AECOM

BELLINGHAM INTERNATIONAL AIRPORT

MASTER PLAN UPDATE

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Airport Master Plan

Bellingham International Airport

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1 Master Plan Objectives & Goals

1 Master Plan Objectives & Goals

1.1 Introduction

The Port of Bellingham (Port) has elected to prepare a new Master Plan for the Bellingham International Airport (BLI). The purpose of the Plan being developed in conjunction with an Airport Geographic Information System (AGIS) required by the Federal Aviation Administration (FAA) is to review, revise, and reprioritize development options associated with BLI as a means of assuring that it will continue to contribute to the regional economy and transportation system in a manner that keeps pace with demand while remaining cognizant of environmental and feasibility criteria. The Master Plan is made possible with a grant from the FAA's Airport Improvement Program (AIP), contains the following work elements, and was prepared using the process depicted in Figure 1-1.

- Prepare an inventory of the existing airport conditions, current and historical activity levels, environmental conditions, and community demographic information.
- Forecast future aviation activity levels and activity levels for improvements.
- Determine the future requirements for facility expansion or upgrades needed to accommodate activity growth.
- Develop alternative concepts for airport development and analyze the best course for future development decisions with respect to cost, environmental factors, land use compatibility, and other factors.
- Prepare the Airport Layout Plan (ALP) in accordance with federal airport operating and design standards.
- Develop a financial implementation plan.
- Complete the AGIS survey and data mapping.

1.2 Master Plan Objectives

- Gateway and Vital Transportation Hub – Bellingham International Airport (BLI) functions as a vital regional transportation hub for passengers and air cargo, and provides a safe, dependable, and welcoming facility for the residents of Bellingham, northwest Washington, and lower mainland British Columbia, Canada.
- Safe and Reliable Customer Service – The airport provides a safe and reliable level of service for its users and stakeholders. The Port prides itself in placing safety foremost in its operational priorities—for commercial and private pilots, passengers, employees, and the community.
- Fiscal Responsibility – As a publicly owned and operated facility, the airport is fiscally responsible. It seeks to balance sources of public and tenant revenue with expenditures, charges and fees, in order to provide essential services and airport improvements.
- Sustainability – The airport strives to incorporate sustainability, through use of innovative technology such as exploring the potential use of solar energy for heat and a program for recycling waste at the airport. It works to provide maximum levels of service with minimum impacts to the community and environment.

- Environment and Recreation – The airport's setting and lands surrounding the airfield are a resource highly valued by Bellingham residents. BLI balances public access with security, and works to minimize its footprint on surrounding lands and waters.
- Operational Efficiency – The airport provides an airport/airfield design that works well for large and small air carrier operations and for recreational pilots. It makes best use of its employees and facilities as valued assets to run an efficient airport operation.
- Economic Development – The airport is an economic driver for Bellingham and Whatcom County. In supporting regional air cargo and tourism, the airport is a hub that diversifies the local and regional economy.
- Community Service – The citizens of Bellingham and the state of Washington take pride in their airport. BLI strives to be an integral part of the community framework.

1.3 Airport Goals

The following were developed for the airport.

Gateway and Vital Transportation Hub

- Provide an efficient, high-quality, and low cost operating environment for the airlines.
- Serve as a competitive regional hub and low-cost alternative for both passengers and air cargo.

Safe and Reliable Customer Service

- Maintain reputation as a safe and technologically advanced airport.
- Create an environment that attracts and sustains aviation and aviation related business tenants.

Community Service and Fiscal Responsibility

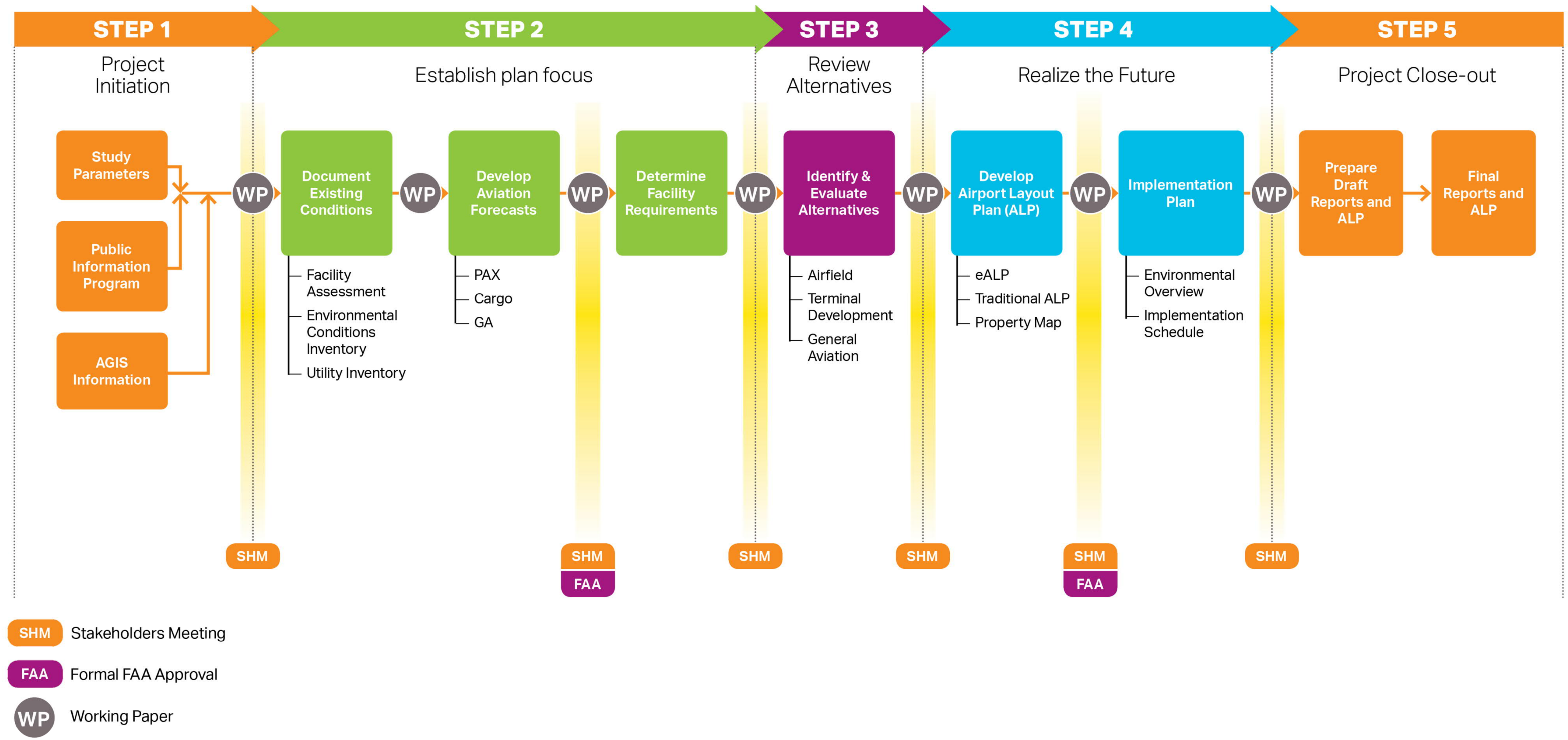
- Grow with the community to meet regional needs, while respecting limits to growth.
- Involve the community in airport planning and gain its support for airport improvement projects.

Environment

- Maximize the full potential of lands and buildings and adapt to changes in the business and natural environment.
- Minimize the airport's environmental footprint on surrounding lands, waters, and neighborhoods.
- Develop the airport in balance with the adjacent community and natural environment.

Leadership

- Make BLI a great place to work; attract and retain great employees.
- Continue to pursue innovation and technological advances.
- Serve as a model airport for the state of Washington.


STEP 1
Project Initiation
Study Parameters
Public Information Program
AGIS Information
WP
SHM
STEP 2
Establish plan focus
Document Existing Conditions
Facility Assessment
Environmental Conditions Inventory
Utility Inventory
WP
Develop Aviation Forecasts
PAX
Cargo
GA
WP
SHM
FAA
Determine Facility Requirements
WP
SHM
STEP 3
Review Alternatives
Identify & Evaluate Alternatives
Airfield
Terminal Development
General Aviation
WP
SHM
STEP 4
Realize the Future
Develop Airport Layout Plan (ALP)
eALP
Traditional ALP
Property Map
WP
SHM
FAA
Implementation Plan
Environmental Overview
Implementation Schedule
WP
SHM
STEP 5
Project Close-out
Prepare Draft Reports and ALP
Final Reports and ALP
SHM Stakeholders Meeting
FAA Formal FAA Approval
WP Working Paper

2 Existing Conditions

2 Existing Conditions

2.1 Introduction

The Bellingham International Airport (BLI) is owned and operated by the Port of Bellingham (Port). BLI is located on approximately 1,169 acres of land in Whatcom County, three miles northwest of downtown 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 Class 1 commercial service primary airport by the Federal Aviation Administration (FAA) and the Washington State Department of Transportation (WSDOT) - Aviation Division.

This chapter documents conditions at BLI and within the airport's environs as they were found at the commencement of this master plan in October 2016. 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 2015 Master Plan and Airport Layout Plan (ALP), the Washington Department of Transportation Long-Term Air Transportation Study (LATS), the airport 5010 report (effective date 09/15/2016), and FAA'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 of Bellingham and Whatcom County personnel, the FAA, WSDOT - Aviation Division, members of the Technical Airport Advisory Committee (TAAC), and others involved with the airport. The year 2016 serves as the base year from which existing conditions have been documented and all information was collected in the fall of 2016.

Figure 2-1: Location Map

2.2 Airport History

BLI serves as the primary air transportation facility for the City of Bellingham, Whatcom County, northwest Washington and lower mainland British Columbia, Canada. The first runway at BLI 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 World War II on the horizon, construction at the airport continued. With National Defense funds, the Army Corps of Engineers completed work on the three paved runways while expanding the property to 350 acres. At this time the original runway was extended to 5,000 feet while the second and third runways were built to be 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, but was subsequently seized by the army for the war effort and renamed Bellingham Army Air Field. The airport was used extensively throughout the war, and by the time it was conveyed 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 order to establish commercial air service.

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

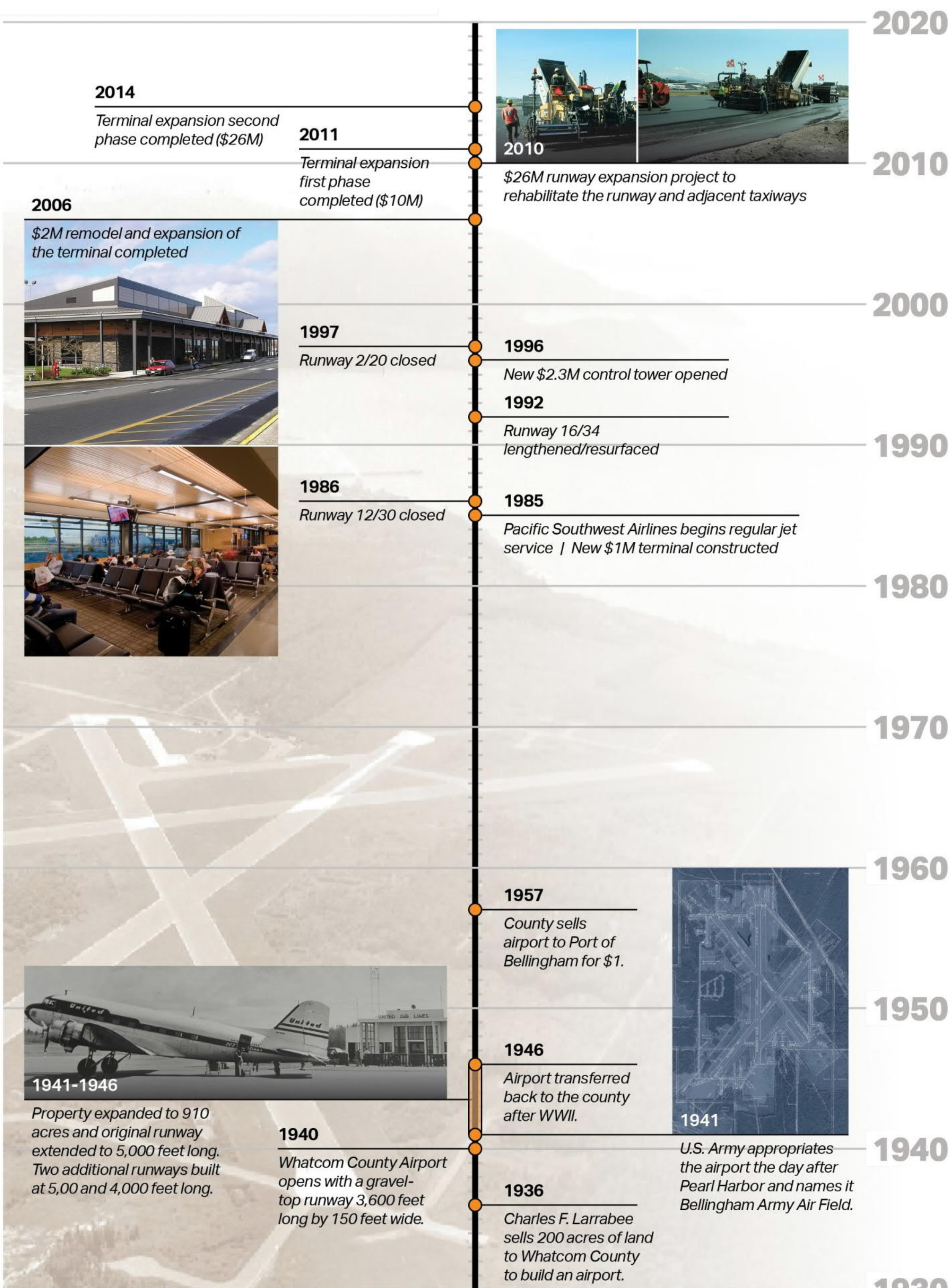
With the arrival of Pacific Southwest Airlines (PSA) in 1985, a new $1 million terminal was constructed. In response to unprecedented growth in passenger levels, the Port remodeled and expanded the terminal in 2006 to 22,000 square feet. The terminal building was again expanded and remodeled in 2011 and 2014 in two phases that encompassed approximately 105,000 square feet. This expansion included extensive remodeling of the ticketing, boarding gates, and baggage claim areas.

In 1986, the Port shut down Runway 12/30 as a cost saving measure since it wasn't required to provide all-weather wind coverage. In the 1990s, Runway 16/34 was lengthened to 6,701 feet and resurfaced and Runway 2/20 was closed. Runway 16/34 was later rehabilitated in 2010 and its pavement strengthened to accommodate Boeing 757 aircraft.

Table 2-1: Historical Airlines Serving BLI

Facilities	Timeframe
San Juan Airlines	1950s–1989; 2002–present
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
Allegiant Air	2004–present
Delta Airlines	2006–2008
Western Airlines	2007
Skybus Airlines	2007–2008
Frontier Airlines	2012–2015

Figure 2-2: Bellingham Airport 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 initiated in 2011 and completed for adoption in 2015 with the forecast based on 2011 base year data. This base year fell in the middle of a period of unprecedented increases in the BLI passenger market as double-digit growth rates were being experienced. Since then the commercial airlines' model for serving small passenger markets has changed yet again with some annual decreases being registered. The passenger decreases have led the Port to seek this new master plan as follows:

- Update the forecast to reflect the current commercial passenger numbers as well as the changed operational environment in BLI and northwest Washington
- Address the shifting demand for airport property
- Develop a realistic financial implementation plan based on activity levels

2.3.2 FAA National Plan of Integrated Airport Systems (NPIAS)

The NPIAS is used by the 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).

In the 2017-2021 NPIAS Report to Congress, Bellingham International Airport is listed as a 'Small-hub Primary Airport' and is one of two such airports in Washington State. NPIAS defines a 'small-hub Primary Airport' as a commercial service airport that enplanes between 0.05 and 0.25 percent of all commercial passenger enplanements in the US.

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

The WSDOT Long-Term Air Transportation Study, completed in 2009 and being updated at the time of this master plan, 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).

2.4 Airport Facilities

Existing airport facilities at BLI consist of a single active runway and a full parallel taxiway system, runway and taxiway lighting systems, visual and electronic navigational aids including an Instrument Landing System (ILS), a general aviation terminal, International Port of Entry Customs Clearance facility, general aviation hangars and tie-down aprons, a passenger terminal building and support facilities, and a contract Airport Traffic Control Tower (ATCT). These are discussed in the following section.

2.4.1 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 to Runway 16 and non-precision approach to 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.

Table 2-2: Runway 16/34 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)	
Pavement Design Strength (PCN)	57/F/A/W/T	
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:	124'10"	
Weight:	225,000 (Maximum Takeoff Weight)	
Approach Speed:	135 knots	
Airport Reference Code (ARC)	C-IV	

S - Single-wheel Gear
D - Dual-wheel Gear
DT - Dual-tandem Gear
DME - Distance Measuring Equipment
F - Pavement Type – Flexible
A - Subgrade Strength – High
W - Max Tire Pressure - No Limit
T - Method used – Technical
ILS - Instrument Landing System
HIRL - High Intensity Runway Lights
MALSR - Medium Intensity Approach Lighting System
PAPI - Precision Approach Path Indicator
RNP – Required Navigation Performance

*RSA on Runway 16 does not meet FAA criteria

Runway Design Code (RDC)

The Runway Design Code (RDC) is used by FAA to relate airport design criteria to the operational and physical characteristics of the most demanding type of aircraft expected to operate at the airport on a regular basis. The RDC is based on a combination of the Aircraft Approach Category (AAC) and the

Airplane Design Group (ADG) for the most demanding aircraft operating on the runway and the approach visibility minimums for the runway.

The AAC is denoted by a letter based on the aircraft's approach speed. Generally, aircraft approach speed affects runway length, exit taxiway locations, and runway-related facilities. The AAC approach speeds are as follows:

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

The second component, depicted by a roman numeral, is the ADG. This relates to the physical characteristics of the design aircraft (wingspan and tail height). The group categories are shown in Table 2-3. Finally, the visibility minimums for the runway are considered. These are expressed in terms of the Runway Visibility Range (RVR) using the categories listed in Table 2-4.

Currently, the BLI Airport Layout Plan shows an Airport Reference Code (ARC) of C-IV based on forecast use by the Boeing 757-200W aircraft that Allegiant Airlines was using at the time that the master plan was prepared. This aircraft no longer serves BLI. The existing and future design aircraft will be determined in the next chapter.

The best approach to BLI is the Category I Instrument Approach to Runway 16. The minimums for this approach are less than ½ mile but more than ¼ mile for an RVR of 1600 feet.

Table 2-3: Group Categories

ADG	Tail Height	Wingspan
I	Less than 20 ft	Less than 49 ft
II	20 to less than 30 ft	49 to less than 79 ft
III	30 to less than 45 ft	79 to less than 118 ft
IV	45 to less than 60 ft	118 to less 171 ft
V	60 to less than 66 ft	171 to less than 214 ft
VI	66 to less than 80 ft	214 to less than 262 ft

ADG – Airplane Design Group

Table 2-4: Instrument Flight Visibility

RVR (feet)	Instrument Flight Visibility Category (statute mile)
5000	Not lower than 1 mile
4000	Lower than 1 mile but not lower than ¾ mile
2400	Lower than ¾ mile but not lower than ½ mile
1600	Lower than ½ mile but not lower than ¼ mile
1200	Lower than ¼ mile

RVR – Runway Visual Range

Table 2-5: Existing Conditions

Design Feature	Existing (feet)
Runway	
Width	150
Runway Shoulder Width	0
Runway Blast Pad Width	0
Runway Blast Pad Length	0
Runway Safety Area (RSA) Width	500
Safety Area Length (beyond RWY 16 end)	866
Safety Area Length (beyond RWY 34 end)	1,000
Object Free Area (OFA) Width	800
Object Free Area Length (beyond RWY end)	1,000
Obstacle Free Zone (OFZ) Width	400
Obstacle Free Zone Length (beyond RWY end)	200
Taxiway	
Width	75
Safety Area Width	171
Object Free Area Width	259
Taxilane Object Free Area Width	225
Runway Centerline to:	
Taxiway Centerline	410
Aircraft Parking Area	600
Taxiway Centerline to Fixed or Movable Object	129.5
Taxilane Centerline to Fixed or Movable Object	112.5

Source: FAA Advisory Circular 150/5300-13A, Airport Design, Change 1

Taxiway Design Group

The taxiway system at BLI consists of a full parallel taxiway (TWY Alpha), four angled exits (TWYs Charlie, Delta, Echo, and Foxtrot), and two entrance taxiways (TWYs Bravo and Golf) and two additional taxiways (TWY Juliet and Hotel). Relevant data for the taxiways is listed in Table 2-6. In November of 2012, the FAA completed the local Runway Safety Action Plan (RSAP) for BLI. The purpose of the RSAP was to review conditions at BLI and identify 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 RSAP was revisited in 2015 and no runway incursion incidents were recorded but 2 surface incidents were associated with runway hotspots on the terminal apron. Tthe 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.

Table 2-6: Existing Taxiway/Taxilane Data Table

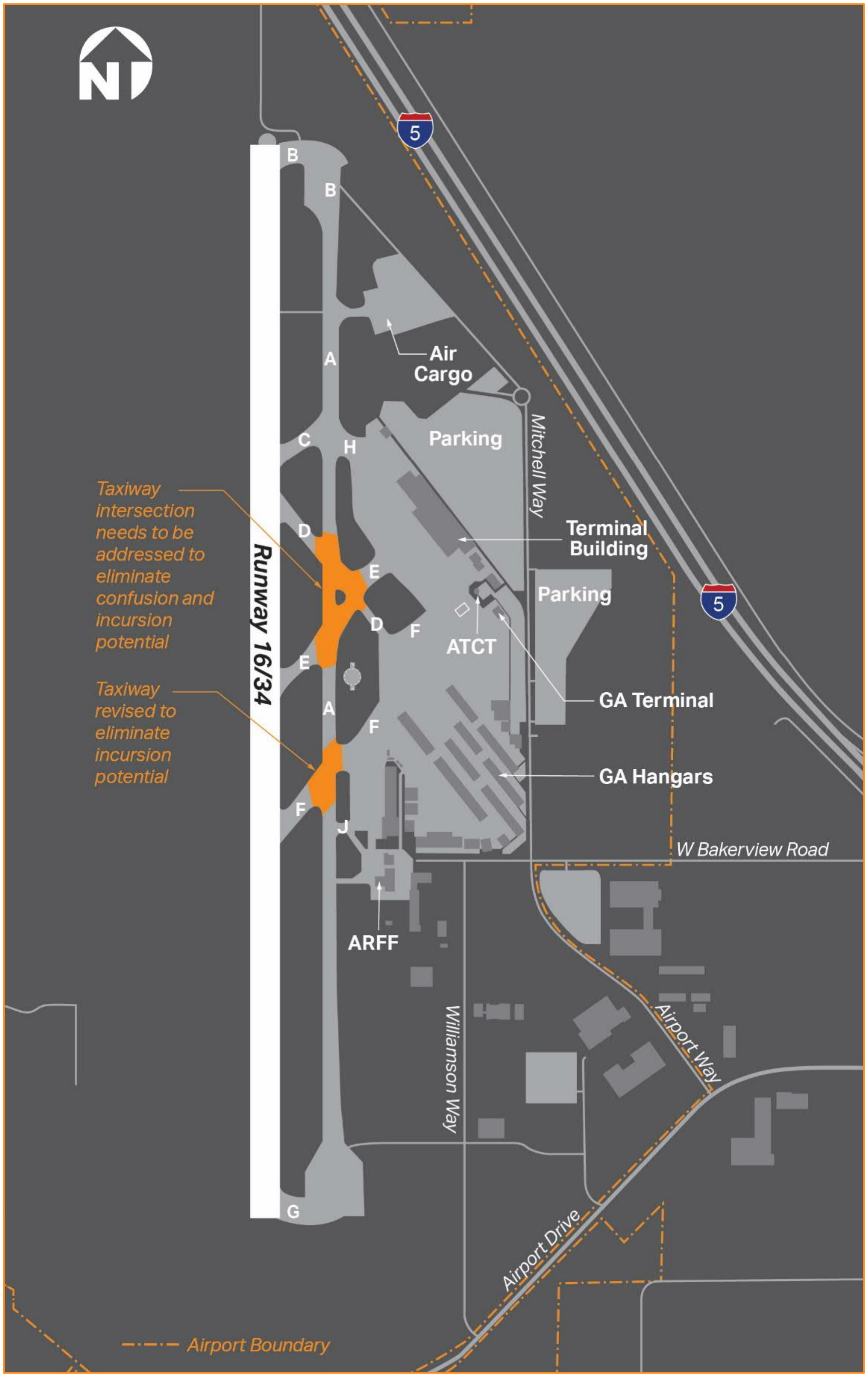
ITEM	Taxiway A		Taxiway B		Taxiway C	
Airplane Design Group (ADG)	III		III		III	
Taxiway Design Group (TDG)	3		3		3	
	Standard	Actual	Standard	Actual	Standard	Actual
Taxiway/Taxilane Width	50'	75'	50'	102.5'	50'	70'
Taxiway/Taxilane Safety Area (TSA) Width	118'	171'	118'	118'	118'	118'
Taxiway/Taxilane Object Free Area (TOFA)	186'/162'	259'	186'/162'	186'	186'/162'	186'
Taxiway/Taxilane Separation	160'	233'	-	-	160'	-
Taxiway/Taxilane Lighting	MITL	MITL	MITL	MITL	MITL	MITL

ITEM	Taxiway D		Taxiway E		Taxiway F	
Airplane Design Group (ADG)	II & III		III		II & III	
Taxiway Design Group (TDG)	2 & 3		3		2 & 3	
	Standard	Actual	Standard	Actual	Standard	Actual
Taxiway/Taxilane Width	35' & 50'	40' & 60'	50'	70'	35' & 50'	40', 48' & 50', 80'
Taxiway/Taxilane Safety Area (TSA) Width	79' & 118'	79' & 118'	118'	118'	79' & 118'	79' & 118'
Taxiway/Taxilane Object Free Area (TOFA)	131'/115' & 186'/162'	131' & 186'	186'/162'	186'/162'	131'/115' & 186'/162'	131' & 186'
Taxiway/Taxilane Separation	-	-	160'	-	-	-
Taxiway/Taxilane Lighting	MITL	MITL	MITL	MITL	MITL	MITL

ITEM	Taxiway G		Taxilane H		Taxiway J	
Airplane Design Group (ADG)	III		III		II	
Taxiway Design Group (TDG)	3		3		2	
	Standard	Actual	Standard	Actual	Standard	Actual
Taxiway/Taxilane Width	50'	75'	50'	60'	35'	40'
Taxiway/Taxilane Safety Area (TSA) Width	118'	118'	118'	118'	79'	79'
Taxiway/Taxilane Object Free Area (TOFA)	186'/162'	186'	186'/162'	225'	131'/115'	
Taxiway/Taxilane Separation	-	-	160'	-	-	-
Taxiway/Taxilane Lighting	MITL	MITL	MITL	MITL	MITL	MITL

MITL – Medium Intensity Taxiway Lights

Figure 2-3: Taxiway Improvement Requirements



In addition, 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 addressed as shown on Figure 2-3 and as described below:

- 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.

Airfield Signage

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

Airfield Lighting and Navigational Aids

Table 2-7 lists the visual and electronic navigation and landing aids that are available at BLI. As indicated in the table, 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 2-7: Navigational Aids

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

Published Instrument Approaches

Precision instrument and non-precision approaches are available for Runway 16 and non- precision approaches are available for Runway 34.

Table 2-8: Published Procedures

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

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 Aircraft Rescue and Fire Fighting (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 150/5300-13A for a C-III 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 as it only measures 990 feet to the point where the northeast edge abuts the Interstate 5 right- of-way. In this corner 6,750 square feet is not owned by the Port. FAA issued a Memorandum addressing this Safety Area Determination in February 2005 but this master plan needs to address methods to achieve full compliance.

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 Navigational Aids (NAVAIDs) and other facilities whose locations are fixed by function, from this area. The Runway 16/34 OFA is 800 feet wide, centered on the runway centerline, and extends 1,000 feet beyond the end of the runway.

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 150/5300-13A, Airport Design. The dimensions for the RPZs at BLI are shown in Table 2-9.

On the Runway 16 end the Port of Bellingham owns all of the property within the RPZ except for approximately 17 acres that are located where Interstate 5 passes through the zone.

The Runway 34 end is similar in that the Port owns all of the land within the RPZ except for those areas within the RSA that contain Interstate Highway 5, Alderwood Avenue, Marine Drive and the Burlington Northern Railroad right-of-way.

Table 2-9: Runway Protection Zone (RPZ)

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

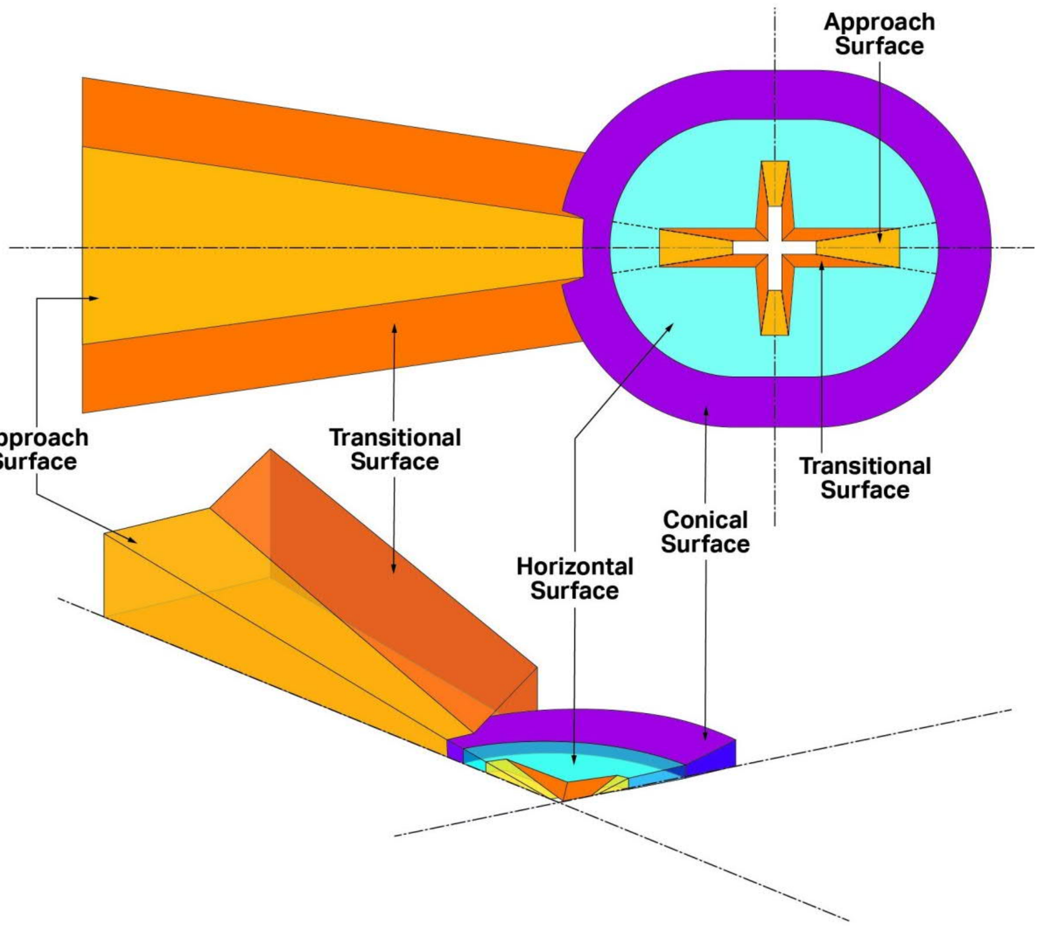
FAR Part 77 Surfaces

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.

Whatcom County 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 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 2-4 shows each element of the Imaginary Surfaces as they relate to each other and the runways and Figure 2-5 shows the Part 77 Surfaces for BLI.

Figure 2-4: FAR Part 77, Imaginary Surfaces - Diagram



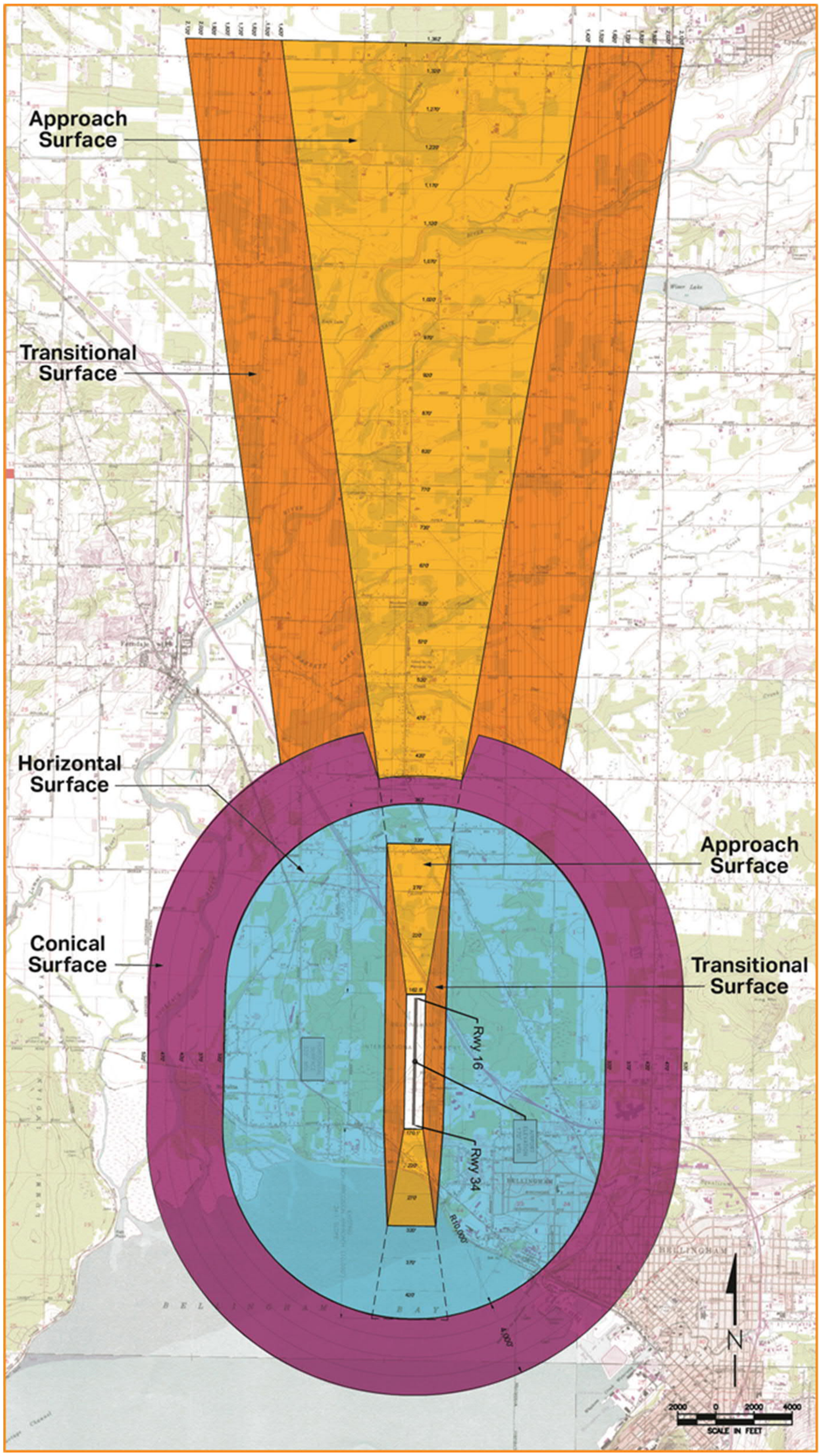
Primary Surface

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 less than ½ mile but more than ¼ 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.

Figure 2-5: FAR Part 77, Imaginary Surfaces for BLI



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.

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.

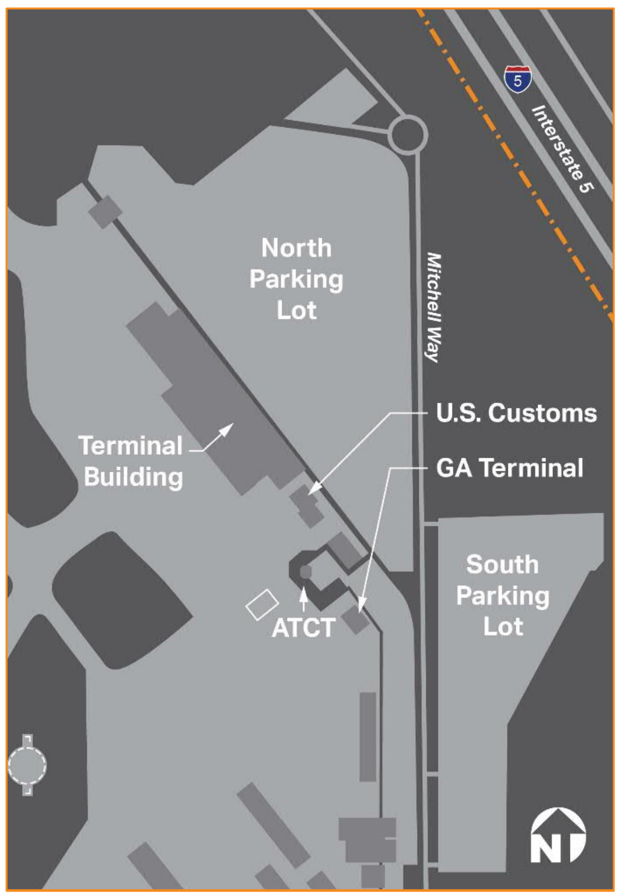
Conical Surface

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.

2.4.2 Terminal Area

The terminal area at Bellingham International Airport, shown in Figure 2-6, 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 ATCT, and automobile parking lots. Access to the terminal is via Mitchell Way.

Figure 2-6: Terminal Area



ATCT - Airport Traffic Control Tower
GA - General Aviation

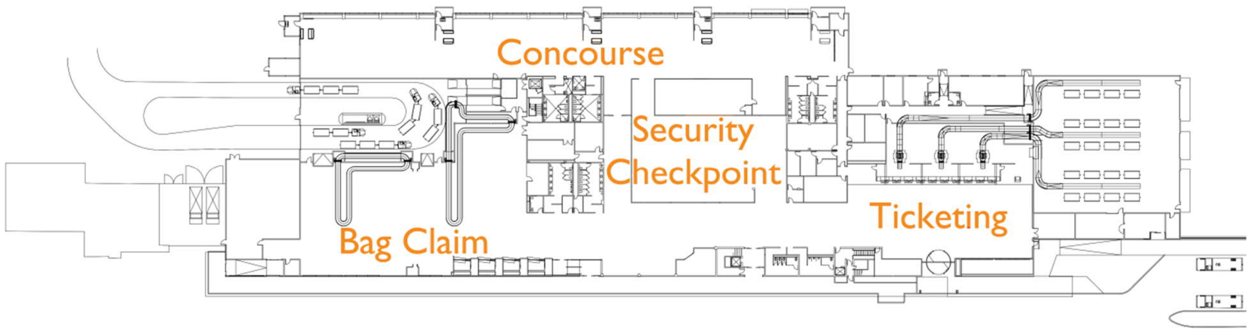
Passenger Terminal Building

The Passenger Terminal Building opened for service in 1946 and was reconstructed in 1985. In 2006, 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 method to address passenger growth. The terminal building was again expanded and remodeled in 2011 as part of a two-phase construction project. This added 22,000 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 was completed in 2014 and expanded the terminal to approximately 105,000 square feet including the ticket lobby and baggage claim lobbies as well as renovated the existing 1980/1987 building.

Terminal Apron Area

Eight aircraft gate positions are arranged linearly along the terminal concourse. These positions are reached using Taxiways H (Hotel) and E (Echo). All gates are power-in/push-out positions. While all eight gates are available for remain overnight (RON) usage, there is currently one designated RON position which is provided on the north side of the terminal at gate number 1.

Figure 2-7: Terminal Floor Plan



U.S. Customs/Immigration

BLI is designated as an International Port of Entry by the Department of Homeland Security. International arrivals are currently limited to general aviation which clear customs at the existing International Arrivals facility located in a building adjacent to the passenger terminal. U.S. Customs and Border Protection (USCBP) on-airport facilities include office space and approximately 3,375 square feet of apron fronting the ATCT that is reserved for incoming international aircraft parking.

Airport Traffic Control Tower (ATCT)

The airport is served by a contract Level 1 ATCT with radar support from Victoria Terminal (Nav Canada) and Naval Air Station (NAS) Whidbey Island. Hours of operation are from 7:00 am to 10:30 pm daily.

Aircraft Rescue and Fire Fighting (ARFF)

BLI is classified as an Index B airport per FAR 139.315. The ARFF building 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.

Access

Primary access to the airport from Interstate 5 is via the Bakerview Way interchange onto Airport Drive and thence to Airport Way and Mitchell Way. Due to increased commercial development in the area, the interchange has become increasingly congested. A multi-agency Value Planning Study was completed in May of 2011 which recommended widening and restriping the section between Pacific Highway on the east side of the freeway and Bennett Drive on the west This project was completed in 2013 and a new ramp at the Bakerview Interchange is currently in the planning stages.

Automobile Parking

Public automobile parking is provided in the immediate terminal area and vicinity. 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 free parking stalls directly across from the terminal and a cell phone parking lot just north of the main lot with 11 stalls. 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.

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.

2.4.3 General Aviation Facilities

The general aviation area is located south of the terminal. The GA area consists of all facilities required to service and support general aviation activity at BLI. The existing facilities are depicted in Figure 2-8. Current records show that there are currently 185 aircraft based at the airport including 166 single-engine piston, 8 multi-engine piston, and 5 jet engine aircraft, as well as 7 helicopters. The general aviation apron has tiedowns for 86 based aircraft as well as 8 for transient aircraft.

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 #9, Figure 2-8), as well as a flight school operating from Building #2 located next to the ARFF facility, east of the ATCT. Bellingham Aviation Services provides aviation maintenance from a hangar (within Building #16) as well as a flight school operating from Building #12.

General Aviation Terminal

The airport has a dedicated general aviation terminal located next to the ATCT. The terminal is approximately 5,300 square feet. Both Command Aviation Inc. and Bellingham Aviation Services lease space in the terminal.

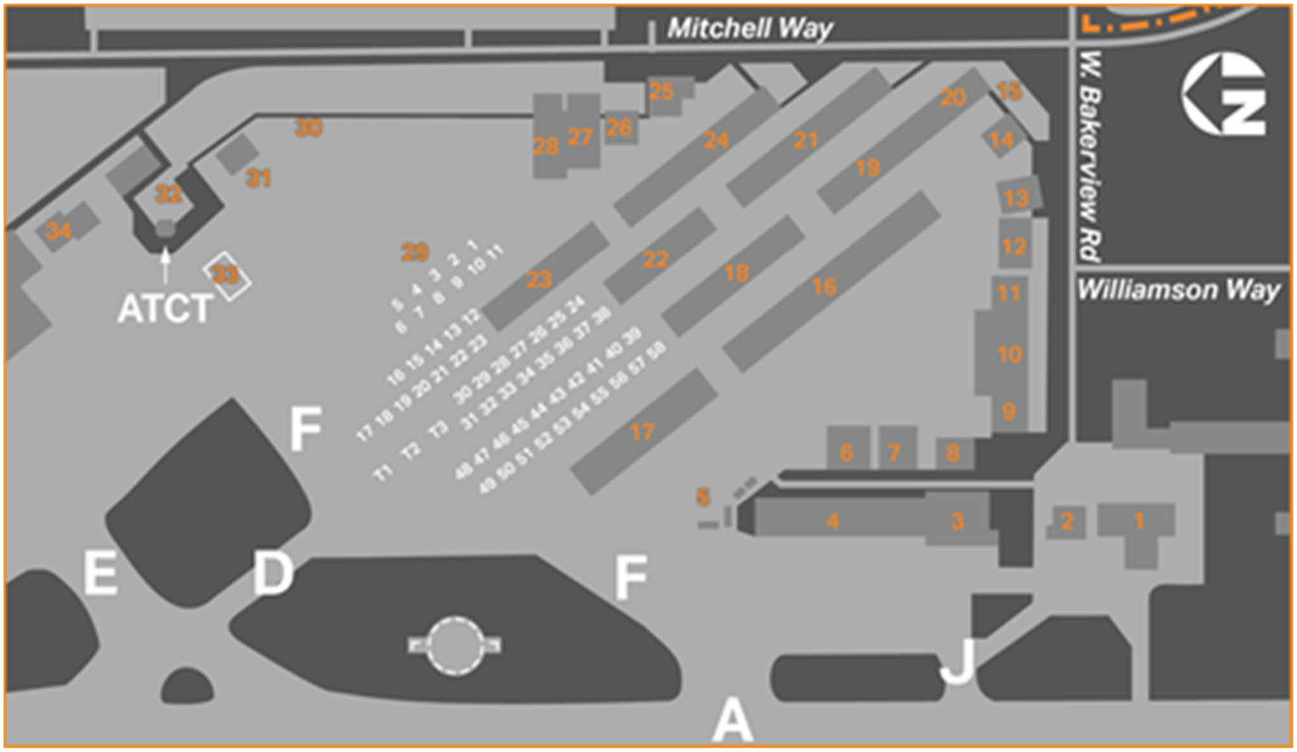
2.4.4 Fuel Storage and Distribution

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

2.4.5 Deicing

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

Figure 2-8: General Aviation Facilities



ID	Tenant
1	ARFF Station
2	Command Aviation - Flight School
3	Department of Homeland Security (DHS) Operations
4	Lonetree
5	FBO's Self-Service Fuel
6	Alpha
7	Alpha II
8	Canyon Industries
9	Command Aviation- Maintenance
10	Evolution
11	Anders
12	TEK Construction
13	Haggen
14	Bellingham Aviation Service (BAS) - Flight School
15	Gate 14
16	Strato
17	Strato II
18	Cirrus

ID	Tenant
19	Echo (Port Hangar)
20	BAS - Maintenance
21	Delta (Port Hangar)
22	Nimbus
23	Solar
24	Alto
25	Customs and Border Protection (CBP) Marine
26	Plank Family LLC
27	Apogee Real Estate LLC
28	San Juan Airlines
29	Transient Tie Downs 1-11
30	Gate 9
31	General Aviation Terminal -
	• Bellingham Aviation Services (BAS): FBO and Flight School
	• Command Aviation: FBO and Flight School
32	Air Traffic Control Tower (ATCT)
33	Customs Inspection Box Location
34	International Arrivals (Customs)

2.4.6 Airport Maintenance Facilities

Maintenance facilities for the airport are located off-site at 619 Cornwall Ave.

2.4.7 Utility Systems

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

2.4.8 Perimeter Fencing

The Air Operations Area (AOA) is completely enclosed by a perimeter security fence. The fence is 7- and 8-foot-high chain link fencing topped with 3-strand barbed wire. This fencing does not meet Transportation Security Administration (TSA) standards on the airports west side, primarily due to vegetation growth that has encroached on the fence. There are 21 security gates on the perimeter fence that allow access to the AOA at various places around the property.

2.4.9 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.

2.4.10 Historical Operations Data

BLI was the fastest growing airport in Washington State in terms of commercial service from 2006 through 2013. The introduction of low-cost service as well as increased travel destinations led to the development of a substantial passenger market that ranged from southern British Columbia to the northern Puget Sound Region. Since the high of 595,074 enplaned passengers in 2013, the airport has experienced steady decreases in passenger levels to 417,930 in 2016. There are numerous explanations for this trend:

- Airline marketing and business plans have shifted nationally.
- Airline marketing and business plans have shifted at BLI.

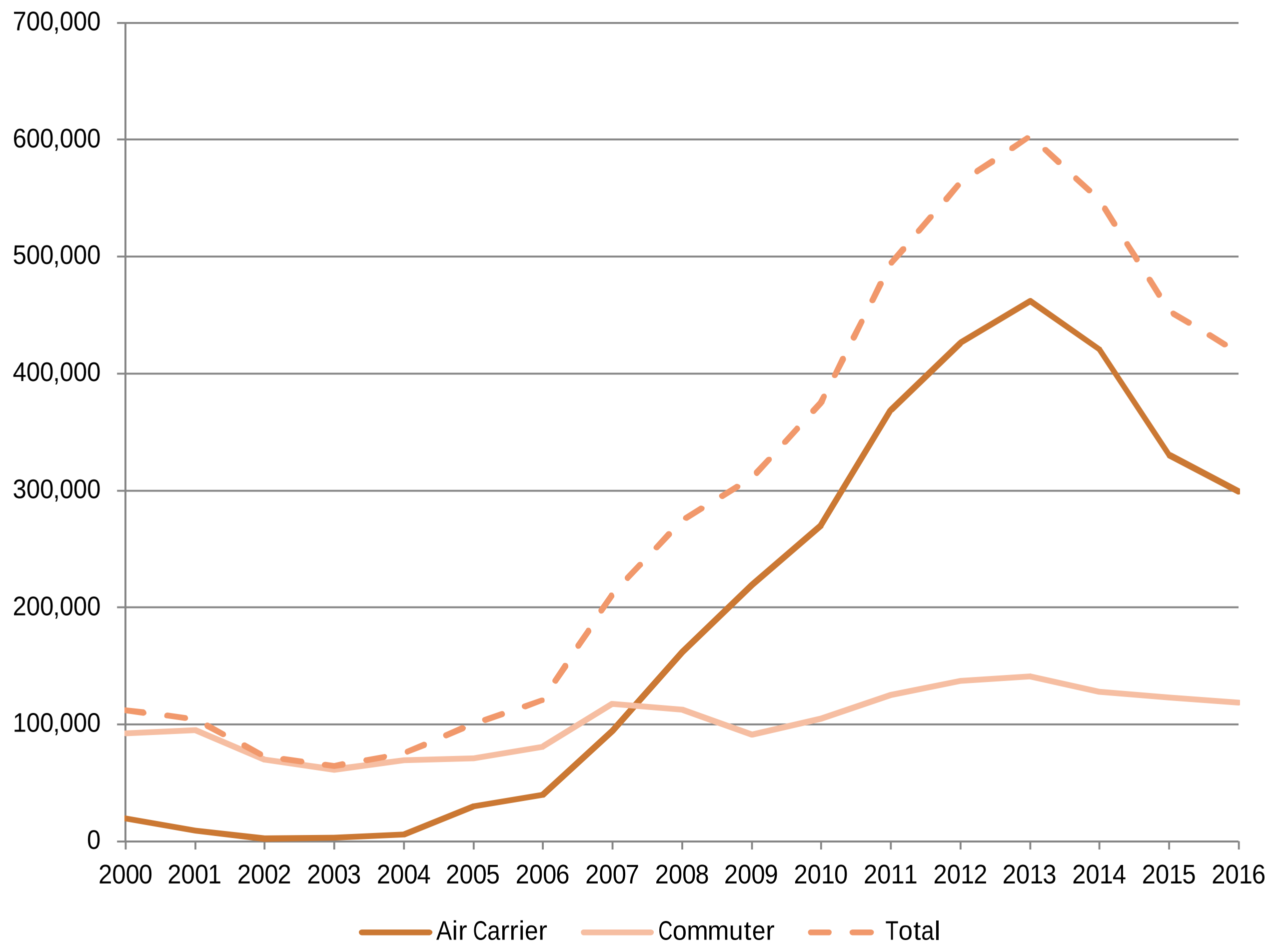
Table 2-10: Historical Enplaned Passengers

Year	Air Carrier	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	270,332	104,992	375,324
2011	368,859	125,098	493,957
2012	426,397	137,039	563,436
2013	461,863	141,204	603,067
2014	420,768	127,867	548,635
2015	343,294	118,284	461,578
2016*	299,417	118,513	417,930

* 2016 information from airport recorder for CY 2016

- Ticket-costs have increased at BLI.
- Allegiant's shifting marketing strategy.
- The regional operational environment has changed.
- Vancouver International Airport (YVR) has new low cost carriers.

Figure 2-9: Historical Enplaned Passengers



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, San Juan Airlines (merged with 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 2-11: Historic Operations Data (CY)

	Itinerant					Local			
Year	Air Carrier	Air Taxi	General Aviation	Military	Total Itinerant	General Aviation	Military	Total Local	Total Operations
2004	399	15,839	42,753	1,091	60,082	21,145	394	21,539	81,621
2005	898	15,471	42,950	1,214	60,533	21,093	474	21,567	82,100
2006	4,246	14,051	38,974	1,079	58,350	15,344	341	15,685	74,035
2007	4,638	17,780	34,327	798	57,543	16,305	426	16,731	74,274
2008	6,173	14,914	31,970	514	53,571	11,263	99	11,362	64,933
2009	6,446	13,188	32,416	608	52,658	14,712	228	14,940	67,598
2010	7,295	12,380	28,577	1,012	49,264	13,296	336	13,632	62,896
2011	8,471	11,502	28,440	862	49,275	19,702	457	20,159	69,434
2012	9,341	11,796	27,127	861	49,125	19,030	277	19,307	68,432
2013	9,908	11,123	28,079	742	49,852	15,941	587	16,528	66,380
2014	8,968	11,165	26,659	655	47,447	13,857	518	14,375	61,822
2015	7,301	11,428	28,758	820	48,307	16,175	1,403	17,578	65,885
2016	7524	17293	32323	682	57822	24378	2400	26778	84600

Source: FAA Air Traffic Activity Systems (ATADS) Data

2.5 Existing Airport/Community Land Use Compatibility Planning

2.5.1 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 comprehensive plans must include, maps, descriptive text covering objectives, principals and standards, and an inventory of air, water, and ground transportation facilities. 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 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.

2.5.2 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 amendments discourage incompatible land uses around public use airports as follows:

- 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
- 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 ordinances are closely defined 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 by its 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 operator, deem it as a non-hazard.

3 Existing Environmental Conditions

3 Existing Environmental Conditions

3.1 Introduction

The purpose of considering environmental factors in airport master planning is to help identify areas where development projects could result in environmental impacts, thereby impacting the ability to implement the recommended development actions. This information can also provide background 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.

3.2 Current Environmental Setting

Development at BLI is currently 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 State Environmental Policy Act (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 FAA-approved commercial passenger enplanement projections through 2031. This was done 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 (City), the City will then 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 such as lots for privately developed hangars 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 undergo 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, which are depicted in Figure 3-1, over a period of 10 years. The wetland fill permit expires in 2020. If the permit can't be extended, all future development will be permitted on a project by project basis.

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 filling 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 the 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, the current Corps permit could be amended to authorize the filling in of these wetlands. An alternative could be allowed if permission is 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:

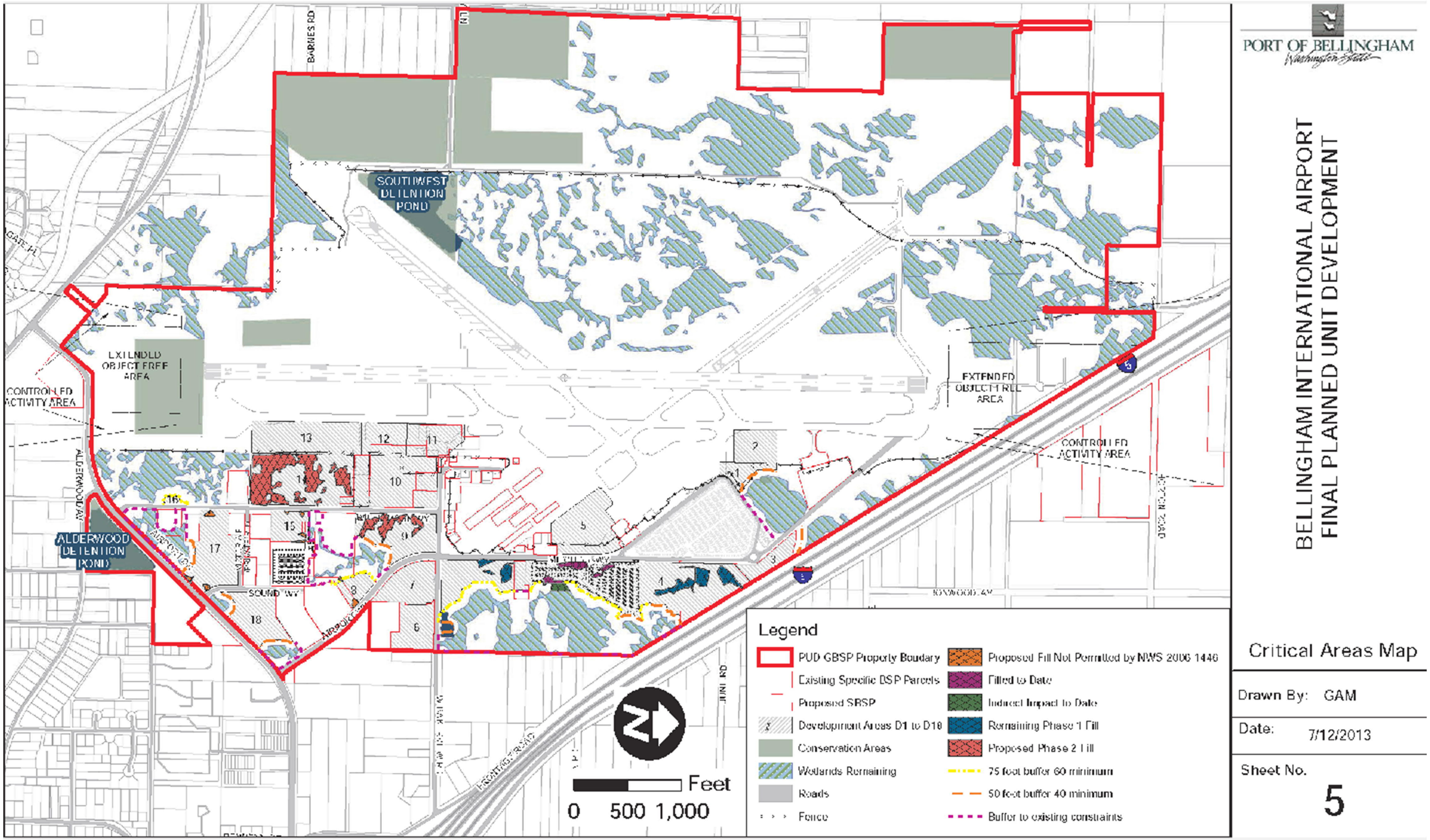
"Stormwater Pollution Prevention Plan," revision dated July 2016

"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 are required for several historic or cultural features within Development Areas 4, 9, and 14.

Figure 3-1: Binding Site Plan & Planned Unit Development



3.3 Environmental Conditions

This section describes the environmental conditions at the Bellingham International Airport that existed at the beginning of the planning process (Fall 2016). The inventory adheres to Federal Aviation Administration (FAA) guidelines, and briefly examines the impact categories identified in FAA Order 1050.1F, Environmental Impacts: Policies and Procedures as follows.

- Air quality
- Biological resources (including fish, wildlife, and plants)
- Climate
- Coastal resources
- Department of Transportation Act, Section 4(f)
- Farmlands
- Hazardous materials, solid waste, and pollution prevention
- Historical, architectural, archaeological, and cultural resources
- Land use
- Natural resources and energy supply
- Noise and compatible land use
- Socioeconomics, environmental justice, and children's environmental health and safety risks
- Visual effects (including light emissions)
- Water resources (including wetlands, floodplains, surface waters, groundwater, and wild and scenic rivers.

3.3.1 Air Quality

The Clean Air Act was passed in 1970 and amended in 1977 and 1990. This federal statute mandated the Environmental Protection Agency (EPA) to set National Ambient Air Quality Standards (NAAQS) and develop National Emissions Standards for Hazardous Air Pollutants (NESHAPs) to protect public health.

The Environmental Protection Agency website 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.

The Federal Aviation Administration Office of Environment and Energy (FAA-AEE) recognizes that the environmental consequences stemming from the operation of commercial aviation – primarily noise, emissions, and fuel burn – are highly interdependent and occur simultaneously throughout all phases of flight. The Aviation Environmental Design Tool (AEDT) is a software system that is designed to dynamically model aircraft performance in space and time to compute fuel burn, emissions, and noise. As part of this master plan the "existing conditions" for the airport were modeled using the year 2016 operations data as shown in Table 3–1. Using the annual operations as input, the AEDT Computer model generates a report that estimates the impacts that airport operations can be expected to have on the region's air quality. This report estimates the number of tons of pollutants that the aircraft can be expected to generate. Table 3–2 shows the results of this.

Table 3–1: Aircraft Fleet Mix

Aircraft	2016
Commercial Air Carrier	
Q400, CRJ	1,520
Airbus A300 series	2,072
MD-80 Series	1,036
Boeing 737 Series	2,280
Total	6,908
Air Cargo	
Cessna Caravan	8,115
Metroliner	4,868
ATR-72	3,247
Total	16,229
General Aviation	
Corporate Jets - Heavy	1,110
Corporate Jets - Light	2,196
Multi-Engine Piston	1,647
Single- Engine Piston	48,315
Rotorcraft	1,647
Total	54,915
Military	
Jet	1,385
Piston	1,385
Total	2,770
TOTAL	80,822

3.3.2 Biologic Resources

Biotic resources on, adjacent to, or near BLI consist of vegetation and wildlife. Birds and fish are discussed as individual biotic resource categories.

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.

Endangered and Threatened Species of Flora and Fauna

The U.S. Fish and Wildlife Services publishes a list of rare, endangered and threatened species for the United States. For Whatcom County this list includes a range of species, both plant and animal, as shown in Table 3–3. It should be noted that, although these species are identified as potentially existing in Whatcom County, there are no record of them having been identified on or near the airport.

Table 3–2: 2016 Aircraft Emissions

Pollutant	Abbreviation	Annual Tons
Carbon Monoxide	CO	5.34216
Hydro Carbons	HC	0.186
Total Organic Gas	TOG	0.20028
Volatile Organic Compounds	VOC	0.18753
Non-Methane Hydro Carbons	NMHC	0.1913
Oxides of Nitrogen	NOx	0.5184
Black Carbon Mass	nvPM Mass	0.00533
Particulate Matter - Sulfur	PMSO	0.00261
Particulate Matter – Fuel Organics	PMFO	168.58047
Carbon Dioxide	CO2	66.09638
Water	H2O	0.06259
Oxides of Sulfur	SOx	235.5205
Particulate Matter with a diameter of 2.5 microns or less	PM 2.5	0.02063
Particulate Matter with a diameter of 10 microns or less	PM 10	0.02063

Source: AEDT 2c – Aviation Emissions Modeling

Table 3–3: Whatcom County Endangered/Threatened Species

Group	Name	Scientific Name	Status
Amphibians	Oregon Spotted Frog	Rana Pretiosa	Threatened
Birds	Northern Spotted Owl	Strix Occidentalis Caurina	Threatened
	Marbled Murrelet	Brachyramphus Marmoratus	Threatened
	Streaked Horned Lark	Eremophila Alpestris Strigata	Threatened
Conifers and Cycads	Whitebark Pine	Pinus Albicaulis	Candidate
Fish	Bull Trout	Salvelinus Confluentus	Threatened
	Dolly Varden	Salvelinus Malma	Proposed Similarity of Appearance (Threatened)
Flowering Plants	Golden Paintbrush	Castilleja Levisecta	Threatened
	Golden Paintbrush	Castilleja Levisecta	Threatened
Mammals	Grizzly Bear	Ursus Arctos Horribilis	Under Review
	Gray Wolf	Canis Lupus	Endangered
	Canada Lynx	Lynx Canadensis	Threatened
	North American Wolverine	Gulo Gulo Luscus	Proposed Threatened

Source: U.S. Fish and Wildlife Services

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. Due to 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 locations to BLI property are tributaries connected with the lower main stem of Silver Creek.

Migratory Bird Act

The USFWS indicates that no listed species occur on the site, although bald eagles may occur in the vicinity year-round with the majority typically from April through August. 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.

3.3.3 Coastal Resources

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.

Coastal Barriers

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

3.3.4 Department of Transportation Section 4(f)

Section 4(f) of the Department of Transportation (DOT) Act of 1966 was codified to protect public parks, recreation spaces, wildlife refuges, and cultural resources from public transportation facilities development. Transportation programs or projects using federal funds or requiring a federal DOT agency approval may not use Section 4(f) lands "unless there is no feasible and prudent alternative" with documented analysis of effects and actions to minimize impacts. Uses of Section 4(f) lands include property acquisition, temporary occupancies, and proximate impacts of transportation facilities that adversely impact the purposes of Section 4(f) properties. FAA in consultation with property managers must determine the Section 4(f) status of parks, recreation lands, wildlife refuges, and cultural resources for properties that may be adversely impacted by aviation transportation facilities.

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 from the need 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.

3.3.5 Farmland

No farmland, prime farmland, unique farmland, or land of state or local significance exists in the vicinity of the airport.

3.3.6 Hazardous Materials

The Resource Conservation and Recovery Act (RCRA) of 1976 directs the EPA to protect the environment and human health and welfare from improper hazardous waste management practices. The RCRA requires labeled and effective containers for hazardous waste, record keeping, and transport manifests. Hazardous materials at BLI include aviation fuel, firefighting chemicals, antifreeze, and deicing fluids. When these materials are discarded, they may fall under RCRA regulations as hazardous waste.

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 on Figure 3-1). 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.

3.3.7 Historic and Cultural Resources

Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended, and its implementing regulation in 36 CFR 800, requires the FAA to consider potential effects to historic properties from airport projects. Historic properties include Traditional Cultural Properties (TCPs) or prehistoric or historic districts, sites, buildings, structures, and objects included in or eligible for inclusion in the National Register of Historic Places (NRHP), per 36 CFR 800.16(1).

A report prepared for the Port of Bellingham entitled “Archaeological Survey and Cultural Resource Evaluation for Developments Proposed in Areas 4, 9, and 14 (as designated on Figure 3-1), 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 are also recommended for several historic or cultural features within Development Areas 4, 9, and 14.

No other studies of cultural or historic resources have been conducted on the airport property.

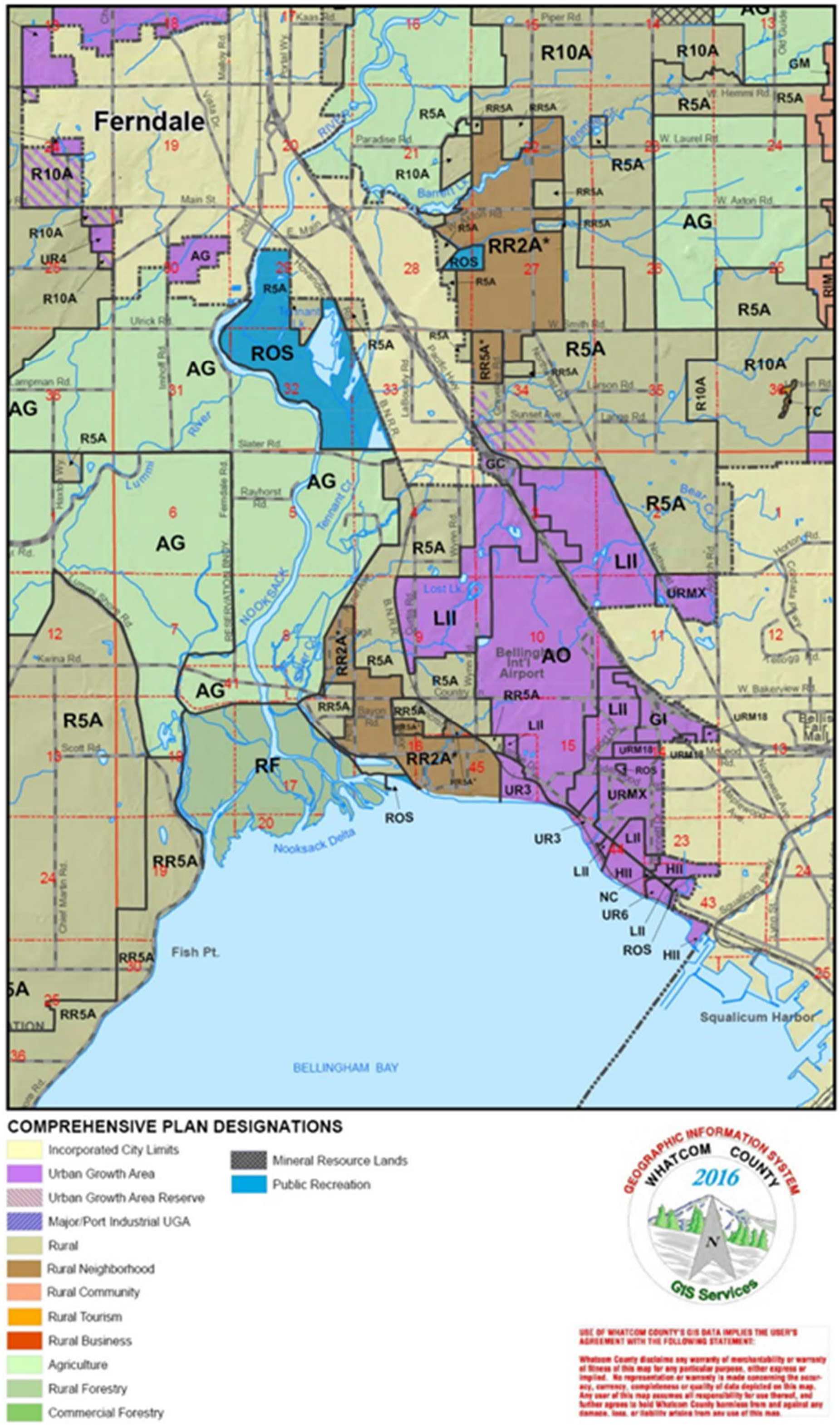
3.3.8 Land Use

BLI 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 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. During the Airport Master Plan (2014) noise contours were generated to define the noise exposure at that time and to identify areas where the level of noise impacted people. These contours were updated to reflect the noise levels associated with operation levels in 2016 in a later section of this inventory.

This information is generated to assist the Port in a continued program to minimize noise impacts through the implementation of aircraft operation techniques consisting of a preferential runway departure, standard noise abatement flight procedures, and flight patterns that direct the majority of arrival

Figure 3-2: Land Use in the Airport Vicinity



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.

shows the land use designations in the vicinity of the airport. 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 the city 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 Port and jurisdictions should continue to implement measures to ensure land use compatibility.

3.3.9 Energy Supplies, Natural Resources, and Sustainable Design

FAA Order 1050.1, Environmental Impacts: Policies and Procedures, asserts that airport improvement projects will be examined to identify effects on local energy supplies or natural resources. If impacts are identified, energy producers and environmental stakeholders must coordinate activities. In its appendix, the FAA order makes reference to Executive Order 13123. Executive Order 13123 encourages the use of renewable energy and requires federal agencies to reduce air emissions and the consumption of petroleum, energy, and water.

Solar

A Solar Feasibility Study was completed in September 2017 for Bellingham International Airport. The study looked at the viability of installing solar carports in select parking lots on airport property as a way to reduce the airport's energy costs. Capacity, location and financial costs were looked at which resulted in two primary financing options. The first being that the Port purchases, installs, and operates the solar equipment and participates in the Renewable Energy Production Incentive Payment Program. The second involves entering into a Power Purchase Agreement with Puget Sound Energy where the equipment is owned by the utility company and power would be purchased at a discounted rate. The study concludes that if FAA funds are available, ownership of the solar equipment is recommended.

3.3.10 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 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.

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 2016 and the forecast operations levels from the approved aviation demand forecasts were used. These are shown in Table 3–4.

Table 3–4: Aircraft Operations

Operations	2016
Commercial	6,908
Air Cargo/Air Taxi	16,229
General Aviation	54,915
Military	2,770
Total Operations	80,822

Source: FAA Air Traffic Activity Systems (ATADS

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 3–5.

Table 3–5: Aircraft Fleet Mix

Aircraft	2016
Commercial Air Carrier	
Q400, CRJ	1,520
Airbus A300 series	2,072
MD-80 Series	1,036
Boeing 737 Series	2,280
Total	6,908
Air Cargo	
Cessna Caravan	8,115
Metroliner	4,868
ATR-72	3,247
Total	16,229
General Aviation	
Corporate Jets - Heavy	1,110
Corporate Jets - Light	2,196
Multi-Engine Piston	1,647
Single- Engine Piston	48,315
Rotorcraft	1,647
Total	54,915
Military	
Jet	1,385
Piston	1,385
Total	2,770
TOTAL	80,822

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. 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 AEDT 2C, 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.

Land Use Compatibility Analysis

The Land Use Compatibility Matrix, presented in Table 3–6, 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 3–6: Land Use Compatibility Matrix

Land Use	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 on the previous page

Numbers in Parentheses refer to notes on the following page.

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.

Table 6 3: Land Use Compatibility Matrix (Continued)

Key to Table 3–6

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.

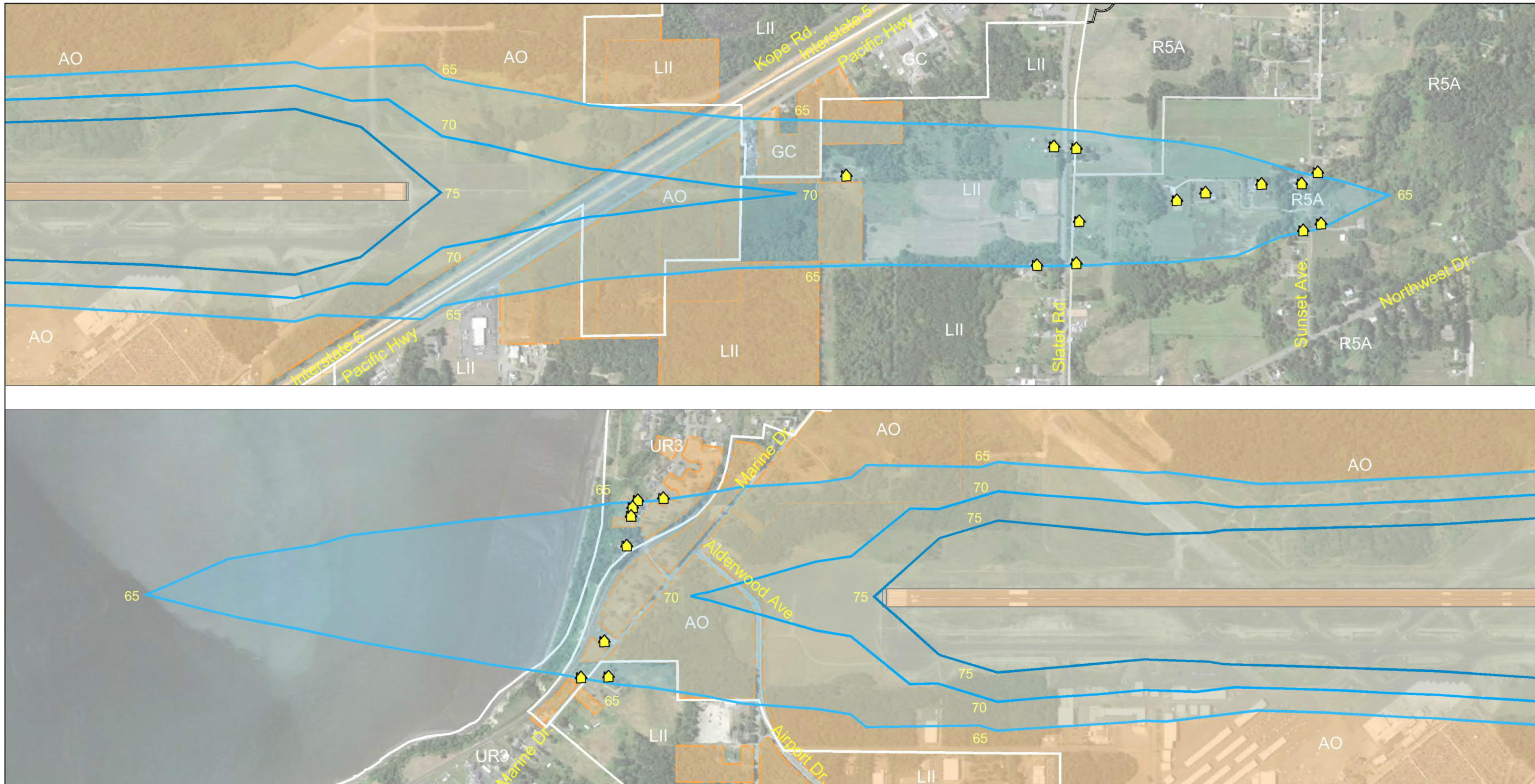
Noise Impacts

Figure 3-3 show three Aviation Environmental Design Tool (AEDT) contours that were generated for the baseline conditions 2016 as well as a compilation of the land uses that exist within each contour. In assessing the impacts of aircraft noise, land uses are compared with the information contained in Table 3–6. This assessment involved overlaying the Zoning designations from Whatcom County 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 2017). The results are shown on Figure 3-3 and discussed in the following paragraphs.

The 2016 analysis shows that there are 43.9 acres of Rural Residential Land (R5A) within the DNL 65-70 dBA contour and 0.9 acres within the DNL 70-75 dBA contour. Additionally, there are 9.8 acres of Urban Residential Land (UR3), 6.9 acres of General Commercial Land (GC), and 82.7 acres of Light Impact Industrial land (LII) within the DNL 65-70 dBA contour. None of these fall within the 70-75 dBA contours. These land uses are generally compatible with DNL 65 dBA noise levels.

Within the 65-70 dBA contours there are 21 housing units and no Noise Sensitive Facilities such as churches, schools, libraries, and nursing homes. There are no units within the 70-75 dBA contours and the 75+ dBA contour falls entirely on airport property.

Figure 3-3: AEDT 2C Model - Base Year (2016)



0 400 800
SCALE IN FEET

LEGEND

Airport Property

Residential Units within the 65 DNL

AEDT 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	21 units	0 units	0 units
Noise Sensitive Facilities (Churches, Schools, Libraries, Nursing Homes)	0 units	0 units	0 units
LII - Light Impact Industrial Land	82.7 acres	0.9 acres	0 acres
GC - General Commercial Land	6.9 acres	0 acres	0 acres
R5A - Rural Residential Land	43.9 acres	0 acres	0 acres
UR3 - Urban Residential Land	9.8 acres	0 acres	0 acres

Bellingham International Airport
Aviation Environmental Design Tool (AEDT) - Year 2016

3.3.11 Light Emissions

Lighting exists on both the landside and airside portions of the airport. This includes 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.

3.3.12 Wetlands

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 (Figure 3-1). 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.

3.3.13 Floodplains

Executive Order 11988, issued in 1977 by President Carter, directs federal agencies to avoid potential adverse impacts to floodplains and to avoid floodplain development wherever there is a practical alternative. Floodplains are the lowland and relatively flat areas that adjoin inland and coastal waters, including flood prone areas of offshore islands. Executive Order 11988 directs federal agencies to see if an action is within the 100-year floodplain (1% or more annual chance for flooding), and in the 500-year floodplain (0.2% annual chance for flooding) for critical infrastructure.

Executive Order 13689 amended Executive Order 11988, and was issued in January 2015 by President Obama. The new executive order identifies three methods for determining the elevation and flood hazard area: the climate- informed science approach (use climate science data), the free-board value approach (add 2–3 feet to the 100-year floodplain), and the 500-year elevation approach (use area that has a 0.2% annual chance for flooding). The Federal Emergency Management Agency (FEMA) simultaneously published “Revised Guidelines for Implementing Executive Order 11988” that reflect these changes. 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.

3.3.14 Surface Waters

Comprehensive federal, state, and local permits related to water quality issues and the airport have been obtained as summarized in Section 3.2. 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.

3.3.15 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.

4 Forecast of Aviation Demand

4 Forecast of Aviation Demand

4.1 Introduction

This master plan chapter presents forecasts of future aviation activity at the Bellingham International Airport (BLI). Developing forecasts is a key step in the airport planning process and provide the basis for determining the airport's role in the larger aviation system and determining improvements to the airfield, terminal facilities, apron areas, airside/landside access and parking facilities that may be needed to accommodate growth in demand. These are then used to estimate potential environmental effects, such as noise, of the airport's operation on the surrounding community and to evaluate the financial feasibility of alternative airport development proposals.

Aviation activity forecasts start with an analysis of past trends as well as an assessment of activity forecasts prepared by others. Historically, BLI was the fastest growing airport in Washington State in terms of commercial service from 2006 through 2013. The introduction of low-cost service as well as increased travel destinations led to the development of a substantial passenger market that ranged from southern British Columbia to the northern Puget Sound Region.

Forecasts that were prepared, both in the previous master plan and the FAA's TAF reflected this growth and showed an expectation of it continuing into the future, at a lesser rate. With the master plan projecting growth to 1,145,989 annual passengers by the year 2013 (based on historical data through 2011).

Since a high of 595,074 enplaned passengers in 2013 however, the airport has experienced steady decreases in passenger levels to 417,930 in 2016. This is primarily due to the fact that much of the passenger growth at BLI was the result of a low price carrier offering service to resort destinations. This attracted passengers from both Southeastern British Columbia and the Puget Sound Region. Changes in border conditions, currency exchange rates and the introduction of low cost service at Vancouver International Airport (YVR) have changed the demand levels. These decreases have several explanations including;

- Airline marketing and business plans have shifted at BLI.
- Ticket-costs have increased at BLI.
- Allegiant's has shifted their marketing strategy, and
- The regional operational environment has changed.

These factors point to the fact that the passenger levels at BLI are dependent on regional conditions more so than local factors. Therefore, forecasts for BLI must consider regional factors such as exchange rate, service changes at other regional airports and the local (Whatcom County) socioeconomic environment.

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. These flights typically carried high load factors ranging from 90% or better on peak flights but lower yields for off peak or commuter flights.

The air taxi/commuter category reflected the departure of United Express but stabilized somewhat as Alaska Airlines (Horizon), West Isle Air, Rite Brothers, San Juan Airlines (merged with Northwest Sky Ferry) and the air cargo flights that make up the base of these continue to provide service.

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 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 4-1 shows the historic operations data for BLI from 2004 through 2015.

Table 4-1: Historic Operations Data (CY)

	Itinerant					Local			
Year	Air Carrier	Air Taxi	General Aviation	Military	Total Itinerant	General Aviation	Military	Total Local	Total Operations
2004	399	15,839	42,753	1,091	60,082	21,145	394	21,539	81,621
2005	898	15,471	42,950	1,214	60,533	21,093	474	21,567	82,100
2006	4,246	14,051	38,974	1,079	58,350	15,344	341	15,685	74,035
2007	4,638	17,780	34,327	798	57,543	16,305	426	16,731	74,274
2008	6,173	14,914	31,970	514	53,571	11,263	99	11,362	64,933
2009	6,446	13,188	32,416	608	52,658	14,712	228	14,940	67,598
2010	7,295	12,380	28,577	1,012	49,264	13,296	336	13,632	62,896
2011	8,471	11,502	28,440	862	49,275	19,702	457	20,159	69,434
2012	9,341	11,796	27,127	861	49,125	19,030	277	19,307	68,432
2013	9,908	11,123	28,079	742	49,852	15,941	587	16,528	66,380
2014	8,968	11,165	26,659	655	47,447	13,857	518	14,375	61,822
2015	7,301	11,428	28,758	820	48,307	16,175	1,403	17,578	65,885

Source: FAA Air Traffic Activity Systems (ATADS) Data

The background data used in preparing this forecast included the following sources;

- Bellingham International Airport Master Plan (URS) – May 2015,
- Airport management records,
- Airport Traffic Control Tower (ATCT) records for BLI,
- Bureau of Transportation Statistics T-100 Data for Domestic Operations,
- The FAA Aerospace Forecast 2016-2036,
- The Operations Network (OPSNET)data,
- FAA Traffic Flow Management System Counts (TFMSC) data,
- FAA Terminal Area Forecast (TAF) – 2015 through 2040.
- The Boeing Company Current Market Outlook 2014-2033
- Airbus General Market Forecast – Navigating the Future 2016-2035
- IATA Air Passenger Forecasts Global Report April 2015

Although these documents were not prepared at the same point in time nor have they used identical baseline data strings or modelling assumptions, they do offer a perspective as to the thoughts of industry experts as to the potential growth and development of aviation trends that could influence activity at BLI over the next 20 years. What these documents show is that the aviation industry as a whole is expected to continue to grow into the future despite the annual fluctuations experienced. The purpose of this forecasting effort is to determine whether BLI will grow at the same rate.

4.2 Summary of Forecasts

Herein is a summary of the forecasting results developed for BLI using process described in FAA Advisory Circular (AC) 150/5070-6B, Airport Master Plans. Enplaned passenger forecasts assumed the following factors would influence future enplaned passenger levels.

2017 - 2021

- Due to weakness in the Canadian exchange rate in relation to the US Dollar and labor issues resulting from contracts negotiated, Allegiant Air has indicated that it will reduce seating capacity at BLI by approximately 9 percent in 2017. This is assumed to result in a decrease in passengers by 9 percent.
- BLI demand will decrease with the start of commercial air-service at Snohomish County Airport/Paine Field (PAE) in 2018. This will be due to the fact that tickets are likely to be priced low to attract initial customers, induce demand and "prove" the service. However, the capacity at PAE has been established at 550,000 annual passengers over the long term so the impact of new service will not be long-term. Although most of the passengers attracted to PAE are expected to be drawn from Seattle-Tacoma International Airport (SEA) service area, a reduced demand on BLI can be expected as its current catchment area extends to the north Seattle region. This forecast assumes that the decrease will be approximately 10 percent.
- By 2019 PAE will have established itself, the current terminal will be operating at or near capacity, and its impact on the market will be established.
- Increasing service by low cost carriers Rouge and WestJet at Vancouver International Airport (YVR) and Abbotsford Airport (YXX) will reduce the number of Canadian customers who cross the border to fly out of BLI. A comparison completed in 2016 shows that ticket prices are generally cheaper at YVR than at BLI but YXX tickets are still higher.
- The relative value of the Canadian Dollar to the US Dollar will not change substantially in the short-term hovering around the 1.3 mark through the end of 2017. This will also discourage the cross-border customer base.
- 2020 - Growth at BLI will continue, but at a rate that is less than the FAA forecast rate for commercial passengers due to the maturing regional commercial air-service market.

2022 – 2027

- Gate and capacity expansion will be stalled at SEA and PAE leading to BLI regaining market share. Growth during this period is projected at the FAA rate of 1.6% annually, which matches the growth rate for Puget Sound passenger demand growth forecasted in the SEA Sustainable Airport Master Plan (SAMP).

Beyond 2027

- SEA and PAE will add capacity and draw from BLI's current catchment area resulting in a suppression of the growth rate at BLI where passenger levels will continue to increase but at a rate lower than FAA projections (estimated to be approximately 1.3% annually).
- Commercial air carrier operations will continue to grow as passenger levels increase but the airlines will seek higher load factors before they add flights. This will make airplane operations grow slower than the growth in passengers.
- The Air taxi category includes the on-demand carriers, air cargo flights, and other for hire air taxi activity. Historically this category has represented a healthy segment of the BLI market. This is expected to continue in the future with growth rates tied to projected growth in the overall national aviation market, as forecast by FAA as well as growth in the regional population.
- General aviation including corporate and business activity makes up the most significant portion of the total operations at BLI. The growth in this category is expected to be moderate over the 20-year forecast period driven primarily by local population growth and economic conditions.
- Military activity at BLI has fluctuated in the past but is a minimal portion of overall activity and in the future is expected to remain flat.

Table 4-2 shows a summary of the forecasts prepared for BLI that will be used in the remainder of this master plan. Details of historical information, assumptions, and decisions regarding these forecasts are contained in this chapter.

Table 4-2: Summary of Forecasts BLI

Category	2016	2022	2027	2032	2037
Enplaned Passengers	417,930	392,209	424,606	459,679	497,649
Air Cargo Tons	1,450	1,535	1,623	1,710	1,792
Based Aircraft	189	207	222	238	256
Annual Operations					
Air Carrier	8,022	7,599	7,630	8,021	8,320
Air Taxi	9,379	9,747	10,058	10,361	10,653
Air Cargo	5,736	6,006	6,349	6,689	7,012
General Aviation	56,701	60,984	63,636	66,489	69,610
Military	2,770	2,770	2,770	2,770	2,770
Total	82,608	87,106	90,443	94,330	98,365

Source: Base year 2016 operations from FAA ATADS data with some additional classification distribution to account for forecasting categories. In this case commuter airline operations by the Q- 400 have been included in the air carrier numbers.

Base year 2016 passenger and air cargo data from airport records

All forecasts by AECOM

4.3 Forecast Categories

While the nature and scope of aviation demand forecasts vary from airport to airport the primary forecast elements are relatively consistent. For BLI, the forecast will address the following activity categories:

Commercial Activity (Air Carrier and Commuter)

- Enplaned passengers (Domestic & International)
- Commercial airplane fleet
- Annual commercial service operations
- Air Taxi Activity
- Total air cargo tonnage
- Air cargo airline fleet
- Annual air cargo operations
- Annual air taxi operations

General Aviation Activity

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

Military Activity

Annual Instrument Operations

Peak Period Forecasts for Peak Month, Design Day, and Design Hour

Critical Aircraft and Operations Activity

4.4 The Forecasting Process

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

- Collect and review previous forecasts;
- Gather additional data as needed;
- Select the forecast methods to include,
- Apply the forecast methods and evaluate the results,
- Select the preferred forecast based on judgement.

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 2016).

4.5 Forecast of Commercial Activity

4.5.1 Background

As described in the Existing Conditions chapter, commercial activity at BLI has changed dramatically since 2004. The airport underwent a transition from a regional service airport served primarily by commuter aircraft with feeder flights to Seattle, into a small-hub airport where the introduction of low-cost carrier service to leisure and vacation destinations, led to a rapid increase in the number of enplaned passengers. The period of continuous passenger enplanement growth from 2004 through 2013 was driven by the introduction of service by Allegiant Airlines. Allegiant focused on drawing new passengers to Bellingham from southwestern British Columbia and the northern Puget Sound Region. For those passengers, the attraction was a combination of ease of access, low fares to new destinations, and the extremely low cost of parking.

As the passenger levels at BLI increased, Alaska Airlines expanded service in 2008 to include 737-service to several destinations. During the initiation of this competing service, both Allegiant and Alaska used low demand inducement fares to attract additional passengers to BLI. This combined with the fact that the relative value of the Canadian dollar vis-à-vis the American dollar made tickets at BLI of greater value to the Canadian passenger which led to the rapid increases in passenger levels.

By 2014 the passenger market at BLI had developed to the point where both airlines sought to better define the value of the market by raising ticket prices and reducing seating capacity to more profitable levels. At the same time airline corporate offices have refocused their attention on new markets or other factors that advanced the overall business goals of the airlines. These decisions, as well as changes in the currency exchange rates and the general conditions and changes in the national air carrier industry have led to three years of declining passenger levels (2013 through 2016).

Table 4-3: Historical Enplaned Passenger Levels (Fiscal Year)

Year	Air Carrier	Commuter	Total
2007	94,399	117,261	211,660
2008	162,086	112,734	274,820
2009	219,212	91,365	310,577
2010	270,332	104,992	375,324
2011	368,859	125,098	493,957
2012	426,397	137,039	563,436
2013	461,863	141,204	603,067
2014	420,768	127,867	548,635
2015	330,472	123,030	453,502
2016	299,417	118,513	417,930

Source: Bellingham Airport records

Table 4-3 shows the historical levels of enplaned passengers at BLI over the past decade.

Over the years the fleet used to transport these passengers has also changed. In 2007 and 2008 the majority of flights at BLI still consisted of Horizon Airlines flights back and forth to SEA. From 2008 forward the increase in scheduled service by Alaska and Allegiant changed the fleet mix to higher seat capacity aircraft (MD-80's for Allegiant and 737's for Alaska). This increased the average seats available per departure at BLI. The data in Table 4-4 shows the relationship between the enplaned passenger levels and the airline departures, expressed and passenger load factor.

Table 4-4: Historical Load Factors

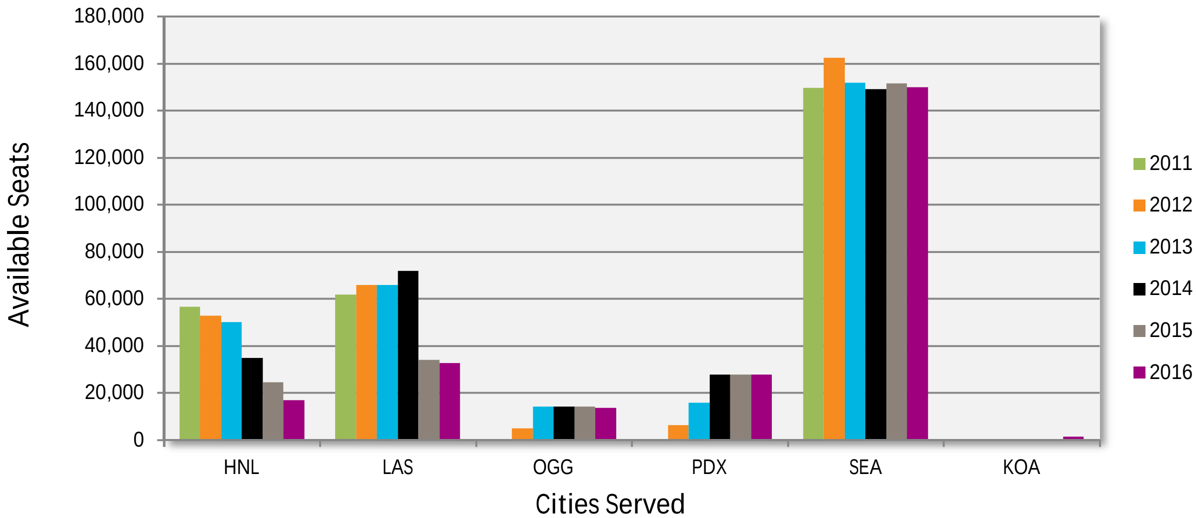
Year	Enplaned Passengers	Commercial Operations	Commercial Departures	Pax per Dep	Avg Seats per Departure	Avg Load Factor
2007	211,660	3,362	1,681	126	130	96.86%
2008	214,820	6,190	3,095	69	130	53.39%
2009	310,557	6,357	3,179	98	162	60.31%
2010	375,324	6,981	3,491	108	162	66.37%
2011	493,957	8,128	4,064	122	162	75.03%
2012	563,436	9,307	4,654	121	162	74.74%
2013	603,067	9,911	4,956	122	162	75.12%
2014	548,635	9,321	4,661	118	162	72.67%
2015	453,502	7,357	3,679	123	162	76.10%
2016	417,930	7,583	3,792	110	162	68.04%

Notes:

- Enplaned Passenger levels taken from airport records
- Operations from the TAF published January 2017

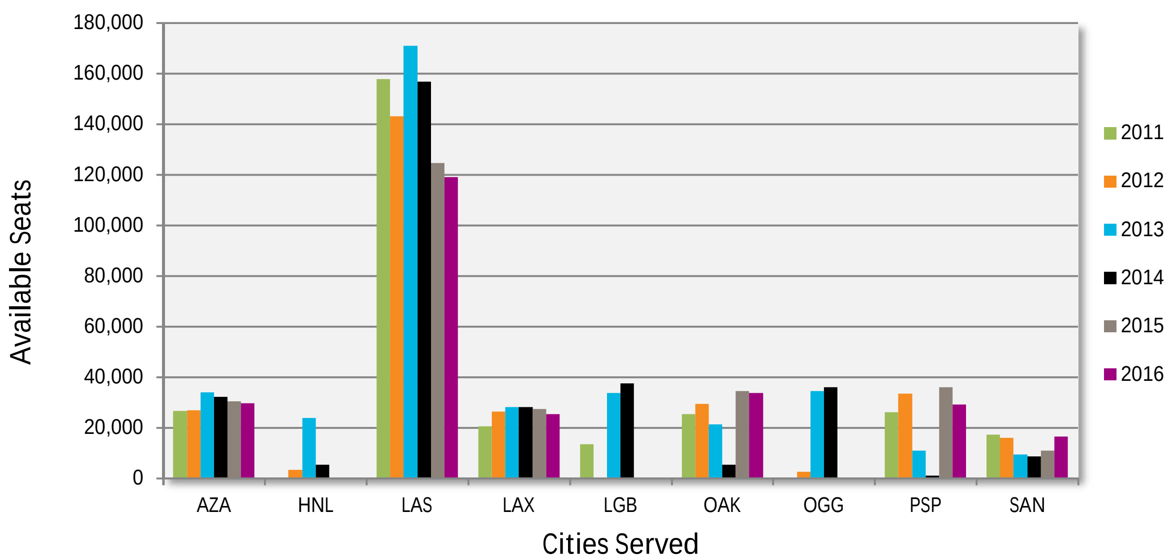
Currently (2017) Allegiant and Alaska Airlines have split the market at BLI with Alaska dominating the market to SEA due to their Horizon Q-400 commuter air-service that is used to connect with other Alaska flights. Allegiant's largest market remains Las Vegas (LAS). The details of the airline service are shown in Figure 4–1 and Figure 4–2.

Figure 4–1: Alaska Airlines Service at BLI



HNL – Honolulu International Airport
LAS – McCarren International Airport (Las Vegas)
OGG - Kahului Airport
PDX – Portland International Airport
SEA – Seattle-Tacoma International Airport
KOA – Kona International Airport

Figure 4–2: Allegiant Service at BLI



AZA – Phoenix-Mesa Gateway Airport
HNL – Honolulu International Airport
LAS – McCarren International Airport (Las Vegas)
LGB – Long Beach Airport
OAK – Oakland International Airport
OGG - Kahului Airport
PSP – Palm Springs International Airport
SAN – San Diego International Airport

The challenge faced in developing a new forecast at BLI is to understand the factors that pushed growth (and decline) in the past and anticipate changes that will influence commercial activity in the future. The first step in making this forecast is to analyze the relative position of BLI within the larger aviation system. These cover a variety of physical, operational and socio-economic considerations and include the following.

The Regional Marketplace: Bellingham and Whatcom County are situated between two large Metropolitan Areas (Seattle and Vancouver B.C.). There are currently three commercial service airports operating within this area in addition to BLI. These are the Seattle-Tacoma International Airport (SEA), Vancouver International Airport (YVR) and Abbotsford Airport (YXX) as shown in Figure 4–3.

Figure 4–3: Bellingham International Airport Passenger Catchment Area

Airport	Location	Distance
Seattle-Tacoma International Airport	SeaTac, Washington	110 miles – 1 hour 55 minutes
Vancouver International Airport	Vancouver, British Columbia	46 miles – 1 hour 45 minutes (with border crossing)
Abbotsford International Airport	Abbotsford, British Columbia	23 miles – 1 hour 10 minutes (with border crossing.)

Physical Facilities: The airports within the region have prepared forecasts that indicate a potential market of 54,000,000 enplaned passengers by 2037. As shown in the following table, previous forecasts have indicated that BLI's share of this regional base was forecast to be from 1.25 to 1.5 percent of the total. Most of the passengers are assumed to continue to use the larger and better airline served facilities at SEA and YVR.

The Sustainable Airport Master Plan for SEA assumes that the airport's ability to provide sufficient gate capacity to keep up with demand is questionable in both the short- and long-term periods. Likewise, at YVR the master plan is currently under development and keeping airport capacity in sync with demand growth will be difficult.

Table 4-5: Forecasts for Regional Airport Passengers

Year	BLI	PAE	SEA	YVR	YXX	Total Regional
2015	461,578	0	19,025,000	10,150,000	406,302	30,042,880
2016	423,949	0	19,450,000	10,424,050	414,428	30,721,427
2017	392,837	56,000	19,875,000	10,705,499	422,717	31,396,053
2022	432,919	238,200	22,000,000	12,230,921	466,713	35,368,753
2027	468,896	262,992	25,040,000	13,973,698	515,289	40,260,876
2032	512,006	290,364	28,690,000	15,964,804	568,921	46,026,095
2037	559,517	320,586	34,990,000	18,239,621	628,135	54,737,858

Sources:
- SEA forecast as prepared in the Sustainability Master Plan
- BLI forecast taken from the FAA Terminal Area Forecast (TAF)
- PAE forecast assumes a terminal opening in 2018 with both opening year passenger levels and 5-years hence from the Finding of No Significant Impact Record of Decision (FONSI/ROD) issued by FAA for the institution of commercial service. From that point forward a 2 percent annual rate is applied based on the passenger growth/regional population ratio.

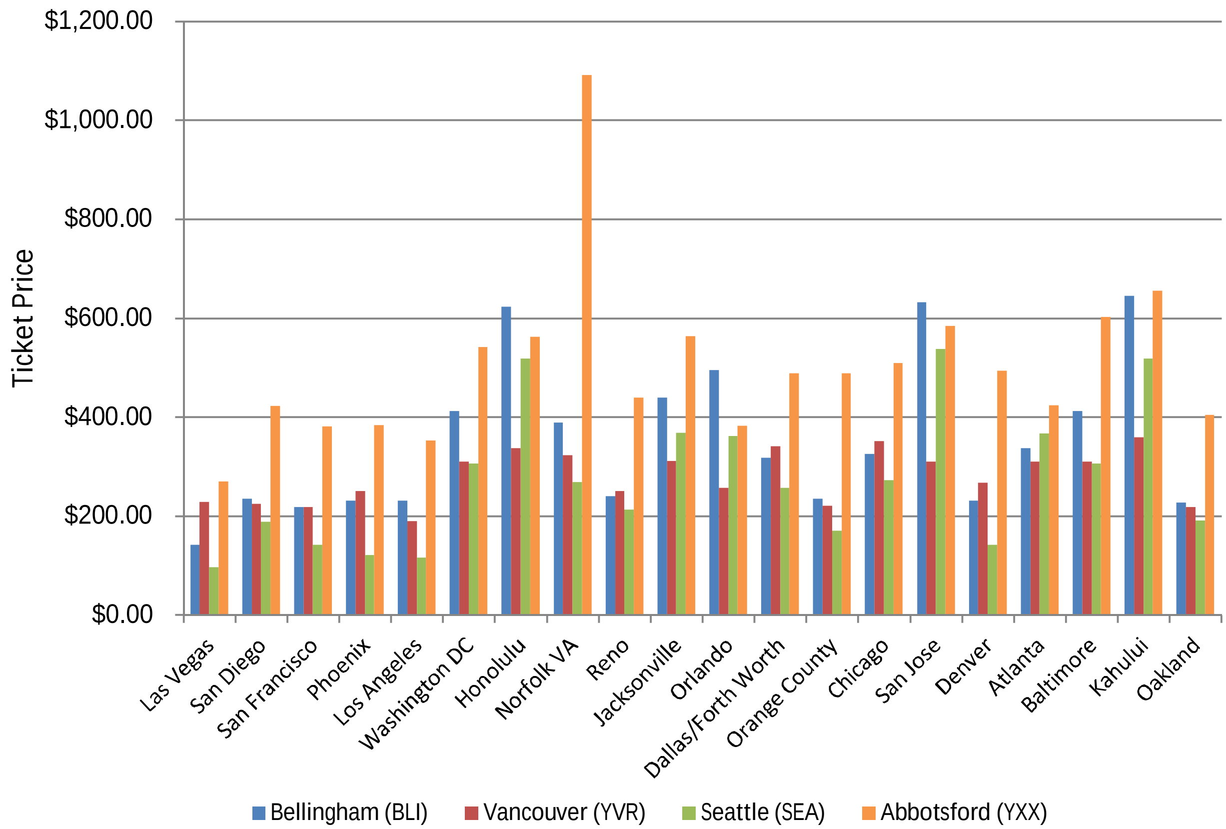
Changing the distribution of passengers between these airports will be based largely on ticket price. A Passenger Retention Analysis conducted for BLI identified the top 20 Destination Markets and a comparison of the cost of tickets to those destinations from each of the regional airports shows that passengers can generally get a better bargain today by purchasing their tickets for SEA or YVR rather than for BLI or YXX (Table 4-6). This is contrary to the situation that existed from 2012 through 2015. When the cost of parking and ease of travel are included the situation becomes less clear. For instance, at Bellingham automobile parking fees are $12.00 per day compared with YXX at $9.00 per day and $28.00 per day at either SEA or YVR. Depending on how long a trip is being taken the difference in parking can be considerable. However, the decision point for deciding which airport to use continues to be ticket price.

Table 4-6: BLI Top 20 Destination Markets – Airline Ticket Price Comparison

#	Destination	BLI	YVR	SEA	YXX
1	Las Vegas, NV	$141.20	$227.91	$96.20	$269.12
2	San Diego, CA	$235.20	$223.98	$188.70	$422.24
3	San Francisco, CA	$218.20	$217.32	$141.20	$380.67
4	Phoenix, AZ	$231.20	$249.87	$121.20	$383.84
5	Los Angeles, CA	$231.20	$188.99	$116.20	$352.37
6	Washington DC	$412.20	$309.55	$305.20	$541.30
7	Honolulu, HI	$623.00	$337.41	$518.00	$562.03
8	Norfolk, VA	$389.20	$322.53	$268.20	$1,090.78
9	Reno, NV	$239.20	$249.76	$212.20	$438.83
10	Jacksonville, FL	$438.83	$310.61	$368.20	$563.82
11	Orlando, FL	$494.20	$256.62	$361.20	$381.74
12	Dallas/Fort Worth, TX	$317.20	$341.02	$256.20	$487.87
13	Orange County, CA	$235.20	$220.55	$170.20	$488.59
14	Chicago, IL	$325.20	$351.10	$272.20	$508.31
15	San Jose, CA	$631.99	$309.85	$537.49	$583.95
16	Denver, CO	$230.20	$266.79	$141.20	$493.03
17	Atlanta, GA	$337.20	$309.55	$366.70	$423.32
18	Baltimore, MD	$412.20	$309.55	$305.20	$602.18
19	Kahului, HI	$645.00	$358.51	$518.00	$654.47
20	Oakland, CA	$227.20	$217.23	$191.20	$404.28

Date of Research: Oct. 31, 2016 (per expedia.com)
Analyzed Travel Days: December 5 - December 7

Figure 4–4: BLI Top 20 Market Destinations – Airline Ticket Price Comparison



In addition to the airports shown, new commercial service is expected to begin at Paine Field in Snohomish County in 2018. This service will likely be initiated with low ticket prices offered to attract initial customers and "prove" the viability of service. However, opening day service will be limited by the capacity of the 30,000 sf two-gate terminal and has been estimated to be limited to 150,000 enplanements during the first year with eventual growth to 550,000.

At BLI however, terminal expansion completed in 2014 allows the Port of Bellingham to offer new state-of-the-art terminal facilities within a low operating cost structure with adequate capacity to handle up to 800,000 annual enplaned passengers – not currently expected to be reached within the next 15 to 20 years.

Service Enhancements: BLI is a Designated International Port of Entry. Although the majority of the international flights are General Aviation, the Port of Entry could be expanded to include commercial flights in the future.

Border Conditions: Historically a percentage of BLI's passengers have been drawn from British Columbia. This portion of the market has been subject to changes in international border dynamics such as economics, currency exchange rates, changes to Canadian airport taxation rules, or border clearance procedures.

Airline Market Factors: Given the competitive regional marketplace BLI's future is particularly sensitive to changing airline business models or service patterns such as;

- Airline consolidations and capacity discipline,

- Fluctuations in the price of oil and
- Changes in the currency exchange rates

Community Input: Although there has been opposition expressed to airport operations in the past, these have been related to noise levels, aircraft emissions and the overall growth in automobile traffic near the airport. There is some general recognition that the increased travel convenience and positive economic impacts at the airport have been positive.

Socioeconomic Conditions: The growth in population and general economy picture for the primary service area (Whatcom County) indicates that demand for air transportation services generated locally will continue.

4.6 Forecast of Enplaned Passengers

The forecast of enplaned passengers at BLI has been prepared to include all passengers whether traveling by air carrier or commuter airline. A variety of methods are available for forecasting air carrier passengers. However, most techniques share a common shortcoming that assumes relationships which existed in the past will continue unchanged into the future. Consequently, they do not allow for the effects of airline marketing decisions, changing service levels, and other changes at BLI that are independent of past indicators but which have been the driving forces behind BLI's passenger levels. For instance, an econometric model that compared passenger growth to population and economic growth within the passenger service area showed no correlation between the number of enplaned passengers and the typical socioeconomic factors that have been linked to such growth. In the case of Bellingham, the primary factor in the past growth levels has been the US/Canadian exchange rate. However, arriving at independently produced projections for how this could change in the future is not possible. To account for these forecasting issues, a deeper dive into local factors has been applied to the forecasts derived from the statistical techniques.

The first method we used for projecting future passenger levels is the market share technique. Market share analyses involve a review of historical activity levels at an airport and comparing these to levels for a larger area. This comparison can be used to determine what share of the larger market area uses the individual airport for which forecasts are being prepared. This share can then be applied to forecasts of passengers prepared for the larger market by the FAA in the Terminal Area Forecast (TAF) to project future activity levels at BLI. Market share models used for these forecasts are as follows:

- 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

The underlying assumption in this method 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 perform in a manner that maintains its demonstrated share of that larger market over time. In the case of BLI, with a customer base that includes southeast British Columbia, these regional forecasts were felt to reflect the best analysis of the growth of the airline passenger market.

To supplement the market share analyses, forecasts were also developed using growth rates in enplaned passengers independently projected by industry and government agencies other than FAA. In the case of these enplaned passenger forecasts, three industry sources were used 1) The Boeing

Company, 2) Airbus, and 3) the International Air Transportation Association (IATA). These publications provide a detailed analysis of the demand for airline travel globally broken down by markets. In our forecasts the growth rates projected for North America were used as an indicator of the latent demand for service, regardless of the airport chosen by the passengers. The growth rates projected in these sources were compared with those found in the FAA's Aerospace Forecasts. These sources project that the air passenger market in North America will grow at a rate of from 1.6 to 3.0 percent per year.

4.6.1 Summary of Enplaned Passenger Projections and Preferred Forecast

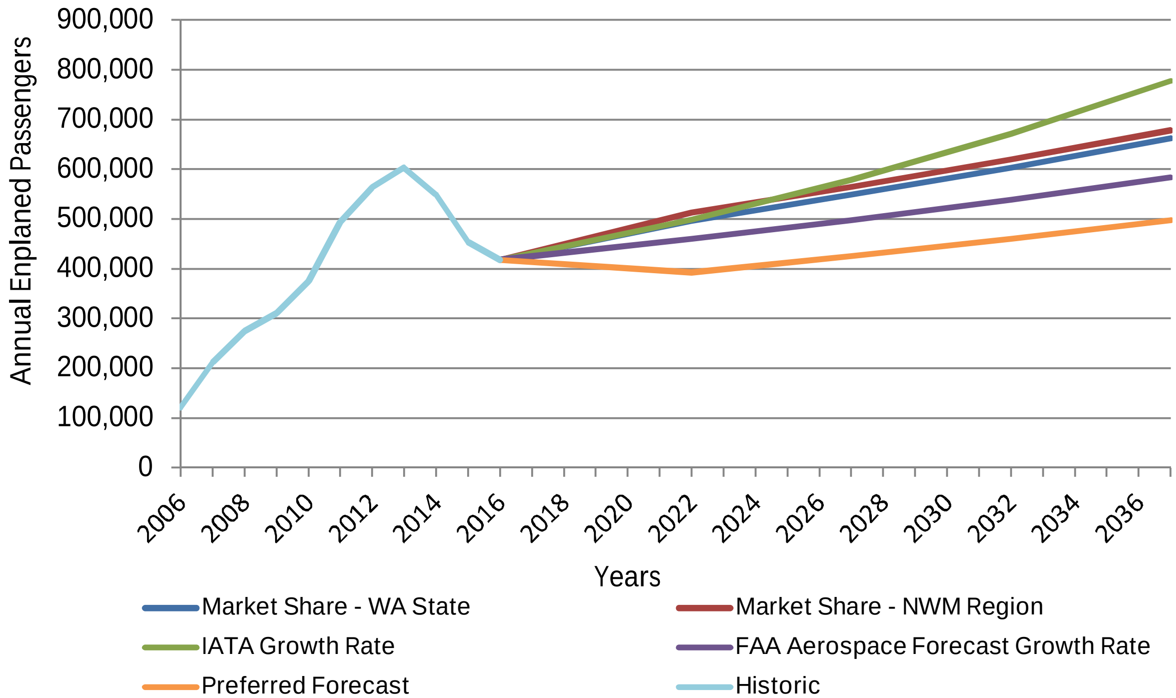
Selecting the preferred forecast of enplaned passengers for BLI was approached as a three-step process. 1) in the short-term, (0 to 5 years) forecast is developed using a scenario-based process that applies the judgement of the forecaster to the knowledge of the local market conditions. This results in a "best guess" as to the direction of the local and regional market on a year-by-year basis, 2) the mid-term (6 to 10 years) is based on a series of local and national factors to give a rate of growth that is reflective of the specific situation at BLI, and 3) the long-term (11 to 20 years) forecast will be developed in more general terms to provide a generalized trend. Table 4-7 shows the range of forecasts produced and presents the preferred forecast for this master plan.

Table 4-7: Bellingham International Airport Forecast of Enplaned Passengers

Year	Market Share (WA State)	Market Share (NWM Region)	IATA Growth Rate	Aerospace Forecasts	Preferred Forecast	Terminal Area Forecast
2016	417,930	417,930	417,930	417,930	417,930	417,930
2022	496,648	512,424	499,030	459,691	392,209	432,919
2027	548,645	564,095	578,513	497,662	424,606	460,869
2032	603,451	619,125	670,655	538,769	459,679	512,006
2037	662,303	678,290	777,473	583,272	497,649	549,800

Source: AECOM

Figure 4–5: Forecast of Enplaned Passengers



In selecting the preferred forecast of enplaned passengers for this master plan elements of each of the forecasting methods were used, but judgement was applied to consider the factors that are known to exist at present. These include the primary acknowledgement that for the next five years, BLI's passenger levels will be heavily influenced by regional growth and industry factors. The assumptions used to make the short-term forecast are as follows.

- Due to labor contract issues, Allegiant Air has indicated that they will cut capacity at BLI by approximately 9 percent in 2017. This is assumed to decrease passengers by 9 percent.
- BLI bookings will decrease with the advent of commercial service at Paine Field in 2018. This will be due to the fact that tickets are likely to be priced low to attract initial customers and "prove" the service. However, the capacity at PAE has been established at 550,000 annual passengers over the long term so the impact of new service will not be long-term. Although most of the passengers attracted to PAE are expected to be drawn from SEA, a reduced demand on BLI can be expected. This forecast assumes that the decrease will be about 10 percent.
- By 2019 PAE will have established itself, the current terminal will be operating at or near capacity, and its impact on the market will have peaked to the established capacity.
- Increased service by low cost carriers Rogue and Westjet at YVR and Abbotsford will limit the number of Canadian customers who cross over to BLI. A comparison completed in 2016 by AECOM shows that, ticket prices are generally cheaper at YVR than they are at BLI but YXX tickets are still priced higher.
- The relative value of the Canadian Dollar to the US Dollar will not change substantially in the short-term hovering around the 1.3 mark through the end of 2017. This will also discourage the cross-border customer base.

- 2020 - Growth at BLI will continue, but at a rate that is less than the FAA forecast rate for commercial passengers due to the maturing regional marketplace

2022 – 2027

Gate and capacity expansion will be stalled at SEA and PAE leading to BLI regaining market share. Growth during this period is projected at the FAA rate of 1.6% annually, which matches the growth rate for Puget Sound passenger demand growth forecasted in the SEA SAMP.

Beyond 2027

SEA and PAE will add capacity causing a suppression of the growth rate at BLI where passenger levels will continue to increase but at a rate lower than FAA projections (estimated to be approximately 1.3 percent annually).

The preferred forecast represents a vision for future passengers at BLI as discussed in the preceding. However, because this forecast will be used as the basis for the master plan it is important to remember the number of assumed circumstances that led to its development and identify the ways that changes in these assumptions could result in markedly different activity levels. In this analysis the following need to be considered.

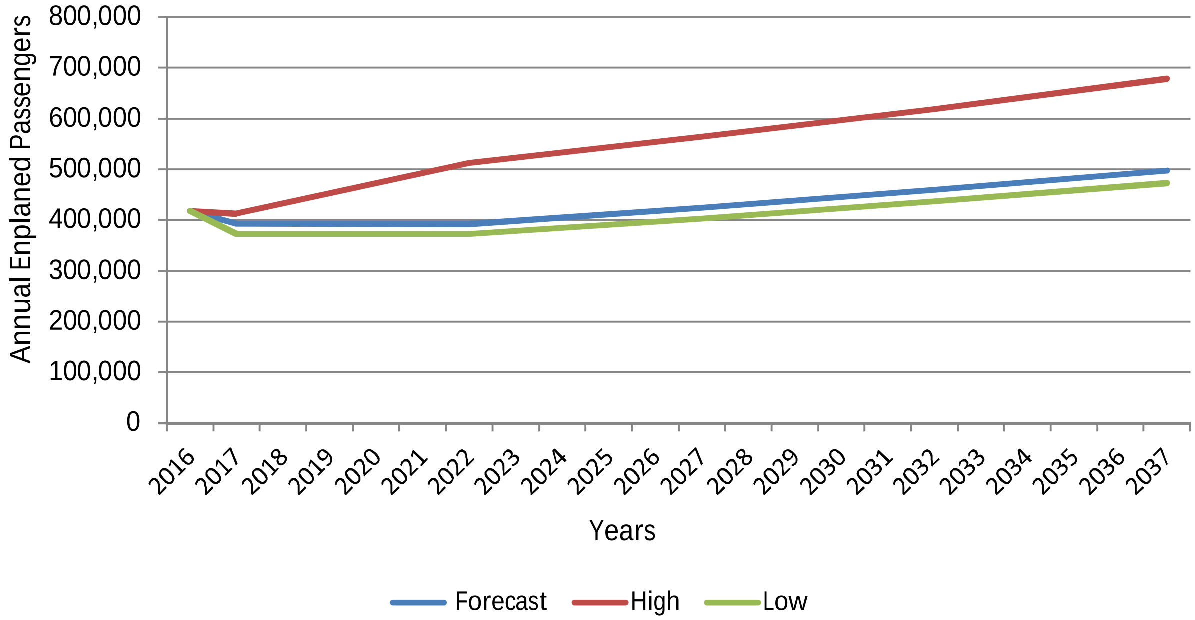
- New air-service to new locations could be offered from BLI at any time. This would impact the forecast in two ways. First, an immediate growth in passenger levels would be experienced. Second the successful introduction of such service would lead to the "reclaiming" of portions of the potential market that currently goes elsewhere.
- BLI could continue in its current state with airline service remaining static. Under this scenario growth would likely decrease in the short term but return to growth mode as other airports reach gate capacity. Growth in the intermediate and long terms would be steadily driven by growth in regional population levels.
- Due to a change in operating or service philosophy, Alaska Airlines or Allegiant Air could decide to concentrate on expansion at PAE and reduce at BLI. Decreasing service will result in a loss of market share over the long run with minimal annual growth rates.

To account for these potential swings in the marketplace, three forecast scenarios will be carried forward. These are a low forecast, which calculates slower recovery from the market fluctuations (the low forecast is 95% of the preferred). The high forecast shown is the market share analysis comparing BLI as a portion of the overall NW Mountain Region. While this forecast does not recognize the specific market factors impacting BLI at present, it does present an optimistic long-term view. The three forecast scenario results are shown on the following table. These represent the range of possibilities for passenger levels for future planning purposes.

Table 4-8: Enplaned Passenger Forecast: Range

Year	Low Range Growth	Preferred Forecast	High Range Growth
2016	417,930	417,930	417,930
2022	372,599	392,209	512,424
2027	403,376	424,606	564,095
2032	436,695	459,679	619,125
2037	472,767	497,649	678,290

Figure 4–6: Range of Enplaned Passengers



Source: AECOM

4.7 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:

- Determine the historical number of enplaned passengers to airline departures,
- Project changes in the enplaned passenger to departure ratio (Load Factor),
- Apply the projected load factors to the enplaned passenger forecast to forecast the annual air carrier departures,
- Double the number of departures to account for total annual operations.

At BLI, a direct relationship has existed between the number of air carrier operations and the level of passenger demand in terms of enplanements. The airlines have based the number of flights on maintaining a high passenger load factor, which is expressed as a percentage of seats filled on each departing aircraft. When the carrier has a high load factor it will choose to either increase the number of flights or use an aircraft with greater seating capacity. The assumptions used in these projections are as follows and as shown in Table 4-9.

Allegiant Airlines currently operates a fleet consisting of Boeing 757-200, MD-80 and 88 and Airbus A319 at BLI. Over the next ten years Allegiant will phase the 757-200 and MD-80 aircraft from the fleet replacing them with more fuel-efficient aircraft like the A319.

Currently, Alaska Airlines has a fleet of Boeing 737 aircraft that includes the 737-700, -800, and -900 serving BLI. 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.

Table 4-9: Air Carrier Fleet Mix

Aircraft Type	Seats	2016		2022		2027		2032		2037	
		%	Seats	%	Seats	%	Seats	%	Seats	%	Seats
MD-80	166	3%	4.8	1%	0.8	0%	0.0	0%	0.0	0%	0.0
A319	156	63%	98.6	60%	93.6	57%	88.9	54%	84.2	50%	78.0
B-737 800	163	0%	0.0	8%	13.0	8%	13.0	8%	13.0	8%	13.0
B-737 900	171	0%	0.0	4%	5.7	9%	14.7	11%	17.9	12%	19.6
B-737 900E	171	0%	0.0	1%	1.6	4%	6.5	5%	8.2	8%	13.0
B-737 700	124	7%	12.1	2%	3.3	2%	3.3	2%	3.3	2%	3.3
Q400	78	27%	43.2	25%	40.8	20%	32.6	20%	32.6	20%	32.6
		100%	158.7	100%	158.8	100%	159.0	100%	159.2	100%	159.5

Source: Fleet mix derived from analysis of BLI gate schedules for four different time periods in 2016 and 2017

From the information in Table 4-9 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 have been calculated. In forecasting air carrier operations, the following factors have been considered.

- Airlines will match seating capacity of departing aircraft with passenger levels to achieve better yields.
- Airline fleet composition and known changes were considered in calculating available seats/departure
- Aircraft load factors assumed to remain high over time

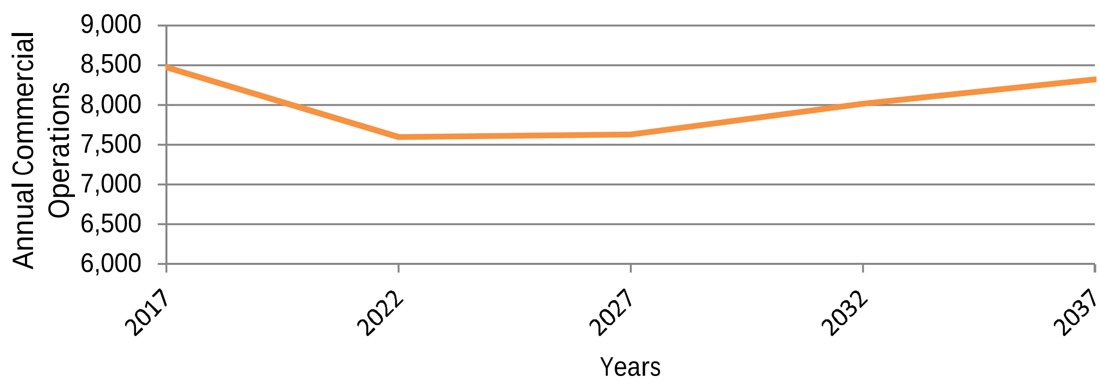
Using the average seats per departure calculated above, the historical passenger load factors and assumptions regarding changes in the future, and the forecast of annual enplaned passengers, the following forecast of annual air carrier operations has been developed, as shown in Table 4-9.

Table 4-10: Forecast of Commercial Operations

Year	Enplaned Passengers	Seats/Dep	Avg. Load Factor	Annual Departures	Annual Operations	TAF [1] Forecast
2016	417,930	158.7	62%	4,241	8,476	8,476
2022	392,209	158.80	65%	3,800	7,599	7,856
2027	424,606	159.00	70%	3,815	7,630	8,361
2032	459,679	159.20	72%	4,010	8,021	9,282
2037	497,649	159.50	75%	4,160	8,320	9,961

[1] The comparison with the TAF is not entirely accurate since we have included all commercial passenger flights, including those on the Q400 which are considered to be commuter/air taxi in the TAF.

Figure 4–7: Commercial Operations Forecast



4.8 Air Taxi

The Air Taxi category traditionally includes all "for hire" services, whether scheduled or non-scheduled that occur at an airport. This category generally includes operations by commuter airlines as well as on-demand carriers, all-cargo activity, and other activity that is performed on a for hire basis. In the case of BLI, the commuter operations have been forecast as part of the commercial service category so the forecasts prepared for air taxi will be limited to the all-cargo carriers and on-demand (charter) carriers.

4.9 Air Cargo

Air cargo at BLI is carried by either the scheduled airlines as belly cargo using the same aircraft used in passenger service, or by all-cargo carriers. Examining airport management records reveals that the majority of cargo at BLI is classified as domestic air freight and is handled by the carriers Ameriflight and Empire Airlines who operate under contract with FedEx and UPS or by independent operators such as Rite Brothers, San Juan, Harbor Air and West Isle Air.

Table 4-11: Air Cargo Forecasts

	2016	2022	2027	2032	2037
Enplaned	638	676	714	753	789
Deplaned	812	860	909	957	1,004
Total	1,450	1,535	1,623	1,710	1,792
Operations	5,736	6,006	6,349	6,689	7,012

Figure 4–8: Forecast of Annual Air Cargo Tonnage

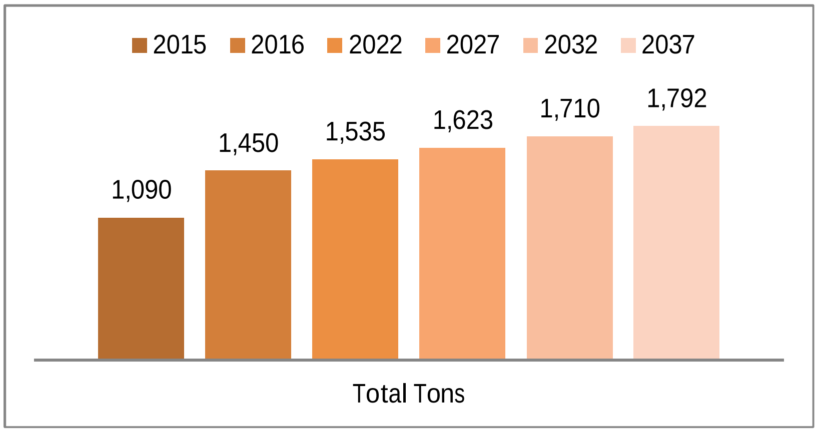
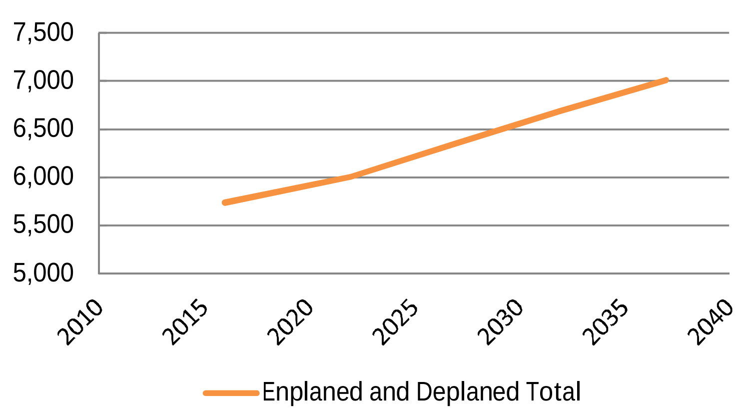


Figure 4–9: Forecast of Annual Air Cargo Operations



This forecast will concentrate on the all-cargo carriers. The cargo business is typically driven by local economic factors, particularly within the service area (Whatcom and San Juan Counties) and is growing at a rate of approximately 1 percent per year.

At present all cargo is hauled on aircraft such as the Cessna Caravan and the Beech 18 or Swearingen Metroliner. In 2016 the all-cargo carriers carried approximately 550 pounds per operation. 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 4-11 shows the forecast for enplaned, deplaned and total air cargo tonnage at BLI. Also shown on the table is the number of annual air cargo operations forecast

4.9.1 On-Demand Operations

The other air taxi operations at BLI are conducted by aircraft for hire. These include special deliveries, cargo deliveries, personnel services, or other. Table 4-11 shows the forecast prepared for these. As shown, future growth was projected using three different rates of growth.

The first forecast showed a growth rate of 1.06 percent as used in the FAA's Aerospace Forecasts. This rate was applied this rate to the historic base numbers to project the future.

The second assumed that these operations will increase at the same rate as regional population (Whatcom and San Juan Counties) approximately 1% per year.

Table 4-12: Forecast of Charter Operations

Year	FAA Aerospace Rates	Population	Preferred
2016	9,379	9,379	9,379
2017	9,389	9,490	9,439
2022	9,439	10,055	9,747
2027	9,489	10,627	10,058
2032	9,539	11,183	10,361
2037	9,590	11,716	10,653

Source: AECOM

The third forecast shown is the preferred forecast adopted for this report. This was developed to reflect the full range of the future influences on activity by averaging the first two forecasts.

4.10 General Aviation

It is assumed that all airports within a 50-mile radius of BLI compete directly for general aviation activity. Few of these, however, have the capability to compete for Corporate Aviation sector customers. Table 4-13 summarizes the facilities that are available at each airport located within 50 miles of BLI. This list includes both those located in Canadian and the United States. The Canadian airports are less likely to be a source of competition due to location and customs issues. Of the remaining airports none but Arlington Municipal and Skagit Regional have the runway length and navigational facilities required to accommodate business jets. Therefore, it is assumed that BLI will continue to be one of the primary US airports in Northwest Washington for the corporate aviation sector.

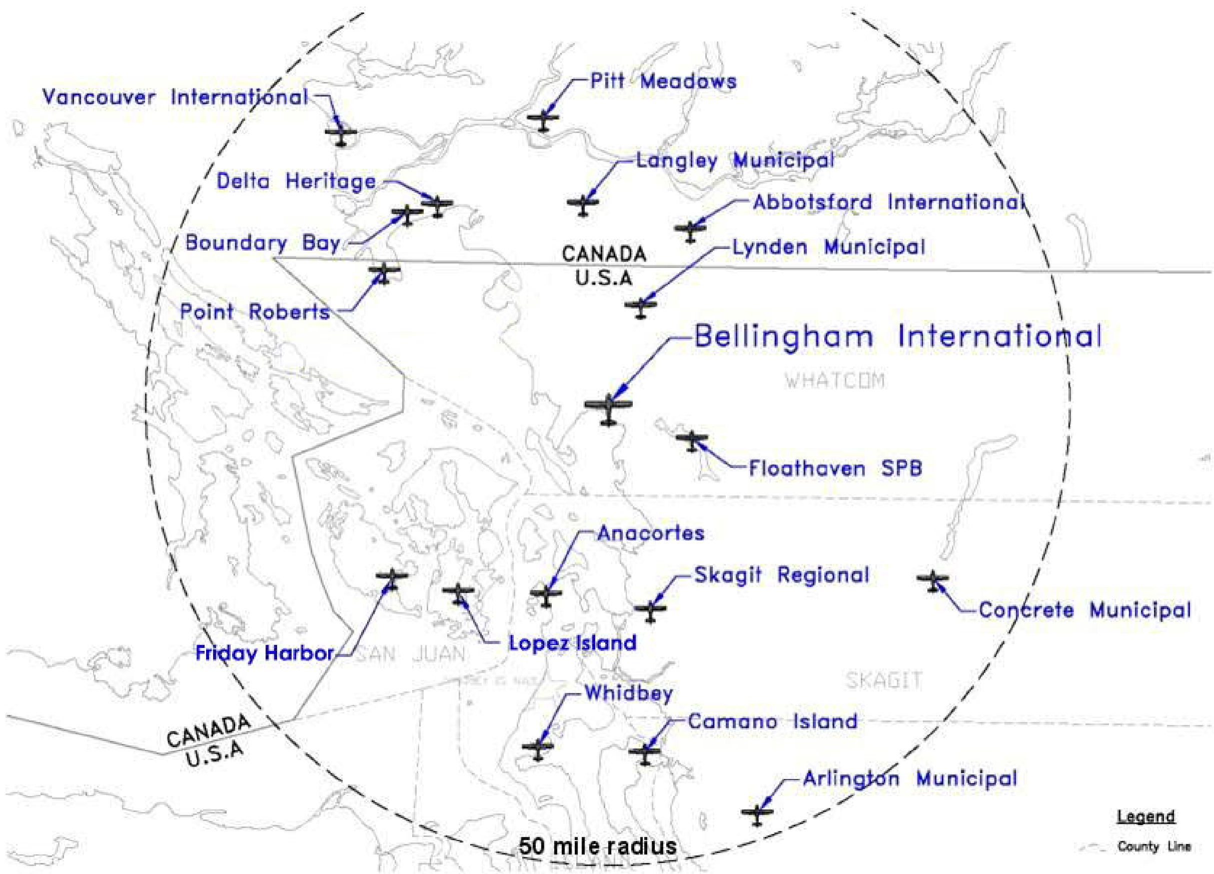
4.10.1 Forecasts of Based Aircraft

In preparing forecasts of general aviation-based aircraft, the other regional airports and the demographic factors within BLI's service area are the primary considerations. At the present time there are no vacant hangars or tiedown spaces available at BLI so based aircraft numbers have been stable as demand continues to grow, as witnessed by the number of aircraft owners who have placed their name on the Port's hangar waiting list (19 individuals at present). These aircraft owners have been willing to pay a fee to be placed on the waiting list and this is therefore seen as a legitimate demand indicator. 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. In forecasting the potential for growth in based aircraft at BLI the following methodologies were used.

Table 4-13: Regional General Aviation Airports

Airport	Country	Service Level	Longest Runway
Abbotsford International Airport	Canada	PR	9,600
Anacortes Airport	USA	GA	3,015
Arlington Municipal Airport	USA	GA	5,333
Bellingham International Airport	USA	PR	6,701
Boundary Bay Airport	Canada	GA	3,750
Camano Island Airfield	USA	GA	1,750
Concrete Municipal Airport	USA	GA	2,609
Delta Heritage Air Pak	Canada	GA	2,600
Langley Municipal Airport	Canada	GA	2,100
Lynden Municipal Airport	USA	GA	2,425
Pitt Meadows Airport	Canada	GA	4,700
Point Roberts Airpark	USA	GA	2,400
Skagit Regional Airport	USA	GA	5,477
Vancouver International Airport	Canada	PR	11,000

PR = Commercial Service – Primary Airport
GA = General Aviation



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. In this case, the number of based aircraft at BLI was compared with the historic and projected population of Whatcom County, resulting in a forecast of 246 aircraft at BLI by 2037.

Market share 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 was compared with the overall number of general aviation aircraft in the State of Washington, as forecast in the FAA Terminal Area Forecast. Historical market shares were calculated based on FAAs forecast and used as the basis for projecting the number of aircraft at BLI. It is 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 general aviation fleet that is based at BLI against that forecast for the Northwest Mountain Region. In this technique, the total number of general aviation aircraft registered in the Northwest Mountain Region was compared to the historical number of aircraft based at BLI. As is seen, if the average ratio of BLI based aircraft to the regions fleet holds steady, the number of aircraft based at BLI will increase to an estimated 230 aircraft over the next twenty years.

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

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

- Neither the most optimistic (the FAA's TAF for BLI) nor the least (BLI as a percentage of the Northwest Mountain Region) should be used as the basis for long term planning.
- 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.

Table 4-14 shows the range of projections as well as the preferred forecast for this master plan. The preferred forecast was selected to represent a higher growth rate in the initial five-year period. 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. In addition, the following factors have been used to select the preferred forecast.

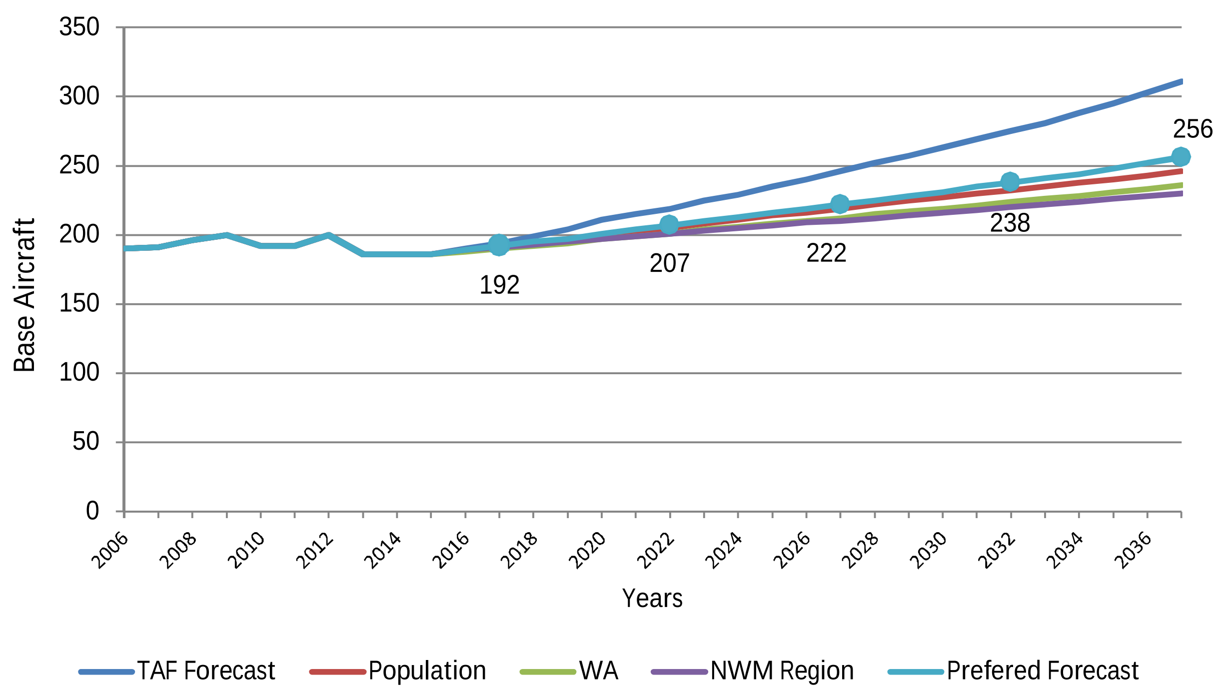
- BLI based aircraft have been relatively stable – limited by the storage capacity
- BLI is a DHS designated International Port of Entry with Customs and Immigration clearance capacity
- BLI is home to an active and involved GA base

- BLI's runway length and precision approach give it competitive advantage over other regional airports. The preferred forecast averages the 4 projections as none could be seen as superior to the others and the, with the exception of the TAF the other scenarios resulted in similar forecast numbers.
- The population growth scenario assumed that the number of based aircraft at an airp0ort would be directly related in the growth in the population of the service area, all other factors being equal. However, because the lack of available hangars combined with the lack of land available for development of new GA facilities the correlation between population and based aircraft did not show a strong correlation. To counter this we used the projected annual growth in population, applied to the current based aircraft numbers to generate a forecast.

Table 4-14: Forecast of Based Aircraft

Year	TAF	Population Growth	Share of WA Market	Share of NWM Region	Preferred Forecast
2016	189	189	189	189	189
2017	194	191	190	191	192
2022	219	205	201	201	207
2027	246	219	212	210	222
2032	275	232	224	220	238
2037	311	246	236	230	256

Figure 4–10: Based Aircraft Forecast

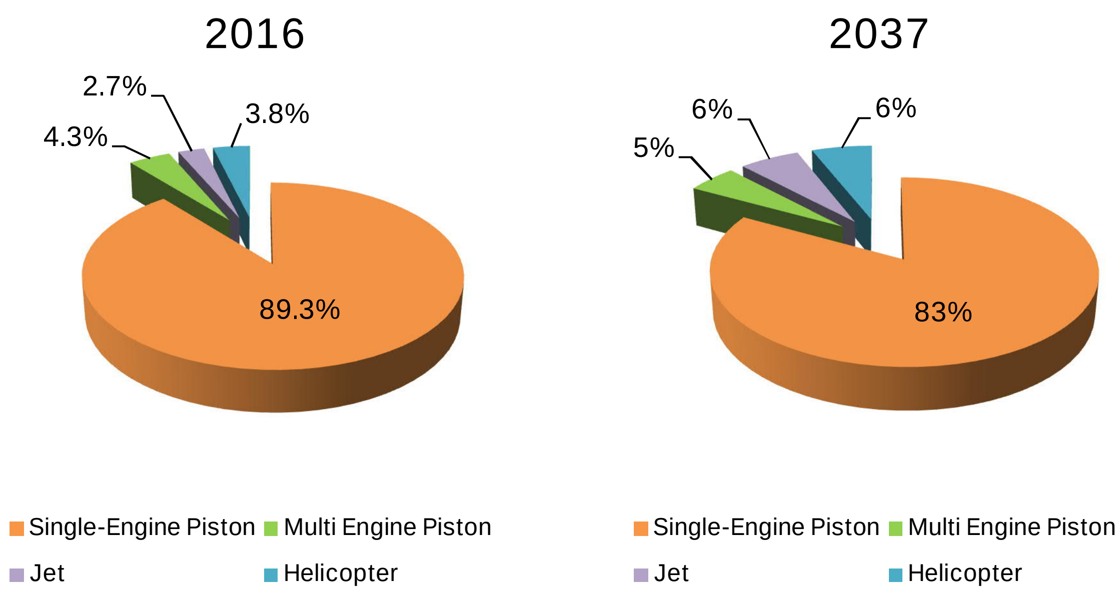


The population growth scenario assumed that the number of based aircraft at the airport would be directly related to the growth in the population of the service area, all other factors being equal. However, because the lack of available hangars combined with the lack of land available for development of new GA facilities the correlation between population and based aircraft did not show a strong correlation. To counter this we used the projected annual growth in population, applied to the current based aircraft numbers to generate a forecast that did not constrain potential growth in aircraft based on historical shortages in available facilities. Also, both market growth scenarios were based on an unconstrained forecast of based aircraft made by others. The preferred forecast averages the four projections as none could be seen as superior to the others and, with the exception of the TAF the other scenarios resulted in similar forecast numbers.

The 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 as detailed in the preceding. As shown in Table 4-15, 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 improve, it is a natural by-product that corporate aviation will become a growth sector.

Table 4-15: Based Aircraft Fleet Mix

	Base – 2016		2022		2027		2032		2037	
	No	%	No	%	No	%	No	%	No	%
Single-Engine Piston	166	89.3%	184	89%	193	87%	202	85%	212	83%
Multi Engine Piston	8	4.3%	8	4%	9	4%	12	5%	13	5%
Jet	5	2.7%	6	3%	9	4%	12	5%	15	6%
Helicopter	7	3.8%	8	4%	11	5%	12	5%	15	6%
Total	189	100.0%	207	100%	222	100%	238	100%	256	100%



4.10.2 General Aviation Operations

By definition, general aviation includes all operations by civil aviation aircraft not classified as commercial or military. Three separate projections of operations were produced.

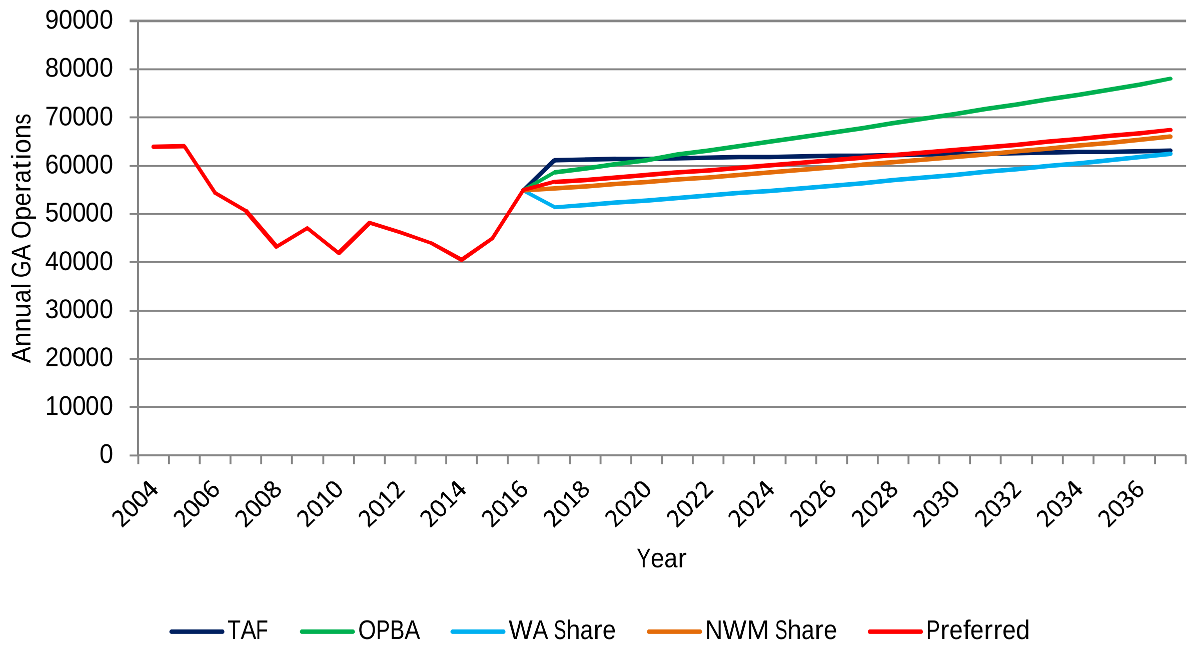
- Operations per Based Aircraft (OPBA). In this methodology, the number of annual general aviation operations in 2016 was compared with the number of based aircraft during that year to determine how many operations each aircraft was responsible for. It is recognized that not all GA operations at the 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 289 operations per based aircraft. This ratio was applied to the forecast of based aircraft to arrive at a forecast of operations.
- Market Share Forecast. The forecasts of General Aviation activity that the FAA prepared for the State of Washington and the Northwest Mountain region have been used to determine what percent of these have occurred at BLI in the past. This relationship has been continued into the future in the market share projections

The preferred forecast tempers the FAA's projections from the TAF, 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 forecast is developed that contains elements of each of the projection methodologies. This is shown in Table 4-16.

Table 4-16: General Aviation Operations Forecast

Year (CY)	TAF	OPBA	WA Share	NWM Share	Preferred
2016	56,701	56,701	56,701	56,701	56,701
2022	63,654	65,228	55,564	59,489	60,984
2027	64,157	70,019	58,259	62,110	63,636
2032	64,666	75,066	61,227	64,997	66,489
2037	65,180	80,564	64,508	68,188	69,610
Note: 2016 data derived from airport records for 2016.					

Figure 4–11: Forecast of General Aviation Activity



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.

Table 4-17: Forecast of Itinerant and Local General Aviation Operations

Year	Itinerant	Local	Total
2016	34,021	22,680	56,701
2022	36,590	24,394	60,984
2026	38,182	25,454	63,636
2032	39,893	26,596	66,489
2037	41,766	27,844	69,610

4.11 Military Operations

Between 2006 and 2016 military operations at BLI have ranged from 613 in 2008 to 2,770 in 2016. Military activity at civilian airports is very difficult to forecast as the level of activity is directly tied to the mission of the related military bases and not the civil indicators that exist for the other categories. In preparing this forecast of military operations, it is assumed that they would remain a low percentage of total airport activity. Therefore, the forecast for military operations assumes that the high level recorded in 2016 (2,770 annual operations) would be used throughout the planning period.

4.12 Peaking

In order to determine facility requirements tied to airport activity levels in the next section, forecasts of peak passenger and aircraft activity levels are needed. These peak levels of activity closely correlate with the need for 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. 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;

4.12.1 Enplaned Passenger Peaking

Peak Month: Records show that 11 percent of total annual enplaned passengers occurred during the peak month at BLI. In 2015 and 2016 the peak month was March.

Average Day: The average day calculation divides the peak month by 30 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

Table 4-18: Enplaned Passenger Peaking Characteristics

Year	Annual	Peak Month	AD/PM	Peak Hour
2016	417,930	45,972	1,532	536
2022	392,209	43,143	1,438	503
2027	424,606	46,707	1,557	545
2032	459,679	50,565	1,685	590
2037	497,649	54,741	1,825	639

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.

Peak period passenger levels are shown in Table 4-18.

4.12.2 Commercial Operations Peaking

Peak Month: This category includes scheduled service where the peak month is about 11 percent of the annual and occurs during March. 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 30 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.

4.12.3 Air Taxi Peaking

Peak Month: This category includes on-demand, charter service where the peak month is about 12 percent of the annual and occurs during July.

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

Peak Hour: Peak hour operations occur during the summer with levels as high as 25 percent of the average day.

4.12.4 Air Cargo Peaking

Peak Month: Since air cargo activity is scheduled operations do not vary much from month to month. The peak month is about 10 percent of the annual operations.

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

Peak Hour: Peak hour operations are as high as 25 percent of the average day.

4.12.5 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 is expected to occur.

4.12.6 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 is expected to occur.

The forecast peak period operations for Bellingham are shown in Table 4-19.

Table 4-19: Operational Peaking Characteristics

Year	Annual	Peak Month	AD/PM	Peak Hour
Commercial Operations				
2016	2016	8,022	882	29
2022	2022	7,599	836	28
2027	2027	7,630	839	28
2032	2032	8,021	882	29
2037	2037	8,320	915	31
Air Taxi				
2016	2016	9,379	1,125	36
2022	2022	9,747	1,170	38
2027	2027	10,058	1,207	39
2032	2032	10,361	1,243	40
2037	2037	10,653	1,278	41
Air Cargo				
2016	5,736	574	19	5
2022	6,006	601	19	5
2027	6,349	635	20	5
2032	6,689	669	22	5
2037	7,012	701	23	6
General Aviation				
2016	56,701	6,237	201	50
2022	60,984	6,708	216	54
2027	63,636	7,000	226	56
2032	66,489	7,314	236	59
2037	69,610	7,657	247	62
Military				
2016	2,770	305	10	2
2022	2,770	305	10	2
2027	2,770	305	10	2
2032	2,770	305	10	2
2037	2,770	305	10	2
Total Operations				
2016	82,608	9,087	293	53
2022	87,106	9,582	309	56
2027	90,443	9,949	321	58
2032	94,330	10,376	335	60
2037	98,365	10,820	349	63

4.13 Critical Aircraft

An airport's critical (or design) aircraft reflects the operating requirements of the most demanding aircraft type, or grouping of aircraft with similar characteristics, that make regular use at the airport. Regular use is 500 annual operations, excluding touch-and-go operations. An operation is either a takeoff or landing. Accordingly, both itinerant and local operations (excluding touch-and-go operations) count towards regular use. 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 forecast of commercial aircraft usage shown in this chapter Table 4-20) shows that commercial service at BLI will be conducted using narrow bodied aircraft such as the Airbus A319 or the Boeing 737 series.

Table 4-20: Operational Fleet Mix Forecast

Category/Aircraft	ADG	2016		2022		2027		2032		2037	
		%	No	%	No	%	No	%	No	%	No
Commercial											
MD-80	C-III	2.9%	236	0.5%	39	0.0%	0	0.0%	0	0.0%	0
A319	C-III	63.2%	5,073	60.0%	4,657	57.0%	4,485	54.0%	4,285	50.0%	4,017
B-737 800	D-III	0.0%	0	8.0%	621	8.0%	629	8.0%	635	8.0%	643
B-737 900	D-III	0.0%	0	3.5%	272	9.0%	708	11.0%	873	12.0%	964
B-737 900E	D-III	0.0%	0	1.0%	78	4.0%	315	5.0%	397	8.0%	643
B-737 700	C-III	7.4%	590	2.0%	155	2.0%	157	2.0%	159	2.0%	161
Q400	C-III	26.5%	2,123	25.0%	1,941	20.0%	1,574	20.0%	1,587	20.0%	1,607
Total Commercial		100.0%	8,022	100.0%	7,762	100.0%	7,868	100.0%	7,936	100.0%	8,034
Air Taxi/Air Cargo											
Jets - Heavy	C-III	0.5%	76	0.5%	79	0.5%	82	0.5%	85	0.5%	88
Jets - Light	B-II	0.5%	76	0.5%	79	0.5%	82	0.5%	85	0.5%	88
Cessna Caravan	A-II	53.0%	8,011	53.0%	8,349	53.0%	8,696	53.0%	9,037	53.0%	9,362
Metroliner	B-II	35.0%	5,290	35.0%	5,514	35.0%	5,742	35.0%	5,968	35.0%	6,183
MEP	B-II	1.0%	151	1.0%	158	1.0%	164	1.0%	171	1.0%	177
SEP	A-II	10.0%	1,512	10.0%	1,575	10.0%	1,641	10.0%	1,705	10.0%	1,767
Total AT/AC		100.0%	15,115		15,753		16,407		17,050		17,665
GA											
Jets - Heavy	D-III	0.2%	113	0.3%	183	1.0%	636	1.0%	665	1.0%	696
Jets - Heavy	C-III	1.8%	1,021	1.7%	1,037	3.0%	1,909	5.0%	3,324	7.0%	4,873
Jets - Light	B-II	4.0%	2,268	4.0%	2,439	4.0%	2,545	4.0%	2,660	4.0%	2,784
MEP	B-II	3.0%	1,701	3.0%	1,830	4.0%	2,545	4.0%	2,660	5.0%	3,481
SEP	A-I	88.0%	49,897	88.0%	53,666	85.0%	54,091	82.0%	54,521	80.0%	55,688
Helicopter	NA	3.0%	1,701	3.0%	1,830	3.0%	1,909	4.0%	2,660	3.0%	2,088
Total GA		100.0%	56,701	100.0%	60,984	100.0%	63,636	100.0%	66,489	100.0%	69,610
Military											
Jet	C-III	25.0%	693	25.0%	693	25.0%	693	25.0%	693	25.0%	693
Piston	B-II	25.0%	693	25.0%	693	25.0%	693	25.0%	693	25.0%	693
Helicopter	NA	50.0%	1,385	50.0%	1,385	50.0%	1,385	50.0%	1,385	50.0%	1,385
Total Military		100.0%	2,770	100.0%	2,770	100.0%	2,770	100.0%	2,770	100.0%	2,770
Total Operations			82,608		87,269		90,681		94,245		98,079

Note: The 2016 fleet mix was calculated from analysis of BLI gate schedules for four different time periods in 2016 and 2017

Table 4-21 shows the critical aircraft for BLI based on the individual aircraft projected to use the airport. As shown the current critical aircraft is the D-III.

Table 4-21: Airport Design Aircraft

Category	2016	2022	2027	2032	2037
A-I	49,897	53,666		54,091	
A-II	9,522	9,924		10,336	
B-II	10,179	10,711		11,772	
C-III	9,811	8,600		8,899	
D-III	113	1,153		2,289	
NA	3,086	3,215		3,294	
	82,608	87,269		90,681	

5 Facility Requirements

5 Facility Requirements

5.1 Introduction

This chapter focuses on the market-based customer needs and the ability of existing airport facilities at the Bellingham International Airport (BLI) to meet forecast demand levels. When demand exceeds capacity, additional facilities are needed to accommodate the unmet demand. In addition, the requirements for new or expanded facilities consider the following:

- Customer Service requirements
- Enhanced security requirements
- Updated FAA Design Standards
- Actions necessary to achieve the Port's strategic vision.

Facility requirement discussions will center on the following areas,

Airfield – including the runway and taxiway system, navigation aids, and instrumentation

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

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

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

Table 5–1 and Figure 5–1 summarizes the conclusions of this chapter and shows the location of some of the recommendations.

Table 5–1: Existing Facilities Assessment

Facilities	Conclusions
Airfield System	• Runway 16/34, at 6,701 feet, provides marginally sufficient take-off length for all aircraft forecast to use the airport and the markets currently being served. Analysis of the future runway needs shows that an extension to 9,900 feet should be considered to allow for potential changes in the future airline destinations. • At the present time there are no shoulders or blast pads on the runway. Blast pads need to be added and shoulders are recommended. • The Runway Safety Area (RSA) for Runway 16 does not meet FAA criteria and needs to be brought into compliance. • The taxiway system, particularly Taxiways E and H, need to be upgraded to eliminate the potential of runway incursions by realigning or truncating Taxiways F, E, D, and C. • The airport's Interior Service Road around the perimeter of the airfield should be completed along with updating fencing where applicable. • In the interest of both sustainability and cost control, new LED lighting systems should be installed on both the runway and taxiway systems.

Facilities	Conclusions
Passenger Terminal	• The passenger terminal building was expanded in 2014 to accommodate 750,000 to 800,000 annual enplaned passengers. Based on the forecasts, this should serve the airport through the planning period. Any expansion of the terminal will be driven by the introduction of new based service by an existing or new carrier that is unforeseen at this time. • Remain Overnight (RON) parking spaces need to be developed to accommodate the airlines' needs. Two of these positions are required immediately.
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. These areas are sufficient to meet forecast demand levels but additional area will need to be considered should the terminal area be expanded.
Automobile Parking	• The current public parking lots provide space for 2,063 vehicles. This includes 1,237 public spaces, 17 Americans with Disabilities Act (ADA) compliant spaces, 3 recreational vehicle (RV) stalls, 16 drop-off/pick-up (30 minutes free) spaces, and a free 14-space cell phone lot. Forecasts show additional expansion may be needed as passenger levels grow although off-site parking could reduce demand for on-airport facilities. The employee parking area consisting of 250 spaces is comingled with the Terminal Main and Economy A parking lots enabled by an upgraded RFID parking management system. The 131 spaces in the northern portion of the main parking lot reserved for Rent-a-Car ready and return has been expanded to 253 spaces and relocated to the southern portion of the lot adjacent to baggage claim and the arrivals exit. These areas are sufficient for activity levels forecast through the planning period. A "Quick Turn Around" (QTA) facility is needed to clean, fuel, service and wash rental vehicles and return them back to service.
Air Cargo	• The passenger terminal contains facilities for processing all 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 Storage Hangars	• With the forecasted growth in based aircraft, as well as the existing unmet demand for hangar space, additional area for hangar development is needed.
FBO and Support	• Adequate Fixed Base Operator (FBO) facilities are provided and available to meet GA needs within the forecast period.
Fueling	• The current fuel storage facility provides less than two days of fueling capacity. The fuel storage capacity needs to match the aviation activity forecast and provide a minimum 7-day storage capacity to cover supply interruption emergencies. Fuel facilities should be relocated within the secure area of the airport.
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. • An Airport Surveillance Radar (ASR) would greatly enhance capacity and flow and should be considered by FAA's ANI for installation at BLI.

Figure 5–1: Summary of Facility Requirements

5.2 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 Chapter 4, Forecast of Aviation Demand, the critical aircraft at BLI was determined to be the Boeing 737-900.

The Runway Design Code (RDC) is used by FAA to relate airport design criteria to the operational and physical characteristics of the most demanding type of aircraft expected to operate at the airport on a regular basis. The RDC is based on a combination of the Aircraft Approach Category (AAC) and the Airplane Design Group (ADG) for the most demanding aircraft operating on the runway and the approach visibility minimums for the runway.

The AAC is denoted by a letter based on the aircraft's approach speed as shown in Table 5–2. Generally, aircraft approach speed affects runway length, exit taxiway locations, and runway-related facilities.

The second component of the RDC is the ADG which is depicted by a roman numeral. This relates numeral to the physical characteristics of the design aircraft (wingspan and tail height). The group categories are shown in Table 5–3. Finally, the visibility minimums for the runway are considered. These are expressed in terms of the Runway Visibility Range (RVR) using the categories listed in Table 5–4.

Table 5–2: Aircraft Approach Category (AAC)

Category	Approach Speed
A	Less than 91 knots
B	91 knots or more, but less than 121 knots
C	121 knots or more, but less than 141 knots
D	141 knots or more, but less than 166 knots
E	166 knots or more

Table 5–3: Airplane Design Group (ADG)

ADG	Tail Height	Wingspan
I	Less than 20 ft.	Less than 49 ft.
II	20 to less than 30 ft.	49 to less than 79 ft.
III	30 to less than 45 ft.	79 to less than 118 ft.
IV	45 to less than 60 ft.	118 to less 171 ft.
V	60 to less than 66 ft.	171 to less than 214 ft.
VI	66 to less than 80 ft.	214 to less than 262 ft.

Table 5–4: Instrument Flight Visibility

RVR (feet)	Instrument Flight Visibility Category (statute mile)
5000	Not lower than 1 mile
4000	Lower than 1 mile but not lower than ¾ mile
2400	Lower than ¾ mile but not lower than ½ mile
1600	Lower than ½ mile but not lower than ¼ mile
1200	Lower than ¼ mile

The current BLI Airport Layout Plan shows an Airport Reference Code (ARC) of C-IV based on forecast use by the Boeing 757-200W aircraft that Allegiant Airlines was using at the time the master plan was prepared in 2015. The current design aircraft, as determined in the forecasts is the Boeing 737 -900. The 737-900 has a wingspan of 117 feet 10 inches and a tail height of 40 feet 9 inches. The 737-900 is classified as a D-III aircraft.

The approach to BLI is a Category I Instrument Approach to Runway 16. The minimums for this approach are less than ½ mile but more than ¼ mile for an RVR of 1,600 feet. Dimensional design criteria for a D-III 1,600 category runway are shown in Table 5–6. The table also provides a comparison of the FAA standards with existing conditions on Runway 16/34.

Table 5–5: Instrument Approach Categories

Approach Category	Decision Height	Runway Visual Range (RVR)
I	200 feet or more	1,800 feet
II	less than 200 feet and more than 100 feet	1,000 feet
IIIa	less than 100 feet and more than 50 feet	600 feet
IIIb	less than 50 feet or none	150 feet

Table 5–6: Existing Conditions vs. D-III Design Criteria

Design Feature	Existing (feet)	Standard (feet)	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
RSA Length Prior To Threshold	600	600	Meets standard
RSA Length (beyond RWY 16 end)	866	1,000	-134 feet
RSA Length (beyond RWY 34 end)	1,000	1,000	Meets standard
Object Free Area (OFA) Width	800	800	Meets Standard
OFA Length Prior To Threshold	600	600	Meets standard
OFA 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	Taxiway Design Group (TGD) III		
Pavement Width	75	50	+25 feet
Shoulder Width	0 to 12	20	-8 to -20 feet
Safety Area Width	171	118	+53 feet
Object Free Area Width	259	186	+73 feet
Taxilane Object Free Area Width	225	162	+63 feet
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	93	+36.5 feet
Taxilane Centerline to Fixed or Movable Object	112.5	81	+31.5 feet

Source: FAA Advisory Circular 150/5300-13A, Airport Design, Change 1

Notes: Runway shoulders are recommended but not required under FAA criteria

As seen in the table, the airfield facilities at BLI meet or exceed FAA design standards in all but three instances;

- Runway shoulders do not meet standards.
- There are no blast pads on either runway end and because the runway length is marginal, jets are running their engines to gain power prior to initiating the takeoff roll and the jet blast is eroding the ground.
- The Runway Safety Area (RSA) on Runway 16 does not meet standards.

5.2.1 Runway Length

5.2.2 Runway Length Requirements

Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5325-4B "Runway Length Requirements for Airport Design" sets forth the procedure used to determine recommended runway lengths for new runways or extensions to existing runways. These are as follows;

- Step 1: Identify the list of critical airplanes.
- Step 2: Identify the aircraft that require the longest length at Maximum Takeoff Weight (MTOW).
- Step 3: Determine the method to be used in determining runway length.
- Step 4: Select the runway length requirement for the critical aircraft.
- Step 5: Make adjustments to the length calculations.

The key factors influencing runway length calculation and specific data used for BLI include;

- Airport Elevation: 170 feet
- Mean Maximum Temperature: 71 degrees F (August)
- Airplane Operating Weights: MTOW
- Flap Settings: High
- Runway Surface Conditions: Dry (Note: F.A.R. takeoff runway length requirements do not consider precipitation)
- Runway Gradient: 1.4%

The overall goal of AC 150/5325-4B is to assure that sufficient runway length is available to serve the needs of the aircraft and users of the airport. The process used for BLI is as follows;

Step 1: Identify the list of critical design aircraft: The projected aircraft fleet for BLI has been presented in the forecast of aviation demand. The most critical aircraft were identified as the commercial aircraft used by the Part 121 carriers. These include the aircraft shown in Table 5–7.

Step 2: Identify the aircraft that require the longest runway lengths. The runway length requirements at BLI are driven by the commercial carriers as listed in the previous exhibit.

Table 5–7: Critical Design Aircraft List

Aircraft	PAX Capacity	MTOW	MLW	Wingspan	Length	Approach Speed	ARC Class
Airbus A319		149,914	128,970	117 ft. 5 in	111 ft. 2 in	131	C-III
Boeing 737-700	128	153,000	128,000	117 ft. 5 in	110 ft. 4 in	132	C-III
Boeing 737-800	160	172,500	144,000	129 ft. 6 in	117 ft. 5 in	142	D-III
Boeing 737-900	177	174,200	147,300	117 ft. 5 in	138 ft. 2 in	141	D-III
Boeing 737-900ER	177	187,700	157,300	117 ft. 5 in	138 ft. 2 in	141	D-III

Step 3: Determine the method to be used in defining runway length: The AC directs that for commercial aircraft runway length requirements should be determined using the airplane manufacturers Airport Planning Manuals (APMs).

Step 4: Select the recommended runway length for the critical aircraft: In calculating runway length, APM data was used to determine takeoff and landing length requirements. These are presented in Table 5–8 which shows the maximum landing and takeoff weights and the runway length requirements.

Given this data, BLI's existing 6,701-foot runway does not meet the recommended runway length for the design airplane family. This is especially true for the critical aircraft – the Boeing 737-900 which requires a landing length of 6,800 feet under wet conditions and a takeoff length of 9,700 feet under maximum takeoff weight. Runway length requirements for the Boeing 737 Max, which is likely to serve BLI in the future have not been calculated by the Boeing Company to date but are assumed to be comparable to the 737-900.

Table 5–8: Recommended Runway Lengths

	Boeing 737-700	Boeing 737-800	Boeing 737-900	Airbus A319
Maximum Landing Design Weight (MLW)	129,200	146,300	147,300	138,450
Landing Length				
- Wet Conditions	5,500	6,600	6,800	5,290
- Dry Conditions	4,800	5,800	5,800	4,600
Maximum Takeoff Design Weight (MTOW)	154,500	174,200	174,200	154,323
Takeoff Length at MTOW	5,500	8,200	9,700	7,400
Takeoff Length Adjusted for Effective Gradient at MTOW	5,700	8,400	9,900	7,600
Takeoff Weight for length of haul @ 1000 NM	145,000	160,000	160,000	141,096
Takeoff Length for length of haul @ 1000 NM	4,900	6,500	8,100	4,400
Takeoff Length Adjusted for Effective Gradient for length of haul @ 1000 NM	5,100	6,700	8,300	4,600

Notes
All models are with winglets
All lengths assume Standard Day plus 27 degrees

Step 5: Make adjustments to the length calculations: An adjustment to the calculated runway length table is made to account for variations in the runway gradient. In this case, a distance of 10 feet of runway length for every foot of difference between the runway high and low points needs to be added. With a high point of 170.1 feet and a low point of 152 feet, this equals an additional 200 feet of length for takeoffs. The calculations are reflected in Table 5–8.

Required Runway Length

Based on the above, the runway length requirement for Bellingham International Airport is 9,900 feet for the most critical aircraft operating (Boeing 737-900) at maximum range and at MTOW. This length would provide the airlines with the flexibility to introduce additional flights and to maintain the seasonal flights to Hawaiian destinations.

While 9,900 feet represents the optimal length to allow a full range of flexibility to the airlines Federal funding under the AIP program would only apply to an 8,300-foot runway based on current eligibility criteria.

5.2.3 Runway Capacity

Runway capacity measures the theoretical maximum number of aircraft operations that can operate on a runway system over a specified time. An operation is counted each time an aircraft lands or takes off. There are a variety of techniques available for determining airfield capacity. The most widely accepted method is 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 5–9 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 within the 20-year planning period. By 2037, hourly demand levels during VFR conditions could equal 62 percent of the capacity of the runway. Under IFR conditions the demand levels will be approximately 40 percent of the hourly capacity.

Table 5–9: Demand/Capacity Comparison

					Annual Capacity
	2016	2022	2027	2032	2037
Annual Service Volume (ASV)	230,000	230,000	230,000	230,000	230,000
Annual Demand	80,822	85,348	88,676	92,151	95,886
Percent Capacity	35.1%	37.1%	38.6%	40.1%	41.7%
					Hourly Capacity
VFR Conditions					
Peak Hour Capacity	98	98	98	98	98
Peak Hour Demand	52	55	57	59	61
Percent Capacity	53.1%	56.1%	58.2%	60.2%	62.2%
IFR Conditions					
Peak Hour Capacity	59	59	59	59	59
Peak Hour Demand	21	21	22	23	24
Percent Capacity	35.6%	35.6%	37.3%	39.0%	40.7%

Source: AECOM:

Capacity for ASV and peak hour conditions derived from Sketch 9 - AC 150/5060-5

VFR – Visual Flight Rules

IFR – Instrument Flight Rules

5.2.4 Lighting and Markings

FAA Advisory Circulars 150/5300-13 B "Airport Design", AC150/5340 and AC150/5345 set forth the standards for runway and taxiway lighting and marking runways. These standards are all currently met at BLI although the 2016 Part 139 Certification Inspection identified a need to adjust some RWY hold position and enhanced pavement marking to meet standards. The Airport currently plans to correct these in 2017 to meet standards. However, the existing lighting fixtures use conventional technology. In the interest of both sustainability and cost control, new LED lighting systems should be installed on both the runway and taxiway systems.

5.2.5 Signage

FAA AC 150/5340-18F provides guidance on airport signage at airports. All airfield signage at BLI meets these FAA standards. The addition of three information signs have been recommended by RSAT to lessen confusion at hotspot intersections.

5.2.6 Navigational Aids

Runway 16 at BLI is currently equipped with an Instrument Landing System that provides Category I instrument approach procedures. Current approaches to Runway 34 are non-precision. To enhance the airport's all-weather capacity and to preserve flexibility in operations the airport should reserve the ability to accommodate the installation of a new ILS on Runway 34 and an Airport Surveillance Radar (ASR) installation should FAA determine that this is needed.

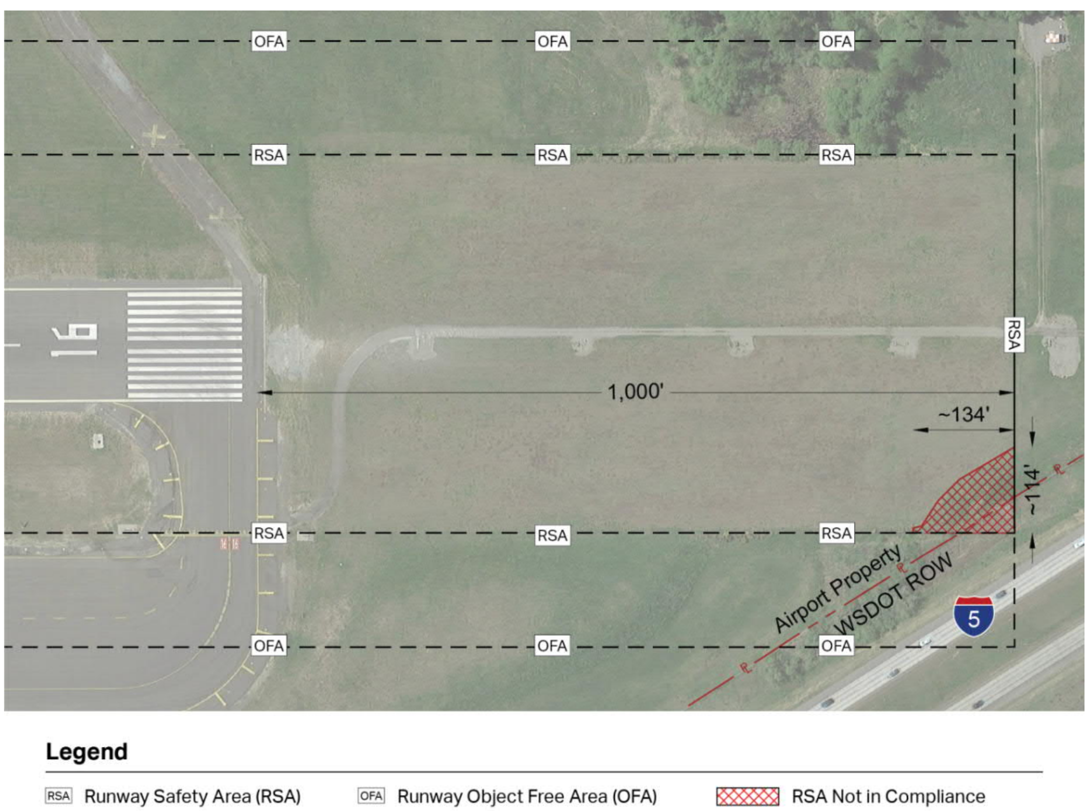
5.2.7 Runway Safety Area (RSA)

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 A for a D-III 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 these standards. However, on the Runway16 end, an area measuring approximately 1,701 SF is not owned by the Port and therefore the RSA is not in compliance with the standard. Additionally, the maximum slope in this area does not meet standards. These two areas combined account for approximately 7,236 SF of not-to-standard RSA. Figure 5–2 shows the area that does not meet the standard. In the interest of compliance, the RSA should be brought to standard.

Figure 5–2: Runway 16 RSA Noncompliance Area



5.2.8 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 dimensions call for an area 800 feet wide and extending 1,000 feet beyond the end of the runway. The OFA dimensions fall entirely on airport property and meet FAA criteria on the Runway 34 end. However, approximately 30,600 SF is not owned by the airport on the Runway 16 end. There are scattered groupings of trees within the OFA on the west side of the runway that will need mitigation.

5.2.9 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 5–10 shows the RPZ dimensions for Runways 16 and 34 Figure 5–3 depicts the RPZ ownership.

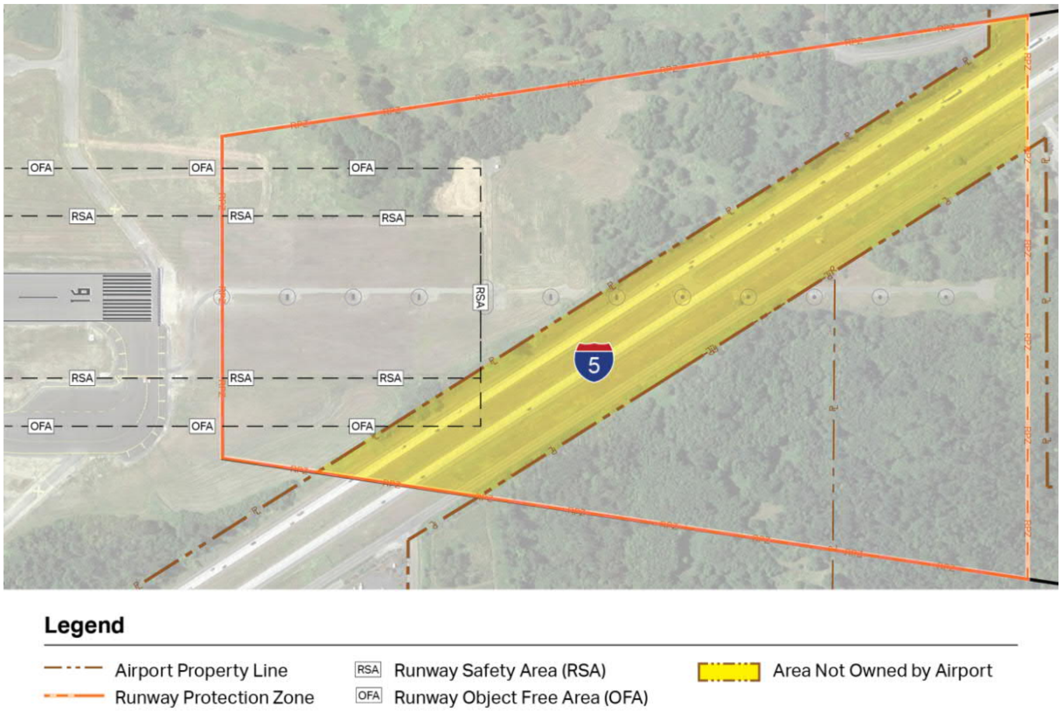
Table 5–10: Runway Protection Zone Dimensions (RPZ)

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

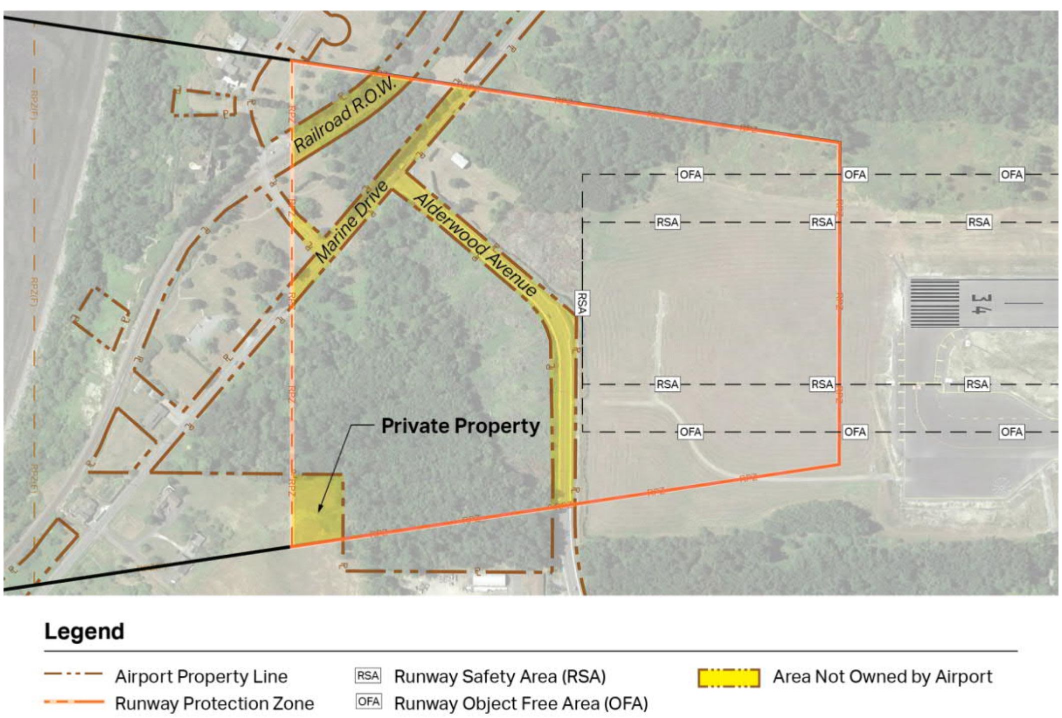
As shown on the 16 end, the RPZ contains portions of Interstate 5 and two local roads. While these are not desirable, they have in the past been viewed as acceptable. On the Runway 34 end, the Port does not own the portions of Alderwood Avenue, Marine Drive, and railroad right-of-way that crosses through the RPZ as well as a small piece (0.78 acres) of property to the south. This parcel is currently undeveloped.

Figure 5–3: BLI RPZ Ownership

Runway 16



Runway 34



5.2.10 Taxiways

The taxiway system at BLI consists of a full parallel taxiway (TWY Alpha), four angled exits (TWYs Charlie, Delta, Echo, and Foxtrot), two entrance taxiways (TWYs Bravo and Golf) and two additional taxiways (TWY Juliet and Hotel). The FAA, in AC 150/5300-13A establishes the concept of Taxiway Design Groups (TDG) to guide the evaluation and design of taxiways. The TDG adds consideration of the dimensions of the aircraft undercarriage (main wheel gear and cockpit to main gear) to the ADG. Table 5–11 shows the dimensional requirements for the TDG groups compared with the actual conditions at BLI.

Table 5–11: Taxiway/Taxilane Data Table

ITEM	Taxiway A	Taxiway B	Taxiway C
Airplane Design Group (ADG)	III	III	III
Taxiway Design Group (TDG)	3	3	3
Taxiway / Taxilane	Actual [Standard]	Actual [Standard]	Actual [Standard]
Width	75' [50']	102.5' [50']	70' [50']
Safety Area (TSA) Width	171' [118']	118' [118']	118' [118']
Object Free Area (TOFA)	259' [186'/162']	186' [186'/162']	186' [186'/162']
Facility Separation[1]	148' [160'] – ICE TLN 340' [152'] – TWY F 181' [160'] – TWY H	Not Applicable	Not Applicable
Lighting	MITL [MITL]	MITL [MITL]	MITL [MITL]

ITEM	Taxiway D		Taxiway E	Taxiway F	
Airplane Design Group (ADG)	II	III	III	II	III
Taxiway Design Group (TDG)	2	3	3	2	3
Taxiway / Taxilane	Actual [Standard]		Actual [Standard]	Actual [Standard]	
Width	40' [35']	60' [50']	70' [50']	40', 48' [35']	50', 80' [50']
Safety Area (TSA) Width	79' [79']	118' [118']	118' [118']	79' [79']	118' [118']
Object Free Area (TOFA)	131' [131'/115']	186' [186'/162']	186' [186'/162']	131' [131'/115']	186' [186'/162']
Facility Separation[1]	328.5' [105'] – TWY H	Not Applicable	Not Applicable	Not Applicable	340' [152'] – TWY A
Lighting	MITL [MITL]	MITL {MITL]	MITL [MITL]	MITL [MITL]	MITL {MITL]

ITEM	Taxiway G	Taxilane H	Taxiway J
Airplane Design Group (ADG)	III	III	II
Taxiway Design Group (TDG)	3	3	2
Taxiway / Taxilane	Actual [Standard]	Actual [Standard]	Actual [Standard]
Width	75' [50']	60' [50']	40' [35']
Safety Area Width	118' [118']	118' [118']	79' [79']
Object Free Area (TOFA)	186' [186'/162']	225' [186'/162']	131' [131'/115']
Facility Separation[1]	Not Applicable	181' [160'] – TWY A 328.5' [152'] – TWY D	Not Applicable
Lighting	MITL [MITL]	MITL [MITL]	MITL [MITL]

[1] AC-150/5300-13A, Table 4-1. When 180° turn between parallel taxiways is required, dimensions in Table 4-2 are used.

As shown, the taxiways at BLI meet or exceed the FAA dimensional criteria for the design aircraft.

5.2.11 Taxiway Layout

In a local Runway Safety Action Plan (RSAP) for BLI conducted in 2015, the FAA conducted a review of conditions at BLI and identified issues or concerns that could affect runway safety. The review found that there were two surface incidents and no runway incursions recorded at BLI in the previous 5-year period. With consideration of the low incident numbers, the design of the exit taxiways was no longer valid for the traffic using the airport. It was recommended that the existing angled exits be replaced with new 90 degree exits. These are shown on Figure 5–4.

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 based on the aircraft expected to use them.

5.3 Terminal 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 in the future 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 (2016) conditions and future requirements summarized in 5-year increments.

5.3.1 Passenger Enplaning Facilities

The terminal expansion, completed in 2014, provided ticket counter space and check-in kiosks for five to six airlines. AECOM 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 also requires 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.

Figure 5–4: Taxiway Design Issues

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 also needs 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 non-secure facilities.

5.3.2 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.

5.3.3 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 non-secure zones, a display area for advertising, and building systems and janitorial rooms.

5.3.4 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.

Table 5–12 shows the calculated areas required for terminal operations at BLI.

Table 5–12: Passenger Terminal Requirements

	Unit	2016	2022	2027	2032	2037
Annual Enplaned Passengers		417,930	392,209	424,606	459,679	497,649
Enplaning						
Ticket counter length	l.f.	32	32	40	48	56
Agent work area	s.f.	320	320	400	480	560
Passenger queueing	s.f.	640	640	800	720	840
Circulation space	s.f.	320	320	400	480	560
Self-service kiosks	s.f.	160	160	200	240	280
Airline offices	s.f.	480	480	600	720	840
Airline baggage make-up	s.f.	4,000	4,000	4,000	5,000	6,000
TSA baggage screening	s.f.	4,000	4,000	5,000	5,000	6,000
Total enplaning requirement	s.f.	9,920	9,920	11,400	12,640	15,080
Security/Screening						
Passenger security lanes	no.	2	2	3	4	5
Screening area	s.f.	2,100	2,100	3,150	4,200	5,250
Passenger queueing area	s.f.	4,824	4,527	4,905	5,310	5,751
TSA administration	s.f.	1,000	1,000	1,000	1,000	1,000
Total security requirement	s.f.	11,924	11,627	14,055	15,510	18,001
Gate Areas						
Number of gates	no.	5	5	5	6	7
Gate area	s.f.	13,000	13,000	13,000	15,600	18,200
Restrooms	s.f.	900	1,800	1,800	1,800	1,800
Concessions	s.f.	1,600	1,600	1,600	1,600	3,200
Circulation	s.f.	4,290	4,290	4,290	5,148	6,006
Total gate area requirement	s.f.	19,790	20,690	20,690	24,148	29,206
Deplaning						
Bag claim devices	unit	2	2	3	3	3
Baggage claim active area	s.f.	600	600	900	900	900
Waiting area	s.f.	8,576	8,048	8,720	9,440	10,224
Circulation area	s.f.	918	865	962	1,034	1,112
Inbound baggage area	s.f.	1,500	1,500	2,200	2,500	3,000
Rental Car						
Counter length	l.f.	32	32	32	32	32
Area	s.f.	320	320	320	320	320
Customer queueing	s.f.	320	320	320	320	320
Offices	s.f.	320	320	320	320	320
Parking pre-pay	s.f.	50	50	50	50	50
Total deplaning requirement	s.f.	11,104	10,523	11,592	12,384	13,246
Offices						
Airport management	s.f.	5,000	5,000	5,000	5,000	5,000
Other	s.f.	1,500	1,500	1,500	1,500	1,500
Total office requirement	s.f.	6,500	6,500	6,500	6,500	6,500

	Unit	2016	2022	2027	2032	2037
Other Needs						
Concessions	s.f.	2,500	2,500	2,943	3,186	3,451
Display area	s.f.	200	500	750	1,000	1,500
Restrooms	s.f.	450	900	900	900	900
Mechanical/Electrical	s.f.	1,777	1,778	1,927	2,135	2,461
Janitorial	s.f.	1,185	1,185	1,285	1,424	1,641
Total other requirement	s.f.	6,112	6,863	7,805	8,645	9,952
Total Requirement	s.f.	65,349	66,123	72,042	79,827	91,986

The Passenger Terminal Building was expanded in 2014 to approximately 105,000 square feet. This will be adequate for the passenger volumes as forecast. No terminal expansion will be required but longer-term provisions for the possibility of a new airline serving BLI should be included in the planning for the terminal area. Should such a situation arise, a determination would need to be made as to whether that airline could be accommodated within the existing terminal footprint or an expanded footprint would be needed.

5.3.5 Terminal Apron

Aircraft parking is arranged along the terminal concourse and currently consists of eight terminal frontage gate positions, all of which are power-in/push-out positions. All of the gate positions can be used as RON spaces based on schedule needs of the airlines.

The exact size of any future terminal apron will depend on the final footprint and layout of the terminal building. Forecasts show that the eight existing gate positions will be adequate for the future. However, two dedicated RON locations should be provided in the short term. 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.

5.3.6 Automobile Parking and Surface Access

The current public parking lots provide space for 2,063 vehicles. This includes 1,237 public spaces, 17 Americans with Disabilities Act (ADA) compliant spaces, 3 recreational vehicle (RV) stalls, 16 drop-off/pick-up (30 minutes free) spaces, and a free 14-space cell phone lot. Forecasts show that additional expansion may be needed as passenger levels grow although off-site parking could reduce the demand for on-airport facilities. The employee parking area consisting of 250 spaces is being comingled with the Terminal Main and Economy A parking lots enabled by an upgraded RFID parking management system.

The 134 spaces in the northern portion of the main parking lot reserved for Rent-a-Car ready and return has been expanded to 253 spaces and relocated the southern portion of the lot adjacent to and in proximity of baggage claim and the arrivals exit. These areas are sufficient for activity levels forecast through the planning, period. A “Quick Turn Around” (QTA) facility is needed to clean, fuel, service and wash rental vehicles and return them back to service.

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 4,936 spaces per million annual passengers. This reflects the fact that a high percentage of the passengers using BLI are traveling for recreational purposes. These passengers typically park for a longer time period than do business flyers. The projections shown in Table 5–13 support growth in passengers with similar use patterns.

Rental car parking projections were made using the assumption that the ready and return lots would continue to be located in the main lot near the terminal building. Currently there are 253 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 3,120 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 use pattern is consistent with the nature of the passengers and airlines using BLI.

Table 5–13: Automobile Parking Requirements

Year	Annual Enplaned Passengers	Public Parking	R-A-C Ready/Return Area	Employee
2016	417,930	2,063	131	250
2022	392,209	1,936	253	250
2027	424,606	2,096	253	250
2032	459,679	2,269	253	300
2037	497,649	2,457	253	350

Note: RAC ready/return area was expanded to 253 spaces in 2017.

5.4 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.

5.4.1 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.

5.4.2 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 located 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. It is assumed 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.

Should any of the major all-cargo carriers decide to expand their facilities at BLI as a result of changes in their logistical planning, long-range plans will need to identify potential locations for such an expansion.

5.5 General Aviation Requirements

In 2016 there were 189 general aviation aircraft based at BLI. The long-term forecast for based aircraft at BLI anticipated that 256 aircraft would need to be accommodated by 2036. This is an increase of 67 aircraft. The majority of these aircraft will require hangars or some form of indoor storage. The number and type of aircraft storage facilities needed over the course of the 20-year planning period is detailed in the sections below.

Table 5–14: Based Aircraft Forecast

Year	Single Engine Piston		Multi Engine Piston		Turbine		Rotor		Total	
	No	%	No	%	No	%	No	%	No	%
2016	169	89.3%	8	4%	5	3%	7	4%	189	100%
2022	184	89.0%	8	4%	6	3%	8	4%	207	100%
2027	193	87.0%	9	4%	9	4%	11	5%	222	100%
2032	202	85.0%	12	5%	12	5%	12	5%	238	100%
2037	212	83.0%	13	5%	15	6%	15	6%	256	100%

5.5.1 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 does not currently meet demand. Table 5–15 lists the assumed storage preferences for based aircraft if adequate facilities were available. These percentages have been based on an assessment of the hangar waiting list that exists for BLI as well as at other facilities in Western Washington. The percentages recognize the value of aircraft and the desire of pilots to protect their investments from the weather.

Table 5–15: Assumed Storage for Based Aircraft

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%

Combining these with the based aircraft forecast produced the requirements for hangar space as shown in Table 5–16. As shown, demand for open-air tiedowns is relatively low and the largest growth in demand is expected to be in corporate hangars.

Table 5–16: Based Aircraft Storage Requirements

Year	T-Hangars	Corporate Hangars	Tiedowns	Totals
2016	139	42	8	189
2022	152	46	9	207
2027	159	53	10	222
2032	168	60	10	238
2037	176	69	11	256

It should be remembered that the demand for aircraft hangars is based on forecasts that can change. Consequently, it is recommended that these larger hangar facilities be reflected in the airport's long-term plans, it is also recommended that hangars only be constructed as specific demand arises.

5.5.2 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. AECOM employed the following method to calculate the number of aircraft that will require transient aircraft parking spaces as shown in Table 5–17.

- 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.

Table 5–17: Itinerant Aircraft Tiedown Requirements

Year	Itinerant Operations			Transient Arrivals	Transient Tiedowns Required
	Annual	Average Day	Daily Arrivals		
2016	31,195	109	55	27	14
2022	35,438	124	62	31	16
2027	36,668	128	64	32	16
2032	38,637	135	68	34	17
2037	40,450	142	71	35	18

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

5.5.3 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 5–18 shows the amount of space needed for aircraft storage throughout the forecast period.

Table 5–18: Aircraft Storage Requirements

Facility		2016	2022	2027	2032	2037
T-Hangars	no.	139	152	159	168	176
	s.f	834,511	909,144	953,712	1,006,740	1,058,304
Corporate Hangars	no.	42	46	53	60	69
	s.f	312,488	346,984	400,433	450,713	517,440
Based Aircraft Tiedowns	no.	8	9	10	10	11
	s.f	4,913	5,581	5,775	6,085	6,371
Transient Tiedowns	no.	14	16	16	17	18
	s.f	9,553	10,853	11,230	11,833	12,388
Total Requirements	s.f	1,161,465	1,272,562	1,371,149	1,475,370	1,594,503
	acres	27	29	31	34	37

5.5.4 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 5–19 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 5–19: FBO Facilities Area Requirements

	2016	2022	2027	2032	2037
GA Needs					
Square feet	1,161,465	1,272,562	1,371,149	1,475,370	1,594,503
Acres	27	29	31	34	37
FBO Needs					
Square feet	174,220	190,884	205,672	221,306	239,175
Acres	4	4	5	5	5

5.6 Utilities and Drainage

The only identified 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 terminal and general aviation areas, utility services typically include electricity, water, data cables, and the collection of storm water treatment.

5.7 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.

Table 5–20: Fuel Storage Requirements

Year	Annual Operations	Capacity (gallons)	Days' Supply	Tanks
2011	23,230	50,000	2	2
2016	24,563	52,868	7	2
2022	25,559	55,013	7	2
2027	26,585	57,220	7	2
2032	27,642	59,497	7	2

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 5–20 shows the need for fuel storage over the 20-year planning period.

In addition to capacity, the current fuel storage area is only accessible from the non-secure side of the airport. As such, fuel trucks must travel on public roads in order to access the fuel. This is not ideal and can lead to issues of Foreign Object Debris (FOD) in the Airport Operations Area (AOA) as well as security concerns and staffing needs in order to conduct inspections. A future location should be identified on the secure side of the airport.

6 Evaluation of Alternatives

6 Evaluation of Alternatives

6.1 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 Facility Requirements chapter. In this discussion, 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.

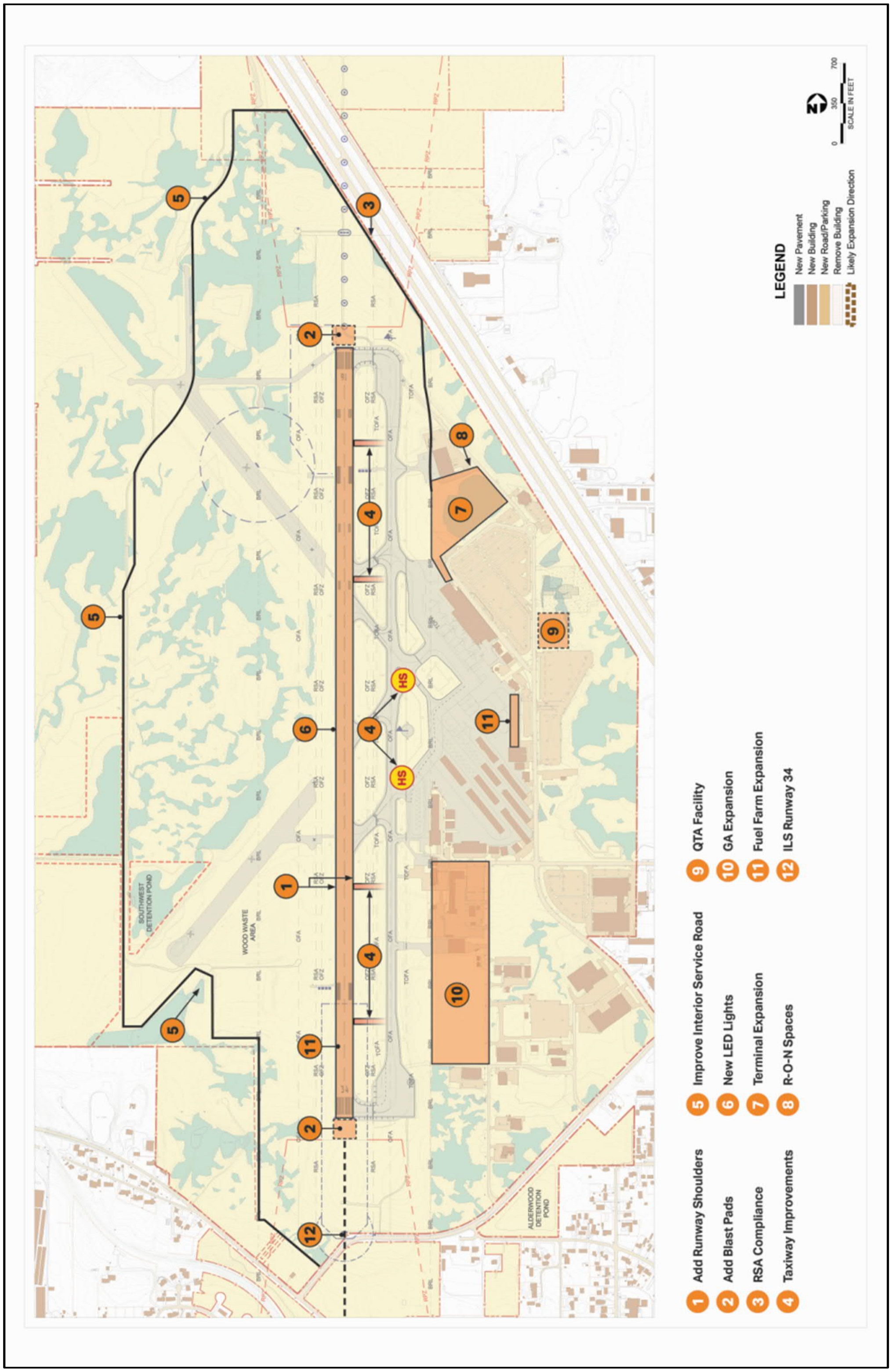
- Airfield - runways, Runway Safety Area (RSA), taxiways, and other facilities
- Environmental – careful study of the impacts of all proposed airport improvements and the relocation of environmental conservation areas from the critical Airport Operations Area (AOA) to more suitable, and sustainable locations.
- Sustainability – upgrade airfield lighting systems to LED technology, solar energy development on airport property
- Terminal area - terminal building (on-demand expansion and LEED upgrades to existing building), aircraft apron, airport access, and auto parking
- General aviation areas - Fixed Base Operator [FBO] facilities, hangars, and tiedowns)
- Other – Fuel farm, Snow Removal Equipment (SRE) storage facility

Table 6–1 shows a summary of the alternative evaluation process. Details of the methodologies employed, recommendations made, and final analyses are contained in the remainder of this chapter. Figure 6-1 graphically depicts the location of the recommended alternatives

Table 6–1: Summary of Recommendations

Area/Facility	Recommendation
Airfield Projects	
Runway length	Do-Nothing
Runway 16 Runway Safety Area (RSA) compliance	Extend RSA onto I-5 Right of Way
Remove obstructions to RSA	No alternatives
Construct runway shoulders	No alternatives
Add Runway blast pads	No alternatives
Realign exit taxiways	Replace current angled exits with right-angled exits spaced to efficiently handle the aircraft fleet at BLI
Install ILS on Runway 34	No alternative. The ILS will be added at a time when FAA determines that it is required based on traffic and need.
Replace perimeter fencing with wildlife fencing on the west side	No alternatives
Complete interior perimeter service road	No alternatives
Environmental Projects	
Relocate conservation areas off the AOA	No alternatives
Conduct Environmental Analyses related to obstruction removal	No alternatives
Sustainability Projects	
Replace airfield lighting with low energy LED systems	No alternatives
Install additional e-car charging stations	No alternatives
Convert GSE to electrical power	No alternatives
Develop solar energy system to move the airport "off-grid"	No alternatives
Terminal Area Projects	
Develop RON parking capability	No alternatives
Expand terminal capacity - on demand	No alternatives
Add RAC QTA Facility	No alternatives
General Aviation Facilities	
Provide land parcels for GA development	No alternatives
Provide area for FBO expansion	No alternatives
Other Projects	
Relocate and expand fuel farm	No alternatives
Relocate ATCT facilities	No alternatives
Construct new SRE Building	No alternatives
Reserve space for ASR Facility	No alternatives
Relocate ASOS	No alternatives

Figure 6-1: Recommended Alternatives



6.2 Airfield Alternatives

The airfield 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).

As detailed in the Facility Requirements chapter the runway length at BLI is marginal for commercial service but sufficient for current and forecast service. However, given the runway's length relative to the recommended design for the most demanding aircraft, this analysis evaluates the feasibility of lengthening the runway to recommended design criteria. Additionally, it has been shown that the Runway Safety Area on Runway 16 does not meet FAA standards and must be brought into compliance. This is the primary issue faced on the airfield at BLI. Details on the alternatives are as follows.

6.3 Evaluation of Runway Extension Alternatives

The analysis from the Facility Requirements chapter established that ideally the runway at BLI should be extended to a length that would fully accommodate operations by the critical aircraft operating at Maximum Takeoff Weight (MTOW). The runway length calculations showed that an optimal length of 9,900 feet should be included in the planning analysis. To determine whether such an extension is feasible four alternatives have been developed for analysis and comparison to the no action alternative.

1. Runway Alternative 1: Do Nothing.
2. Runway Alternative 2: Extend the Runway to the north 3,199 feet
3. Runway Alternative 3: Extend the Runway to the south 3,199 feet
4. Runway Alternative 4: Shift the orientation of the Runway 16 end
5. Runway Alternative 5: Construct a new runway to the west, on airport property

These are depicted on the exhibits that accompany discussion of each alternative. The extended runway and taxiway as well as land that would be acquired to assure compliance with Runway Safety Area (RSA), Object Free Area (OFA), and Runway Protection Zone (RPZ) criteria are shown. Each alternative will be defined, evaluated and compared to assure that the safest, most practicable and optimum action is recommended. The criteria to be used in the analysis include:

Meet Airport/Aircraft Operational Needs: The current runway length (6,701 feet) is marginally sufficient to serve the routes that the airlines are currently operating from BLI. The runway's length limits the destinations that could be served at MTOW in the future. Currently aircraft serving some destinations have to take performance restrictions to operate, meaning that the payload (passenger and cargo) and range (distances they travel) are limited. These criteria will be used to measure whether the alternative meets the needs of the critical aircraft at MTOW.

Constructability: This category defines the special considerations that would be involved in implementation of the concept and explores the ability of the Runway to remain open and usable during construction. As a single-runway commercial service airport with marginal runway length, any runway closure or extended reduction of available length due to construction will adversely impact the airlines' ability to operate, the airport's reliability vis-à-vis the passenger base, and airport revenue stream. In the competitive environment in which BLI operates, any interruption of service will cause long-term degradation to the Airport's commercial airline market.

Environmental Considerations: All of the alternative actions will require construction activity and therefore consideration of the environmental impacts of construction or land disturbance activities will be needed. The level of environmental analysis required will be determined by the FAA prior to any construction activity; however, with an extension of the runway as the proposed action, extensive environmental analyses will be required. Additionally, a new analysis of the aircraft noise environment will be needed to assess and evaluate the changes in the areas exposed to aircraft noise.

Cost/Financial Implications: Each of the identified alternatives involves significant phased (for maintenance of traffic) construction activity. This category will estimate the cost of the construction. Cost estimates are developed using planning level data and recent construction costs in Whatcom County, where applicable.

Additional financial impacts will result from any alternative that causes runway closure or limits activity during construction. The most immediate impact will be in the reduction of both airline and non-airline revenues which include landing fees, terminal fees, aircraft parking fees, auto parking revenues, and fees from rental cars, food and beverage and other concessions. In addition, Passenger Facility Charges (PFCs) will be reduced based on any reduction of passenger loads. Although further economic impacts will be felt throughout the region resulting in reduced spending on hotels and other amenities due to the service interruptions, these are not included in the estimates.

6.3.1 Runway Alternative 1: No Action

This alternative posits that the existing runway length and orientation be maintained as is. Should this be the preferred alternative, the Runway Safety Area (RSA) on Runway 16 would need to be brought into compliance.

Meet Airport/Aircraft Operational Needs: This alternative does not provide for full use of the critical aircraft operating at MTOW. However as shown on the following table the existing length of 6,701 feet adequately accommodates the critical design aircraft at nearly 90% of MTOW. This is sufficient to serve existing and anticipated routes being served at BLI.

Table 6–2: Aircraft Use of Existing Runway Length

Aircraft	MTOW* (lbs.)	Required RW Length (ft.)	Required RW Length at 90% MTOW* (ft.)	Percent of MTOW* at 6,701-foot RW
Boeing 737-700**	154,500	8,500	6,250	93%
Boeing 737-800	174,200	9,700	6,900	89%
Boeing 737-900**	174,200	9,400	7,000	87%
Boeing 737-900ER	187,700	8,700	6,900	89%
A319	154,323	7,400	5,100	100%

* MTOW = Maximum Takeoff Weight
** With Winglets

Complexity: Given that the alternative does not require any action be taken regarding the runway there is no complexity in implementation except that the Runway Safety Area (RSA) for Runway 16 will need to be improved in order to meet FAA design criteria.

Constructability: No runway construction is involved.

Environmental Considerations: As no construction is involved, environmental considerations are limited to the portion of RSA to be improved.

Cost: There are no costs associated with maintaining the runway length as-is, and since airport operations will not be impacted there is no operational cost associated with this alternative.

6.3.2 Runway Alternative 2: Extend the Runway to the North

This alternative involves extending the existing runway by 3,199 feet to the north to achieve the full 9,900 feet. This extension includes the area from the end of the new runway sufficient to provide for full RSA and RPZ compliance. Figure 6-2 shows the extent of the improvements envisioned.

Meet Airport/Aircraft Operational Needs: This alternative would provide for the full 9,900 feet of runway that previous analyses show would be needed for the critical commercial service aircraft to operate to any and all destinations at MTOW.

Complexity: Extending the runway to the north would require that the runway and taxiway extend over Interstate 5 and into property that is not presently owned by the Port of Bellingham. Constructing the structure to allow this will require the Port of Bellingham, FAA, FHWA and WSDOT to work together to assure that the resultant structure meets all of their design criteria and requirements.

Additionally, the extension will require the acquisition of approximately 83 acres of property on the north side of the interstate. This land would need to be filled to match the lengthened runway elevation as it currently starts approximately 30 feet below the threshold of the extended runway and slopes downward to almost 60 feet below the threshold.

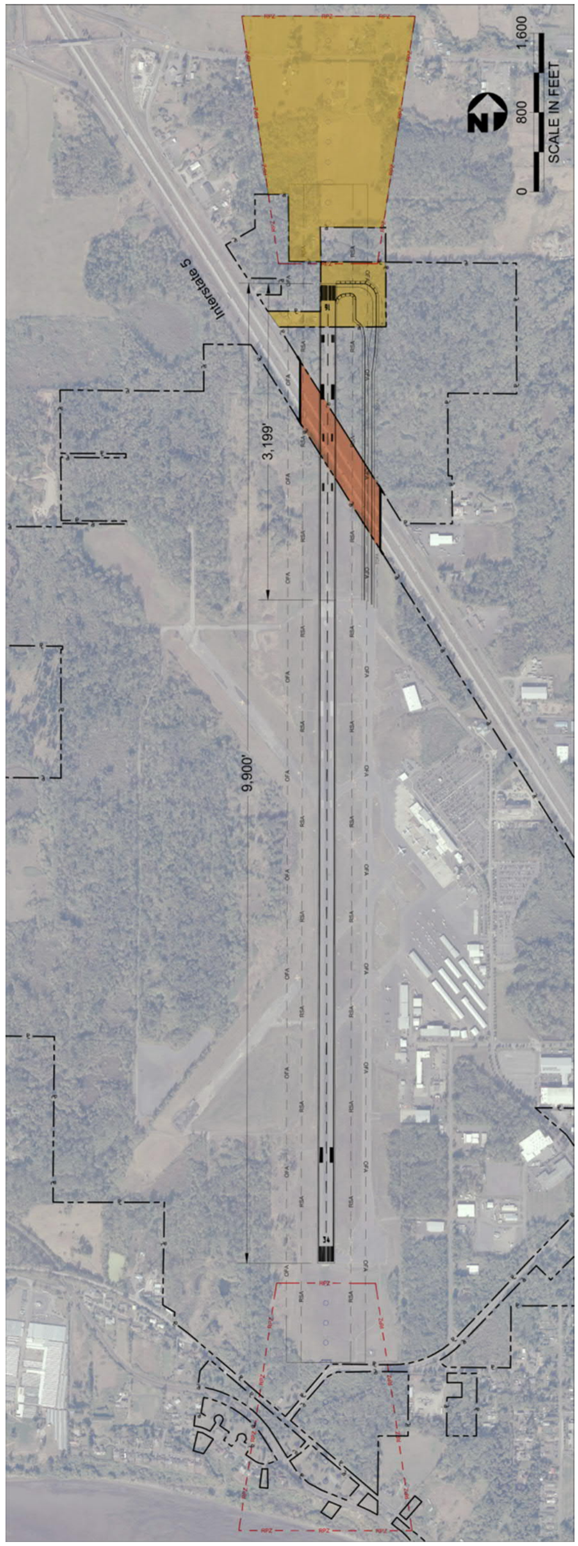
Constructability: Extending the runway in this direction will require the construction of a runway taxiway bridge across Interstate Highway 5 (I-5) and Pacific Highway. This structure will need to be approximately 800 feet wide by 1,520 feet in length to provide for the runway, taxiway, RSA area, and service roads. During runway extension and construction of the structure the existing runway length will need to be significantly reduced. This will result in having less than 6,701 feet available for flights for a period of at least 150 days.

Environmental Considerations: Although the level of environmental analysis required to permit this project will need to be determined through discussions between the FAA and Port, the assumption is that since a runway extension is involved, a full Environmental Impact Statement (EIS) will be required. Additionally, the change in noise patterns resulting from the shifting of the runway will impact different sections of the community and will need to be coordinated.

Cost: A preliminary order of magnitude cost estimate for this alternative was developed and considered environmental analysis, land acquisition, site preparation (including fill to bring the land up to the runway end level), construction of a bridge spanning I-5, runway and taxiway pavement, NAVAID relocation and recalibration, design fees, taxes and contingencies. The estimate to implement this alternative is estimated at $740 million.

In addition, the fact that the runway will not be operational for commercial service for a period of approximately 150 days the airport will lose about $2.6 million in operating revenue and $768,000 in PFC revenues – totaling more than $3.3million in lost revenues. Such an extensive closure will likely result in commercial schedule airline attrition resulting in an estimated annual revenue loss of $6.1 million and a significant number of full-time jobs.

Figure 6-2: Alternative 2 - Extend Runway to the North



6.3.3 Runway Alternative 3: Extend the Runway to the South

This alternative involves moving the runway 16 threshold 110 feet to the south to accommodate the full RSA requirement and extending the existing runway to the south by 3,199 feet to provide the full 9,900 feet. This extension includes area off the new end of the runway sufficient to provide for full RSA compliance. Figure 6-3 shows the extent of the improvements.

Meet Airport/Aircraft Operational Needs: This alternative would provide for the full 9,900 feet of runway that previous analyses show to enable the critical commercial service aircraft to operate to any and all destinations at MTOW.

Complexity: Extending the runway to the south requires that the 800-foot-wide runway and taxiway platform extend approximately 1,700 feet into Bellingham Bay requiring approximately 23 acres to be on an elevated bridge structure or on fill. This is made even more complex by the fact that the current runway end is at an elevation of 170 feet and the Bay sits at between 0 and 5 feet. The 165 feet difference makes this alternative impractical.

Additionally, the extension will require purchase of approximately 7 acres of property in the Cliffside neighborhood. Moreover, this alternative would involve relocation, abandonment or spanning the Burlington Northern Railroad, Alderwood Avenue and Marine Drive.

Constructability: Extending the runway in the southerly direction will cause the existing runway length to be reduced during some of the construction activities in the existing RSA. This will result in having less than 6,701 feet available for flights for a period of at least 90 days, although these may not be consecutive, depending on project phasing.

Environmental Considerations: Although the level of environmental analysis required to permit this project will need to be determined through discussions between the FAA and Port, the assumption is that since a runway extension and required bay fill is involved, a full Environmental Impact Statement (EIS) will be required. Additionally, the change in noise patterns resulting from the shifting of the runway will impact different sections of the community and will need to be coordinated.

Cost: The cost of extending the runway to the south is estimated to exceed $800 million. The exact cost of either spanning or filling the Bay and relocating the railroad is impossible to determine accurately without detailed engineering studies.

Having the runway out of operation for commercial service for a period of approximately 90 days, the airport will lose about $1.6 million in lost operating revenues and $461,000 in PFCs. Such an extensive closure will likely result in commercial schedule airline attrition resulting in an estimated annual revenue loss of $6.1 million and a significant number of full-time jobs.

Figure 6-3: Alternative 3 - Extend Runway to the South

6.3.4 Runway Alternative 4: Shift Runway Orientation

This alternative involves extending the existing runway by shifting the runway alignment to provide for a full 9,900 feet, as much as possible on the airport property. This extension includes area off the new end of the runway sufficient to provide for full RSA and RPZ compliance. This shift would result in a new runway alignment to roughly 14-32. Figure 6-4 shows the extent of the improvements envisioned.

Meet Airport/Aircraft Operational Needs: This alternative would provide for the full 9,900 feet of runway length that previous analyses show as needed for the critical commercial service aircraft to operate to any and all destinations at MTOW. However, the new runway alignment would impact air traffic flow and coordination with YVR. The new alignment would also reduce runway wind coverage, although the new alignment would still provide adequate cross-wind coverage and if the current runway is retained and remains operational, will actually improve capacity.

Another operational consideration in this alternative is the increases in taxiing distance to the landside facilities (Terminal and Hangars) required. To access the new north runway end will require an airplane to taxi more than 6,200 feet to access the terminal area. This is a substantial increase over current taxiing distances.

Complexity: Realigning the runway requires that the platform for the runway and taxiway extend into the wetland area on the airport's west side. Approximately 170 acres of undeveloped land on current airport property will be required for this development, much of which has previously been designated as wetland. In addition, approximately 150 acres of new land will need to be acquired to provide for RSA and RPZ protections.

Constructability: Constructing a new runway along this alignment will cause the existing runway length to be reduced during construction activities required from the 34 end until all activities are clear of the RSA. This will result in having the runway length reduced to the extent that commercial flights would need to be cancelled for a period of at least 120 days.

Environmental Considerations: Although the level of environmental analysis required to permit this project will need to be determined through discussions between the FAA and Port, the assumption is that since a runway extension and much of the development would occur in designated wetlands, a full Environmental Impact Statement (EIS) will be required. Additionally, the change in noise patterns resulting from the shifting of the runway will impact different sections of the community and will need to be coordinated.

Cost: A preliminary Order of Magnitude Estimate (OME) shows that the cost for this alternative will exceed $95 million not including wetland remediation activities that are assumed to be required to gain approvals.

The runway will not be operational for commercial service for a period of approximately 120 days under this alternative. During this down time the airport will lose about $2.1 million in operating revenue and $614,000 in PFC revenues – totaling more than $2.7 million in lost revenues. Such an extensive airport closure will likely result in commercial schedule airline attrition resulting in an estimated annual revenue loss of $6.1 million and a significant number of full-time jobs.

Figure 6-4: Alternative 4 - Shift Runway Orientation

6.3.5 Runway Alternative 5: Move the Runway

This alternative involves constructing a new runway to provide the length while remaining on existing airport property to the degree possible. This extension includes sufficient land to provide for full RSA and RPZ compliance. Figure 6-5 shows the extent of the improvements envisioned.

Meet Airport/Aircraft Operational Needs: This alternative would provide for the full 9,900 feet of new runway approximately 2,300 feet north of the existing runway. This would provide sufficient runway length for commercial service aircraft to operate to any and all destinations at MTOW.

Complexity: Realigning the runway requires that the platform for the runway and taxiway extend into the wetland area on the airport's west side. To do this will require that 150 acres of currently undeveloped airport land be included in the construction area. In addition, about 214 acres of additional land would need to be acquired and developed.

Constructability: Providing the runway in this manner will not cause the existing runway length to be reduced or closed during construction activities.

Environmental Considerations: Although the level of environmental analysis required to permit this project will need to be determined through discussions between the FAA and Port, the assumption is that since a runway extension and much of the development would occur in designated wetlands, a full Environmental Impact Statement (EIS) will be required. Additionally, the change in noise patterns resulting from the addition of the runway will impact different sections of the community and will need to be coordinated.

Cost: A preliminary Order of Magnitude Estimate (OME) shows that the cost for this alternative will exceed $100 Million, not including wetland mitigation efforts.

There is no impact on revenues or PFC income since the construction can occur independent of the existing runway.

Figure 6-5: Alternative 5 - Move the Runway

6.3.6 Runway Length Recommendation

The following table presents a summary of the Runway Length alternative analysis. As shown in the summary table following;

Table 6–3: Summary of Runway Extension Alternatives

	Runway Extension Alternative				
	1 No Action	2 Extend North	3 Extend South	4 Shift Orientation	5 Relocate
Meets Operational Need	Does not permit take-offs by the critical aircraft at MTOW. Meets current and forecast demand.	Can accommodate operations by the critical aircraft at MTOW.	Can accommodate operations by the critical aircraft at MTOW.	Can accommodate operations by the critical aircraft at MTOW. Taxi distances from the northern end of the runway increased to approximately 7,500 feet.	Can accommodate operations by the critical aircraft at MTOW. Taxi distances from either runway end increased to more than 7,500 feet.
Complexity	Doing nothing involves no construction.	The runway and taxiway extension will span I-5 and Pacific Highway and require fill.	The runway and taxiway extension will require substantial fill and development into Bellingham Bay.	Reorienting the runway will require fill of large areas of undeveloped land, much of which is wetland.	Moving the runway will require the fill of large areas of undeveloped land, much of which is classified as wetland.
Constructability	Doing nothing involves no construction. Commercial flights not impacted.	Construction would cancel commercial activity for approximately 150 days	Construction would cancel commercial activity for approximately 90 days.	Construction would cancel commercial activity for approximately 120 days.	The new runway could be developed independent of operations on the existing.
Environmental Considerations	Minor impacts from RSA compliance action.	Major impacts likely to change in noise exposure.	Major impacts due to the extension of the runway into Bellingham Bay.	Major impacts likely to change in noise exposure and wetland impacts.	Major impacts likely to change in noise exposure and wetland impacts.
Financial Implications					
Construction Cost	$0	$740,000,000	Exceeds $800,000,000	$95,000,000	Exceeds $100,000,000
Revenue Loss	$0	$2,630,000	$1,580,000	$2,110,000	$0
PFC Loss	$0	$768,000	$461,000	$614,000	$0

As shown, each of the runway extension alternatives has specific characteristics that make implementation complex, expensive and time consuming.

For Alternative 2, the need to span Interstate 5 and Pacific Highway with a structure robust enough to support aircraft landings and operations adds a level of complexity and cost in addition to the $3.3 million in lost revenue from the need to shut the runway down during certain construction activities.

Likewise, Alternative 3 is seen as impracticable because it would require substantial fill to be placed into Bellingham Bay. The scale of this will be environmentally controversial, time consuming and it is impossible to estimate the cost with any accuracy.

Alternative 4 is less complicated to construct but the new runway will require substantial environmental and design consideration due to the wetlands that would need to be disturbed. In the end the construction would cost more than $95,000,000 and operational cancellations will cause a $2,700,000 loss in revenue.

Alternatives 2-4 involve extensive closures during construction and will likely result in commercial schedule airline attrition resulting in an estimated annual revenue loss of $6.1million and 400 full-time jobs.

Alternative 5 also involves development of large areas designated as wetlands and would therefore be complicated environmentally. In addition, the cost of construction would be more than $98,000,000.

Because of these factors, and the marginal need for additional runway length, it is recommended that the Port adopt Alternative 1 – Do Nothing as the preferred runway development option.

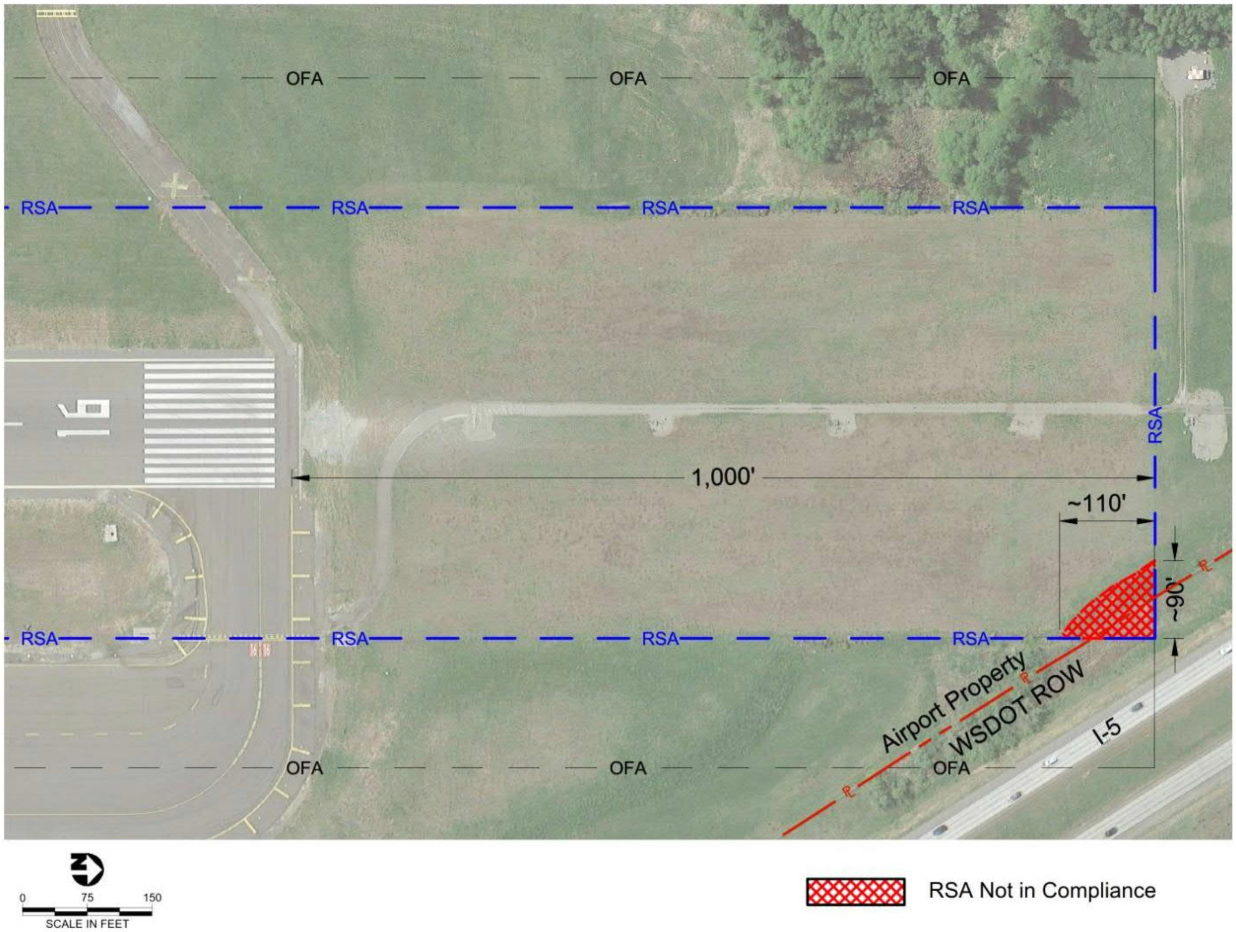
6.4 Runway 16 Runway Safety Area (RSA)

FAA AC 150/5300-13A defines the Runway Safety Area (RSA) as a critical, two-dimensional area surrounding an 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 navigational aids mounted using low-impact frangible supports and whose location in the RSA is fixed by function.

Based on FAA criteria for a D-III 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 these standards. However, on the Runway16 end, an area measuring approximately 1,700 sf[1] is not owned by the Port and therefore the RSA is not in compliance with the standard. Additionally, the maximum slope in an area transitioning to the off-property area does not meet standards. These two areas combined account for approximately 5,700 sf[1] of not-to-standard RSA. Figure 6-6shows the current RSA for Runway 16 and highlights the area that does not meet the standard. In the interest of safety and compliance with FAA criteria the RSA must be brought to standard.

Figure 6-6: Existing Runway 16 RSA[1]



[1] These are best estimates based on existing data. A property survey will be required for more accurate dimensions.

6.5 Runway Safety Area Alternatives

Several alternatives that allow the Port to meet the RSA standard have been identified as follows:

1. RSA Alternative 1: Do-Nothing (Administrative Solution)
2. RSA Alternative 2: Extend the RSA into WSDOT/FHWA I-5 Right of Way
3. RSA Alternative 3: Use Declared Distances to achieve RSA Compliance
4. RSA Alternative 4: Relocate the Threshold on RWY 16 and Replace on 34 end to maintain the runway length
5. RSA Alternative 5: Relocate the Runway
6. RSA Alternative 6: Use an Engineered Solution (EMAS)

6.6 Evaluation of Runway Safety Area Alternatives

Each of the alternatives is addressed in the following text. They are defined, evaluated and compared to assure that the safest, most practicable and optimum action is recommended. The criteria to be used in the analysis include:

Meet FAA Safety Standards: The FAA has a mandate to achieve RSA compliance at all airports in the United States. As previously stated any alternative that does not achieve that mandate is not acceptable from a safety and regulatory standpoint and will be deemed impracticable.

Meet Airport/Aircraft Operational Needs: The current runway length (6,701 feet) is marginally sufficient to serve the current airlines operating at BLI. This runway length limits the destinations that can be served due to operational requirements of larger aircraft. Currently, several aircraft have to take performance restrictions to operate, meaning that the payload (passenger and cargo) and range (distances they travel) are artificially limited. Table 6–4 shows the take-off length weight restrictions for aircraft at BLI. As shown, the runway length is marginal but as demonstrated in the Section 6.3, extending the runway to provide for full use by the critical aircraft operating at MTOW is not practical. Lacking the ability to extend the runway means that any alternative that further reduces the safety margins such as displacing the RWY 16 threshold and applying declared distances by reducing usable runway length to meet RSA design criteria is deemed unacceptable.

Table 6–4: Runway Length Requirements for Aircraft Fleet

Aircraft	MTOW (lbs.)*	Required RWY Length (ft.)	Percent MTOW* at 6,701 feet	Payload plus OEW** at 6,701 feet (lbs.)
Boeing 737-700***	154,500	5,300	100%	154,500
Boeing 737-800	174,200	7,700	95%	166,000
Boeing 737-900***	174,200	9,200	89%	155,000
Boeing 737-900ER	187,700	9,800	87%	164,000
Airbus A319	154,323	7,400	96%	160,000

* MTOW = Maximum Takeoff Weight
** OEW = Operating Empty Weight
*** with winglets

Environmental Considerations: All of the alternative actions that have been identified to meet the RSA standard will require construction activity and therefore consideration of the environmental impacts of construction or land disturbance activities will be needed. The level of environmental analysis required will be determined by the FAA prior to any construction activity.

Constructability: This category explores the ability of the runway to remain open and usable during implementation and construction activities. As a single-runway commercial service airport with marginal runway length, any runway closure or extended reduction of available length due to construction will impact the airlines, passenger base, and airport revenue stream. In the competitive environment in which BLI operates, this will cause long-term degradation to the Airport's commercial airline market and significant regional economic losses.

Community Impacts: Some alternatives being discussed would alter the runway's proximity and relationship with the community in terms of intensifying or shifting operations over new areas. This has been considered in the analysis where applicable.

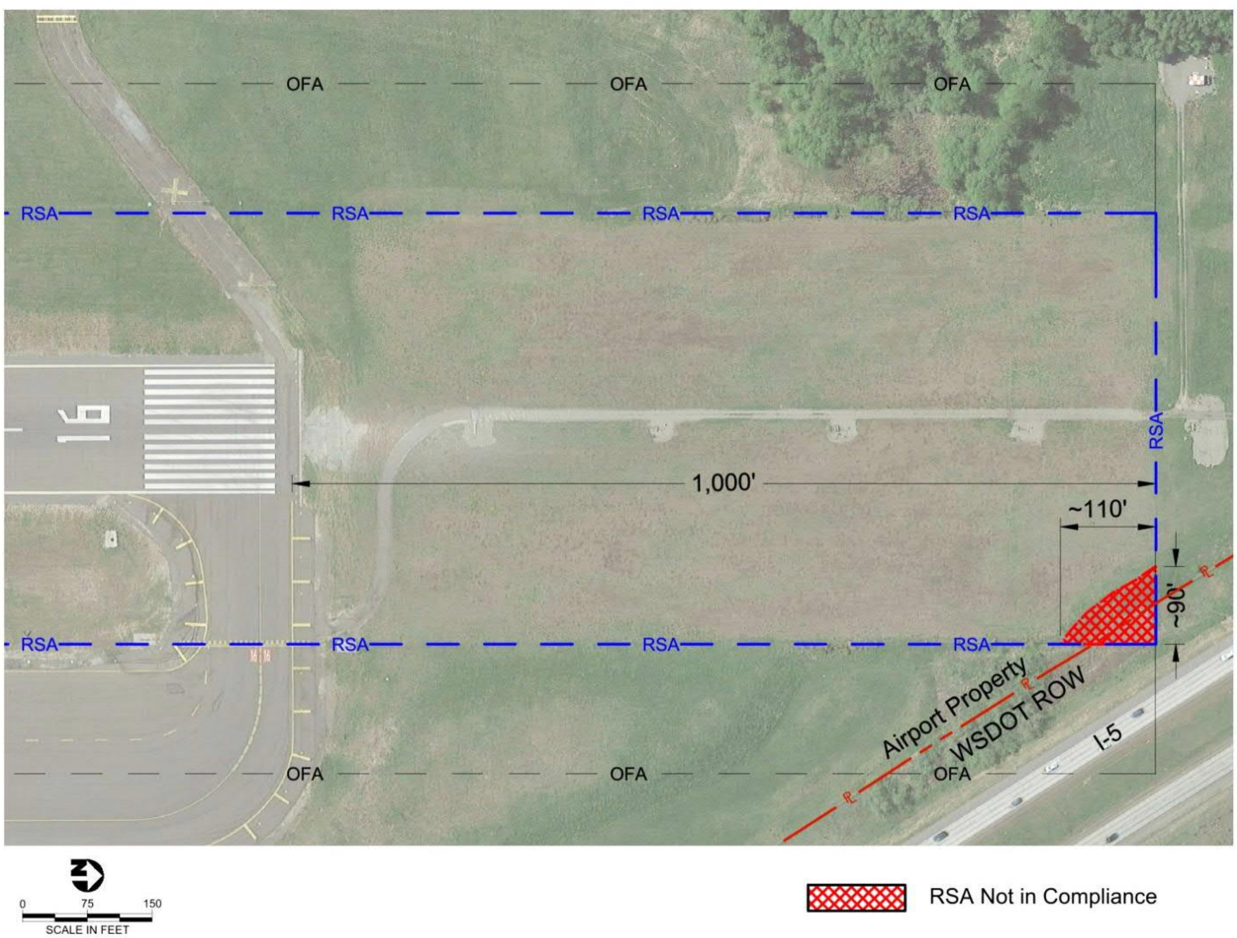
Cost/Financial Implications: Each of the identified alternatives involves some level of construction activity. This category estimates the cost of the construction. Cost estimates were developed using planning level data and recent construction costs in Whatcom County where applicable.

Additional financial impacts will result from any alternative that causes runway closure or limits activity during construction. The most immediate impact will be in the reduction of Operating Revenues in the form of parking revenues, landing fees, concession revenue shares and Passenger Facility Charges (PFCs) collected, but impacts will also be felt throughout the region resulting in reduced spending on hotels, rental cars, and other amenities due to service interruptions. Such an extensive runway closure will likely result in commercial schedule airline attrition resulting in an estimated annual revenue loss of $6.1 million and 400 full-time jobs.

6.6.1 RSA Alternative 1: Do Nothing (Administrative Solution)

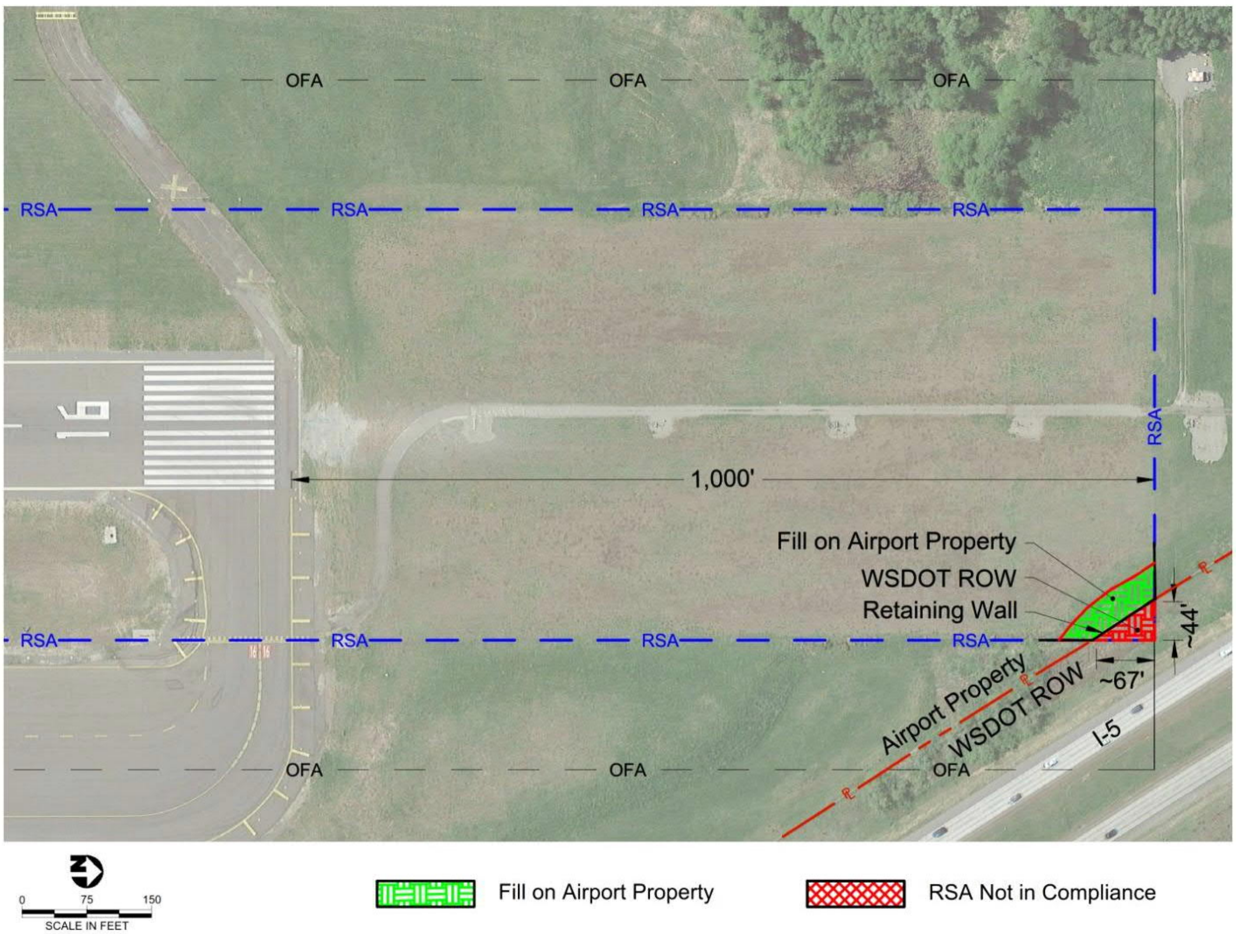
This alternative represents the do-nothing case. The basic assumption in this alternative is that the FAA will grant a Modification to Standard (MOS) that allows the RSA to remain sub-standard while maintaining full use of the runway. Two variations of this administrative solution were identified. The first, shown in Figure 6-7, does nothing to change the RSA compliance issue.

Figure 6-7: RSA Alternative 1 – Administrative Solution



The second, depicted in Figure 6-8 explores the option of maximizing the RSA on Port property to the degree possible. This alternative includes the construction of a retaining wall to provide the grading requirement for the RSA but approximately 1,700 sf of the RSA will still remain out of compliance.

Figure 6-8: RSA Alternative 1(a) – Administrative Solution with Maximized RSA on-site



Conclusion

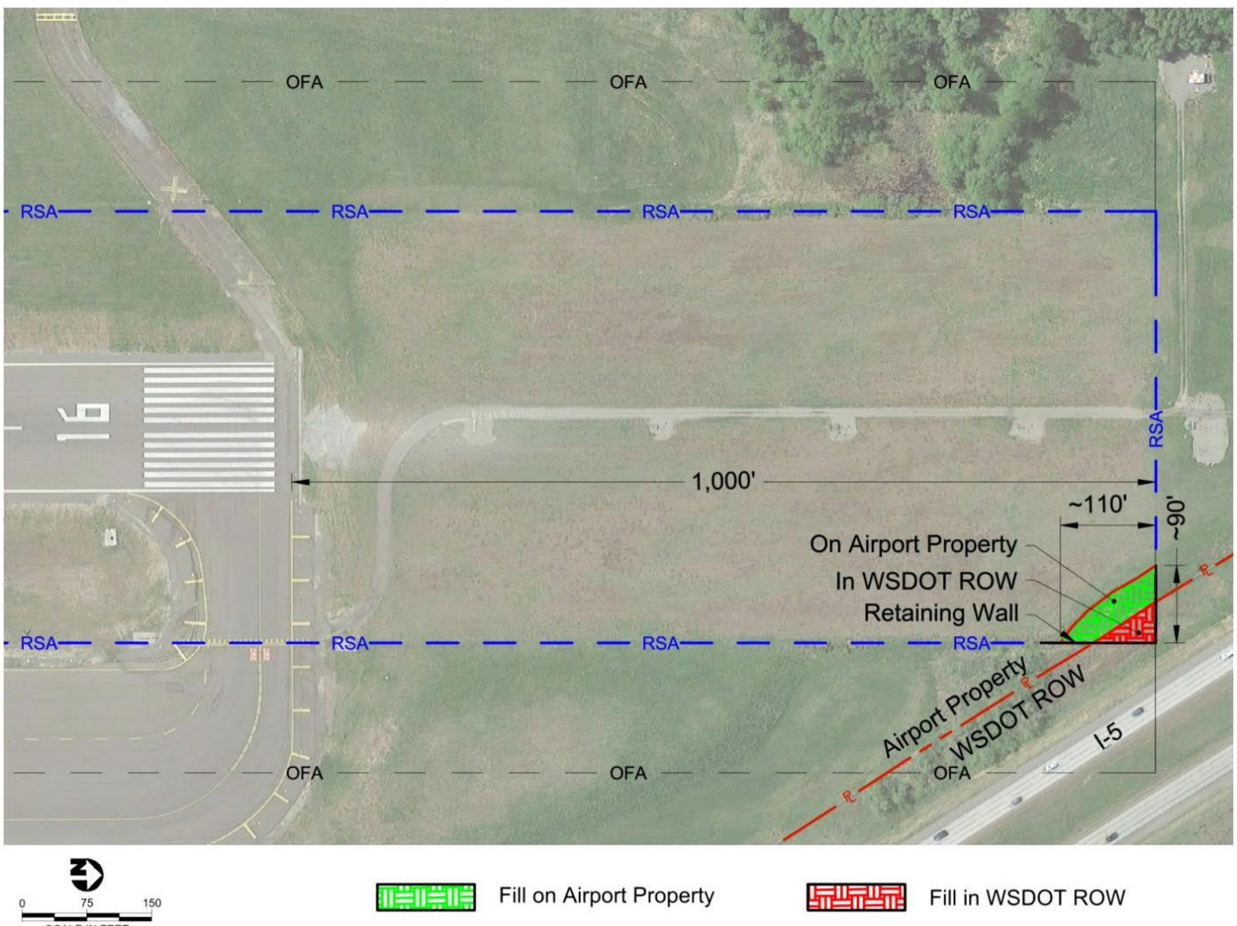
These alternatives are included to establish the base case for other alternatives. However, since they do not meet the essential FAA safety and design criteria they are considered to not be practicable solutions and further analysis is unnecessary.

6.6.2 RSA Alternative 2: Extend RSA into Interstate 5 Right-of-Way (ROW)

This alternative would achieve compliance by extending the RSA onto a small portion of land currently set aside as ROW for Interstate 5. Implementing this alternative will require close coordination with both the Federal Highway Administration (FHWA) and the Washington State Department of Transportation (WSDOT) who control access to the property.

Two variants of this alternative have been included. The first, Alternative 2, shows the RSA being constructed in a conventional manner within the property designated as Interstate 5 ROW. Figure 6-9 shows this. As depicted the project involves using approximately 1,700 sf of land from the ROW to construct a retaining wall and provide for the RSA.

Figure 6-9: RSA Alternative 2 – Extend RSA into WSDOT/FHWA Right-of-Way



Meet FAA Standards

The alternative would provide full compliance for the RSA.

Meet Airport/Aircraft Operational Needs

Since this alternative brings the RSA into full compliance, there are no negative impacts on long term operations at BLI.

Environmental Factors

Since there is construction activity involved in this project some level of environmental analyses, likely an Environmental Assessment in accordance with NEPA will be needed. The actual level of analysis will be determined in consultation with FAA prior to design and construction.

Constructability

This alternative will involve construction of a retaining wall and regrading of the RSA. Retaining wall construction will have no impact on operations but regrading activities will cause a need for a temporary threshold displacement (estimated at less than 150 feet). Additionally, temporarily displacing the threshold will impact the instrument approach procedure for the duration of construction, potentially limiting service during marginal weather conditions.

This will limit flexibility for the airlines but activity will be able to continue throughout construction with minimal impacts. Construction activity would likely be 60 days. The operational impacts may be avoided if the work is done in conjunction with nighttime closures between 0030 and 0530 hrs. In this case the disruption to service would be minimized but the cost of construction would be higher.

Finally, construction within the ROW will require that special construction conditions be applied to the project site and close coordination with WSDOT will be needed. This adds to the cost of construction.

Cost/Financial Implications

The cost of the alternative has been estimated to be approximately $916,400.

Other Considerations

Both FHWA and WSDOT have expressed concerns with Alternative 2; specifically, that construction of a retaining wall could limit the ability to expand/widen the interstate in the future. In addition, FHWA is concerned that the construction of a retaining wall as proposed x creates a roadside hazard that does not exist today.

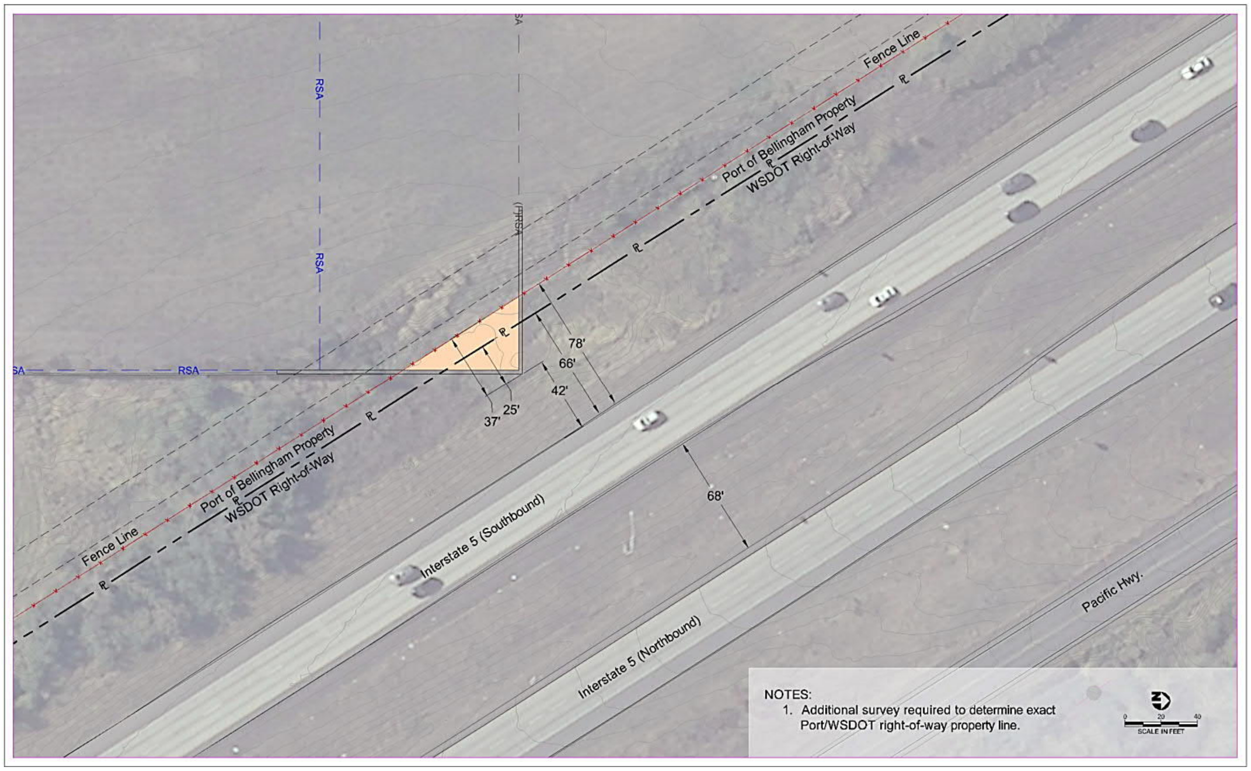
FHWA also notes that in the future if expansion/widening of I-5 is needed, the retaining wall could preclude widening of the southbound lanes to the outside (towards the ROW line) and direct the expansion/widening efforts onto the median area between the northbound and southbound lanes.

Figure 6-10 provides a closer view at the relationship between an improved RSA and the existing I-5 corridor. As shown, the current distance between the airport property and the fog line on the innermost southbound lane measures approximately 95 feet. With the extended RSA this distance is reduced to approximately 50 feet. Based on WSDOT standards, this distance is sufficient to allow for an additional inboard lane while maintaining a 38-foot buffer. Two additional lanes would reduce the setback line to 26 feet.

However, with a median strip of 80 feet, any expansion could be done within this area without impacting the setback distances.

It is noted however that the 1973 Quit Claim Deed wherein the Port of Bellingham transferred land from Port ownership to WSDOT for Interstate 5 included a provision that the use of the transferred property would not interfere with landing or taking off of aircraft at the Bellingham International Airport, or otherwise constitute an airport hazard.

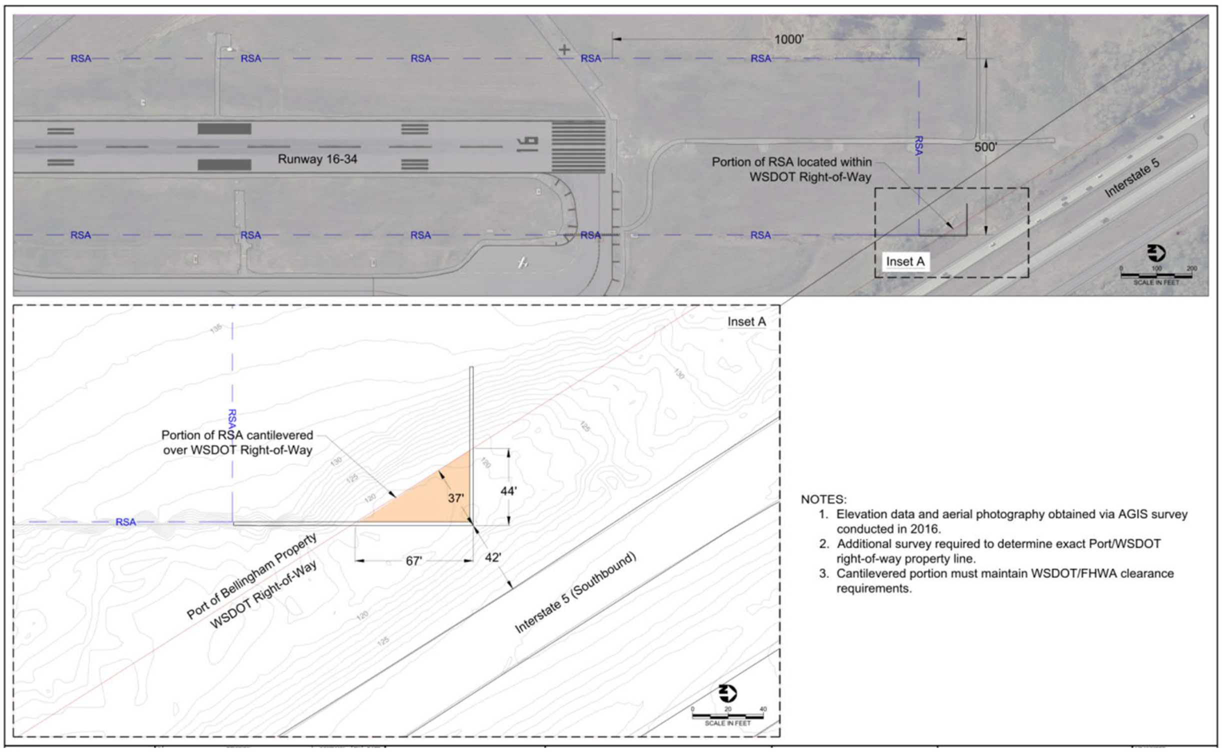
Figure 6-10: I-5 Right-of-Way Relative to Runway 16 RSA



6.6.3 RSA Alternative 2(a): Extend RSA into Interstate 5 ROW using a cantilevered structure

This alternative would extend the RSA into the I-5 Right-of Way but the RSA would be built on a structure cantilevered and "floating" over the ROW to minimize impacts to I-5. Implementing this alternative would require close coordination with both the Federal Highway Administration (FHWA) and the Washington State Department of Transportation (WSDOT) who control the ROW. Figure 6-11 shows the details of this alternative.

Figure 6-11: RSA Alternative 2(a) – Extend RSA into WSDOT/FHWA Right-of-Way Using a Cantilevered Structure



Meet FAA Standards

The alternative would provide full compliance of the RSA.

Meet Airport/Aircraft Operational Needs

Since this alternative brings the RSA into full compliance, there will be no negative impact on long term operations at BLI.

Environmental Factors

Since there is construction activity involved in this project some level of environmental analyses will be needed. The level of analysis is to be determined in coordination with FAA prior to design and construction activity.

Constructability

The structure would need to be designed to handle the load of the critical aircraft at MTOW. It also requires construction within the existing RSA as well as within the I-5 ROW. In addition, the structure will need to be constructed to permit at least 17 feet of clearance above the highway south-bound lane "clear zone" though at no time will it span above an additional expanded lane, requiring extensive regrading within the RSA. This will cause a temporary threshold displacement (estimated at 1,000 feet) throughout construction. The construction is anticipated to take 150 days.

This displacement will limit the available runway length to less than 5,701 ft. for 150 days thereby severely limiting flexibility for the airlines and cause service disruptions and flight cancellations. The temporary threshold relocation will also negatively impact the instrument approach procedure for all flights through the duration of construction, limiting poor weather access to the airport.

Construction within the I-5 ROW will require that special conditions are applied to the project site and will require close coordination with WSDOT. This will add cost to the project.

Cost/Financial Implications

The cost of the alternative has been estimated to be approximately $5,500,000.

Additional Financial impact would result from the loss of commercial flights during the construction period and the possible loss of commercial air-service airlines would result in job losses and lost revenue of $3 million.

Other Considerations

A cantilevered structure over the I-5 right-of-way would address FHWA and WSDOT's concerns with encroachment of the RSA onto the I-5 ROW for future expansion. The most important aspect of this alternative is that the structure be developed so that there was at least 17 feet of clearance above the future roadway elevation so as to not limit future expansion/widening of I-5.

6.6.4 RSA Alternative 3: Use Declared Distances

Alternative 3 would achieve RSA compliance by displacing the threshold to Runway 16 by 110 feet and employing the concept of declared distances. Declared distances are defined as those that are available and suitable for satisfying an airplane's take-off distance, accelerated-stop distance, and landing distance requirements. The declared distances include:

- 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.

While using declared distances would enable the Port to comply with FAA standards, it would also result in a permanently shortened single runway available for aircraft take-off and landing operations depending on runway use.

Two methods for applying declared distances have been studied. The first assumes that the threshold displacement alone will be used to achieve compliance. This alternative is shown in Figure 6-12 and results in a displaced threshold on Runway 16 of approximately 110 feet.

The sub alternative – 3(a) – assumes that the Port will maximize the RSA within their property line by constructing a retaining wall and extending the RSA into the newly gradable area. This will reduce the required displacement to 67 feet. This is shown in Figure 6-13.

Figure 6-12: RSA Alternative 3 – Use Declared Distances – Without a Maximized RSA

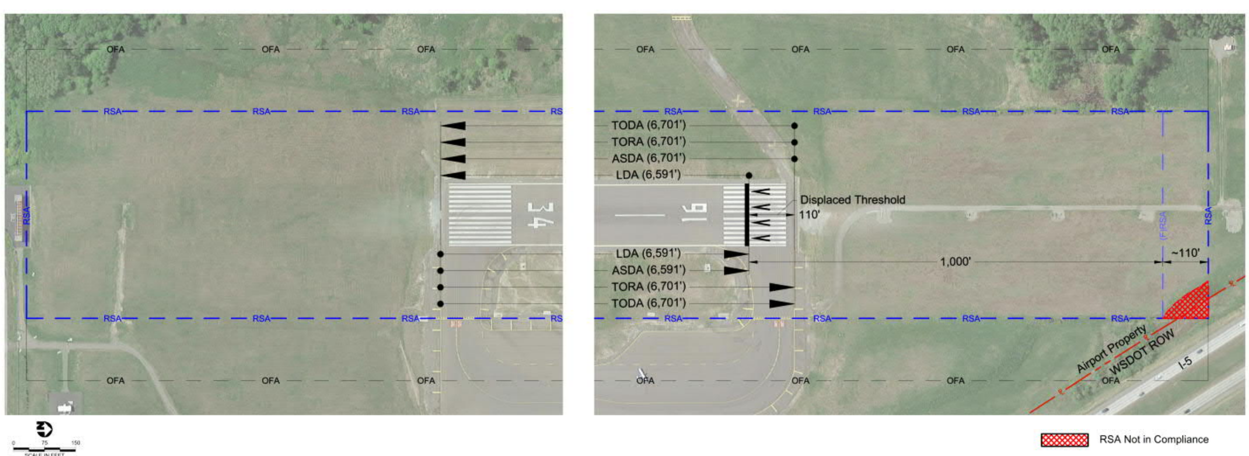
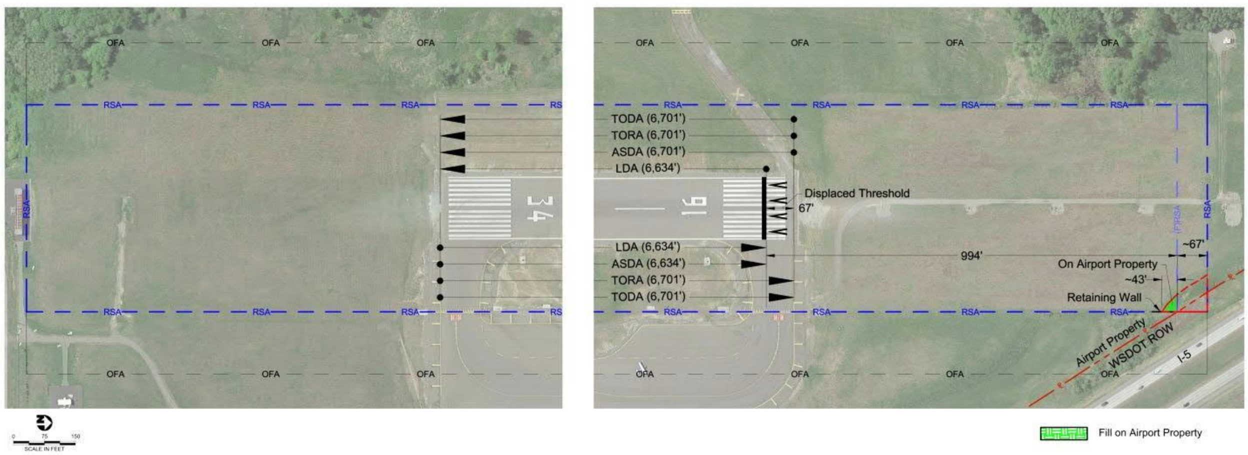


Figure 6-13: RSA Alternative 3(a) – Use Declared Distances – With a Maximized RSA



Meet FAA Standards

Either alternative would meet full compliance of the RSA.

Meet Airport/Aircraft Operational Needs

Both alternatives will result in a permanent reduction of the available runway length to less than 6,701 feet in certain situations. The available lengths, using declared distances, have been calculated as shown in the following table.

Table 6–5: Declared Distance Calculations

	Alternative 3		Alternative 3(a)	
	Takeoffs on Runway 34	Takeoffs on Runway 16	Takeoffs on Runway 34	Takeoffs on Runway 16
Runway Length	6,701	6701	6,701	6,701
TODA	6,701	6701	6,701	6,701
TORA	6,701	6701	6,701	6,701
ASDA	6,591	6701	6,634	6,701
LDA	6,591	6591	6,634	6,634

All distances cited are estimated. Exact displacement to be determined.

Reducing the available runway length permanently reduces safety margins and operational flexibility and the airport's ability to maintain service levels. The reduced length also makes it difficult to attract new airlines or for current airlines to add additional routes. This could lead to airlines deciding to reduce or eliminate service altogether at BLI. Alternately flights would need to have additional restrictions placed on them which would limit passenger capacity and therefore airline profitability or reduced fuel loading which range/weight limits the markets that can be served.

Environmental Factors

Since there is no construction activity involved in Alternative 3, no environmental analysis will likely be required. Alternative 3(a) includes construction of a new retaining wall or other soils retention solution and regrading of a portion of the existing RSA so some level of environmental analyses will be needed. The level of analysis is to be determined in consultation with FAA prior to design and construction activities.

Constructability

Alternative 3 involves no construction activity beyond remarking the runway threshold. Alternative 3(a) will involve construction of a retaining wall and regrading of the RSA to meet FAA standards. Retaining wall construction will have minimal impact on operations but regrading activities within the RSA will cause a need for a temporary threshold displacement (estimated at less than 150 feet). Duration of this activity is likely to be 30 days. This will limit flexibility for the airlines during the construction activities. Construction could be limited to night hours outside the commercial flight schedule (12:30 am through 5:00 am). In this case the disruption to service would be minimized but the cost of construction will be higher.

Cost/Financial Implications

The cost of Alternative 3 is minimal, limited to the cost of new precision runway pavement marking and striping and recalibration of the ILS equipment. It is estimated that this would be approximately $400,000 with the local share equaling $40,000.

Alternative 3(a) has retaining wall construction and the estimated cost would be $788,000 with the local share being $78,800.

6.6.5 RSA Alternative 4: Relocate the Threshold on Runway 16 and Reclaim the length on Runway 34

This examines the possibility of relocating the Runway 16 threshold in order to achieve RSA compliance but replacing the lost length on the 34 end to maintain existing length. Two sub-alternatives are identified.

Alternative 4 shows the alternative without making any improvements to the current RSA and 4(a) shows that all efforts have been made to maximize the RSA on Runway 16 before replacing pavements on Runway 34.

Figure 6-14: RSA Alternative 4 – Relocate Threshold on RW 16 and Replace on RW 34 without Graded RSA

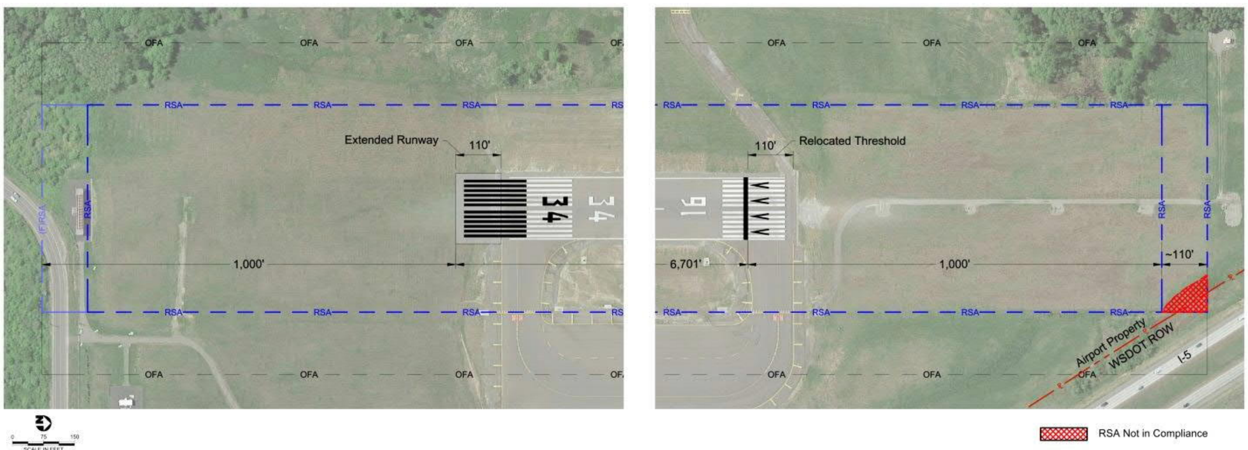
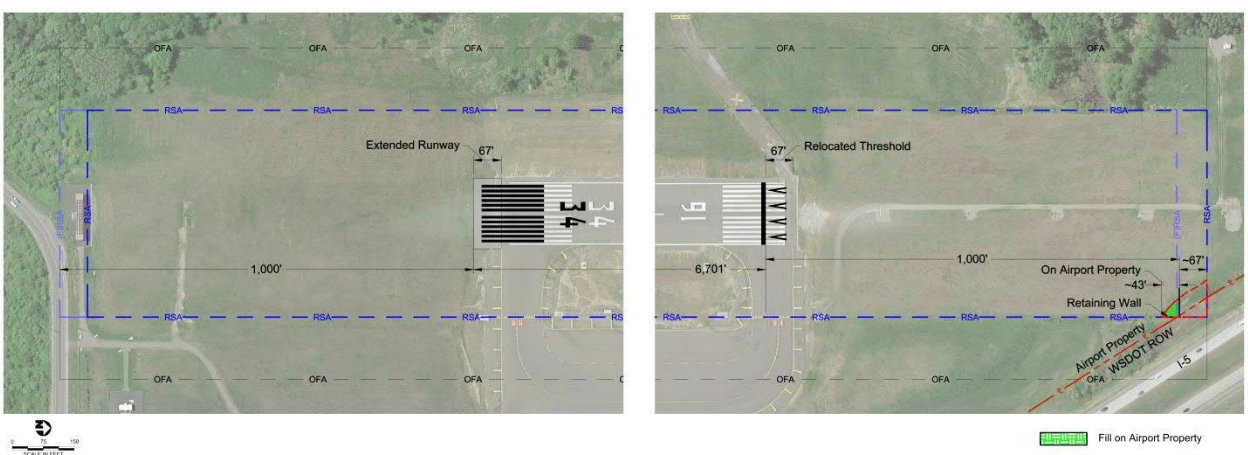


Figure 6-15: RSA Alternative 4(a) – Relocate Threshold on RW 16 and Replace on RW 34 with Graded RSA



Meet FAA Standards

Either alternative would provide full compliance of the RSA.

Meet Airport/Aircraft Operational Needs

Both alternatives maintain the current available runway length and therefore would have no long-term impacts on airport operations.

Environmental Factors

Either of these alternatives will involve extending the Runway 34 RSA further to the south into an environmentally sensitive area (Conservation Area B), relocation of Alderwood Road, the ILS localizer and displacement of wetlands. The alternative would also move the end of the runway closer to the residents on the south end of the airport.

It is assumed that in-depth environmental analyses, likely a lengthy Environmental Impact Statement (EIS) and public approval process would need to be conducted before either alternative could be implemented. The exact nature of the analyses would need to be determined in coordination with FAA.

Constructability

Several issues with constructability exist. First is that the implementation of either of these will involve extensive construction activities to occur within the RSA for Runway 34, creating the need to shorten available runway length during construction. This construction is likely to last for 150 days. Such an extensive closure will likely result in commercial schedule airline attrition resulting in an estimated annual revenue loss of $6.1 million and 400 full-time jobs.

Other issues related to constructability include the need to abandon or relocate Alderwood Avenue and extensive earthwork involving the filling and displacement of the wetlands south of Alderwood Avenue.

Cost/Financial Implications

The cost of alternative 4 is estimated to be $4,600,000 with the local share equaling $460,000.

Alternative 4(a)'s cost is estimated to be $6,000,000 with the local share equaling $600,000.

6.6.6 RSA Alternative 5: Relocate the Runway

Alternative 5 has been developed to explore the possibility of achieving RSA compliance by relocating the runway itself. Two variations have been developed for this alternative.

Alternative 5(a) would relocate the runway a distance of 800 feet to the north and construction of new taxiways. This distance is sufficient to allow construction activities to occur with no operational impacts on the existing runway. Figure 6-16 shows this alternative layout.

Alternative 5(b) proposes shifting the runway orientation so the RSA for Runway 16 falls entirely within existing Port property. Figure 6-17 shows this alternative layout.

Figure 6-16: RSA Alternative 5(a): Relocate the Runway

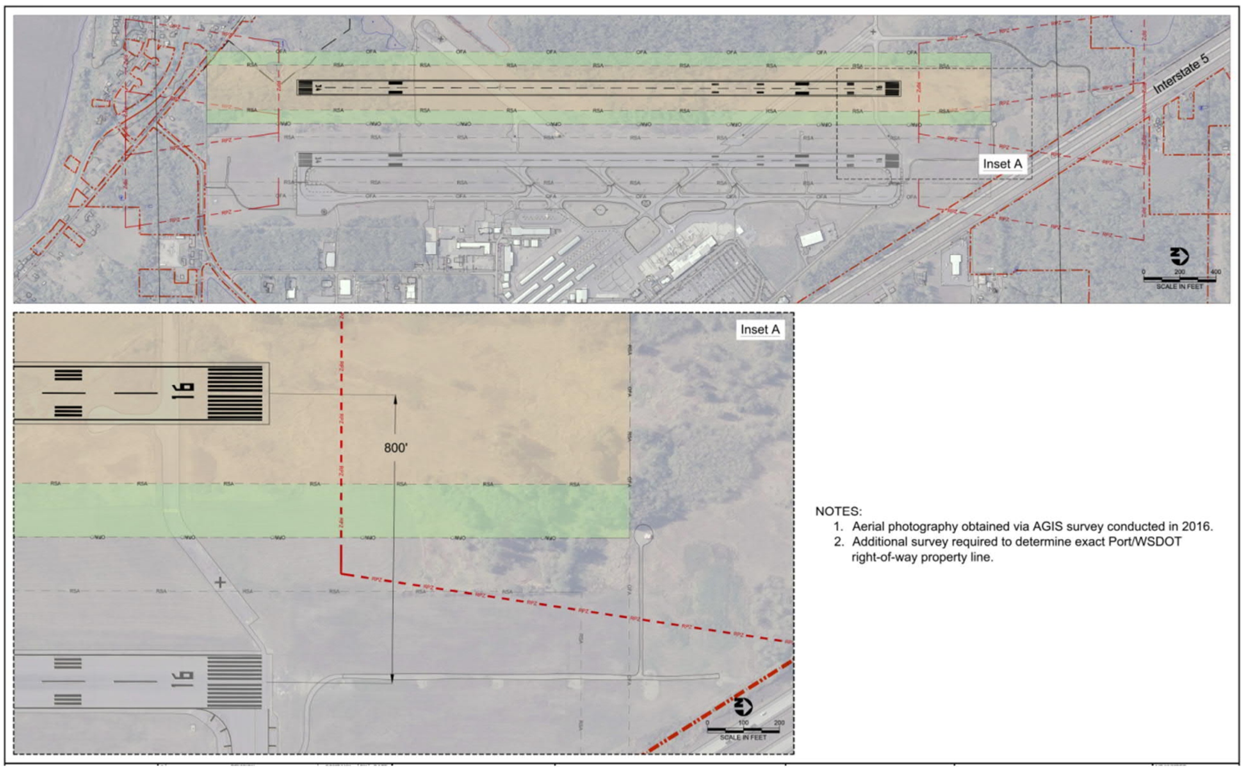
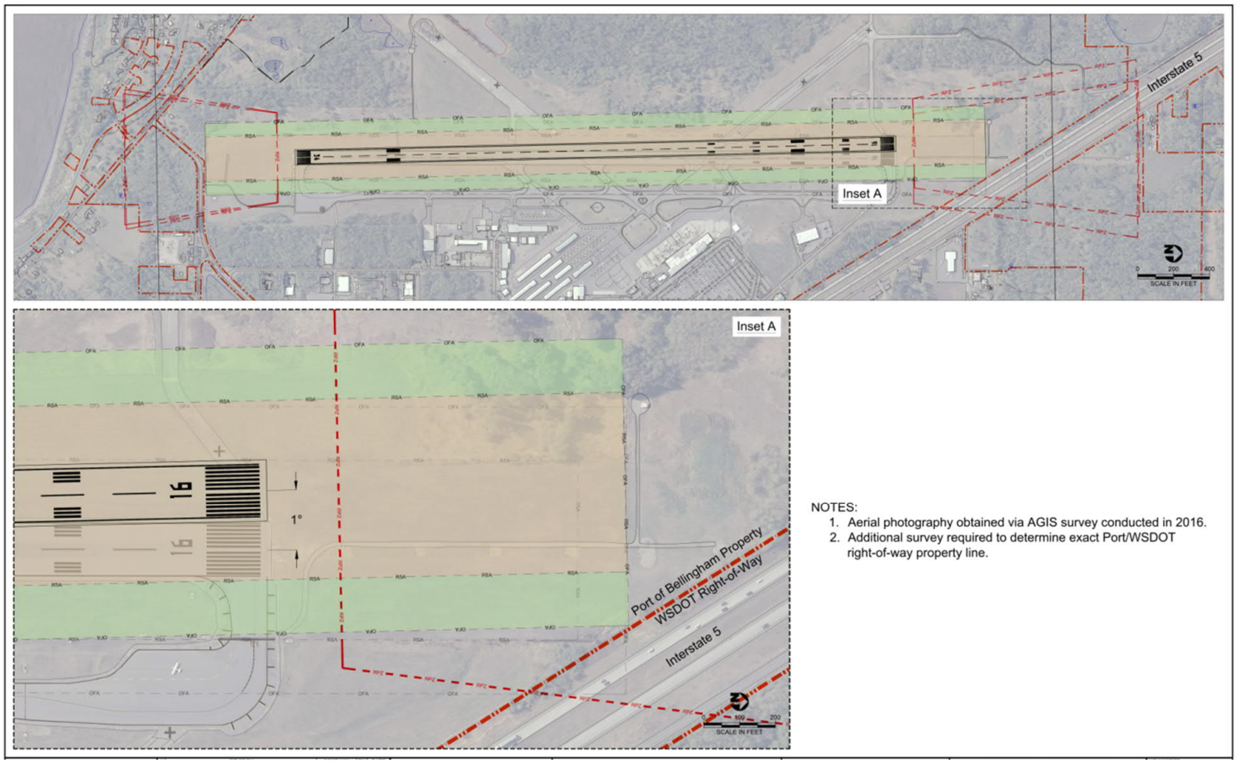


Figure 6-17: RSA Alternative 5(b): Reorient the Runway



Meet FAA Standards

Although either alternative would eventually provide full compliance of the RSA on both runway ends, neither would be in place in a timely enough manner to satisfy the FAA mandate for full RSA compliance on all operational runways. It is estimated that implementation of either alternative would be a decade long process to achieve environmental approval, mitigate environmental impacts, design and construct the new runway. In the interim, the RSA compliance issue for Runway 16 would need to be addressed to allow for continued operations at BLI.

Meet Airport/Aircraft Operational Needs

Both alternatives maintain the current available runway length and therefore would have no long-term impacts on airport operations.

Environmental Factors

Detailed environmental analyses likely an Environmental Impact Statement (EIS) would be required before either of these alternatives could be adopted for RSA compliance. Alternative 5(a) would also move the runway closer to residents on the west side of the airport.

Constructability

Alternative 5(a) could be constructed with minimal impact to current operations as the runway separation of 800 feet would allow construction efforts to occur.

Alternative 5(b) would require runway closure for the duration of the construction.

Cost/Financial Implications

Rough costs for the construction of the new runway would be $91,000,000 while canting the runway would cost $84,000,000.

Conclusion

These alternatives do not meet the goal of bringing the current RSA into compliance. Adoption of either would delay compliance for at least 10 years. In the meantime, the current RSA would need to be improved to allow for continued operation. Therefore, neither of these can be considered to be a cost or operationally feasible alternative ways to meet the need.

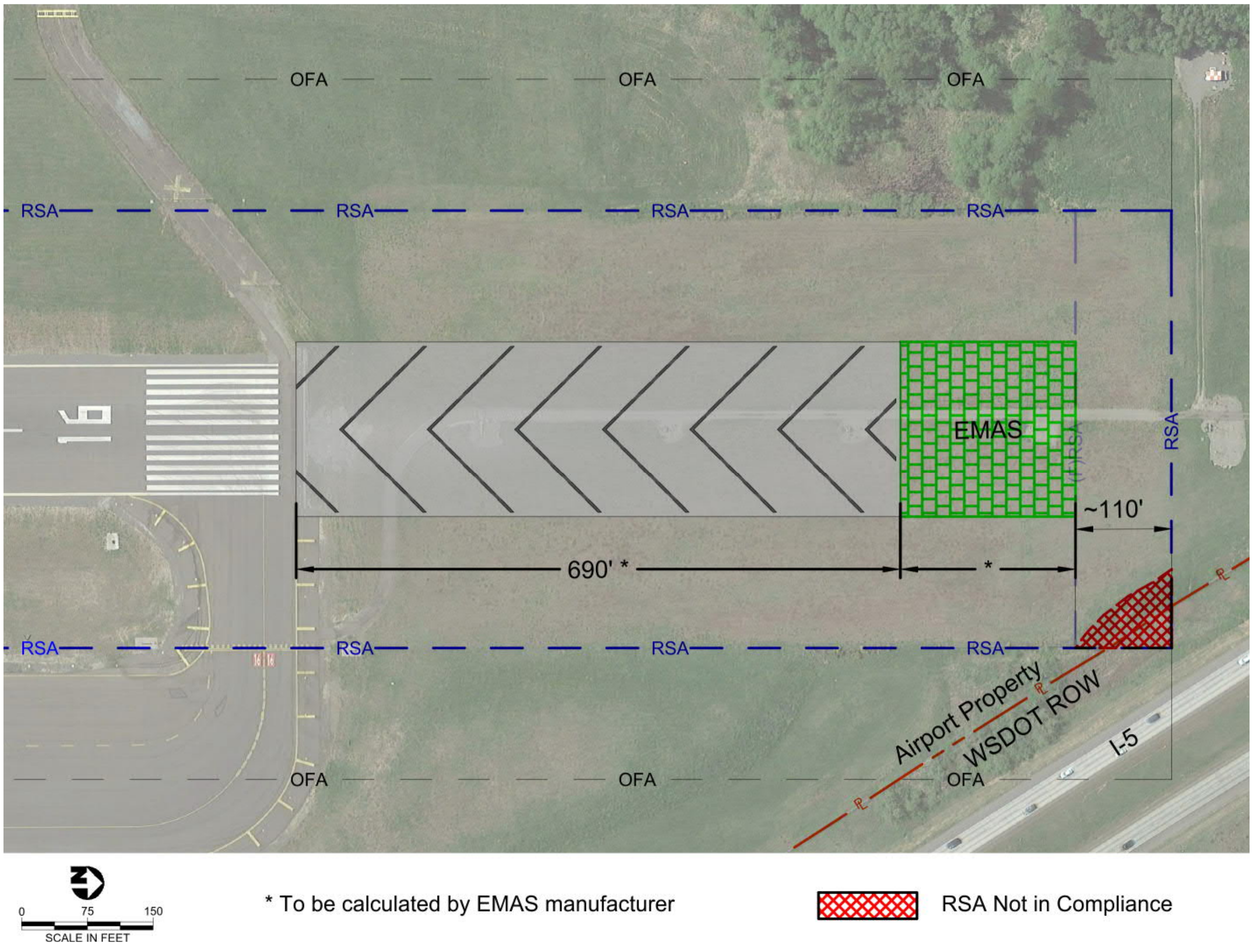
6.6.7 RSA Alternative 6: Use Engineered Materials

This alternative focuses on the use of engineered materials to stop the movement an aircraft in lieu of a runway safety area within a limited parcel of land. Engineered materials are defined in FAA Advisory Circular No 150/5220-22B as "high energy absorbing materials of selected strength, which will reliably and predictably crush under the weight of an aircraft". While the current technology involves lightweight, crushable concrete blocks, any material that has been approved to meet the FAA Advisory Circular can be used for an EMAS. The purpose of an EMAS is to stop an aircraft overrun with no human injury and minimal aircraft damage. The aircraft is slowed by the loss of energy required to crush the EMAS material. An EMAS is similar in concept to the runaway truck ramp made of gravel or sand. It is intended to stop an aircraft that has overshot a runway when there is an insufficient free space for a standard runway safety area (RSA). However, EMAS is not intended to provide an equivalent level of safety to a compliant RSA.

Figure 6-18 shows the area where an EMAS installation could be used to provide RSA compliance. As shown, to achieve the benefits of the EMAS as well as to provide for the RSA needs of approaching aircraft, the EMAS installation will need to be positioned at least 600 feet from the runway threshold. These 600 feet will need to be paved, although not at full strength (pavement strength similar to a blast pad). The addition of the paved overrun will require reinstallation of the innermost lighting fixtures associated with the ILS and the calibration and recertification of the Instrument Approach.

Actual dimensions of the EMAS bed and paved overrun area will be determined prior to construction.

Figure 6-18: RSA Alternative 6 – Use Engineered Materials (EMAS)



Meet FAA Standards

The EMAS installation will provide full RSA compliance.

Meet Airport/Aircraft Operational Needs

Long term, the EMAS bed may impact operations at the airport. If the bed is used for any reason by any aircraft, then the RSA would become non-compliant and the runway would need to be shut down until the EMAS bed can be repaired. This could lead to significant operations costs to the Airport, airlines, and all other users of the Airport.

Environmental Factors

Construction of the EMAS bed would require environmental approvals. The nature of the analyses to be conducted would need to be determined in consultation with FAA prior to design and construction activities.

Constructability

To provide the EMAS an extended paved area would need to be added between the current runway threshold and the EMAS installation. Therefore, construction would require a temporary displacement of the threshold by 1,000 feet during paving and grading activities. This will result in an available runway length of 5,701 feet for the 90-day construction period which would severely limit commercial operations and cause flight cancellations.

Cost/Financial Implications

The cost of this option is estimated to be $6,500,000 to include the paving, relocation and reinstallation of the 5 innermost light bars of the Approach Lighting System (ALS), construction of the EMAS Bed and regrading the RSA. In addition, longer term maintenance and replacement of the engineered materials will be required and this is costly. Given that BLI is a mixed use airport with more than 55,000 annual general aviation operations the chance of EMAS damage from overruns increases and is not ideal for a single use airport. EMAS is not an operational or cost feasible alternative.

6.6.8 Summary of RSA Evaluation and Recommended Alternatives

The following summarizes the results of the analysis of alternatives for the RSA at BLI. Details of the analysis are contained in the discussion following this summary.

RSA Alternative 1: Do Nothing (Administrative Solution) - Rejected as it does not result in RSA compliance.

RSA Alternative 1(a): Do Nothing (Administrative Solution) with maximized RSA - Rejected as it does not result in RSA compliance.

RSA Alternative 2: Extend into the I-5 Right of Way - Provides full RSA coverage without reducing the available runway length or interfering with potential widening of I-5. The community impacts would be minimal and the construction cost of $916,000 is reasonable with the Port's share ($92,000) seen as affordable. The overall impact on the airlines and airport operations would be minimal.

RSA Alternative 2(a): Extend into the I-5 Right of Way with a Cantilevered Structure - This alternative would provide full RSA coverage without long term impacts on operations. In the short term, the construction activities would limit use of the runway to less than 5,701 feet throughout the duration of construction (approximately 150 days). This reduced length would cause cessation of commercial airline flights at BLI. Beyond the reduced service impacts, the community impacts would be minimal since the runway thresholds would remain where they are today.

The cost of constructing the cantilevered structure is estimated to be $5,500,000, which will require an investment of Port funds equal to 10% of the total. The operations impact from construction and the financial impact of the Port’s required share of the project are not acceptable or feasible.

RSA Alternative 3: Use Declared Distances - Two different methods of applying the declared distance tables were examined but both result in a permanent reduction of available runway length at BLI. This reduces the already marginal runway length, further reducing margins of operational safety and limiting operational flexibility.

RSA Alternative 4: Relocate Threshold on RW16 and Replace on 34 End - This alternative involves shifting the runway to the south in order to maintain the available runway length while bringing the RSA into compliance by relocating the Runway 16 threshold. This action will require detailed environmental analysis as it will extend the Runway 34 threshold and require construction activity in an environmentally sensitive conservation easement area located in the current RSA and wetlands south of Alderwood Avenue. Also, moving the Runway 34 threshold would move the threshold closer to the residents to the south.

This alternative requires considerable construction activity to take place as the Runway 34 RSA has to move with the threshold and this requires closure or relocation of Alderwood Avenue, the relocation of ILS equipment, and considerable work due to the topography of the site. These construction activities will reduce the available runway length for a period of 3 to 4 months, constraining or cancelling commercial airline activity.

The cost of the alternative is estimated at $4.6 Million for the relocation with a maximized RSA on Runway 16 to $6.0 Million for the longer extension resulting from not constructing a retaining wall on the 16 end. This alternative is not recommended for this reason.

RSA Alternative 5: Relocate the Runway - Two alternatives were examined under this alternative but both are rejected because the amount of time required to implement either would exceed 10 years. During the interim period, the current RSA would need to be brought into compliance. Therefore, neither of these was seen as practical or even feasible from a cost and constructability for maintenance of operations standpoint.

RSA Alternative 6: Engineered Solution (EMAS) - Gaining RSA compliance using engineered materials. The use of these materials allows for the airport to operate safely. However, maintenance and replacement of the materials is required and costly. Furthermore, EMAS does not provide the same level of operational safety provided and afforded by RSA meeting design standards.

Table 6–6: Summary of RSA Recommendations

	RSA Alternative	Meets FAA Standard	Meets Airline Operational Needs	Environmental	Community Reaction	Constructability/ MOT	Estimated Cost
1	Do Nothing (Administrative Solution)	FAA must comply with the congressional mandate. This option is not practicable					
1(a)	Do Nothing (Administrative Solution) with maximized RSA	FAA must comply with the congressional mandate. This option is not practicable					
2	Extend onto FHWA/WSDOT ROW	Yes	Yes	Requires limited Environmental Analysis (EA)	None	Construction activity would reduce available runway length to 6,300 ft. during site grading, which can be done at night.	$916K
2(a)	Extend onto FHWA/WSDOT ROW with cantilevered structure	Yes	No	Requires Environmental Analysis	None	Construction activity would reduce available runway length to 5,701 ft. for approximately 150 days. Closed for commercial flights during construction.	$5.5 Million
3	Use Declared Distances (without maximized RSA)	Yes	No - reduces available landing distance	None	None	Operational restrictions For 30 days w/o ILS	$400K
3(a)	Use Declared Distances (with maximized RSA)	Yes	No - reduces available landing distance	Requires Environmental Analysis	None	Operational restrictions for 30 days w/o ILS	$788K
4	Relocate and replace (without maximized RSA)	Yes	Yes	Requires Environmental Analysis	Likely intense community Interest	Operational restrictions for 90 days with available runway length to 6,000 ft. closed for commercial flights	$4.6 Million
4(a)	Relocate and replace (with maximized RSA)	Yes	Yes	Requires Environmental Analysis	Likely intense community Interest	Operational restrictions for 90 days with available runway length to 5,701 ft. closed for commercial flights	$6.0 Million
5(a)	Move Runway to the West	Planning, environmental, design and construction likely to be 10-year process. In the meantime the existing RSA will need to be addressed					
5(b)	Reorient the Runway	Planning, environmental, design and construction likely to be 10-year process. In the meantime the existing RSA will need to be addressed					
6	Engineered Solution	Yes	Yes	None	None	Operational restrictions for 45 days with available runway length to 5,701 ft. closed for commercial flights	$6.5 Million

6.7 Improve Exit Taxiway Layout

To maximize the capacity of the single runway, adequate exit taxiways need to be positioned to allow all aircraft to safely and efficiently vacate the runway upon landing. Taxiway design is guided by the Taxiway Design Group (TDG) of the critical aircraft, the B737-900 which is classified as TDG-4. Ideally, runway exits locations are determined based on what best serves the specific aircraft fleet operating at the airport. At BLI the operational fleet has been analyzed and exits should be spaced at distances that consider the needs of three distinct types of aircraft;

- Small GA aircraft with short landing length requirements.
- Turbo-prop (including the Q400 used by Alaska for commercial service) and small jet aircraft.
- The Boeing 737 and Airbus A319 aircraft that can exit without needing to proceed to the runway end.

At BLI, the taxiway system consists of right angle exits at each runway end and four angled exit taxiways. The location and angles of the existing exits are based on the existence of pavement that dated from the time when BLI had three active runways. However, right angle taxiways are the standard for all runway/taxiway intersections except when a need for high-speed exits is justified. In the case of BLI no justification for high-speed exits has been identified. Therefore, to improve the efficiency of the runway system the exits should be reconfigured. Only two alternatives were considered;

- Do-nothing – shown in Figure 6-19.
- Reposition the exit taxiways and construct 90 degree exits as shown in Figure 6-20.

Figure 6-19: Taxiway Layout Alternative 1 – Do Nothing

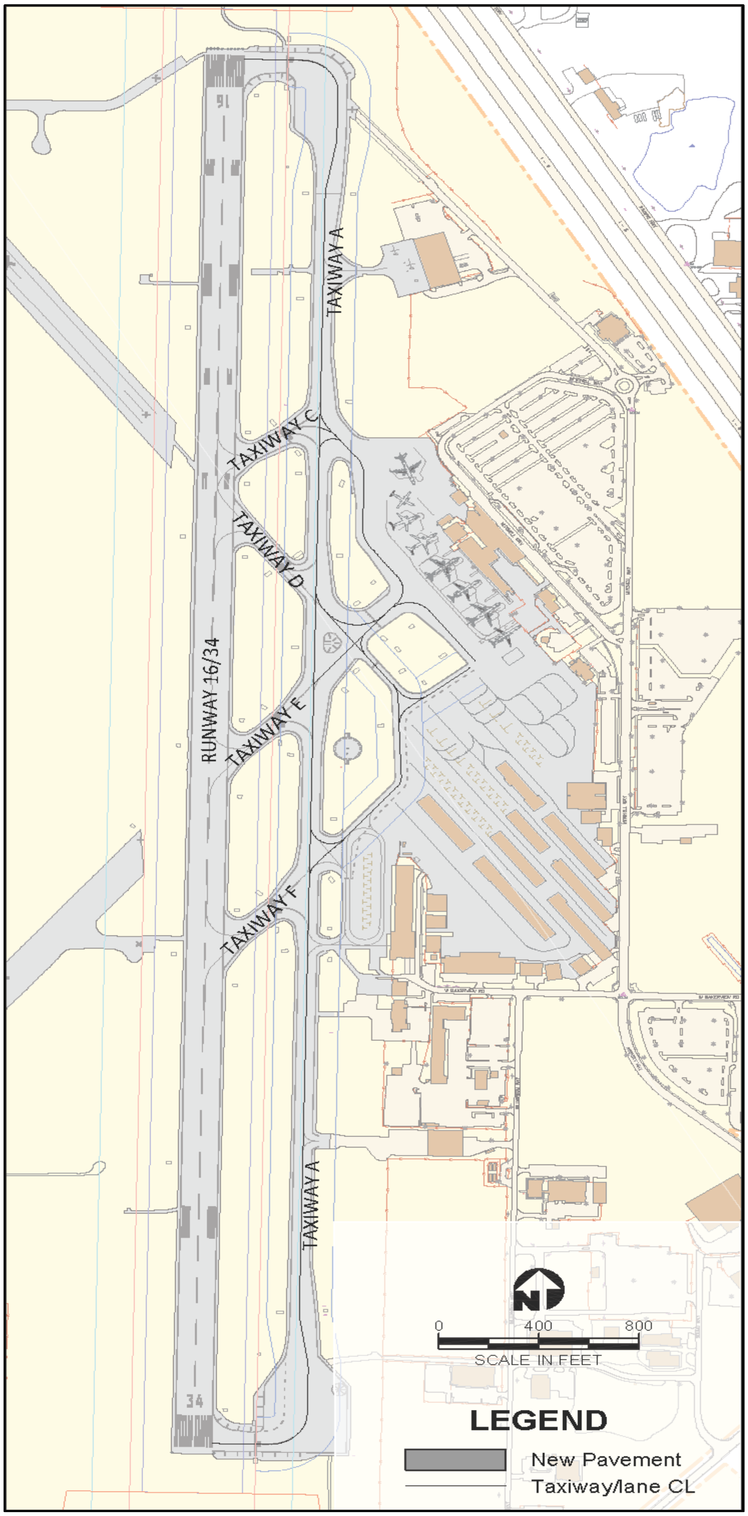
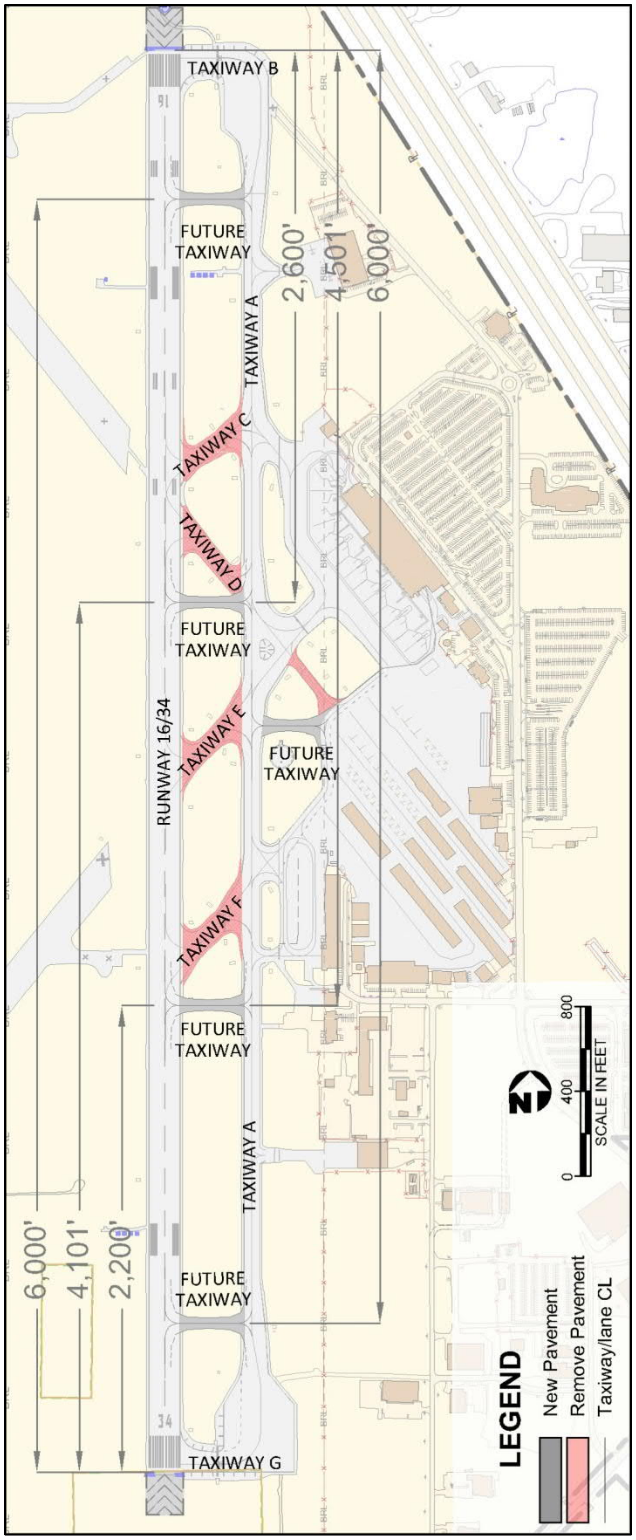


Figure 6-20: Taxiway Layout Alternative 2 - Reposition and Construct 90 Degree Exits



The decision on the ultimate layout of the taxiway system was based on these factors:

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

Adherence to FAA Criteria: The do nothing alternative maintains the current exit and connecting taxiway system as is. 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. However, the angled exits (C, D, E, and F) were not reconstructed at that time.

Alternative 2 suggests reconstruction of the exit taxiways in an optimal layout for operations in both directions using 90 degree exits. Under this alternative, the design criteria for TDG-4 aircraft is 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.

Operational Considerations: As previously stated, the current exit taxiway layout 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 closes the existing exit taxiways and constructs new ones at locations that are optimal for the aircraft fleet. Table 6–7 was prepared to show the cumulative percentage of the various aircraft classifications that will be able to use the new exits under both wet and dry conditions as calculated using the methodology from FAA AC 150/5300-13 using the aircraft classifications as follows.

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.
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 daily flights to and from Seattle.
D. Heavy aircraft weighing more than 300,000 pounds. All of the Boeing 737 aircraft, the A319 and A320 flights are in this category.

As the data 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.

Table 6–7: Exit Taxiway Use

Exit Taxiway	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%
Existing 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%
Existing 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%
Existing 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%
Existing B	6,701	100	100%	100%	97%

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: There is no construction cost associated with doing nothing but the inefficiencies in operations will cost operators.

Building the new exit taxiways is estimated to cost approximately $6.5 Million.

6.7.1 Taxiway Layout Recommendation

It is recommended that Alternative 2 be adopted as the parallel and exit taxiway layout for BLI. The layout meets the requirements of the existing and 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 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 RSAT recommendation to minimize congestion and confusing traffic paths in the apron area.

6.8 Navigation Aids

The Port acknowledges that the need for and location of certain Navigation Aids (Navaids) is solely determined by the appropriate FAA division responsible for Navaids. However, including them in the master plan serves as both documentation of continued interest to FAA for making them available at BLI but also considers relocating them to more appropriate sites to better use the available land for aviation-related development and increase and diversify airport revenue sources.

6.8.1 Airport Surveillance Radar (ASR)

As BLI traffic increases the possibility of delays and potential safety issues associated with congestion will need to be addressed at some point in the future (beyond 20 years). The way to improve on this capability is to add Airport Surveillance Radar (ASR) to the airport. 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. 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. The primary benefit of the ASR is the reduction of delays during IFR conditions and increased operational safety.

ASR Siting

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.

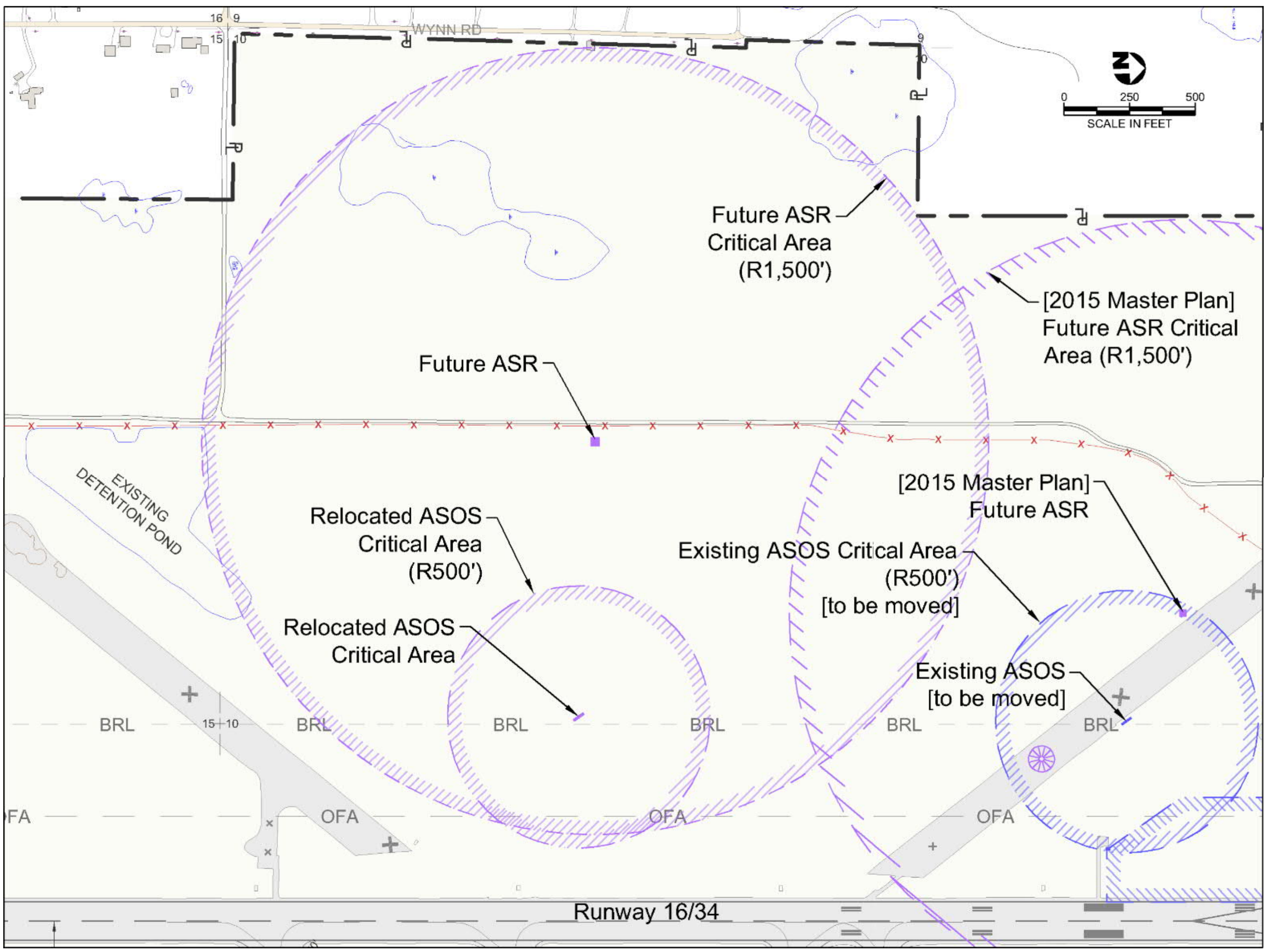
As stated previously, the final siting for the ASR will be determined by FAA, the recommendation in the 2015 master plan was to reserve space for the ASR located on the airport's west side, which is the only area where it can be positioned without interference from other facilities. The location designated has been re-considered since siting it here would consume property adjacent to the closed runway, which can be developable for revenue generation purposes. By moving this location to the south, the Port increases their ability to offer westside land for aviation related development. Figure 6-21 shows the reserved area for the ASR, as well as the location reserved in the 2015 master plan.

Automated Surface Observation System (ASOS)

The purpose of ASOS installations is to give real time information on cloud cover and ceiling visibility, wind speed and direction, temperature, dew point, precipitation accumulation, icing, and sea level pressure. The current location of the ASOS is suitable for its continued operation.

However, the ASOS will need to be relocated should demand for the Innovation Technology Business Park materialize. To accommodate this, a location centered on the runway with adequate clearance has been designated as the proposed future site. (See Figure 6-21)

Figure 6-21: ASR Reserve and Proposed ASOS Site



Compass Calibration Pad

During the airfield reconstruction project in 2010, a compass rose was installed at the south end of the airfield at BLI adjacent to Taxiway Golf that met Federal Aviation Administration (FAA) design standards at the time. However, in 2012 the FAA updated the design standards for compass rose locations and determined set back distances for magnetic objects such as airfield lighting, hangars, and drainage pipes. The design standards are detailed in Advisory Circular 150/5300-13A, Appendix 6 and include:

1. The center of the pad should be at least 600 feet from magnetic objects and at least 300 feet from buildings, arresting gear, electrical conduits or other objects that could cause magnetic interference.
2. The center portion of the pad needs to be outside the airport's critical design surfaces.
3. After preliminarily selecting a site that suits these requirements, a magnetic survey will need to be conducted to assure that there are no locally generated magnetic anomalies.

With the updated FAA design criteria, the compass rose at BLI no longer met FAA specifications and in 2015, when the calibration requirement expired, the compass rose was removed.

In 2015 the Port made efforts to determine a new location for the compass rose that met the new design criteria however no practical solution was identified. Three possible locations were explored. Only one location on the northwest closed runway met current standards; the other two locations noted did not meet the current FAA standards due to their proximity to airfield lighting circuits and interference with adjacent buildings.

The northwest closed runway location was deemed impractical due to the area not being useable for aircraft operations in its current state. BLI would be required to undertake significant pavement upgrades such as designing and constructing a connecting taxiway and reconstructing the pavement on the northwest closed runway to meet FAA pavement design standards. The Air Traffic Control Tower (ATCT) also opposed the location on the northwest closed runway as it would increase safety risk due to the rise of aircraft crossing the runway.

Due to the reasons noted above, including the ongoing maintenance cost of calibration, the Port did not proceed forward with installing a compass rose on the northwest closed runway.

6.9 Passenger Terminal Building

The previous master plan included a forecast of commercial passenger growth that was robust enough to cause a terminal expansion and anticipated adding aircraft gates to the south of the current building in the 2025 – 2030 time-period. The expansion of the terminal required that the existing general aviation facilities be relocated into a new GA area south of the Aircraft Rescue and Fire Fighting (ARFF) building. Long term this plan was needed to create a separation of increasing commercial traffic from GA activity by small aircraft. It also provided area for expansion of FBO and GA hangars and was a short-term solution to providing RON positions. Figure 6-22 shows this concept.

As discussed in depth in the forecast chapter, commercial aviation demand levels have not grown at the rate expected in the previous plan and in fact have declined. Therefore, potential terminal expansion in the next 20-years will be driven by airline decisions (and investments) to increase their market at BLI rather than passenger demand levels. Therefore, this master plan has reexamined the terminal expansion plans and created a terminal development plan (Figure 6-23);

This terminal expansion plan maintains all ticketing and bag screening functions in their current location in the existing building with a new building connected to the existing terminal through a non-secure corridor. The new facility will contain a passenger screening checkpoint, four airline gates, concessions and baggage claim facilities. In addition, two 12-foot wide load/unload lanes along Terminal Drive will serve the expanded terminal.

The terminal development concept provides for the construction of RON positions as needed with eventual terminal expansion to meet demand beyond the 20-year horizon. The primary issues associated with this concept include;

1. Construction of the RON positions will require filling of 5 to 6 acres of wetland.
2. Unless a relocation of the Airport Traffic Control Tower (ATCT) is completed, the two westernmost RON spaces are positioned in a manner that the tails of the aircraft affect the ATCT Line of sight (LOS).
3. The terminal expansion concept includes some basic assumptions regarding the use of the new facilities and services to be provided therein. Some of these are likely to require additional consideration and detailed stakeholder involvement prior to implementation. These include;
    a. The need for an additional checkpoint in the new facility will need to be coordinated with TSA.
    b. The addition of a second baggage claim area in the new building may be required to maintain a high level of customer service., and
    c. The 300-foot corridor connecting the existing terminal with the expanded building is envisioned as being non-secure. This will require duplication of concessions for secure side passengers.

Considerations: Any terminal expansion will need to give full consideration of sustainability factors, both in building design and associated amenities. For instance, terminal design will need to include adequate vehicle charging stations to allow for conversion of the GSE fleet from fossil fuels to electrical power. Also, any new buildings should include consideration of the solar power potential in both location and design.

Figure 6-22: Expand Terminal to the South

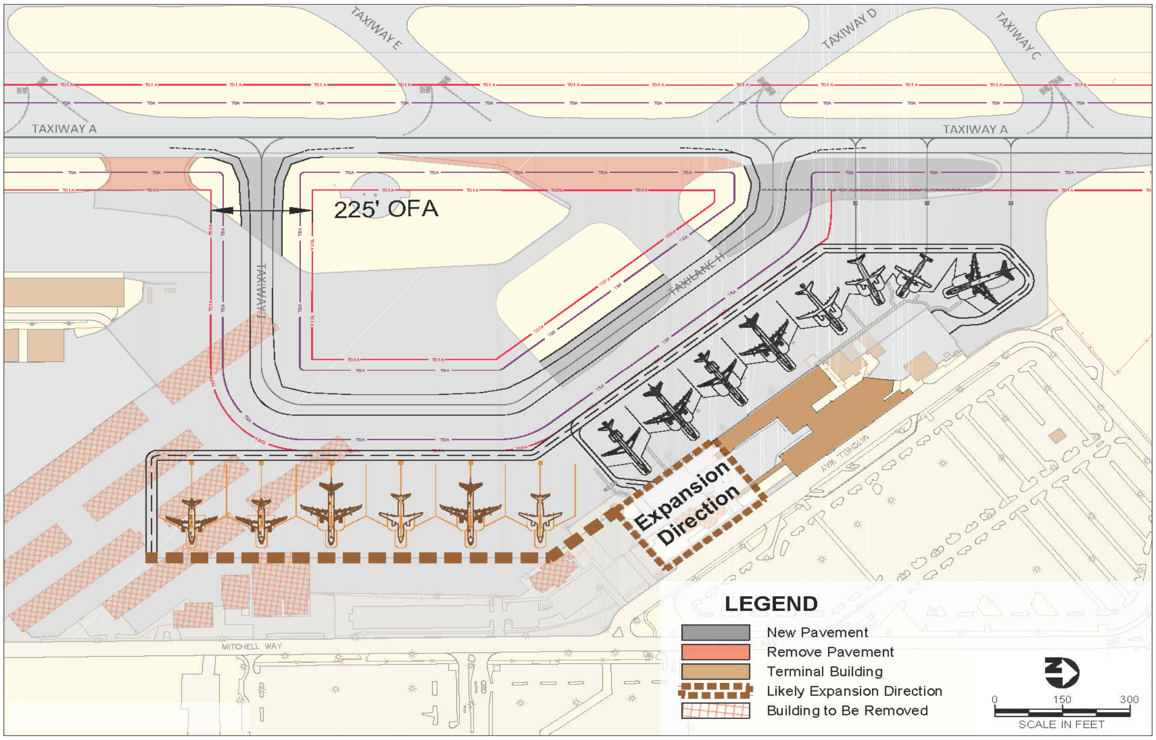
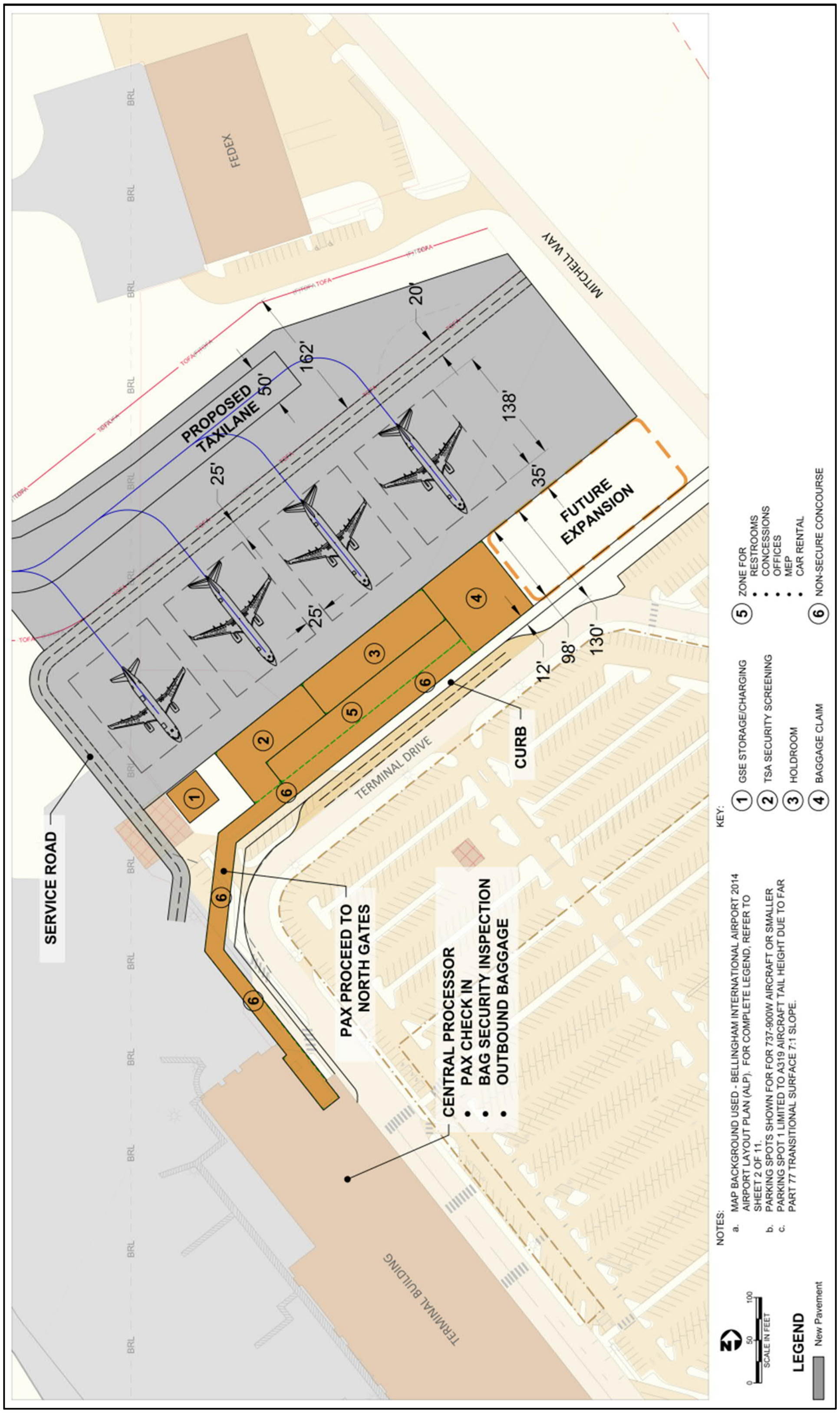


Figure 6-23: Expand Terminal to the North

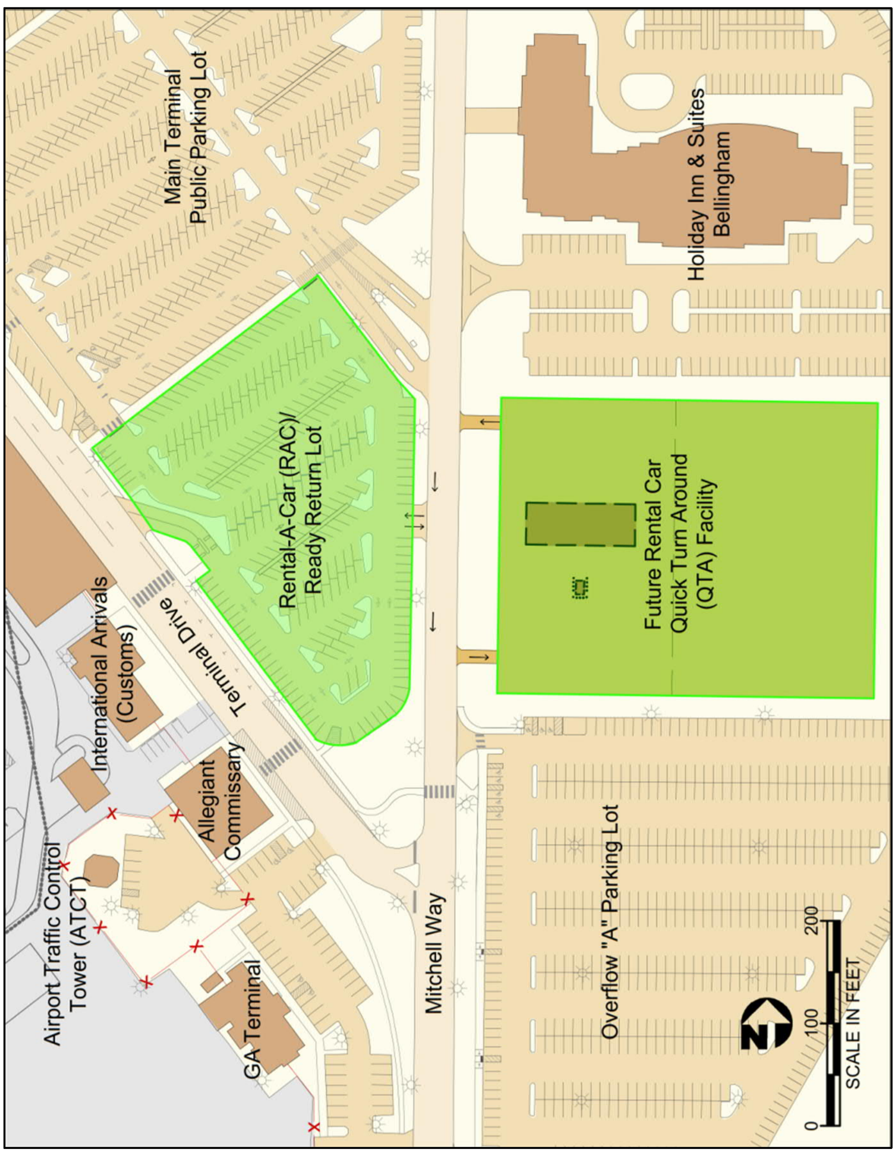


6.10 Improved Rental Car (RAC) Facilities

Improvements to RAC facilities in the terminal area are currently underway (Figure 6-24). These include a relocation of the ready/return area from the southern portion of the public parking lot to a northern location. This location will provide more convenience for both customers and RAC providers as it will move the ready area nearer to the arriving passengers by better aligning with the rental car counters in the terminal building providing a direct route for customer.

In addition, the RAC providers have requested that a Quick Turnaround (QTA) facility be provided to better serve their needs. The QTA Facility is intended to provide facilities for car cleaning, refueling and other preparation activities. The Port and the RAC companies have determined that the optimal location for this facility is adjacent to the relocated Ready/Return lot, east of the current terminal. The primary drivers behind this project were to improve customer service and enhance airport revenues.

Figure 6-24: Rental-A-Car (RAC) and Quick Turnaround (QTA) Facilities

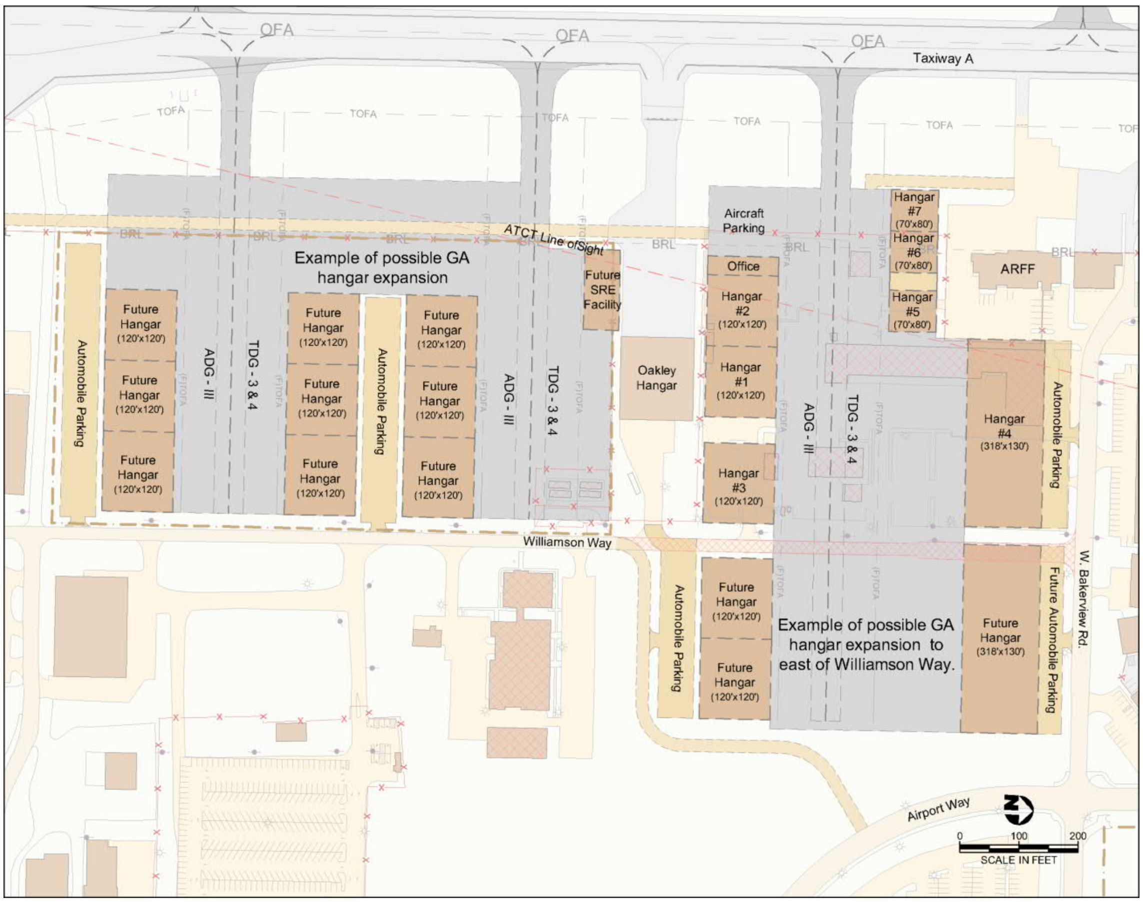


6.11 Expand Area for General Aviation Facilities

Previous master plans have recommended that GA development be directed to the southeastern portion of the airport property. The Port has been actively pursuing this direction, having completed all environmental studies and securing approvals for development. 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 completes the approved wetland mitigation plan. Phase 4 has not been included in the approvals.

It is recommended that the Port of Bellingham continue with on-going plans for expansion of general aviation to the southeast. Figure 6-25 shows a potential layout for development to include corporate hangars and a logistics center.

Figure 6-25: Expand GA Area to the South



6.12 Westside Development

The west side of the airport property is currently undeveloped but has been designated for Commercial/Light Industrial uses to reserve land for facilities that, while perhaps 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.

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. The FAA Master Plan process AC does not restrict developments that are not strictly enplanement or cargo driven nor does the AC contemplate rapidly emerging trends in e-commerce and if the design criteria met can be met and subject to Port working to create an economically viable and sustainable airport. These options will be part of the planning effort.

Figure 6-26 shows one possible development option for this area. Depicted is a Logistics Center for air cargo or other uses, should need arise. The other possibility shown in Figure 6-27 is for an Aviation related technical center to accommodate demand in this area. The primary purpose of depicting these uses is to assure that developable airport property on the west side is reserved for potential revenue producing uses that could occur in the future.

Figure 6-26: Westside Logistics Center

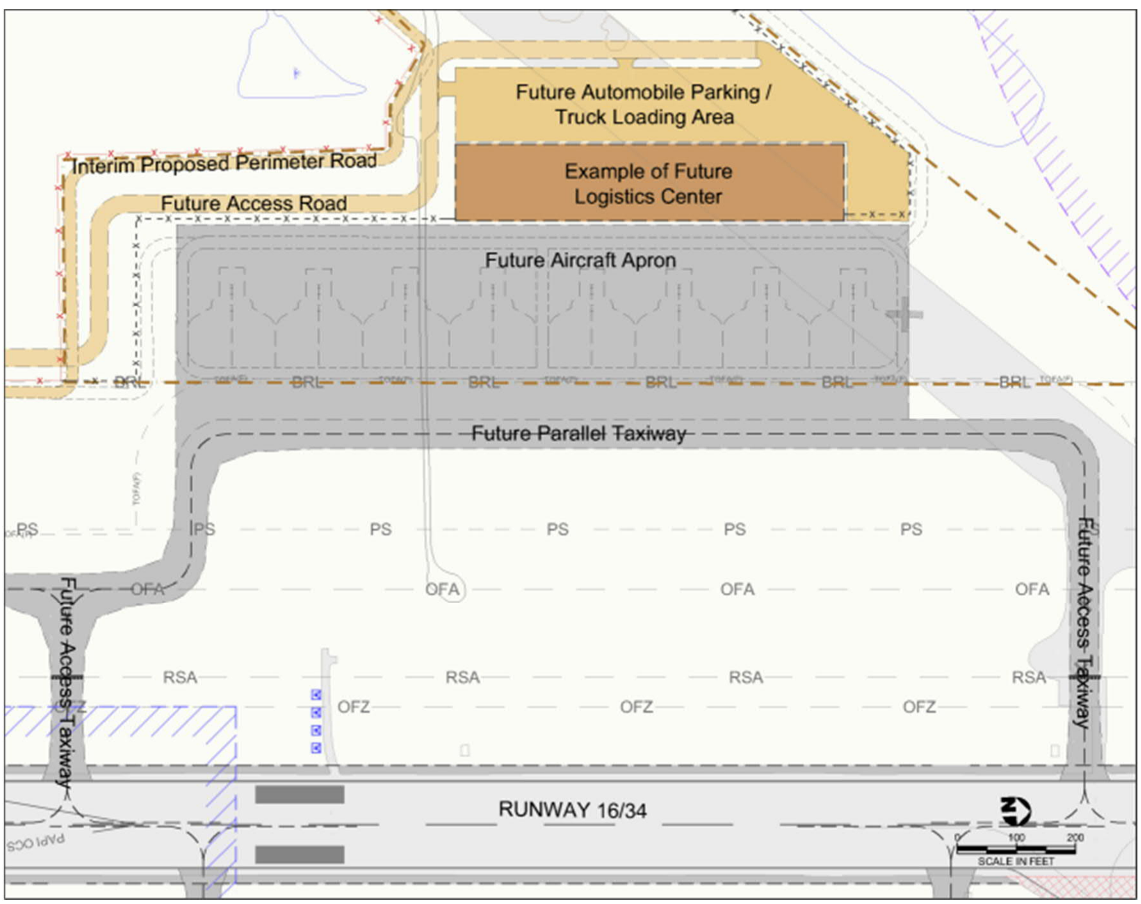
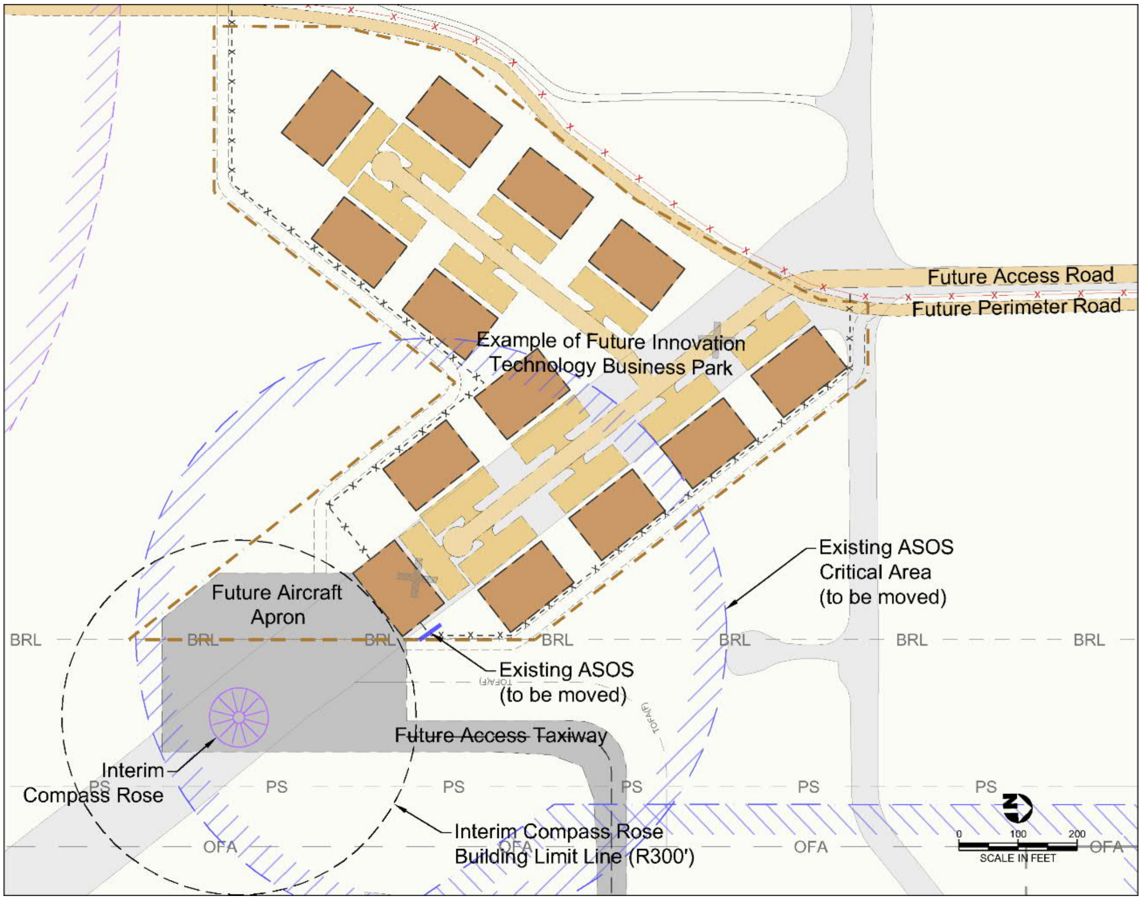


Figure 6-27: Westside Innovation Technology Business Park



6.13 Expand Fuel Storage Capacity

The existing fuel storage area is located south of the terminal and near the area recommended for expanded GA development. As stated in the Facility Requirements discussion fuel storage capacity needs to be increased. In addition, the current fuel farm is in need of repair. Therefore, a decision as to whether to reconstruct and expand the existing facility or to relocate needs to be considered. The three possible locations are shown on Figure 6-28 and described as follows.

- Alternative 1: Expand on Existing Site
- Alternative 2: Relocate to a location closer to the runway
- Alternative 3: Relocate to the terminal apron.

Important factors to be considered in the determination as to the best location are.

- Access to the local roadways for deliveries
- Ability of refueler trucks to access the facility without leaving the airfield
- Ability to service aircraft
- Environmental considerations

6.13.1 Analysis

Access to Local Roadways

All three alternatives offer access to the local roadway system for delivery of fuel by tanker trucks. However, the current site requires that special security provisions be made for deliveries since the trucks need to come inside the fence (onto secure airport property) to make deliveries. This requires that security personnel be available for each delivery. For alternatives 2 and 3, a new fuel farm will be designed to address this deficiency. On these alternatives refuelers will be able to reach the site and make deliveries without entering the secure areas, although on Site 2 a new road will need to be constructed to provide access.

Access for Refueler Trucks

The current location requires that refueler trucks exit the AOA and proceed down Williamson Way to the fuel farm. Once they are fueled, they return to the airfield to fuel aircraft. This situation is flawed in that fuel trucks are constructed in a manner which does not make them street legal and using the public street is technically illegal. Additionally, having each fuel truck pass from the non-secure area where they refuel back onto the airfield creates a need for physical inspection of each vehicle for both security and to minimize the introduction of FOD to the airfield.

Both alternatives 2 and 3 eliminate this situation by locating the fuel farm where it is accessible using on-airport roadways. This makes either alternative preferable to the status quo.

Ability to Service Aircraft

All three alternatives are located in a manner where the refueler trucks can service the aircraft. However, alternatives 1 and 2 are located a distance from the terminal apron, where the commercial refueling occurs. In both cases the distance traveled between tanks and terminal is approximately 0.75 mile, following the most direct routes. Alternative 3, which is located on the terminal apron, is a much shorter distance, approximately 0.1 miles.

In this matter then, Alternative 3 is more advantageous.

Environmental Considerations

Alternative 1, the existing facility is aged and in need of repair. In its current state any inadvertent fuel spill would likely flow into the adjacent wetland due to the lack of effective containment provisions. Should this be reconstructed, the containment facilities would be improved as well. Alternatives 2 and 3, as new facilities, would have environmental considerations built into them.

Recommendation

The optimum location for the expanded fuel farm has been determined to be Alternative 3. This alternative provides a clear differentiation between airside and landside traffic and allows for more efficient use of the fuel farm and eliminates the need for security personnel to be present for any delivery or refueling activities. In addition, the location on the terminal apron facilitates refueling activities and decreases the distances that each refueler must traverse to access the commercial aircraft. Figure 6-29 shows a possible layout for the fuel farm on site 3.

Figure 6-28: Alternative Fuel Farm Sites

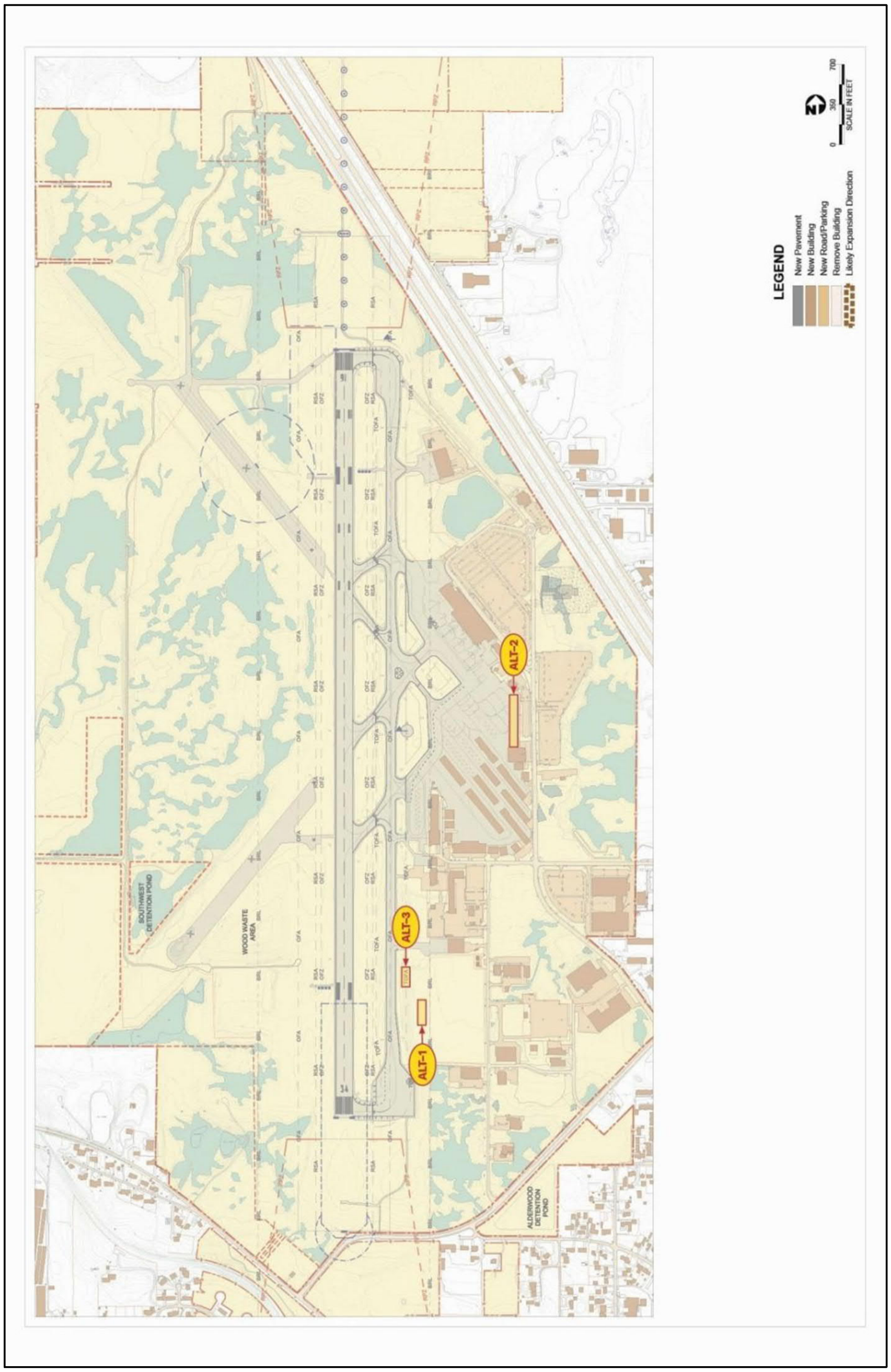
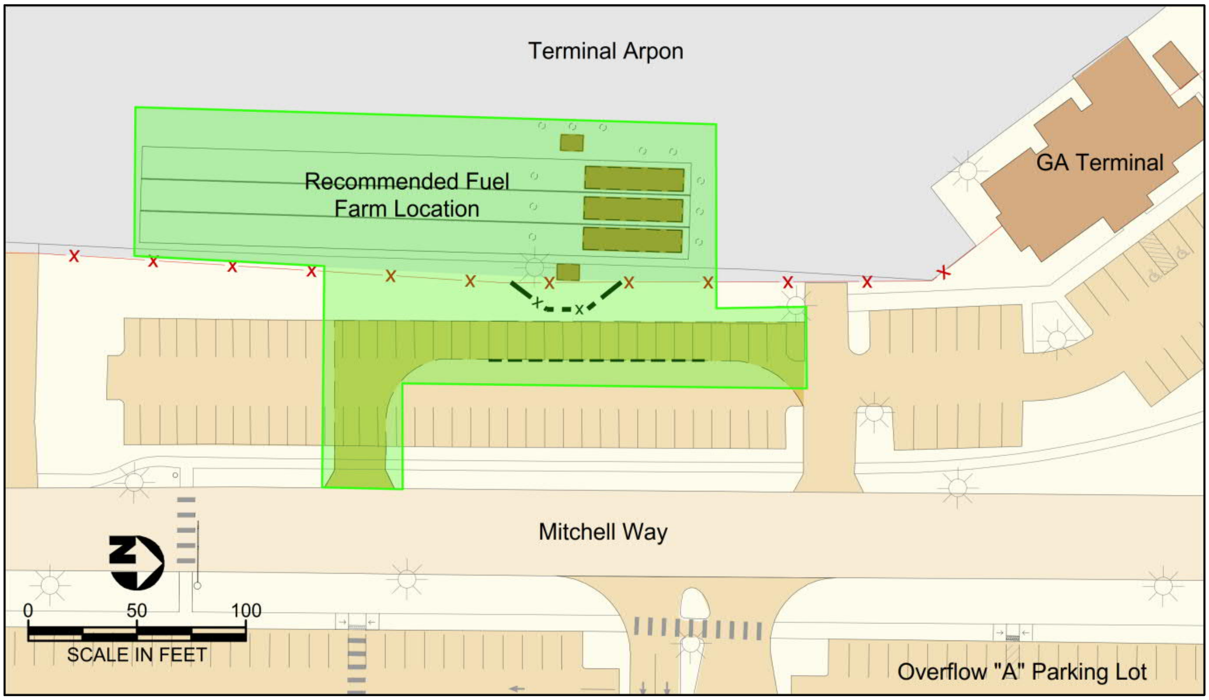


Figure 6-29: Recommended New Fuel Farm Location



6.14 Improvements for which there are No Alternatives

6.14.1 Airfield Projects

Construct Runway Shoulders and Blast Pads

Runway Shoulders are required for the runway to meet FAA design standards for the runway and to prevent soil erosion and minimize the potential for FOD. Shoulders should be included as part of next runway rehabilitation project.

With the runway length being marginal for some commercial operations, the need for blast pad improvement is evidenced today as the commercial aircraft are creating scouring conditions at the runway ends as they power their engines for takeoff. Blast pads should be included as part of next runway rehabilitation project.

Complete Airport Interior Service Road/Wildlife Fencing

The airport's perimeter road does not adequately serve areas on the east side of the runway. This program involves completing this roadway along the existing fence line.

At the same time the perimeter fence on the north side should be upgraded to include wildlife fencing for reducing potential animal incursions on the airfield.

Preserve Precision Instrument Approach Capability on Runway 34

Preserving the ability to add a precision approach to Runway 34 allows for land use protection measures to be incorporated into the Whatcom County Land Use Plans. The reason for preserving this possibility is to increase operational efficiency and reduce delays due to weather.

This recommendation is made regardless of the equipment that FAA authorizes for use in the future. It also recognizes that FAA criteria is not likely to justify a need at this time.

6.14.2 Airport Sustainability/Compliance/Environmental Projects

Several projects are recommended as part of the airport's overall program of sustainable development planning. These projects include the following elements

Solar Farm Development

Develop solar energy farms on airport to enhance self-sufficiency. The Port commissioned a Solar Feasibility Study. This report assesses the feasibility of installing solar carports in the parking lots of Bellingham International Airport. This design combines the amenity of premium, shaded parking, while doubling the use of valuable square footage for on-site solar power generation.

The decision to construct solar carports avoids the necessary structural and wind-load calculations for rooftop solar, while still placing the solar arrays far enough from runways to avoid glare into the approach and takeoff flight paths. The placement of the solar field was done in conjunction with future parking lot changes and the possible relocation of the ATCT. The field that is located in the parking lot will be in a good position to supply electricity to additional automobile charging stations in anticipation of the increase in the number of electric vehicles expected in the near- and long-term future. This placement also will provide for covered parking spaces.

The solar feasibility study, containing details of siting as well as financing options is attached to this report as Appendix C.

Other Sustainability Projects

Two additional efforts are recommended to improve the overall environmental footprint of the airport. These are the replacement of the airfield lighting systems with LED fixtures as existing systems are replaced. Additionally, the Port will replace most airfield service equipment with electric models and encourage all tenants to do likewise. This will be preceded by a project to add additional charging stations on the airside, particularly at the terminal.

Environmental Projects

There is a designated conservation area situated at the end of Runway 34, within the RSA. This plan recommends that the Port begin the process of relocating this, and other conservation areas within the Airport Operations Area (AOA) to more suitable locations.

Compliance Projects

Finally, two projects are required to assure that the airport remains in compliance with FAA criteria. These are;

- Remove obstructions from Critical Part 77 Surfaces
- Construct a new SRE Facility

6.15 Recommended Airport Development Alternative

Combining the recommended alternatives for individual facilities into a single, long range airport development plan to serve as the basis for the Airport Layout Plan. The recommendations are driven by several factors as defined in other sections of this report. The primary driving forces for projects are.

1. Safety: The primary driver for any alternative is improving safety in operations.
2. FAA Design Standards: BLI has been an operating airport since 1940. Over the course of time facilities have been updated and FAA Design Criteria have evolved.
3. Enhanced security requirements: Like design standards, security requirements at airports have evolved and require periodic re-evaluation.
4. Increased Demand: As activity increases at an airport, demand for facilities increases, causing the airport to provide expansion opportunities.
5. Customer Service requirements: Demand is not the sole reason for facility improvements. Increasing service levels for customers also results in a need for expanded facilities among those airport-dependent businesses that rely on customer loyalty for long term viability.
6. Actions necessary to achieve the Port's strategic vision: This category includes all projects that are driven by the goals that have been set by the Port of Bellingham Commission. Included are those that support financial goals for the airport or that promote and support sustainable operations at Port facilities.

Figure 6-1 graphically show the totality of the recommended plan. A brief summation of the specific projects that are included, as well as the factor driving its inclusion is contained in the following.

6.15.1 Airfield

Airfield improvements are intended to increase airport operational safety through projects that eliminate non-standard conditions and support continued safe and efficient operations including;

- Runway Safety Area (RSA) for Runway 16 improvements – Safety
- Runway shoulders - Design Standards
- Runway blast pads – Design Standards
- Remove obstructions to approaches or Part 77-Surfaces – Safety
- Realign exit taxiways to facilitate more efficient operations – Design Standards
- Complete interior service road - Safety
- Improve perimeter fencing and add wildlife fence on the west side of the airport - Security
- Preserve the ability to install and ILS approach on Runway 34 – Customer service
- Relocate the ATCT – Strategic vision

6.15.2 Terminal Area

Projects for the terminal area are driven by the needs of the commercial passengers, airlines and other terminal users. These include;

- Develop Remain Over Night (RON) area for commercial aircraft – Demand/Strategic vision
- Expand terminal capacity – Demand (post 2050)
- Add Rental Car Quick Turnaround Facility (QTA) – Customer service

6.15.3 General Aviation Area

The master plan includes provisions for the continued growth of general aviation facilities. A summary of the recommendations includes;

- Provide sufficient land for new GA Hangars - Demand
- Provide for FBO expansion - Demand
- Construct a new Snow Removal Equipment (SRE) Building – FAA Criteria
- Relocate and Expand the Fuel Farm – Demand/Customer Service
- Reserve west side for potential logistics center development or GA expansion – Demand/ Port Strategic vision

6.15.4 Westside Development

The west side of the Bellingham International Airport property is currently undeveloped but has been designated for Commercial/Light Industrial uses to reserve land for facilities that, while perhaps 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 of development:

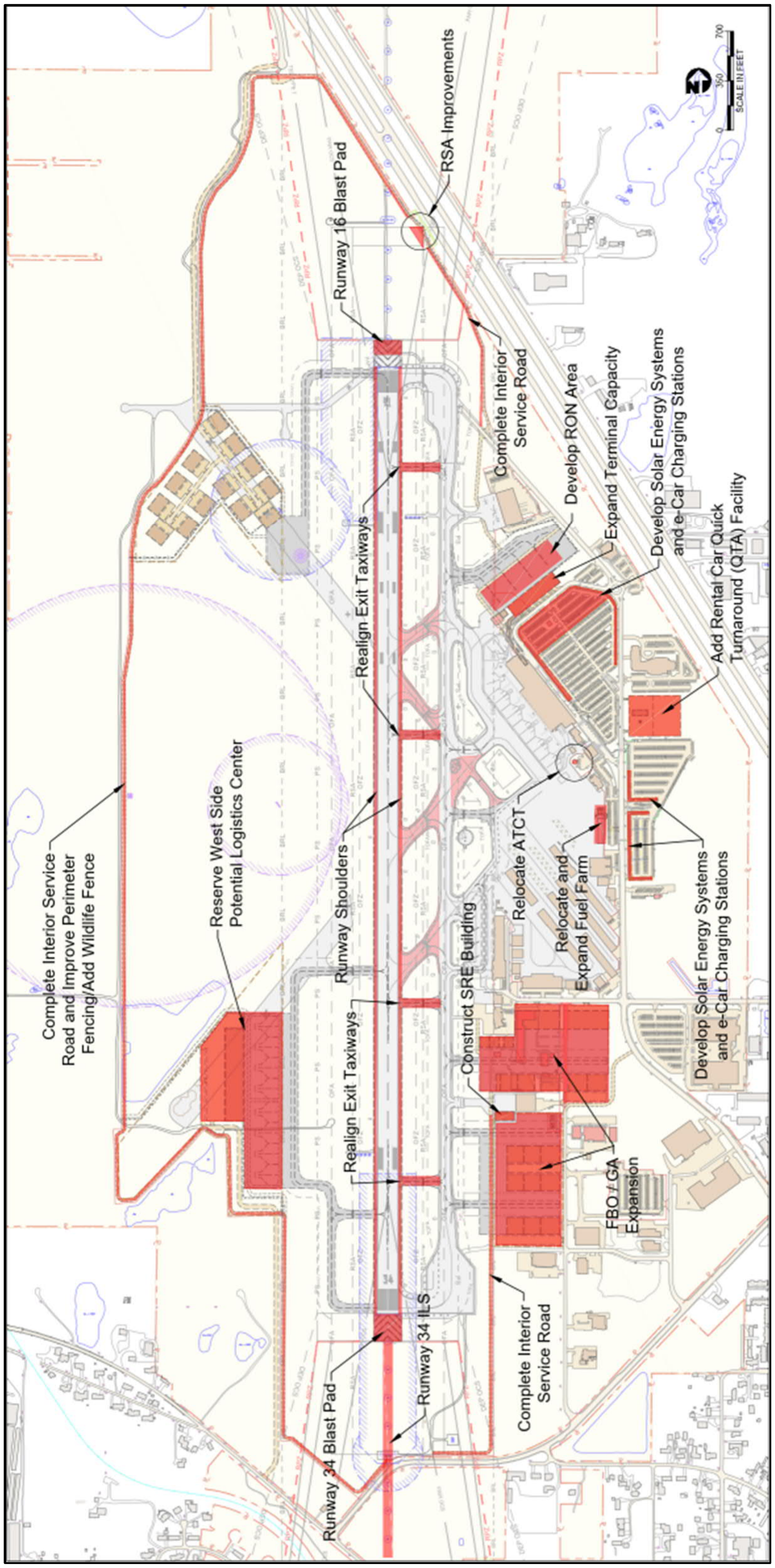
1. Activities accommodated under this category include, but are not limited to, restaurants, automobile parking, rental cars, hotels, commercial offices, light industrial facilities, warehousing, retail, or similar uses.
2. The FAA Master Plan process AC does not restrict developments that are not strictly enplanement or cargo driven.
3. The AC does not contemplate rapidly emerging trends in e-commerce and if the design criteria can be met and subject to Port working to create an economically viable and sustainable airport.
4. No objection to removal from the CIP.

6.15.5 Sustainability Projects

Several projects are recommended in this master plan that are intended to reduce the airports environmental footprint and improve the overall operational efficiency of airport operations. These are;

- Replace all airfield lighting with LED systems – Strategic Vision
- Develop solar energy systems to move the airport "off-grid" – Strategic Vision
- Install e-car charging stations– Strategic Vision/Customer Service/Demand
- Convert Port-owned Ground Service Equipment (GSE) to electrical vehicles and encourage tenants to do likewise. – Strategic Vision/Customer Service
- Relocate all conservation areas out of the AOA– Strategic Vision.

Figure 6-30: Recommended Airport Development Alternative



7 Environmental Review

7 Environmental Review

7.1 Introduction

This chapter presents an overview of the potential environmental impacts of the improvements recommended in this master plan update. Guidance for this was taken from Federal Aviation Administration (FAA) Order 5050.4B, Airport Environmental Handbook, FAA Order 1050.1F, Environmental Impacts: Policies and Procedures, information contained in Chapter 3 of this report, Existing Environmental Conditions 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 impacts and to provide information that can assist with subsequent environmental review and processing.

The recommendations from this master plan recognize the need to achieve a balance between the man-made 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, can help minimize unavoidable environmental impacts and the delay of project design and construction.

It is important to note that the following assessment is not official as the FAA will make the ultimate determination on a project-by-project basis using information from Table 4.1 of the order to assess whether the significance threshold will be reached or exceeded by the project.

7.2 Impact Category Review

In assessing the potential environmental issues, the following resource categories (as reference in FAA Order 1050.1F) are addressed. Greater emphasis of analysis was applied to areas where issues were known to exist.

- Air quality
- Biological resources (including fish, wildlife, and plants)
- Climate/Greenhouse Gases (GHG)
- Coastal resources
- Department of Transportation Act, Section 4(f)
- Farmlands
- Hazardous materials, solid waste, and pollution prevention
- Historical, architectural, archaeological, and cultural resources
- Land use
- Natural resources and energy supply
- Noise and compatible land use

- Socioeconomics, environmental justice, and children's environmental health and safety risks
- Visual effects (including light emissions)
- Water resources (including wetlands, floodplains, surface waters, groundwater, and wild and scenic rivers.

7.2.1 Air Quality

Changes in air quality related to the airport are the result of increasing demand levels and/or changes in the aircraft fleet. These changes are demand related and are unrelated to the individual projects.

However, as a point of reference the Aviation Environmental Design Tool (AEDT) Computer model generated reports for the years 2016 and 2036 that estimate the impacts that airport operations will have on the region's air quality. This report shows the number of tons of various pollutants that aircraft can be expected to generate given the number of annual operations. The following table shows the results of both the 2016 and 2037 models.

Table 7–1: Aircraft Emissions (2016 and 2037)

Pollutant	Abbreviation	Annual Tons	
		2016	2037
Carbon Monoxide	CO	5.34216	7.26402
Hydro Carbons	HC	0.186	0.24379
Total Organic Gas	TOG	0.20028	0.26173
Volatile Organic Compounds	VOC	0.18753	0.24434
Non-Methane Hydro Carbons	NMHC	0.1913	0.24945
Oxides of Nitrogen	NOx	0.5184	0.77075
Black Carbon Mass	nvPM Mass	0.00533	0.0102
Particulate Matter - Sulfur	PMSO	0.00261	0.00374
Particulate Matter - Fuel Organics	PMFO	0.1269	0.01773
Carbon Dioxide	CO2	168.5805	243.12596
Water	H2O	66.09638	95.32388
Oxides of sulfur	SOx	0.06259	0.09025
Particulate Matter with a diameter of 2.5 microns or less	PM 2-5	0.02063	0.0317
Particulate Matter with a diameter of 10 microns or less	PM 10	0.02063	0.0317

Source: AEDT 2c – Aviation Emissions Modeling

7.2.2 Biological Resources

A preliminary desktop analysis of the master plan update concludes that none of the recommended projects are likely to significantly impact endangered and threatened species of Flora and Fauna, essential fish habitat (EFH), bald eagles, or migratory birds discussed in Chapter 3.

Endangered Species

Endangered Species Act (ESA)-listed species present in Whatcom County are discussed in Chapter 3. No ESA-listed species are documented in the project area. BLI is not within the range of several of these species so it is not likely that they are present in the project area. The species that may occur in the vicinity of BLI are listed in Table 7-2. For example, whitebark pine (Pinus albicaulis) grows near timberline in the Cascades in Whatcom County, but not at lower elevations, so was excluded from Table 7-2. The remaining species will likely have to be assessed during permitting with a federal nexus (e.g. a wetland permit). While these species are known or possible in the vicinity of BLI, it is unlikely they would be affected by most of the projects recommended in the master plan update. Therefore a "no effect letter" would likely be the required ESA compliance document for most master plan update projects.

Table 7–2: ESA-Listed Species That May Occur in the Vicinity of BLI

Group	Name	Scientific Name	Status
Amphibians	Oregon Spotted Frog	*Rana pretiosa*	Threatened
Birds	Marbled Murrelet	*Brachyramphus marmoratus*	Threatened
	Streaked Horned Lark	*Eremophila alpestris strigata*	Threatened
Fish	Bull Trout	*Salvelinus confluentus*	Threatened
	Dolly Varden	*Salvelinus malma*	Proposed Similarity of Appearance (Threatened)
Flowering Plants	Golden Paintbrush	*Castilleja levisecta*	Threatened

Source: U.S. Fish and Wildlife Services

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. A review of WDFW SalmonScape data showed no documented presence of EFH Pacific Coast salmon. Due to 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 locations to BLI property are tributaries connected with the lower main stem of Silver Creek.

Although EFH is not likely on the BLI airport, it does occur immediately adjacent. Similar to ESA, projects with a federal nexus must comply with the Magnuson-Stevens Fisheries Act. This compliance can also be included within a “no effect letter” for projects with no impacts to EFH. If a project will adversely impact EFH, an EFH evaluation will need to be prepared.

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, including at BLI. Several migratory birds likely use habitat in the BLI area as it contains a mix of grassland, riparian areas, and wetlands. Pre-construction surveys for migratory birds and/or seasonal restrictions may be necessary to comply with the Migratory Bird Treaty Act

Bald Eagles

Bald eagles are protected under the Bald Eagle and Golden Eagle Protection Act, which is administered by the USFWS. Under this Act, permits must be granted for projects that either remove an eagle nest, or propose disturbance within 660 feet of a nest. Bald eagles may occur in the vicinity year round with the majority typically from April through August. There is at least one known bald eagle nest on BLI property. If a bald eagle nest is found within 660 feet of a recommended project, even it is currently inactive, an Eagle Non-Purposeful Take Permit application would be prepared and submitted to USFWS.

7.2.3 Climate

The FAA has not identified a threshold of significance for climate impacts but the projects included are not known to have negative impacts. In fact the solar array, electric car charging stations, and GSE electrification projects are in keeping with larger programs to achieve sustainability in operations, thus lessening climate impacts.

For all recommended projects, subsequent environmental NEPA Analyses will address Greenhouse Gases and Climate in conformance with FAA guidance.

7.2.4 Coastal resources

The Coastal Zone Management Act (CZMA) authorizes certain coastal states to actively manage and protect coastal and shoreline resources. States have the primary role of managing coastal areas via an approved Coastal Zone Management Program (CZMP). The Washington State Department of Ecology (Ecology) administers Washington’s CZMP. Washington’s CZMP applies to all lands and waters in Washington’s coastal counties, including Whatcom County.

The federal CZMA authorizes states with approved CZMPs to review federal activities, projects which require a federal permit, or project utilizing federal funding proposed in a state's coastal zone. The state review process for these federal actions is known as federal consistency. The specific type of federal action will determine whether a consistency determination or certification is required.

The most likely trigger for CZMA consistency determinations in the master plan update are for projects that require an individual wetland permit under the Clean Water Act.

7.2.5 Department of Transportation Act Section 4(f)

Section 4(f) of the U.S. DOT Act of 1966 protects significant publicly owned parks, recreational areas, wildlife and waterfowl refuges, and public and private historic sites. A preliminary analysis indicates that none of the recommended projects will impact Section 4(f) land because BLI does not contain any of these areas. However subsequent NEPA Analyses associated with each project will verify this assumption, especially with regards to historic sites.

7.2.6 Farmlands

None of the recommended projects impact farmland.

7.2.7 Hazardous Materials, Solid Waste, and Pollution Prevention

The Port of Bellingham has conducted and documented a history of hazardous material investigation of the airport property. 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.

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. Contents of the site consist of a mixture of rejected wood pulp fiber and wood ash.

None of the scheduled recommended projects will be constructed on the land where the wood waste landfill exists. The Airport Layout Plan does reserve the impacted area for potential development for “on-demand” aviation related development (specifically an aviation related logistics center). This development will only be undertaken should demand beyond the forecast levels occur. At that time the landfill will need to be remediated as part of any construction/site development project.

The proposed relocation of the fuel farm will require that a plan for site testing and remediation of the existing site be conducted.

7.2.8 Historical, Architectural, Archeological and Cultural Resources

The recommended projects will include assessment of cultural resources and comply with Section 106 of the National Historic Preservation Act. The Port of Bellingham has examined this issue at the airport in a report entitled “Archaeological Survey and Cultural Resource Evaluation for Developments Proposed in Areas 4, 9, and 14, Bellingham International Airport, Whatcom County, Washington” This report identified one historic property of unknown importance. This is a rock feature, designated as site 45WH839.

The development of future General Aviation Facilities must consider the location of this site prior to construction.

For all other recommended projects government to government consultation will be required to verify the assumption. In addition, pedestrian cultural resources surveys will be completed for non-paved areas outside of Areas 4, 9, and 14.

7.2.9 Land Use

The Port of Bellingham has worked extensively with the City of Bellingham, Whatcom County, and the FAA to reduce existing incompatible land uses. This master plan produced noise contours for the existing and predicted noise impacts at BLI, The details of this analysis are presented in section 7.2.11 that follows.

The local jurisdictions also have contributed to land use compatibility success within the airport's environs. Whatcom County currently has an adopted Land Use Compatibility Ordinance and the Port is currently working with the City of Bellingham to adopt an airport land use compatibility ordinance now that the city has begun to annex property within 10,000 feet of the airport. The Port 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.

None of the projects proposed in this master plan will have impact on the land use surrounding the airport property.

7.2.10 Natural Resources and Energy Supply

No impacts in this area are expected except for some unspecified positive impacts to arise from the replacement of airfield, lighting, solar farm installations, e-car charging stations and electrification of GSE.

7.2.11 Noise and Compatible Land Use

The recommendations in this master plan are not intended to induce demand but rather to accommodate that which is likely to occur in response to community demand, as projected in Chapter 4 of this master plan. FAA Advisory Circular 150/5020-1, Noise Control and Compatibility Planning for Airports, as well as Desk reference accompanying FAA Order 1050.1F 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.

Airport Activity Levels and Fleet Mix

To model the existing and predicted noise impacts at BLI, the actual recorded activity levels obtained from ATCT and the airport for 2016 and the forecast operations levels from the approved aviation demand forecasts were used (Table 7–2). Additionally, 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 as shown in Table 7–3.

Table 7–2: Annual Operations (2016 Actual and 2037 Forecast)

Category	2016	2037
Air Carrier	8,022	8,320
Air Taxi	9,379	10,653
Air Cargo	5,736	7,012
General Aviation	56,701	69,610
Military	2,770	2,770
Total	82,608	98,365

Source: Base year 2016 operations from FAA ATADS data and airport records
All forecasts by AECOM

Table 7–3: Existing and Forecast Aircraft Fleet Mix

Category/Aircraft	ADG	2016 %	2016 No	2037 %	2037 No
Commercial					
MD-80	C-III	2.9%	236	0.0%	0
A319	C-III	63.2%	5,073	50.0%	4,017
B-737 800	D-III	0.0%	0	8.0%	643
B-737 900	D-III	0.0%	0	12.0%	964
B-737 900E	D-III	0.0%	0	8.0%	643
B-737 700	C-III	7.4%	590	2.0%	161
Q400	C-III	26.5%	2,123	20.0%	1,607
Total Commercial		100.0%	8,022	100.0%	8,034
Air Taxi/Air Cargo					
Jets - Heavy	C-III	0.5%	76	0.5%	88
Jets - Light	B-II	0.5%	76	0.5%	88
Cessna Caravan	A-II	53.0%	8,011	53.0%	9,362
Metroliner	B-II	35.0%	5,290	35.0%	6,183
MEP	B-II	1.0%	151	1.0%	177
SEP	A-II	10.0%	1,512	10.0%	1,767
Total AT/AC		100.0%	15,115	100.0%	17,665
GA					
Jets - Heavy	D-III	0.2%	113	1.0%	696
Jets - Heavy	C-III	1.8%	1,021	7.0%	4,873
Jets - Light	B-II	4.0%	2,268	4.0%	2,784
MEP	B-II	3.0%	1,701	5.0%	3,481
SEP	A-I	88.0%	49,897	80.0%	55,688
Helicopter	NA	3.0%	1,701	3.0%	2,088
Total GA		100.0%	56,701	100.0%	69,610
Military					
Jet	C-III	25.0%	693	25.0%	693
Piston	B-II	25.0%	693	25.0%	693
Helicopter	NA	50.0%	1,385	50.0%	1,385
Total Military		100.0%	2,770	100.0%	2,770
Total Operations			82,608		98,079

Source: Base year 2016 operations from FAA ATADS data and airport records
All forecasts by AECOM

Aircraft Operational Characteristics

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.

The path of the approach to (or departure from) a runway helps to define where noise impacts are experienced.

The time of day when an operation occurs is also important in determining the impact that the noise will have on a community. In the AEDT 2C, 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.

Land Use Compatibility Analysis

The Land Use Compatibility Matrix, shown in Table 7–4, indicates those land uses that are considered 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 is intended to act 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.

For this master plan DNL 65, 70, and 75 dBA noise contours were generated for the years 2016 and 2037 to help determine land use impacts and compare the existing condition with conditions projected for the future years.

Table 7–4: Land Use Compatibility Matrix

Land Use	Below 65	65-70	70-75	75-80	80-85	Over 85
	Yearly Day-Night Noise Level (DNL) In Decibels					
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 notes on the following page.

Key to Table 7–4

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.

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.

Noise Impacts

Figure 7–1 and Figure 7–2 show the AEDT contours that were generated for the baseline conditions 2016 and the forecast year 2037 respectively, as well as a compilation of the land uses that exist within each contour. In assessing the impacts of aircraft noise, land uses are compared with the information contained in Table 7–4. This assessment involved overlaying the Zoning designations from Whatcom County 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 2017). The comparative results are shown on Figure 7–3 and discussed in the following paragraphs.

Year 2016

DNL 65-70 dBA

The analysis of the DNL 65-70 dBA contours for year 2016 shows 43.9 acres of Rural Residential Land (R5A) lie within the contour. Additionally, there are 9.8 acres of Urban Residential Land (UR3), 6.9 acres of General Commercial Land (GC), and 82.7 acres of Light Impact Industrial land (LII). These land uses are generally compatible with DNL 65 dBA noise levels.

There are 21 housing units and no Noise Sensitive Facilities such as churches, schools, libraries, and nursing homes within the DNL 65-70 dBA contours.

DNL 70-75 dBA

Within the DNL 70-75 dBA contours there are 0.9 acres of Light Impact Industrial Land (LII) and no housing units or Noise Sensitive Facilities.

Year 2037

DNL 65-70 dBA

The 2037 analysis shows a slight increase in encompassed area; 48.9 acres of Rural Residential Land (R5A), 11.7 acres of Urban Residential Land (UR3), 7.4 acres of General Commercial Land (GC), and 89.3 acres of Light Impact Industrial land (LII) within the DNL 65-70 dBA contour. These land uses are generally compatible with DNL 65 dBA noise levels.

There are 21 housing units and no Noise Sensitive Facilities such as churches, schools, libraries, and nursing homes within the DNL 65-70 dBA contours for the forecasted year 2037.

DNL 70-75 dBA

Within the DNL 70-75 dBA contours there are 1.7 acres of Light Impact Industrial Land (LII) and no housing units or Noise Sensitive Facilities.

Figure 7–1: 2016 Noise Contours

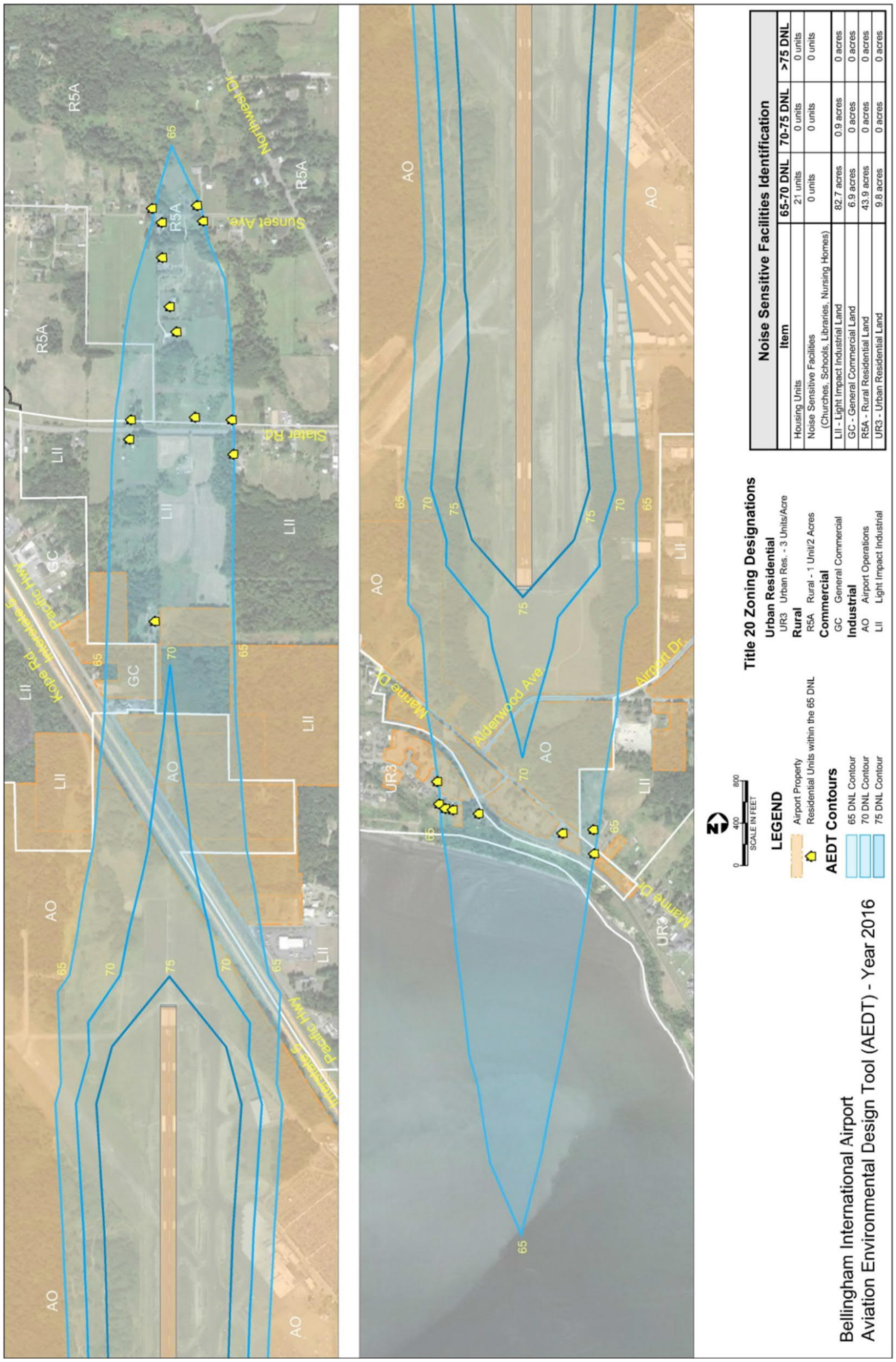
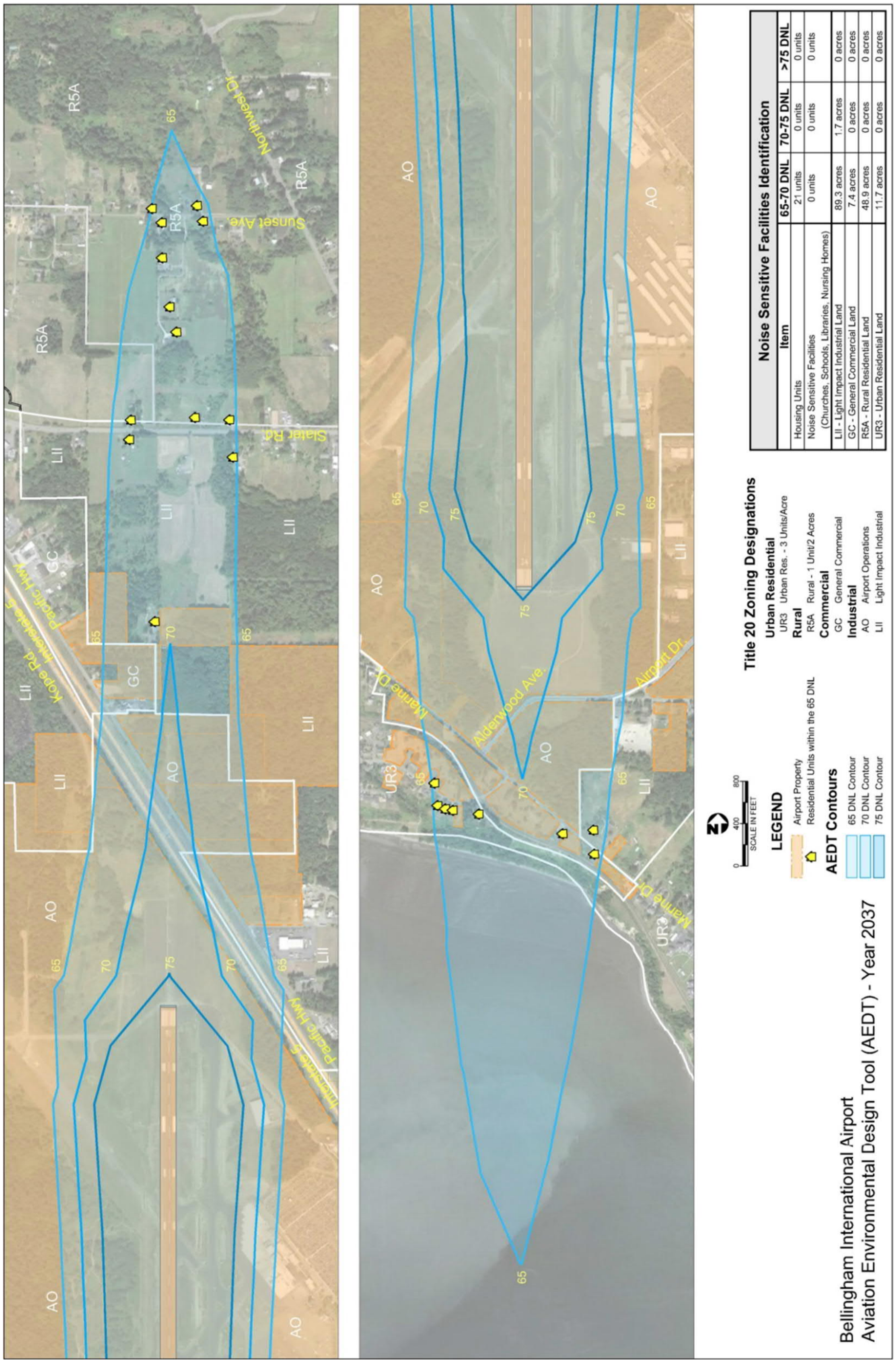


Figure 7–2: 2037 Noise Contours



Item	65-70 DNL	70-75 DNL	>75 DNL
Housing Units	21 units	0 units	0 units
Noise Sensitive Facilities (Churches, Schools, Libraries, Nursing Homes)	0 units	0 units	0 units
LII - Light Impact Industrial Land	89.3 acres	1.7 acres	0 acres
GC - General Commercial Land	7.4 acres	0 acres	0 acres
R5A - Rural Residential Land	48.9 acres	0 acres	0 acres
UR3 - Urban Residential Land	11.7 acres	0 acres	0 acres

Figure 7–3: 2016 and 2037 Noise Contour Comparison

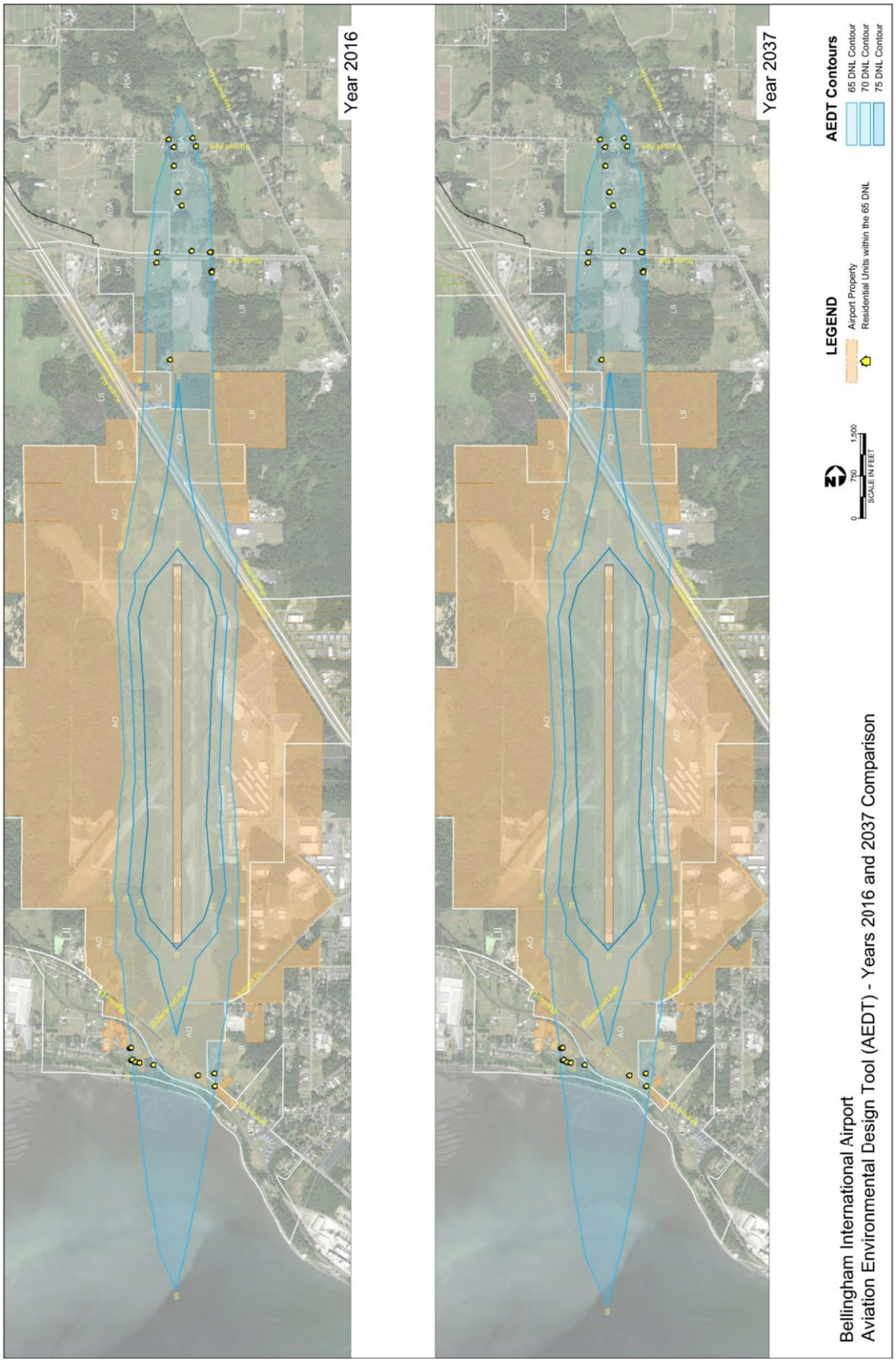


Table 7–5: 2016 and 2037 Aircraft Noise Impacts

Decibels	2016	2037	Difference Between 2016 and 2037
Housing Units (no. of units)			
65-70	21	21	0
70-75	0	0	0
75	0	0	0
Noise Sensitive Facilities (Churches, Schools, Libraries and Nursing Homes) (no. of Units)			
65-70	0	0	0
70-75	0	0	0
75	0	0	0
R5A - Rural Residential Land (acres)			
65-70	43.9	48.9	5
70-75	0	0	0
75	0	0	0
UR3 - Urban Residential Land (acres)			
65-70	9.8	11.7	1.9
70-75	0	0	0
75	0	0	0
LII - Light Impact Industrial Land (acres)			
65-70	82.7	89.3	6.6
70-75	0.9	1.7	0.8
75	0	0	0
GC - General Commercial Land (acres)			
65-70	6.9	7.4	0.5
70-75	0	0	0
75	0	0	0

7.2.12 Socioeconomics, Environmental Justice, and Children's Health and Safety Risks:

The NEPA analysis for recommended projects will take these topics into consideration, including the impacts to the local economy, tax collection, and potential secondary economic benefits from activities. The projects will comply with Executive Order 12898, which encourages the consideration of environmental justice impacts in EAs, and Executive Order 13045, which prioritizes identification of health and safety risks that disproportionately affect children. A preliminary assessment has not identified any impacts in this area that is associated with the recommended projects. Visual Effects

The FAA has not identified a significance threshold for this category but none of the projects have the potential to have an adverse visual impact Except for those with that create new lighting in areas where none currently exists such as the recommended ILS or the development of the areas on the west side (logistics center and technology park) or that change the location of lights such as the realigned taxiways. For these projects an assessment of the potential for visual impact will be conducted prior to construction.

7.2.13 Water Resources:

None of the projects are expected to impact floodplains, surface water resources or wild and scenic rivers. Since no surface waters are anticipated to be impacted, Hydraulic Project Approvals from the Washington State Department of Fish and Wildlife are not anticipated to be necessary. However, each project design will be analyzed to confirm this premise.

7.2.14 Wetlands:

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 projects that include land that is not already paved/graveled.

Compliance with Sections 401 and 404 of the Clean Water Act will need to be assured prior to construction approval. In addition, impacts to wetlands will also have to be permitting by the local jurisdiction under their critical areas code. Impacts to wetlands will likely require mitigation, which will be determined on a project-by-project basis.

Several of the recommended projects have the potential to impact wetland areas. These are depicted on Error! Reference source not found. and include

- Runway Safety Area (RSA) Improvements
- Complete interior service road
- Improve perimeter fencing and add wildlife fence on the west side of the airport
- Develop Remain Over Night (RON) area for commercial aircraft
- Expand terminal capacity

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.

7.2.15 Cumulative Impacts

The cumulative impacts of the airport development plan have not been assessed in this master plan. Future NEPA environmental actions will include this assessment.

8 Airport Layout Plan

8 Airport Layout Plan

8.1 Introduction

The material contained in this chapter describes and graphically depicts both existing conditions and the recommended Capital Improvement Plan (CIP) for the Bellingham International Airport (BLI). The Master Plan generated CIP covers a period of 20 years (2017 through 2037) and is based on increased demand levels from Chapter 4, Forecast of Aviation demand, FAA Design Criteria and Port of Bellingham direction, goals or aspirations. All of the recommendations reflect input received over the course of the planning process from the airport staff, Federal Aviation Administration (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 this master plan are reflected in the recommendations described herein.

The five primary functions of the Airport Layout Plan (ALP) set are:

1. An approved ALP is necessary for the airport to receive financial assistance under the terms of the Airport and Airway Improvement Act of 1982 (AAIA), as amended, and to be able to receive specific Airport Improvement Program (AIP) Funds and Passenger Facility Charge (PFC) funding. An airport must keep its ALP current and follow that plan, since this is one of the grant assurance requirements of the AAIA.
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, meet safety requirements, and are 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 and the community to protect the airspace required for facility or approach procedure improvements.
5. The ALP is intended to be a working tool for the Airport staff and the Port of Bellingham.

The ALP drawing set for BLI contains a series of inter-related drawings providing details on development recommendations. These are planning drawings and are not intended to provide design engineering accuracy. The following sixteen sheets make up the ALP set:

- Sheet 1: Title Sheet
- Sheet 2: Data Sheet
- Sheet 3: Airport Layout Plan
- Sheet 4: Airspace Plan – Runway 16/34
- Sheet 5: Airspace Plan – Outer Approach, Runway 16
- Sheet 6: Airspace Plan – Outer Approach, Runway 34
- Sheet 7: Inner Approach Surface, Runway 16
- Sheet 8: Inner Approach Surface, Runway 34
- Sheet 9: Runway Departure Surface, Runway 16/34
- Sheet 10: Obstruction Data – Table 1
- Sheet 11: Obstruction Data – Table 2
- Sheet 12: Terminal Area Plan
- Sheet 13: General Aviation Area Plan
- Sheet 14: On-Airport Land Use Plan
- Sheet 15: Airport Community Land Use Plan
- Sheet 16: Airport Property Map (Exhibit 'A')

These plan sheets are found at the end of this chapter.

8.2 Title Sheet

The Title Sheet, (Sheet 1), serves as an introduction to the Airport Layout Plan (ALP) drawing set, providing an index of the 16 drawings.

8.3 Airport Data Sheet

Sheet 2, The Airport Data Sheet, is a companion drawing to the Airport Layout Plan providing the Airport and Runway Data information that are important in determining and assessing the airport's design category and provides information related to the development recommendations. Other information on the data sheet includes wind information, airport location and vicinity maps, a list of any non-standard conditions at the airport, a list of agreed upon Modifications to Standards and a runway declared distance table.

8.4 Airport Layout Plan

The Airport Layout Plan, Sheet 3, depicts both existing airport facilities and the airside and landside projects that have been recommended for the 20-year planning period. These are summarized as follows;

8.4.1 Airfield Projects

Airfield improvements recommended at BLI are intended to increase airport operational safety through projects that eliminate non-standard conditions and support continued safe and efficient operations including;

- Bringing the Runway Safety Area (RSA) for Runway 16 into compliance with FAA standards.
- Constructing runway shoulders that are compliant with standards the full length of Runway 16/34.
- Constructing paved blast pads on both runway ends.
- Removing obstructions to approaches or Part 77-Surfaces.
- Realigning exit taxiways to facilitate safer and more efficient operations.
- Completing the interior service road.
- Improving perimeter fencing and adding wildlife fencing on the west side of the airport.
- Preserving the ability to install an Instrument Landing System (ILS) on Runway 34.
- Relocating the Airport Traffic Control Tower (ATCT).

8.4.2 Terminal Area Projects

Projects recommended for the terminal area are driven by the number of commercial passengers, and the special needs of the airlines and other terminal users. These include;

- Developing Remain Over Night (RON) parking for commercial service aircraft
- Expanding terminal capacity should additional airlines request service. Passenger demand is not expected to require additional terminal space for more than 20-years.
- Adding a Rental Car Quick Turnaround Facility (QTA)

8.4.3 General Aviation (GA) Area Projects

The master plan includes provisions for the continued growth of general aviation facilities. A summary of the recommendations includes;

- Providing sufficient land for new GA Hangars
- Providing area for Fixed Base Operator (FBO) expansion
- Constructing a new Snow Removal Equipment (SRE) Building
- Relocating and Expanding the Fuel Farm
- Reserving west side property for potential logistics center development or Technical Center development should demand arise.

8.4.4 Sustainability Projects

Several projects are recommended that are intended to reduce the airports environmental footprint and improve the overall efficiency of airport operations. These are;

- Replacing all airfield lighting with LED systems

- Developing solar energy systems to move the airport "off-grid"
- Installing additional e-car charging stations
- Converting Port-owned Ground Service Equipment (GSE) to electric vehicles and encouraging tenants to do likewise.

8.5 Airspace Plans

Eight drawings have been included in the ALP set to analyze the airport's airspace. These drawings have used data generated in the AGIS data collection effort to supplement other sources in order to identify potential obstructions to the airspace that could affect operations. The drawings include the FAR Part 77-Imaginary Surfaces Plans, and the inner approach and departure surface showing detailed obstruction maps, and two sheets containing detailed data on the objects within the airspace. These are described as follows.

8.5.1 FAR Part 77 Imaginary Surfaces Plan(s)

Three drawings are included to depict the Part 77 surfaces associated with Runway 16/34 (Sheets 4, 5, and 6). The five surfaces included in Part 77 are the primary, approach, transitional, horizontal, and conical surfaces.

Primary Surface

The primary surface is an imaginary surface longitudinally centered on the runway and extending 200 feet beyond each runway end. The elevation of any point on the primary surface is equal to the elevation of the nearest point on the runway centerline. The width varies, depending on the type of approach available. For BLI, Runway 16 has a precision instrument approach with visibility minimums less than ½ mile but more than ¼ 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 extends 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 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.

It is recommended that the approach to Runway 34 be upgraded to precision standards. The approach surface would then be up-sized to 1,000 feet wide where it intersects with the primary surface and would expand uniformly for a distance of 10,000 feet at a slope of 50:1. It would then continue outward and upward for an additional 40,000 feet at a slope of 40:1 where the final width is 16,000 feet.

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.

8.5.2 INNER APPROACH AND DEPARTURE SURFACES

Sheets 7 and 8 present the inner approach surfaces for Runways 16 and 34 respectively and Sheet 9 presents the departure surfaces for Runway 16/34. These drawings depict the critical inner portions of the approach and departure zones for each runway end. Existing and potential obstructions have been identified on these sheets and are noted on Data Sheets 10 and 11 with the proposed disposition of any obstructions noted. As shown on the Data Sheets, the GIS survey identified 245 obstructions to the Part 77 Surfaces that may have impact on the approach capabilities at BLI.

Each obstruction on these sheets is identified by location, elevation and impact on Part 77 Surfaces. In addition, an Obstruction Removal Plan has been shown on the table showing which obstructions have been removed, which should be removed, which will remain, and those where no future actions have been identified.

8.6 TERMINAL AREA PLAN (TAP)

The focus of Sheet 12 is the passenger terminal building, aircraft parking positions, terminal access roadways and curb frontage, 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. Although the demand forecasts do not project sufficient passengers to require an increase in terminal capacity within the master plan forecast period, the TAP shows the potential direction for a future terminal expansion should demand grow at a faster pace than predicted or should an airline request additional terminal space.

Terminal support facilities shown on the TAP include public parking lots, a consolidated rental car facility with future Quick Turnaround (QTA) facility, the ATCT, GA Terminal, Fuel Far, and existing GA hangars.

8.7 GENERAL AVIATION AREA PLAN

The General Aviation Plan is shown on Sheet 13. Existing general aviation facilities that are located on the existing apron are depicted on the drawing. The recommended facility development for general aviation functions and services consists of the following:

- Identifying area sufficient to provide for new FBO facilities.
- Providing sufficient space for future GA development.
- Constructing a new Snow Removal Equipment (SRE) storage building.
- Designating an area for rerouting Williamson Way

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. After this is complete the area further south will be developed followed by the rerouting of Williamson Way and subsequent expansion of GA development eastward.

The General Aviation Area Plan also shows the potential for development to occur on the airport's west side should demand materialize. The plan shows potential logistics center development as well as the location and possible layout for a technology center.

8.8 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 14 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.

8.8.1 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.

8.8.2 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.)

8.8.3 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.

8.9 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 ensure that similar airport compatibility provisions are adopted in the Bellingham zoning code.

Sheet 15 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 4, 5, 6, 7, and 8), 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.

8.10 AIRPORT PROPERTY MAP

The Airport Property Map is shown on Sheet 16. 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.

9 Implementation Plan

9 Implementation Plan

9.1 Introduction

In this chapter the airport improvements that have been presented in previous chapters are organized into an overall 20-year Airport Capital Improvement Program (CIP). The CIP was developed by balancing the needs for capital improvement projects against the competing, and sometimes conflicting financial priorities represented by annual airport operating and maintenance costs.

The items listed in this CIP are limited to those where the Port has the responsibility for implementation. Some recommendations discussed in the plan, such as new Fixed Base Operator (FBO) facilities or privately developed aircraft hangars as well as the large-scale cargo logistics facility and innovation/technology campus planned on the west side, 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 they are outside the CIP process. The implementation period for the CIP covers the three phases of development through the year 2037:

- Phase I: Encompasses the short-term period from 2019 through 2023.
- Phase II: Encompasses the midterm 5-year period from 2024 through 2028.
- Phase III: Encompasses the long-term period from 2029 through 2037.

Projects are assigned to a time phase based on forecast activity levels or because they are necessary precursors to achieving long-term development goals. Actual timing of the individual projects will depend on the availability of funding as well as actual realized demand. Table 8.1 shows the projects that are included in the master plan. This table includes information on the reason behind the inclusion of the project. These include;

- Safety: Projects that have been identified as necessary to ensure safe operations. These projects are identified as needed based on compliance with FAA Design Criteria.
- Design Standards: Projects that are driven by the FAA Design Standards as found in AC 150/5300-13A.
- Security: Projects that are required to maintain a secure airport.
- Customer Service: Projects that are being included to raise the customer service levels at the airport.
- Sustainability: Projects that are intended to enhance the sustainability of the airport in line with the Port's strategic vision.
- Demand: These projects are recommended in response to aviation activity demand levels. The phasing of these projects is based on the forecasts contained in Chapter 4 but actual implementation will depend on achieving the forecast numbers.
- Planning: Projects that are required to assure an on-going planning process that is reactive to changes in demand at the airport.

Table 9-1: Proposed Project Phasing

Project	Project Driver	Phase I	Phase II	Phase III	Beyond 20-Years
Airfield					
RSA Environmental Analyses	Safety	X			
RSA Final Design and Construction	Safety	X			
Remove obstructions to RSA	Safety	X			
Construct runway shoulders	Design Standards			X	
Add Runway blast pads	Design Standards			X	
Realign exit taxiways	Safety/Design Standards		X		
Install ILS on Runway 34	Customer Service				X
Replace perimeter fencing with wildlife fencing	Security	X			
Complete interior perimeter service road	Safety		X		
Sustainability Projects					
Replace airfield lighting with low energy LED	Sustainability		X		
Install additional e-car charging stations	Sustainability		X		
Convert GSE to electrical power	Sustainability		X		
Develop solar energy farm	Sustainability		X		
Terminal Area Projects					
Develop RON parking capability	Demand		X		
Expand terminal capacity - on demand	Demand				X
Add RAC QTA Facility	Customer Service	X			
General Aviation Facilities					
Provide land parcels for GA development	Demand	X			
Develop Logistics Center	Demand/Customer Service			X	
Develop Technology Center on West Side	Demand				X
Other Projects					
Relocate and expand fuel farm	Demand/Customer Service	X			
Construct new SRE Building	Design Standards			X	
Purchase Snow Removal Equipment	Safety			X	
Miscellaneous					
Airport Master Plan Update	Planning		X	X	
EA For MP Projects	Planning	X	X	X	
Pavement Maintenance	On-going	X	X	X	

9.2 Estimates of Probable Cost

The next step in developing the implementation plan is to prepare an estimate of the probable cost for each individual project. These estimates have been prepared at a planning level detail with quantities estimated from data presented in Chapter 5 - 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 Western Washington. All costs are based on 2018 prices.

The cost estimates summarize total project costs and include sales taxes (8.7 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.

9.3 Potential Funding Sources

The overall cost of the recommended improvements will exceed $50 million over the implementation period. To fund these projects, the Port will use a combination of FAA Airport Improvement Program (AIP) entitlement funds, Passenger Facility Charge (PFC) and possibly discretionary grants, airport revenues, and continued financial support from the Port of Bellingham. The funding sources that will serve as the airport's primary means to finance the projects are discussed in the following sections.

9.3.1 FAA AIP Grants

The Port receives annual entitlement grants from the FAA through the Airport Improvement Program (AIP). AIP entitlement grants are allocated using a formula based on the number of annual enplaned passengers using the airport. 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 terminal buildings 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.

BLI is also eligible to receive AIP discretionary grants. The approval of AIP discretionary funding for a project is dependent on an FAA eligibility ranking method used to award grants, at the FAAs 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.

9.3.2 Port Funding through Passenger Facility Charge (PFC)

The Aviation Safety and Capacity Expansion Act of 1990 established the authority for commercial service airports to apply to the FAA for implementation of 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 or 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 such as airport generated revenues.

9.3.3 Private Financing

Airports usually 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 general aviation 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 projects such as development of aircraft hangars and the improvements needed to support such hangar development, development of a logistics center or technology park on the airport's west side, a new fuel farm and distribution center and a quick turn-around facility for the rental cars. 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 as approved by the FAA. Should the Port decide to construct these facilities, it is assumed that they will lease them 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.

9.4 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 terminal expansion and new hangar construction. Although the CIP attaches timeframes to these developments for scheduling purposes, they will not be constructed until demand materializes. Therefore, certain forecasted improvements may be accelerated or delayed based on demand and activity levels.
- 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 8-2, Table 8-3, and Table 8-4 show the estimated cost of the Capital Improvement Projects. Figure 8-1, Figure 8-2, and Figure 8-3 identifies the locations of the individual projects in numerical order. The Airport Layout Plan (ALP), presented in Chapter 7, Airport Layout Plan, incorporates all of the projects reflected in this Implementation Plan.

Table 9-1: Phase I Capital Improvement Projects

Project	Cost	Federal	Port
Runway Shoulders and Blast Pads - Design	$900,000	$810,000	$90,000
Perimeter Road - Design	$400,000	$360,000	$40,000
Environmental Study of Master Plan	$250,000	$225,000	$25,000
RSA Compliance - Environmental Study	$100,000	$90,000	$10,000
RSA Compliance – Design and Land Acquisition	$505,000	$454,500	$50,500
RSA Compliance - Construction	$950,000	$855,000	$95,000
Relocation of Exit Taxiways - Design	$236,000	$212,400	$23,600
Relocation of Exit Taxiways - Construction	$2,000,000	$1,800,000	$200,000
Convert Airfield Lights & Signs To LED	$2,000,000	$1,800,000	$200,000
Convert Terminal Apron Lights To LED	$200,000	$180,000	$20,000
QTA Facility	$2,229,500	$0	$2,229,500
Landside Solar Project	$4,500,000	$0	$4,500,000
Electric Vehicle Charging Stations	$56,838	$0	$56,838
Snow Removal Equipment	$783,163	$704,847	$78,316
Pavement Maintenance	$250,000	$0	$250,000
GA Expansion	$16,500,000	$14,850,000	$1,650,000
Total Phase I	$32,175,501	$22,625,247	$9,550,254

- Runway shoulder and blast pads are eligible for AIP funds.
- The airport perimeter road is eligible for AIP funds.
- The environmental study of the master plan recommendations is eligible for AIP funds.
- The Runway Safety Area compliance actions (Environmental, design, and construction) are required to meet FAA criteria. They are therefore eligible for AIP funding.
- The relocation of the exit taxiways is required to eliminate the potential for runway incursions and to meet FAA Criteria. They are eligible for AIP funding.
- Converting the airfield lighting is being done to replace existing aging lighting and signs. The project is therefore eligible for AIP funding.
- Converting the terminal apron lights to LED will be done as existing lighting has aged out. This purchase is eligible for AIP funding.
- Constructing a QTA facility will be paid for from local funds using a customer facility charge.
- GA expansion consists of site preparation to enable land to be available for private development. This is not eligible under AIP and will be paid for by the hangar developer.
- The Solar Project and the electric vehicle charging stations will be financed with local funds.
- Purchase of the snow removal equipment will be eligible for FAA AIP funding
- Pavement maintenance is not eligible for AIP funding but is required nonetheless. It is assumed that the amount shown herein will be Port funded.
-

Figure 9-1: Phase I Capital Improvements

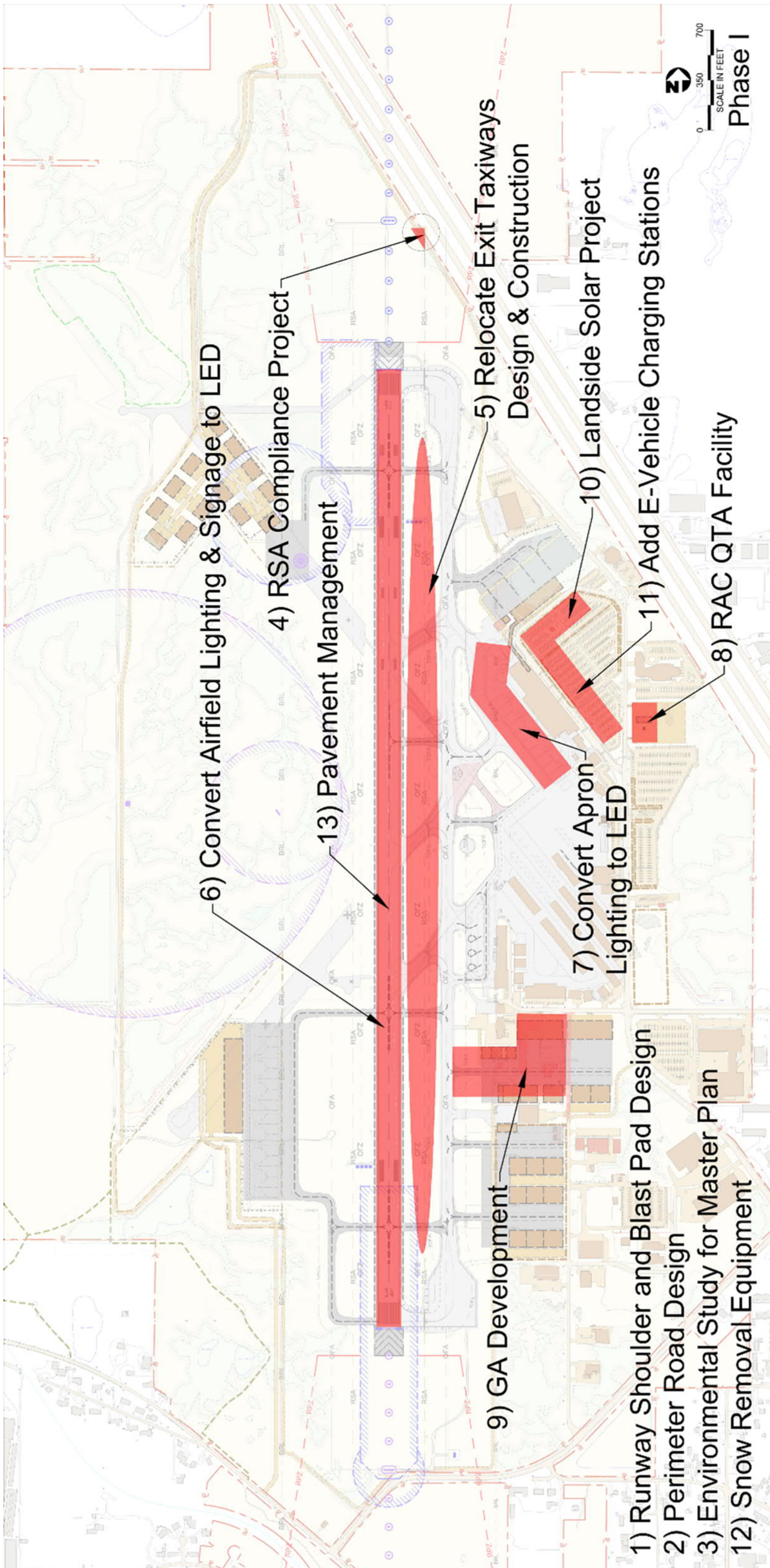


Table 9-2: Phase II Capital Improvement Projects

	Total Cost	Federal	Port
Runway Shoulders and blast pads - construction	$614,500	$553,050	$61,450
Perimeter Road - Construction	$1,975,000	$1,777,500	$197,500
Perimeter Fencing	$2,275,000	$2,047,500	$227,500
Install additional e-car charging stations	$1,000,000	$900,000	$100,000
Convert GSE to electrical power	$1,500,000	$1,350,000	$150,000
Develop RON parking capability	$7,200,000	$6,480,000	$720,000
Construct new SRE Building	$12,000,000	$10,800,000	$1,200,000
Airport Master Plan Update	$600,000	$540,000	$60,000
EA For MP Projects	$225,000	$202,500	$22,500
Pavement Maintenance	$250,000	$0	$250,000
GA Expansion	$1,600,000	$0	$1,600,000
Total Phase II	$29,014,500	$25,888,050	$3,126,450

- Runway shoulder and blast pads are required to meet FAA design criteria and are eligible for AIP funds.
- The airport perimeter road is required to meet FAA design criteria and are eligible for AIP funds.
- Replacing the perimeter fencing is required to meet FAA criteria and is eligible for AIP funds for 90% of project costs.
- Converting GSE to electrical power, developing solar energy capabilities and adding e-charging capabilities are projects designed to meet sustainability goals. Currently these are not eligible for AIP funds.
- The cost of the RON apron is eligible for AIP funding but eligibility is dependent on demand.
- The costs of a new building to house and protect snow removal equipment is eligible for AIP funds at 90% of project costs.
- A Master Plan Update is recommended for airports operating in a dynamic area such as Bellingham. The cost of this planning and the associated environmental elements is AIP eligible.
- Pavement maintenance is not eligible for AIP funding but is required nonetheless. It is assumed that the amount shown herein will be Port funded.

Figure 9-2: Phase II Capital Improvements

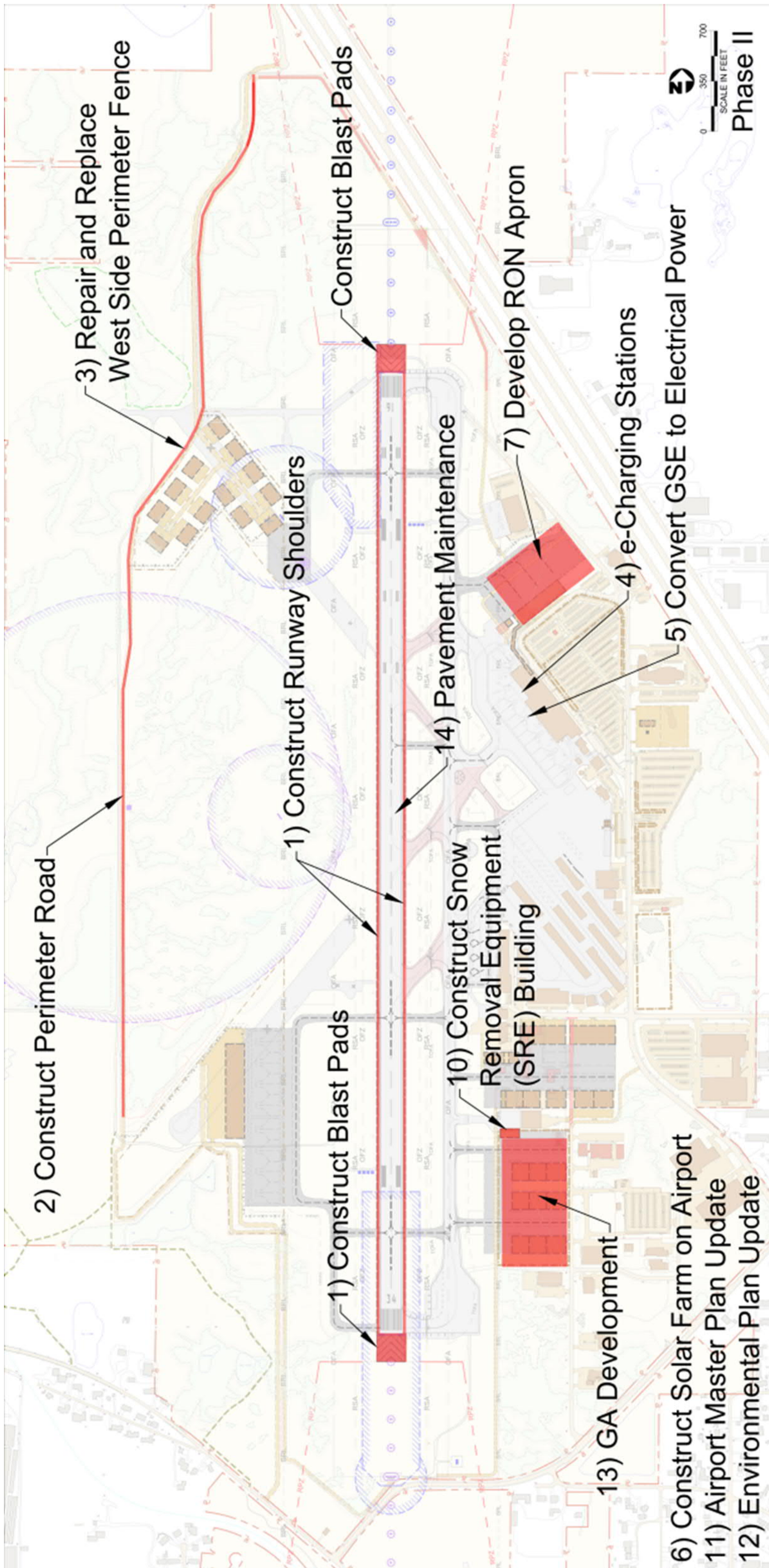
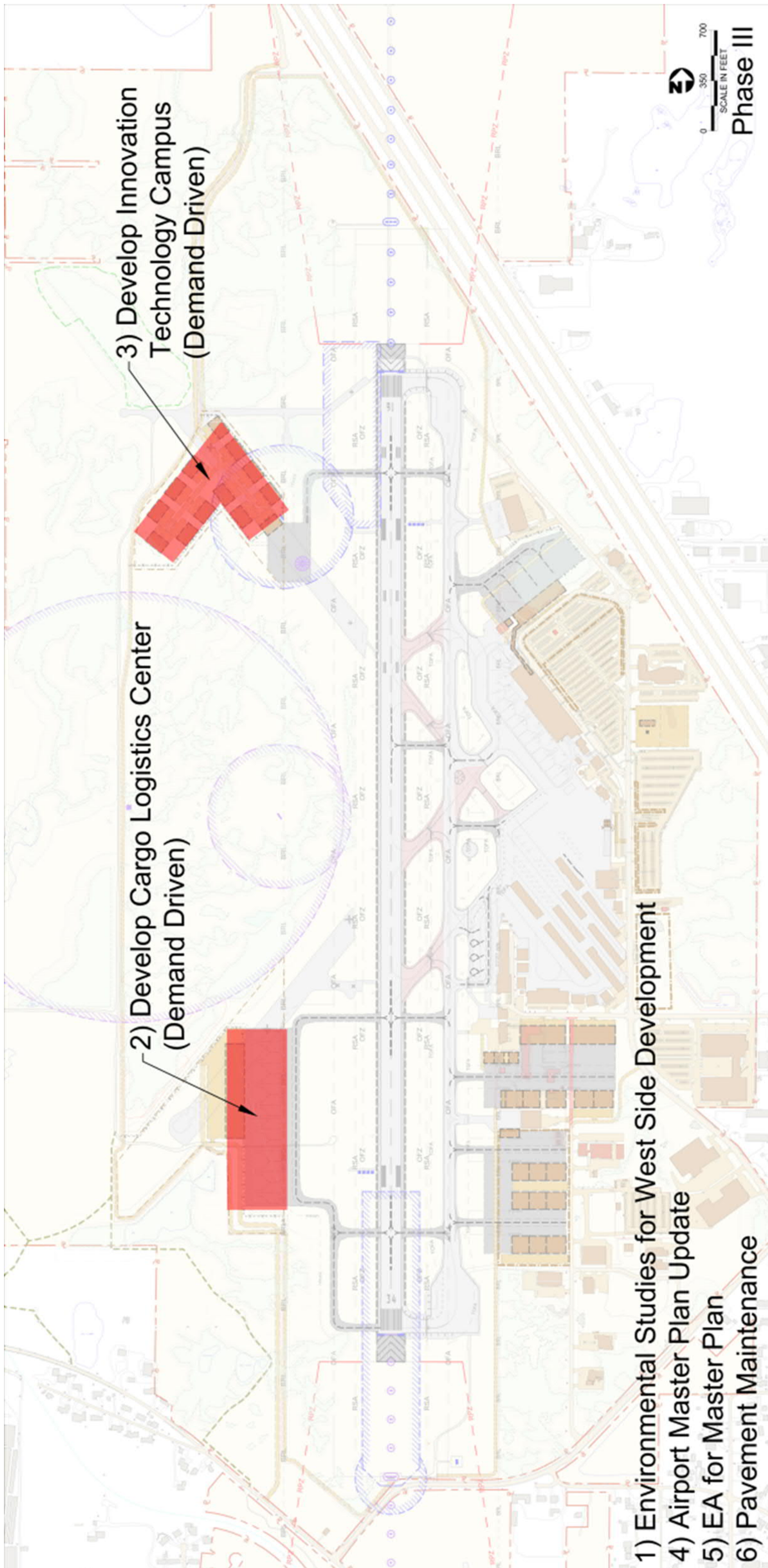


Table 9-3: Phase III Capital Improvement Projects

	Total Cost	Federal	Port
Environmental studies for west side development	$3,000,000	$2,700,000	$300,000
Site Development - Cargo Logistics Facility	$2,500,000	$0	$2,500,000
Site Development - Innovation/Technology Campus on West Side	$2,500,000	$0	$2,500,000
Airport Master Plan Update	$750,000	$675,000	$75,000
EA For MP Projects	$350,000	$315,000	$35,000
Pavement Maintenance	$250,000	$0	$250,000
Total	$9,575,000	$3,892,500	$5,682,500

- Developing the land for a logistic and/or technology center on the west side will be a developer expense as these areas will not be eligible for AIP funds.
- A Master Plan Update is recommended for airports operating in a dynamic area such as Bellingham. The cost of this planning and the associated environmental elements is AIP eligible.
- Pavement maintenance is not eligible for AIP funding but is required nonetheless. It is assumed that the amount shown herein will be Port funded.

Figure 9-3: Phase III Capital Improvements

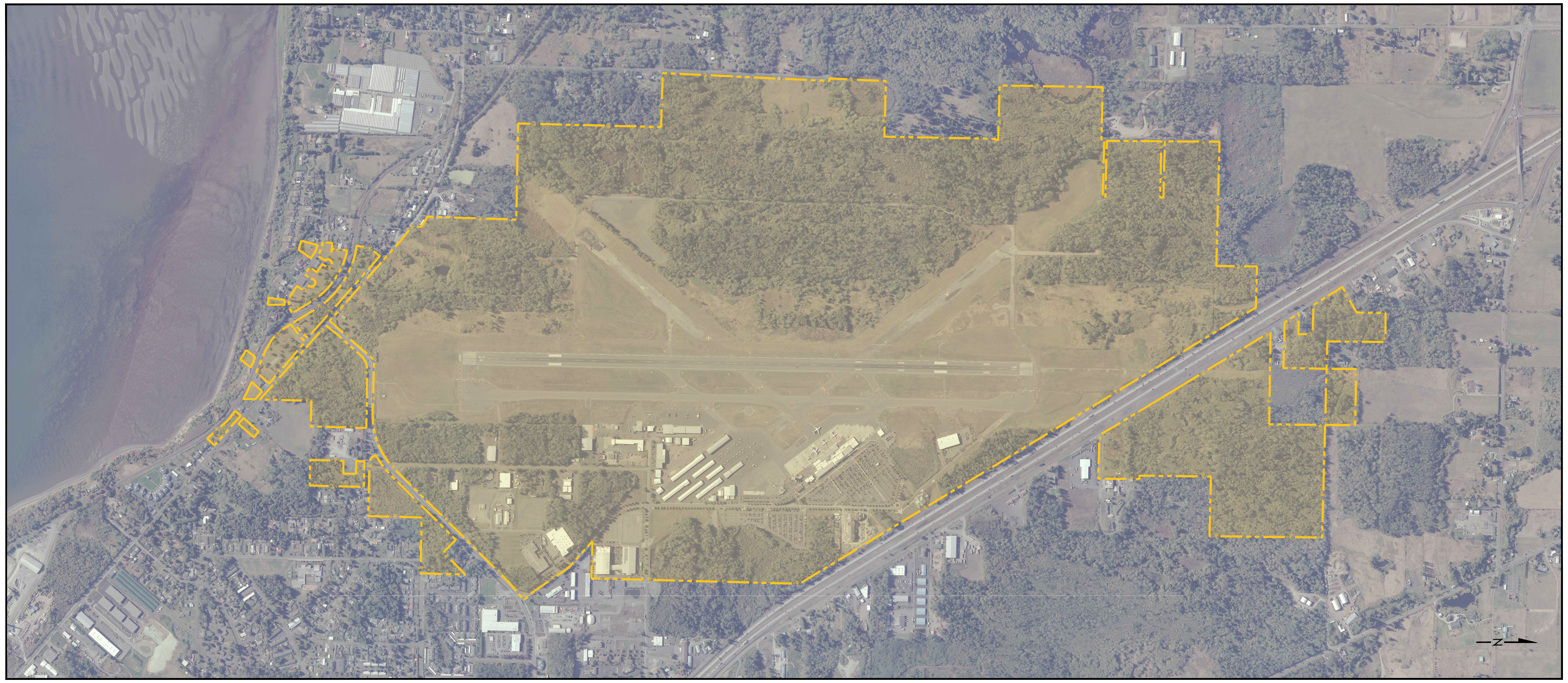


The preceding information depicts the phased development of BLI and includes all projects, regardless of the likely funding source. Table 9-4 shows the airport CIP including only those projects that are AIP eligible or are to be funded solely by the Port of Bellingham. This information is presented in the format preferred by FAA for capital improvement planning within the agency.

Table 9-4: Airport CIP

	Cost		Short Term Phase I					Intermediate Term Phase II					Long Term Phase III
Project	AIP Eligible	Port Funded	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029 - 2037
Runway Shoulders and blast pads - design	$810,000	$90,000					$900,000						
Perimeter Road - Design	$360,000	$40,000					$400,000						
Environmental Study of master plan	$225,000	$25,000	$250,000										
RSA Compliance - Environmental Study	$90,000	$10,000	$100,000										
RSA Compliance – Design and Land Acquisition	$454,500	$50,500	$505,000										
RSA Compliance - Construction	$855,000	$95,000		$950,000									
Relocation of Exit Taxiways - Design	$212,400	$23,600			$236,000								
Relocation of Exit Taxiways - Construction	$1,800,000	$200,000				$2,000,000							
Convert Airfield Lights & Signs to LED	$1,800,000	$200,000				$2,000,000							
Convert Terminal Apron Lights to LED	$180,000	$20,000			$200,000								
QTA Facility	$0	$2,229,500	$371,000	$1,858,500									
Landside Solar Sustainability Project	$0	$4,500,000					$4,500,000						
Property Acquisition	$283,500	$31,500			$315,000								
Electric Vehicle Charging Stations	$0	$56,838	$56,838										
Snow Removal Equipment	$704,847	$78,316	$783,163										
Pavement Maintenance	$0	$750,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$50,000	$350,000
GA Expansion	$16,290,000	$1,810,000					$16,500,000					$1,600,000	
Runway Shoulders and blast pads - construction	$553,050	$61,450							$614,500				
Perimeter Road - Construction	$1,777,500	$197,500								$1,975,000			
Perimeter Fencing	$2,047,500	$227,500									$2,275,000		
Install additional e-car charging stations	$900,000	$100,000										$1,000,000	
Convert GSE to electrical power	$1,350,000	$150,000										$1,500,000	
Develop RON parking capability	$6,480,000	$720,000										$7,200,000	
Construct new SRE Building	$10,800,000	$1,200,000										$12,000,000	
Airport Master Plan Update	$540,000	$60,000										$600,000	
Environmental studies for west side development	$2,700,000	$300,000											$3,000,000
Site Development - Cargo Logistics Facility	$0	$2,500,000											$2,500,000
Site Development - Innovation/Technology Campus	$0	$2,500,000											$2,500,000
EA For MP Projects	$202,500	$22,500											$225,000
Airport Master Plan Update	$675,000	$75,000											$750,000
EA For MP Projects	$315,000	$35,000											$350,000
Annual Federal Cost (90%)			$1,474,347	$855,000	$675,900	$3,600,000	$16,020,000	$0	$553,050	$1,777,500	$2,047,500	$21,510,000	$3,892,500
Annual Port Cost (10%)			$641,654	$2,003,500	$125,100	$450,000	$6,330,000	$50,000	$111,450	$247,500	$277,500	$2,440,000	$5,782,500
Total Program	$52,405,797	$18,359,204	$2,116,001	$2,858,500	$801,000	$4,050,000	$22,350,000	$50,000	$664,500	$2,025,000	$2,325,000	$23,950,000	$9,675,000

*Red denotes Port funded only. All other costs are paid by Port at 10% total fee.



BELLINGHAM INTERNATIONAL AIRPORT

2019 Airport Layout Plan Drawing Set

AIP NUMBER: 3-53-0005-054

SHEET INDEX		
SHEET	SHEET TITLE	REV. DATE
1	TITLE SHEET	--/--/----
2	DATA SHEET	--/--/----
3	AIRPORT LAYOUT PLAN	--/--/----
4	AIRSPACE PLAN - RUNWAY 16/34	--/--/----
5	AIRSPACE PLAN - OUTER APPROACH, RUNWAY 16	--/--/----
6	AIRSPACE PLAN - OUTER APPROACH, RUNWAY 34	--/--/----
7	INNER APPROACH SURFACE, RUNWAY 16	--/--/----
8	INNER APPROACH SURFACE, RUNWAY 34	--/--/----

SHEET INDEX		
SHEET	SHEET TITLE	REV. DATE
9	RUNWAY DEPARTURE SURFACE, RUNWAY 16/34	--/--/----
10	OBSTRUCTION DATA - TABLE 1	--/--/----
11	OBSTRUCTION DATA - TABLE 2	--/--/----
12	TERMINAL AREA PLAN	--/--/----
13	GENERAL AVIATION PLAN	--/--/----
14	ON-AIRPORT LAND USE PLAN	--/--/----
15	AIRPORT COMMUNITY LAND USE PLAN	--/--/----
16	AIRPORT PROPERTY MAP (EXHIBIT 'A')	--/--/----

BLI - Sheet 01 (Title Sheet).dwg

AECOM
1111 3rd AVENUE, SUITE 1600
SEATTLE, WA 98101
PHONE: 206-438-2700

PROJECT MANAGER:	JY	DRAFTED BY:	RO
DESIGNED BY:	RO	CHECKED BY:	JY

#	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.

APPROVAL: PORT OF BELLINGHAM

Sunil Harman A.A.E., IAP / Director of Aviation   Date

PORT OF BELLINGHAM Washington State

BELLINGHAM INTERNATIONAL AIRPORT
AIRPORT MASTER PLAN

TITLE SHEET

SCALE:

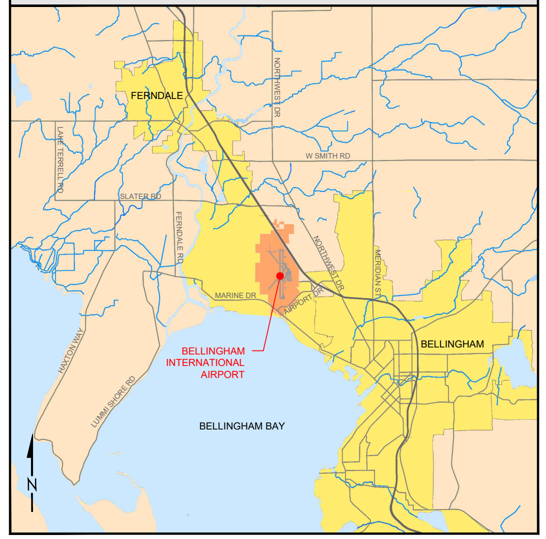
DATE: OCTOBER 2019

AIP NUMBER: 3-53-0005-054

SHEET NUMBER: 1 OF 16

AIRPORT LOCATION

AIRPORT VICINITY



AIRPORT DATA TABLE

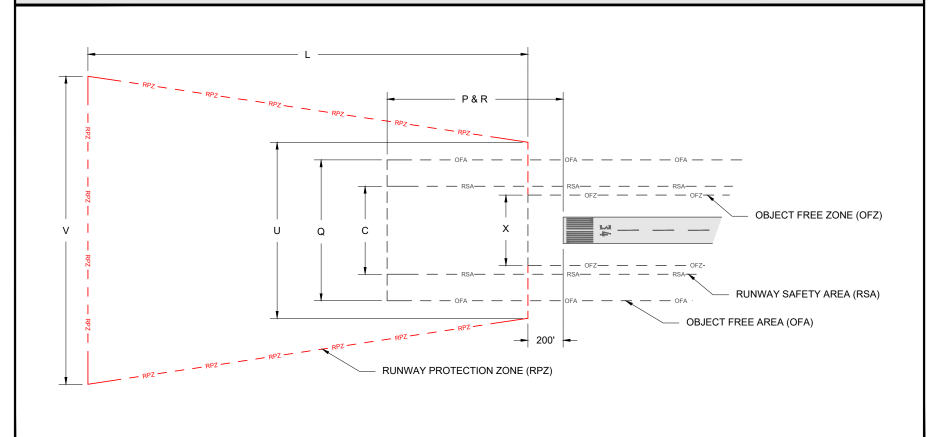
ITEM	EXISTING	FUTURE
AIRPORT TERMINAL CODE	BLI	N/C
AIRPORT REFERENCE CODE (ARC) FOR AIRPORT	D-III	N/C
MEAN MAX. TEMP. OF HOTTEST MONTH	71° F (AUGUST)	
AIRPORT ELEVATION (MSL)	170.0'	N/C
AIRPORT NAVIGATIONAL AIDS	ASOS, GPS, ILS, NDB, VOR	ASOS, ASR, GPS, ILS, NDB, VOR
AIRPORT REFERENCE POINT (ARP) LAT.	48° 47' 33.70" N	N/C
(NAD 83) LON.	122° 32' 15.10" W	N/C
CRITICAL AIRCRAFT (>500 ANNUAL OPERATIONS)	A319/B737-700	B737-900
MAGNETIC DECLINATION & YEAR	15°59' E ± 0°23' (JUNE 2018)	ANNUAL CHANGE: 0°09' W
COMBINED WIND COVERAGE	99.86% (16 KNOTS)	
NPIAS SERVICE LEVEL	COMMERCIAL SERVICE (CS)	N/C

RUNWAY DATA TABLE

ITEM	EXISTING RUNWAY 16 ACTUAL [STANDARD]	EXISTING RUNWAY 34 ACTUAL [STANDARD]	FUTURE RUNWAY 16 ACTUAL [STANDARD]	FUTURE RUNWAY 34 ACTUAL [STANDARD]
RUNWAY IDENTIFICATION	OTHER THAN UTILITY		N/C	
RUNWAY DESIGN CODE (RDC)	D-III		N/C	
RUNWAY REFERENCE CODE (RRC)	D/III/4000		D/III/4000	
PAVEMENT TYPE/TREATMENT	ASPHALT (GROOVED)		N/C	
PAVEMENT DESIGN STRENGTH (x1,000 LBS) SINGLE GEAR:	75		N/C	
DUAL GEAR:	160		N/C	
DUAL TANDEM GEAR:	250		N/C	
PAVEMENT DESIGN STRENGTH (PCN)	57/F/A/W/T		N/C	
EFFECTIVE RUNWAY GRADIENT *	0.2%		N/C	
PERCENT WIND COVEREAGE (16 KNOT)	99.86% [95%]		N/C	
RUNWAY DIMENSIONS WIDTH:	150' [150']	150' [150']	N/C	N/C
LENGTH:	6,701'	6,701'	N/C	N/C
DISPLACED THRESHOLD (DISTANCE/ELEVATION)	NONE	NONE	N/C	N/C
RUNWAY SAFETY AREA (RSA) *				
LENGTH BEYOND DEPARTURE END (R):	1,000' [1,000']	866' [1,000']	N/C	1,000' [1,000']
LENGTH PRIOR TO THRESHOLD (P):	866' [1,000']	1,000' [1,000']	1,000' [1,000']	N/C
WIDTH (C):	500' [500']	500' [500']	N/C	N/C
END COORDINATES (NAD 83): *				
LATITUDE:	48°48'06.750" N	48°47'00.633" N	N/C	N/C
LONGITUDE:	122°32'15.199" W	122°32'14.932" W	N/C	N/C
RUNWAY ORIENTATION	N 179°01'42" W (TRUE)		N/C	
RUNWAY LIGHTING	HIRL	HIRL	N/C	N/C
RUNWAY PROTECTION ZONE (RPZ)				
LENGTH (L):	2,500' [2,500']	1,700' [1,700']	N/C	2,500' [2,500']
INNER WIDTH (U):	1,000' [1,000']	1,000' 1,000']	N/C	N/C
OUTER WIDTH (V):	1,750' [1,750']	1,510' [1,510']	N/C	1,750' [1,750']
MARKING	PRECISION	NON PRECISION	N/C	PRECISION
14 CFR PART 77 APPROACH SLOPE	50:1	34:1	N/C	50:1
APPROACH TYPE	PRECISION	NON PRECISION	N/C	PRECISION
VISIBILITY MINIMUMS	≥1/4 NM	≥ 1 NM	N/C	≥ 1/4 NM
TYPE OF AERONAUTICAL SURVEY REQUIRED	VG	NVG	N/C	VG
RUNWAY DEPARTURE SURFACE	40:1	40:1	N/C	N/C
OBJECT FREE AREA (OFA)				
LENGTH BEYOND DEPARTURE END (R):	1,000' [1,000']	1,000' [1,000']	N/C	N/C
LENGTH PRIOR TO THRESHOLD (P):	1,000' [1,000']	1,000' [1,000']	N/C	N/C
WIDTH (Q):	800' [800']	800' [800']	N/C	N/C
OBSTACLE FREE ZONE (OFZ)	(NO OFZ OBJECT PENETRATIONS)			
WIDTH (X):	400' [400']	400' [400']	N/C	N/C
LENGTH BEYOND RW END:	200' [200']	200' [200']	N/C	N/C
THRESHOLD SITING SURFACE (TSS)	(NO TSS PENETRATIONS)		(NO TSS PENETRATIONS)	
	APRCH 50:1	APRCH 34:1	N/C	APRCH 50:1
NAVAIDS VISUAL:	PAPI, MALSR, REIL	PAPI, REIL	N/C	PAPI, MALSR, REIL
INSTRUMENT:	GPS, ILS/DME, RNAV, RNP	GPS, RNP	N/C	GPS, ILS/DME, RNP
TOUCHDOWN ZONE ELEVATION	162.5'	170.1'	N/C	N/C

* SEE NOTES THIS PAGE

RUNWAY PROTECTION



NOTE: SEE RUNWAY DATA TABLE FOR DIMENSIONS C, L, P, Q, R, U, V, AND X

ACRONYMS

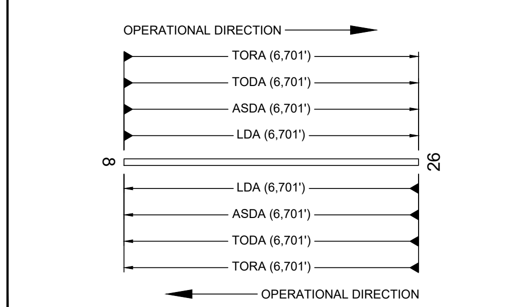
ITEM	DEFINITION
[F]	FUTURE
ADG	AIRPLANE DESIGN GROUP
ARC	AIRPORT REFERENCE CODE
ARFF	AIRCRAFT RESCUE FIRE FIGHTING
ARP	AIRPORT REFERENCE POINT
ASDA	ACCELERATE STOP DISTANCE AVAILABLE
ASOS	AUTOMATED SURFACE OBSERVING SYSTEM
ASR	AIRPORT SURVEILLANCE RADAR
ATCT	AIRPORT TRAFFIC CONTROL TOWER
BRL	BUILDING RESTRICTION LINE
DME	DISTANCE MEASURING EQUIPMENT
GPS	GLOBAL POSITIONING SYSTEM
HIRL	HIGH INTENSITY RUNWAY LIGHTS
ICE	IMMIGRATION AND CUSTOMS ENFORCEMENT
IFR	INSTRUMENT FLIGHT RULES
ILS	INSTRUMENT LANDING SYSTEM
LDA	LANDING DISTANCE AVAILABLE
MALSR	MEDIUM INTENSITY APPROACH LIGHTING SYSTEM WITH RUNWAY ALIGNMENT INDICATOR LIGHTS
MITL	MEDIUM INTENSITY TAXIWAY LIGHTS
MSL	MEAN SEA LEVEL
MWA	MAXIMUM WINGSPAN ALLOWABLE
N/A	NOT APPLICABLE
N/C	NO CHANGE
NDB	NON-DIRECTIONAL BEACON
NPI	NON-PRECISION INSTRUMENT APPROACH
NPIAS	NATL. PLAN OF INTEGRATED AIRPORT SYSTEMS
NVG	NOT VERTICALLY GUIDED
OFA	RUNWAY OBJECT FREE AREA

ACRONYMS

ITEM	DEFINITION
OFZ	RUNWAY OBJECT FREE ZONE
PAPI	PRECISION APPROACH PATH INDICATOR
PID	PERMANENT IDENTIFIER
PIR	PRECISION INSTRUMENT APPROACH
RAC	RENT-A-CAR
RDC	RUNWAY DESIGN CODE
REIL	RUNWAY END IDENTIFIER LIGHTS
RNAV	AREA NAVIGATION
RNP	REQUIRED NAVIGATION PERFORMANCE
RPZ	RUNWAY PROTECTION ZONE
RRC	RUNWAY REFERENCE CODE
RSA	RUNWAY SAFETY AREA
RVR	RUNWAY VISUAL RANGE
RVZ	RUNWAY VISIBILITY ZONE
RWY	RUNWAY
SRE	SNOW REMOVAL EQUIPMENT
TBD	TO BE DETERMINED
TDG	TAXIWAY DESIGN GROUP
TESM	TAXIWAY EDGE SAFETY MARGIN
TLN	TAXILANE
TODA	TAKE OFF DISTANCE AVAILABLE
TOFA	TAXIWAY OBJECT FREE AREA
TORA	TAKE OFF RUN AVAILABLE
TSA	TAXIWAY SAFETY AREA
TSS	THRESHOLD SITING SURFACE
TWY	TAXIWAY
VG	VERTICALLY GUIDED
VFR	VISUAL FLIGHT RULES
VOR	VERY HIGH FREQUENCY (VHF) OMNI-DIRECTIONAL RANGE

DECLARED DISTANCES

RUNWAY	TORA	TODA	ASDA	LDA
16	6,701'	6,701'	6,701'	6,701'
34	6,701'	6,701'	6,701'	6,701'



MODIFICATION TO STANDARDS

DATE	AIRSPACE CASE NO.	STANDARD MODIFIED	DESCRIPTION
-	NONE	NONE	NONE
-	-	-	-
-	-	-	-
-	-	-	-

NON-STANDARD CONDITIONS

ITEM	STANDARD	EXISTING	ULTIMATE
RUNWAY 16 SAFETY AREA (RSA) LENGTH BEYOND RWY END	1,000'	890'	1,000'
-	-	-	-
-	-	-	-
-	-	-	-

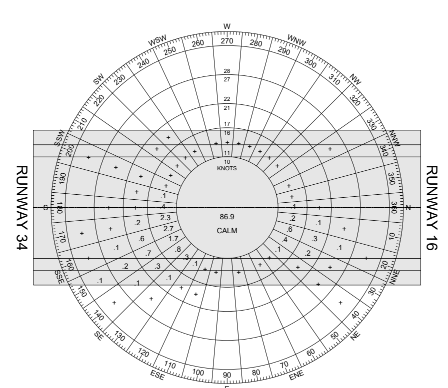
TAXIWAY DATA TABLE

TAXIWAY	ADG	TDG	WIDTH ACTUAL [STANDARD] TAXIWAY	SHOULDER	TESM	TSA	TOFA	SEPARATION FROM CENTERLINE * ACTUAL [STANDARD]	LIGHTING
A	III	3	75' [50']	12' [20']	10' [10']	171' [118']	259' [186']	148' [160'] - ICE APRON TLN (EXISTING) 273' [152'] - ICE APRON TLN (FUTURE) 340' [152'] - TWY F 181' [160'] - TWY H	MITL
B	III	3	102.5' [50']	12' [20']	25' [10']	118' [118']	186' [186']	N/A	MITL
C	III	3	70' [50']	12' [20']	10' [10']	118' [118']	186' [186']	N/A	MITL
D [1]	II	2	40' [35']	6' [15']	7.5' [7.5']	79' [79']	131' [131']	328.5' [105'] - TWY H	MITL
D [2]	III	3	60' [50']	12' [20']	10' [10']	118' [118']	186' [186']	N/A	MITL
E	III	3	70' [50']	12' [20']	10' [10']	118' [118']	186' [186']	N/A	MITL
F [3]	II	2	40', 48' [35']	0' [15']	7.5' [7.5']	79' [79']	186' [131']	N/A	MITL
F [4]	III	3	50', 80' [50']	12' [20']	10' [10']	118' [118']	186' [186']	340' [152'] - TWY A	MITL
G	III	3	75' [50']	12' [20']	10' [10']	118' [118']	186' [186']	N/A	MITL
H	III	3	60' [50']	0, 12' [20']	10' [10']	118' [118']	162' [162']	181' [160'] - TWY A 328.5' [152'] - TWY D	MITL MITL
J	II	2	40' [35']	12' [20']	10' [10']	79' [79']	131' [131']	N/A	MITL

[1] TAXIWAY D BETWEEN TAXIWAY A AND TAXIWAY F
[2] TAXIWAY D BETWEEN TAXIWAY A AND RUNWAY 16/34
[3] TAXIWAY F BETWEEN TAXIWAY A AND TAXIWAY H
[4] TAXIWAY F BETWEEN TAXIWAY A AND RUNWAY 16/34

* FOR TAXIWAY/TAXILANE SEPARATIONS, AC-150/5300-13A, TABLE 4-1 IS USED.
WHEN 180° TURN BETWEEN PARALLEL TAXIWAYS IS REQUIRED, DIMENSIONS IN TABLE 4-2 ARE USED.

ALL-WEATHER WIND ROSE

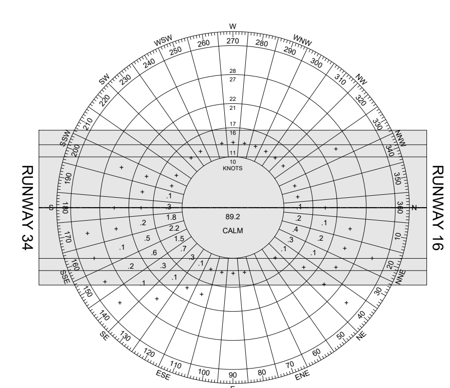


ALL-WEATHER (110,494 OBSERVATIONS)

CROSSWIND	RWY 16/34
10.5 KNOTS	98.51%
13 KNOTS	99.46%
16 KNOTS	99.89%
20 KNOTS	99.99%

NOAA WEATHER REPORTING STATION: 727976 BELLINGHAM, WA
OBSERVATION PERIOD: 2007 - 2016

VISUAL FLIGHT RULES WIND ROSE

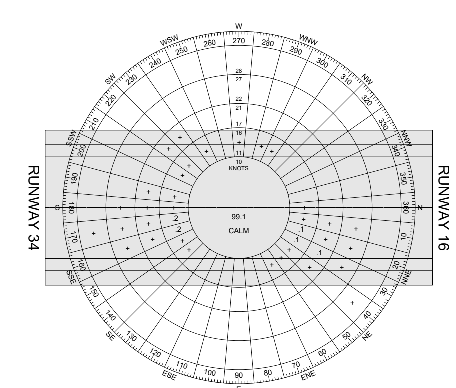


VFR (127,357 OBSERVATIONS)

CROSSWIND	RWY 16/34
10.5 KNOTS	98.73%
13 KNOTS	99.54%
16 KNOTS	99.90%
20 KNOTS	99.99%

NOAA WEATHER REPORTING STATION: 727976 BELLINGHAM, WA
OBSERVATION PERIOD: 2007 - 2016

INSTRUMENT FLIGHT RULES WIND ROSE



IFR (75,121 OBSERVATIONS)

CROSSWIND	RWY 16/34
10.5 KNOTS	99.97%
13 KNOTS	99.99%
16 KNOTS	100.0%
20 KNOTS	100.0%

NOAA WEATHER REPORTING STATION: 727976 BELLINGHAM, WA
OBSERVATION PERIOD: 2007 - 2016

SURVEY MONUMNETS

TYPE	PID	DESIGNATION	LATITUDE	LONGITUDE	ELEVATION
PACS	AA7394	BLI ARP	48° 47' 39.44693" N	122° 32' 17.40560" W	154.0' MSL
SACS	AA7393	BLI A2	48° 48' 05.81002" N	122° 32' 11.47539" W	159.0' MSL
SACS	AI0441	BLI D	48° 47' 00.05810" N	122° 32' 11.18904" W	164.3' MSL
-	-	-	-	-	-

NOTES

1. COORDINATE DATA IS BASED ON WASHINGTON STATE PLAN NORTH ZONE, HORIZONTAL DATUM IS NORTH AMERICAN DATUM OF 1983 (NAD83), VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NADV88).
2. RUNWAY MEETS LINE OF SIGHT REQUIREMENTS.
3. APPROXIMATELY 1,700 SF OF THE RUNWAY 16 END RSA IS NOT OWNED BY THE PORT AND THEREFORE NOT IN COMPLIANCE WITH FAA STANDARDS. ADDITIONALLY, THE MAXIMUM SLOPE OF GROUND TRANSITIONING TO THE OFF-PROPERTY AREA DOES NOT MEET STANDARDS WHICH REDUCES THE CURRENT USABLE RSA TO A LENGTH OF 890' INSTEAD OF THE STANDARD 1,000'.
4. SEE SHEETS 12, 13 AND 14 FOR DETAILS ON LANDSIDE DEVELOPMENT.
5. 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.
6. THERE ARE NO DECLARED DISTANCES USED OR PROPOSED.
7. THERE ARE NO THRESHOLD SITING SURFACE PENETRATIONS.
8. THERE ARE NO OBSTACLE FREE ZONE OBJECT PENETRATIONS.
9. RUNWAY PROTECTION ZONE CONTROL IS VIA OWNERSHIP EXCEPT FOR APPROXIMATELY 17.76 ACRES LOCATED WHERE INTERSTATE 5 PASSES THROUGH THE RUNWAY 16 RPZ AND THOSE PORTIONS OF RUNWAY 34 RPZ WHERE MARINE DRIVE, ALDERWOOD AVENUE, AND THE B.N.S.F. RAILROAD PASS THROUGH AS WELL AS APPROXIMATELY 0.77 ACRES IN THE SOUTHEAST CORNER OF THE ZONE.
10. TAXIWAY CENTERLINE TO AIRCRAFT PARKING/FIXED MOVABLE OBJECT SEPARATION DIMENSIONS ARE THE SAME AS TOFA DIMENSIONS AS LABELED.

APPROVAL:

FEDERAL AVIATION ADMINISTRATION APPROVAL
FAA SEATTLE AIRPORTS DISTRICT OFFICE

AECOM
1111 3rd AVENUE, SUITE 1600
SEATTLE, WA 98101
PHONE: 206-438-2700

PROJECT MANAGER:	JY	DRAFTED BY:	RO
DESIGNED BY:	RO	CHECKED BY:	JY

#	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.

APPROVAL: PORT OF BELLINGHAM

Sunil Harman A.A.E., IAP / Director of Aviation   Date

PORT OF BELLINGHAM
Washington State

BELLINGHAM INTERNATIONAL AIRPORT
AIRPORT MASTER PLAN

AIRPORT LAYOUT PLAN

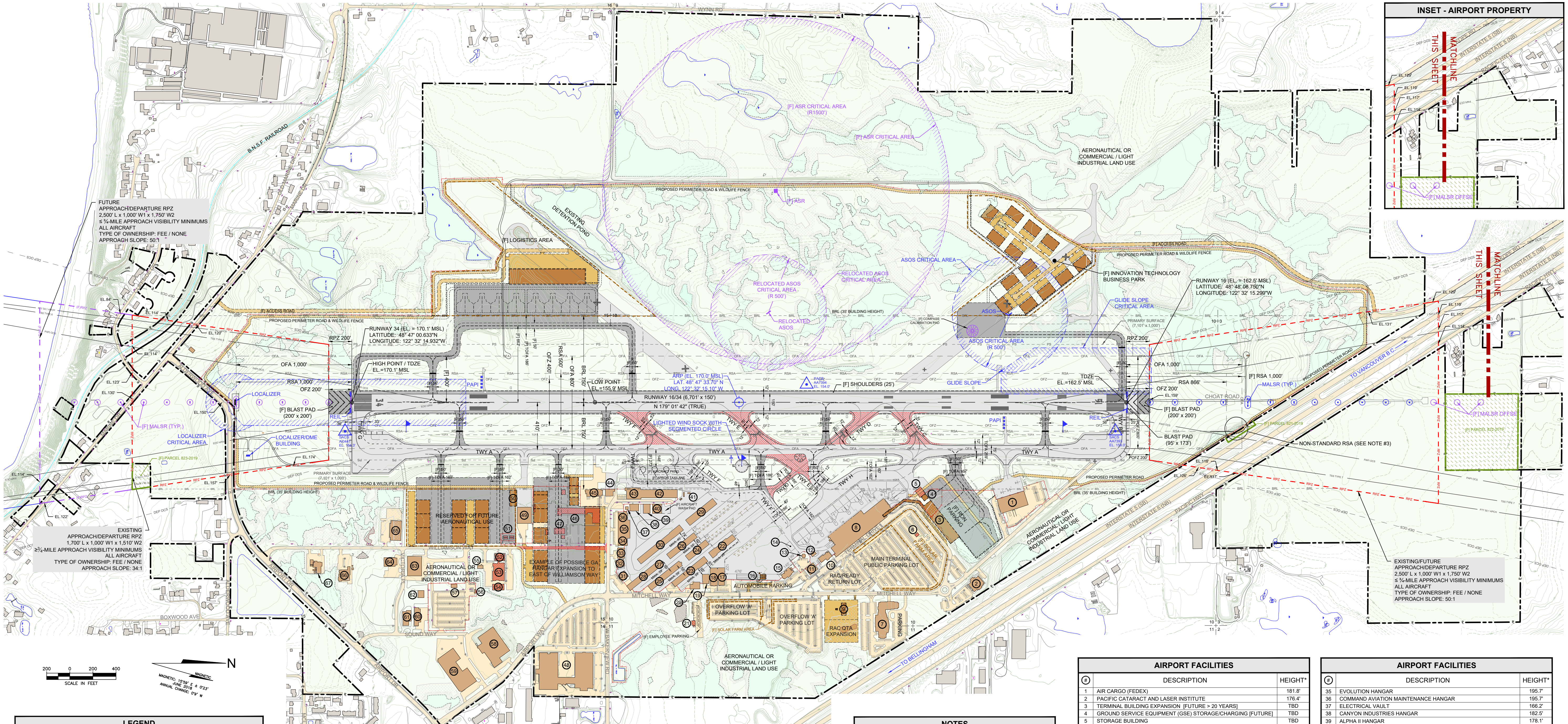
SCALE:

DATE: OCTOBER 2019

AIP NUMBER: 3-53-0005-054

SHEET NUMBER: 2 OF 16

BLI - Sheet 02 (Data Sheet).dwg



LEGEND

DESCRIPTION	EXISTING	PROPOSED
AIRCRAFT TIEDOWN POSITION		N/C
AIRFIELD PAVEMENT		
AIRPORT PROPERTY		
AIRPORT REFERENCE POINT (ARP)		N/C
ANEMOMETER		N/C
AUTOMOBILE PARKING		
BUILDING - OFF AIRPORT PROPERTY		N/C
BUILDING - ON AIRPORT PROPERTY		
BUILDING RESTRICTION LINE (BRL)	BRL	N/C
FENCE		
HOLDING POSITION MARKING		N/C
PRECISION APPROACH PATH INDICATOR (PAPI)	PAPI	N/C
ROADWAY		
RUNWAY END IDENTIFIER LIGHTS (REIL)		N/C
RUNWAY OBJECT FREE AREA (OFA)	OFA	N/C
RUNWAY OBJECT FREE ZONE (OFZ)	OFZ	N/C
RUNWAY PROTECTION ZONE (RPZ)	RPZ	(F)RPZ
RUNWAY SAFETY AREA (RSA)	RSA	N/C
SECTION/QUARTER SECTION CORNER		N/C
SURVEY MONUMENT		N/C
TAXIWAY OBJECT FREE AREA (TOFA)	TOFA	TOFA(F)
TO BE REMOVED	N/A	
TOPOGRAPHIC CONTOUR		N/C
WETLAND		N/C
WETLAND FILL	N/A	
WIND SOCK		N/C

ACRONYMS

ITEM	DEFINITION
[F]	FUTURE
ARFF	AIRCRAFT RESCUE FIRE FIGHTING
ARP	AIRPORT REFERENCE POINT
ASDA	ACCELERATE STOP DISTANCE AVAILABLE
ASOS	AUTOMATED SURFACE OBSERVING SYSTEM
ASR	AIRPORT SURVEILLANCE RADAR
ATCT	AIRPORT TRAFFIC CONTROL TOWER
BRL	BUILDING RESTRICTION LINE
GPS	GLOBAL POSITIONING SYSTEM
HIRL	HIGH INTENSITY RUNWAY LIGHTS
IFR	INSTRUMENT FLIGHT RULES
ILS	INSTRUMENT LANDING SYSTEM
LDA	LANDING DISTANCE AVAILABLE
MALSR	MEDIUM INTENSITY APPROACH LIGHTING SYSTEM WITH RUNWAY ALIGNMENT INDICATOR LIGHTS
MITL	MEDIUM INTENSITY TAXIWAY LIGHTS
MSL	MEAN SEA LEVEL
MWA	MAXIMUM WINGSPAN ALLOWABLE
N/A	NOT APPLICABLE
N/C	NO CHANGE
NDB	NON-DIRECTIONAL BEACON

ACRONYMS

ITEM	DEFINITION
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
RNP	REQUIRED NAVIGATION PERFORMANCE
RPZ	RUNWAY PROTECTION ZONE
RSA	RUNWAY SAFETY AREA
RVR	RUNWAY VISUAL RANGE
RVZ	RUNWAY VISIBILITY ZONE
SRE	SNOW REMOVAL EQUIPMENT
TBD	TO BE DETERMINED
TODA	TAKE OFF DISTANCE AVAILABLE
TOFA	TAXIWAY OBJECT FREE AREA
TORA	TAKE OFF RUN AVAILABLE
VFR	VISUAL FLIGHT RULES

APPROVAL:

FEDERAL AVIATION ADMINISTRATION APPROVAL
FAA SEATTLE AIRPORTS DISTRICT OFFICE

10/4/19
Manager, Seattle Airports District Office

NOTES

1. COORDINATE DATA IS BASED ON WASHINGTON STATE PLAN NORTH ZONE, HORIZONTAL DATUM IS NORTH AMERICAN DATUM OF 1983 (NAD83), VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NADV88).
2. RUNWAY MEETS LINE OF SIGHT REQUIREMENTS.
3. APPROXIMATELY 1,700 SF OF THE RUNWAY 16 END RSA IS NOT OWNED BY THE PORT AND THEREFORE NOT IN COMPLIANCE WITH FAA STANDARDS. ADDITIONALLY, THE MAXIMUM SLOPE OF GROUND TRANSITIONING TO THE OFF-PROPERTY AREA DOES NOT MEET STANDARDS WHICH REDUCES THE CURRENT USABLE RSA TO A LENGTH OF 890' INSTEAD OF THE STANDARD 1,000'.
4. SEE SHEETS 12, 13, AND 14 FOR DETAILS ON LANDSIDE DEVELOPMENT.
5. THE BUILDING RESTRICTION LINE (BRL) IS BASED ON A MAXIMUM BUILDING HEIGHT OF 35' 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.
6. THERE ARE NO DECLARED DISTANCES USED OR PROPOSED.
7. THERE ARE NO THRESHOLD SITING SURFACE PENETRATIONS.
8. THERE ARE NO OBSTACLE FREE ZONE OBJECT PENETRATIONS.
9. RUNWAY PROTECTION ZONE CONTROL IS VIA OWNERSHIP EXCEPT FOR APPROXIMATELY 17.76 ACRES LOCATED WHERE INTERSTATE 5 PASSES THROUGH THE RUNWAY 16 RPZ AND THOSE PORTIONS OF RUNWAY 34 RPZ WHERE MARINE DRIVE, ALDERWOOD AVENUE, AND THE B.N.S.F. RAILROAD PASS THROUGH AS WELL AS APPROXIMATELY 0.77 ACRES IN THE SOUTHEAST CORNER OF THE ZONE.
10. TAXIWAY CENTERLINE TO AIRCRAFT PARKING/FIXED MOVABLE OBJECT SEPARATION DIMENSIONS ARE THE SAME AS TOFA DIMENSIONS AS LABELED.

AIRPORT FACILITIES

#	DESCRIPTION	HEIGHT*
1	AIR CARGO (FEDEX)	181.8'
2	PACIFIC CATARACT AND LASER INSTITUTE	176.4'
3	TERMINAL BUILDING EXPANSION [FUTURE > 20 YEARS]	TBD
4	GROUND SERVICE EQUIPMENT (GSE) STORAGE/CHARGING [FUTURE]	TBD
5	STORAGE BUILDING	TBD
6	RENTAL CAR QUICK TURN AROUND (QTA) FACILITY [TO BE REMOVED]	TBD
7	HOLIDAY INN & SUITES BELLINGHAM	220.0'
8	TERMINAL BUILDING	196.0'
9	RENTAL CAR QUICK TURN AROUND (QTA) FACILITY [FUTURE]	TBD
10	INTERNATIONAL ARRIVALS (CUSTOMS)	172.3'
11	ALLEGIANT AIRLINES COMMISSARY	183.2'
12	WASH FACILITY/LAVATORY WASTE FACILITY	TBD
13	AIRPORT TRAFFIC CONTROL TOWER (ATCT)	231.0'
14	CUSTOMS INSPECTION BOX	-
15	GENERAL AVIATION TERMINAL	174.4'
16	FUEL FARM [FUTURE]	TBD
17	SAN JUAN AIRLINES HANGAR	179.6'
18	APOGEE HANGAR	179.6'
19	WHATCOM TERRITORY AERO SERVICES HANGAR	182.6'
20	CUSTOMS AND BORDER PROTECTION (CBP) MARINE HANGAR	177.9'
21	VACANT STRUCTURE [TO BE REMOVED]	168.0'
22	SOLAR HANGAR	174.3'
23	ALTO HANGAR	178.9'
24	NIMBUS HANGAR	175.6'
25	DELTA (PORT HANGAR)	175.3'
26	CIRRUS HANGAR	174.9'
27	SRE BUILDING	180.5'
28	ECHO (PORT HANGAR)	180.5'
29	HANGAR III	183.7'
30	STRATO HANGAR	179.3'
31	ROYER HANGAR	180.6'
32	BAYSIDE, LLC HANGAR	180.3'
33	TEK CONSTRUCTION HANGAR	178.8'
34	ANDERS HANGAR	195.7'

* ABOVE MEAN SEA LEVEL (MSL)

AIRPORT FACILITIES

#	DESCRIPTION	HEIGHT*
35	EVOLUTION HANGAR	195.7'
36	COMMAND AVIATION MAINTENANCE HANGAR	195.7'
37	ELECTRICAL VAULT	166.2'
38	CANYON INDUSTRIES HANGAR	182.5'
39	ALPHA II HANGAR	178.1'
40	ALPHA I HANGAR	189.9'
41	FBO's SELF-SERVICE FUEL	162.0'
42	LONETREE HANGAR	178.2'
43	DEPARTMENT OF HOMELAND SECURITY (DHS) OPERATIONS HANGAR	178.2'
44	COMMAND AVIATION HANGAR	178.3'
45	AIRCRAFT RESCUE FIRE FIGHTING (ARFF)	179.9'
46	AIR NATIONAL GUARD [TO BE REMOVED]	183.3'
47	AIR NATIONAL GUARD [TO BE REMOVED]	185.2'
48	WOODSTONE	221.3'
49	EAST PERCH, LLC. HANGAR	209.0'
50	SNOW REMOVAL EQUIPMENT (SRE) FACILITY [FUTURE]	TBD
51	FUEL FARM STORAGE TANKS [TO BE REMOVED]	187.1'
52	NATIONAL GUARD ARMORY [FOR LEASE]	204.7'
53	NATIONAL GUARD ARMORY [FOR LEASE]	TBD
54	NATIONAL GUARD ARMORY [FOR LEASE]	TBD
55	NATIONAL GUARD ARMORY [FOR LEASE]	TBD
56	VACANT [TO BE REMOVED]	TBD
57	PORT OF BELLINGHAM EQUIPMENT STORAGE	TBD
58	SOUND BEVERAGE DISTRIBUTION, INC.	213.6'
59	EMERGENCE OPERATIONS CENTER (EOC)	214.2'
60	B & P VENDING	TBD
61	WISE ENTERPRISES	TBD
62	VACANT	TBD
63	YAMAMOTO PROPERTIES, LLC.	220.4'
64	WISE ENTERPRISES	211.5'
65	JCKK MARK, LLC.	207.2'
66	WHATCOM COUNTY OFFICES	195.6'
67	THE PUGET HOUND	183.1'

AECOM
1111 3rd AVENUE, SUITE 1600
SEATTLE, WA 98101
PHONE: 206-438-2700

PROJECT MANAGER: JY | DRAFTED BY: RO
DESIGNED BY: RO | CHECKED BY: JY

#	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.

APPROVAL: PORT OF BELLINGHAM

Sunil Harman A.A.E., IAP / Director of Aviation — Date 10/3/2019

PORT OF BELLINGHAM Washington State

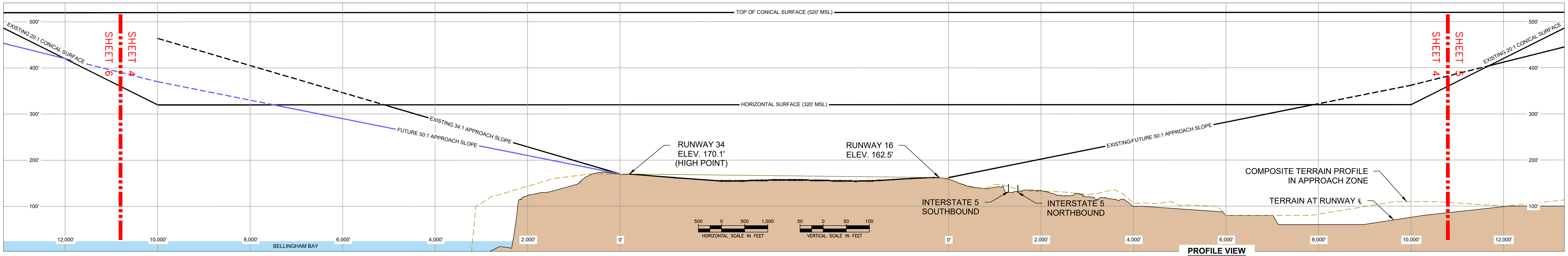
BELLINGHAM INTERNATIONAL AIRPORT
AIRPORT MASTER PLAN

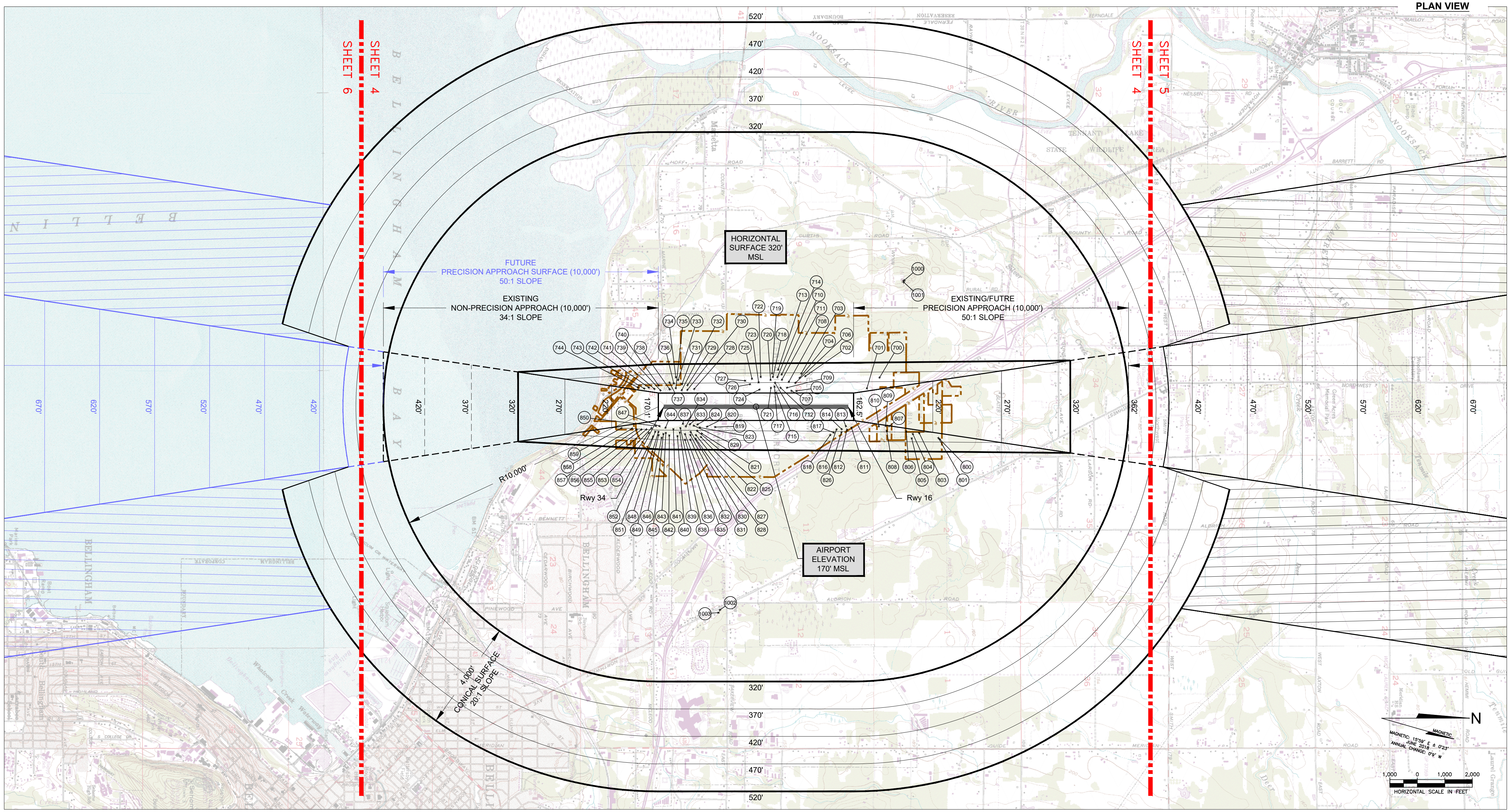
AIRPORT LAYOUT PLAN

SCALE: 1" = 400'
DATE: OCTOBER 2019

AIP NUMBER: 3-53-0005-054

BLI - Sheet 03 (ALP).dwg





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'	

NOTES

1. SOURCE OF DATA: FAA 18-B SURVEY COMPLETED OCTOBER 17, 2016. HORIZONTAL DATUM FOR OBSTRUCTIONS IS NORTH AMERICAN DATUM (NAD) 1983, VERTICAL DATUM IS NATIONAL GEODETIC VERTICAL DATUM 1988.).
2. REFER TO SHEET 7, INNER APPROACH SURFACE, RUNWAY 16 AND SHEET 8, INNER APPROACH SURFACE, RUNWAY 34 FOR APPROACH 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.

OBSTRUCTION DATA TABLE

(800) OBSTRUCTION DATA IS LIMITED TO LOCATION ONLY ON THIS SHEET. ADDITIONAL DATA FOR EACH OBSTRUCTION CAN BE FOUND ON THE OBSTRUCTION DATA TABLES (SHEETS 10 AND 11).

LEGEND

DESCRIPTION	SYMBOL
ELEVATION ABOVE MEAN SEA LEVEL (MSL)	EL.
AIRPORT PROPERTY	— - — - —

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

AECOM
1111 3rd AVENUE, SUITE 1600
SEATTLE, WA 98101
PHONE: 206-438-2700

PROJECT MANAGER:	JY	DRAFTED BY:	RO
DESIGNED BY:	RO	CHECKED BY:	JY

#	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.

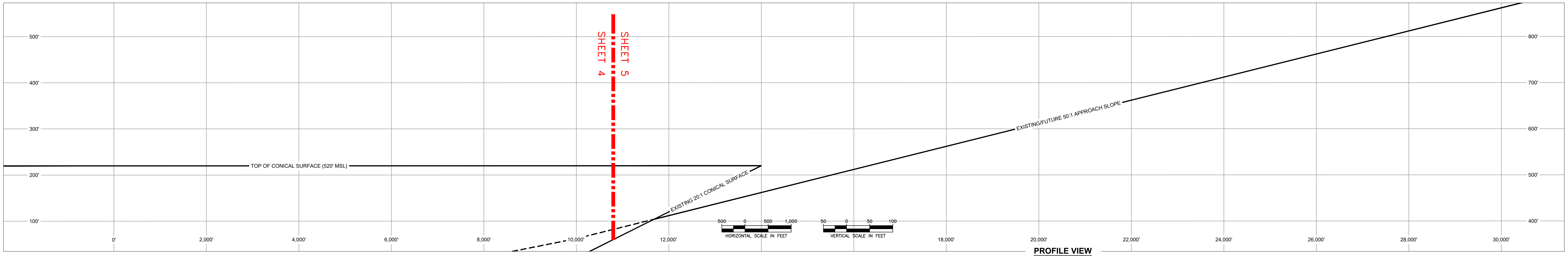
PORT OF BELLINGHAM
Washington State

BELLINGHAM INTERNATIONAL AIRPORT
AIRPORT MASTER PLAN

AIRSPACE PLAN
RUNWAY 16-34

SCALE: H: 1" = 2,000'; H: 1" = 1,000', V: 1" = 100'
DATE: OCTOBER 2019

AIP NUMBER: 3-53-0005-054



PROFILE VIEW

PLAN 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	NO CHANGE	50:1
APPROACH SURFACE - INNER WIDTH	NO CHANGE	1,000'
APPROACH SURFACE - OUTER WIDTH	NO CHANGE	16,000'
APPROACH SURFACE - LENGTH	NO CHANGE	50,000'
PRIMARY SURFACE - WIDTH	NO CHANGE	
RADIUS OF HORIZONTAL SURFACE	NO CHANGE	

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 7, INNER APPROACH SURFACE, RUNWAY 16 AND SHEET 8, INNER APPROACH SURFACE, RUNWAY 34 FOR APPROACH 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.
AIRPORT PROPERTY	

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

BLI - Sheet 05 (Airspace Plan, Outer Approach - Runway 16).dwg

AECOM
1111 3rd AVENUE, SUITE 1600
SEATTLE, WA 98101
PHONE: 206-438-2700

PROJECT MANAGER:	JY	DRAFTED BY:	RO
DESIGNED BY:	RO	CHECKED BY:	JY

#	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

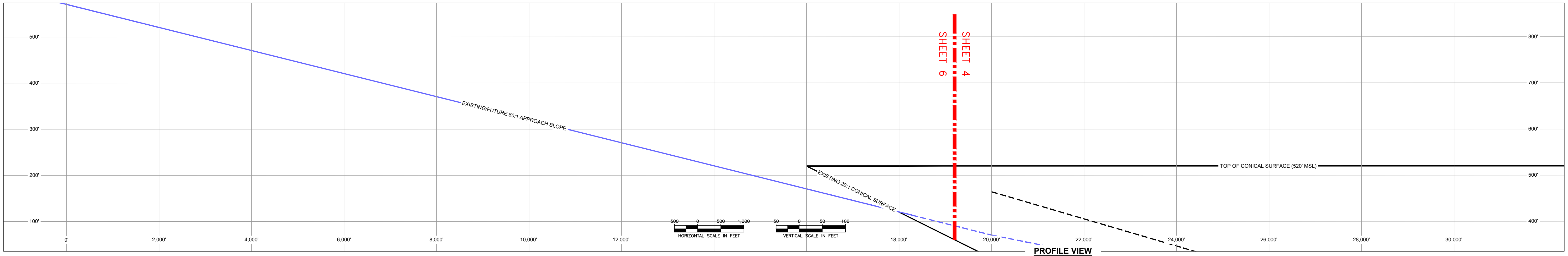
AIRSPACE PLAN, OUTER APPROACH RUNWAY 16

SCALE: H: 1" = 2,000'; H: 1" = 1,000', V: 1" = 100'

DATE: OCTOBER 2019

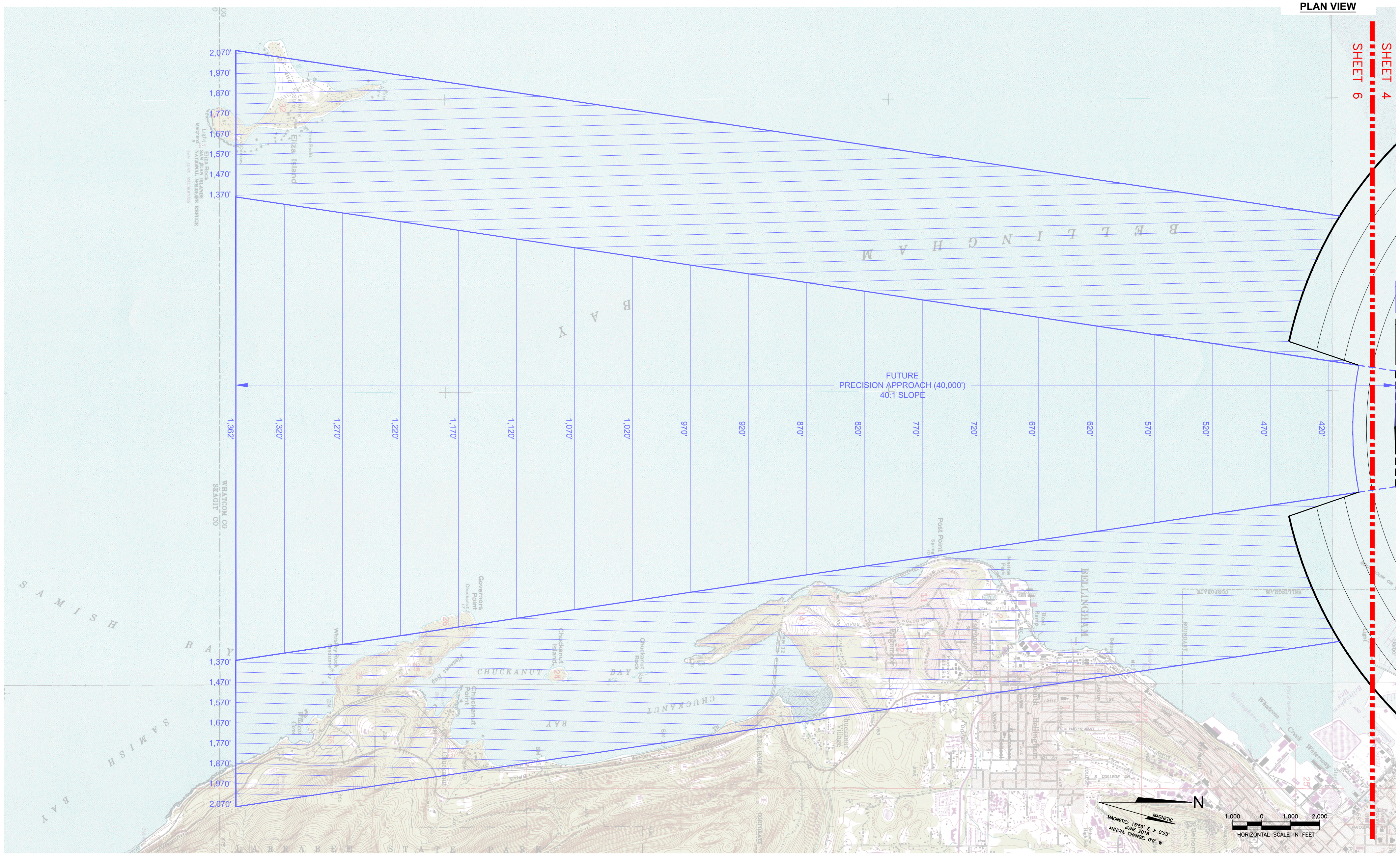
AIP NUMBER: 3-53-0005-054

SHEET NUMBER: 5 OF 16



PROFILE VIEW

PLAN 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	NO CHANGE	50:1
APPROACH SURFACE - INNER WIDTH	NO CHANGE	1,000'
APPROACH SURFACE - OUTER WIDTH	NO CHANGE	16,000'
APPROACH SURFACE - LENGTH	NO CHANGE	50,000'
PRIMARY SURFACE - WIDTH	NO CHANGE	
RADIUS OF HORIZONTAL SURFACE	NO CHANGE	

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 7, INNER APPROACH SURFACE, RUNWAY 16 AND SHEET 8, INNER APPROACH SURFACE, RUNWAY 34 FOR APPROACH 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.
AIRPORT PROPERTY	— — — ℞ —

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

AECOM
1111 3rd AVENUE, SUITE 1600
SEATTLE, WA 98101
PHONE: 206-438-2700

PROJECT MANAGER:	JY	DRAFTED BY:	RO
DESIGNED BY:	RO	CHECKED BY:	JY

#	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

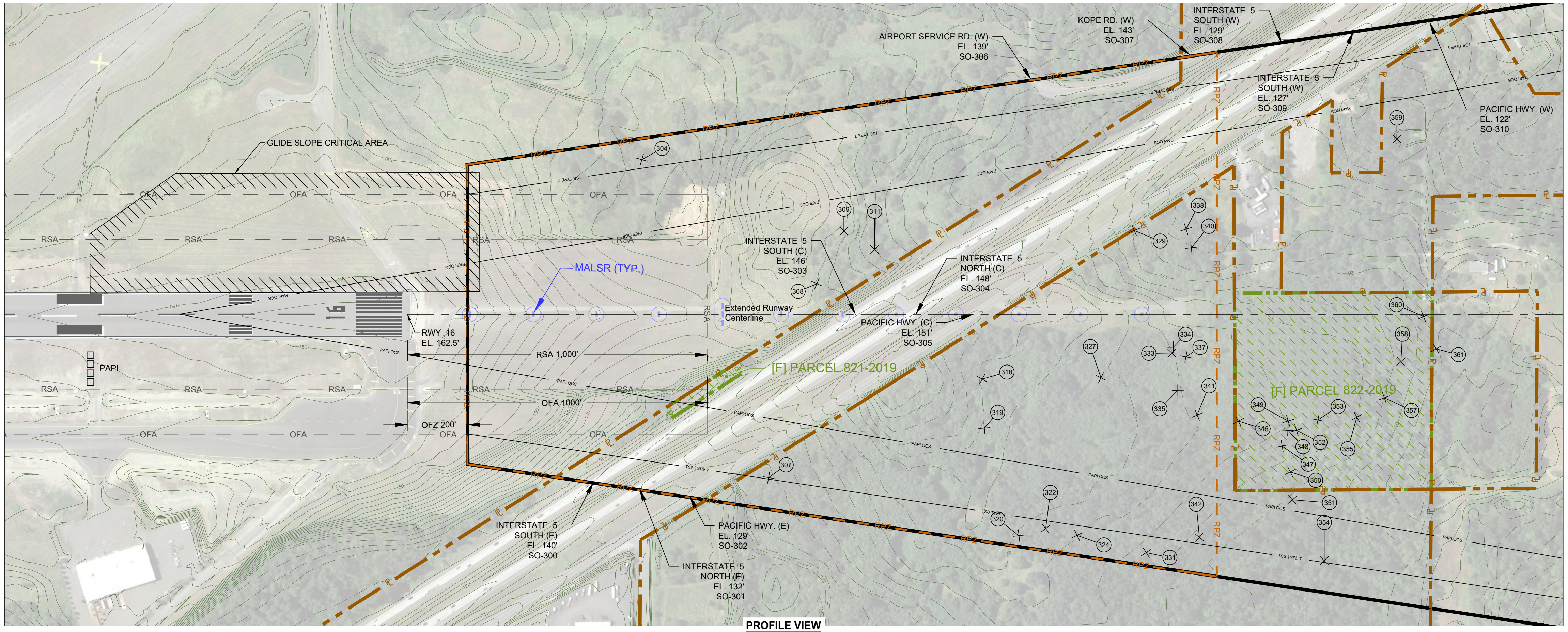
BELLINGHAM INTERNATIONAL AIRPORT
AIRPORT MASTER PLAN

AIRSPACE PLAN - OUTER APPROACH RUNWAY 34

SCALE: H: 1" = 2,000'; H: 1" = 1,000', V: 1" = 100'

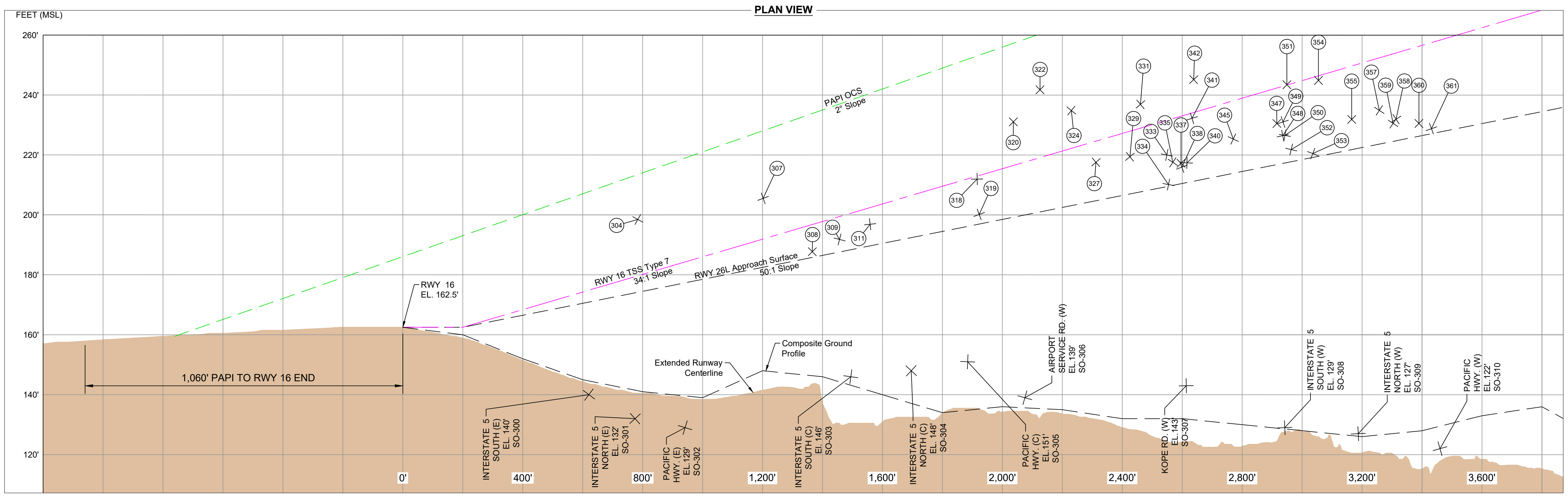
DATE: OCTOBER 2019

AIP NUMBER: 3-53-0005-054

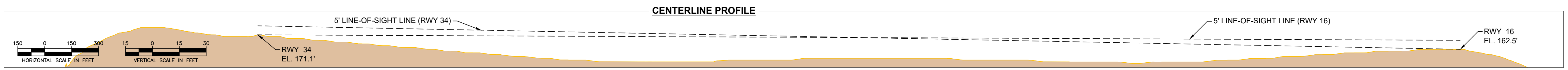


PROFILE VIEW

PLAN VIEW



CENTERLINE PROFILE



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'	

NOTES

1. ELEVATIONS ARE IN FEET ABOVE MEAN SEA LEVEL (MSL).
2. GROUND PROFILE REPRESENTS THE COMPOSITE PROFILE BASED ON HIGHEST TERRAIN ACROSS WIDTH AND ALONG LENGTH OF THE APPROACH SURFACE.
3. 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.
4. TRAVERSE WAY ELEVATIONS HAVE BEEN INCREASED BY 23 FEET FOR RAILWAYS, 17 FEET FOR HIGHWAYS, 15 FEET FOR PUBLIC ROADS, AND 10 FEET FOR PRIVATE ROADS TO ACCOMMODATE MOBILE OBJECTS. THESE ELEVATIONS HAVE BEEN ADDED TO THE CFR PART 77 APPROACH SURFACE AND EXTENDED RUNWAY CENTERLINE INTERSECTION ELEVATIONS.
5. SOURCE OF DATA: FAA 18-B SURVEY COMPLETED OCTOBER 17, 2016. HORIZONTAL DATUM FOR OBSTRUCTIONS IS NORTH AMERICAN DATUM (NAD) 1983, VERTICAL DATUM IS NATIONAL GEODETIC VERTICAL DATUM 1988.
6. THRESHOLD SITING SURFACE OBJECT PENETRATIONS WERE NOT EVALUATED.

OBSTRUCTION DATA TABLE

(800) OBSTRUCTION DATA IS LIMITED TO LOCATION ONLY ON THIS SHEET. ADDITIONAL DATA FOR EACH OBSTRUCTION CAN BE FOUND ON THE OBSTRUCTION DATA TABLES (SHEETS 10 AND 11).

LEGEND

DESCRIPTION	SYMBOL
ELEVATION ABOVE MEAN SEA LEVEL (MSL)	EL.
AIRPORT PROPERTY	
AIRPORT PROPERTY (PROPOSED)	
RUNWAY SAFETY AREA (RSA)	RSA
RUNWAY OBJECT FREE AREA (ROFA)	ROFA
RUNWAY OBSTACLE FREE ZONE (OFZ)	OFZ
RUNWAY PROTECTION ZONE (RPZ)	RPZ
PART 77 APPROACH SURFACE (PLAN VIEW)	P77 50:1 APCH
PART 77 APPROACH SURFACE (PROFILE VIEW)	
THRESHOLD SITING SURFACE (PROFILE VIEW)	
PAPI OBSTACLE CLEARANCE SURFACE (OCS)	PAPI OCS
PAPI OCS (PROFILE VIEW)	

MAGNETIC: 17°59' E ± 0°23' JUNE 2016 ANNUAL CHANGE: 0°9' W

100 0 100 200
HORIZONTAL SCALE IN FEET
10 0 10 20
VERTICAL SCALE IN FEET

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

BLI - Sheet 07 (Inner Approach Surface, Runway 16).dwg

AECOM
1111 3rd AVENUE, SUITE 1600
SEATTLE, WA 98101
PHONE: 206-438-2700

PROJECT MANAGER:	JY	DRAFTED BY:	JC
DESIGNED BY:	JC	CHECKED BY:	AC

#	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

INNER APPROACH SURFACE RUNWAY 16

SCALE: H: 1" = 200', V: 1" = 20'
DATE: OCTOBER 2019

AIP NUMBER: 3-53-0005-054

SHEET NUMBER: 7 OF 16

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'	

NOTES

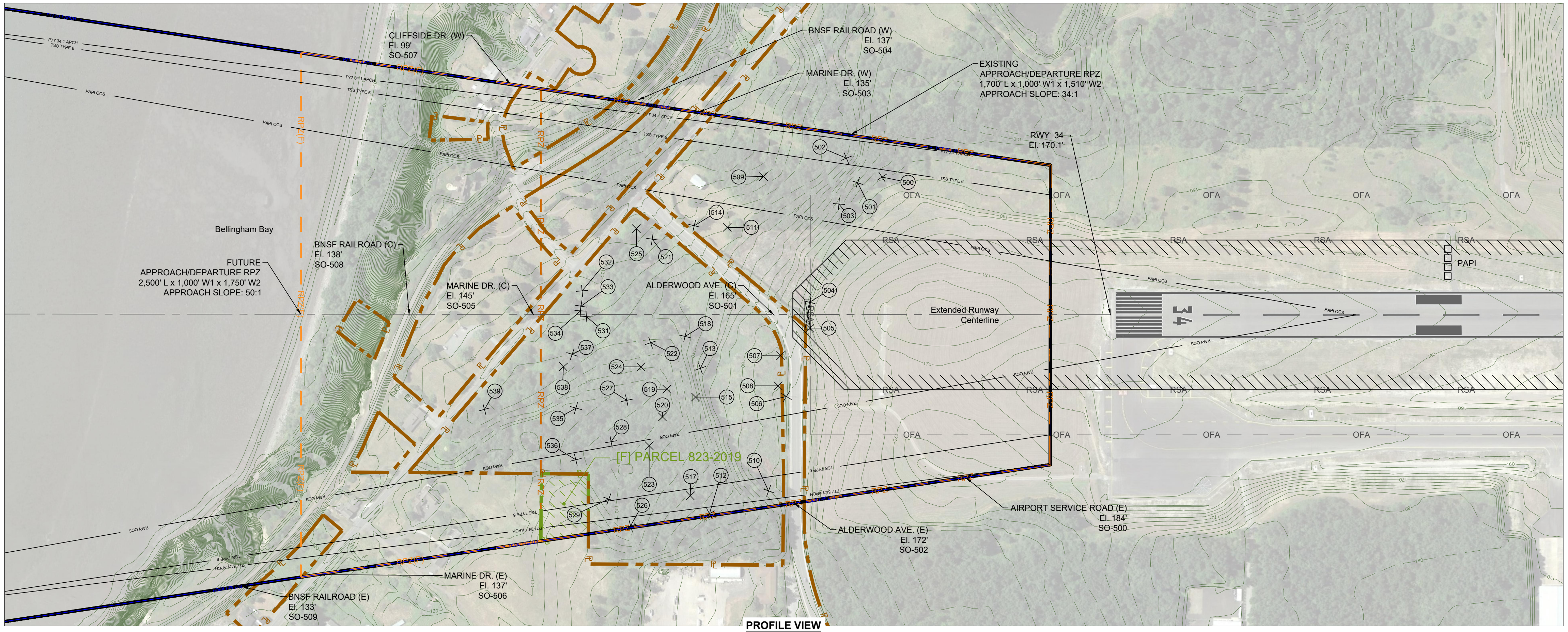
1. ELEVATIONS ARE IN FEET ABOVE MEAN SEA LEVEL (MSL).
2. GROUND PROFILE REPRESENTS THE COMPOSITE PROFILE BASED ON HIGHEST TERRAIN ACROSS WIDTH AND ALONG LENGTH OF THE APPROACH SURFACE.
3. AIRPORT OPERATIONS HEIGHT PROTECTION IS CONTAINED IN WHATCOM COUNTY ZONING ORDINANCE UNDER TITLE 20, SUPPLEMENTARY 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.
4. TRAVERSE WAY ELEVATIONS HAVE BEEN INCREASED BY 23 FEET FOR RAILWAYS, 17 FEET FOR HIGHWAYS, 15 FEET FOR PUBLIC ROADS, AND 10 FEET FOR PRIVATE ROADS TO ACCOMMODATE MOBILE OBJECTS. THESE ELEVATIONS HAVE BEEN ADDED TO THE CFR PART 77 APPROACH SURFACE AND EXTENDED RUNWAY CENTERLINE INTERSECTION ELEVATIONS.
5. SOURCE OF DATA: FAA 18-B SURVEY COMPLETED OCTOBER 17, 2016. HORIZONTAL DATUM FOR OBSTRUCTIONS IS NORTH AMERICAN DATUM (NAD) 1983, VERTICAL DATUM IS NATIONAL GEODETIC VERTICAL DATUM 1988.
6. THRESHOLD SITING SURFACE OBJECT PENETRATIONS WERE NOT EVALUATED.
7. THE TRAVERSE WAY ELEVATION FOR CLIFFSIDE DR. IS NOT SHOWN IN PROFILE VIEW DUE TO BEING LOCATED BELOW THE LOWEST CHARTED ELEVATION.
8. THE EXTENDED APPROACH FOR THE PROPOSED PRECISION APPROACH (50:1) IS NOT SHOWN UP TO 100 FEET ABOVE RUNWAY END AS IT EXTENDS OVER BELLINGHAM BAY WHERE THERE ARE NO OBSTRUCTIONS OR SIGNIFICANT OBJECTS.
9. FUTURE THRESHOLD SITING SURFACE IS CO-LOCATED WITH EXISTING RUNWAY 34 APPROACH SURFACE AND IS NOT SHOWN FOR CLARITY.

OBSTRUCTION DATA TABLE

(800) OBSTRUCTION DATA IS LIMITED TO LOCATION ONLY ON THIS SHEET. ADDITIONAL DATA FOR EACH OBSTRUCTION CAN BE FOUND ON THE OBSTRUCTION DATA TABLES (SHEETS 10 AND 11).

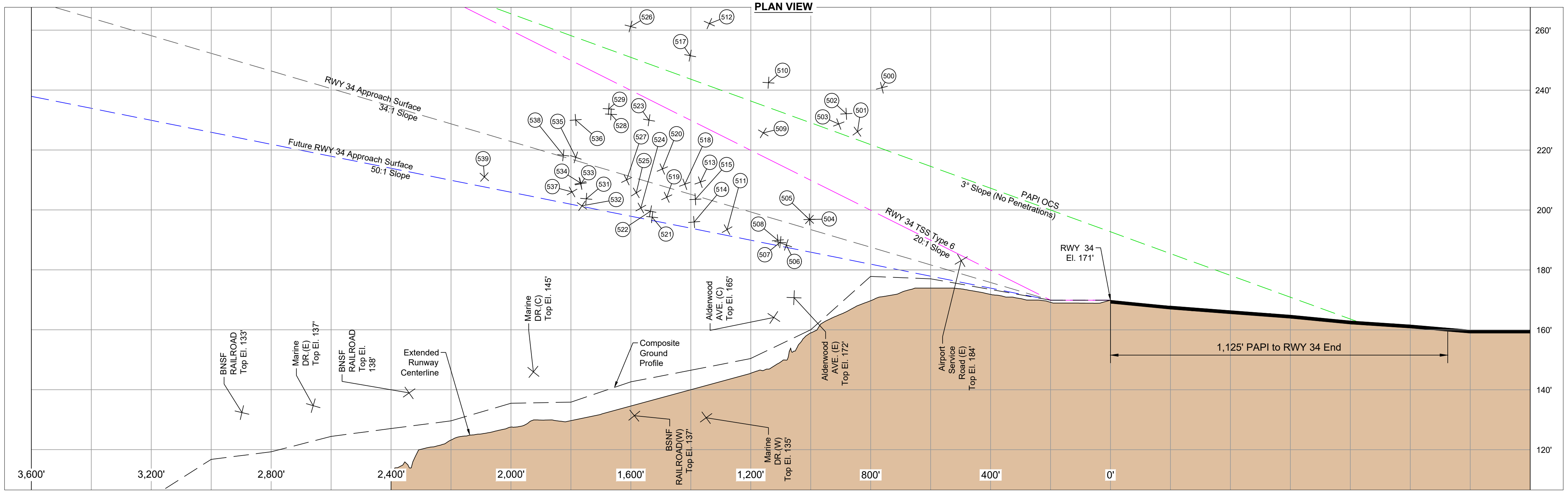
LEGEND

DESCRIPTION	SYMBOL
ELEVATION ABOVE MEAN SEA LEVEL (MSL)	EL.
AIRPORT PROPERTY	
AIRPORT PROPERTY (PROPOSED)	
RUNWAY SAFETY AREA (RSA)	RSA
RUNWAY OBJECT FREE AREA (ROFA)	ROFA
RUNWAY OBSTACLE FREE ZONE (OFZ)	OFZ
RUNWAY PROTECTION ZONE (RPZ)	RPZ
PART 77 APPROACH SURFACE (PLAN VIEW)	P77 50:1 APCH
PART 77 APPROACH SURFACE (FUTURE)	P77 50:1 APCH
PART 77 APPROACH SURFACE (PROFILE VIEW)	
THRESHOLD SITING SURFACE (PROFILE VIEW)	
PAPI OBSTACLE CLEARANCE SURFACE (OCS)	PAPI OCS
PAPI OCS (PROFILE VIEW)	

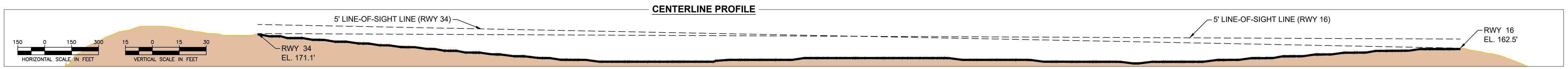


PROFILE VIEW

PLAN VIEW



CENTERLINE PROFILE



N
MAGNETIC
MAGNETIC: 15°59' E ± 0°23'
JUNE 2019
ANNUAL CHANGE: 0°9' W

100 0 100 200
HORIZONTAL SCALE IN FEET
10 0 10 20
VERTICAL SCALE IN FEET

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

BLI - Sheet 08 (Inner Approach Surface, Runway 34).dwg

AECOM
1111 3rd AVENUE, SUITE 1600
SEATTLE, WA 98101
PHONE: 206-438-2700

PROJECT MANAGER:	JY	DRAFTED BY:	JC
DESIGNED BY:	JC	CHECKED BY:	AC

#	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

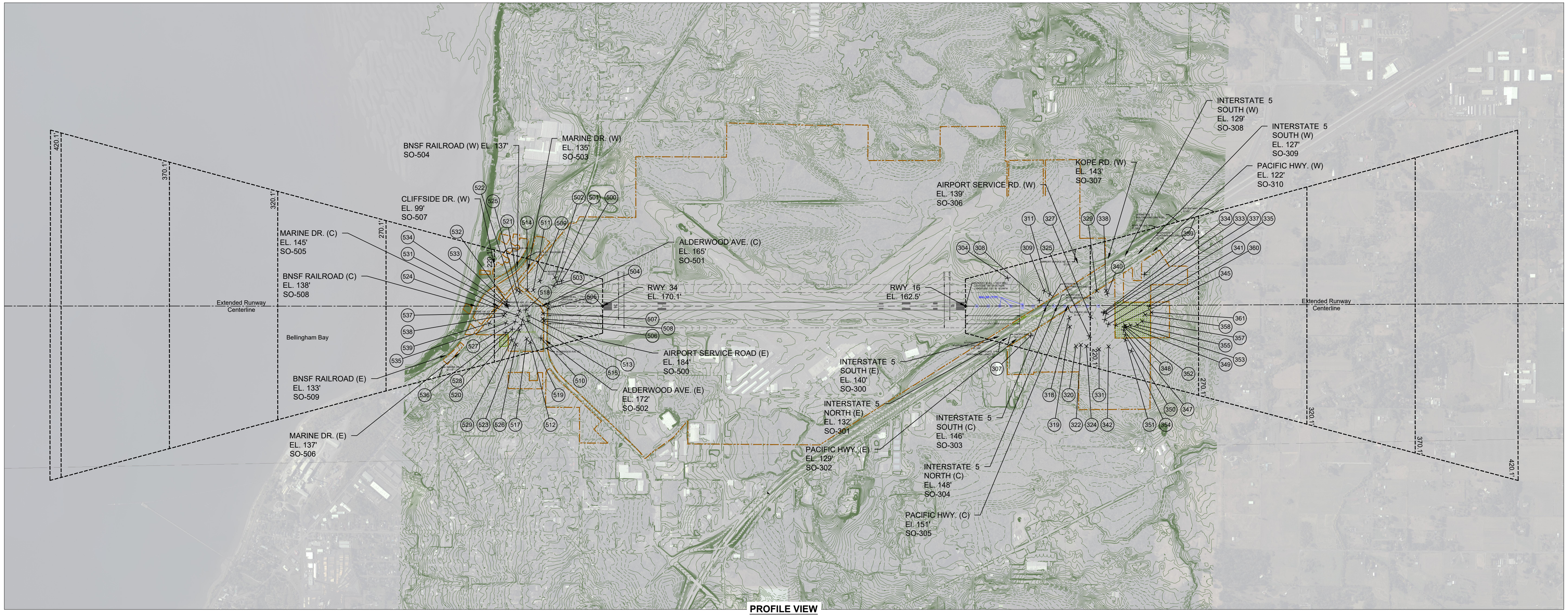
INNER APPROACH SURFACE RUNWAY 34

SCALE: H: 1" = 200', V: 1" = 20'

DATE: OCTOBER 2019

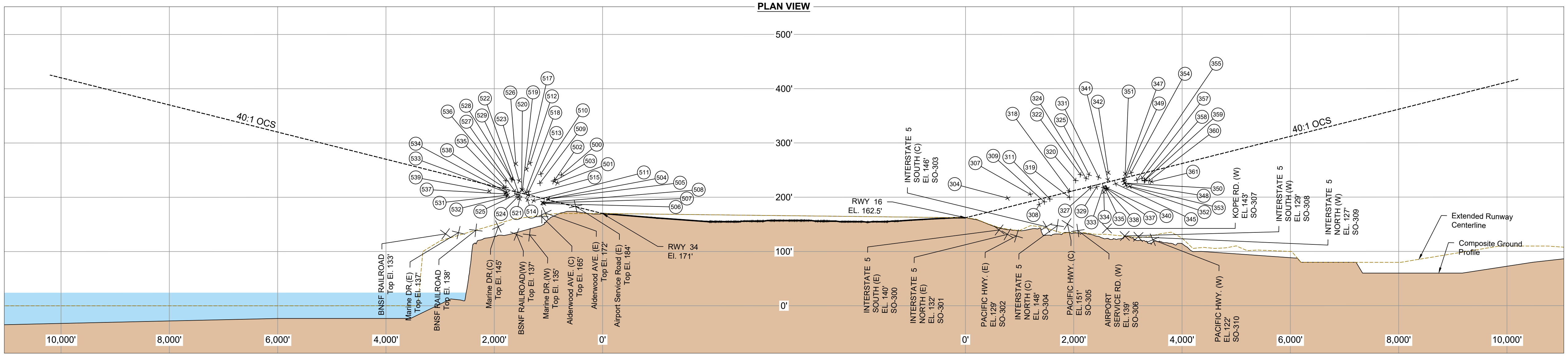
AIP NUMBER: 3-53-0005-054

SHEET NUMBER: 8 OF 16



PROFILE VIEW

PLAN VIEW



NOTES

1. ELEVATIONS ARE IN FEET ABOVE MEAN SEA LEVEL (MSL).
2. GROUND PROFILE REPRESENTS THE COMPOSITE PROFILE BASED ON HIGHEST TERRAIN ACROSS WIDTH AND ALONG LENGTH OF THE APPROACH SURFACE.
3. 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.
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5. SOURCE OF DATA: FAA 18-B SURVEY COMPLETED OCTOBER 17, 2016. HORIZONTAL DATUM FOR OBSTRUCTIONS IS NORTH AMERICAN DATUM (NAD) 1983, VERTICAL DATUM IS NATIONAL GEODETIC VERTICAL DATUM 1988.
6. THRESHOLD SITING SURFACE OBJECT PENETRATIONS WERE NOT EVALUATED.

OBSTRUCTION DATA TABLE

(900) OBSTRUCTION DATA IS LIMITED TO LOCATION ONLY ON THIS SHEET. ADDITIONAL DATA FOR EACH OBSTRUCTION CAN BE FOUND ON THE OBSTRUCTION DATA TABLES (SHEETS 10 AND 11).

LEGEND

DESCRIPTION	SYMBOL
AIRPORT PROPERTY	
AIRPORT PROPERTY (PROPOSED)	

MAGNETIC 15°59' E ± 0°23' JUNE 2016 ANNUAL CHANGE: 0°9' W

N

500 0 500 1,000 HORIZONTAL SCALE IN FEET

50 0 50 100 VERTICAL SCALE IN FEET

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

BLI - Sheet 09 (Runway Departure Surface Runway 16-34).dwg

AECOM
1111 3rd AVENUE, SUITE 1600
SEATTLE, WA 98101
PHONE: 206-438-2700

PROJECT MANAGER:	JY	DRAFTED BY:	RO
DESIGNED BY:	RO	CHECKED BY:	JY

#	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

RUNWAY DEPARTURE SURFACE
RUNWAY 16/34

SCALE: H: 1" = 1,000', V: 1" = 100'

DATE: OCTOBER 2019

AIP NUMBER: 3-53-0005-054

SHEET NUMBER: 9 OF 16

OBSTACLE IDENTIFICATION TABLE

OBS NUMBER	LATITUDE	LONGITUDE	DESCRIPTION	DATE OF SURVEY	TOP ELEVATION (MSL)	GROUND ELEVATION (MSL)	OBJECT HEIGHT (AGL)	14 CFR PART 77 SURFACE	14 CFR PART 77 PENETRATION AMOUNT	TERPS DEPATURE PENETRATION AMOUNT	OEI PENETRATION AMOUNT	PROPOSED DISPOSITION
100	48°48'07.37990"N	122°32'11.44923"W	SIGN	2016	164.3 '	159.6 '	4.8 '	PRIMARY	0.9 '	-0.8 '	-0.2 '	NO ACTION
101	48°48'06.83366"N	122°32'16.49006"W	RUNWAY LIGHT	2016	165.2 '	163.1 '	2.2 '	PRIMARY	1.8 '	1.6 '	1.7 '	NO ACTION
102	48°48'06.83936"N	122°32'16.03647"W	RUNWAY LIGHT	2016	165.4 '	163.1 '	2.3 '	PRIMARY	2 '	1.8 '	1.9 '	NO ACTION
103	48°48'06.84608"N	122°32'14.38320"W	RUNWAY LIGHT	2016	164.9 '	162.8 '	2.1 '	PRIMARY	1.4 '	1.2 '	1.3 '	NO ACTION
104	48°48'06.84458"N	122°32'13.92913"W	RUNWAY LIGHT	2016	164.7 '	163.2 '	1.5 '	PRIMARY	1.2 '	1 '	1.1 '	NO ACTION
105	48°48'01.34937"N	122°32'11.35026"W	WINDSOCK	2016	177 '	157.2 '	19.9 '	PRIMARY	13 '	N/A	N/A	NO ACTION
106	48°47'56.31577"N	122°32'19.28469"W	NAVAID	2016	182.8 '	152.3 '	30.6 '	PRIMARY	18.2 '	N/A	N/A	NO ACTION
107	48°47'44.72365"N	122°32'22.29587"W	TREE	2016	225.6 '	156.2 '	69.4 '	PRIMARY	59.6 '	N/A	N/A	TRIM/REMOVE
108	48°47'42.59205"N	122°32'21.72759"W	TREE	2016	236.1 '	160 '	76.1 '	PRIMARY	69.8 '	N/A	N/A	TRIM/REMOVE
109	48°47'38.31442"N	122°32'21.82435"W	TREE	2016	201 '	160 '	41 '	PRIMARY	34.2 '	N/A	N/A	TRIM/REMOVE
110	48°47'35.39609"N	122°32'21.54537"W	TREE	2016	209.6 '	155 '	54.6 '	PRIMARY	42.5 '	N/A	N/A	TRIM/REMOVE
111	48°47'11.06850"N	122°32'21.37086"W	TREE	2016	227.3 '	155 '	72.3 '	PRIMARY	57.4 '	N/A	N/A	TRIM/REMOVE
112	48°47'09.98986"N	122°32'20.09311"W	TREE	2016	235.6 '	157 '	78.6 '	PRIMARY	65.6 '	N/A	N/A	TRIM/REMOVE
113	48°47'05.28280"N	122°32'11.15527"W	WINDSOCK	2016	177.6 '	163.5 '	14.1 '	PRIMARY	7 '	N/A	N/A	NO ACTION
114	48°47'04.68915"N	122°32'21.76563"W	TREE	2016	239.4 '	160 '	79.5 '	PRIMARY	68.8 '	N/A	N/A	TRIM/REMOVE
115	48°47'02.41151"N	122°32'21.29183"W	TREE	2016	227.9 '	159.6 '	68.4 '	PRIMARY	57.1 '	N/A	N/A	TRIM/REMOVE
116	48°47'01.35015"N	122°32'19.71650"W	TREE	2016	201.5 '	157 '	44.5 '	PRIMARY	30.5 '	N/A	N/A	TRIM/REMOVE
117	48°47'00.52912"N	122°32'15.75088"W	RUNWAY LIGHT	2016	175 '	170.9 '	4.1 '	PRIMARY	3.9 '	3.7 '	3.8 '	NO ACTION
118	48°47'00.53281"N	122°32'14.12564"W	RUNWAY LIGHT	2016	174.8 '	170.5 '	4.3 '	PRIMARY	3.7 '	3.5 '	3.6 '	NO ACTION
119	48°47'00.22668"N	122°32'12.69487"W	VERTICAL POINT	2016	171.6 '	168.5 '	3.1 '	PRIMARY	0.6 '	-0.5 '	-0.2 '	NO ACTION
120	48°46'58.65865"N	122°32'22.27986"W	TREE	2016	235.3 '	151.1 '	84.3 '	PRIMARY	64.2 '	59.3 '	0 '	TRIM/REMOVE
304	48°48'14.47031"N	122°32'22.92202"W	TREE	2016	199 '	129.5 '	69.5 '	APPROACH (16)	24 '	16 '	0 '	TRIM/REMOVE
307	48°48'18.62647"N	122°32'07.05752"W	TREE	2016	206.1 '	114.5 '	91.6 '	APPROACH (16)	22.6 '	12.6 '	23.4 '	TRIM/REMOVE
308	48°48'20.22590"N	122°32'16.72007"W	TREE	2016	188.3 '	146.9 '	41.4 '	APPROACH (16)	1.5 '	-9.4 '	3 '	TRIM/REMOVE
309	48°48'21.11806"N	122°32'19.34171"W	TREE	2016	192.4 '	142.2 '	50.2 '	APPROACH (16)	3.8 '	-7.6 '	5.6 '	TRIM/REMOVE
311	48°48'22.12590"N	122°32'18.41625"W	TREE	2016	197.4 '	136.9 '	60.5 '	APPROACH (16)	6.9 '	-5 '	9.1 '	TRIM/REMOVE
318	48°48'25.66001"N	122°32'11.94994"W	TREE	2016	212.5 '	133.4 '	79.1 '	APPROACH (16)	14.8 '	1.2 '	18.5 '	TRIM/REMOVE
319	48°48'25.73138"N	122°32'09.50542"W	TREE	2016	200.7 '	134.2 '	66.5 '	APPROACH (16)	2.9 '	-10.9 '	6.5 '	TRIM/REMOVE
320	48°48'26.86451"N	122°32'04.13885"W	TREE	2016	231.6 '	129.9 '	101.7 '	APPROACH (16)	31.5 '	17.3 '	35.6 '	TRIM/REMOVE
322	48°48'27.74200"N	122°32'04.49395"W	TREE	2016	242.3 '	130.1 '	112.2 '	APPROACH (16)	40.4 '	25.8 '	44.9 '	TRIM/REMOVE
324	48°48'28.77527"N	122°32'04.15231"W	TREE	2016	235.4 '	132.9 '	102.5 '	APPROACH (16)	31.4 '	16.2 '	36.3 '	TRIM/REMOVE
327	48°48'29.57059"N	122°32'12.00588"W	TREE	2016	218.1 '	128 '	90.1 '	APPROACH (16)	12.5 '	-3.2 '	17.7 '	TRIM/REMOVE
329	48°48'30.67430"N	122°32'19.35434"W	TREE	2016	220 '	118.4 '	101.6 '	APPROACH (16)	12 '	-4.2 '	17.8 '	TRIM/REMOVE
331	48°48'31.05097"N	122°32'03.28705"W	TREE	2016	237.5 '	127.2 '	110.3 '	APPROACH (16)	28.8 '	12.5 '	34.7 '	TRIM/REMOVE
333	48°48'31.90217"N	122°32'13.23981"W	TREE	2016	220.6 '	127 '	93.6 '	APPROACH (16)	10.2 '	-6.7 '	16.4 '	TRIM/REMOVE
334	48°48'31.95601"N	122°32'13.52749"W	TREE	2016	210.7 '	126.9 '	83.8 '	APPROACH (16)	0.2 '	-16.7 '	6.4 '	TRIM/REMOVE
335	48°48'32.10065"N	122°32'11.37542"W	TREE	2016	218.1 '	127 '	91.1 '	APPROACH (16)	7.3 '	-9.6 '	13.6 '	TRIM/REMOVE
337	48°48'32.36897"N	122°32'13.04545"W	TREE	2016	217.8 '	126.2 '	91.6 '	APPROACH (16)	6.5 '	-10.6 '	12.8 '	TRIM/REMOVE
338	48°48'32.38205"N	122°32'19.41489"W	TREE	2016	216.5 '	114.6 '	101.9 '	APPROACH (16)	5.1 '	-12 '	11.5 '	TRIM/REMOVE
340	48°48'32.55259"N	122°32'18.48063"W	TREE	2016	217.9 '	114.6 '	103.3 '	APPROACH (16)	6.2 '	-11 '	12.7 '	TRIM/REMOVE
341	48°48'32.73566"N	122°32'10.14189"W	TREE	2016	232.8 '	126 '	106.8 '	APPROACH (16)	20.7 '	3.6 '	27.3 '	TRIM/REMOVE
342	48°48'32.80193"N	122°32'04.03916"W	TREE	2016	245.7 '	126 '	119.7 '	APPROACH (16)	33.6 '	16.4 '	40.1 '	TRIM/REMOVE
345	48°48'34.09225"N	122°32'09.83708"W	TREE	2016	225.9 '	127.7 '	98.2 '	APPROACH (16)	11.1 '	-6.9 '	18.2 '	TRIM/REMOVE
347	48°48'35.53076"N	122°32'08.59158"W	TREE	2016	231.1 '	127 '	104.1 '	APPROACH (16)	13.4 '	-5.3 '	21 '	TRIM/REMOVE
348	48°48'35.72189"N	122°32'09.37864"W	TREE	2016	227 '	126 '	101 '	APPROACH (16)	8.9 '	-9.9 '	16.6 '	TRIM/REMOVE
349	48°48'35.73004"N	122°32'09.84042"W	TREE	2016	231.6 '	125 '	106.6 '	APPROACH (16)	13.5 '	-5.3 '	21.2 '	TRIM/REMOVE
350	48°48'35.79768"N	122°32'07.29906"W	TREE	2016	227.1 '	127 '	100.1 '	APPROACH (16)	8.8 '	-10 '	16.6 '	TRIM/REMOVE
351	48°48'35.86557"N	122°32'05.90766"W	TREE	2016	244 '	123 '	121 '	APPROACH (16)	25.6 '	6.9 '	33.4 '	TRIM/REMOVE
352	48°48'36.00243"N	122°32'09.38293"W	TREE	2016	222.4 '	126.8 '	95.6 '	APPROACH (16)	3.7 '	-15.2 '	11.6 '	TRIM/REMOVE
353	48°48'36.71092"N	122°32'09.88537"W	TREE	2016	221 '	123.6 '	97.4 '	APPROACH (16)	0.9 '	-18.4 '	9.1 '	TRIM/REMOVE
354	48°48'36.91085"N	122°32'02.87308"W	TREE	2016	245.5 '	122.8 '	122.7 '	APPROACH (16)	25 '	5.7 '	33.2 '	TRIM/REMOVE
355	48°48'37.99160"N	122°32'10.02686"W	TREE	2016	232.4 '	117.2 '	115.2 '	APPROACH (16)	9.7 '	-10.2 '	18.4 '	TRIM/REMOVE
357	48°48'38.89788"N	122°32'10.98793"W	TREE	2016	235.5 '	115 '	120.5 '	APPROACH (16)	10.9 '	-9.5 '	19.9 '	TRIM/REMOVE
358	48°48'39.44718"N	122°32'12.78926"W	TREE	2016	232.5 '	115 '	117.5 '	APPROACH (16)	6.8 '	-13.8 '	16.1 '	TRIM/REMOVE
359	48°48'39.32776"N	122°32'23.89383"W	TREE	2016	231.1 '	102.4 '	128.7 '	APPROACH (16)	5.6 '	-15 '	14.8 '	TRIM/REMOVE
360	48°48'40.19481"N	122°32'15.03660"W	TREE	2016	231.1 '	115.4 '	115.7 '	APPROACH (16)	3.9 '	-17.2 '	13.4 '	TRIM/REMOVE
361	48°48'40.60906"N	122°32'13.42584"W	TREE	2016	229.3 '	115.1 '	114.2 '	APPROACH (16)	1.3 '	-20 '	11 '	TRIM/REMOVE

OBSTACLE IDENTIFICATION TABLE

OBS NUMBER	LATITUDE	LONGITUDE	DESCRIPTION	DATE OF SURVEY	TOP ELEVATION (MSL)	GROUND ELEVATION (MSL)	OBJECT HEIGHT (AGL)	14 CFR PART 77 SURFACE	14 CFR PART 77 PENETRATION AMOUNT	TERPS DEPATURE PENETRATION AMOUNT	OEI PENETRATION AMOUNT	PROPOSED DISPOSITION
500	48°46'53.09289"N	122°32'21.78043"W	TREE	2016	241.9 '	153.9 '	88 '	APPROACH (34)	59.7 '	51.8 '	58.7 '	TRIM/REMOVE
501	48°46'52.29167"N	122°32'21.49484"W	TREE	2016	227.3 '	154.1 '	73.2 '	APPROACH (34)	43.4 '	35.1 '	42.7 '	TRIM/REMOVE
502	48°46'51.92064"N	122°32'22.71788"W	TREE	2016	233.2 '	151.1 '	82.1 '	APPROACH (34)	48.6 '	40.2 '	48.1 '	TRIM/REMOVE
503	48°46'51.67653"N	122°32'20.43329"W	TREE	2016	229.8 '	148.9 '	80.9 '	APPROACH (34)	44.7 '	36.1 '	44.3 '	TRIM/REMOVE
504	48°46'50.72000"N	122°32'15.52923"W	NAVAID	2016	198 '	159.7 '	38.3 '	APPROACH (34)	10.9 '	1.8 '	10.9 '	NO ACTION
505	48°46'50.72571"N	122°32'14.24477"W	NAVAID	2016	198 '	158.4 '	39.6 '	APPROACH (34)	10.9 '	1.8 '	10.9 '	NO ACTION
506	48°46'49.96704"N	122°32'10.83201"W	UTILITY POLE	2016	189.5 '	156.2 '	33.3 '	APPROACH (34)	0.8 '	-8.7 '	1.2 '	NO ACTION
507	48°46'49.76811"N	122°32'12.86129"W	TREE	2016	190.4 '	154.2 '	36.2 '	APPROACH (34)	1.4 '	-8.3 '	1.8 '	TRIM/REMOVE
508	48°46'49.69104"N	122°32'11.36416"W	TREE	2016	191 '	154.1 '	36.9 '	APPROACH (34)	1.8 '	-7.9 '	2.2 '	TRIM/REMOVE
509	48°46'49.18809"N	122°32'21.79347"W	TREE	2016	226.9 '	134.6 '	92.3 '	APPROACH (34)	36.7 '	26.9 '	37.3 '	TRIM/REMOVE
510	48°46'49.38876"N	122°32'06.12243"W	TREE	2016	243.6 '	153.4 '	90.2 '	APPROACH (34)	53.8 '	44.1 '	54.3 '	TRIM/REMOVE
511	48°46'48.00230"N	122°32'19.25309"W	TREE	2016	194.6 '	134.1 '	60.5 '	APPROACH (34)	2 '	-8.5 '	3.1 '	TRIM/REMOVE
512	48°46'47.44506"N	122°32'04.98018"W	TREE	2016	263.3 '	146.1 '	117.2 '	APPROACH (34)	69.5 '	58.9 '	0 '	TRIM/REMOVE
513	48°46'47.13327"N	122°32'12.22341"W	TREE	2016	210.4 '	142.8 '	67.6 '	APPROACH (34)	16 '	5.2 '	17.5 '	TRIM/REMOVE
514	48°46'46.91857"N	122°32'19.33118"W	TREE	2016	197.1 '	131.1 '	66 '	APPROACH (34)	2.3 '	-8.7 '	3.9 '	TRIM/REMOVE
515	48°46'46.97456"N	122°32'10.79059"W	TREE	2016	204.7 '	144.3 '	60.4 '	APPROACH (34)	10 '	-1.1 '	11.5 '	TRIM/REMOVE
517	48°46'46.81328"N	122°32'05.86807"W	TREE	2016	252.6 '	145 '	107.6 '	APPROACH (34)	57.6 '	46.5 '	59.2 '	TRIM/REMOVE
518	48°46'46.62247"N	122°32'13.81157"W	TREE	2016	209.7 '	140 '	69.7 '	APPROACH (34)	14.3 '	3.2 '	16 '	TRIM/REMOVE
519	48°46'46.03176"N	122°32'11.17590"W	TREE	2016	205.4 '	140 '	65.4 '	APPROACH (34)	8.7 '	-2.8 '	10.7 '	TRIM/REMOVE
520	48°46'45.88900"N	122°32'09.79657"W	TREE	2016	214.8 '	140 '	74.8 '	APPROACH (34)	17.9 '	6.4 '	19.8 '	TRIM/REMOVE
521	48°46'45.53710"N	122°32'18.65543"W	TREE	2016	198.8 '	130 '	68.8 '	APPROACH (34)	1.1 '	-10.6 '	3.3 '	TRIM/REMOVE
522	48°46'45.49134"N	122°32'13.48866"W	TREE	2016	200.7 '	140 '	60.7 '	APPROACH (34)	3 '	-8.8 '	5.1 '	TRIM/REMOVE
523	48°46'45.45424"N	122°32'08.36079"W	TREE	2016	231.1 '	140 '	91.1 '	APPROACH (34)	33.3 '	21.6 '	35.4 '	TRIM/REMOVE
524	48°46'45.17751"N	122°32'12.29012"W	TREE	2016	201.8 '	140 '	61.8 '	APPROACH (34)	3.4 '	-8.5 '	5.7 '	TRIM/REMOVE
525	48°46'45.01408"N	122°32'19.17119"W	TREE	2016	206.8 '	128.1 '	78.7 '	APPROACH (34)	8.2 '	-3.8 '	10.5 '	TRIM/REMOVE
526	48°46'44.85287"N	122°32'04.36379"W	TREE	2016	262.4 '	140 '	122.4 '	APPROACH (34)	63.3 '	51.3 '	65.7 '	TRIM/REMOVE
527	48°46'44.71119"N	122°32'10.61556"W	TREE	2016	211.2 '	135 '	76.2 '	APPROACH (34)	11.9 '	-0.3 '	14.3 '	TRIM/REMOVE
528	48°46'44.20166"N	122°32'08.55329"W	TREE	2016	233.1 '	134.6 '	98.5 '	APPROACH (34)	32.7 '	20.4 '	35.4 '	TRIM/REMOVE
529	48°46'44.13162"N	122°32'05.69142"W	TREE	2016	234.9 '	135 '	99.9 '	APPROACH (34)	34.3 '	22 '	37 '	TRIM/REMOVE
531	48°46'43.37547"N	122°32'14.79456"W	TREE	2016	204.8 '	131 '	73.8 '	APPROACH (34)	2.8 '	-10 '	5.8 '	TRIM/REMOVE
532	48°46'43.23128"N	122°32'16.06527"W	TREE	2016	202.5 '	129.4 '	73.1 '	APPROACH (34)	0.2 '	-12.7 '	3.3 '	TRIM/REMOVE
533	48°46'43.19684"N	122°32'15.30145"W	TREE	2016	209.8 '	130 '	79.8 '	APPROACH (34)	7.5 '	-5.5 '	10.5 '	TRIM/REMOVE
534	48°46'43.18335"N	122°32'15.07162"W	TREE	2016	210.2 '	130.2 '	80 '	APPROACH (34)	7.8 '	-5.2 '	10.9 '	TRIM/REMOVE
535	48°46'43.04167"N	122°32'10.22344"W	TREE	2016	218.7 '	130.6 '	88.1 '	APPROACH (34)	16 '	3.1 '	19.1 '	TRIM/REMOVE
536	48°46'43.04012"N	122°32'07.64813"W	TREE	2016	231.2 '	135 '	96.2 '	APPROACH (34)	28.5 '	15.6 '	31.7 '	TRIM/REMOVE
537	48°46'42.91168"N	122°32'12.90196"W	TREE	2016	207.1 '	134.4 '	72.7 '	APPROACH (34)	4.2 '	-8.9 '	7.4 '	TRIM/REMOVE
538	48°46'42.62489"N	122°32'12.27919"W	TREE	2016	219.2 '	134.4 '	84.8 '	APPROACH (34)	15.7 '	2.6 '	19 '	TRIM/REMOVE
539	48°46'40.03044"N	122°32'10.14575"W	TREE	2016	212.1 '	132.2 '	79.9 '	APPROACH (34)	3.3 '	-11.2 '	7.7 '	TRIM/REMOVE

SIGNIFICANT OBJECT DATA TABLE

SO-500			SERVICE ROAD	N/A	184'	174'	10'	APPROACH (34)	NONE	NONE	NONE	TO REMAIN
SO-501			ROAD	N/A	168'	150'	15'	APPROACH (34)	NONE	NONE	NONE	TO REMAIN
SO-502			ROAD	N/A	172'	157'	15'	APPROACH (34)	NONE	NONE	NONE	TO REMAIN
SO-503			ROAD	N/A	132'	120'	15'	APPROACH (34)	NONE	NONE	NONE	TO REMAIN
SO-504			ROAD	N/A	137'	122'	15'	APPROACH (34)	NONE	NONE	NONE	TO REMAIN
SO-505			ROAD	N/A	145'	120'	15'	APPROACH (34)	NONE	NONE	NONE	TO REMAIN
SO-506			ROAD	N/A	137'	122'	15'	APPROACH (34)	NONE	NONE	NONE	TO REMAIN
SO-507			ROAD	N/A	99'	84'	15'	APPROACH (34)	NONE	NONE	NONE	TO REMAIN
SO-508			BNSF RAILROAD	N/A	138'	115'	23'	APPROACH (34)	NONE	NONE	NONE	TO REMAIN
SO-509			BNSF RAILROAD	N/A	133'	110'	23'	APPROACH (34)	NONE	NONE	NONE	TO REMAIN
SO-300			ROAD	N/A	140'	123'	17'	APPROACH (16)	NONE	NONE	NONE	TO REMAIN
SO-301			ROAD	N/A	132'	115'	17'	APPROACH (16)	NONE	NONE	NONE	TO REMAIN
SO-302			ROAD	N/A	129'	114'	15'	APPROACH (16)	NONE	NONE	NONE	TO REMAIN
SO-303			ROAD	N/A	146'	129'	17'	APPROACH (16)	NONE	NONE	NONE	TO REMAIN
SO-304			ROAD	N/A	148'	131'	17'	APPROACH (16)	NONE	NONE	NONE	TO REMAIN
SO-305			ROAD	N/A	151'	136'	15'	APPROACH (16)	NONE	NONE	NONE	TO REMAIN
SO-306			SERVICE ROAD	N/A	139'	129'	10'	APPROACH (16)	NONE	NONE	NONE	TO REMAIN
SO-307			ROAD	N/A	143'	128'	15'	APPROACH (16)	NONE	NONE	NONE	TO REMAIN
SO-308			ROAD	N/A	129'	112'	17'	APPROACH (16)	NONE	NONE	NONE	TO REMAIN
SO-309			ROAD	N/A	127'	110'	17'	APPROACH (16)	NONE	NONE	NONE	TO REMAIN
SO-310			ROAD	N/A	122'	107'	15'	APPROACH (16)	NONE	NONE	NONE	TO REMAIN

NOTES

1. ELEVATIONS ARE IN FEET ABOVE MEAN SEA LEVEL (MSL).
2. THRESHOLD SITING SURFACE OBJECT PENETRATIONS WERE NOT EVALUATED.
3. SOURCE OF DATA: FAA 18-B SURVEY COMPLETED OCTOBER 17, 2016. HORIZONTAL DATUM FOR OBSTRUCTIONS IS NORTH AMERICAN DATUM (NAD) 1983, VERTICAL DATUM IS NATIONAL GEODETIC VERTICAL DATUM 1988.
4. TRAVERSE ELEVATIONS FOR SIGNIFICANT OBJECTS ARE AS FOLLOWS: 10 FEET ADDED TO PRIVATE ROADWAYS, 15 FEET ADDED TO NON-INTERSTATE ROADWAYS, 17 FEET ADDED TO INTERSTATE ROADWAYS, AND 23 FEET ADDED TO RAILROADS.

AECOM
1111 3rd AVENUE, SUITE 1600
SEATTLE, WA 98101
PHONE: 206-438-2700

PROJECT MANAGER: JY | DRAFTED BY: JC
DESIGNED BY: JC | CHECKED BY: AC

#	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

OBSTRUCTION DATA
TABLE 1

SCALE:
DATE: OCTOBER 2019

AIP NUMBER: 3-53-0005-054

SHEET NUMBER: 10 OF 16

OBSTACLE IDENTIFICATION TABLE

OBS NUMBER	LATITUDE	LONGITUDE	DESCRIPTION	DATE OF SURVEY	TOP ELEVATION (MSL)	GROUND ELEVATION (MSL)	OBJECT HEIGHT (AGL)	14 CFR PART 77 SURFACE	14 CFR PART 77 PENETRATION AMOUNT	TERPS DEPATURE PENETRATION AMOUNT	OEI PENETRATION AMOUNT	PROPOSED DISPOSITION
700	48°48'18.00162"N	122°32'31.13184"W	TREE	2016	251.6 '	138.5 '	113.1 '	TRANSITIONAL WEST	9.1 '	N/A	N/A	TRIM/REMOVE
701	48°48'13.49387"N	122°32'25.17896"W	TREE	2016	217.9 '	130 '	87.9 '	TRANSITIONAL WEST	31.5 '	37.3 '	N/A	TRIM/REMOVE
702	48°47'51.32652"N	122°32'33.74880"W	TREE	2016	275.8 '	155 '	120.8 '	TRANSITIONAL WEST	23.2 '	N/A	N/A	TRIM/REMOVE
703	48°47'49.89834"N	122°32'33.15095"W	TREE	2016	272.5 '	155 '	117.5 '	TRANSITIONAL WEST	6.3 '	N/A	N/A	TRIM/REMOVE
704	48°47'49.29744"N	122°32'30.81658"W	TREE	2016	256.3 '	159.7 '	96.6 '	TRANSITIONAL WEST	12.3 '	N/A	N/A	TRIM/REMOVE
705	48°47'48.17027"N	122°32'23.72795"W	TREE	2016	191.2 '	155 '	36.2 '	TRANSITIONAL WEST	14.9 '	N/A	N/A	TRIM/REMOVE
706	48°47'47.78461"N	122°32'28.09039"W	TREE	2016	219.1 '	155 '	64.1 '	TRANSITIONAL WEST	1 '	N/A	N/A	TRIM/REMOVE
707	48°47'46.35965"N	122°32'23.84286"W	TREE	2016	190.5 '	155 '	35.5 '	TRANSITIONAL WEST	12.8 '	N/A	N/A	TRIM/REMOVE
708	48°47'45.44420"N	122°32'28.67721"W	TREE	2016	233.8 '	155 '	78.8 '	TRANSITIONAL WEST	9.7 '	N/A	N/A	TRIM/REMOVE
709	48°47'44.78480"N	122°32'25.48826"W	TREE	2016	237 '	155.3 '	81.7 '	TRANSITIONAL WEST	43.2 '	N/A	N/A	TRIM/REMOVE
710	48°47'42.87224"N	122°32'32.64672"W	TREE	2016	265 '	160 '	105 '	TRANSITIONAL WEST	2.5 '	N/A	N/A	TRIM/REMOVE
711	48°47'42.96004"N	122°32'29.76919"W	TREE	2016	258.2 '	158.8 '	99.4 '	TRANSITIONAL WEST	23.3 '	N/A	N/A	TRIM/REMOVE
712	48°47'42.44782"N	122°32'25.46809"W	TREE	2016	233.5 '	160.1 '	73.4 '	TRANSITIONAL WEST	39.6 '	N/A	N/A	TRIM/REMOVE
713	48°47'41.61321"N	122°32'35.21242"W	TREE	2016	288.1 '	161.4 '	126.7 '	TRANSITIONAL WEST	0.9 '	N/A	N/A	TRIM/REMOVE
714	48°47'41.34450"N	122°32'31.15615"W	TREE	2016	259.9 '	163.5 '	96.4 '	TRANSITIONAL WEST	11.4 '	N/A	N/A	TRIM/REMOVE
715	48°47'40.92726"N	122°32'22.83015"W	TREE	2016	226.9 '	165 '	61.9 '	TRANSITIONAL WEST	57.9 '	N/A	N/A	TRIM/REMOVE
716	48°47'40.45730"N	122°32'28.22430"W	TREE	2016	231.7 '	165 '	66.7 '	TRANSITIONAL WEST	11.1 '	N/A	N/A	TRIM/REMOVE
717	48°47'40.30540"N	122°32'26.11752"W	TREE	2016	211.1 '	165 '	46.1 '	TRANSITIONAL WEST	10.7 '	N/A	N/A	TRIM/REMOVE
718	48°47'39.72283"N	122°32'31.26827"W	TREE	2016	279.6 '	168.1 '	111.5 '	TRANSITIONAL WEST	29.8 '	N/A	N/A	TRIM/REMOVE
719	48°47'39.42275"N	122°32'33.18933"W	TREE	2016	284.1 '	165 '	119.1 '	TRANSITIONAL WEST	15.9 '	N/A	N/A	TRIM/REMOVE
720	48°47'38.89919"N	122°32'29.68798"W	TREE	2016	254.3 '	170.8 '	83.5 '	TRANSITIONAL WEST	19.5 '	N/A	N/A	TRIM/REMOVE
721	48°47'39.02399"N	122°32'25.40828"W	TREE	2016	204 '	163 '	41 '	TRANSITIONAL WEST	10.1 '	N/A	N/A	TRIM/REMOVE
722	48°47'35.36338"N	122°32'31.28392"W	TREE	2016	266.1 '	165 '	101.1 '	TRANSITIONAL WEST	15.5 '	N/A	N/A	TRIM/REMOVE
723	48°47'34.61442"N	122°32'28.30999"W	TREE	2016	243 '	165 '	78 '	TRANSITIONAL WEST	20.7 '	N/A	N/A	TRIM/REMOVE
724	48°47'34.96094"N	122°32'24.45792"W	TREE	2016	204.9 '	158.5 '	46.4 '	TRANSITIONAL WEST	19.5 '	N/A	N/A	TRIM/REMOVE
725	48°47'32.22988"N	122°32'30.26710"W	TREE	2016	271 '	162.2 '	108.8 '	TRANSITIONAL WEST	29.6 '	N/A	N/A	TRIM/REMOVE
726	48°47'31.54263"N	122°32'27.31309"W	TREE	2016	227 '	160 '	67 '	TRANSITIONAL WEST	13.7 '	N/A	N/A	TRIM/REMOVE
727	48°47'29.79034"N	122°32'29.20389"W	TREE	2016	232.9 '	158.1 '	74.8 '	TRANSITIONAL WEST	1.3 '	N/A	N/A	TRIM/REMOVE
728	48°47'11.48599"N	122°32'24.59812"W	TREE	2016	221.1 '	145 '	76.1 '	TRANSITIONAL WEST	30.7 '	N/A	N/A	TRIM/REMOVE
729	48°47'09.10105"N	122°32'26.69115"W	TREE	2016	259.4 '	155 '	104.4 '	TRANSITIONAL WEST	48.6 '	N/A	N/A	TRIM/REMOVE
730	48°47'09.03984"N	122°32'24.11317"W	TREE	2016	237.6 '	158.9 '	78.7 '	TRANSITIONAL WEST	51.5 '	N/A	N/A	TRIM/REMOVE
731	48°47'07.12933"N	122°32'27.25060"W	TREE	2016	248.1 '	158 '	90.1 '	TRANSITIONAL WEST	31.7 '	N/A	N/A	TRIM/REMOVE
732	48°47'07.01918"N	122°32'23.94878"W	TREE	2016	214.1 '	160 '	54.1 '	TRANSITIONAL WEST	29.2 '	N/A	N/A	TRIM/REMOVE
733	48°47'05.72677"N	122°32'29.48814"W	TREE	2016	282.4 '	155 '	127.4 '	TRANSITIONAL WEST	44.3 '	N/A	N/A	TRIM/REMOVE
734	48°47'04.90540"N	122°32'30.93032"W	TREE	2016	267.6 '	155 '	112.6 '	TRANSITIONAL WEST	15.6 '	N/A	N/A	TRIM/REMOVE
735	48°47'04.90603"N	122°32'25.00615"W	TREE	2016	253.1 '	157.4 '	95.7 '	TRANSITIONAL WEST	57.7 '	N/A	N/A	TRIM/REMOVE
736	48°47'04.15662"N	122°32'27.62611"W	TREE	2016	267.2 '	155 '	112.2 '	TRANSITIONAL WEST	46.7 '	N/A	N/A	TRIM/REMOVE
737	48°47'02.62178"N	122°32'28.15419"W	TREE	2016	266.2 '	155 '	111.2 '	TRANSITIONAL WEST	40.4 '	N/A	N/A	TRIM/REMOVE
738	48°47'02.73965"N	122°32'24.36144"W	TREE	2016	227.2 '	155.3 '	71.9 '	TRANSITIONAL WEST	37.7 '	N/A	N/A	TRIM/REMOVE
739	48°46'59.40230"N	122°32'23.83872"W	TREE	2016	244.4 '	146.2 '	98.2 '	TRANSITIONAL WEST	59.5 '	N/A	N/A	TRIM/REMOVE
740	48°46'58.74482"N	122°32'26.50830"W	TREE	2016	246.5 '	140 '	106.5 '	TRANSITIONAL WEST	36.1 '	N/A	N/A	TRIM/REMOVE
741	48°46'57.25148"N	122°32'24.57521"W	TREE	2016	253.4 '	149.7 '	103.7 '	TRANSITIONAL WEST	61.6 '	N/A	N/A	TRIM/REMOVE
742	48°46'55.23846"N	122°32'25.31839"W	TREE	2016	246.2 '	155 '	91.2 '	TRANSITIONAL WEST	47.5 '	N/A	N/A	TRIM/REMOVE
743	48°46'53.60450"N	122°32'24.76918"W	TREE	2016	240.5 '	153.6 '	86.9 '	TRANSITIONAL WEST	47.2 '	51.7 '	N/A	TRIM/REMOVE
744	48°46'51.34479"N	122°32'25.38149"W	TREE	2016	222.8 '	139.9 '	82.9 '	TRANSITIONAL WEST	23.9 '	28.3 '	N/A	TRIM/REMOVE
800	48°48'39.67833"N	122°31'57.68691"W	TREE	2016	271.2 '	125 '	146.2 '	TRANSITIONAL EAST	14.8 '	24.4 '	54.4 '	TRIM/REMOVE
801	48°48'39.19132"N	122°31'58.39467"W	TREE	2016	249.8 '	127.7 '	122.1 '	TRANSITIONAL EAST	0.2 '	4.3 '	33.9 '	TRIM/REMOVE
803	48°48'32.26720"N	122°32'01.02263"W	TREE	2016	232.4 '	124.7 '	107.7 '	TRANSITIONAL EAST	7.2 '	4.4 '	27.6 '	TRIM/REMOVE
804	48°48'29.99060"N	122°32'00.54859"W	TREE	2016	238.5 '	126.4 '	112.1 '	TRANSITIONAL EAST	8.5 '	16.3 '	N/A	TRIM/REMOVE
805	48°48'29.59096"N	122°31'58.16873"W	TREE	2016	255.5 '	126 '	129.5 '	TRANSITIONAL EAST	2.8 '	N/A	N/A	TRIM/REMOVE
806	48°48'27.64038"N	122°32'01.92999"W	TREE	2016	241.2 '	129 '	112.2 '	TRANSITIONAL EAST	24.2 '	24.9 '	N/A	TRIM/REMOVE
807	48°48'21.50984"N	122°32'04.74040"W	TREE	2016	225.3 '	121.9 '	103.4 '	TRANSITIONAL EAST	34.5 '	24.5 '	N/A	TRIM/REMOVE
808	48°48'20.62534"N	122°32'02.25837"W	TREE	2016	217.8 '	113 '	104.8 '	TRANSITIONAL EAST	3.2 '	19.3 '	N/A	TRIM/REMOVE

OBSTACLE IDENTIFICATION TABLE

OBS NUMBER	LATITUDE	LONGITUDE	DESCRIPTION	DATE OF SURVEY	TOP ELEVATION (MSL)	GROUND ELEVATION (MSL)	OBJECT HEIGHT (AGL)	14 CFR PART 77 SURFACE	14 CFR PART 77 PENETRATION AMOUNT	TERPS DEPATURE PENETRATION AMOUNT	OEI PENETRATION AMOUNT	PROPOSED DISPOSITION
809	48°48'20.25253"N	122°32'04.84069"W	TREE	2016	223 '	115.7 '	107.3 '	TRANSITIONAL EAST	33.1 '	25.4 '	N/A	TRIM/REMOVE
810	48°48'17.80685"N	122°32'04.60306"W	TREE	2016	206.4 '	112.6 '	93.8 '	TRANSITIONAL EAST	13.9 '	15 '	N/A	TRIM/REMOVE
811	48°48'07.98757"N	122°32'03.86987"W	TREE	2016	236.4 '	126.7 '	109.7 '	TRANSITIONAL EAST	36 '	N/A	N/A	TRIM/REMOVE
812	48°48'06.38643"N	122°32'02.80084"W	TREE	2016	230.1 '	123.8 '	106.3 '	TRANSITIONAL EAST	19.4 '	N/A	N/A	TRIM/REMOVE
813	48°48'05.98630"N	122°32'04.59644"W	TREE	2016	245.2 '	134.5 '	110.7 '	TRANSITIONAL EAST	51.7 '	N/A	N/A	TRIM/REMOVE
814	48°48'04.48743"N	122°32'03.00264"W	TREE	2016	241.5 '	131.9 '	109.6 '	TRANSITIONAL EAST	32.6 '	N/A	N/A	TRIM/REMOVE
816	48°48'02.63064"N	122°32'02.91958"W	TREE	2016	252.6 '	147 '	105.6 '	TRANSITIONAL EAST	42.8 '	N/A	N/A	TRIM/REMOVE
817	48°48'01.63548"N	122°32'01.15423"W	TREE	2016	259.6 '	146.7 '	112.9 '	TRANSITIONAL EAST	32.9 '	N/A	N/A	TRIM/REMOVE
818	48°48'00.41313"N	122°31'59.89033"W	TREE	2016	253.7 '	144.4 '	109.3 '	TRANSITIONAL EAST	14.8 '	N/A	N/A	TRIM/REMOVE
819	48°47'19.05830"N	122°32'03.99673"W	LIGHT POLE	2016	204.7 '	163 '	41.7 '	TRANSITIONAL EAST	1.9 '	N/A	N/A	NO ACTION
820	48°47'16.13589"N	122°32'04.15597"W	LIGHT POLE	2016	214 '	166 '	48 '	TRANSITIONAL EAST	12.5 '	N/A	N/A	NO ACTION
821	48°47'14.22568"N	122°32'00.49836"W	TREE	2016	261.6 '	174.3 '	87.3 '	TRANSITIONAL EAST	25 '	N/A	N/A	TRIM/REMOVE
822	48°47'13.95163"N	122°31'58.56437"W	TREE	2016	263.1 '	175.3 '	87.8 '	TRANSITIONAL EAST	7.9 '	N/A	N/A	TRIM/REMOVE
823	48°47'13.48338"N	122°32'03.70728"W	TREE	2016	251.5 '	179.2 '	72.3 '	TRANSITIONAL EAST	45.5 '	N/A	N/A	TRIM/REMOVE
824	48°47'12.70903"N	122°32'05.36065"W	TREE	2016	247 '	178.3 '	68.7 '	TRANSITIONAL EAST	56.8 '	N/A	N/A	TRIM/REMOVE
825	48°47'12.58812"N	122°32'01.88485"W	TREE	2016	254.2 '	176.7 '	77.5 '	TRANSITIONAL EAST	30.7 '	N/A	N/A	TRIM/REMOVE
826	48°48'04.39083"N	122°32'01.30399"W	TREE	2016	249 '	130.5 '	118.5 '	TRANSITIONAL EAST	23.9 '	N/A	N/A	TRIM/REMOVE
827	48°47'12.14889"N	122°31'59.61966"W	TREE	2016	258.3 '	181 '	77.3 '	TRANSITIONAL EAST	13.1 '	N/A	N/A	TRIM/REMOVE
828	48°47'12.06519"N	122°31'57.63952"W	TREE	2016	273.9 '	179.1 '	94.8 '	TRANSITIONAL EAST	9.7 '	N/A	N/A	TRIM/REMOVE
829	48°47'11.36133"N	122°32'04.75230"W	TREE	2016	257.6 '	178.4 '	79.2 '	TRANSITIONAL EAST	61.4 '	N/A	N/A	TRIM/REMOVE
830	48°47'10.27069"N	122°32'01.33233"W	TREE	2016	249.3 '	178 '	71.3 '	TRANSITIONAL EAST	20.3 '	N/A	N/A	TRIM/REMOVE
831	48°47'10.15434"N	122°31'59.70044"W	TREE	2016	269.9 '	178.5 '	91.4 '	TRANSITIONAL EAST	25.4 '	N/A	N/A	TRIM/REMOVE
832	48°47'10.20297"N	122°31'57.11103"W	TREE	2016	286.9 '	179.5 '	107.4 '	TRANSITIONAL EAST	17.6 '	N/A	N/A	TRIM/REMOVE
833	48°47'09.99050"N	122°32'05.45362"W	TREE	2016	246.3 '	179 '	67.3 '	TRANSITIONAL EAST	56.8 '	N/A	N/A	TRIM/REMOVE
834	48°47'08.54981"N	122°32'04.27194"W	TREE	2016	252.5 '	181.4 '	71.1 '	TRANSITIONAL EAST	51.6 '	N/A	N/A	TRIM/REMOVE
835	48°47'08.25224"N	122°32'00.11066"W	TREE	2016	281.7 '	184 '	97.7 '	TRANSITIONAL EAST	40.9 '	N/A	N/A	TRIM/REMOVE
836	48°47'08.26060"N	122°31'57.02437"W	TREE	2016	292.9 '	180.7 '	112.2 '	TRANSITIONAL EAST	22.5 '	N/A	N/A	TRIM/REMOVE
837	48°47'07.47322"N	122°32'05.67884"W	TREE	2016	262.5 '	182 '	80.5 '	TRANSITIONAL EAST	74.9 '	N/A	N/A	TRIM/REMOVE
838	48°47'06.57831"N	122°32'03.41394"W	TREE	2016	268.6 '	180 '	88.6 '	TRANSITIONAL EAST	59.2 '	N/A	N/A	TRIM/REMOVE
839	48°47'06.39244"N	122°32'01.03579"W	TREE	2016	272.8 '	183.8 '	89 '	TRANSITIONAL EAST	40.7 '	N/A	N/A	TRIM/REMOVE
840	48°47'05.54311"N	122°31'59.04007"W	TREE	2016	261.1 '	182.8 '	78.3 '	TRANSITIONAL EAST	9.9 '	N/A	N/A	TRIM/REMOVE
841	48°47'04.07052"N	122°32'02.80600"W	TREE	2016	255.5 '	179.5 '	76 '	TRANSITIONAL EAST	40.2 '	N/A	N/A	TRIM/REMOVE
842	48°47'02.59990"N	122°31'59.38166"W	TREE	2016	263.7 '	177.8 '	85.9 '	TRANSITIONAL EAST	15.5 '	N/A	N/A	TRIM/REMOVE
843	48°47'01.35851"N	122°32'00.73000"W	TREE	2016	261.9 '	174.4 '	87.5 '	TRANSITIONAL EAST	26.5 '	N/A	N/A	TRIM/REMOVE
844	48°47'01.22672"N	122°32'03.52447"W	TREE	2016	241.1 '	172.5 '	68.6 '	TRANSITIONAL EAST	32.5 '	N/A	N/A	TRIM/REMOVE
845	48°47'00.48289"N	122°32'00.16558"W	TREE	2016	263.4 '	174 '	89.4 '	TRANSITIONAL EAST	22.6 '	N/A	N/A	TRIM/REMOVE
846	48°46'59.86568"N	122°31'58.10149"W	TREE	2016	269.3 '	173.1 '	96.2 '	TRANSITIONAL EAST	8.7 '	N/A	N/A	TRIM/REMOVE
847	48°46'59.13859"N	122°32'04.37182"W	TREE	2016	257.5 '	169.8 '	87.7 '	TRANSITIONAL EAST	57 '	N/A	N/A	TRIM/REMOVE
848	48°46'58.73047"N	122°32'01.34661"W	TREE	2016	271.6 '	165.6 '	106 '	TRANSITIONAL EAST	42.1 '	N/A	N/A	TRIM/REMOVE
849	48°46'58.77948"N	122°31'59.56488"W	TREE	2016	261.5 '	169.1 '	92.4 '	TRANSITIONAL EAST	15 '	N/A	N/A	TRIM/REMOVE
850	48°46'57.82711"N	122°32'04.49490"W	TREE	2016	249.8 '	168.7 '	81.1 '	TRANSITIONAL EAST	50.6 '	N/A	N/A	TRIM/REMOVE
851	48°46'57.57398"N	122°32'01.43291"W	TREE	2016	260 '	164.1 '	95.9 '	TRANSITIONAL EAST	31.6 '	N/A	N/A	TRIM/REMOVE
852	48°46'56.80037"N	122°31'58.83074"W	TREE	2016	264 '	162.1 '	101.9 '	TRANSITIONAL EAST	10.8 '	N/A	N/A	TRIM/REMOVE
853	48°46'56.21612"N	122°32'03.39723"W	TREE	2016	263.6 '	162.3 '	101.3 '	TRANSITIONAL EAST	54.2 '	N/A	N/A	TRIM/REMOVE
854	48°46'55.29244"N	122°32'00.75754"W	TREE	2016	259.8 '	161.1 '	98.7 '	TRANSITIONAL EAST	25.3 '	N/A	N/A	TRIM/REMOVE
855	48°46'54.39942"N	122°32'02.63521"W	TREE	2016	257.3 '	164 '	93.3 '	TRANSITIONAL EAST	41 '	N/A	N/A	TRIM/REMOVE
856	48°46'52.61207"N	122°32'02.54972"W	TREE	2016	236.8 '	159.9 '	76.9 '	TRANSITIONAL EAST	20 '	N/A	N/A	TRIM/REMOVE
857	48°46'50.92523"N	122°32'02.52081"W	TREE	2016	238.1 '	156.9 '	81.2 '	TRANSITIONAL EAST	21.3 '	N/A	N/A	TRIM/REMOVE
858	48°46'49.29888"N	122°32'03.09309"W	TREE	2016	269 '	155.7 '	113.3 '	TRANSITIONAL EAST	57.9 '	69.2 '	N/A	TRIM/REMOVE
859	48°46'45.47415"N	122°32'03.28256"W	TREE	2016	231.9 '	140.3 '	91.6 '	TRANSITIONAL EAST	23.4 '	22.4 '	N/A	TRIM/REMOVE
1000	48°48'26.66741"N	122°33'23.92686"W	TREE	2016	322 '	220 '	102 '	HORIZONTAL	1 '	N/A	N/A	TRIM/REMOVE
1001	48°48'26.48108"N	122°33'23.16050"W	CELL TOWER	2016	325.2 '	219.9 '	105.3 '	HORIZONTAL	4.2 '	N/A	N/A	NO ACTION
1002	48°47'20.89986"N	122°30'24.54878"W	TREE	2016	330.8 '	207.1 '	123.7 '	HORIZONTAL	9.8 '	N/A	N/A	TRIM/REMOVE
1003	48°47'20.44549"N	122°30'23.14326"W	TREE	2016	330.8 '	202.5 '	128.3 '	HORIZONTAL	9.7 '	N/A	N/A	TRIM/REMOVE

NOTES

1. ELEVATIONS ARE IN FEET ABOVE MEAN SEA LEVEL (MSL).
2. THRESHOLD SITING SURFACE OBJECT PENETRATIONS WERE NOT EVALUATED.
3. SOURCE OF DATA: FAA 18-B SURVEY COMPLETED OCTOBER 17, 2016. HORIZONTAL DATUM FOR OBSTRUCTIONS IS NORTH AMERICAN DATUM (NAD) 1983, VERTICAL DATUM IS NATIONAL GEODETIC VERTICAL DATUM 1988.
4. OBSTRUCTION REMOVAL NEEDS TO BE VERIFIED BY SURVEY OR OTHER MEANS AND REQUIRES DOCUMENTATION IN ORDER TO ELIMINATE FROM THE OBSTRUCTION LIST.

AECOM
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PHONE: 206-438-2700

PROJECT MANAGER: JY | DRAFTED BY: JC
DESIGNED BY: JC | CHECKED BY: AC

#	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.

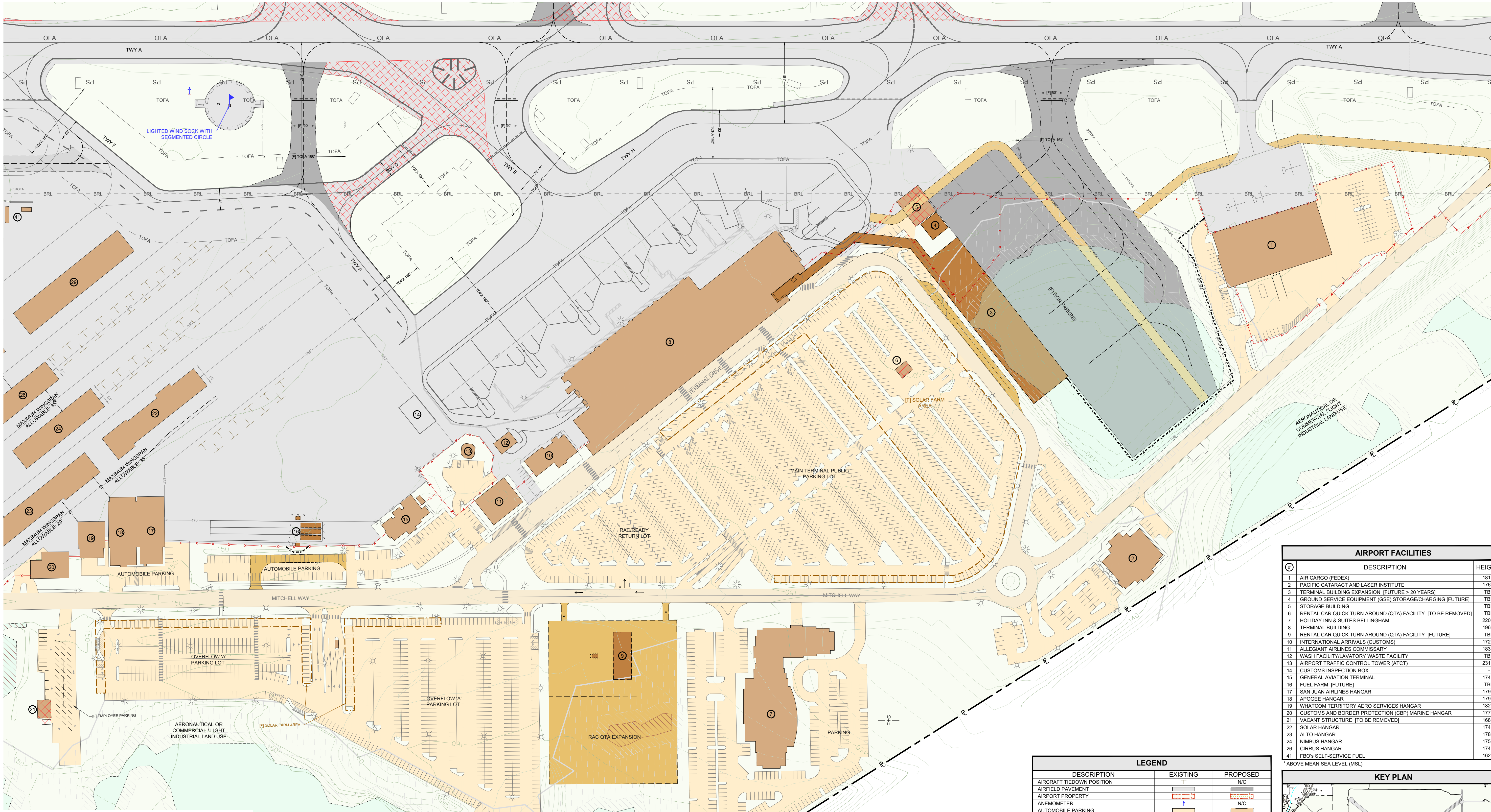
PORT OF BELLINGHAM
Washington State

BELLINGHAM INTERNATIONAL AIRPORT
AIRPORT MASTER PLAN

OBSTRUCTION DATA
TABLE 2

SCALE:
DATE: OCTOBER 2019

AIP NUMBER: 3-53-0005-054



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. TAXIWAY CENTERLINE TO AIRCRAFT PARKING/FIXED MOVABLE OBJECT SEPARATION DIMENSIONS ARE THE SAME AS TOFA DIMENSIONS AS LABELED.

LEGEND

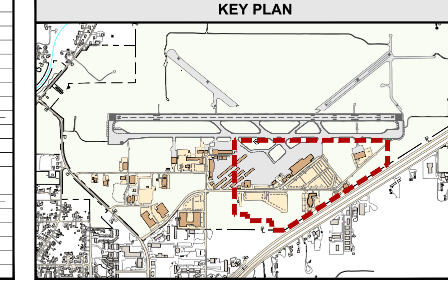
DESCRIPTION	EXISTING	PROPOSED
AIRCRAFT TIEDOWN POSITION		N/C
AIRFIELD PAVEMENT		
AIRPORT PROPERTY		
ANEMOMETER		N/C
AUTOMOBILE PARKING		
BUILDING - ON AIRPORT PROPERTY		
BUILDING RESTRICTION LINE (BRL)		N/C
FENCE		
HOLDING POSITION MARKING		N/C
ROADWAY		
RUNWAY OBJECT FREE AREA (OFA)	OFA	N/C
SECTION/QUARTER SECTION CORNER		N/C
TAXIWAY OBJECT FREE AREA (TOFA)	TOFA	TOFA(F)
TO BE REMOVED	N/A	
TOPOGRAPHIC CONTOUR	10	N/C
WETLAND		N/C
WETLAND FILL	N/A	
WIND SOCK		N/C

AIRPORT FACILITIES

#	DESCRIPTION	HEIGHT*
1	AIR CARGO (FEDEX)	181.8'
2	PACIFIC CATARACT AND LASER INSTITUTE	176.4'
3	TERMINAL BUILDING EXPANSION [FUTURE > 20 YEARS]	TBD
4	GROUND SERVICE EQUIPMENT (GSE) STORAGE/CHARGING [FUTURE]	TBD
5	STORAGE BUILDING	TBD
6	RENTAL CAR QUICK TURN AROUND (QTA) FACILITY [TO BE REMOVED]	TBD
7	HOLIDAY INN & SUITES BELLINGHAM	220.0'
8	TERMINAL BUILDING	196.0'
9	RENTAL CAR QUICK TURN AROUND (QTA) FACILITY [FUTURE]	TBD
10	INTERNATIONAL ARRIVALS (CUSTOMS)	172.3'
11	ALLEGIANT AIRLINES COMMISSARY	183.2'
12	WASH FACILITY/LAVATORY WASTE FACILITY	TBD
13	AIRPORT TRAFFIC CONTROL TOWER (ATCT)	231.0'
14	CUSTOMS INSPECTION BOX	-
15	GENERAL AVIATION TERMINAL	174.4'
16	FUEL FARM [FUTURE]	TBD
17	SAN JUAN AIRLINES HANGAR	179.6'
18	APOGEE HANGAR	179.6'
19	WHATCOM TERRITORY AERO SERVICES HANGAR	182.6'
20	CUSTOMS AND BORDER PROTECTION (CBP) MARINE HANGAR	177.9'
21	VACANT STRUCTURE [TO BE REMOVED]	168.0'
22	SOLAR HANGAR	174.3'
23	ALTO HANGAR	178.9'
24	NIMBUS HANGAR	175.6'
26	CIRRUS HANGAR	174.9'
41	FBO's SELF-SERVICE FUEL	162.0'

* ABOVE MEAN SEA LEVEL (MSL)

KEY PLAN



BLI - Sheet 12 (Terminal Area Plan).dwg

AECOM
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PHONE: 206-438-2700

PROJECT MANAGER:	JY	DRAFTED BY:	RO
DESIGNED BY:	RO	CHECKED BY:	JY

#	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

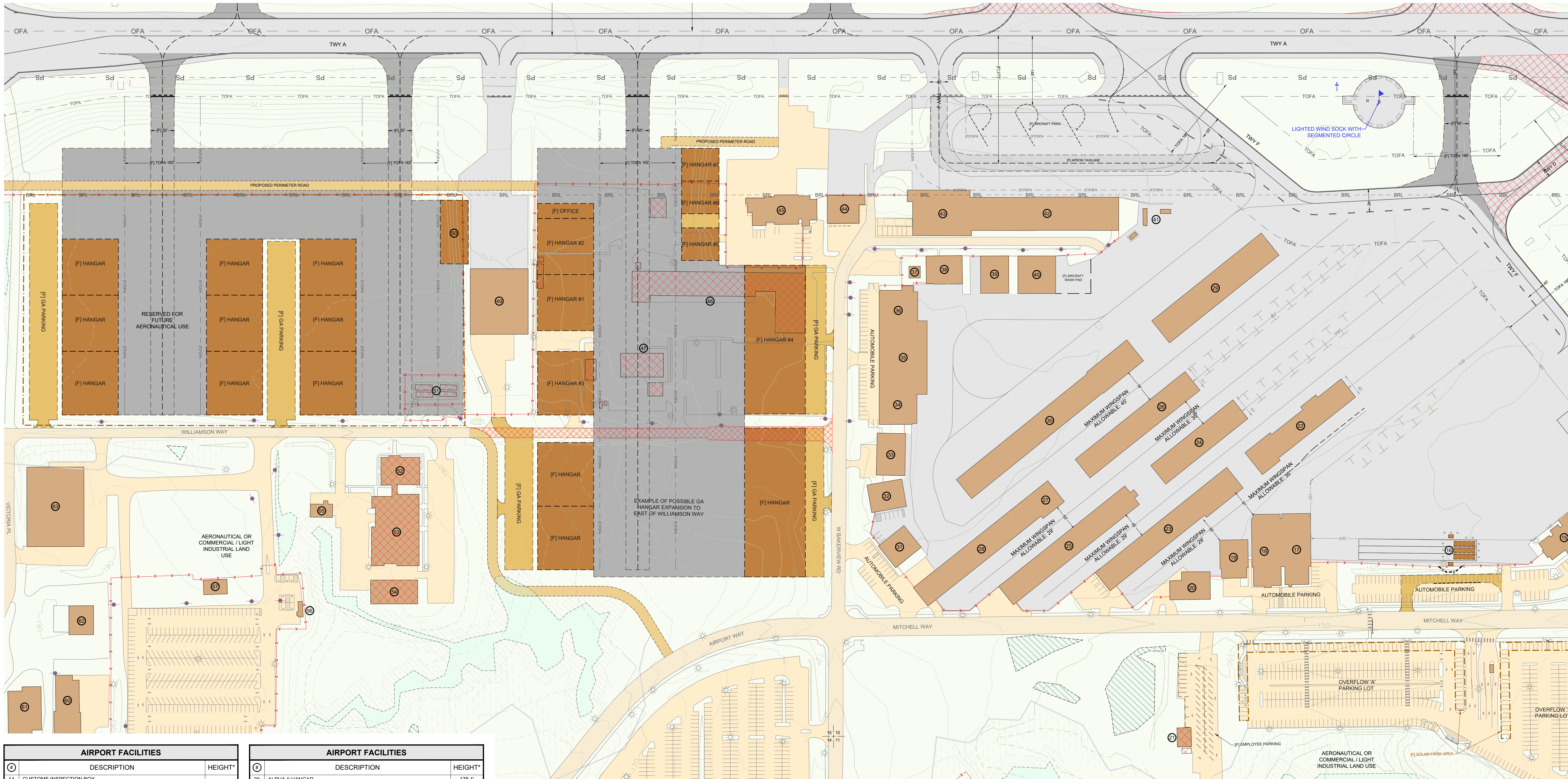
BELLINGHAM INTERNATIONAL AIRPORT
AIRPORT MASTER PLAN

TERMINAL AREA PLAN

SCALE: 1" = 100'
DATE: OCTOBER 2019

AIP NUMBER: 3-53-0005-054

SHEET NUMBER: 12 OF 16



AIRPORT FACILITIES

#	DESCRIPTION	HEIGHT*
14	CUSTOMS INSPECTION BOX	-
15	GENERAL AVIATION TERMINAL	174.4'
16	FUEL FARM [FUTURE]	TBD
17	SAN JUAN AIRLINES HANGAR	179.6'
18	APOGEE HANGAR	179.6'
19	WHATCOM TERRITORY AERO SERVICES	182.6'
20	CUSTOMS AND BORDER PROTECTION (CBP) MARINE	177.9'
21	VACANT STRUCTURE [TO BE REMOVED]	168.0'
22	SOLAR HANGAR	174.3'
23	ALTO HANGAR	178.9'
24	NIMBUS HANGAR	175.6'
25	DELTA (PORT HANGAR)	175.3'
26	CIRRUS HANGAR	174.9'
27	SRE BUILDING	180.5'
28	ECHO (PORT HANGAR)	180.5'
29	HANGAR III	183.7'
30	STRATO HANGAR	179.3'
31	ROYER HANGAR	180.6'
32	BAYSIDE, LLC HANGAR	180.3'
33	TEK CONSTRUCTION HANGAR	178.8'
34	ANDERS HANGAR	195.7'
35	EVOLUTION HANGAR	195.7'
36	COMMAND AVIATION MAINTENANCE HANGAR	195.7'
37	ELECTRICAL VAULT	166.2'
38	CANYON INDUSTRIES HANGAR	182.5'

* ABOVE MEAN SEA LEVEL (MSL)

AIRPORT FACILITIES

#	DESCRIPTION	HEIGHT*
39	ALPHA II HANGAR	178.1'
40	ALPHA I HANGAR	189.9'
41	FBO's SELF-SERVICE FUEL	162.0'
42	LONETREE HANGAR	178.2'
43	DEPARTMENT OF HOMELAND SECURITY (DHS) OPERATIONS HANGAR	178.2'
44	COMMAND AVIATION HANGAR	178.3'
45	AIRCRAFT RESCUE FIRE FIGHTING (ARFF)	179.9'
46	AIR NATIONAL GUARD [TO BE REMOVED]	183.3'
47	AIR NATIONAL GUARD [TO BE REMOVED]	185.2'
49	EAST PERCH, LLC. HANGAR	209.0'
50	SNOW REMOVAL EQUIPMENT (SRE) FACILITY [FUTURE]	TBD
51	FUEL FARM STORAGE TANKS [TO BE REMOVED]	187.1'
52	NATIONAL GUARD ARMORY [FOR LEASE]	204.7'
53	NATIONAL GUARD ARMORY [FOR LEASE]	TBD
54	NATIONAL GUARD ARMORY [FOR LEASE]	TBD
55	NATIONAL GUARD ARMORY [FOR LEASE]	TBD
56	VACANT	TBD
57	PORT OF BELLINGHAM EQUIPMENT STORAGE	TBD
58	SOUND BEVERAGE DISTRIBUTION, INC.	213.6'
59	EMERGENCE OPERATIONS CENTER (EOC)	214.2'
60	B & P VENDING	TBD
61	WISE ENTERPRISES	TBD
62	VACANT	TBD
63	YAMAMOTO PROPERTIES, LLC.	220.4'

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. TAXIWAY CENTERLINE TO AIRCRAFT PARKING/FIXED MOVABLE OBJECT SEPARATION DIMENSIONS ARE THE SAME AS TOFA DIMENSIONS AS LABELED.

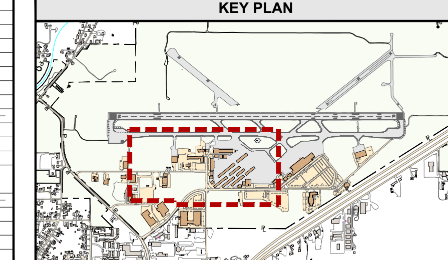
50 0 50 100
SCALE IN FEET

N
MAGNETIC
MAGNETIC: 15°59' E ± 0°23'
JUNE 2018
ANNUAL CHANGE: 0°9' W

LEGEND

DESCRIPTION	EXISTING	PROPOSED
AIRCRAFT TIEDOWN POSITION		N/C
AIRFIELD PAVEMENT		
AIRPORT PROPERTY		
ANEMOMETER		N/C
AUTOMOBILE PARKING		
BUILDING - ON AIRPORT PROPERTY		
BUILDING RESTRICTION LINE (BRL)		N/C
FENCE		
HOLDING POSITION MARKING		N/C
ROADWAY		
RUNWAY OBJECT FREE AREA (OFA)	OFA	N/C
SECTION/QUARTER SECTION CORNER		N/C
TAXIWAY OBJECT FREE AREA (TOFA)	TOFA	TOFA(F)
TO BE REMOVED	N/A	
TOPOGRAPHIC CONTOUR		N/C
WETLAND		N/C
WETLAND FILL	N/A	
WIND SOCK		N/C

KEY PLAN



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PROJECT MANAGER:	JY	DRAFTED BY:	RO
DESIGNED BY:	RO	CHECKED BY:	JY

#	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

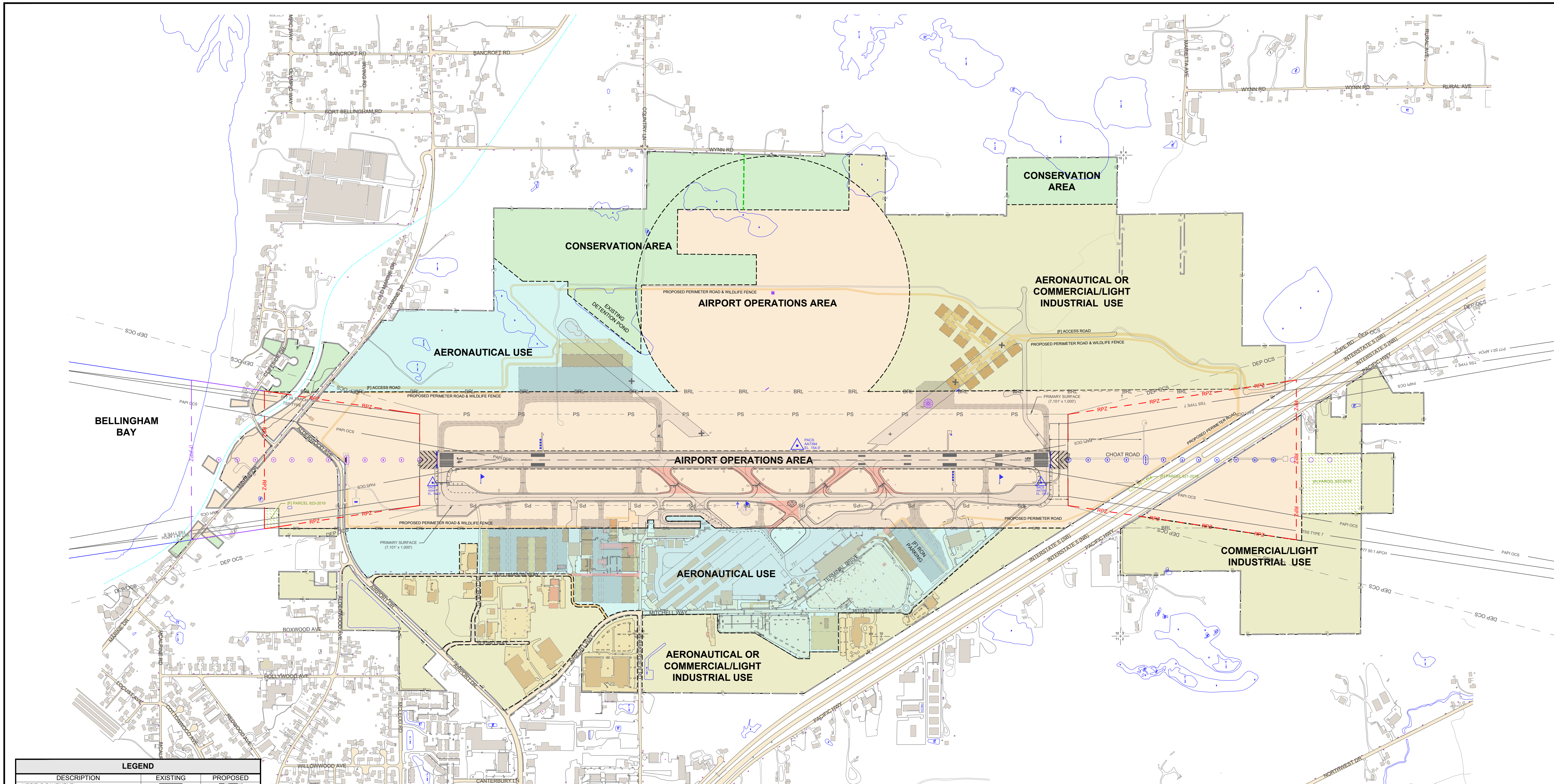
GENERAL AVIATION PLAN

SCALE: 1" = 100'
DATE: OCTOBER 2019

AIP NUMBER: 3-53-0005-054

SHEET NUMBER: 13 OF 16

BLI - Sheet 13 (General Aviation Plan).dwg



LEGEND

DESCRIPTION	EXISTING	PROPOSED
AIRFIELD PAVEMENT		
AIRPORT PROPERTY		
AUTOMOBILE PARKING		
BUILDING - ON AIRPORT PROPERTY		
BUILDING RESTRICTION LINE (BRL)		N/C
FENCE		
ROADWAY		
RUNWAY OBJECT FREE AREA (OFA)	OFA	N/C
RUNWAY OBJECT FREE ZONE (OFZ)	OFZ	N/C
RUNWAY PROTECTION ZONE (RPZ)	RPZ	(F)RPZ
RUNWAY SAFETY AREA (RSA)	RSA	N/C
SECTION/QUARTER SECTION CORNER		N/C
SURVEY MONUMENT		N/C

DESCRIPTION	HATCH
AERONAUTICAL USE	
AIRPORT OPERATIONS AREA	
AERONAUTICAL OR COMMERCIAL/LIGHT INDUSTRIAL USE	
CONSERVATION AREA	

NOTES

1. RUNWAY PROTECTION ZONE CONTROL IS VIA OWNERSHIP FOR BOTH RUNWAY ENDS EXCEPT FOR JURISDICTIONAL RIGHT-OF-WAYS FOR BURLINGTON NORTHERN RAILROAD, CITY AND COUNTY ROADS, AND WASHINGTON STATE DEPARTMENT OF TRANSPORTATION INTERSTATE ROADS (I-5). THESE ARE NOT INCLUDED IN THE RUNWAY PROTECTION ZONE LAND USE CONTROL AREA OF THE PORT OF BELLINGHAM / BELLINGHAM INTERNATIONAL AIRPORT.

BLI - Sheet 14 (On-Airport Land Use Plan).dwg

AECOM
1111 3rd AVENUE, SUITE 1600
SEATTLE, WA 98101
PHONE: 206-438-2700

PROJECT MANAGER:	JY	DRAFTED BY:	RO
DESIGNED BY:	RO	CHECKED BY:	JY

#	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

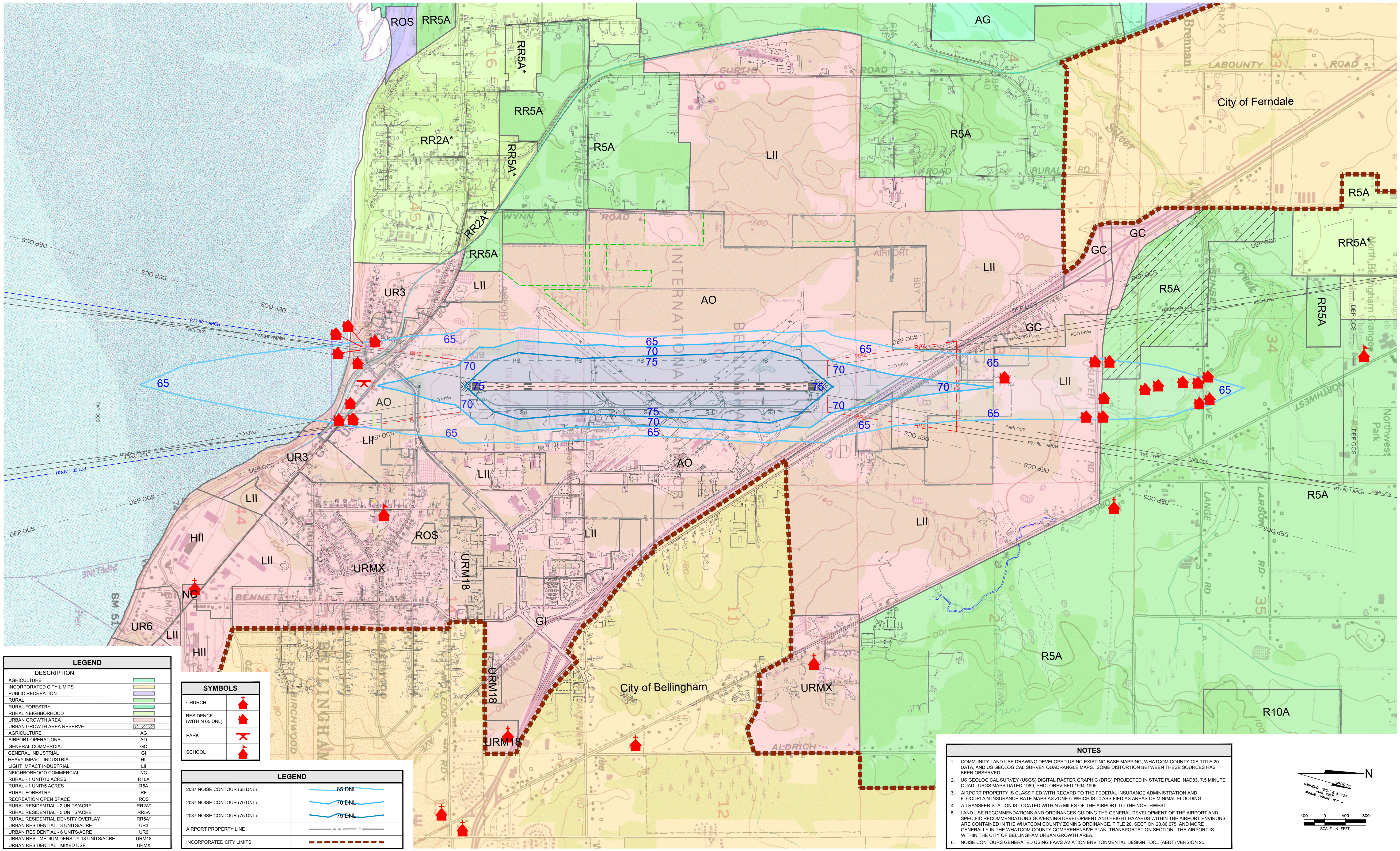
ON-AIRPORT LAND USE PLAN

SCALE: 1" = 500'

DATE: OCTOBER 2019

AIP NUMBER: 3-53-0005-054

SHEET NUMBER: 14 OF 16



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	
RESIDENCE (WITHIN 65 DNL)	
PARK	
SCHOOL	

LEGEND	
2037 NOISE CONTOUR (65 DNL)	65 DNL
2037 NOISE CONTOUR (70 DNL)	70 DNL
2037 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 URBAN GROWTH AREA.
6. NOISE CONTOURS GENERATED USING FAA'S AVIATION ENVITONMENTAL DESIGN TOOL (AEDT) VERSION 2c

N

MAGNETIC: 15°59' E ± 0°23' JUNE 2018 ANNUAL CHANGE: 0°9' W

400 0 400 800
SCALE IN FEET

AECOM
1111 3rd AVENUE, SUITE 1600
SEATTLE, WA 98101
PHONE: 206-438-2700

PROJECT MANAGER:	JY	DRAFTED BY:	RO
DESIGNED BY:	RO	CHECKED BY:	JY

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

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PORT OF BELLINGHAM
Washington State

BELLINGHAM INTERNATIONAL AIRPORT
AIRPORT MASTER PLAN

AIRPORT COMMUNITY
LAND USE PLAN

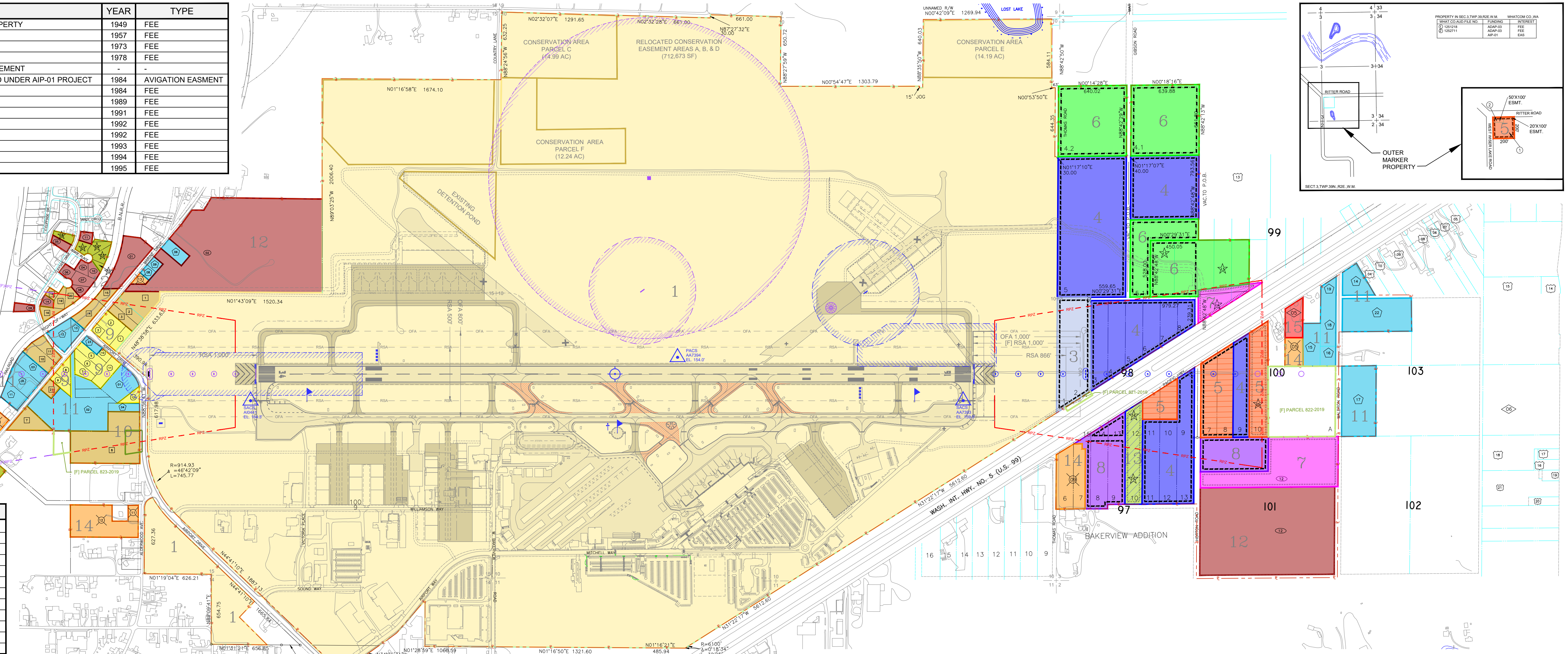
SCALE: 1" = 1,000'
DATE: OCTOBER 2019

AIP NUMBER: 3-53-0005-054

SHEET NUMBER: 15 OF 16

BLI - Sheet 15 (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	

AREA 10 (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		

AREA 11 (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		

AREA 12 (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		

AREA 13 (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		

AREA 14 (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

FUTURE ACQUISITION

ITEM	PROPERTY	ACRES	TOTAL LAND AQUISTION COST ($)
821-2019	WSDOT ROW	0.25	TBD
822-2019	WALDRON RD. BLK. 100, LOT A	9.48	TBD
823-2019	RWY 34 RPZ	0.77	TBD
-	-	-	-
-	-	-	-
-	-	-	-

N

SCALE IN FEET 250 0 250 500

AECOM
1111 3rd AVENUE, SUITE 1600
SEATTLE, WA 98101
PHONE: 206-438-2700

PROJECT MANAGER: JY | DRAFTED BY: RO
DESIGNED BY: RO | CHECKED BY: JY

#	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.

APPROVAL: PORT OF BELLINGHAM

Sunil Harman A.A.E., IAP / Director of Aviation — Date

PORT OF BELLINGHAM Washington State

BELLINGHAM INTERNATIONAL AIRPORT
AIRPORT MASTER PLAN

AIRPORT PROPERTY MAP
EXHIBIT A

SCALE: 1" = 500' | DATE: OCTOBER 2019

AIP NUMBER: 3-53-0005-054

SHEET NUMBER: 16 OF 16

BLI - Sheet 16 (Airport Property Map - Exhibit A).dwg

Appendix A – Glossary

9 Glossary

9.1 Abbreviations/Acronyms

AC - Advisory Circular

ADF - Automatic Direction Finder

ADPM - Average Day of the Peak Month

AEDT - Aviation Environmental Design Tool

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 - U. S. 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

FHWA - Federal Highway Administration

FIS - Federal Inspection Service

FSS - Flight Service Station

GA - General Aviation

GPS - Global Positioning System

IFR - Instrument Flight Rules

ILS - Instrument Landing System

LATS - Washington State Department of Transportation – Aviation Division's Long-term Air Transportation Study.

LDA - Landing Distance Available

Ldn - Day-Night Sound Levels

LIRL - Low-Intensity Runway Lights

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

RPZ - Runway Protection Zone

RSA - Runway Safety Area

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

WSDOT - Washington State Department of Transportation

9.2 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 workloads 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.

Appendix B – ALP Checklist

APPENDIX A. ALP REVIEW CHECKLIST

The following checklist shall be used in lieu of FAA AC 150/5070-6B, Appendix F, Airport Layout Plan Drawing set. This checklist is intended for use when submitting a new or updated ALP to the FAA for review and approval. Consultants and/or sponsors should indicate "Yes," "No" or "N/A" (not applicable) for every item on the checklist. The same checklist shall be provided to FAA for review and verification. For all reviewers: It is important that each item listed be shown on the respective plan.

Airport Identification (to be completed by Sponsor or Consultant)			
Airport	Bellingham International Airport		
City and State	Bellingham, WA	Location Identifier	BLI ....
Airport Owner	Port of Bellingham		

ALP Submission Information (to be completed by Sponsor or Consultant)		
ALP Prepared by	AECOM Name of Consulting Firm	
	Rob Osmanson Name of Individual	September 2018 Date
	206-438-2265 Telephone	
	rob.osmanson@aecom.com Email address	
Consulting QA/QC Review	John Yarnish Name and Title of Individual	September 2018 Date
Sponsor Review	Name and Title of Individual	Date

FAA Review (to be completed by FAA)	
Name and Title of Individual	Date

Critical Design Aircraft or Family of Aircraft:

	Make	Model	Annual Itinerant Operations
Existing	Boeing	757	0
Future	Boeing	737-900	964

Forecasted Year: 2037

Airport Reference Code (ARC): D-III

Runway Design Code (RDC) & Runway Reference (RRC):

Runway	RDC	RRC
16	D-III	D/III/4000
34	D-III	D/III/4000

Approach Minimums:

Rwy End	Minimum	Rwy End	Minimum
16	>3/4		
34	>1		

Runways (Existing and Future):

Runway	Existing		Future		Departure Surface (Y or N/A)
	Length (ft)	Width (ft)	Length (ft)	Width (ft)	
16/34	6701	150	6701	150	Y

For the balance of the checklist, enter a mark (✔ or X) to confirm inclusion.

A.1. Narrative Report

Narrative Report					
Item	**Instructions**	**Sponsor/Consultant**			**FAA**
		Yes	**No**	**N/A**	
A. Executive Summary – A concise summary of the findings/ recommendations of the master planning effort or changes to the ALP. This should include a description of planned projects, an implementation plan/timeline, and identification of benchmarks or actions that will be conducted to either verify the original planning assumptions or proceed with project implementation.	From AC 150/5070-6, Section 202: An accompanying ALP Narrative Report should explain and document those changes and contain at least the following elements: – Basic aeronautical forecasts. – Basis for the proposed items of development. – Rationale for unusual design features and/or modifications to FAA Airport Design Standards. – Summary of the various stages of airport development and layout sketches of the major items of development in each stage. – An environmental overview to document environmental conditions that should be considered in the identification and analysis of airport development alternatives and proposed projects.	×			
1. Identify Projects along with description		×			
2. Create a Timeline for each Project		×			
3. Identify and List:		×			
a. Proposed Projects (e.g., Hangar development)		×			
b. Milestones/ Triggering Events (e.g., 1. All hangars are full, 2. There is a waiting list long enough to fill a new development, 3. Hangars have reached their useful life, etc.)		×			
c. Action items/Next Steps (e.g., 1. Maintain log and gather data, 2. Discuss plan with ADO, 3. Coordinate with ADO regarding potential for inclusion in FAA ACIP (Airports Capital Improvement Program), 4. Identify funding sources.)		×			
d. Funding Plan	Capital Improvement Plan for the forecast horizons. See AC 150/5070-6, Chapter 11. Only a rough, order-of-magnitude report is needed in the executive summary.	×			

Narrative Report					
Item	**Instructions**	**Sponsor/Consultant**			**FAA**
		Yes	**No**	**N/A**	
B. Basic aeronautical forecasts (0-5, 6-10, 11-20 years): Basic aeronautical forecasts (0-5, 6-10, 11-20 years):	Forecasts of future levels of aviation activity as approved by the FAA. These projections are used to determine the need for new or expanded facilities. See AC 150/5070-6, Chapter 7.	×			
1. Total annual operations	Total local and itinerant aircraft operations at the airport.	×			
2. Annual itinerant operations by all aircraft	Itinerant operations by aircraft that leaves the local airspace, generally 25 miles or more from the airport. See AC 150/5070-6, Chapter 7, Section 702.a. and Figure 7-2.	×			
3. Annual itinerant operations by current critical aircraft		×			
4. Annual itinerant operations by future critical aircraft		×			
5. Number of based aircraft	Aircraft that use the subject airport as a home base, i.e., have hangar or tie-down space agreements. See AC 150/5070-6, Chapter 7, Section 702.a. and Figure 7-2.	×			
6. Annual instrument approaches	Number of instrument approaches expected to be executed during a 12-month period. See AC 150/5070-6, Chapter 7, Section 702.a. and Figure 7-2.	×			
7. Number of enplanements	See AC 150/5070-6, Chapter 7, Section 702.a. and Figure 7-2.	×			

Narrative Report					
Item	**Instructions**	**Sponsor/Consultant**			**FAA**
		Yes	**No**	**N/A**	
8. Critical Aircraft (also referred as "design aircraft" or "critical design aircraft)	The critical aircraft is the most demanding aircraft identified in the forecast that will use the airport. Federally funded projects require that the critical aircraft will make substantial use of the airport in the planning period. Substantial use means either 500 or more annual itinerant operations or scheduled service. The critical aircraft may be a single aircraft or a composite of the most demanding characteristics of several aircraft. Provide the aircraft, AAC, and ADG. (e.g. Boeing 737-400, C-III) See AC 150/5300-13A, Paragraph 105(b) and FAA Order 5090.3C, 3-4.	×			
9. Runway Design Code (RDC)	Describe the RDC for each runway. For the purpose of airport geometric design, each runway will contain a RDC which signifies the design standards to which the runway is to be built. The RDC consists of three parameters: Aircraft Approach Category (AAC), Airplane Design Group (ADG) and the approach visibility minimums. These parameters represent the aircraft that are intended to be accommodated by the airport, regardless of substantial use. See AC 150/5300-13A, Paragraph 105(c).	×			
10. Runway Reference Code (RRC)	Describe the RRC for each runway. The RRC describes the current operational capabilities of a runway where no special operating procedures are necessary. The RRC consists of the same three components as the RDC, but is based on planned development and has no operational application. See AC 150/5300-13A, Paragraph 318.	×			
C. Alternatives/Proposed Development		×			

Narrative Report					
Item	**Instructions**	**Sponsor/Consultant**			**FAA**
		Yes	**No**	**N/A**	
11. Explanation of proposed development items	Specific projects can be described as project listings on a master table, on individual project data sheets, or in projects booklets.	×			
12. Discuss near-term and future Approach Procedure Requirements or effects (e.g., LPV, Circling, etc.)	Based on existing or forecast usage. See FAA Order 7400.2, Figures 6-6-3 and 6-3-9.				
13. Navigational Aids or Other Equipment Needs (e.g., Approach Lights, Wind Cones, AWOS, etc.)	The need for new or additional navigational aids is a function of the fleet mix, the percentage of time that poor weather conditions are present, and the cost to the users of not being able to use the airport while it is not accessible.				
14. Wind coverage. Is it adequate for existing and future runway layouts? Has wind data been updated?	This analysis determines if additional runways are needed to provide the necessary wind coverage. Reference AC 150/5300-13A, Appendix 2 for guidance on wind coverage analysis techniques.	×			
D. Modification to Standards.	Any approved nonconformance to FAA standards, other than dimensional standards for RSAs and OFZs, require FAA approval. A description of all approved modification to standards shall be provided. See AC 150/5300-13A, Paragraph 106(b) and FAA Order 5300.1.			×	
E. Obstruction Surfaces (14 CFR Part 77 and Threshold Siting Surface)	Reference 14 CFR Part 77 and AC 150/5300-13A, Paragraph 303.				
F. Runway Protection Zone	A description of any incompatible land uses inside the RPZ shall be provided. Prior to including new or modified land use in the RPZ, the Regional and ADO staff must consult with the National Airport Planning and Environmental Division, APP-400. This policy is exempt from existing land uses in the RPZ. See AC 150/5300-13A, Paragraph 310 and FAA memorandum dated September 27, 2012.	×			

Narrative Report					
Item	**Instructions**	**Sponsor/Consultant**			**FAA**
		Yes	**No**	**N/A**	
G. Development summary (including sketches, schedules, and cost estimates) for stages of construction for: Development summary (including sketches, schedules, and cost estimates) for stages of construction for:	Documentation provided should include any electronic spreadsheets and files to facilitate in modifying the financial plan on an as-needed basis.	×			
15. Development Projects Completed Since Last ALP		×			
16. 0-5 years		×			
17. 6-10 years		×			
18. 11-20 years		×			
H. Shadow or line-of-sight study for towered airports (negative or positive statements are required).	Reference FAA Order 6480.4. This can be from the Airway Facilities Tower Integration Laboratory (AFTIL) or simpler GIS-generated studies.		×		
I. Letters of coordination with all levels of government, as needed.	Affected private and/or governmental groups, agencies, commissions, etc., that may have input on the plans. See AC 150/5070-6, Chapter 3.			×	
J. Wildlife Hazard Management Issues Review (in narrative).	Reference AC 150/5200-33.			×	
K. Preliminary Identification of Environmental Features	Potential or known features only. Further environmental analysis will be necessary. Reference FAA Order 5050.4B. Begin framework for NEPA analysis.	×			
19. Major airport drainage ditches					
20. Wetlands		×			
21. Flood Zones					
22. Historic or Cultural features		×			
23. Section 4(f) features				×	
24. Flora/Fauna		×			

Narrative Report					
Item	**Instructions**	**Sponsor/Consultant**			**FAA**
		Yes	**No**	**N/A**	
25. Natural Resources				×	
26. Etc. (other features identified in Order 5050.4B)		×			
L. Note Action Items from Runway Safety Program Office	List and note status of items from Runway Safety Program Office or Runway Safety Action Plan.			×	
M. Declared Distance (DD)	The narrative on declared distances is used to aid in understanding the maximum distances available and suitable for meeting takeoff, rejected takeoff, and landing distances performance requirements for turbine powered aircraft. The narrative shall also provide clarification on why declared distances have been implemented. Declared distances data must be listed for all runway ends. The TORA, TODA, ASDA, and LDA will be equal to the runway length in cases where a runway does not have displaced thresholds, stopways, or clearway, and have standard RSAs, ROFAs, RPZs, and TSS. Reference AC 150/5300-13A, Paragraph 323.			×	
Remarks					

A.2. Title Sheet

- The scale of the Title Sheet should be developed to include the items listed below.
- The minimum size for the final drawing set is 22" X 34" (ANSI D) and 24" X 36" (ARCH D). Coordinate use of 34" x 44" (ANSI E) and 26" X 48" (ARCH E) with FAA. Color drawings may be acceptable if they are still usable if reproduced in grey scale.

Title Sheet					
Item	**Instructions**	**Sponsor/Consultant**			**FAA**
		Yes	**No**	**N/A**	
A. Title and revision blocks	Each drawing in the Airport Layout Plan drawing set shall have a Title and Revision Block. For drawings that have been updated, e.g., as-builts, the revision block should show the current revision number and date of revision.	×			
B. Airport sponsor approval block	Provide an approval block for the sponsoring authority's representative to sign. Include space for name, title, and date.	×			
C. Date of ALP (date the airport sponsor signs the ALP)	The month and year of signature prominently shown near the title.	×			
D. Index of sheets (including revision date column)	Airport Layout Drawing, Airport Airspace Drawing, Inner Portion of the Approach Surface Drawing, Terminal Area Drawing, Land Use Drawing, Airport Property Map, Airport Departure Surface, etc.	×			
E. State Aeronautics Agency Approval Block (as needed)	Provide an approval block for the sponsoring authority's representative to sign. Include space for name, title, and date.		×		
F. State outline with county boundaries. County in which airport is located should be highlighted.	Provide as needed.	×			
G. Location map (general area)		×			
H. Vicinity map (specific airport area)		×			
Remarks					

A.3. Airport Data Sheet

- For smaller airports, some of the ALP sheets may be combined if practical and approved FAA.

Airport Data Sheet					
Item	**Instructions**	**Sponsor/Consultant**			**FAA**
		Yes	**No**	**N/A**	
A. Title and Revision Blocks	Each drawing in the Airport Layout Plan drawing set shall have a Title and Revision Block. For drawings that have been updated, e.g., as-builts, the revision block should show the current revision number and date of revision.	×			
B. Wind Rose (all weather and IFR) with appropriate airport reference code and runway orientation depicted, crosswind coverage, and combined coverage, source of wind information and time period covered (for IFR runways applicable minimums should be included):	Assembly and analysis of wind data to determine ultimate runway orientation and also provides the operational impact of winds on existing runways. If instrument procedures are present or will be requested then both all-weather and instrument meteorological condition wind roses are required. See AC 150/5300-13A, Appendix 2.	×			
1. 10.5, 13, 16, 20 knots wind rose (based on appropriate airport reference code)	When a runway orientation provides less than 95 percent wind coverage for any aircraft forecasted to use the airport on a regular basis, a crosswind runway is recommended. The 95 percent wind coverage is computed on the basis of the crosswind not exceeding 10.5 knots for Airport Reference Codes A-I and B-I, 13 knots for Airport Reference Codes A-II and B-II, 16 knots for Airport Reference Codes A-III, B-III, and C-I through D-III, and 20 knots for Airport Reference Codes A-IV through D-VI. See also AC 150/5300-13A, Paragraph 302(c)(3) and AC 150/5300-13A, Appendix 2.	×			
2. Percentage of wind coverage/crosswind		×			
3. Source of data	Wind data may be obtained from NOAA at http://www.ncdc.noaa.gov/ Reference AC 150/5300-13A, Appendix 2, Paragraph A2-5 and A2-6.	×			

Airport Data Sheet					
Item	**Instructions**	**Sponsor/Consultant**			**FAA**
		Yes	**No**	**N/A**	
4. Age of data (last 10 consecutive years of data with most current data no older than 10 years)	Data must be from the latest 10-year period from the reporting station closest to the airport. Reference AC 150/5300-13A, Appendix 2, Paragraph A2-5.	×			
C. Airport Data Table					
1. ARC for Airport	List the Airport Reference Code (ARC) for airport. 5300-13AARC is an airport designation that signifies the airport's highest Runway Design Code (RDC), minus the third (visibility) component of the RDC. Reference AC 150/5300-13A.	×			
2. Mean maximum temperature of hottest month	List the mean maximum temperature and the hottest month for the airport location as listed in "Monthly Station Normals of Temperature, Precipitation, and Heating and Cooling Degree-Days" (Climatography of the United States No. 81). See AC 150/5325-4, 506.b.	×			
3. Airport elevation (highest point of the landing areas, nearest 0.1 foot) – using North American Vertical Datum of 1988 (NAVD88)	List the Airport Elevation, the highest point on an airport's usable runway expressed in feet above mean sea level (MSL). Use NAVD88. Reference AC 150/5300-13A, Paragraph 102(g) All elevations shall be in NAVD88. A note shall be put on the Airport Layout Drawing that denotes that the NAVD88 vertical control datum was used.	×			
4. Airport Navigational Aids, including ownership (NDB, TVOR, ASR, Beacon, etc.)	List the electronic aids available at the airport.	×			

Airport Data Sheet					
Item	**Instructions**	**Sponsor/Consultant**			**FAA**
		Yes	**No**	**N/A**	
5. Airport reference point coordinates, nearest second (existing, future if appropriate, and ultimate) - NAD83	List the Airport Reference Point, the latitude and longitude of the approximate center of the airport. Use the North American Datum of 1983 (NAD83) coordinate system. See AC 150/5300-13A, Paragraph 207. All latitude/longitude coordinates shall be in NAD83. A note shall be put on the Airport Layout Drawing that denotes that the NAD83 coordinate system was used.	×			
6. Miscellaneous facilities (taxiway lighting, lighted wind cone(s), AWOS, etc.) [Including type/model and any facility critical areas]	List any other facilities available at the airport.	×			
7. Airport Reference Code and Critical Aircraft (existing & future)	List the existing and ultimate Airport Reference Code and Critical Aircraft, the most demanding aircraft identified in the forecast that will use the airport. Federally funded projects require that critical design airplanes have at least 500 or more annual itinerant operations at the airport (landings and takeoffs are considered as separate operations) for an individual airplane or a family grouping of airplanes. See AC 150/5325-4, 102.a.(8) and AC 150/5070-6, 702.a. Indicated dimensions for wingspan and undercarriage, along with approach speed.	×			
8. Airport magnetic variation, date and source	Magnetic declination may be calculated at http://www.ngdc.noaa.gov/geomag-web/#declination. This model is using the latest World Magnetic Model which has an Epoch Year of 2010. See FAA Order 8260.19, "Flight Procedures and Airspace." Chapter 2, Section 5, for further information.	×			
9. NPIAS service level (GA, RL, P, CS, etc.)	See FAA Order 5090.3C.	×			

Airport Data Sheet					
Item	**Instructions**	**Sponsor/Consultant**			**FAA**
		Yes	**No**	**N/A**	
10. State equivalent service role	As applicable pursuant to State Aviation Department System Plan.			×	
D. Runway Data Table	The Runway Data Table should show information for both existing and ultimate runways.	×			
1. Runway identification (Include identifying runways that are “utility”)	A column for each runway end should be present. List the runway end number and if pavement strength is less than 12,500 pounds (single-wheel), then note as utility.	×			
2. Runway Design Code (RDC)	5300-13AThe first component, depicted by a letter, is the AAC and relates to aircraft approach speed (operational characteristics). The second component, depicted by a Roman numeral, is the ADG and relates to either the aircraft wingspan or tail height (physical characteristics); whichever is more restrictive. The third component relates to the visibility minimums expressed by RVR values in feet of 1200, 1600, 2400, and 4000. List the RDC for each runway. See AC 150/5300-13A, Paragraph 105(c).	×			
3. Runway Reference Code (RRC)	The RRC describes the current operational capabilities of a runway where no special operating procedures are necessary. Like the RDC, it is composed of three components: AAC, ADG, and visibility minimums. List the RRC for each Runway. See AC 150/5300-13A, Paragraph 318.	×			
4. Pavement Strength & Material Type	Indicate the runway surface material type, e.g., turf, asphalt, concrete, water, etc.	×			
a. Strength by wheel loading	List the existing and ultimate design strength of the landing surface. See AC 150/5320-6, Chapter 3.	×			
b. Strength by PCN	See AC 150/5335-5.	×			

Airport Data Sheet					
Item	**Instructions**	**Sponsor/Consultant**			**FAA**
		Yes	**No**	**N/A**	
c. Surface treatment	Note any surface treatment: grooved, PFC, etc.	×			
5. Effective Runway Gradient (%) Author to note maximum grade within runway length. Note to included statement that the runway meets line of sight requirements	List the maximum longitudinal grade of each runway centerline. See AC 150/5300-13A, Paragraph 313.	×			
6. Percent (%) Wind Coverage (each runway)	List the percent wind coverage for each runway for each Aircraft Approach Category. See AC 150/5300-13A, Appendix 2.	×			
7. Runway dimensions (length and width)	Dimensions determined for the Critical Design Aircraft by using graphical information in AC 150/5325-4.	×			
8. Displaced Threshold	Provide the pavement elevation of the runway pavement at any displaced threshold. See AC 150/5300-13A, Paragraph 303(2).	×			
9. Runway safety area dimensions (actual existing and design standard)	List the existing and ultimate dimensions of the Runway Safety Area (RSA). See AC 150/5300-13A, Paragraph 307.	×			
10. Runway end coordinates (NAD83) (include displaced threshold coordinates, if applicable) to the nearest 0.01 second and 0.1 foot of elevation.	Show the latitude and longitude of the threshold center and end of pavement (if different) to the nearest .01 of a second and 0.1 foot of elevation.	×			
11. Runway lighting type (LIRL, MIRL, HIRL)	List the existing and ultimate type of runway lighting system for each runway, e.g., Reflectors, Low Intensity Runway Lighting (LIRL), Medium Intensity Runway Lighting (MIRL), or High Intensity Runway Lighting (HIRL). LIRLs will typically not be shown for new systems. See AC 150/5340-30, Ch. 2.	×			

Airport Data Sheet					
Item	**Instructions**	**Sponsor/Consultant**			**FAA**
		Yes	**No**	**N/A**	
12. Runway Protection Zone (RPZ) Dimensions	List the existing and ultimate Runway Protection Zone (RPZ) dimensions. See AC 150/5300-13A, Paragraph 310. Prior to including new or modified land use in the RPZ, the Regional and ADO staff must consult with the National Airport Planning and Environmental Division, APP-400. This policy is exempt from existing land uses in the RPZ. See AC 150/5300-13A, Paragraph 310 and FAA memorandum dated September 27, 2012.	×			
13. Runway marking type (visual or basic, non-precision, precision)	Indicate the existing and ultimate pavement markings for each runway. See AC 150/5340-1, Section 2.	×			
14. 14 CFR Part 77 approach category (50:1; 34:1; 20:1) Existing and Future	List the existing and ultimate approach surface slope. See FAA Order 7400.2, Figures 6-6-3 and 6-3-9.	×			
15. Approach Type (precision, non-precision, visual)	List the existing and ultimate Part 77 Approach Use Types. See FAA Order 7400.2, Figures 6-6-3 and 6-3-9.	×			
16. Visibility minimums (existing and future)	List the existing and ultimate visibility minimums for each runway. See AC 150/5300-13A, Table 1-3.	×			
17. Type of Aeronautical Survey Required for Approach (Vertically Guided, not Vert. Guided)	List the type of aeronautical survey required for the visibility minimums given. See AC 150/5300-18, Section 2.7 and AC 150/5300-13A, Table 3-4 and Table 3-5.	×			
18. Runway Departure Surface (Yes or N/A)"	Determine applicability of 40:1 Departure Obstacle Clearance Surface (OCS) as defined in Paragraph 303(c) of AC 150/5300-13A.	×			

Airport Data Sheet					
Item	**Instructions**	**Sponsor/Consultant**			**FAA**
		Yes	**No**	**N/A**	
19. Runway Object Free Area	List the existing and ultimate dimensions of the Runway Object Free Area (OFA). See AC 150/5300-13A, Paragraph 309. Objects non-essential for air navigation or aircraft ground maneuvering purposes must not be placed in the ROFA, unless a modification to standard has been approved.	×			
20. Obstacle Free Zone	The OFZ clearing standard precludes aircraft and other object penetrations, except for frangible NAVAIDs that need to be located in the OFZ because of their function. Modification to standards does not apply to the OFZ. List the Runway OFZ, Inner-approach OFZ, Inner-transitional OFZ, and Precision OFZ if applicable.	×			
21. Threshold siting surface (TSS)	List the existing and ultimate threshold siting surface (i.e. approach and departure surfaces). Identify any objects penetrating the surface. If none, state “No TSS Penetrations”. Reference AC 150/5300-13A, Paragraph 303.	×			
22. Visual and instrument NAVAIDs (Localizer, GS, PAPI, etc.)	List the existing and ultimate visual navigational aids serving each runway.	×			
23. Touchdown Zone Elevation	List the highest runway centerline elevation in the existing and ultimate first 3000 feet from landing threshold. See FAA Order 8260.3, Appendix 1.	×			
23. Taxiway and Taxilane width	List the existing and ultimate width of the taxiways and taxilane. Reference AC 150/5300-13A, Paragraph 403 and Table 4-2.	×			
24. Taxiway and Taxilane Safety Area dimensions	List the existing and ultimate taxiway and taxilane safety area dimensions. Reference AC 150/5300-13A, Paragraph 404(c) and Table 4-1.	×			

Airport Data Sheet					
Item	**Instructions**	**Sponsor/Consultant**			**FAA**
		Yes	**No**	**N/A**	
25. Taxiway and Taxilane Object Free Area	List the existing and ultimate taxiway and taxilane object free area dimensions. Reference AC 150/5300-13A, Paragraph 404(b) and Table 4-1.	×			
26. Taxiway and Taxilane Separation	List any objects located inside the Taxiway/Taxilane Safety Area and Taxiway/Taxilane Object Free Area. Also provide the distance from the taxiway/taxilane centerline to the fixed or movable object. Reference Paragraph 404(a) and Table 4-1.	×			
27. Taxiway/Taxilane lighting	List the existing and ultimate type of taxiway lighting system, e.g., Reflectors, Low Intensity Taxiway Lighting (LITL), Medium Intensity Taxiway Lighting (MITL), or High Intensity Taxiway Lighting (HITL). LITLs will typically not be shown for new systems. See AC 150/5340-30, Chapter 4.	×			
28. Identify the vertical and horizontal datum	All latitude/longitude coordinates shall be in North American Datum of 1983 (NAD 83). A note shall be put on the Airport Layout Drawing that denotes that the NAD 83 coordinate system was used. All elevations shall be NAVD88. A note shall be put on the Airport Layout Drawing that denotes that the NAVD88 vertical control datum was used.	×			
E. Modification to Standards Approval Table (if applicable, a separate written request, including justification, should accompany the modification to standards). Show: Approval Date/ Airspace Case No. / Standard to be Modified / Description	Provide a table to list all FAA approved Modifications to Standards. See AC 150/5300-13A, Paragraph 106(b), and FAA Order 5300.1. List “None Required” on the table if no Modifications have yet been proposed or approved.	×			

Airport Data Sheet					
Item	Instructions	Sponsor/Consultant			FAA
		Yes	No	N/A	
F. Declared Distances Table	Required even if Declared Distances are not in effect. Declared distances are only to be used for runways with turbine-powered aircraft. The TORA, TODA, ASDA, and LDA will be equal to the runway length in cases where a runway does not have displaced thresholds, stopways, or clearways, and have standard RSAs, ROFAs, RPZs, and TSS. Reference AC 150/5300-13A, Paragraph 323.	×			
1. Take Off Run Available (TORA)	List the runway length declared available and suitable for the ground run of an airplane taking off, i.e., Take Off Run Available (TORA). The TORA may be reduced such that it ends prior to the runway to resolve incompatible land uses in the departure RPZ, and/or to mitigate environmental effects. Reference AC 150/5300-13A, Paragraph 323(d)(1).	×			
2. Take Off Distance Available (TODA)	List the length of remaining runway or clearway (CWY) beyond the far end of the TORA ADDED TO the TORA. The resulting sum is the Take Off Distance Available (TODA) for the runway. The TODA may be reduced to mitigate penetrations to the 40:1 instrument departure surface, if applicable. The TODA may also extend beyond the runway end through the use of a clearway Reference AC 150/5300-13A, Paragraph 323(d)(2).	×			
3. Accelerate Stop Distance Available (ASDA)	5300-13A List the length the length of runway plus stopway (if any) declared available and suitable for satisfying accelerate-stop distance requirements for a rejected takeoff. Additional RSA and ROFA can be obtained by reducing the ASDA. Reference AC 150/5300-13A, Paragraph 323(d)(3).	×			

Airport Data Sheet					
Item	**Instructions**	**Sponsor/Consultant**			**FAA**
		Yes	**No**	**N/A**	
4. Landing Distance Available (LDA)	5300-13A List the length of runway declared available and suitable for satisfying landing distance requirements. The LDA may be reduced to satisfy the approach RPZ, RSA, and ROFA requirements. Reference AC 150/5300-13A, Paragraph 323(e).	×			
G. Legend	Provide a Legend that identifies all symbols and line types used on the drawing. Lines must be clear and readable with sufficient scale and quality to discern details.	×			
Remarks A single lengend is not appropriate, each sheet hyas a individualized legend.					

A.4. Airport Layout Plan Drawing

- For smaller airports, some of the ALP sheets may be combined if practical and approved by FAA.
- Two, or more, sheets may be necessary for clarity, existing and proposed. The reviewer should be able to differentiate between existing, future, and ultimate development. If clarity is an issue, some features of this drawing may be placed in tabular format. North should be pointed towards the top of the page or to the left. (scale 1"=200' to 1"=600')

Airport Layout Plan Drawing					
Item	**Instructions**	**Sponsor/Consultant**			**FAA**
		Yes	**No**	**N/A**	
A. Title and Revision Blocks	Each drawing in the Airport Layout Plan drawing set shall have a Title and Revision Block. For drawings that have been updated, e.g., as-builts, the revision block should show the current revision number and date of revision.	×			
B. Space for the FAA approval stamp	Leave a blank four-inch by four-inch area for the FAA approval stamp.	×			
C. Layout of existing and proposed facilities and features:	To assure full consideration of future airport development in 14 CFR Part 77 studies, airport owners must have their plans on file with the FAA. The necessary plan data includes, as a minimum, planned runway end coordinates, elevation, and type of approach for any new runway or runway extension. See AC 150/5300-13A, Paragraph 106.	×			
1. True and magnetic North arrow with year of magnetic declination	Magnetic declination may be calculated at http://www.ngdc.noaa.gov/geomag-web/#declination. This model is using the latest World Magnetic Model which has an Epoch Year of 2010. See FAA Order 8260.19, "Flight Procedures and Airspace." Chapter 2, Section 5, for further information.	×			
2. Airport reference point – locate by symbol a Lat./Long. To nearest second (existing, future, and ultimate) NAD 83	List the Airport Reference Point, the latitude and longitude of the center of the airport. Use the NAD 83 coordinate system. See AC 150/5300-13A, Paragraph 207.	×			
3. Wind cones, segmented circle, beacon, AWOS, etc.	Show as applicable pursuant to AC 150/5300-13A, Chapter 6.	×			

Airport Layout Plan Drawing					
Item	**Instructions**	**Sponsor/Consultant**			**FAA**
		Yes	**No**	**N/A**	
4. Contours (showing only significant terrain differences)	Topography, budget, and future uses of the base mapping, will dictate what intervals of topographical contours to use on the maps. Topographic issues may be important in the alternatives analysis, which may require that reduced contour intervals be used. See AC 150/5070-6, 1005.	×			
5. Elevations: All NAVD88	All latitude/longitude coordinates shall be in NAD83/NAVD88.	×			
a. Runway – existing, future, and ultimate ends (nearest 0.1 ft.)	Show the latitude and longitude of the threshold center and end of pavement.	×			
b. Touchdown Zone Elevation (highest point in first 3,000 ft. of runway)	List the highest runway centerline elevation in the existing and ultimate first 3000 feet from landing threshold. See FAA Order 8260.3, Appendix 1.	×			
c. Runway high/low points (existing and future)	For all runways identify high and low points (centerline) and provide elevation information.	×			
d. Label runway/runway intersection elevations	Label the pavement elevation of runway intersections where the centerlines cross.			×	
e. Displaced Thresholds (if any)	Label the pavement elevation and coordinates of the runway pavement at any displaced threshold. See AC 150/5300-13A, Paragraph 303(a)(2).			×	
f. Roadways & Railroads (where they intersect Approach surfaces, the extended runway centerline, and at the most critical points)	Provide elevation information for the traverse ways' centerline elevation where they intersect the Part 77 Approach surfaces (existing and ultimate). Note whether this elevation is the actual elevation or the traverseway elevation plus the traverseway adjustment (23' for railways, 17' for interstate highways, 15' for other public roads, or 10' for private roads). See also 14 CFR Part 77.	×			

Airport Layout Plan Drawing					
Item	**Instructions**	**Sponsor/Consultant**			**FAA**
		Yes	**No**	**N/A**	
g. Structures, Buildings, and Facilities	All buildings on the Airport Layout Drawing should be identified by an alphanumeric character. List these identifiers in a table and give a description of the building. If no Terminal Area drawing is done, also include the top of structure elevation in MSL. If any of the structures violate any airport or approach surfaces give an ultimate disposition to remedy the violation. Don't forget navigation aid shelters, AWOS/ASOS, RVRs, PAPIs, Fueling systems, REILs, etc. Also identify the structure use (hangar, FBO, crew quarters, etc.), as needed. Some lesser objects may be identified by symbols in the legend.	×			
h. Define features to include: trees streams, water bodies, etc.	Provide information and delineate trees, streams, water bodies, etc., on or near airport property and approach surfaces.	×			
6. Runway Details					
a. Runway Design – runway length, runway width, shoulder width, blast pad width, blast pad length, and cross wind component. (existing, future, and ultimate)	AC 150/5325-4 describes procedures for establishing the appropriate runway length. AC 150/5300-13A, Table 3-4 and Table 3-5 provides the minimum runway length. AC 150/5300-13A, Table 3-8 provides the standard dimensions of the runway width, shoulder width, blast pad width, blast pad length, and crosswind component based on RDC. Clearly denote the runway numbers at the thresholds. Show location of existing and future threshold lights.	×			
b. Orientation – true bearing to nearest 0.01 second (and runway numbers)	Show the true bearing to the nearest .01 of a degree of the runway centerline.	×			

Airport Layout Plan Drawing					
Item	Instructions	Sponsor/Consultant			FAA
		Yes	No	N/A	
c. End Coordinates – existing, future, and ultimate degrees, minutes, seconds (to the nearest 0.01 second)	Show the latitude and longitude of the threshold center and end of pavement (if different) to the nearest .01 of a second.	×			
d. Runway Safety Areas (RSA) – actual, existing, future, and ultimate (including dimensions)	Show the extents of the existing and ultimate RSA 5300-13A. Reference AC 150/5300-13A, Paragraph 307.	×			
e. Runway Object Free Areas (ROFA)	Show the extents of the existing and ultimate ROFA. Reference AC 150/5300-13A, Paragraph 309.	×			
f. Precision Obstacle Free Zone (POFZ)	Show the extents of the existing and ultimate POFZ. Reference AC 150/5300-13A, Paragraph 308(d).	×			
g. Obstacle Free Zone (OFZ)	Show the extents of the existing and ultimate OFZ. Reference AC 150/5300-13A, Paragraph 308.	×			
h. Clearways and Stopways	Show any/all clearways and stopways/overruns and the markings used to denote these areas. See AC 150/5300-13A, Paragraph 311 and 312; and AC 150/5340-1, Section 2, Paragraph 14.			×	
i. Runway Protection Zone (RPZ) - Dimensions (existing, future, and ultimate)	Show existing and ultimate RPZ. See AC 150/5300-13A, Paragraph 310. Show the existing and ultimate protective area/zone type of ownership. Identify any incompatible objects and activities inside the RPZ. Prior to including new or modified land use in the RPZ, the Regional and ADO staff must consult with the National Airport Planning and Environmental Division, APP-400. This policy is exempt from existing land uses in the RPZ. See AC 150/5300-13A, Paragraph 310 and FAA memorandum dated September 27, 2012.	×			

Airport Layout Plan Drawing					
Item	Instructions	Sponsor/Consultant			FAA
		Yes	No	N/A	
j. 14 CFR Part 77 Approach Surfaces	Show the portion of the existing and ultimate approach surfaces that are over airport and adjacent property and identify the approach surface dimensions and slope. See FAA Order 7400.2, Figure 6-3-9.	×			
k. Threshold Siting Criteria: Approach/Departure Surface (existing, future, and ultimate) 5300-13A	Determine and identify pursuant to AC 150/5300-13A, Paragraph 303(b) and 303(c).	×			
l. Terminal Instrument Procedures (TERPS)surface and TERPS GQS, if applicable.	Determine and identify pursuant to AC 150/5300-13A, Paragraph 303(a)(4)(a), Table 3-4, and Table 3-5. Reference FAA Order 8260.3.			×	
m. Navigation Aids (NAVAIDS) – PAPI, ILS, GS, LOC, ALS, MALSR, REIL, etc., (plus facility critical area's)	Show all NAVAIDS and provide clearance distances from runways, taxiways, etc. Reference AC 150/5300-13A, Chapter 6.	×			
n. Marking – thresholds, hold lines, etc.	Show on the runway the type and location of markings, existing and ultimate. See AC 150/5340-1, Section 2.	×			
o. Displaced threshold coordinates and elevation	Show the latitude, longitude, and the pavement elevation of the runway pavement at any displaced threshold. See AC 150/5300-13A, Paragraph 303(a)(2).5300-13A.			×	
p. Runway centerline separation distances	Show the runway centerline separation distances to parallel runway centerline, holding position, parallel taxiway/taxilane centerline, aircraft parking area, and helicopter touchdown pad, if applicable. Reference AC 150/5300-13A, Paragraph 321 and Table 3-8.	×			
7. Taxiway Details	Show the taxiway centerline separation distances to parallel taxiway/taxilane centerlines, fixed or movable objects.	×			

Airport Layout Plan Drawing					
Item	Instructions	Sponsor/Consultant			FAA
		Yes	No	N/A	
a. Dimensions – width (existing & ultimate)	Taxiway width based on Taxiway Design Group (TDG). See AC 150/5300-13A, Table 4-2.	×			
b. Taxiway Edge Safety Margin (TESM)	TESM dimension based on TDG. See AC 150/5300-13A, Table 4-2.	×			
c. Taxiway Shoulder Width	Taxiway shoulder width based on TDG. See AC 150/5300-13A, Table 4-2.	×			
b. Taxiway/Taxilane Object Free Area (TOFA)	TOFA width based on Taxiway Design Group (TDG). TOFA extend the entire length of taxiway. See AC 150/5300-13A, Table 4-1.	×			
c. Taxiway/Taxilane Safety Area (TSA)	TSA width based on TDG. TSA extend the entire length of taxiway. See AC 150/5300-13A, Table 4-1.	×			
d. Taxiway/Taxilane Centerline Separation from:					
i. Runway centerline	Show the distance from centerline of runway to centerline of taxiway. See AC 150/5300-13A, Table 4-1.	×			
ii. Parallel taxiway	Show the distance from centerline of taxiway to centerline of parallel taxiway. See AC 150/5300-13A, Table 4-1.	×			
iii. Aircraft parking	Show the distance from centerline of taxiway to marked aircraft parking/tie downs. See AC 150/5300-13A, Table 4-1.	×			
iv. Fixed or Movable Objects	Show the distance from centerline of taxiway to airport objects such as buildings, facilities, poles, etc. See AC 150/5300-13A, Table 4-1.	×			
8. Fences (identify height)	Show the location of existing and ultimate fences and identify height.	×			

Airport Layout Plan Drawing					
Item	Instructions	Sponsor/Consultant			FAA
		Yes	No	N/A	
9. Aprons					
a. Dimensions (square footage, dimension, or length and width)	Include dimensions of apron and distance from runway and taxiway centerlines. Apron should be sized using activity forecast and the apron design spreadsheet. See AC 150/5300-13A, Chapter 5 and FAA Engineering Brief No. 75.	×			
b. Identify aircraft tie-down layout	Show proposed tie-down layout on the apron area. See AC 150/5300-13A, Figure A5-1, AC 20-35, and AC 150/5340-1.	×			
c. Identify Special Use Areas (e.g., deicing or aerial application areas on or near apron)	Show as applicable and pursuant to representative ACs.	×			
10. Roads	Label all roads.	×			
11. Legend	Provide a Legend that identifies all symbols and line types used on the drawing. Lines must be clear and readable with sufficient scale and quality to discern details.	×			
12. Items to be identified with distinct line types	Use distinct line types to identify different items and differentiate between existing and ultimate.	×			
a. NAVAID Critical Areas (Glide Slope, Localizer, AWOS, ASOS, VOR, RVR, etc.)	Show the critical area outline for all Instrument Landing System and other electronic Navigational Aids located on the airport. See AC 150/5300-13A, Chapter 6 for general guidance and FAA Order 5750.16 for critical area dimensions.	×			
b. Building Restriction Lines 5300-13A(BRL)	The BRL is the line indicating where airport buildings must not be located, limiting building proximity to aircraft movement areas. See AC 150/5300-13A, Paragraph 213(a).	×			
c. Runway Visibility Zone (RVZ)	Show the RVZ for the existing and ultimate airport configurations. See AC 150/5300-13A, 305(c).			×	

Airport Layout Plan Drawing					
Item	**Instructions**	**Sponsor/Consultant**			**FAA**
		Yes	**No**	**N/A**	
d. Airport Property Lines and Easements (existing, future, and ultimate)	Show the airport property boundaries, including easements, for the existing and ultimate airport configurations.	×			
13. Survey Documentation					
a. Survey Monuments (PACS/SACS, see AC 150/5300-16)	Show the location of all established survey monuments located on or near the airport property. Identify Primary and Secondary Airport Control Stations (PACS/SACS) if they exist. See AC 150/5300-16. Show the location of all section corners on or near the airport property.	×			
b. Offsets, stations, etc.	Show as applicable.			×	
14. Any Air Traffic Control Tower (ATCT) line of sight/shadow study areas (use separate sheet if necessary)	Reference FAA Order 6480.4.	×			
15. General Aviation development area (e.g., fuel facilities, FBO, hangars, etc.) – greater detail can be shown on the terminal area drawing	Show as applicable.	×			
16. Facilities and movement areas that are to be phased out, if any, are described	Show as applicable.	×			
Remarks					

A.5. Airport Airspace Drawing

- A required drawing.
- Scale 1" = 2000' plan view, 1" = 1000' approach profiles, 1"=100' (vertical) for approach profiles.
- 14 CFR Part 77, Objects Affecting Navigable Airspace, defines this as a drawing depicting obstacle identification surfaces for the full extent of all airport development. It should also depict airspace obstructions for the portions of the surfaces excluded from the Inner Portion of the Approach Surface Drawing.

Airport Airspace Drawing					
Item	**Instructions**	**Sponsor/Consultant**			**FAA**
		Yes	**No**	**N/A**	
A. Title and Revision Block	Each drawing in the Airport Layout Plan drawing set shall have a Title and Revision Block. For drawings that have been updated, e.g., as-builts, the revision block should show the current revision number and date of revision.	×			
B. Plan view (based on ultimate runway lengths) Include location of water or sewage facilities if inside horizontal surface.		×			
1. U.S. Geological Survey (USGS) Quad Sheet for base map	Use the most current USGS Quadrangle(s) as a base map for the airspace drawing.	×			
2. Runway end numbers	Show the ultimate runways and runway numbers. Contact the FAA before renumbering existing runways.	×			
3. Part 77 Surfaces (Horizontal, Conical, Transition, based on ultimate). Including elevations at the point where surfaces change.	Show the extents of the Part 77 imaginary surfaces. For airports that have precision approach runways show balance of the 40,000' approach on a second sheet, if necessary. See 14 CFR Part 77.19.	×			
4. 50' elevation contours on sloping surfaces (NAVD88)	Show contour lines on all sloping Part 77 imaginary surfaces. See 14 CFR Part 77.19.	×			
5. Top elevations of penetrating objects for the inner portion of the approach surface drawing	Identify by unique alphanumeric symbol all objects beyond the Runway Protection Zones that penetrate any of the Part 77 surfaces. See 14 CFR Part 77.	×			
6. Note specifying height restriction (ordinances/statutes)	List any local zoning restrictions that are in place to protect the airport and surrounding airspace. See AC 150/5190-4.		×		
7. North Arrow with magnetic declination and	Magnetic declination may be calculated at	×			

Airport Airspace Drawing					
Item	**Instructions**	**Sponsor/Consultant**			**FAA**
		Yes	**No**	**N/A**	
year	http://www.ngdc.noaa.gov/geomag-web/#declination. This model is using the latest World Magnetic Model which has an Epoch Year of 2010. See FAA Order 8260.19, "Flight Procedures and Airspace." Chapter 2, Section 5, for further information.				
C. Profile view					
1. Airport Elevation	List the Airport Elevation, the highest point on an airport's usable runway expressed in feet above mean sea level (MSL). Use NAVD88 datum. See AC 150/5300-13A, Chapter 1, Paragraph 102(g).	✕			
2. Composite Ground Profile along extended Runway Centerline (Representing the composite profile, based on the highest terrain across the width and along the length of the approach surface)	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.	✕			
3. Significant objects (bluffs, rivers, roads, schools, towers, etc.) and elevations	Identify all significant objects (roads, rivers, railroads, towers, poles, etc.) within the approach surfaces, regardless of whether or not they are obstructions. Use the objects' same alphanumeric identifier that was used on the plan view. Identify the top elevations of all significant objects (roads, rivers, railroads, towers, poles, etc.) within the approach surfaces, regardless of whether or not they are obstructions.	✕			
4. Existing, future, and ultimate runway ends and approach slopes	Show existing and ultimate runway ends and FAR Part 77 approach surface slopes. See 14 CFR Part 77.19.	✕			
D. Obstruction Data Tables (identify obstacles not depicted on the Inner Portion of the Approach Surface Drawing)					
1. Object identification number	Identify all significant objects (roads, rivers, railroads, towers, poles, etc.) within the approach surfaces, regardless of whether	✕			

Airport Airspace Drawing

Item	Instructions	Sponsor/Consultant Yes	Sponsor/Consultant No	Sponsor/Consultant N/A	FAA
	or not they are obstructions. Use the objects alphanumeric identifier that was used on the plan view.				
	Identify the top elevations of all significant objects (roads, rivers, railroads, towers, poles, etc.) within the approach surfaces, regardless of whether or not they are obstructions.				
2. Description	Provide a brief description of the object, e.g., Power Pole, Cell Tower, Natural Gas Flare, etc.	×			
3. Date of Obstruction Survey	Provide the date of latest obstruction survey.	×			
4. Ground Surface Elevation	Provide the ground surface elevation (MSL) at the base of each object.	×			
5. Object Elevation	List the above ground level (AGL) height and the top of object elevation (above mean sea level / AMSL / MSL) for each object.	×			
6. Amount of surface penetration	List the surface that is penetrated and the amount the object protrudes above the surface. See 14 CFR Part 77.	×			
7. Proposed or existing disposition of the obstruction	Provide a proposed or existing disposition of the object to remedy the penetration. See AC 70/7460-1.				
a. Proposed Disposition (existing)		×			
b. Proposed Disposition (future)		×			

Remarks

Due to the large number of objects identified in the aGIS survey separate sheets were prepared to provide these details. In other words the information is provided on other sheets prepared specifically for that purpose.

A.6. Inner Portion of the Approach Surface Drawing

- A required drawing.
- Scale 1"=200' Horizontal, 1"=20' Vertical, two sheets may be necessary for clarity. Typically, the plan view is on the top half of the drawing and the profile view is on the bottom half. Views should be drawn from the runway threshold to a point on the approach slope 100 feet above the runway threshold elevation, at a minimum, or the limits of the RPZ, whichever is further.
- Drawings containing the plan and profile view of the inner portion of the approach surface to the runway and a tabular listing of all surface penetrations. The drawing will depict the obstacle identification approach surfaces contained in 14 CFR Part 77, Objects Affecting Navigable Airspace. The drawing may also depict other surfaces, including the threshold-siting surface, Glideslope Qualification Surface (GQS), those surfaces associated with United States Standards for Instrument Procedures (TERPS), or those required by the local FAA office or state agency. The extent of the approach surface and the number of airspace obstructions shown may restrict each sheet to only one runway end or approach.

Inner Portion of the Approach Surface Drawing					
Item	Instructions	Sponsor/Consultant			FAA
		Yes	No	N/A	
A. Title and Revision Block	Each drawing in the Airport Layout Plan drawing set shall have a Title and Revision Block. For drawings that have been updated, e.g., as-builts, the revision block should show the current revision number and date of revision.	×			
B. Plan View (existing, future, and ultimate)		×			
1. Inner portion of approach surface	Show the area from the runway threshold out to where the ultimate approach surface slope is 100 feet above the threshold elevation.	×			
2. Aerial photo for base map	Use an aerial photograph for the base map.	×			
3. Objects (identified by numbers)	Identify all significant objects (roads, rivers, railroads, towers, poles, etc.) within the approach surfaces, regardless of whether or not they are obstructions using an alphanumeric character.	×			
4. Property line within approaches	Show the property lines that are within the area/portion of airport shown.	×			

Inner Portion of the Approach Surface Drawing					
Item	Instructions	Sponsor/Consultant			FAA
		Yes	No	N/A	
5. Road & railroad elevations, plus movable object heights	Provide elevation information for the traverse ways' centerline elevation where they intersect the Part 77 Approach surfaces (existing and ultimate). Note whether this elevation is the actual elevation or the traverse way elevation plus the traverse way adjustment (23' for railways, 17' for interstate highways, 15' for other public roads, or 10' for private roads). See also 14 CFR Part 77.	×			
6. Part 77 Approach Surface clearance over Roads and Railroads at the most critical points, the Centerline and Edge of the surface.	Provide elevation information for the traverse ways where they intersect the edges and centerline of the Part 77 Approach surfaces (existing and ultimate). Note whether this elevation is the actual elevation or the traverseway elevation plus the traverseway adjustment (23' for railways, 17' for interstate highways, 15' for other public roads, or 10' for private roads). See also 14 CFR Part 77.	×			
7. Physical end of runway, end number, elevation (NAVD88) Nearest 0.1 foot	Show the existing and ultimate runway end, runway number, and the elevation of the threshold center.	×			
8. Airport Design Surfaces		×			
a. Runway Safety Area	Show the extents of the existing and ultimate Runway Safety Area (RSA). See AC 150/5300-13A, Paragraph 307 and Table 3-8.	×			
b. Runway Object Free Area	Show the extents of the existing and ultimate Object Free Area (OFA). See AC 150/5300-13A, Paragraph 309 and Table 3-8.	×			
c. Runway Obstacle Free Zone (OFZ)	Show the extents of the existing and ultimate OFZ which includes the inner-approach OFZ, inner-transitional OFZ, and the Precision OFZ (POFZ), if applicable. See AC 150/5300-13A, Paragraph 308.	×			

Inner Portion of the Approach Surface Drawing					
Item	**Instructions**	**Sponsor/Consultant**			**FAA**
		Yes	**No**	**N/A**	
d. Runway Protection Zone (RPZ)	Show the extents of the existing and ultimate RPZ. Prior to including new or modified land use in the RPZ, the Regional and ADO staff must consult with the National Airport Planning and Environmental Division, APP-400. This policy is exempt from existing land uses in the RPZ. See AC 150/5300-13A, Paragraph 310, Table 3-5 and FAA memorandum dated September 27, 2012.	×			
e. NAVAID critical area	Show the critical area outline for all Instrument Landing System and other electronic Navigational Aids located on the airport. See AC 150/5300-13A, Chapter 6 for general guidance and FAA Order 5750.16 for critical area dimensions.	×			
9. Ground contours	Show ground contour lines in 2', 5', or 10' intervals. Topographic issues may be important in the alternatives analysis, which may require that reduced contour intervals be used. See AC 150/5070-6, Paragraph 1005.	×			
10. North arrow with magnetic declination and year	Magnetic declination may be calculated at http://www.ngdc.noaa.gov/geomag-web/#declination. This model is using the latest World Magnetic Model which has an Epoch Year of 2010. See FAA Order 8260.19, Chapter 2, Section 5, for further information.	×			
C. Profile view					
1. Existing and proposed runway centerline ground profile (list elevations at runway ends & at all points of grade changes) (representing the composite profile based on the highest terrain across the width and along the length of the approach surface)	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 to where the ultimate approach surface slope is 100 feet above the threshold elevation. A more effective presentation may be a rendering of a composite critical profile.	×			

Inner Portion of the Approach Surface Drawing					
Item	**Instructions**	**Sponsor/Consultant**			**FAA**
		Yes	**No**	**N/A**	
2. Future development from plan view	Identify future development using same alphanumeric identifier that was used on the plan view.			×	
3. Part 77 Approach/transition surface; existing and future VASI/PAPI siting surface	Show the boundaries of the existing and ultimate Part 77 Approach Surface. See FAA Order 7400.2, Figure 6-3-9, See also 14 CFR Part 77.	×			
4. Threshold Siting Surface	Depict any applicable siting requirements pursuant to Table 3-2 of FAA AC 150/5300-13A.	×			
5. Terrain in approach area (fences, streams, etc.)	Show all significant terrain(fences, streams, mountains, etc.) within the approach surfaces, regardless of whether or not they are obstructions	×			
6. Objects – identify the controlling object (same numbers as plan view)	Show all significant objects (roads, rivers, railroads, towers, sign and power poles, etc.) within the approach surfaces, regardless of whether or not they are obstructions.	×			
	Identify the objects using same alphanumeric identifier that was used on the plan view.				
7. Cross section of road & railroad	Show the cross-section of any roads and/or railroads that cross the area shown. Indicate cross section elevations of roads and railroads at edges and extended centerlines that cross the area shown.	×			
8. Existing and proposed property and easement lines	Show the airport property boundaries, including easements, for the existing and ultimate airport configurations. AC 5300-13A Note easements for pipelines and residential through the fence gateways.	×			
D. Obstruction tables for each approach surface (surface should be identified)	A separate table for each runway end must be used to enhance information clarity.				
1. Object identification number	List each object by the same alphanumeric symbol used in the plan view.	×			

Inner Portion of the Approach Surface Drawing					
Item	**Instructions**	**Sponsor/Consultant**			**FAA**
		Yes	**No**	**N/A**	
2. Description	Provide a brief description of the object, e.g., Power Pole, Cell Tower, Natural Gas Flare, etc.	×			
3. Date of Obstruction Survey and Survey Accuracy	Provide the date of latest obstruction survey.	×			
4. Surface Penetrations	5300-13A For any object that penetrates the Part 77 surface, the approach surface, or the obstacle free zone, describe the vertical length the object protrudes.	×			
5. Proposed disposition of surface penetrations	Provide a proposed disposition of the object to remedy the penetration as described in item 4 above. See AC 70/7460-1 for Part 77 violations. “Removal” and/or “Lower” should be listed for any Airports safety area/zone violations. See AC 150/5300-13A, Paragraph 303 and 308.	×			
6. Object elevation	List the Above Ground Level (AGL) height and the top of object elevation in MSL for each object.	×			
7. Triggering Event (e.g., a runway extension) – Timeframe/expected date for removal	List the surface that is penetrated and the amount the object protrudes above the surface. See 14 CFR Part 77 and AC 150/5300-13A, Paragraphs 303 and 308.	×			
8. Allowable approach surface elevation (if applicable)		×			
9. Amount of approach surface penetration (if applicable)		×			
10. Proposed disposition of approach surface obstruction (if applicable)	Provide a proposed disposition of the object to remedy the penetration. See AC 70/7460-1 for Part 77 violations. “Removal” and/or “Lower” should be listed for any Airports safety area/zone violations. See AC 150/5300-13A, Paragraph 303.	×			

Inner Portion of the Approach Surface Drawing					
Item	**Instructions**	**Sponsor/Consultant**			**FAA**
		Yes	**No**	**N/A**	
11. Obstacle Free Zone (OFZ)	Determine and depict the applicable OFZ surfaces, see AC 150/5300-13A, Paragraph 308. Provide a proposed disposition of the object to remedy the penetration. Note: Modification to the OFZ standard is not permitted.	×			
E. Runway Centerline Profile	This may be shown on the Inner Portion of the Approach Surface drawing if there is space to show the runway and Runway Safety Area in sufficient detail otherwise a separate sheet may be necessary. At a minimum this drawing is to show the full length of the runway and Runway Safety Area including: runway elevations, runway and Runway Safety Area gradients, all vertical curves, and a line representing the 5' line-of-sight. See AC 150/5300-13A, Paragraph 305.	×			
1. Scale	The vertical scale of this drawing must be able to show the separation of the runway surface and the 5' Line-of-Sight line. See AC 150/5300-13A, Paragraph 305.	×			
2. Elevation	Show runway elevations, runway and Runway Safety Area gradients, and all vertical curve data. See AC 150/5300-13A, Paragraph 318.	×			
3. Line of Sight	The vertical scale of this drawing must be able to show the separation of the runway surface and the 5' Line-of-Sight line. See AC 150/5300-13A, Section 305.	×			

Remarks

Due to the large number of objects identified in the aGIS survey separate sheets were prepared to provide these details. In other words the information is provided on other sheets prepared specifically for that purpose. The plan provided refers people to this separate drawing

A.7. Runway Departure Surface Drawing

- Required where applicable. For each runway that is designated for instrument departures.
- This drawing depicts the applicable departure surfaces as defined in Paragraph 303 of FAA AC 150/5300-13A. The surfaces are shown for runway end(s) designated for instrument departures.
- 40:1 for Instrument Procedure Runways (Scale, 1" = 1000' Horizontal, 1" = 100' Vertical, Out to 10,200' beyond Runway threshold) 62.5:1 for Commercial Service Runways (Scale, 1" = 2000' Horizontal, 1" = 100' Vertical, Out to 50,000' beyond Runway threshold).
- Contact the FAA if the scale does not allow the entire area to fit on a single sheet. The depiction of the One Engine Inoperative (OEI) surface is optional; it is not currently required.

Runway Departure Surface Drawing					
Item	**Instructions**	**Sponsor/Consultant**			**FAA**
		Yes	**No**	**N/A**	
A. Title and Revision Blocks	Each drawing in the Airport Layout Plan drawing set shall have a Title and Revision Block. For drawings that have been updated, e.g., as-builts, the revision block should show the current revision number and date of revision.	×			
B. Plan view (existing & future)	See AC 150/5300-13A, Paragraph 303(c).	×			
1. Aerial Photo for base map	Use an aerial photograph for the base map. A USGS 7.5 minute series map is also acceptable.	×			
2. Runway end numbers and elevations (nearest 1/10 of a foot)	Show the existing and ultimate runway end, runway number, and the elevation of the threshold center. For runways that have a clearway, depict this surface and the relocated departure surface. Reference AC 150/5300-13A, Paragraph 303(c)(1).	×			
3. 50' elevation contours on sloping surfaces (NAVD88)	Show contour lines on the Part 77 imaginary surfaces. See 14 CFR Part 77.19.	×			
4. Depict property line, including easements	Show the property line(s) that are within the area/portion of airport shown.	×			
5. Identify, by numbers, all traverse ways with elevations and computed vertical clearance in the departure surface	Identify all significant objects (roads, rivers, railroads, towers, poles, etc.) within the departure surfaces, regardless of whether or not they are obstructions using unique alphanumeric characters.	×			

Runway Departure Surface Drawing					
Item	Instructions	Sponsor/Consultant			FAA
		Yes	No	N/A	
6. Ground contours	Show ground contour lines in 2', 5', or 10' intervals. Topographic issues may be important in the alternatives analysis, which may require that reduced contour intervals be used.	×			
C. Profile view (existing & future)		×			
1. Ground profile	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 departure surface to extents of the surface dimensions.	×			
2. Significant objects (bluffs, rivers, roads, buildings, fences, structures, etc.)	Show all significant objects (roads, rivers, railroads, towers, poles, etc.) within the approach surfaces, regardless of whether or not they are obstructions using an alphanumeric character.	×			
3. Identify obstructions with numbers on the plan view	Identify the objects using same alphanumeric identifier that was used on the plan view.	×			
4. Show roads and railroads with dashed lines at edge of the departure surface	Show the cross-section of any roads and/or railroads that cross the area shown.	×			
D. Obstruction Data Tables					
1. Object identification number	Identify all significant objects (roads, rivers, railroads, towers, poles, etc.) within the departure surfaces, regardless of whether or not they are obstructions using unique alphanumeric characters. List each object by the same alphanumeric symbol used in the plan view.	×			
2. Description	Provide a brief description of the object, e.g., Power Pole, Cell Tower, Tree, Natural Gas Flare, etc.	×			
3. Object Elevation	List the Above Ground Level (AGL) height and the top of object elevation in MSL for each object.	×			

Runway Departure Surface Drawing					
Item	Instructions	Sponsor/Consultant			FAA
		Yes	No	N/A	
4. Amount of surface penetration	List the object protrudes above the departure surface. See AC 150/5300-13A, Paragraph 303(c).	×			
5. Proposed or existing disposition of the obstruction	Provide a proposed disposition of the object to remedy the penetration. See AC 150/5300-13A, Paragraph 303(c).	×			
6. Separate table for each departure surface	A separate table for each runway end must be used to enhance information clarity.	×			

Remarks

Due to the large number of objects identified in the aGIS survey separate sheets were prepared to provide these details. In other words the information is provided on other sheets prepared specifically for that purpose.

A.8. Terminal Area Drawing

- Scale 1”=50’ or 1”=100’. Plan view of aprons, buildings, hangars, parking lots, roads.
- This plan consists of one or more drawings that present a large-scale depiction of areas with significant terminal facility development. Such a drawing is typically an enlargement of a portion of the ALP. At a commercial service airport, the drawing would include the passenger terminal area, but might also include general aviation facilities and cargo facilities. See AC 150/5300-13A, Appendix 5.
- Use scale that allows the extent of the terminal/FBO apron area to best fit the chosen sheet size, e.g., typical GA airports may be able to use 1”=50’ scale on a 22” X 34” sheet, but a complex hub airport with multiple terminal areas may require a 1”=100’ scale on a 36” X 48” sheet. Contact FAA if an airport layout requires scaling or sheet sizing other than what is listed.
- This drawing is not needed at every airport type and is therefore optional.

Terminal Area Drawing					
Item	**Instructions**	**Sponsor/Consultant**			**FAA**
		Yes	**No**	**N/A**	
A. Title and Revision Blocks	Each drawing in the Airport Layout Plan drawing set shall have a Title and Revision Block. For drawings that have been updated, e.g., as-builts, the revision block should show the current revision number and date of revision.	×			
B. Building data table	All buildings on the Airport Layout Drawing should be identified by an alphanumeric character. List these identifiers in a table and give a description of the building. If no Terminal Area drawing is done, also include the top of structure elevation in MSL.				
1. Structure identification number		×			
2. Top elevation of structures (AMSL)		×			
3. Obstruction marking/lighting (existing/future)	Show the location of existing and ultimate hangars. Include dimensions of apron and distance from runway and taxiway centerlines. See AC 150/5300-13A, Appendix 5. Show the elevation of the highest point of each structure.	×			
C. Buildings to be removed or relocated noted	If any of the structures violate any airport or approach surfaces give an ultimate disposition to remedy the violation.	×			
D. Fueling facilities, existing and future	Show the location of existing and ultimate fueling facilities. Include dimensions of apron and distance from runway and taxiway centerlines.	×			

Terminal Area Drawing					
Item	**Instructions**	**Sponsor/Consultant**			**FAA**
		Yes	**No**	**N/A**	
E. Air carrier gates positions shown (existing/future)	Show the existing and ultimate air carrier gate positions. See AC 150/5300-13A, Chapter 5.	×			
F. Existing and future security fencing with gates	Show the existing and ultimate security fencing and gates. See AC 150/5300-13A, Paragraph 606.	×			
G. Building restriction line (BRL)	Show the Building Restriction Line (BRL) that is within the area/portion of airport shown. The BRL identifies suitable building area locations on airports. This should be located where the Part 77 surfaces are at 35' above the airport elevation unless a different height is coordinated with the FAA. See AC 150/5300-13A, Paragraph 213(a).	×			
H. Taxiway or Taxilane centerlines designated	Show centerlines of all taxiway and taxilanes within the area/portion of airport shown.	×			
I. Dimensions					
1. Clearance Dimensions between runway, taxiway, and taxilane centerlines and hangars, buildings, aircraft parking, and other objects.	Show the location of existing and ultimate apron. Include dimensions of apron and distance from runway and taxiway centerlines. Apron should be sized using activity forecast and the apron design spreadsheet. See AC 150/5300-13A, Chapter 5 and FAA Engineering Brief No. 75.	×			
2. Dimensions of aprons, taxiways, etc. Apron/Hangar areas that do not meet dimensional standards of the critical aircraft should be identified and the wingspan/design group of the aircraft that can use that area depicted. Include tie down location with clearances	Show the dimensions between existing and ultimate runway, taxiway, and taxilane centerlines and existing and ultimate hangars, buildings, aircraft parking, and other fixed or movable objects. See AC 150/5300-13A, Chapter 3 and Chapter 4. Show proposed tie-down layout on the apron area as well as taxilane marking plan. See AC 150/5300-13A, Appendix 5, AC 20-35, and AC 150/5340-1.	×			

Terminal Area Drawing					
Item	**Instructions**	**Sponsor/Consultant**			**FAA**
		Yes	**No**	**N/A**	
J. Property Line	Show the property line(s) that are within the area/portion of airport shown.	×			
K. Auto parking (existing & ultimate)	Show the existing and ultimate auto parking areas. See AC 150/5300-13A, Appendix 5.	×			
L. Major airport drainage ditches or storm sewers	Show any significant airport drainage ditches or storm sewers within the area/portion of airport shown.	×			
M. Special Use Area (e.g., Agricultural spraying support, Deicing, or Containment)	Show any special use areas within the area/portion of airport shown.	×			
N. North Arrow with magnetic declination and year	Magnetic declination may be calculated at http://www.ngdc.noaa.gov/geomag-web/#declination. This model is using the latest World Magnetic Model which has an Epoch Year of 2010. See FAA Order 8260.19, "Flight Procedures and Airspace." Chapter 2, Section 5, for further information.	×			
O. Fence	Show the existing and ultimate perimeter fencing or general area fencing.	×			
P. Entrance Road	Show the existing and ultimate entrance road. See 5300-13AFAA Order 5100.38, Chapter 6, Section 2.	×			
Remarks					

A.9. Land Use Drawing

- Scale 1”=200’ to 1”=600’.
- A drawing depicting on- and off-airport land uses and zoning in the area around the airport. At a minimum, the drawing must contain land within the 65 DNL noise contour. For medium or high activity commercial service airports, on-airport land use and off-airport land use may be on separate drawings. The Airport Layout Drawing should be used as a base map.
- Drawing optional. Need based on scope of work.

Land Use Drawing					
Item	Instructions	Sponsor/Consultant			FAA
		Yes	No	N/A	
A. Title and Revision Blocks	Each drawing in the Airport Layout Plan drawing set shall have a Title and Revision Block. For drawings that have been updated, e.g., as-builts, the revision block should show the current revision number and date of revision.	×			
B. Airport boundaries/property, existing & future (fee and easement)	Show the existing and ultimate property lines. If known, show property lines for parcels surrounding the airport.	×			
C. Plan view of land uses by category (Agricultural, Aeronautical, Commercial, Residential, etc.). Use local land use categories.					
1. On-Airport (existing & future)	Label existing and ultimate on-airport property by usage, e.g., Terminal Area, Air Cargo, Public Ramp, Airfield - Movement, Airfield - Non-movement, etc. Include existing and future airport features (e.g., runways, taxiways, aprons, safety areas/zones, terminal buildings and navigational aids).	×			
2. Off-Airport (existing & future) [to the 65 DNL Contour at a minimum, if contour known]	Label existing and ultimate off-airport property by usage and zoning, e.g., Agricultural, Industrial, Residential, Commercial, etc.	×			
D. Boundaries of local government	List any local zoning restrictions that are in place to protect the airport and surrounding airspace. See AC 150/5190-4.	×			
E. Land use legend	Provide a legend that identifies all symbols and line types used on the drawing. Lines must be clear and readable with sufficient scale and quality to discern details.	×			
F. Public facilities (schools,	Identify public facilities, e.g.,	×			

Land Use Drawing					
Item	**Instructions**	**Sponsor/Consultant**			**FAA**
		Yes	**No**	**N/A**	
hospitals, parks, churches etc.)	schools, parks, etc.				
G. Runway visibility zone for intersecting runways	Show the Runway Visibility Zone(s) for the existing and ultimate airport configurations. See AC 150/5300-13A, Section 305.			×	
H. Show off-airport property out to 65 DNL if available	Label existing and ultimate off-airport property by usage and zoning, e.g., Agricultural, Industrial, Residential, Commercial, etc.	×			
I. Airport Overlay Zoning or Zoning Restrictions	List any local zoning restrictions that are in place to protect the airport and surrounding airspace. See AC 150/5190-4.			×	
J. North arrow with magnetic declination and year	Magnetic declination may be calculated at http://www.ngdc.noaa.gov/geomag-web/#declination. This model is using the latest World Magnetic Model which has an Epoch Year of 2010. See FAA Order 8260.19, "Flight Procedures and Airspace." Chapter 2, Section 5, for further information.	×			
K. Drawing details to include runways, taxiways, aprons, RPZ, terminal buildings and NAVAIDS	Show existing and future airport features (e.g., runways, taxiways, aprons, safety areas/zones, terminal buildings and navigational aids, etc.). See AC 150/5300-13A.	×			
L. Crop Restrictions	Show the Crop Restriction Line (CRL). See AC 150/5300-13A, Paragraph 322 and AC 150/5200-33.			×	
Remarks					

A.10. Airport Property Map / Exhibit A

- Scale 1”=200’ to 1”=600’.

Airport Property Map / Exhibit A					
Item	**Instructions**	**Sponsor/Consultant**			**FAA**
		Yes	**No**	**N/A**	
A. Will Property Map serve as Exhibit A? – **If YES,** follow the directions to the right. – **If NO,** go to item B below.	If prepared in accordance with AC 150/5100-17, Land Acquisition and Relocation Assistance for Airport Improvement Program Assisted Projects, use ARP SOP no. 3.00 Exhibit A guidance instead of below checklist.		×		
If Property Map *will not* serve as Exhibit A: B. Title and Revision Blocks		×			
C. Plan view showing parcels of land (existing, future, and ultimate)		×			
1. Fee land interests (existing and future)		×			
2. Easement interests (existing and future)		×			
a. Part 77 protection		×			
b. Compatible Land Use		×			
c. RPZ protection		×			
3. Airport Property Line		×			
D. Legend – shading/cross hatching, survey monuments, etc.		×			
E. Data Table					
1. Depiction of various tracts of land acquired to develop airport	If any obligations were incurred as a result of obtaining property, or an interest therein, they should be noted. Obligations that stem from Federal grant or an FAA-administered land transfer program, such as surplus property programs, should also be noted. The drawing should also depict easements beyond the airport boundary.	×			

Airport Property Map / Exhibit A					
Item	**Instructions**	**Sponsor/Consultant**			**FAA**
		Yes	**No**	**N/A**	
2. Method of acquisition or property status (fee simple, easement, etc.)		×			
3. Type of Acquisition Indicated	(e.g., AIP-noise, AIP-entitlement, PFC, surplus property, local purchase, local donation, condemnation, other)	×			
4. Acreage		×			
F. Access point(s) for through-the-fence arrangements including residential			×		
Remarks					

Appendix C – Solar Feasibility Study

Appendix C – Solar Feasibility Study

SOLAR FEASIBILITY STUDY - BLI

9/19/2017

Phase 1 Design – Carport Solar

The following report details a feasibility study on implementing solar carports for the parking lots of Bellingham International Airport in Bellingham, Washington. It focuses primarily on the capacity needed and financials of the solar panel system.

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Solar Feasibility Study - BLI

PHASE 1 DESIGN – CARPORT SOLAR

EXECUTIVE SUMMARY

This report assesses the feasibility of installing solar carports in the parking lots of Bellingham International Airport. This design combines the amenity of premium, shaded parking, while also doubling the use of valuable square footage as on-site solar power generation.

The decision to construct solar carports avoids the necessary structural and wind-load calculations for rooftop solar, while still placing the solar arrays far enough from runways to avoid glare into the approach and takeoff flight paths, as calculated by the Sandia National Laboratories tool SGHAT. The placement of the solar field was done in conjunction with future parking lot changes and the possible relocation of the traffic control tower, per the Bellingham International Airport Master Plan.

There are two primary options for financing the solar carports that were analyzed in SAM. The first involves the purchase of the equipment by the airport itself and participating in the Renewable Energy Production Incentive Payment Program, via Puget Sound Energy's Schedule 151, as a means to recoup prices. The second would be to generate a Power Purchase Agreement with Puget Sound Energy, such that the utility owns the equipment and the airport purchases the power at a reduced rate. It is also possible to purchase the system from the utility either partway through the life cycle of the system or at the end of its life cycle, if such a buyout option is included in the agreement.

Without the guarantee of the FAA grants and funding other federal agencies, a Power Purchase Agreement (PPA) represents the simplest funding method to design and construct the solar carport systems at Bellingham International Airport. However, if enough federal funding is available, outright ownership of the carports is a desirable outcome.

Table 1 on the next page summarizes the findings of this feasibility study. The annual savings are based on the first-year calculations found in SAM, and that first year's offset of the expected electricity bill for 2017.

The potential second phase of the design is beyond the scope of this report, but discussion with airport management has included the possibility of the abandoned taxiway as a contiguous ground-mounted solar array. At over 800,000 square feet, this option is a viable opportunity to greatly increase solar production at Bellingham International Airport.

Table 1: SOLAR SYSTEM SIMULATION SUMMARIES

Simulation Model	Metering Scenario	Annual Savings on Bill	Percent of Bill Offset by System
Self-Ownership	Main Terminal, Z007588624	$198,867.00	94%
PPA	All meters	$116,269.00	53%

SOLAR SITE ASSESSMENT

This report represents a very high level assessment on identified areas capable of supporting sizable solar fields. The areas identified in Table 2 indicate the possible sizes and capacities of the proposed carport panels.

Table 2: SOLAR ARRAY SIZE DATA

Array Designation	Location	Total Usable Area (ft^2)	Approximate Panel Count	Watts/ft^2	Potential Capacity (kWdc)
PV Array 1	Main Parking Lot – Terminal Side	58,820	3280	16.51	971.21
PV Array 2	Main Parking Lot – Road Side	64,792	3760	17.18	1113.34
PV Array 3	Auxiliary Parking Lot	23,049	1440	18.49	426.38

The bulk of the data in this report was calculated using the System Advisor Model (abbreviated as SAM), a renewable energy simulation program developed by the National Renewable Energy Laboratory, NREL. Common parameters between the two simulations performed using SAM include specification of 480V iTek solar modules, Yaskawa-Solectria inverters, and a 25-year lifespan for the photovoltaic (PV) system.

Figure 1 shows an approximate depiction of the airport grounds, calling out the rough ground areas for the carport solar fields, as well as a possible second phase of the solar generation system on an abandoned taxi-way on the west side of the airfield. The primary area comprising PV arrays 1 and 2 is over 200,000 square feet, with a good portion of that available due to the construction of the parking lot, as seen in Figure 2. The auxiliary parking lot shown in Figure 3 to the south has a usable area of almost 200,000 square feet, but the current layout of the parking lot leaves much of it unusable for carport solar. This section is not included in the self-ownership simulation, as that option focused on offsetting the electricity use of the main terminal building, which represents almost 70% of the airports total electrical utility bill alone.

Figures 2 and 3 represent larger depictions of the individual carport layouts, with approximated areas shown, and a corresponding estimated panel count. The proposed idea of the panel support structures relies on the existing medians between parking curbs as the location of the structural support beams for the carports, which are not present in much of the auxiliary parking lot.

Comments from Bellingham Airport management about future plans for the main parking lot dictated certain decisions on possible placement as well. For instance, one section with a broken median in PV Array 1 is currently the rental car staff structure, which is to be removed and the median extended. The lower half the parking lot will become the new rental care area, much of which is coincidentally within the cutoff region where solar panel glare would affect the current air traffic control tower.

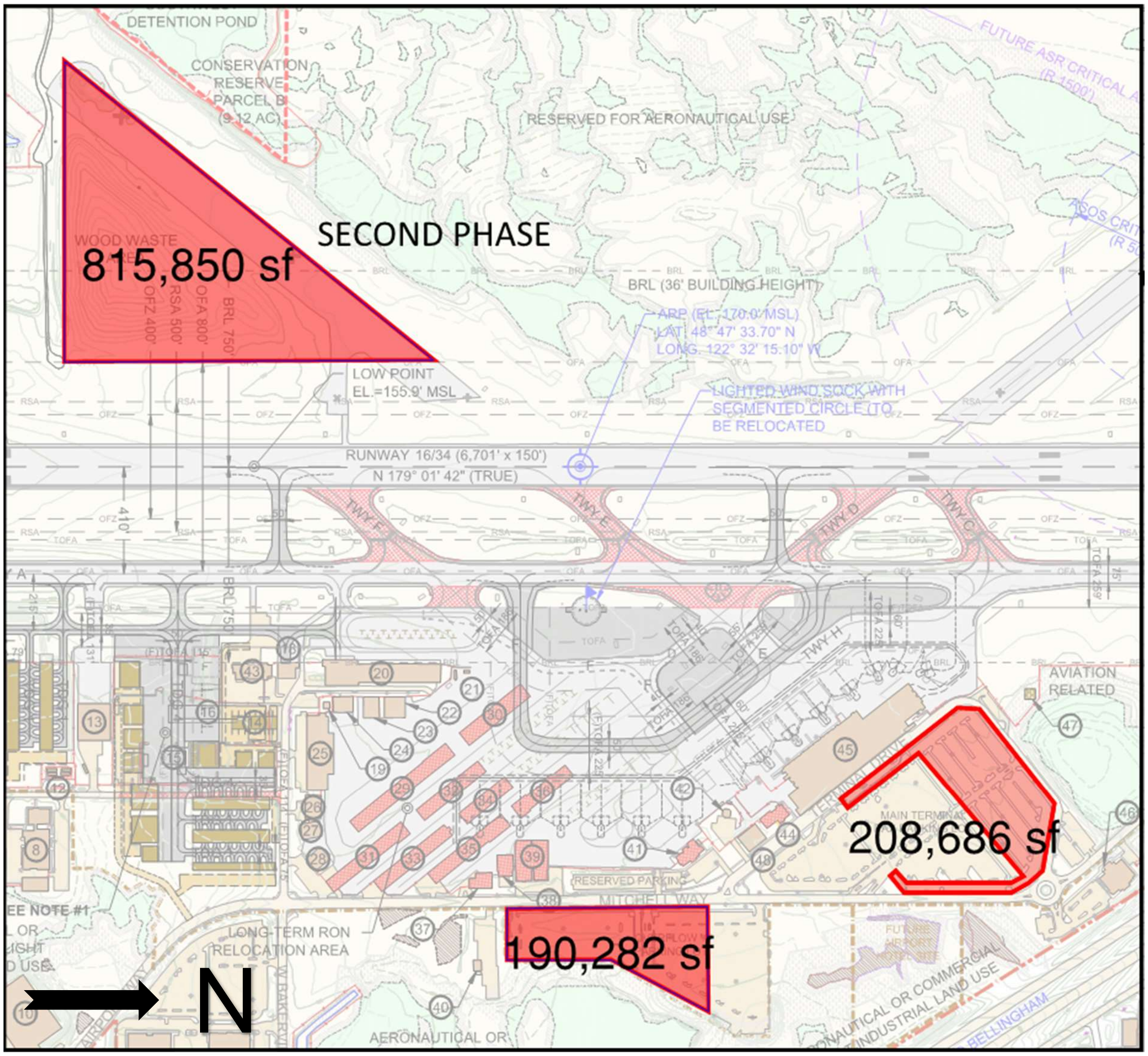

Figure 1: AIRPORT SOLAR OPTIONS

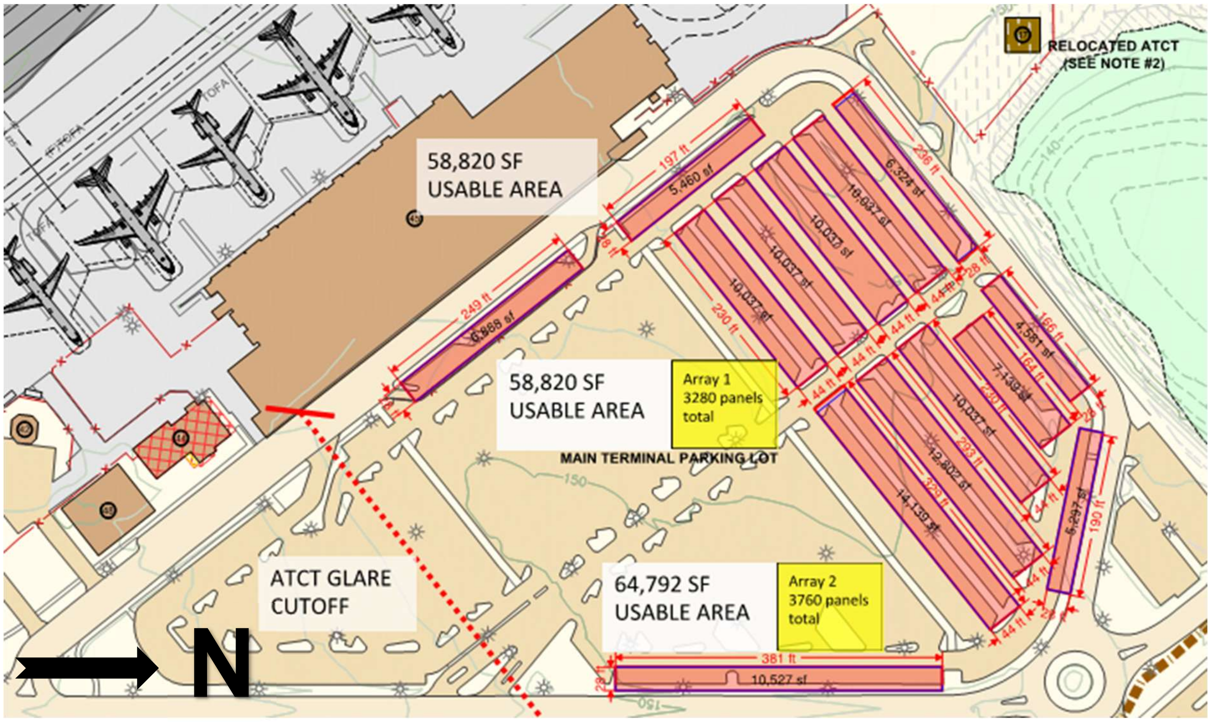

Figure 2: MAIN TERMINAL PARKING LOT CARPORTS

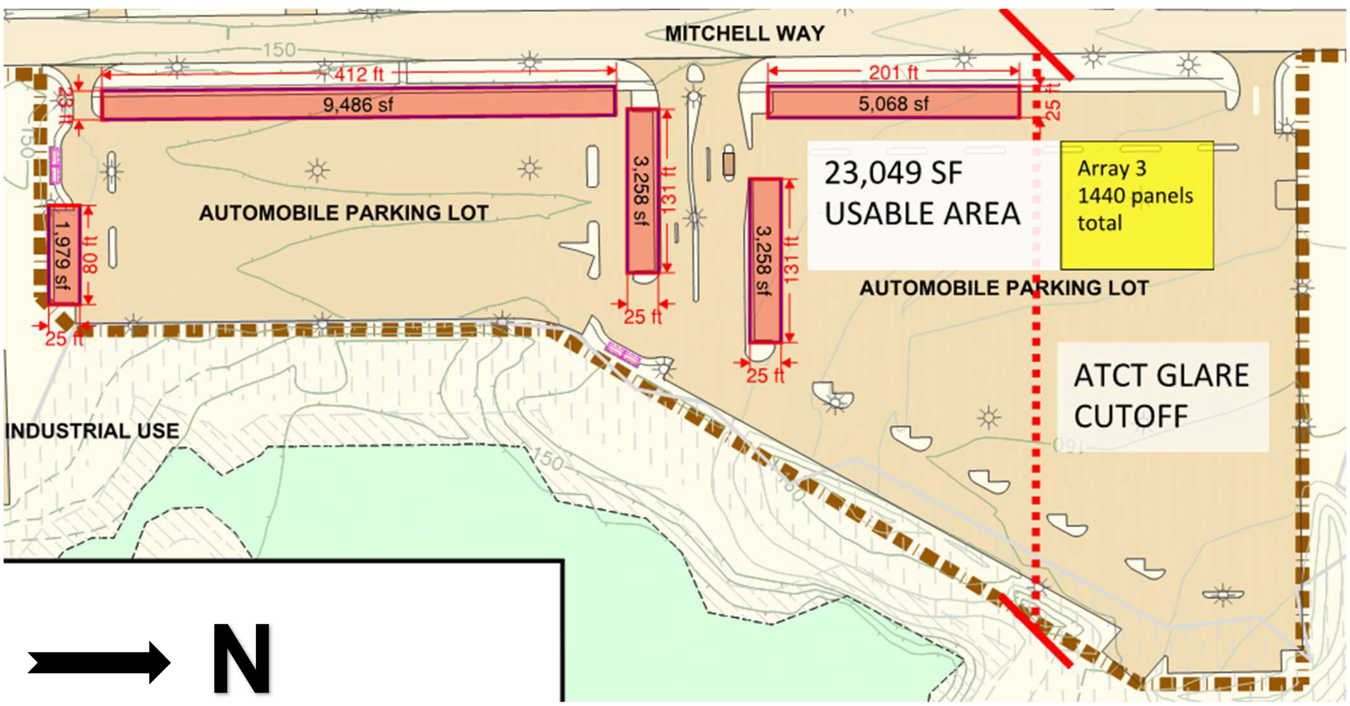

Figure 3: AUXILIARY TERMINAL PARKING LOT CARPORTS

SOLAR ECONOMIC ASSESSMENT

The economic assessment was calculated using SAM, and exported to Excel tables and graphs. Inputs SAM utilizes to consider array capacity and corresponding economic results include the following:

- Photovoltaic module, inverter makes and models
- Array sizes and orientations
- Imported utility rates from an online database, allowing for a calculation of utility bill savings
- Utility rate inflation
- Federal and state incentives and subsidies
- Tariff structure
- Estimated capitol cost of whole solar system

The available options in Washington State to fund the proposed solar carports for the airport include purchasing the system itself and advisedly participate in the Renewable Energy Production Incentive Payment Program, or a Power Purchase Agreement (PPA).

Self-Ownership

The production incentive program, detailed within Puget Sound Energy's Schedule 151 electrical tariff, offers production incentives depending on the equipment used in the design of PV arrays. The highest payment factor of $0.54/kWh is reached when Washington State manufactured PV modules and inverters are used. This was taken into account for the first simulation, where the airport purchases the system for itself.

Figure 4 depicts the terminal's expected use for 2017, based on the data recorded from 2016, and compares that side by side to the PV array's contribution and the corresponding excess generation credits accumulated over the course of the year. Figure 5 shows the resulting electricity bill for the terminal building due to the solar system's energy offset. Using the PV arrays located in the Main Terminal Parking area, the system is very nearly matched to the load of the terminal, almost negating the electricity bill for most of the year. This results in almost $200,000 of savings from the airport terminal's electricity bill in the first year.

Power Purchase Agreement

The second financing option is much more affordable up front. A Power Purchase Agreement (PPA) is a contract reached with the utility to become a third-party owner of the solar system constructed on their land, and purchasing power from the utility at a reduced rate. Solar systems constructed via PPA's are generally funded by investors looking to reap the tax benefits. Due to the airport not owning the system in such an agreement, several federal and state incentives are no longer accessible.

A separate simulation was run in SAM to model this. This simulation included PV Array 3 in the system, as Puget Sound Energy is receiving the power directly and selling it back, so focusing on specific meters is not necessary. The entire airport's electrical load was considered, as opposed to just the Main Terminal Building, and Figure 6 shows the first year's system energy generated versus the expected load. In this method, SAM calculated a savings of about $116,000 on the airports first year of electricity bills. Table 3 below shows the calculated first-year data from SAM for both simulations.

Table 3: SOLAR SYSTEM MODEL ENERGY AND MONETARY SAVINGS

Simulation Model	Metering Scenario	Model Electrical Load (kWh)	Annual System Energy (kWh)	Original Annual Bill	Annual Bill After Solar	Annual Savings on Bill	Percent of Bill Offset by System
Self-Ownership	Main Terminal, Z007588624	2,233,709	2,246,049	$211,553.00	$12,685.80	$198,867.00	94%
PPA	All meters	3,031,308	2,674,227	$217,871.00	$101,601.00	$116,269.00	53%

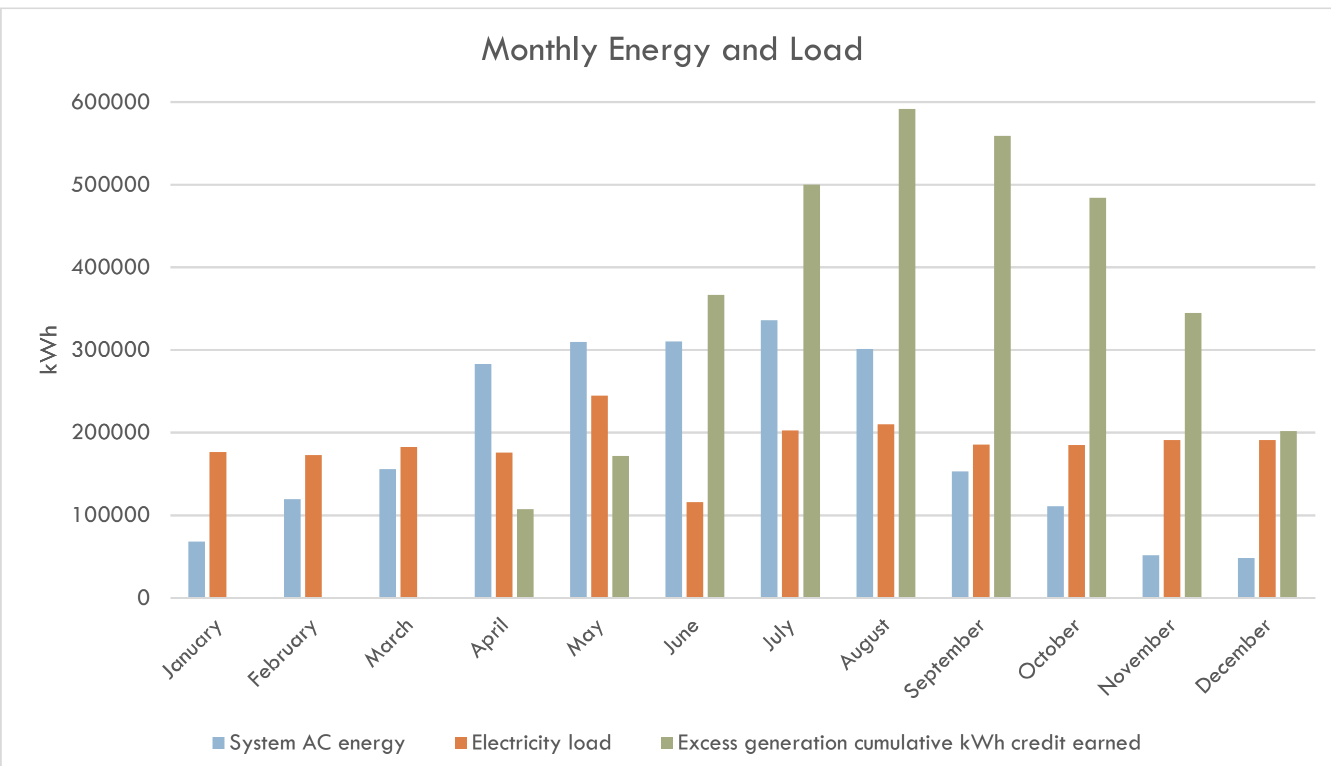

Figure 4: MONTHLY ENERGY AND LOAD

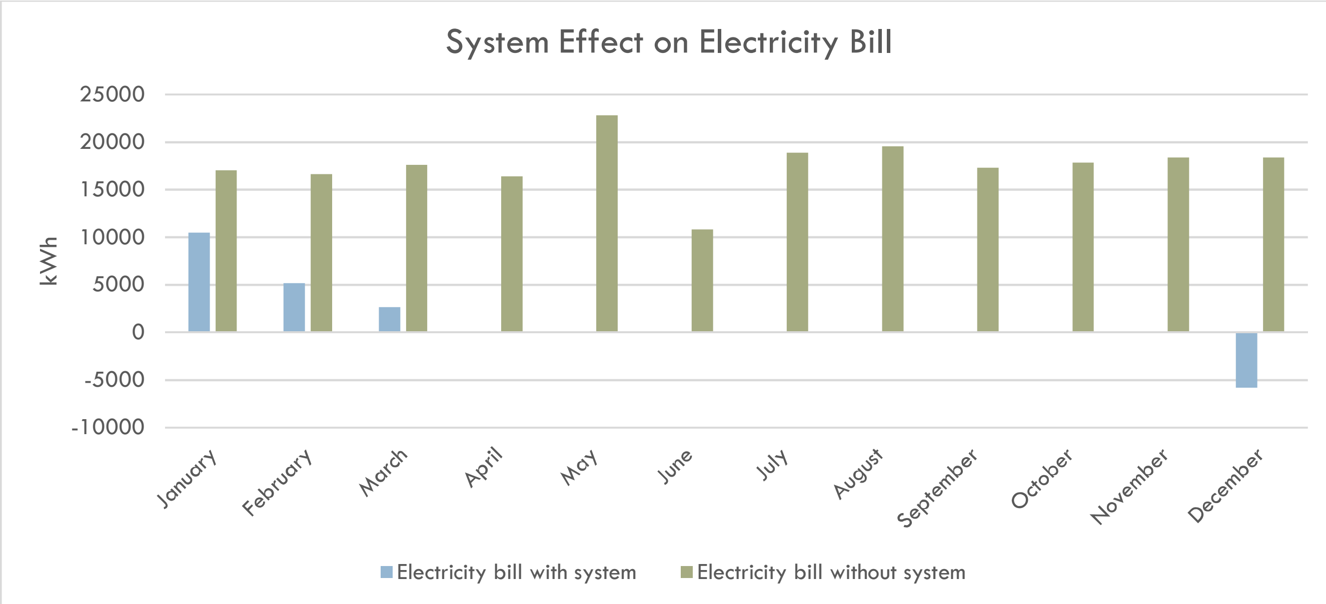

Figure 5: SYSTEM EFFECT ON ELECTRICITY BILL

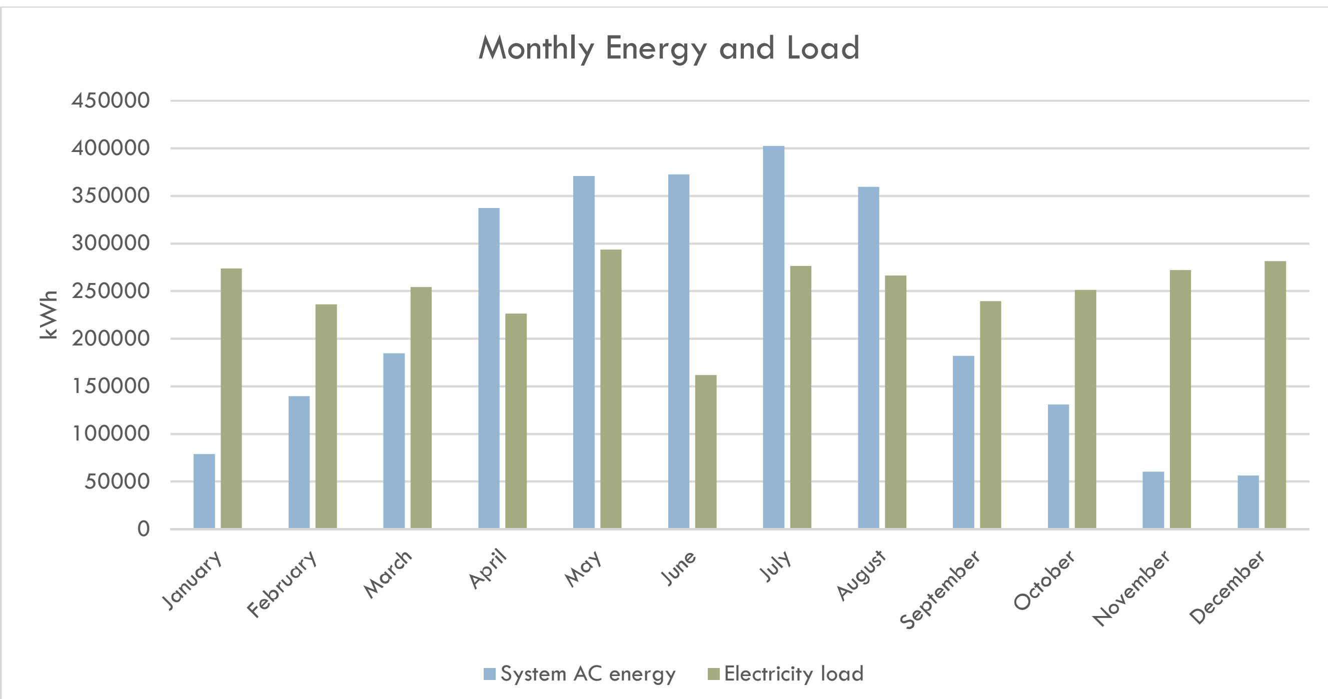

Figure 6: MONTHLY ENERGY AND LOAD, PPA

COST OF SYSTEM AND VALUE OF SAVINGS

This section discusses the costs of the initial installation of the system (if applicable), and the behavior of the savings over the course of the system's lifespan.

Under the self-ownership simulation, SAM calculated the total cost of the arrays in the main parking lot as $4,552,645, including equipment, installation, installer overhead, a fixed $20/kW of capacity each year in operation and maintenance costs, and a 5% contingency for the project. Assuming the airport receives no assistance in funding this project via grants from the federal government, the solar system would pay for itself in just over 19 years. That said, numerous federal programs offer funding for airport improvement and sustainable energy, so this payback period could reasonably be shorter in practice. Figure 7's corresponding table and graph depict the cash flow for this 19 year payback period.

Operating Year	Cumulative cash flow
0	$(4,552,640.00)
1	$(2,812,310.00)
2	$(2,336,863.83)
3	$(2,032,865.23)
4	$(1,829,296.36)
5	$(1,619,757.97)
6	$(1,483,515.93)
7	$(1,420,243.73)
8	$(1,350,020.59)
9	$(1,272,485.67)
10	$(1,187,260.67)
11	$(1,093,949.17)
12	$(992,133.44)
13	$(881,375.73)
14	$(761,216.33)
15	$(631,172.97)
16	$(490,738.87)
17	$(339,382.75)
18	$(176,546.94)
19	$(1,645.40)
20	$85,936.87
21	$386,845.11
22	$601,755.46
23	$831,379.46
24	$1,075,631.40
25	$1,334,882.11

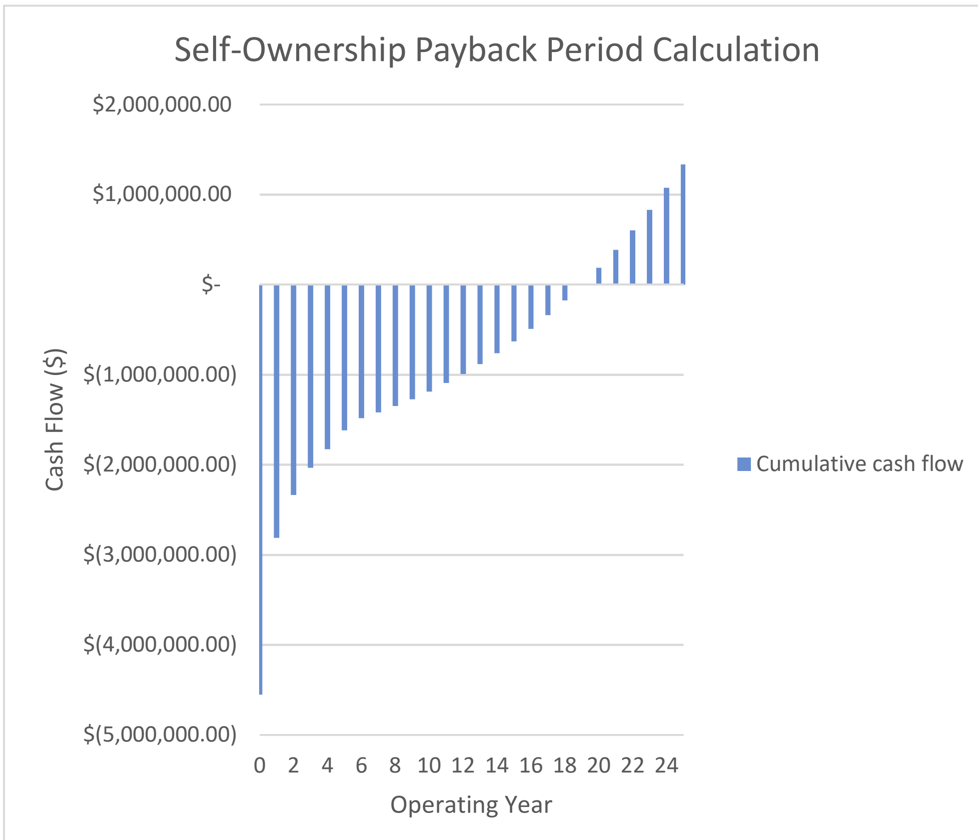

Figure 7: PAYBACK PERIOD CASH FLOW

Under a Power Purchase Agreement, the airport will see little-to-no upfront costs for the construction of the system, being paid for mainly by investors. SAM is however able to calculate that at initial construction under the PPA scenario, the solar system is worth $1,451,038.

CONCLUSION

Without the guarantee of grants and awards from the FAA and other federal entities, a Power Purchase Agreement is a feasible model to design and construct Bellingham International Airport's solar carports. BLI already has a close relationship with the utility, and savings are reaped with little upfront cost to the airport itself. The airport's current master plan concludes in 2031, so if possible it could be discussed to buy out the solar equipment by then to gain the freedom to plan any improvements for the next master plan.

However, if BLI can acquire significant funding assistance from the federal government, or reduce the capitol cost seen by the airport through the contractor's ownership of the production tax credits from the beginning of the project, the payback period could be significantly reduced. The FAA's Airport Improvement Program grant could potentially fund up to 90% of the solar system's cost. Any of these funding strategies would allow the airport to fully enjoy the benefits of heavily reduced electricity bills for more of the solar system's lifespan, with double the electricity bill savings in the first year alone compared to the PPA option.

The second phase of this design, while not a part of this study, would require a great deal of partnership with Puget Sound Energy. With the abandoned taxiway's 800,000 square feet available, this would more than cover the current electricity needs for the airport. A Power Purchase Agreement (PPA) would probably work best for this system, due to its size and the amount of excess power it would generate, but that is all that can be said for now.

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