420 AGATE PLACE	TALLEY	229-149	0.42	151,669.19	136,502.27	11/30/1993	AO
5	4640 PACIFIC HWY	TICE	344-192	3.45	293,375.31	264,037.78	10/8/1993	AO
9	LAND - MARINE DRIVE	PARK	468-032	0.48	113,118.20	101,806.38	10/19/1993	AO
10	983 MARINE DRIVE	ANDERSON	457-041	0.48	131,744.81	118,570.33	2/1/1994	AO
11	984 MARINE DRIVE	BURKLAND	471-064	0.49	164,640.44	148,176.40	10/21/1993	LII
13	LAND - KOPE ROAD	TAPLETT	229-160	5.33	283,153.10	254,837.79	12/28/1993	LII
14	LAND - KOPE ROAD	TAPLETT	282-145	1.09	129.93	116.94	12/28/1993	AO
15	LAND - PACIFIC HIGHWAY	LONEY	429-076	2.14	297,176.26	267,458.63	9/15/1993	AO
16	LAND - PACIFIC HIGHWAY	LONEY	386-076	0.92	563.70	507.33	9/15/1993	AO
17	LAND - PACIFIC HIGHWAY	BURGESS	237-096	2.73	280,981.52	252,883.37	3/16/1994	AO
18	3893 CLIFFSIDE DRIVE	FULLNER	217-120	0.30	235,341.94	211,807.75	4/12/1994	UR3
-	ADMINISTRATIVE FEES	-	-	-	69,082.87	62,174.58	-	-
14	: TOTAL PROPERTIES		TOTAL:	18.58	2,369,131.40	2,132,218.26		

AIP 17

ITEM	ADDRESS	FORMER OWNER	PARCEL #	ACRES	TOTAL LAND ACQUISITION COST ($)	90% AIP FUNDS APPLIED TO PURCHASE ($)	CLOSING DATE	CURRENT ZONING CODE
7	4662 PACIFIC HWY	WESTHAVER	295-225	1.10	357,655.35	321,889.82	8/10/1994	AO
8	1003 MARINE DRIVE	AKERS	424-060	0.56	385,637.18	347,073.46	10/12/1994	AO
9	LAND - PACIFIC HWY	BURGESS	450-019	3.57	326,989.04	294,290.14	10/21/1994	AO
11	3621 W. ALDERWOOD AVE.	HANSEN	512-190	0.33	133,222.53	119,900.28	1/24/1995	LII
12	3619 W. ALDERWOOD AVE.	ISERT	522-158	3.53	175,023.02	157,520.72	10/3/1994	LII
13	1110 MARINE DRIVE	BYRNE	258-201	0.32	223,891.78	201,502.60	8/19/1994	LII
-	ADMINISTRATIVE FEES	-	-	-	74,887.96	67,399.16	-	-
6	: TOTAL PROPERTIES		TOTAL:	9.41	1,677,306.86	1,509,576.17		

TOTALS

ITEM	PROPERTIES	ACRES	TOTAL LAND AQUISTION COST ($)	90% AIP FUNDS APPLIED TO PURCHASE ($)
AIP-11	14	13.29	$2,340,472.94	$2,106,425.65
AIP-12	19	29.36	$3,389,882.05	$3,050,893.85
AIP-14	13	53.68	$2,794,098.95	$2,514,689.06
AIP-16	14	18.58	$2,369,131.40	$2,132,218.26
AIP-17	6	9.41	$1,677,306.86	$1,509,576.17
	66	124.32	$12,570,892.20	$11,313,812.00

ONE INCH
AT FULL SIZE, IF NOT ONE INCH SCALE ACCORDINGLY

URS
1501 4TH AVENUE, SUITE 1400
SEATTLE, WA 98101
PHONE: (206) 438-2700

PROJECT MANAGER: JJY	DRAFTED BY: RLO
DESIGNED BY: RLO	CHECKED BY: JJY

#	REVISION	COMPANY	BY	DATE
-	-	---	---	--/--/----

THE PREPARATION OF THIS AIRPORT LAYOUT PLAN (ALP) WAS FINANCED IN PART THROUGH A PLANNING GRANT FROM THE FEDERAL AVIATION ADMINISTRATION (FAA) AS PROVIDED UNDER SECTION 505 OF THE AIRPORT AND AIRWAY IMPROVEMENT ACT OF 1982. THE CONTENTS DO NOT NECESSARILY REFLECT THE OFFICIAL VIEWS OR POLICIES OF THE FAA. ACCEPTANCE OF THIS ALP BY THE FAA DOES NOT IN ANY WAY CONSTITUTE A COMMITMENT ON THE PART OF THE UNITED STATES TO PARTICIPATE IN ANY DEVELOPMENT DEPICTED THEREIN NOR DOES IT IMPLY THAT THE PROPOSED DEVELOPMENT IS ENVIRONMENTALLY ACCEPTABLE IN ACCORDANCE WITH APPROPRIATE PUBLIC LAWS.

PORT OF BELLINGHAM
Washington State

BELLINGHAM INTERNATIONAL AIRPORT
AIRPORT MASTER PLAN

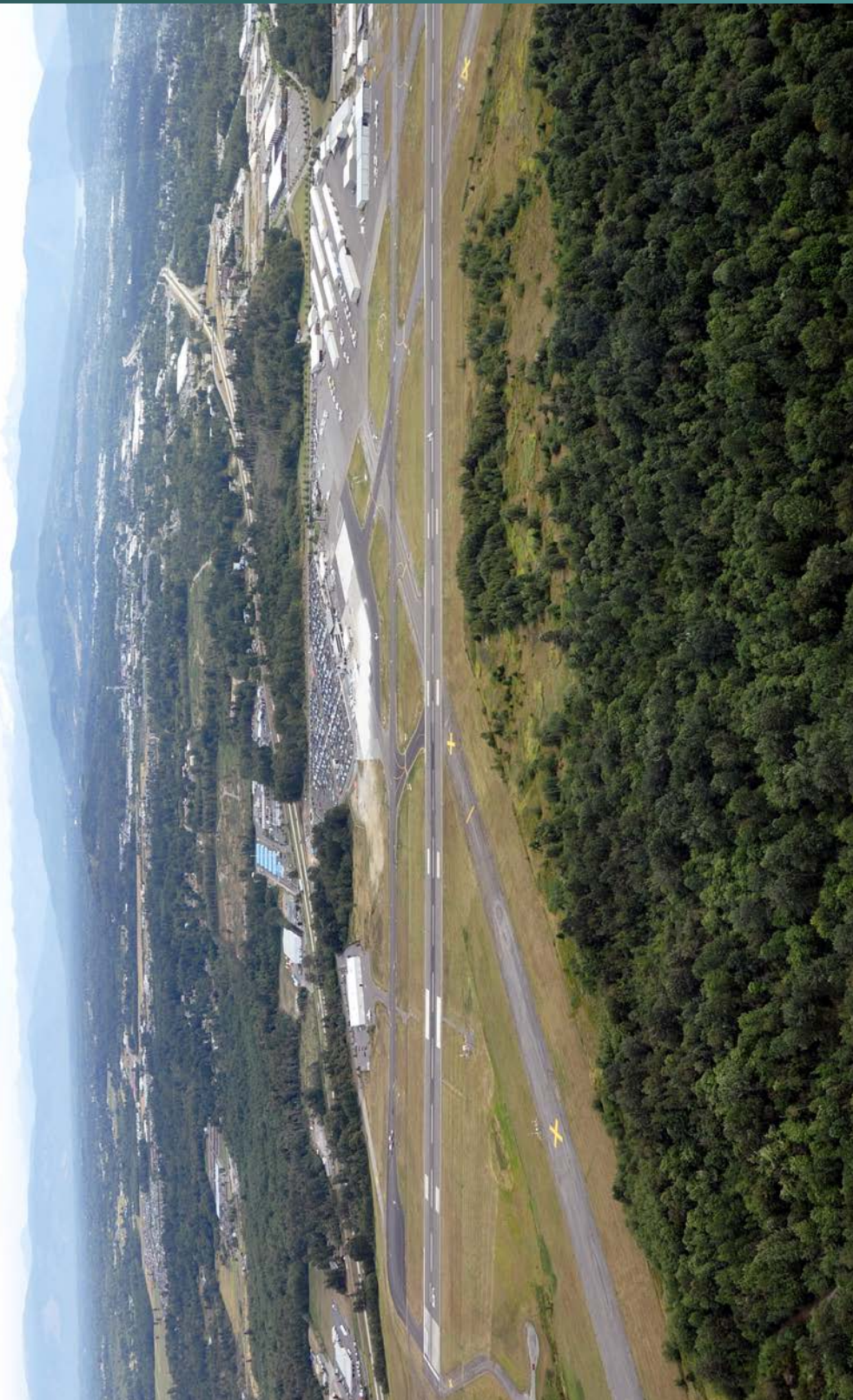
AIRPORT PROPERTY MAP
EXHIBIT A

SCALE: 1" = 500'
DATE: APRIL 2015

AIP NUMBER: 03-53-0005-046

SHEET NUMBER: 11 OF 11

BLI - Sheet 11 (Airport Property Map - Exhibit A).dwg



8

8 FINANCIAL IMPLEMENTATION PLAN

8.1 INTRODUCTION

In this chapter the airport improvements that have been recommended in previous chapters of the master plan are organized into an overall Airport Capital Improvement Program (CIP). The CIP was developed using a process that balanced the needs for capital improvement projects against the competing, and sometimes conflicting financial priorities represented by annual airport operating and maintenance costs. In addition, the potential projects developed in this Master Plan include some that are outside the Port of Bellingham's (Port's) ability to implement. These include Port-desired improvements to Federal Aviation Administration (FAA) facilities such as the Air Traffic Control Tower (ATCT), Airport Surveillance Radar (ASR), and new Instrument Landing System (ILS) that would be implemented only after the FAA conducts its own analyses and determines that the action would be beneficial and enhance their ability to assure a safe and efficient aviation system. Other improvements that have been discussed in this plan, such as new Fixed Base Operator (FBO) facilities or privately developed aircraft hangars, will be financed by private parties and the decision of when and how to construct these will be business decisions made by private investors and therefore outside the standard CIP process.

The items listed in this CIP are limited to those where the Port has the responsibility for implementation. The implementation period for the CIP covers the three phases of development through the year 2031:

- Phase I: Encompasses the short-term period from 2015 through 2019.
- Phase II: Encompasses the midterm 5-year period from 2020 through 2024.
- Phase III: Encompasses the long-term period from 2025 through 2031.

Projects are assigned to the time phase based on their anticipated need to meet demand levels or because they are necessary precursors to achieving long-term development goals.

8.2 ESTIMATES OF PROBABLE COST

The first step in the implementation plan is the development of an estimate of the probable cost for each project. These estimates were prepared at planning level detail with quantities estimated from data presented in Chapter 4 - Facility Requirements or by scaling the Airport Layout Plan (ALP) or other available maps. The estimated quantities were multiplied by a unit cost based on contractor's bids for similar projects in Bellingham or western Washington. All costs are based on 2014 prices.

The cost estimates shown in Table 8-1 summarize total project costs and include sales taxes (7.9 percent); professional service fees including design, project management, construction management, and others (10 percent); and contingencies (20 percent of construction cost) for all projects. Updated estimates will need to be prepared for each project prior to design as more detailed definition becomes available.

Table 8-1: Estimated Cost of Capital Improvement Projects

Item	Project Cost	Taxes	Professional Service Fees	Contingencies	Total
Airfield Projects					
New Right Angle Taxiways	$3,276,200	$258,820	$327,620	$655,240	$4,517,880
Runway Shoulders	$5,709,500	$451,051	$570,950	$1,141,900	$7,873,401
Jet Engine Run-Up Area	$2,387,500	$188,613	$238,750	$477,500	$3,292,363
Perimeter Road Extension	$2,052,000	$162,108	$205,200	$410,400	$2,829,708
SRE Building	$1,575,600	$124,472	$157,560	$315,120	$2,172,752
Total Airfield Projects	***$15,000,800***				***$20,686,103***
Terminal Projects					
Expand the Terminal Building	$18,096,000	$1,429,584	$1,809,600	$3,619,200	$24,954,384
Realign Taxilanes H and J	$1,344,500	$106,216	$134,450	$268,900	$1,854,066
Expand Terminal Apron	$4,398,500	$347,482	$439,850	$879,700	$6,065,532
Expand Auto Parking	$5,795,000	$457,805	$579,500	$1,159,000	$7,991,305
Construct RON Spaces	$5,671,500	$448,049	$567,150	$1,134,300	$7,820,999
Total Terminal Projects	***$35,305,500***				***$48,686,285***
General Aviation (GA) Projects					
GA Area Phase 1 Development					
Prepare the Site	$5,816,000	$459,464	$581,600	$1,163,200	$8,020,264
Relocate the GA Terminal	$1,440,000	$113,760	$144,000	$288,000	$1,985,760
Relocate the GA FIS Building	$810,000	$63,990	$81,000	$162,000	$1,116,990
Relocate Existing GA T-Hangars	$4,382,500	$346,218	$438,250	$876,500	$6,043,468
Relocate Existing GA Corporate Hangars	$2,994,000	$236,526	$299,400	$598,800	$4,128,726
GA Area Phase 2 Development					
Prepare the Site	$4,689,000	$370,431	$468,900	$937,800	$6,466,131
Construct FBO Facility	$450,000	$35,550	$45,000	$90,000	$620,550
Construct New T-Hangars	$6,815,000	$538,385	$681,500	$1,363,000	$9,397,885
Construct New Corporate Hangars	$11,219,670	$886,354	$1,121,967	$2,243,934	$15,471,925
Total GA Projects	***$38,616,170***				***$53,251,698***

Table 8-1: Estimated Cost of Capital Improvement Projects (Continued)

Item	Project Cost	Taxes	Professional Service Fees	Contingencies	Total
Other Projects					
Relocate RON Spaces	10,943,500	$864,537	1,094,350	2,188,700	15,091,087
Noise Study	500,000	$39,500	50,000	100,000	689,500
Master Planning	750,000	$59,250	75,000	150,000	1,034,250
RAC Facility	2,000,000	$158,000	200,000	400,000	2,758,000
Fuel Farm Expansion	2,000,000	$158,000	200,000	400,000	2,758,000
Environmental for Phase 4 GA	1,500,000	$118,500	150,000	300,000	2,068,500
Environmental for West Side	1,000,000	$79,000	100,000	200,000	1,379,000
Total Other Projects	***18,693,500***				***25,778,337***
Grand Total					**$148,402,423**

Notes:
FBO - Fixed Base Operator
FIS - Federal Immigration Services
RAC - Rent-a-Car
RON - Remain Overnight Aircraft Parking Positions
SRE - Snow Removal Equipment

As shown, the overall cost of the recommended improvements will exceed $148 million over the implementation period. To fund these projects, the Port will use a combination of FAA Airport Improvement Program (AIP) entitlement funds and discretionary grants, funds derived from airport lease agreements, and continued financial support from the Port. The funding sources that will serve as the airport's primary means to finance the projects are discussed in the following sections.

8.2.1 FAA AIP Grants

The Port receives annual grants from the FAA through the AIP. AIP grants can be either entitlement grants or discretionary grants. Entitlement grants are allocated using a formula based on the number of annual enplaned passengers at BLI. The FAA evaluates all airport grant requests using a priority ranking system that is weighted toward safety, security, airfield pavement, and airfield capacity projects. Other projects, such as the terminal building and general aviation development are also eligible under AIP but receive lower priority rankings. Within the entitlement amount, up to 90 percent of eligible project costs are funded for small-hub airports such as BLI with the remaining 10 percent required from other sources.

Table 8-2 shows the projects included that are eligible for AIP grants.

Table 8-2: Projects Eligible for AIP Grants

AIP Eligible Projects	Cost
New Right Angle Taxiways (Design)	$327,620
New Right Angle Taxiways (Construction)	$4,190,260
Runway Shoulders (Design)	$570,950
Runway Shoulders (Construction)	$7,302,451
Jet Engine Run-Up Area (Design and Construction)	$3,292,363
Perimeter Road Extension (Design)	$205,200
Perimeter Road Extension (Construction)	$2,624,508
SRE Building (Design and Construction)	$2,172,752
Realign Taxilanes H and J (Design)	$134,450
Realign Taxilanes H and J (Construction)	$1,719,616
Expand Terminal Apron (Design and Construction)	$6,065,532
Construct RON Spaces (Design and Construction)	$7,820,999
GA Area Phase 1 Site Preparation (Design)	$581,600
GA Area Phase 1 Site Preparation (Construction)	$7,438,664
Relocate the GA FIS Building	$1,116,990
GA Area Phase 2 Site Preparation (Design and Construction)	$6,466,131
Relocate RON Spaces (Design and Construction)	$15,091,087
Master Planning	$1,034,250
Environmental for Phase 4 GA	$2,068,500
Environmental for West Side	$1,379,000
Total AIP Eligible Projects	***$71,602,923***

BLI is also eligible to receive AIP discretionary grants. The approval of AIP discretionary funding for a project is dependent on an eligibility ranking method the FAA uses to award grants, at their discretion, based on a project's priority and importance to the national airport and airway system. Although BLI could receive some discretionary funding during the planning period for high priority, eligible projects, where the cost of such projects exceeds the Port's funding capability, this Implementation Plan is not reliant on such grants.

In addition to FAA funding under the AIP program, several projects involve the installation of new FAA facilities related to air traffic control and Navigational Aids. Table 8-3 shows these improvements. Any decisions regarding these projects will be made by FAA outside this master plan. They are included here for long range planning purposes. Should FAA determine that these projects meet their criteria, they will be funded by FAA. The decision to install any of these facilities will be made by FAA based on their assessment of demand levels.

Table 8-3: FAA Funded Projects

FAA Funded Projects	Project Costs
Relocate the ATCT	$6,895,000
Install an ASR	$1,379,000
ILS on Runway 34	$2,068,500
Total FAA Projects	***$10,342,500***

8.2.2 Port Funding

The Aviation Safety and Capacity Expansion Act of 1990 established the authority for commercial service airports to apply to the FAA for imposing a Passenger Facility Charge (PFC) of up to $3 per enplaned passenger. AIR-21, enacted in 2000, increased the allowable PFC level to $4.50. The proceeds from PFCs can be used for the local share of AIP eligible projects and for additional projects that preserve or enhance airport capacity, safety, or security; mitigate the effects of aircraft noise; or enhance airline competition. PFCs may also be used to pay debt service on bonds and other indebtedness incurred to carry out eligible projects. In addition, the Port can fund projects that aren't eligible under AIP through other means. Table 8-4 shows the projects that are anticipated to be funded by Port funds.

Table 8-4: Port Funded Projects

Port Funded Projects	Project Costs
Expand the Terminal Building	$24,954,384
Expand Auto Parking	$7,991,305
Relocate the GA Terminal	$1,985,760
Noise Study	$689,500
Total Port Projects	***$35,620,949***

8.2.3 Private Financing

Airports often rely on private financing for improvements that are to be used by a private business or otherwise could be seen as a potentially profitable business investment.

Projects of this kind include aircraft hangars, FBO facilities, cargo facilities, or exclusive aircraft parking aprons. Such projects are not eligible for Federal funding under the AIP. This implementation plan assumes that a private third-party will provide funding for development of aircraft hangars and the improvements needed to support such hangar development. These improvements will be done on airport property and the Port will receive annual revenue through land leases. Additionally, any private development will include provisions that the ownership of the facility will revert to the Port after an appropriate amortization period (generally 30 years). Should the Port decide to construct hangars themselves, it is assumed that they will lease them to aircraft owners at a rate that amortizes the cost of construction as well as the cost of borrowed money. In this case they are seen as neutral to the CIP, generating neither expense nor income.

Table 8-5 shows the projects that are anticipated to be privately funded.

Table 8-5: Privately Funded Projects

Privately Funded Projects	Project Costs
Relocate Existing GA T-Hangars	$6,043,468
Relocate Existing GA Corporate Hangars	$4,128,726
Construct FBO Facility	$620,550
Construct New T-Hangars	$9,397,885
Construct New Corporate Hangars	$15,471,925
Expand Fuel Storage Area	$2,758,000
RAC Facility	$2,758,000
Total Privately Funded Projects	***$1,178,554***

8.3 IMPLEMENTATION PLAN

The implementation plan that is shown in the following tables represents the planned phased development of the capital projects. While a reasonable degree of certainty is involved in creating this project schedule, various factors can be expected to cause schedule changes in the plan over time as follows:

- Financial Feasibility: The financial feasibility of projects may change due to changes in project costs, shifting of FAA priorities, or changes in the levels of FAA funding.
- Activity Levels: Activity levels trigger the need for all demand-driven improvements such as the terminal expansion and new hangar construction. Although the CIP attaches timeframes to these developments for scheduling purposes, they should not be constructed until demand materializes. Thus,

depending on how a particular segment of activity is tracking with the forecast, certain improvements may be accelerated or delayed.

- Changing Priorities: Over time, changes in airport business and strategic plans occur in response to the dynamic nature of the aviation industry as well as in the direction and policies of the airport's sponsoring body. Such changes will trigger revisions to or adjustments of the CIP.

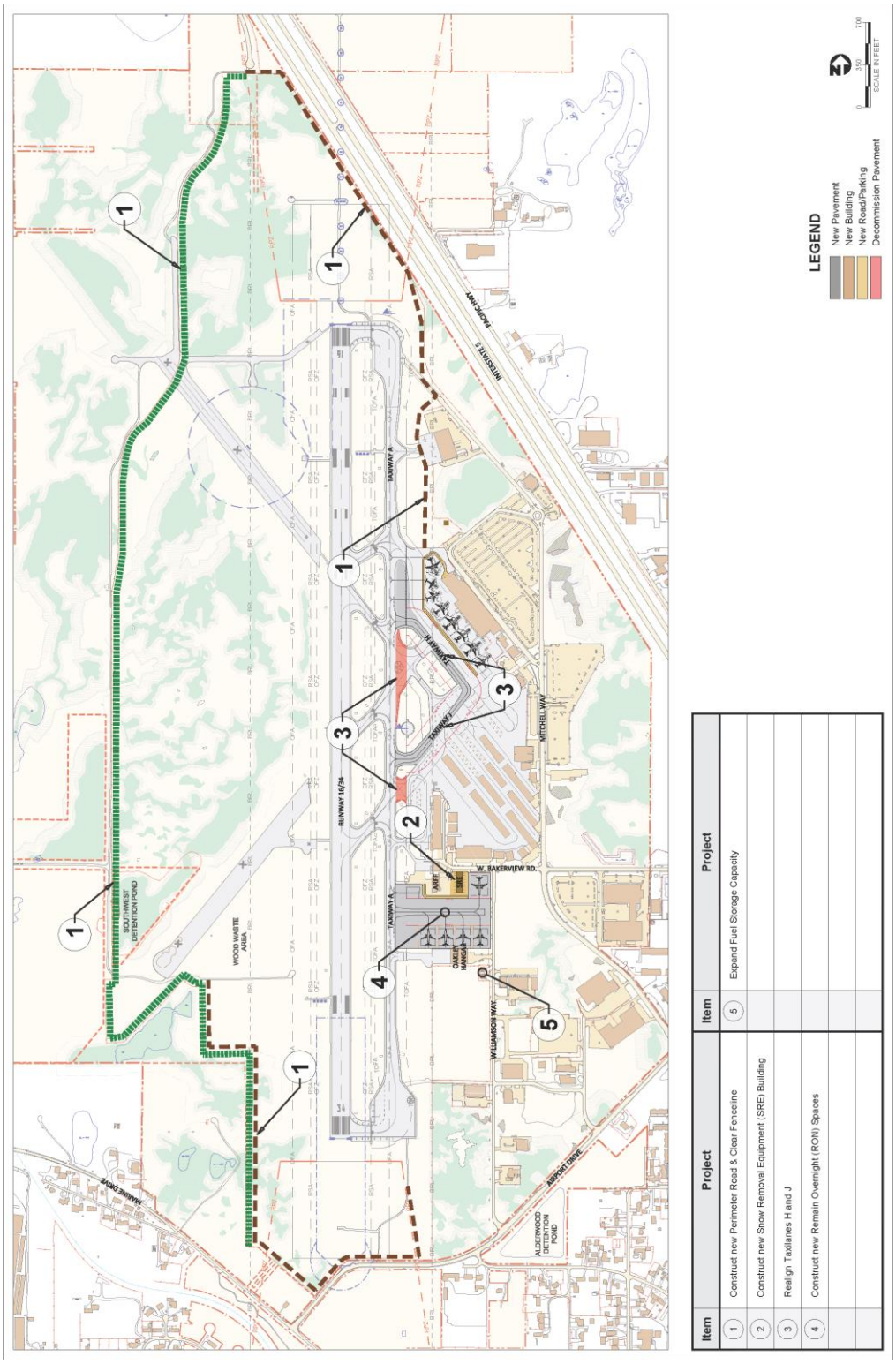
Table 8-6, Table 8-7 and Table 8-8 show the estimated cost of the Capital Improvement Projects. Figure 8-1, Figure 8-2, and Figure 8-3 identify the locations of the individual projects in numerical order. The Airport Layout Plan, presented in Chapter 7, Airport Layout Plan, incorporates all of the projects reflected in this Implementation Plan.

Table 8-6: Phase I Capital Improvement Projects

No.	Project Description	Cost	Funding Sources		
			Federal	Local	Private
Airfield Projects					
1	Perimeter Road Extension	$2,829,708	$2,546,737	$282,971	$0
2	SRE Building	$2,172,752	$1,955,477	$217,275	$0
Terminal Projects					
3	Realign Taxilanes H and J	$1,854,066	$1,668,659	$185,407	$0
4	Construct RON Spaces	$7,820,999	$7,038,899	$782,100	$0
5	Expand Fuel Storage Area	$2,758,000	$0	$0	$2,758,000
	Total Phase I CIP Projects	**$17,435,525**	**$13,209,772**	**$1,467,753**	**$2,758,000**

Priority No.:

1. The extension of the existing Perimeter Road to completely cover the airport's perimeter is eligible for 90 percent AIP funding and is shown as a 90/10 split.
2. The new Snow Removal Equipment (SRE) building will be funded using AIP funds at a 90/10 split.
3. The realignment of Taxiways H and J will be funded using AIP funds at a 90/10 split.
4. The construction of two RON spaces will be funded using AIP funds at a 90/10 split.
5. The expansion of the fuel storage capacity is assumed to be funded by private sources.



Item	Project
1	Construct new Perimeter Road & Clear Fenceline
2	Construct new Snow Removal Equipment (SRE) Building
3	Realign Taxilanes H and J
4	Construct new Remain Overnight (RON) Spaces
5	Expand Fuel Storage Capacity

Figure 8-1: Phase I Capital Improvements

Table 8-7: Phase II Capital Improvement Projects

No.	Project Description	Cost	Funding Sources		
			Federal	Local	Private
Airfield Projects					
1	New Right Angle Taxiways	$4,517,880	$4,066,092	$451,788	$0
2	Runway Shoulders	$7,873,401	$7,086,060	$787,340	$0
3	Jet Engine Run-Up Area	$3,292,363	$2,963,126	$329,236	$0
General Aviation Projects					
4	**GA Area Phase 1 Development**				
	- Grading	$501,267	$451,140	$50,127	$0
	- Stabilization	$2,506,333	$2,255,699	$250,633	$0
	- Pavement	$5,012,665	$4,511,399	$501,267	$0
	Relocate the GA terminal	$1,985,760	$0	$1,985,760	$0
	Relocate the GA FIS Building	$1,116,990	$1,005,291	$111,699	$0
	Relocate Existing GA T-Hangars	$6,043,468	$0	$0	$6,043,468
	Relocate Existing GA Corporate Hangars	$4,128,726	$0	$0	$4,128,726
Other Projects					
5	Master Planning	$1,034,250	$930,825	$103,425	$0
6	RAC Facility	$2,758,000	$0	$1,379,000	$1,379,000
7	Noise Study	$689,500	$0	$689,500	$0
	Total Phase II CIP Projects	**$41,460,603**	**$23,269,632**	**$6,639,775**	**$11,551,194**

Priority No.:

1. The construction of new right angle taxiways and the decommissioning of the existing angled exits is an AIP eligible project with a 90/10 split.
2. The paving of the runway shoulders is also an AIP project with a 90/10 split.
3. Building a jet run-up area will be an AIP project with a 90/10 split.
4. Preparing the GA area will be accomplished with a mixture of funds.
   a. Preparing the site and providing apron and taxiway areas are AIP eligible projects and they are assumed to be a 90/10 split.
   b. During the relocation of facilities, demolition of buildings is AIP eligible and will be funded at the 90/10 split.
   c. Relocating the GA terminal and FIS Facility will be Port funded activities.
   d. When relocating the GA hangars, the Port will negotiate with the owners to "buy out" their leases. After these negotiations are complete, the hangar owners will be offered new leases on which to build new hangar facilities. The actual construction of the hangars is shown to be a private investment.
5. It is assumed that by the mid-range timeframe a new master plan will be needed. This will be an AIP project with a 90/10 split.
6. The construction of a new consolidated Rent-A-Car (RAC) center will be funded by the Port and the RAC companies.
7. The noise study envisioned will be a follow up to the noise contour development included in the master plan. FAA does not support funding for this study so it will need to be 100% Port funded.

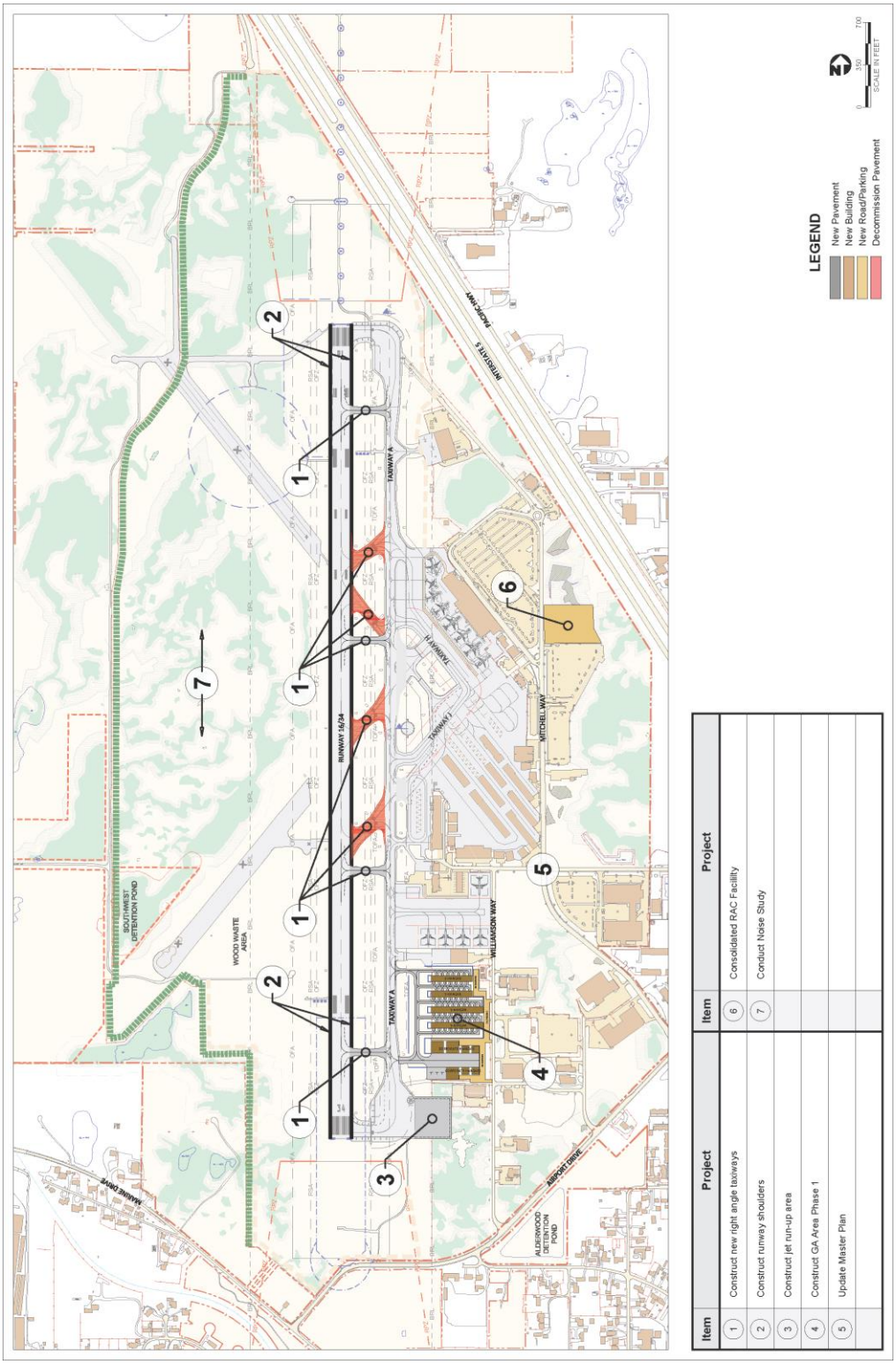


Figure 8-2: Phase II Capital Improvements

Table 8-8: Phase III Capital Improvement Projects

Priority No.	Project	Cost	Funding Sources		
			Federal	Local	Private
Terminal Projects					
1	Expand the Terminal Building	$24,954,384	$0	$24,954,384	$0
2	Expand Terminal Apron	$6,065,532	$5,458,978	$606,553	$0
3	Expand Auto Parking	$7,991,305	$0	$7,991,305	$0
General Aviation Projects					
4	**GA Area Phase 2 Development**				
	Prepare the Site	$6,466,131	$5,819,518	$646,613	$0
	Construct FBO Facility	$620,550	$0	$0	$620,550
	Construct New T-Hangars	$9,397,885	$0	$0	$9,397,885
	Construct New Corporate Hangars	$15,471,925	$0	$0	$15,471,925
Other Projects					
5	Relocate RON Spaces	$15,091,087	$13,581,978	$1,509,109	$0
6	Environmental for Phase 4 GA	$2,068,500	$1,861,650	$206,850	$0
7	Environmental for West Side	$1,379,000	$1,241,100	$137,900	$0
	Total Phase III CIP Projects	**$89,506,298**	**$27,963,224**	**$36,052,714**	**$25,490,360**

Priority No.:

1. Although portions of the terminal building are eligible for funding under the AIP, they are a low priority under FAA guidance. It is assumed that should expansion be necessary the cost would be financed using PFC and Port funds.
2. The expansion of the terminal apron will be an AIP project with a 90/10 split.
3. Expanding the auto parking areas will be a Port expense.
4. Preparing the GA area will be accomplished with a mixture of funds.
   a. Preparing the site and providing apron and taxiway areas are AIP eligible projects and they are assumed to be a 90/10 split.
5. Relocation of the RON spaces to the terminal apron is an AIP eligible project and will be funded using the 90/10 split.
6. The environmental work for Phase 4 GA development will only be initiated if general aviation demand levels indicate a need. If such a need exists the environmental work will be an AIP project with a 90/10 split.
7. The environmental work for West Side development will only be initiated if general aviation demand levels indicate a need. If such a need exists the environmental work will be an AIP project with a 90/10 split.

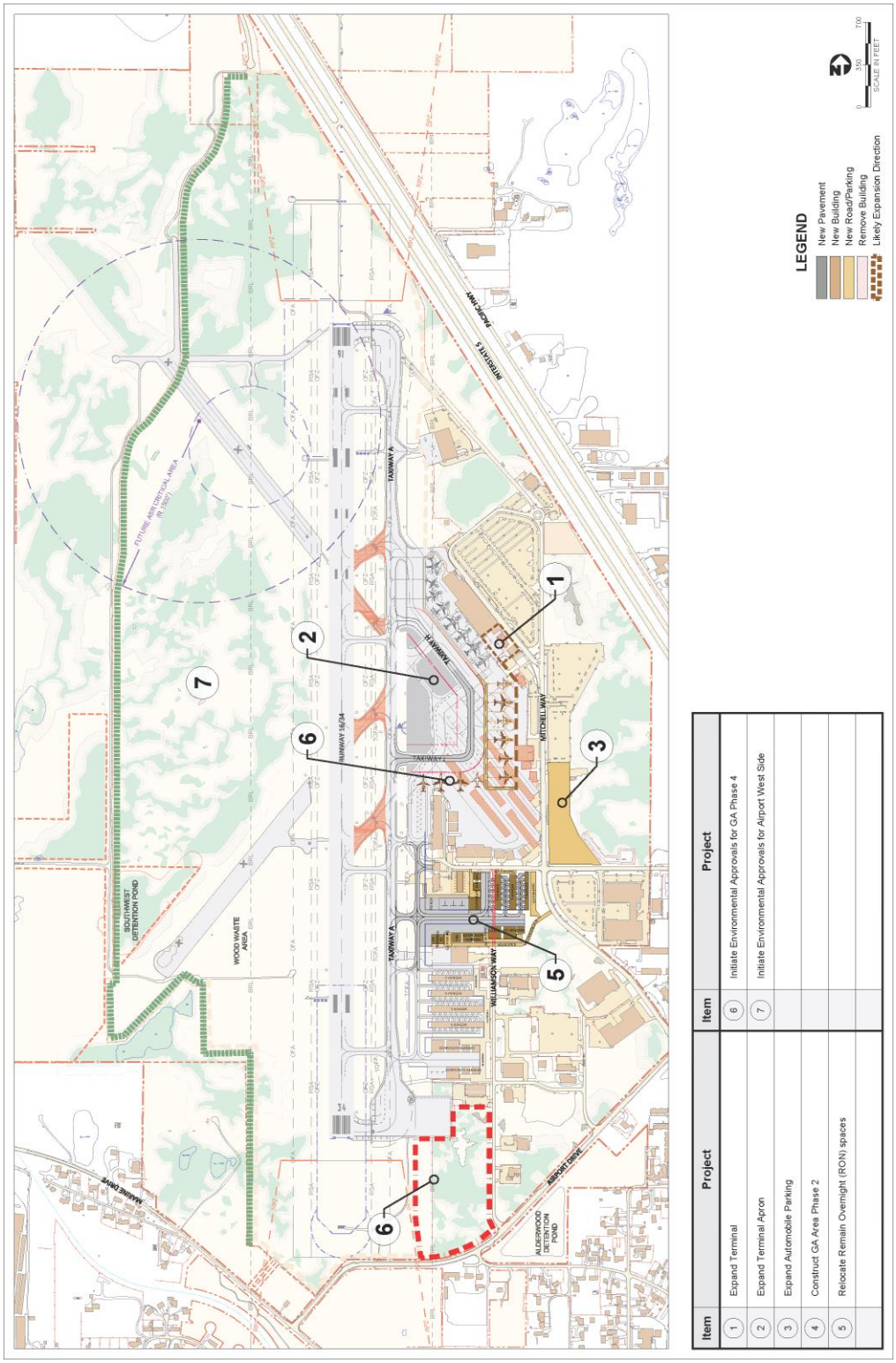
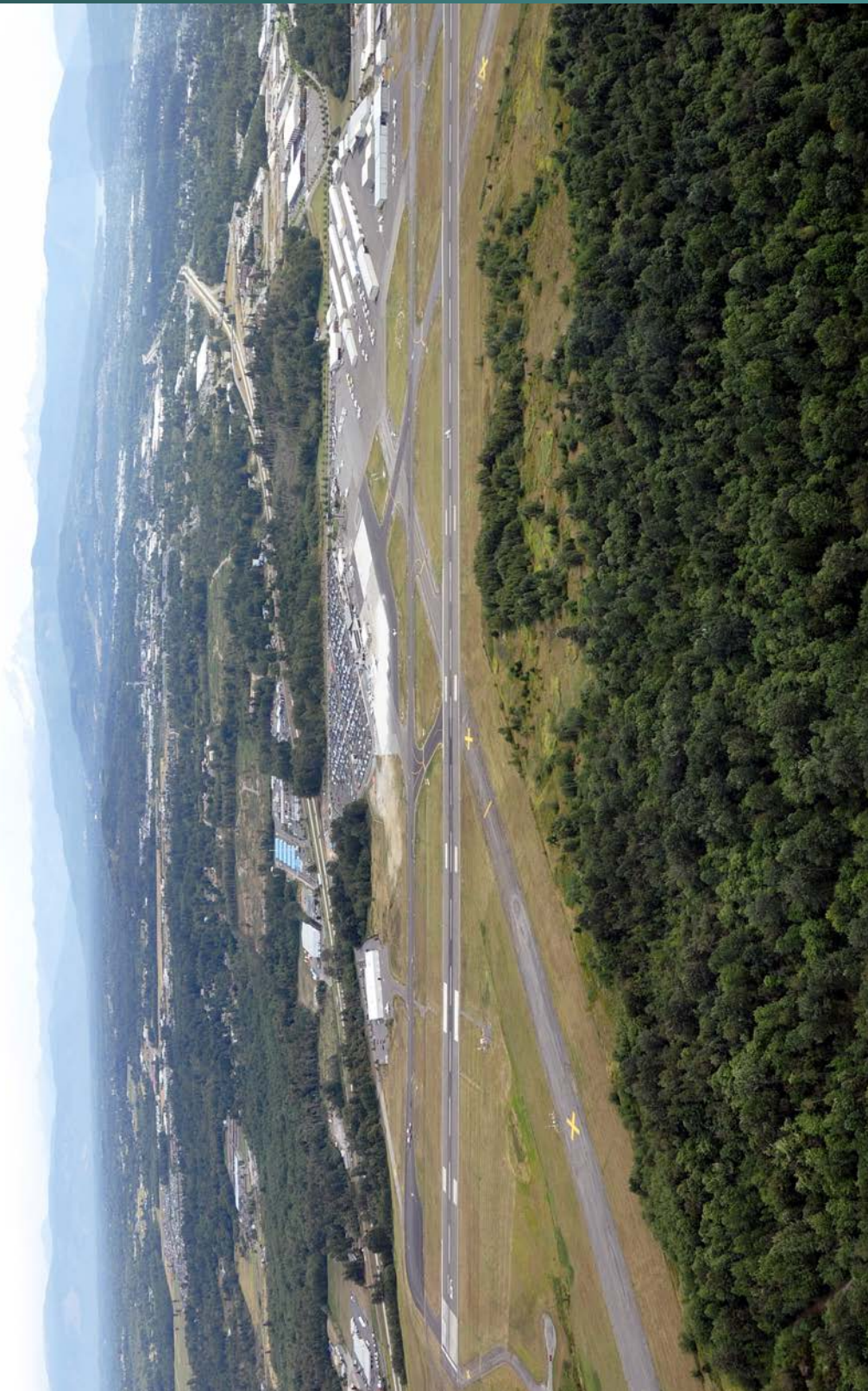


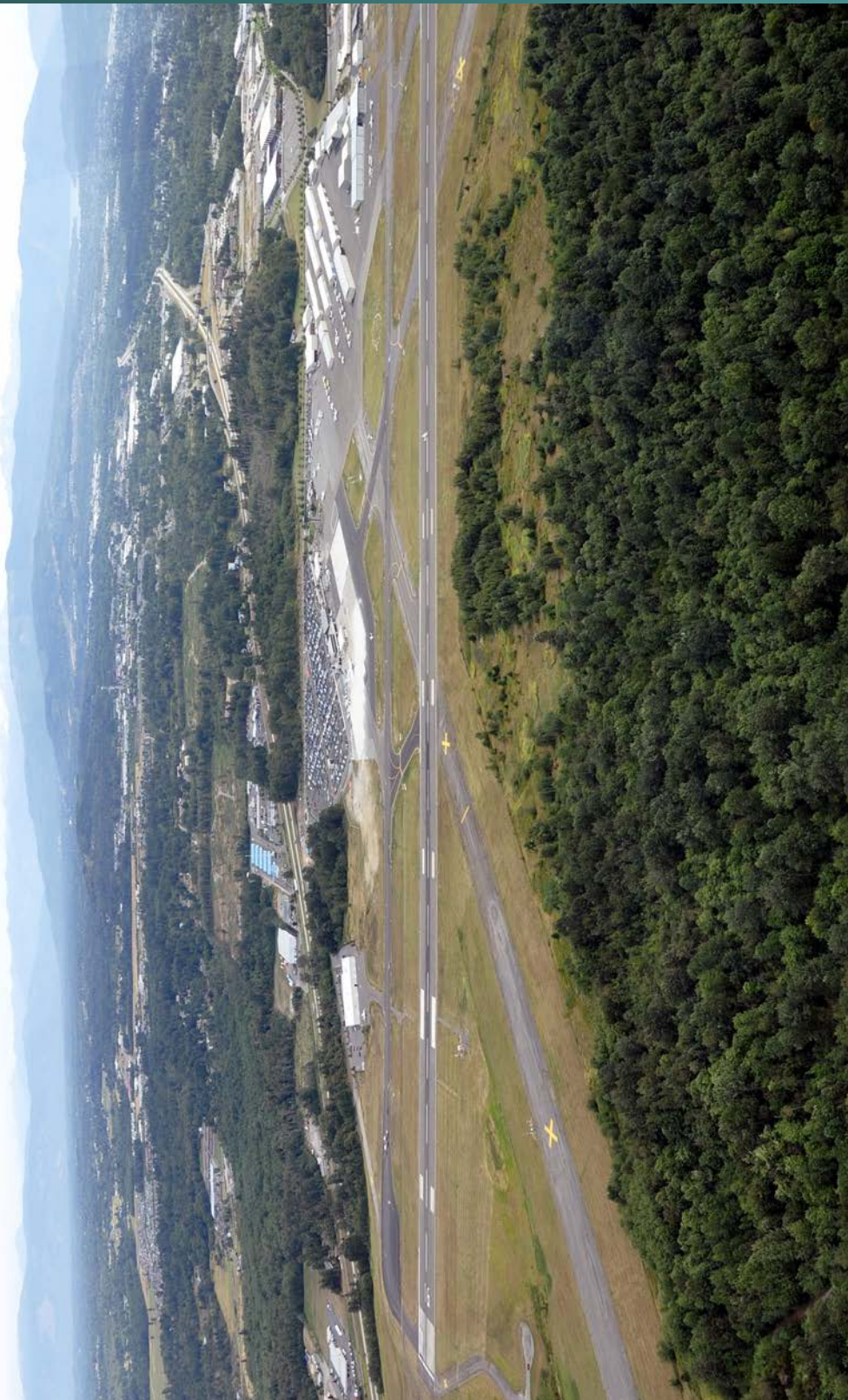
Figure 8-3: Phase III Capital Improvements

The preceding information depicts the phased development of BLI and includes all projects, regardless of the likely funding source. Table 8-9 shows the airport CIP including only those projects that are AIP eligible or are to be funded solely by the Port of Bellingham. This information is presented in the format preferred by FAA for capital improvement planning within the agency.

Table 8-9: Airport CIP

		Short Term					Intermediate Term					Long Term
Project	**Project Cost**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025 - 2031**
Construct RON Spaces (Design and Construction)	$7,820,999	$7,820,999										
SRE Building (Design and Construction)	$2,172,752		$2,172,752									
Perimeter Road Extension (Design and Construction)	$2,829,708			$2,829,708								
Realign Taxilanes H and J (Design)	$134,450				$134,450							
Realign Taxilanes H and J (Construction)	$1,719,616					$1,719,616						
Noise Study	$689,500						$689,500					
New Right Angle Taxiways (Design)	$327,620						$327,620					
New Right Angle Taxiways (Construction)	$4,190,260							$4,190,260				
Runway Shoulders (Design)	$570,950						$570,950					
Runway Shoulders (Construction)	$7,302,451							$7,302,451				
Jet Engine Run-Up Area (Design and Construction)	$3,292,363								$3,292,363			
GA Area Phase 1 Site Preparation (Design)	$581,600								$581,600			
GA Area Phase 1 Site Preparation (Construction)	$7,438,664									$7,438,664		
Relocate the GA Terminal	$1,985,760									$1,985,760		
Relocate the GA FIS Building	$1,116,990									$1,116,990		
Master Planning	$1,034,250										$1,034,250	
Expand the Terminal Building	$24,954,384											$24,954,384
Expand Terminal Apron	$6,065,532											$6,065,532
Expand Auto Parking	$7,991,305											$7,991,305
GA Area Phase 2 Site Preparation	$6,466,131											$6,466,131
Relocate RON Spaces	$15,091,087											$15,091,087
Environmental for Phase 4 GA	$2,068,500											$2,068,500
Environmental for West Side	$1,379,000											$1,379,000
Total Program	**$107,223,870**											
AIP Eligible Projects	$71,602,922	$7,820,999	$2,172,752	$2,829,708	$134,450	$1,719,616	$898,570	$11,492,711	$3,873,963	$8,555,654	$1,034,250	$31,070,249
Port Funded Projects	$35,620,949	$0	$0	$0	$0	$0	$689,500	$0	$0	$1,985,760	$0	$32,945,689
Total Project Costs	$107,223,870	$7,820,999	$2,172,752	$2,829,708	$134,450	$1,719,616	$1,588,070	$11,492,711	$3,873,963	$10,541,414	$1,034,250	$64,015,938
FAA Funding	$64,442,629	$7,038,899	$1,955,477	$2,546,737	$121,005	$1,547,654	$808,713	$10,343,440	$3,486,566	$7,700,089	$930,825	$27,963,224
Port Funding	$42,781,241	$782,100	$217,275	$282,971	$13,445	$171,962	$779,357	$1,149,271	$387,396	$2,841,325	$103,425	$36,052,714
FAA Eligible Projects	$64,442,629	$7,038,899	$1,955,477	$2,546,737	$121,005	$1,547,654	$808,713	$10,343,440	$3,486,566	$7,700,089	$930,825	$27,963,224
Available AIP Entitlements		$4,042,218	$4,281,300	$4,456,568	$4,631,836	$4,807,104	$4,982,372	$5,157,640	$5,332,907	$5,508,173	$5,683,440	$44,691,569
Annual Difference		($2,996,681)	$2,325,823	$1,909,831	$4,510,831	$3,259,450	$4,173,659	($5,185,800)	$1,846,340	($2,191,916)	$4,752,615	$16,728,345
Cumulative Difference			($670,858)	$1,238,973	$5,749,804	$9,009,253	$13,182,913	$7,997,113	$9,843,453	$7,651,537	$12,404,153	$29,132,498





A

A GLOSSARY

A.1 ABBREVIATIONS/ACRONYMS

AC - Advisory Circular

ADF - Automatic Direction Finder

ADPM - Average Day of the Peak Month

AGL - Above Ground Level

AIP - Airport Improvement Program

ALP - Airport Layout Plan

ALS - Approach Lighting System

ALSF-1 - Approach Light System with Sequence Flasher Lights

ARC - Airport Reference Code

ARFF - Airport Rescue and Fire Fighting

ARP - Airport Reference Point

ARTCC - Air Route Traffic Control Center

ASDA - Accelerate-Stop Distance Available

ASO - Airport Safety Overlay Zone

ASR - Airport Surveillance Radar

ASV - Annual Service Volume

ATC - Air Traffic Control

ATCT - Airport Traffic Control Tower

AVGAS - Aviation Gasoline

BLI - Bellingham International Airport

CBP - Customs and Border Patrol

CIP - Capital Improvement Program

CL - Centerline

dBA - A-weighted Decibels

DH - Decision Height

DME - Distance Measuring Equipment

DNL - Day-Night Sound Levels

EA - Environmental Assessment

EIS - Environmental Impact Statement

EPA - The United States Environmental Protection Agency

FAA - Federal Aviation Administration

FAR - Federal Aviation Regulation

FBO - Fixed Based Operator

FIS - Federal Inspection Service

FSS - Flight Service Station

GA - General Aviation

GPS - Global Positioning System

IFR - Instrument Flight Rules

ILS - Instrument Landing System

INM - Integrated Noise Model

LATS - Washington State Department of Transportation – Aviation Division's Long-term Air Transportation Study.

LDA - Landing Distance Available

MALS - Medium-Intensity Approach Light System

MALSF - Medium-Intensity Approach Light System with sequence flashing Lights

MALSR - Medium-Intensity Approach Lighting System with Runway Alignment Indicators

MGW - Maximum Gross Weight

MIRL - Medium-Intensity Runway Lights

MSL - Mean Sea Level

NAVAID - Air Navigation Facility/Aid

NDB - Non-Directional Beacon

NPIAS - National Plan of Integrated Airport Systems

OFA - Object-Free Area

OFZ - Obstacle-Free Zone

PAPI - Precision Approach Path Indicator

PORT - Port of Bellingham

RAIL - Runway Alignment Indicator Lights

REIL - Runway End Identifier Lights

RSA - Runway Safety Area

RPZ - Runway Protection Zone

TAF - FAA Terminal Area Forecasts

TODA - Take-Off Distance Available

TORA - Take-Off Run Available

UHF - Ultra High Frequency

VASI - Visual Approach Slope Indicator

VFR - Visual Flight Rules

VHF - Very High Frequency

A.2 DEFINITIONS

Activity - Used in aviation to refer to any kind of movement; e.g., cargo flights, passenger flights, or passenger enplanements. Without clarification, it has no particular meaning.

ADF - Automatic Direction Finder.

Advisory Circular (AC) - A series of Federal Aviation Administration (FAA) publications providing guidance and standards for the design, operation, and performance of aircraft and airport facilities.

AGL - Above Ground Level.

Airport Improvement Program (AIP) - A congressionally mandated program through which the FAA provides funding assistance for the development and enhancement of airport facilities.

Air Cargo - Commercial freight, including express packages and mail, transported by passenger or all-cargo airlines.

Air Carrier - An airline providing scheduled air service for the commercial transport of passengers or cargo.

Air Navigation Facility (NAVAID) - Although generally referring to electronic radio wave transmitters (VOR, NDB, and ILS), it also includes any structure or mechanism designed to guide or control aircraft involved in flight operations.

Air Route Traffic Control Center (ARTCC) - FAA-manned facility established to provide air traffic control services to aircraft operating in controlled airspace, en route between terminal areas. Although designed to handle aircraft operating under IFR conditions, some advisory services are provided to participating VFR aircraft when controller work loads permit.

Air Taxi - An air carrier certificated in accordance with FAR Part 135 and authorized to provide, on demand, public transportation of persons and property by aircraft. Air taxi operators generally operate small aircraft "for hire" for specific trips.

Aircraft Approach Category - A grouping of aircraft based on a speed of 1.3 times the stall speed in the landing configuration at maximum gross landing weight. The aircraft approach categories are:

Category A - Speed less than 91 knots;

Category B - Speed 91 knots or more but less than 121 knots;

Category C - Speed 121 knots or more but less than 141 knots;

Category D - Speed 141 knots or more but less than 166 knots; and

Category E - Speed 166 knots or more.

Aircraft Mix - The classification of aircraft into groups that are similar in size, noise, and operational characteristics.

Aircraft Operations - The airborne movement of aircraft. There are two types of operations, local and itinerant, defined as follows:

1. Local Operations are performed by aircraft that:

   (a) Operate in the local traffic pattern or within sight of the airport;

   (b) Are known to be departing for or arriving from a local practice area.

2. Itinerant operations are all others.

Airfield - A defined area on land or water including any buildings, installations, and equipment intended to be used either wholly or in part for the arrival, departure, or movement of aircraft.

Airplane Design Group - A grouping of airplanes based on wingspan. The groups are:

Group I:	Up to, but not including, 49 feet
Group II:	49 feet up to, but not including, 79 feet
Group III:	79 feet up to, but not including, 118 feet
Group IV:	118 feet up to, but not including, 171 feet
Group V:	171 feet up to, but not including, 214 feet
Group VI:	214 feet up to, but not including, 262 feet

Airport Layout Plan (ALP) - An FAA required map of an airport depicting existing and proposed facilities and uses, with clearance and dimensional information showing compliance with applicable standards.

Airport Reference Code (ARC) - A coding system used to relate airport design criteria to the operational and physical characteristics of the airplanes intended to operate at the airport. It is a combination of the aircraft approach category and the airplane design group.

Airport Reference Point (ARP) - The location at which the designated latitude and longitude for an airport are measured.

Airport Service Area - The geographic area that generates demand for aviation services at an airport.

Airport Surveillance Radar (ASR) - Radar providing position of aircraft by azimuth and range data without elevation data. It is designed for a range of approximately 50 miles.

Airport Traffic Area - Unless otherwise specifically designated, that airspace with a horizontal radius of five statute miles from the geographic center of any airport at which a control tower is operating, extending from the surface up to, but not including, 3,000 feet above the surface.

Airside - That portion of the airport facility where aircraft movements take place, airline operations areas, and areas that directly serve the aircraft (taxiway, runway, maintenance, and fueling areas). Also called the airport operations area.

Airspace - The area above the ground in which aircraft travel. It is divided into corridors, routes, and restricted zones for the control and safety of aircraft.

All-Cargo Carrier - An air carrier certificated in accordance with FAR Part 121 to provide scheduled air freight, express, and mail transportation over specific routes, as well as the conduct of nonscheduled operations that may include passengers.

Ambient Noise Level - Background noise level, exclusive of the contribution made by aircraft.

Annual Service Volume (ASV) - A reasonable estimate of an airport's annual capacity. It accounts for differences in runway use, aircraft mix, weather conditions, etc., that would be encountered over a year's time.

Approach End of Runway - The near end of the runway as viewed from the cockpit of a landing aircraft.

Approach Surface - An imaginary surface longitudinally centered on the extended runway centerline and extending outward and upward from each end of the primary surface. An approach surface is applied to each end of the runway based upon the planned approach. The inner edge of the approach surface is the same width as the primary surface and expands uniformly depending upon the planned approach.

Approved Instrument Approach - Instrument approach meeting the design requirements, equipment specifications, and accuracies, as determined by periodic FAA flight checks, and which are approved for general use and publication by the FAA.

Apron - A defined area where aircraft are maneuvered and parked and where activities associated with the handling of flights can be carried out.

ARFF - Aircraft Rescue and Fire Fighting.

ATC - Air Traffic Control.

ATCT - Airport Traffic Control Tower.

AVGAS - Aviation gasoline. Fuel used in reciprocating (piston) aircraft engines. Avgas is manufactured in the following grades; 80/87, 100LL, 100/130, and 115/145.

Avigation Easement - A form of limited property right purchase that establishes legal land-use control prohibiting incompatible development of areas required for airports or aviation-related purposes.

Based Aircraft - Aircraft stationed at an airport on an annual basis.

BRL - Building Restriction Line.

Capacity - A measure of the maximum number of aircraft operations that can be accommodated on the airport component in an hour.

Capital Improvement Program (CIP) - A scheduled of planned projects and costs, often prepared and adopted by public agencies.

CAT I (one) - Category I Instrument Landing System that provides for approach to a height above touchdown of not less than 200 feet and with Runway Visual Range of not less than 1,800 feet.

CAT II (two) - Category II ILS approach procedure that provides for approach to a height above touchdown of not less than 100 feet and a RVR of not less than 1,200 feet.

CAT III (three) - Category III ILS approach that provides for an approach with no decision height and a RVR of not less than 700 feet.

Ceiling - The height above the ground of the base of the lowest layer of clouds or obscuring phenomena aloft that is reported as broken or overcast and not classified as scattered, thin, or partial. Ceiling figures in aviation weather reports may be determined as measured, estimated, or indefinite.

Circling Approach - An instrument approach procedure in which an aircraft executes the published instrument approach to one runway, the maneuvers visually to land on a different runway. Circling approaches are also used at airports that have published instrument approaches with a final approach course that is not aligned within 30 degrees of any runway.

Clear Zone - See Runway Protection Zone

Clearway - A clearway is an area available for the continuation of the take-off operation that is above a clearly defined area connected to and extending beyond the end of the runway. The area over which the clearway lies need not be suitable for stopping aircraft in the event of an aborted take-off. Clearways are applicable only in the take-off operations of turbine-engined aircraft.

Commuter Air Carrier - An air carrier certificated in accordance with FAR Part 135, which operates aircraft with a maximum of 60 seats and provides at least five scheduled round trips per week between two or more points, or carries mail.

Commuter/Air Taxi Operations - Those arrivals and departures performed by air carriers certificated in accordance with FAR Part 135.

Conical Surface - An imaginary surface extending outward and upward from the periphery of the horizontal surface at a slope of 20:1 for a horizontal distance of 4,000 feet.

Control Areas - These consist of the airspace designated as Federal Airways, additional Control Areas, and Control Area Extensions, but do not include the Continental Control Areas.

Control Tower - A central operations facility in the terminal air traffic control system consisting of a tower cab structure using air/ground communications and/or radar, visual signaling, and other devices to provide safe and expeditious movement of air traffic.

Control Zones - Areas of controlled airspace that extend upward from the surface and terminate at the base of the continental control area. Control zones that do not underlie the continental control area have no upper limit. A control zone may include one or more airports and is normally a circular area with a radius of five statute miles and any extensions necessary to include instrument departure and arrival paths.

Controlled Airspace - Airspace designated as continental control area, control area, control zone, or transition area within which some or all aircraft may be subject to air traffic control.

Critical Aircraft - The aircraft which controls one or more design items based on wingspan, approach speed, and/or maximum certificated takeoff weight. The same aircraft may not be critical to all design items.

Crosswind - When used concerning wind conditions, the word means a wind not parallel to the runway or the path of an aircraft.

dBA - Decibels measured on the A-weighted scale to factor out anomalies.

Decision Height (DH) - During a precision approach, the height (or altitude) at which a decision must be made to either continue the approach or execute a missed approach.

Declared Distances - The distances the airport owner declares available and suitable for satisfying an airplane's take-off distance, accelerated-stop distance, and landing distance requirements. The distances are:

- **Take-off run available (TORA)** - The runway length declared available and suitable for the ground run of an airplane taking off.
- **Take-off distance available (TODA)** - The TORA plus the length of any remaining runway and/or clearway (CWY) beyond the far end of the TORA.
- **Accelerate-stop distance available (ASDA)** - The runway plus stopway (SWY) length declared available and suitable for the acceleration and deceleration of an airplane aborting take-off.

- **Landing distance available (LDA)** - The runway length declared available and suitable for a landing airplane.

Design Hour - The design hour is an hour close to the peak but not the absolute peak, which is used for airport planning and design purposes. It is usually the peak hour of the average day of the peak month.

Displaced Threshold - Actual touchdown point on specific runways designated due to obstructions that make it impossible to use the actual physical runway end.

Distance Measuring Equipment (DME) - An airborne instrument that indicates the distance the aircraft is from a fixed point, usually a VOR station.

DOT - U. S. Department of Transportation.

Effective Runway Gradient - The maximum difference between runway centerline elevations divided by the runway length, expressed as a percentage.

Eminent Domain - Right of the government to take property from the owner, upon compensation, for public facilities or other purposes in the public interest.

Environmental Assessment (EA) - A report prepared under the National Environmental Policy Act (NEPA), analyzing the potential environmental impacts of a federally funded project.

Environmental Impact Statement (EIS) - A report prepared under NEPA, fully analyzing the potential significant environmental impacts of a federally funded project.

EPA - The United States Environmental Protection Agency.

FAR Part 77 - Federal Aviation Regulations that establish standards for determining obstructions in navigable airspace.

Federal Aviation Administration (FAA) - A branch of the U.S. Department of Transportation responsible for the regulation of all civil aviation activities.

Fixed Base Operator (FBO) - An individual or company located at an airport providing commercial general aviation services.

Final Approach - The flight path of an aircraft that is inbound to the airport on an approved final instrument approach course, beginning at the point of interception of that course and extending to the airport or the point where circling for landing or missed approach is executed.

Fixed Wing - For the purposes of this report, any aircraft not considered rotorcraft.

Flight Plan - A description or outline of a planned flight that a pilot submits to the FAA, usually through a Flight Service Station.

Flight Service Station (FSS) - Air traffic facility operated by the FAA to provide flight service assistance such as pilot briefing, en route communications, search and rescue assistance, and weather information.

General Aviation - All civil aviation operations other than scheduled air services and non-scheduled air transport operations for remuneration or hire.

Global Positioning System (GPS) - GPS uses a group of many satellites orbiting the earth to determine the position of users on or above the earth's surface. This system will provide at least non-precision approach capability to any airport having published instrument approach procedures.

HIRL - High-Intensity Runway Lights.

Horizontal Surface - A horizontal plane 150 feet above the established airport elevation, the perimeter of which is constructed by swinging arcs with a radius of 5,000 feet for all runways designated as utility or general; and 10,000 feet for all other runways from the center of each end of the primary surface and connecting the adjacent arc by tangent lines.

Instrument Flight Rules (IFR) - These rules govern the procedures for conducting instrument flight. Pilots are required to follow these rules when operating in controlled airspace with visibility of less than three miles and/or ceiling lower than 1,000 feet.

Instrument Landing System (ILS) - ILS is designed to provide an exact approach path for alignment and descent of aircraft. Generally consists of a localizer, glide slope, outer marker, middle marker, and approach lights. This type of precision instrument system is being replaced by Microwave Landing Systems (MLS).

Instrument Runway - A runway equipped with electronic and visual navigation aids for which a precision or non-precision approach procedure having straight-in landing minimums has been approved.

Itinerant Operation - All aircraft operations at an airport other than local.

Local Operation - Aircraft operation in the traffic pattern or within sight of the tower, or aircraft known to be departing or arriving from flight in local practice areas, or aircraft executing practice instrument approaches at the airport.

Mean Sea Level (MSL) - Elevation above Mean Sea Level.

Medium-Intensity Approach Lighting (MALSR) - This system includes runway alignment indicator lights. An airport lighting facility that provides visual guidance to landing aircraft.

Minimums - Weather condition requirements established for a particular operation or type of operation.

MIRL - Medium-Intensity Runway Lights.

Movement Area - The runways, taxiways, and other areas of the airport used for taxiing, takeoff and landing of aircraft, exclusive of loading ramps and parking areas.

Navigational Aid (NAVAID) - Any visual or electronic device, airborne or on the surface that provides point-to-point guidance information or position data to aircraft in flight.

Non-Directional Beacon (NDB) - Transmits a signal on which a pilot may "home" using equipment installed in the aircraft.

Non-Precision Instrument Approach - An instrument approach procedure with only horizontal guidance or area-type navigational guidance for straight-in approaches.

Object Free Area (OFA) - A two-dimensional ground area surrounding runways, taxiways, and taxilanes that is clear of objects except those whose location is fixed by function.

Object Free Zone (OFZ) - The airspace defined by the runway OFZ and, as appropriate, the inner-approach OFZ and the inner-transitional OFZ, which is clear of object penetrations other than frangible NAVAIDS.

- **Runway OFZ** - The airspace above a surface centered runway centerline.
- **Inner-approach OFZ** - The airspace above a surface centered on the extended runway centerline. It applies to runways with an approach lighting system.
- **Inner-transitional OFZ** - The airspace above the surfaces located on the outer edges of the runway OFZ and the inner-approach OFZ. It applies to precision instrument runways.

Obstruction - An object that penetrates an imaginary surface described in FAR Part 77.

Peaking Factor - The factor applied to the annual operations to determine the peak-hour activity.

Precision Approach Path Indicator (PAPI) - Provides visual approach slope guidance to aircraft during approach to landing by radiating a directional pattern of high intensity focused light beams.

Precision Instrument Approach - An instrument approach procedure in which electronic vertical and horizontal guidance is provided; e.g. ILS.

Primary Surface - A surface longitudinally centered on the runway, extending 200 feet beyond each end of the runway. The elevation of any point on the primary surface is the same as the elevation of the nearest point on the runway centerline.

Rotorcraft (e.g. Helicopter) - A heavier-than-air aircraft supported in flight by the reactions of the air on one or more power-driven rotors on substantially vertical axis.

Runway End Identifier Lights (REIL) - These lights aid in early identification of the approach end of the runway.

Runway Protection Zone (RPZ) - The ground area under the approach surface which extends from the primary surface to a point where the approach surface is fifty feet above the ground. This was formerly known as the clear zone.

Runway Safety Area (RSA) - A defined surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway.

Segmented Circle - A system of visual indicators designed to provide traffic pattern information at airports without operating control towers.

Touch and Go Operation - Practice flight performed by a landing touch down and continuous take off without stopping or exiting the runway.

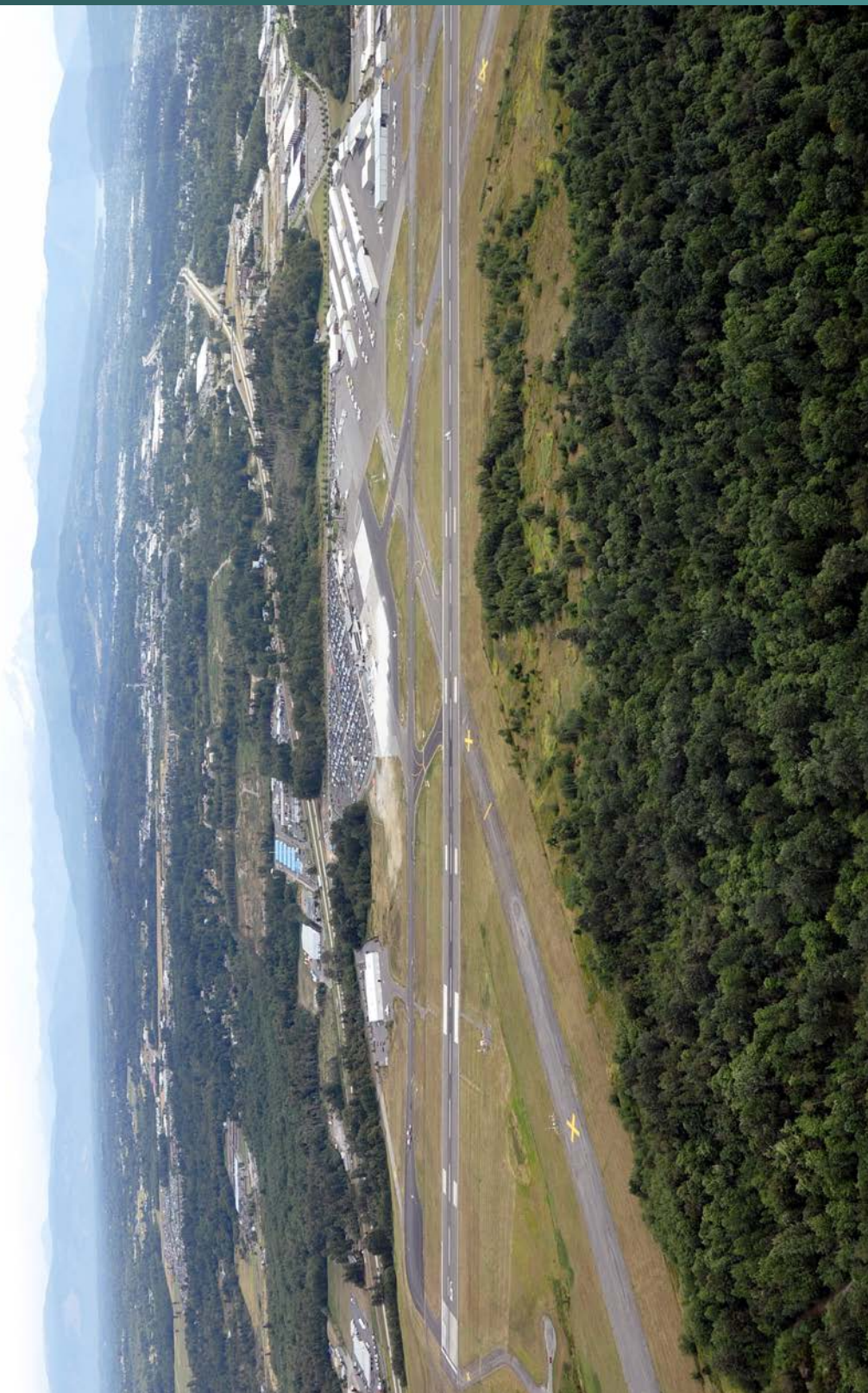
Transitional Surfaces - These surfaces extend outward and upward at right angles to the runway centerline and the extended runway centerline at a slope of 7:1 from the sides of the primary surface and from the sides of the approach surfaces. Transitional surfaces for those portions of a precision approach surface which project through and beyond the limits of the conical surface extend a distance of 5,000 feet measured horizontally from the edge of the approach surface and at right angles to the runway centerline.

VASI - Visual Approach Slope Indicator. See definition of PAPI.

Visual Flight Rules (VFR) - Flight rules by which aircraft are operated by visual reference to the ground. Weather conditions for flying under these rules must include a ceiling greater than 1,000 feet, three-miles visibility, and standard cloud clearance.

Wind Coverage - Wind coverage is the percent of time for which aeronautical operations are considered safe due to acceptable crosswind components.

Wind Rose - A scaled graphical presentation of wind information.



B

B AIRPORT LAYOUT PLAN CHECKLIST

From AC 150/5070-6B Appendix F

(incl. Chg. 1, 5/1/07)

The following list provides general guidelines in preparing the Airport Layout Plan drawing set. The individual sheets that comprise the Airport Layout Plan drawing set will vary with each planning effort. Since these checklists are comprehensive, not all items will be applicable to a specific project.

Drawing	Yes	No	N/A	Remarks
1. AIRPORT LAYOUT DRAWING				
a. Sheet size – Minimum 24” x 36”	X			
b. Scale –Within a range of 1” = 200’ to 1” = 600’	X			
c. North Arrow				
1) True and Magnetic North	X			
2) Year of the magnetic declination	X			
3) Orient drawing so that north is to the top or left of the sheet	X			
d. Wind Rose				
1) Data source and the time period covered	X			
2) Include individual and combined coverage for:				
a) Runways with 10.5 knots crosswind	X			
b) Runways with 13 knots crosswind	X			
c) Runways with 16 knots crosswind	X			
d) Runways with 20 knots crosswind	X			
e. Airport Reference Point (ARP) – Existing and ultimate, with latitude and longitude to the nearest second based on NAD 83	X			
f. Ground contours at intervals of 2’ to 10’, lightly drawn	X			
g. Elevations (Existing and Ultimate to 1/10 of a foot)				
1) Runway	X			
2) Displaced thresholds		X		There are no displaced thresholds

Drawing	Yes	No	N/A	Remarks
3) Touchdown zones	X			
4) Intersections		X		There are no runway intersections
5) Runway high and low points	X			
6) Roadways where they intersect the RPZ edges and extended runway centerlines	X			
7) Structures on Airport--If a terminal area plan is not included, show structure top elevations on this sheet.	X			
h. Building limit lines – Show on both sides of the runways and extend to the airport property line or RPZ.	X			
i. Runway Details (Existing and Ultimate)				
1) Dimensions – length and width within the outline of the runway	X			
2) Orientation – Runway end numbers and true bearing to the nearest 0.01 degree	X			
3) Markings	X			
4) Lighting – Threshold lights only	X			
5) Runway Safety Areas--Dimensions may be included in the Runway Data Table	X			No displaced thresholds
6) End Coordinates – Note near end (existing and ultimate) of each runway end, to nearest 0.01 second	X			
7) Displaced threshold coordinates, to the nearest 0.01 second		X		No displaced threshold
8) Declared Distances – For each runway direction if applicable. Identify any clearway/stopway portions in the declared distances		X		Declared distances no applicable
j. Taxiway details (Existing and Ultimate)				
1) Taxiway widths and separations from the runway centerlines, parallel taxiway, aircraft parking, and objects	X			
k. RPZ Details (Existing and Ultimate)				
1) Dimensions	X			
2) Type of property acquisition (fee or easement)	X			
l. Approach slope ratio (20:1; 34:1; 50:1)	X			
m. Airport Data Table (Existing and Ultimate)				
1) Airport elevation (MSL)	X			

Drawing	Yes	No	N/A	Remarks
2) Airport Reference Point data	X			
3) Mean maximum temperature	X			
4) Airport Reference Code for each runway	X			
5) Design Aircraft for each runway or airfield component	X			
n. Runway Data Table (Existing and Ultimate)				
1) Percent effective gradient	X			
2) Percent wind coverage	X			
3) Maximum elevation above MSL	X			
4) Runway length and width	X			
5) Runway surface type	X			
6) Runway strength	X			
7) FAR Part 77 approach category	X			
8) Approach type	X			
9) Approach slope	X			
10) Runway lighting (HIRL, MIRL, LIRL)	X			
11) Runway marking	X			
12) Navigational and visual aids	X			
13) RSA dimensions	X			
o. Title and Revision Blocks				
1) Name and location of the airport	X			
2) Name of preparer	X			
3) Date of drawing	X			
4) Drawing title	X			
5) Revision block	X			
6) FAA disclaimer	X			
7) Approval block	X			
p. Other				
1) Standard legend	X			
2) Existing and Ultimate airport facility and building list	X			
3) Location map	X			
4) Vicinity map	X			

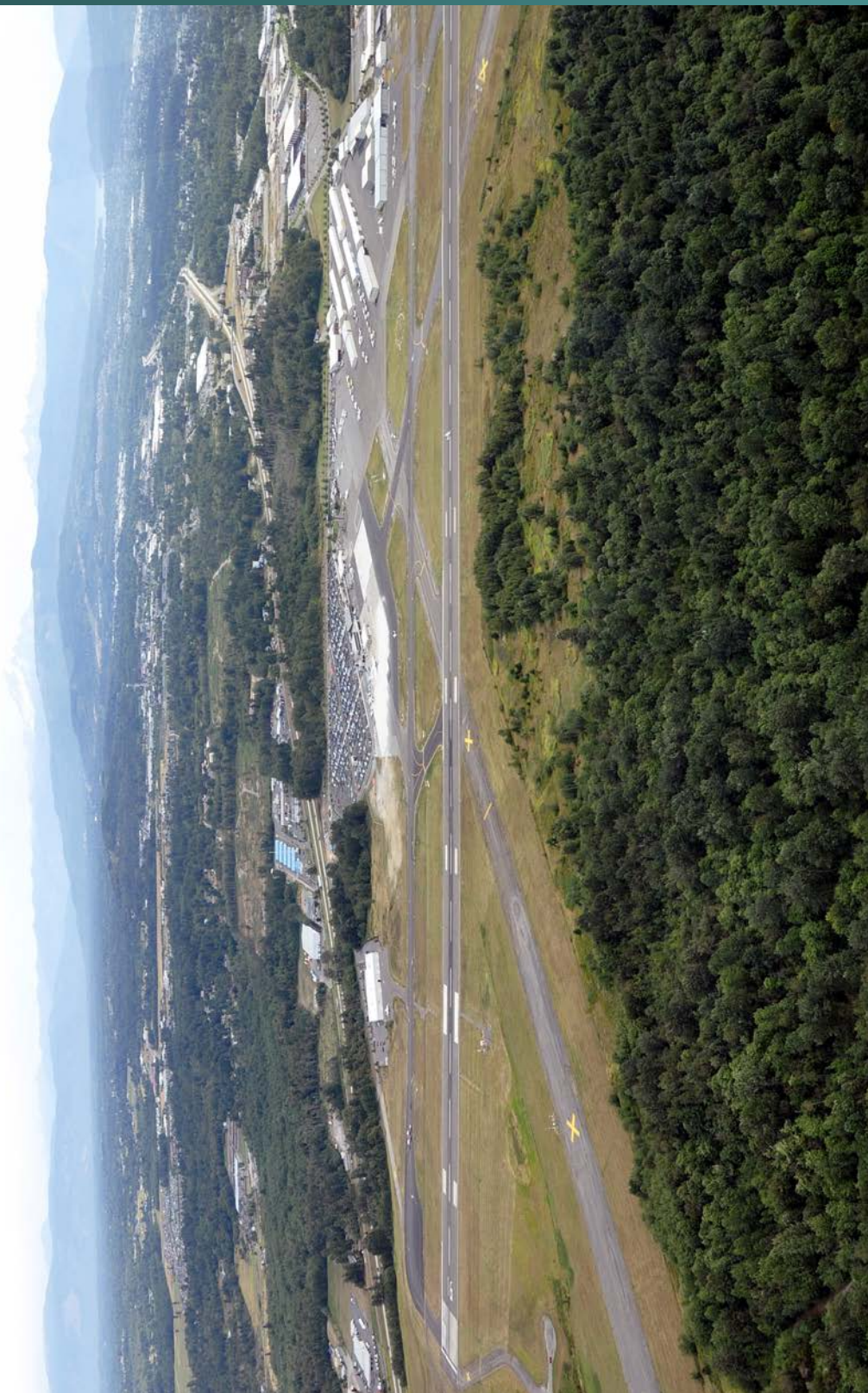
Drawing	Yes	No	N/A	Remarks
2. AIRPORT AIRSPACE DRAWING				
a. Plan view of all FAR Part 77 surfaces, based on ultimate runway lengths	X			
b. Small scale profile views of existing and ultimate approaches	X			
c. Obstruction data tables, as appropriate	X			
d. Sheet size – same as the airport layout drawing	X			
e. Scale – 1” = 2,000’ for the plan view; 1” = 1,000’ for approach profiles; and 1” = 100’ (vertical) for approach profiles	X			VERTICAL SCALE = 1:200
f. Title and revision blocks - same as the airport layout drawing	X			
g. Approach Plan View Details				
1) USGS for base map	X			
2) Show runway end numbers	X			
3) Include 50’ elevation contours on all slopes	X			
4) Show the most demanding surfaces with solid lines and others with dashed lines	X			
5) Identify top elevations of objects that penetrate any of the surfaces. For objects in the inner approach, add note “See inner portion of the approach plan view for close-in obstructions.”	X			
6) For precision instrument runways, show balance of 40,000’ approach on a separate sheet.	X			
h. Approach Profile Details				
1) Depict the ground profile along the extended runway centerline representing the composite profile, based on the highest terrain across the width and along the length of the approach surface.	X			
2) Identify all significant objects (roads, rivers, and so forth) and top elevations within the approach surfaces, regardless of whether or not they are obstructions	X			
3) Show existing and ultimate runway ends and FAR Part 77 approach slopes.	X			

Drawing	Yes	No	N/A	Remarks
3. INNER PORTION OF THE APPROACH SURFACE DRAWING				
a. Large scale plan views of inner portions of approaches for each runway, usually limited to the RPZ areas	X			
b. Large scale projected profile views of inner portions of approaches for each runway, usually limited to the RPZ areas	X			
c. Interim stage RPZs when plans for interim runways extensions are firm and construction is expected in the near future			X	
d. Sheet size – Same as Airport Layout drawing	X			
e. Scale – Horizontal 1” = 200’; vertical 1” = 20’	X			
f. Title and revision blocks – Same as for Airport Layout drawing	X			
g. Plan View Details				
1) Aerial photos for base maps	X			
2) Numbering system to identify obstructions	X			
3) Depict property line	X			
4) Identify, by numbers, all traverse ways with elevations and computed vertical clearance in the approach	X			
5) Depict the existing and ultimate physical end of the runways. Note runway end number and elevation	X			
6) Show ground contours, lightly drawn	X			
h. Profile View Details				
1) Depict terrain and significant items (fences, roadways, and so forth)	X			
2) Identify obstructions with numbers on the plan view	X			
3) Show roads and railroads with dashed lines at edge of the approach	X			
i. Obstruction Table Details				
1) Depict terrain and significant items (fences, roadways, and so forth)	X			
2) Identify obstructions with numbers on the plan view	X			
3) Show roads and railroads with dashed lines at edge of the approach	X			

Drawing	Yes	No	N/A	Remarks
4) Prepare a separate table for each RPZ	X			
5) Include obstruction identification number and description, the amount of the approach surface penetration, and the proposed disposition of the obstructions	X			
4. TERMINAL AREA DRAWING				
The need for this drawing will be decided on a case-by-case basis. For small airports, where the Airport Layout drawing is prepared to a fairly large scale, a separate drawing for the terminal area may not be needed.				
a. Large scale plan view of the area or areas where aprons, buildings, hangars, and parking lots are located	X			
b. Sheet size – Same as Airport Layout drawing	X			
c. Scale – Range of 1” = 50’ to 1” = 100’	X			
d. Title and revision blocks – Same as for Airport Layout drawing	X			
e. Building Data Table – To list structures and show pertinent information about them. Include space and columns for:				
1) A numbering system to identify structures	X			
2) Top elevation of structures	X			
3) Existing and planned obstruction markings	X			None
5. LAND USE DRAWING				
a. Include all land uses (industrial, residential, and so forth), on and off the airport, to at least the 65 DNL contour	X			
b. Sheet size – Same as Airport Layout drawing	X			
c. Scale – Same as the Airport Layout drawing				Scaled at 1=1,000
d. Title and revision blocks – Same as for Airport Layout drawing	X			
e. Aerial base map				USGS Base used
f. Legend (symbols and land use descriptions)	X			
g. Identify public facilities (such as schools, parks, and other)	X			
h. Drawing details – Normally limited to existing and future airport features (i.e., runways, taxiways, aprons, RPZs, terminal buildings and navigational aids)	X			

Drawing	Yes	No	N/A	Remarks
6. RUNWAY DEPARTURE SURFACES DRAWING				
a. Large scale plan views of departure surfaces for each runway end that is designated primarily for instrument departures. The one-engine inoperative (OEI) obstacle identification surface (OIS) should be shown for any departure runway end supporting air carrier operations.		**X**		**Not part of the scope for BLI**
b. Large scale projected profile views of departure surfaces for each runway that is designated primarily for instrument departures.				
c. Sheet size – Same as Airport Layout drawing				
d. Scale – Horizontal 1” = 1000’; vertical 1” = 100’ (runway departure surfaces); and Scale – Horizontal 1” = 2000’; vertical 1” = 100’ (OEI obstacle identification surfaces)				
e. Title and revision blocks – Same as for Airport Layout drawing				
f. Plan View Details				
1) Aerial photos for base maps				
2) Numbering system to identify obstructions				
3) Depict property line, including easements				
4) Identify, by numbers, all traverse ways with elevations and computed vertical clearance in the departure surface				
5) Depict the existing and ultimate physical end of the runways. Note runway end number and elevation				
6) Show ground contours, lightly drawn				
g. Profile View Details				
1) Depict terrain and significant objects, including fences, roadways, rivers, structures, and buildings.				
2) Identify obstructions with numbers on the plan view				
3) Show roads and railroads with dashed lines at edge of the departure surface				
h. Obstruction Table Details				
1) Depict terrain and significant objects, including fences, roadways, rivers, structures and buildings				

Drawing	Yes	No	N/A	Remarks
2) Identify obstructions with numbers on the plan view				
3) Show roads and railroads with dashed lines at edge of the approach				
4) Prepare a separate table for each departure surface				
5) Include obstruction identification number and description, the amount of the departure surface penetration, and the proposed disposition of the obstructions				
7. AIRPORT PROPERTY MAP				
a. Sheet size – Same as Airport Layout drawing	X			
b. Scale – Same as the Airport Layout drawing	X			
c. Title and revision blocks – Same as for Airport Layout drawing	X			
d. Legend	X			
e. Data Table				
1) A numbering or lettering system to identify tracts of land	X			
2) The date the property was acquired	X			
3) The Federal aid project number under which it was acquired	X			
4) Type of ownership (fee, easement, federal surplus, and others)	X			
f. Show existing and future airport features (i.e., runways, RPZs, navigational aids and so forth) that would indicate a future aeronautical need for airport property.	X			



C SEPA ENVIRONMENTAL CHECKLIST

WAC 197-11-960 Environmental checklist.

ENVIRONMENTAL CHECKLIST

Purpose of checklist:

The State Environmental Policy Act (SEPA), chapter 43.21C RCW, requires all governmental agencies to consider the environmental impacts of a proposal before making decisions. An environmental impact statement (EIS) must be prepared for all proposals with probable significant adverse impacts on the quality of the environment. The purpose of this checklist is to provide information to help you and the agency identify impacts from your proposal (and to reduce or avoid impacts from the proposal, if it can be done) and to help the agency decide whether an EIS is required.

Instructions for applicants:

This environmental checklist asks you to describe some basic information about your proposal. Governmental agencies use this checklist to determine whether the environmental impacts of your proposal are significant, requiring preparation of an EIS. Answer the questions briefly, with the most precise information known, or give the best description you can.

You must answer each question accurately and carefully, to the best of your knowledge. In most cases, you should be able to answer the questions from your own observations or project plans without the need to hire experts. If you really do not know the answer, or if a question does not apply to your proposal, write "do not know" or "does not apply." Complete answers to the questions now may avoid unnecessary delays later.

Some questions ask about governmental regulations, such as zoning, shoreline, and landmark designations. Answer these questions if you can. If you have problems, the governmental agencies can assist you.

The checklist questions apply to all parts of your proposal, even if you plan to do them over a period of time or on different parcels of land. Attach any additional information that will help describe your proposal or its environmental effects. The agency to which you submit this checklist may ask you to explain your answers or provide additional information reasonably related to determining if there may be significant adverse impact.

Use of checklist for nonproject proposals:

Complete this checklist for nonproject proposals, even though questions may be answered "does not apply." IN ADDITION, complete the SUPPLEMENTAL SHEET FOR NONPROJECT ACTIONS (part D).

For nonproject actions, the references in the checklist to the words "project," "applicant," and "property or site" should be read as "proposal," "proposer," and "affected geographic area," respectively.

A. BACKGROUND

1) Name of proposed project, if applicable:
Bellingham International Airport Master Plan

2) Name of applicant:
Port of Bellingham

3) Address and phone number of applicant and contact person:
Sylvia Goodwin
P.O. Box 1677
Bellingham, WA 98227-1677
(360) 676-2500

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4) Date checklist prepared:
April 3, 2015/2015

5) Agency requesting checklist:
Port of Bellingham

6) Proposed timing or schedule (including phasing, if applicable):
The Master Plan's recommended improvements are planned for three implementation phases.
Phase 1 covers the short-term projects (0 to 5 years);
Phase 2 covers the intermediate term (6 to 10 years);
Phase 3 covers the long term plan (more than 10 years).

7) Do you have any plans for future additions, expansion, or further activity related to or connected with this proposal? If yes, explain.
Capital Improvement Projects recommended in the Master Plan will be built during the phases noted in the preceding answer. Some will include asphalt work to reconstruct and rehabilitate taxiways, add runway shoulders, rehabilitate and expand aprons, and aircraft ramps; rehabilitate Federal Aviation Administration required airfield lighting and signage; and acquisition of equipment to perform maintenance at airport.

8) List any environmental information you know about that has been prepared, or will be prepared, directly related to this proposal.
Previous environmental information prepared for the Bellingham International Airport and the airport industrial area properties include a variety of documents including, but not limited to, the following:

1. **Revised SEPA Checklist and Mitigated Determination of Non-Signifcance (MDNS) for BLI Planned Unit Development and General Binding Site Plan, August, 2013.**
2. **Bellingham International Airport Off-Site Wetland Mitigation Design Report-ADDENDUM#2, CH2M Hill (January 2013)**
3. **Transportation Impact Analysis – Bellingham International Airport, Transpo Group (November 2009, updated in December, 2012))**
4. **Off-Site Wetland Mitigation Design Report – Slater Road Site, Cooke Scientific (November 2009) and Addendum#1 (May 2012)**
5. **SEPA Checklist and Mitigated Determination of Non-Signifcance (MDNS) for BLI Planned Unit Development and General Binding Site Plan, February, 2010.**
6. **SEPA Checklist and Mitigated Determination of Non-Significance for Bellingham International Airport Runway Rehabilitation Project (February, 2010)**
7. **Bellingham International Airport – Airport Improvements NEPA Categorical Exclusion Document, URS Group, Inc. (January, 2010)**
8. **Archaeological Survey and Cultural Resource Evaluation for Developments Proposed in Areas 4, 9, and 14, Bellingham International Airport, Whatcom County, Washington, Rosario Archaeology (December 2009)**
9. **Port of Bellingham Revised Wetland Buffer Plan for the Bellingham International Airport Eastside Development Master Plan, David Evans and Associates, Inc. (November 2007, and December 2009 Addendum)**
10. **Bellingham International Airport Stormwater Management Master Plan, David Evans and Associates, Inc. (Revised July 2009)**
11. **Bellingham International Airport Noise Study, Harris Miller Miller & Hanson Inc. (April 2009**

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12. **Preliminary Geotechnical Engineering Report for the Bellingham International Airport Binding Site Plan, GeoEngineers (June 2008)**
13. **Bellingham Airport Revised Biological Evaluation, Cooke Scientific Services Inc. and David Evans and Associates, Inc. (December 2003, 2005 Addendum and 2007 Addendum)**
14. **Bellingham International Airport Master Plan, URS (June 2004)**
15. **Wetland Analysis Report for Bellingham International Airport, David Evans and Associates, Inc. (March 1998)**

The Port operates BLI under a Planned Unit Development Agreement (PUD) and Binding Site Plan (BSP) submitted in 2008 and approved in 2014. This PUD & BSP establishes procedures for the development of land as an alternative to seeking approvals on a project-by-project basis with the exception of the SEPA review process. The PUD & BSP provides that the approval for improvements and finalization of specific individual commercial or industrial lots is done by administrative approval.

In 2010 the Port received authorization from the U.S. Army Corps of Engineers (Corps) to develop certain areas on airport property based on the PUD & BSP. The work authorized by this permit included the filling of wetlands and tributaries for commercial and industrial development.

The permit requires that prior to placing fill in wetlands or tributaries the Port will submit information to include the proposed use of the site, specific development plans, and site design criteria. No fill areas may occur until the Corps provides the Port with written approval, verifying that the proposed use is consistent with the provisions of this permit.

As condition of the Corps permit the Port has agreed to implement and abide by:

1. **"Stormwater Pollution Prevention Plan," revision dated June 2010**
2. **"Bellingham International Airport Comprehensive Wetland Strategy," dated 2012**
3. **"Off-Site Wetland Mitigation Design Report Addendum," dated 2012**
4. **"Archaeological Survey and Cultural Resource Evaluation for Developments Proposed in Areas 4, 9, and 14, Bellingham International Airport, Whatcom County, Washington, Appendix H," dated December 28, 2009. Additional investigation and monitoring is required for historic or cultural features within development areas 4, 9 and 14.**

9) Do you know whether applications are pending for governmental approvals of other proposals directly affecting the property covered by your proposal? If yes, explain.
None.

10) List any government approvals or permits that will be needed for your proposal, if known.
The Airport Layout Plan Update will need to be approved by the Port of Bellingham and Federal Aviation Administration.

11) Give brief, complete description of your proposal, including the proposed uses and the size of the project and site. There are several questions later in this checklist that ask you to describe certain aspects of your proposal. You do not need to repeat those answers on this page. (Lead agencies may modify this form to include additional specific information on project description.)
The Airport Layout Plan Update (a non-project action) for the Bellingham International Airport is intended to evaluate and determine a short, intermediate and long-term development and maintenance program for the

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airport. A 20-year Capital Improvement Program (CIP) has been prepared. The CIP consists of actions that support continued safe and efficient operation of the airport.

12) Location of the proposal. Give sufficient information for a person to understand the precise location of your proposed project, including a street address, if any, and section, township, and range, if known. If a proposal would occur over a range of area, provide the range or boundaries of the site(s). Provide a legal description, site plan, vicinity map, and topographic map, if reasonably available. While you should submit any plans required by the agency, you are not required to duplicate maps or detailed plans submitted with any permit applications related to this checklist.
The Bellingham International Airport (BLI), owned and operated by the Port of Bellingham, is located on approximately 1,080 acres of land in Whatcom County three miles northwest of the City of Bellingham within Sections 3, 10, 11, 14, and 15 of Township 38 North, Range 2 East, W.M. It is bordered by Interstate 5 to the north, Marine Drive to the south, Mitchell Way to the east, and Wynn Road to the west.

B. ENVIRONMENTAL ELEMENTS

1) Earth

a. General description of the site (circle one): **FLAT,** rolling, hilly, steep slopes, mountainous, other . . . . . .

b. What is the steepest slope on the site (approximate percent slope)?
The site slopes from the south and west to the north and east, with an approximate slope ranging from 1% to 6%.

c. What general types of soils are found on the site (for example, clay, sand, gravel, peat, muck)? If you know the classification of agricultural soils, specify them and note any prime farmland.
Soil information at the project site was obtained from the Soil Survey of Whatcom County Area, Washington (Soil Survey) published by the NRCS. There are four soil types for the site: #172 – Urban Land, Whatcom, and Labounty complex, #178 and #179 – both Whatcom silt loam; and, #182 – Whatcom – Labounty silt loam. The Whatcom silt loams (types 178 and 179) both have a Hydrologic Group "C" classification. The Whatcom and Labounty mixes (types 172 and 182) have a Hydrologic Group "C" and "D" classification.

d. Are there surface indications or history of unstable soils in the immediate vicinity? If so, describe.
No.

e. Describe the purpose, type, and approximate quantities of any filling or grading proposed. Indicate source of fill.
Not applicable at the present time. However, future projects such as construction of new taxiways or runway shoulders may require minor filling or grading to ensure the airfield meets Federal Aviation Administration standards.

f. Could erosion occur as a result of clearing, construction, or use? If so, generally describe.
Not applicable at the present time. However, future projects may require additional consideration to ensure erosion doesn't occur if any clearing or construction is required to meet Federal Aviation Administration standards.

g. About what percent of the site will be covered with impervious surfaces after project construction (for example, asphalt or buildings)?

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The project area currently contains approximately 8,145,720 square feet (187 acres) of existing impervious surfaces. If all of the recommendations from the master plan are implemented, this total could result in new impervious surface up to 1,444,500 s.f. This increase would be incremental over the next 20-years and would occur only if demand for facility expansion occurred.

h. Proposed measures to reduce or control erosion, or other impacts to the earth, if any:
Not applicable at the present time. However, future proposed projects may require measures to be implemented to reduce or control erosion to assist the airport in meeting Federal Aviation Administration standards.

2) Air

a. What types of emissions to the air would result from the proposal (i.e., dust, automobile, odors, industrial wood smoke) during construction and when the project is completed? If any, generally describe and give approximate quantities if known.
Individual projects in the Master Plan Update may result in increased air emissions during construction activities. These will be examined on a per project basis.

b. Are there any off-site sources of emissions or odor that may affect your proposal? If so, generally describe.

None.

c. Proposed measures to reduce or control emissions or other impacts to air, if any:
Mitigation measures for individual projects will be implemented as needed to reduce or control emissions.

3) Water

a. Surface:

1) Is there any surface water body on or in the immediate vicinity of the site (including year-round and seasonal streams, saltwater, lakes, ponds, wetlands)? If yes, describe type and provide names. If appropriate, state what stream or river it flows into.
BLI occupies a watershed divided between Bellingham Bay and Silver Creek. The southern portions of the site drain directly into Bellingham Bay (via Airport Creek) and the northern area drains into Silver Creek (a tributary of the Nooksack River). Water flows through a variety of ditches, streams and drainage basins in both watersheds. Ten drainage areas have been identified within the site.

2) Will the project require any work over, in, or adjacent to (within 200 feet) the described waters? If yes, please describe and attach available plans.

No.

3) Estimate the amount of fill and dredge material that would be placed in or removed from surface water or wetlands and indicate the area of the site that would be affected. Indicate the source of fill material.

None.

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4) Will the proposal require surface water withdrawals or diversions? Give general description, purpose, and approximate quantities if known.

No.

5) Does the proposal lie within a 100-year floodplain? If so, note location on the site plan.
Review of FIRM (Flood Insurance Rate Map) identifies the entire airport planning area as being located in Zone C and outside any 100-year flood plain.

6) Does the proposal involve any discharges of waste materials to surface waters? If so, describe the type of waste and anticipated volume of discharge.

No.

b. Ground:

1) Will ground water be withdrawn, or will water be discharged to ground water? Give general description, purpose, and approximate quantities if known.

Does not apply.

2) Describe waste material that will be discharged into the ground from septic tanks or other sources, if any (for example: Domestic sewage; industrial, containing the following chemicals. . . ; agricultural; etc.). Describe the general size of the system, the number of such systems, the number of houses to be served (if applicable), or the number of animals or humans the system(s) are expected to serve.

Does not apply.

c. Water runoff (including stormwater):

1) Describe the source of runoff (including storm water) and method of collection and disposal, if any (include quantities, if known). Where will this water flow? Will this water flow into other waters? If so, describe.
The BLI Master Plan, a non-project action, will not generate water runoff. BLI stormwater runoff, as described in the BLI Stormwater Management Master Plan July 2009, is based on site drainage areas between Bellingham Bay and Silver Creek. The southern portions of the site drain directly into Bellingham Bay (via Airport Creek) and the northern area drains into Silver Creek (a tributary of the Nooksack River). Water flows through a variety of ditches, streams and drainage basins in both watersheds. Ten drainage areas have been identified within the site.

2) Could waste materials enter ground or surface waters? If so, generally describe.
Does not apply.

d. Proposed measures to reduce or control surface, ground, and runoff water impacts, if any:
Does not apply.

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4) Plants

a. Check or circle types of vegetation found on the site:

__X__ deciduous tree: alder, maple, aspen, **other**

__X__ evergreen tree: fir, cedar, pine, other:

__X__ shrubs

__X__ grass

_____ pasture

_____ crop or grain

__X__ wet soil plants: cattail, buttercup, bullrush, skunk cabbage, other;

__X__ water plants: water lily, eelgrass, milfoil, other

_____ other types of vegetation

b. What kind and amount of vegetation will be removed or altered?

Future proposed projects may require some relocation or removal of vegetation depending on the scope of work to meet Federal Aviation Administration standards.

c. List threatened or endangered species known to be on or near the site.

There are no threatened or endangered plant species known to be on or near the site.

d. Proposed landscaping, use of native plants, or other measures to preserve or enhance vegetation on the site, if any:

Does not apply to the Airport Layout Plan Update.

5) Animals

a. Circle any birds and animals which have been observed on or near the site or are known to be on or near the site:

birds: hawk, heron, eagle, songbirds, **other (Blue Heron, ducks and geese):**
mammals: deer, bear, elk, beaver, other
fish: bass, salmon, trout, herring, shellfish,

b. List any threatened or endangered species known to be on or near the site.

Refer to the Revised Biological Evaluation prepared by Cooke Scientific Services Inc. in December 2003, with 2005 and 2007 Addendums. The bald eagle (Haliaeetus leucocephalus) is known to be present in the relative vicinity of the Bellingham International Airport. WDFW Priority Habitats and Species (PHS) map data (2008) indicates that there are three known bald eagle nest sites and associated management buffers within one-half mile of the Bellingham International Airport. However, it is important to note that the identified sites/buffer areas are not located within the 20-year phased project area, nor is there suitable habitat within the project site. (Note: The bald eagle was de-listed June 27, 2007.)

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c. Is the site part of a migration route? If so, explain.
Yes, all lands within the Whatcom County lowlands are within the Pacific Migratory Flyway.

d. Proposed measures to preserve or enhance wildlife, if any:
The BLI Master Plan is a non-project action which will not impact wildlife. An off-site wetland mitigation site has been enhanced for bird and wildlife habitat as a condition of wetland development permits obtained in 2010.

6) Energy and natural resources

a. What kinds of energy (electric, natural gas, oil, wood stove, solar) will be used to meet the completed project's energy needs? Describe whether it will be used for heating, manufacturing, etc.

Does not apply.

b. Would your project affect the potential use of solar energy by adjacent properties? If so, generally describe.

Does not apply.

c. What kinds of energy conservation features are included in the plans of this proposal? List other proposed measures to reduce or control energy impacts, if any:

Does not apply.

7) Environmental health

a. Are there any environmental health hazards, including exposure to toxic chemicals, risk of fire and explosion, spill, or hazardous waste, that could occur as a result of this proposal? If so, describe.
Not applicable at the present time. However, future proposed projects may require further consideration to the above question depending on the scope of work to be completed to meet Federal Aviation Administration standards.

1) Describe special emergency services that might be required.
Not applicable at the present time. However, future proposed projects may require further consideration for emergency services (responding routes) depending on the scope of work to be completed to meet Federal Aviation Administration standards.

2) Proposed measures to reduce or control environmental health hazards, if any:

Does not apply at this time.

b. Noise

1) What types of noise exist in the area which may affect your project (for example: traffic, equipment, operation, other)?

Does not apply.

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2) What types and levels of noise would be created by or associated with the project on a short-term or a long-term basis (for example: traffic, construction, operation, other)? Indicate what hours noise would come from the site.
Noise associated with the operation of the airport is the result of increased airport operations due to rising demand levels. The airport master plan involves identifying likely demand and creating a plan that allow the Port to assure that the airport is prepared to accommodate the demand in a safe and efficient manner. The projects listed in the Master Plan will not create noise beyond that which is normally associated with construction activities.

3) Proposed measures to reduce or control noise impacts, if any:
Although none of the Capital Projects identified in the master plan will cause increased noise levels in the community, the master plan does recognized that increased noise from aircraft operations will occur as demand levels rise. In response to this, the master plan includes recommendations for capital improvements that will address these increases and mitigate their impacts. These projects include a more detailed analysis of the noise on the community and the construction of a new area for engine run-up activities to assure that this does not adversely affect area residents.

8) Land and shoreline use

a. What is the current use of the site and adjacent properties?
The current use of the site is an FAA class C airport.

b. Has the site been used for agriculture? If so, describe.
No

c. Describe any structures on the site.
The structures include a variety of buildings such as airport hangars, terminal building, and maintenance buildings.

d. Will any structures be demolished? If so, what?
Not as a result of the Airport Layout Plan Update. Individual projects recommended in the various phases such as the construction of the new RON apron or the GA hangar relocation do involve demolition of specific structures to accommodate future development of the airport.

e. What is the current zoning classification of the site?
The zoning is Airport Operations and Light Impact Industrial.

f. What is the current comprehensive plan designation of the site?
The comprehensive plan designation is Airport Operations and Industrial

g. If applicable, what is the current shoreline master program designation of the site?
Does not apply.

h. Has any part of the site been classified as an "environmentally sensitive" area? If so, specify.

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Yes, there are some wetlands on the site. Permits have been obtained for proposed development areas.

i. Approximately how many people would reside or work in the completed project?

Not applicable at the present time. However, future proposed projects may require further consideration to the above question depending on the scope of work and building size.

j. Approximately how many people would the completed project displace?

None.

k. Proposed measures to avoid or reduce displacement impacts, if any:

Does not apply.

l. Proposed measures to ensure the proposal is compatible with existing and projected land uses and plans, if any:

The Airport Layout Plan Update incorporates a discussion on land use and will be in compliance with existing land use policies. Continuing planning efforts are under way to protect the airport or community within the airport influence area.

9) Housing

a. Approximately how many units would be provided, if any? Indicate whether high, middle, or low-income housing.

None.

b. Approximately how many units, if any, would be eliminated? Indicate whether high, middle, or low-income housing.

None.

c. Proposed measures to reduce or control housing impacts, if any:

Does not apply.

10) Aesthetics

a. What is the tallest height of any proposed structure(s), not including antennas; what is the principal exterior building material(s) proposed?

Does not apply.

b. What views in the immediate vicinity would be altered or obstructed?

Does not apply.

c. Proposed measures to reduce or control aesthetic impacts, if any:

Does not apply.

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11) Light and glare

a. What type of light or glare will the proposal produce? What time of day would it mainly occur?

Airport use requires various lighting intensity levels, day and night as outlined in the Federal Aviation Regulations related to Part 139 commercial service airports.

b. Could light or glare from the finished project be a safety hazard or interfere with views?

No.

c. What existing off-site sources of light or glare may affect your proposal?

Does not apply.

d. Proposed measures to reduce or control light and glare impacts, if any:

Does not apply.

12) Recreation

a. What designated and informal recreational opportunities are in the immediate vicinity?

The Port has created a scenic trail on airport property in the Cliffside area to the south of the airport runway. The property upon which the trail was constructed is noncontiguous with the main property of the airport, is not required for active airport operations aside for it needing to be compatible with airport operations use. There are no other recreational uses like functions on the airport. Adoption of the Master Plan does not necessitate or cause the taking of Section 4(f) / Section 303 lands within the airport environs.

b. Would the proposed project displace any existing recreational uses? If so, describe.

No.

c. Proposed measures to reduce or control impacts on recreation, including recreation opportunities to be provided by the project or applicant, if any:

Does not apply.

13) Historic and cultural preservation

a. Are there any places or objects listed on, or proposed for, national, state, or local preservation registers known to be on or next to the site? If so, generally describe.

A report prepared for the Port of Bellingham entitled "Archaeological Survey and Cultural Resource Evaluation for Developments Proposed in Areas 4, 9, and 14, Bellingham International Airport, Whatcom County, Washington" in 2009 identified the building currently occupied by the Pit Stop as a building over 50 years old, and three features of unknown cultural or historic significance. Additional investigation and monitoring was recommended for the potential historic or cultural features.

b. Generally describe any landmarks or evidence of historic, archaeological, scientific, or cultural importance known to be on or next to the site.

See the answer to question 13 a.

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c. Proposed measures to reduce or control impacts, if any:

None needed.

14) Transportation

a. Identify public streets and highways serving the site, and describe proposed access to the existing street system. Show on site plans, if any.

The airport terminal, general aviation area and industrial park are all served by existing public and private roads. West Bakerview Road and Airport Drive are Whatcom County roads, and Mitchell Way, Sound Way, Airport Way Williamson Way, Victoria Place and the Hangar Access road are owned and maintained by the Port of Bellingham. The access easement width of the Port roads ranges from 40 to 80 feet, depending on use and function. Mitchell Way has sidewalks on one side and Airport Way has sidewalks on both sides

b. Is site currently served by public transit? If not, what is the approximate distance to the nearest transit stop?

Yes, Route #50 named Gooseberry Pt.-Downtown Bellingham stops on Airport Dr. adjacent to the exterior boundary of the site.

c. How many parking spaces would the completed project have? How many would the project eliminate?

The adoption of the Airport Master Plan will not result in demand or construction of parking spaces. There are currently 4,109 airport parking spaces, and space identified for an additional 646 spaces, which will be constructed in the future to meet demand.

d. Will the proposal require any new roads or streets, or improvements to existing roads or streets, not including driveways? If so, generally describe (indicate whether public or private).

Some of the projects listed in the Master Plan Update may require on-site airport private road improvements.

e. Will the project use (or occur in the immediate vicinity of) water, rail, or air transportation? If so, generally describe.

No. Projects are focused on improvements to the airport's transportation system.

f. How many vehicular trips per day would be generated by the completed project? If known, indicate when peak volumes would occur.

Adoption of the BLI Master Plan will not generate traffic, but traffic impacts related to projected air traffic, services and light industrial development have been studied in Transportation Impact Analysis-Bellingham International Airport, Transpo Group (December 2012.)

g. Proposed measures to reduce or control transportation impacts, if any:

Traffic mitigation, including contribution toward E. Bakerview/ I-5 interchange, upgrade to Airport Way/Airport Drive intersection and installation of sidewalks has been or will be completed a condition of approval for the BLI Planned Unit Development and General Binding Site Plan.

TO BE COMPLETED BY APPLICANT

EVALUATION FOR AGENCY USE ONLY

15) Public services

a. Would the project result in an increased need for public services (for example: fire protection, police protection, health care, schools, other)? If so, generally describe.

The Airport Layout Plan Update would not require the addition or increased need for public services.

b. Proposed measures to reduce or control direct impacts on public services, if any.

Does not apply.

16) Utilities

a. Circle utilities currently available at the site:

Electricity, natural gas, water, refuse service, telephone, sanitary sewer, septic system, other.

b. Describe the utilities that are proposed for the project, the utility providing the service, and the general construction activities on the site or in the immediate vicinity which might be needed.

Does not apply.

C. SIGNATURE

The above answers are true and complete to the best of my knowledge. I understand that the lead agency is relying on them to make its decision.

Signature: .....

Date Submitted: .....

TO BE COMPLETED BY APPLICANT

EVALUATION FOR AGENCY USE ONLY

D. SUPPLEMENTAL SHEET FOR NONPROJECT ACTIONS

(do not use this sheet for project actions)

Because these questions are very general, it may be helpful to read them in conjunction with the list of the elements of the environment.

When answering these questions, be aware of the extent the proposal, or the types of activities likely to result from the proposal, would affect the item at a greater intensity or at a faster rate than if the proposal were not implemented. Respond briefly and in general terms.

1. How would the proposal be likely to increase discharge to water; emissions to air; production, storage, or release of toxic or hazardous substances; or production of noise?

Proposed improvements recommended in the Master Plan Update may result in increased discharges to water; air emissions; or production of noise.

Proposed measures to avoid or reduce such increases are:

SEPA compliance, permits and other agency approvals will be obtained and mitigation provided as needed on a case by case basis for individual projects.

2. How would the proposal be likely to affect plants, animals, fish, or marine life?

Individual projects listed in the Master Plan Update may have the potential to affect plants or animals.

Proposed measures to protect or conserve plants, animals, fish, or marine life are:

Mitigation measures will be outlined as needed for individual projects listed in the Master Plan Update.

3. How would the proposal be likely to deplete energy or natural resources?

Although all of the projects listed in the Master Plan Update will use energy and natural resources, none have the potential to deplete energy or natural resources.

Proposed measures to protect or conserve energy and natural resources are:
Mitigation measure will be outlined as needed for individual projects listed in the Master Plan Update.

4. How would the proposal be likely to use or affect environmentally sensitive areas or areas designated (or eligible or under study) for governmental protection; such as parks, wilderness, wild and scenic rivers, threatened or endangered species habitat, historic or cultural sites, wetlands, floodplains, or prime farmlands?

Individual projects listed in the Master Plan Update may have the potential to affect environmentally sensitive areas.

Proposed measures to protect such resources or to avoid or reduce impacts are:

Mitigation measure will be outlined as needed for individual projects listed in the Master Plan Update.

TO BE COMPLETED BY APPLICANT

EVALUATION FOR AGENCY USE ONLY

5. How would the proposal be likely to affect land and shoreline use, including whether it would allow or encourage land or shoreline uses incompatible with existing plans?

Individual projects listed in the Master Plan Update will be in compliance with existing land and shoreline uses and plans.

Proposed measures to avoid or reduce shoreline and land use impacts are:

None needed.

6. How would the proposal be likely to increase demands on transportation or public services and utilities?

Individual projects listed in the Master Plan Update may have the potential to increase demands on transportation or public services and utilities.

Proposed measures to reduce or respond to such demand(s) are:

Mitigation measures will be outlined as needed for individual projects listed in the Master Plan Update.

7. Identify, if possible, whether the proposal may conflict with local, state, or federal laws or requirements for the protection of the environment.

To the extent known at this time, individual projects listed in the Master Plan Update will not conflict with local, state or federal laws or requirements for protection of the environment.

Courtesy of Magnusson Klemencic Associates – Michael Dickter

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