Port of Lopez

MASTER PLAN UPDATE

Lopez Island Airport

December 2018

PREPARED FOR
Federal Aviation Administration
Port of Lopez

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CHAPTER 1. EXECUTIVE SUMMARY

Introduction

Lopez Island Airport is part of the national plan of integrated airports and provides important access to the national airspace system for residents and visitors to Lopez Island, San Juan County, and northwestern Washington State. As such, and in keeping with Federal Aviation Administration (FAA) guidelines and grant assurances, the preparation of this report explains and documents the reasons and goals for updating the Airport Master Plan. The update illustrates the comprehensive, long-term airport development that addresses community needs and meets FAA standards, guidelines, and policies. This chapter provides a concise summary of the findings and recommendations of the Lopez Island Airport Master Plan Update.

Development Considerations

Forecasts provide the basis for effective decisions in airport planning. They are used to determine the need for new or expanded facilities and should be realistic, based upon the latest aviation data, and provide adequate justification for airport development. Table 1-1 provides a summary of the existing and projected aviation activity at Lopez Island Airport as prepared in the Forecast Chapter. As presented, the Critical Aircraft has been identified as the Cessna 206, which has a Runway Design Code (RDC) of B-I (Small). Generally, the same aircraft types will continue to use the airport with a trend in increasing percentage of single engine piston aircraft and turboprop aircraft, with a slight trend in decreasing usage by multi-engine piston aircraft.

Table 1-1. Summary of Aviation Activity, 2015-2035

	2015[1]	2020	2025	2030	2035
Aircraft Operations					
Air Taxi	**3,760**	**3,809**	**3,859**	**3,909**	**3,960**
Single Engine	3,760	3,809	3,859	3,909	3,960
General Aviation	**9,850**	**10,250**	**10,667**	**11,101**	**11,552**
Single Engine	9,520	9,900	10,300	10,691	11,112
Multi-Engine Piston	100	105	97	90	80
Multi-Engine Turboprop	100	115	140	190	230
Helicopter	130	130	130	130	130
Military	**24**	**24**	**24**	**24**	**24**
Helicopter	24	24	24	24	24
Total Operations	**13,634**	**14,083**	**14,550**	**15,033**	**15,536**
Local Operations	1,084	1,127	1,237	1,353	1,554
Itinerant Operations	12,550	12,956	13,313	13,680	13,982
Critical Aircraft (Cessna 206)	**400**	**420**	**440**	**450**	**460**
Based Aircraft	**24**	**26**	**28**	**30**	**32**
Single Engine	24	26	28	29	31
Multi-Engine Turboprop	---	---	---	1	1

Source: Reid Middleton, Inc. and Mead & Hunt.
[1]Actual, as estimated by Port of Lopez personnel, February 2016.

Analyzing the existing airport facilities identified many of the existing facilities as adequate to meet the long-term demand, but others will need improvement. Identified needs or deficiencies include:

- Runway Safety Area (RSA) is a defined surface centered on the runway centerline, prepared and suitable for reducing the risk of damage to aircraft in the event of an undershoot, overshoot, or excursion from the runway. The existing gradient at either end of the runway and along the west side of the runway exceeds standards and does not meet length and width criteria. The Port of Lopez (Port) should plan for regrading and extension of the RSA to meet design criteria. An Environmental Assessment (EA) will be required before this project can proceed.

- Runway Protection Zones (RPZs) enhance the protection of people and property on the ground beyond the runway ends. This is achieved through airport control of the RPZ areas, and control is preferably exercised through fee simple ownership by the airport within the RPZs. The Port should pursue the purchase of an RPZ development easement for the remainder of lands within the Runway 34 RPZ beyond airport property. A first right of refusal agreement should be included in the easement purchase for the property west of Shark Reef Road giving the Port the first opportunity to purchase the property when it becomes available. Ultimately, the Port should program for the fee simple purchase of this property. The EA will include the environmental analysis for ultimate purchase of the property within the RPZ.

- Obstructions are a significant issue facing the airport because of the many trees located within the approach areas to both runway ends. Recently, the Port has been active in removing trees both on and off airport-owned property. It is recommended that the Port continue the process of removing trees on airport property and continue to explore options to attain the rights to remove or trim trees considered to be obstructions to the threshold siting surfaces beyond airport property. The EA will include the analysis of removing any trees off airport property that will be funded with FAA funds.

- Taxiways facilitate aircraft movement between the various functional landside areas on an airport and the runway system. The Lopez Island Airport parallel taxiway system meets FAA design criteria except for a tree and a portion of fence that penetrate the Taxiway Object Free Area (TOFA). The Port's preferred course of action is to pursue a Modification of Standards (MOS) to use taxilane clearance standards and reduce aircraft taxiing speeds to mitigate the hazards.

- The Port desires to install an Automated Weather Observing Station (AWOS) on the airport providing local weather reporting services to pilots. These stations require proper siting and ample land area to provide accurate data recording. A siting study and Benefit Cost Analysis will be required to implement an AWOS III. The EA will include the analysis for AWOS installation.

- The Port desires to implement an Instrument Approach Procedure (IAP) at the airport. Additional analysis will require further FAA studies, including an EA before a final decision can be made and the IAP implemented.

- At the Lopez Island Airport, landside facilities consist of hangars and the aircraft parking apron. The amount of tiedowns and hangar spaces available appears capable of accommodating the aircraft storage demand throughout the planning period. However, long-term projects have been identified that replace hangars in the south hangar development area as age and condition warrant to correct Taxilane OFA design criteria and remove direct runway access from the apron. Additional hangars are proposed in the north hangar development area as needs arise.

Development Recommendations

After careful consideration of various alternatives, the preferred future development of Lopez Island Airport was determined and is presented below. There are no anticipated environmental impacts involved with the implementation of the proposed long-term development plan.

The major components of the future development for Lopez Island Airport include:

- Prepare an update to the Airport Layout Plan that evaluates the alternate siting of an AWOS III and the implementation of an Instrument Approach.

- Purchase Runway 34 RPZ development easements and first right of refusal.

- Conduct Benefit Cost Analysis if siting study determines an AWOS III facility is feasible.
- Conduct Environmental Assessment (EA) for RSA extension, AWOS installation, Instrument Approach implementation, and ultimate land acquisition within Runway 34 RPZ.
- Continued removal/trimming of trees within approach areas.
- Property development, including residential structure removal and storm water facilities.
- MOS for Taxiway A TOFA deficiency.
- Restripe existing apron and all airport markings.
- Prepare EA for north hangar development
- Construct north hangar development area
- Redevelop south hangar development area when age and condition warrants.

The planning costs for short-, medium-, and long -term planning horizons are provided in Table 1-2.

Table 1-2. Funding Plan

Phase	Total Cost[1]	Federal[2]	State	Local/Private[3]
Total Phase I (2019-2023)	$1,648,000	$1,467,000	$81,500	$99,500
Total Phase II (2024-2028)	$710,000	$639,000	$35,500	$35,500
Total Phase III (2029-2038)	$6,774,000	$108,000	$6,000	$6,660,000
GRAND TOTAL (2019-2038)	**$9,132,000**	**$2,214,000**	**$123,000**	**$6,795,000**

Notes: [1]Cost estimates based on 2018 data, are intended for planning purposes only, and do not reflect a detailed engineering evaluation.

[2]Eligible for FAA AIP, Non-Primary Entitlement (NPE) and Discretionary grants.

[3]Local match requirements from current revenues, cash reserves, bonds, and other sources. Can include private monies, funding from revenue bond, or special tax assessments.

Summary

The development plan for Lopez Island Airport calls for the retention of the basic runway layout as it presently exists, with programmed improvements to maximize the efficient and safe aircraft operational activity and to provide adequate area for future landside facilities. This program is a comprehensive, long-term proposal intended to establish a strategy for funding airport improvements and capitalize on the potential for receiving federal and state funds. The projects represented as potentially needed based on forecast demand. Only those projects that are required by actual demand will be proposed for construction. If actual demand does not materialize as

anticipated, some the projects will need to be revised, delayed, or potentially eliminated. Providing a flexible and realistic development plan and program for future airport growth is the overall objective of this Master Plan Update.

CHAPTER 2. EXISTING CONDITIONS/INVENTORY

Introduction

The objective of the inventory chapter is to summarize significant airport facilities, airspace, land use, environmental and demographics data. Primary sources of information included Port commissioners, on-site investigations, FAA's National Plan of Integrated Airport Systems (NPIAS), the Washington State Department of Transportation's (WSDOT) Long-Term Air Transportation Study (LATS), San Juan County Planning Department, and commercial airport operators.

Lopez Island Airport (S31) is located on the top of a west facing bluff along the San Juan Channel, southwest of the village of Lopez on Lopez Island. The airport (approximately 50 acres total) is owned and operated by the Port of Lopez and is classified as a general aviation non-primary airport by the Federal Aviation Administration (FAA) and as a general aviation airport by the Washington State Department of Transportation, Aviation Division.

Existing Airport Plans and Documents

The location of Lopez Island is depicted in the regional map in Exhibit 2-1. The locations of the airport and surrounding airports are depicted in Exhibit 2-2. The location of the airport in relation to the surrounding vicinity is provided in Exhibit 2-3.

Exhibit 2-1. Regional Map

Exhibit 2-2. Location Map

Exhibit 2-3. Vicinity Map

Existing Airport Facilities

The layout and location of airport facilities are identified the Airport Layout Plan (Exhibit 2-4). Additional information is listed below.

There is a two-room single story Port-owned airport administration/terminal building located adjacent to the apron near the main airport gate. A part of this building is open to serve air taxi passengers, pilots and other airport users.

At the present time, there are no full service Fixed Base Operators (FBOs) or fuel facilities.

Property that had been privately owned was purchased by the Port to provide storage/parking for up to 21 aircraft in four buildings, A-D, and adjacent grassed areas. Aircraft access the airport via a central taxilane at about mid-apron of the airport. There are an additional 10 hangar buildings, capable of holding 15 aircraft. These hangars are privately owned with long-term land leases with the Port.

There are 16 aircraft tiedown spots, with eight not occupied for transient aircraft parking.

At the present time, there are no landing fees for individual operations but the charter carriers serving Lopez Island are charged $300 per year for their operations.

Exhibit 2-4. Terminal and GA Ramp Map

Inventory of Existing Runway 16/34 RPZ Conditions

Runway Protection Zones (RPZ) protect people and property on the ground beyond runway ends. RPZs are trapezoidal in shape and centered about the extended runway centerline. They extend from a point 200 feet from runway ends and their dimensions are based on the Aircraft Approach

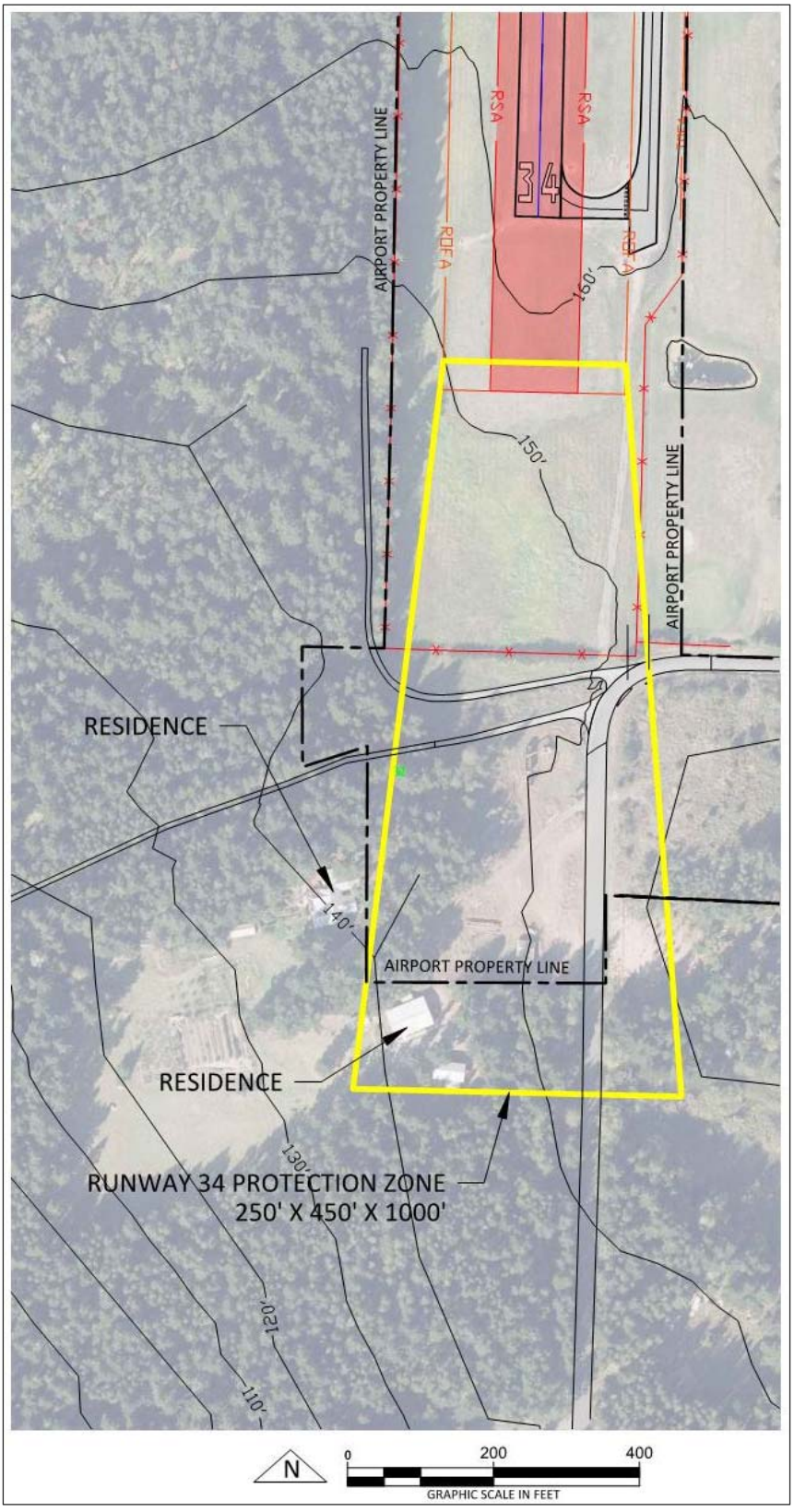
Category (AAC) and the most demanding visibility minimums associated with the approach runway end. In consideration of the visual approaches, and the size of the aircraft operating at the airport, Table 2-1 provides the existing RPZ dimensions for the runway ends at Lopez Island Airport.

Table 2-1. Runway Protection Zone Dimensions, In Feet

Runway	Width at Runway End	Length	Width at Outer End	Airport Controls Entire Land Area
16	250	1,000	450	Yes
34	250	1,000	450	No

Through recent land acquisitions, the airport owns the majority of the property within the existing Runway RPZs. However, a small portion of the Runway 34 RPZ extends beyond airport property south of the airport, west and east of Shark Reef Road into privately-owned property containing one residence. Exhibit 2-5 provides a detailed illustration of the location of the Runway 34 RPZ, airport property, and the residence.

Exhibit 2-5. Runway 34 Runway Protection Zone



Inventory of Existing Land Use Existing Land Use

Existing land uses in the vicinity of Lopez Airport consists primarily of scattered rural residences on large lots. A golf course is located immediately east of the airport. North of airport property, north of Channel Road, industrial/mining land use occurs. Exhibit 2-6 illustrates the generalized land uses in the vicinity of the airport.

Exhibit 2-6. Generalized Existing Land Use

Comprehensive Plan Land Use Designations

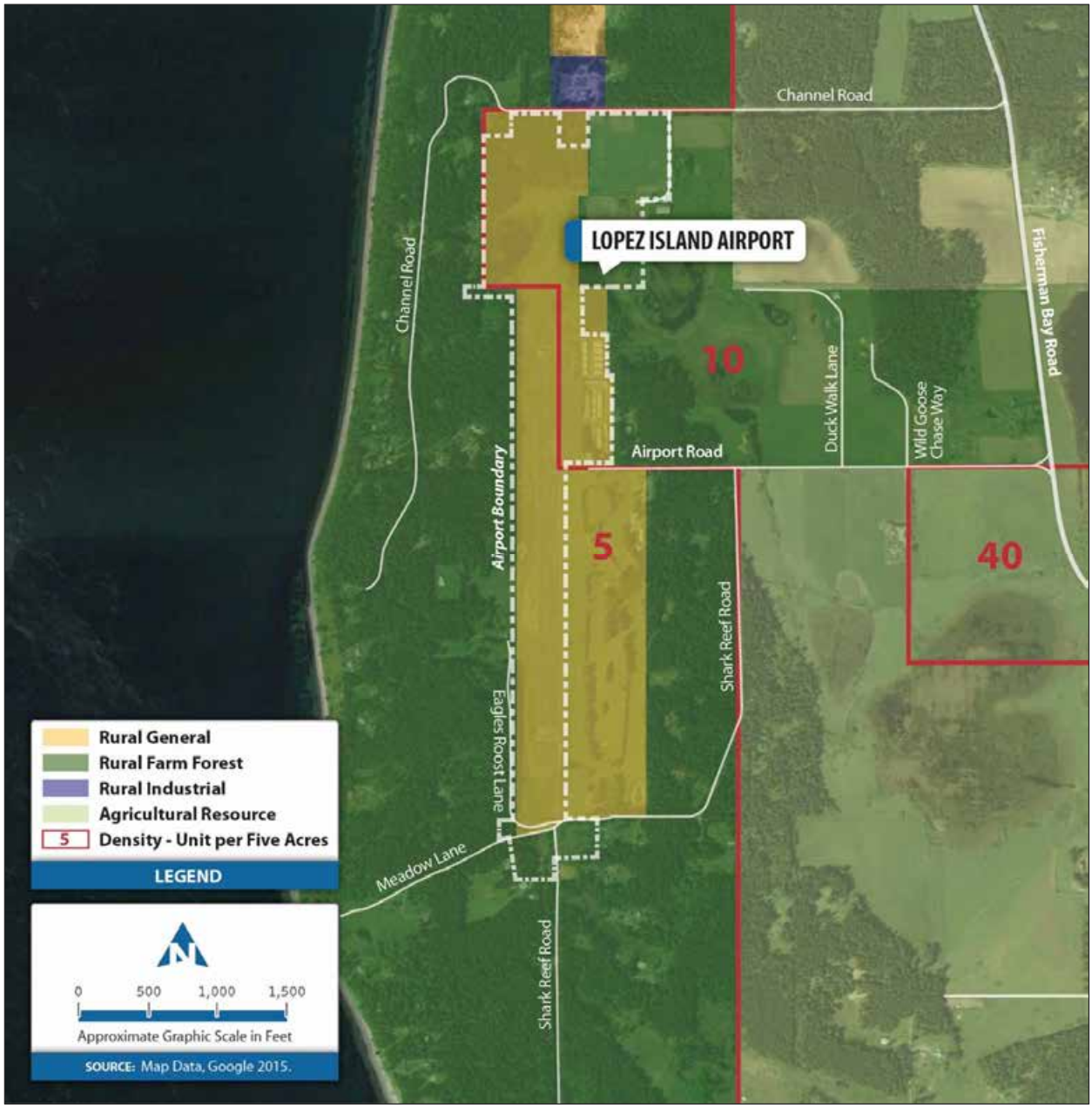
According to the 1998 San Juan County Comprehensive Plan, Lopez Airport is designated as Rural General Use. This designation is intended to provide flexibility for a variety of small-scale, low-impact uses to locate on rural lands that maintain and enhance the rural character of San Juan County. Allowable uses are intended to be compatible with the existing rural character and should not result in more than a minimal and manageable increase in demand on existing rural governmental services and facilities, utilities, community water systems, sewage disposal systems, and County roads.

Land use to the east, south, and west of the airport is predominantly Rural Farm Forest. This designation provides for rural living opportunities that are compatible with small-scale farming and forestry activities. Allowable land uses are predominantly farming and forestry mixed with residential development, generally on parcels five or more acres in size. This designation also allows for cottage enterprise uses and agriculture- and forestry-related commercial and industrial uses, such as processing and limited retailing facilities for farm and forest products.

Land to the north of the airport, just north of Channel Road, is a parcel of property designated Rural Industrial. This designation provides for rural oriented industrial uses that are not generally compatible with activity center land uses, which complement rural character and development, and that can be served by rural governmental services. Allowable sues should be limited to those which are most appropriately located in the rural environment because of incompatibility with intensive, mixed use development patterns characteristic of activity centers. Such uses include, but are not limited to, storage yards, lumber mills, wood craft manufacturing, gas storage facilities, and cement batch plants. Further to the north of this property is another Rural General Use designated area.

Exhibit 2-7 presents the San Juan County Comprehensive Plan land use designations for lands surrounding the airport. It should be noted that the Comprehensive Plan is in the process of being updated, scheduled for completion by the year 2018.

Exhibit 2-7. Generalized Comprehensive Plan Land Use Designations



Inventory of Current Traffic Patterns

The airport traffic pattern is a standard left-hand pattern to Runway 34, and a right-hand pattern to Runway 16. In this way, regardless of wind direction and runway being utilized the airport traffic stays primarily west of the airport over the San Juan Channel to lessen associated noise impacts on local area residents. Voluntary Noise Abatement procedures are now posted on the airport to remind pilots about noise impacts and foster a fly-friendly attitude. Aircraft separation in the terminal area is maintained visually by pilots. According to information provided on the

WSDOT Aviation website (www.wsdot.wa.gov/aviation), the flight pattern altitude for the airport is 1,209 feet Above Mean Sea Level (AMSL) [i.e., 1,000 feet Above Ground Level (AGL)]. There are no mandatory procedures established for the airport.

Inventory of Airspace/NAVAIDS

Lopez Island Airport functions within the local, regional, and national airspace system. The airport is equipped with an Aeronautical Advisory Station (UNICOM) and Common Traffic Advisory Frequency (CTAF) on frequency 128.25. Local controlled airspace surrounding the airport is designated Class E with floor established at 700 feet Above Ground Level (AGL). To the Southeast of Lopez Island lies the Whidbey Island Naval Air Station Class C airspace. The outer perimeter of the Class C is ten miles from the air base. The outer ring begins 5 miles from the base, and goes out to ten mile perimeter with a base at 1,300' MSL up to 4,000' MSL. The Class C inner ring goes from the surface up to 4,000' MSL. To the west of the San Juan Islands lies the international border between the United States and Canada. The Chinook B Military Operations Area (MOA) and the Alert Area A-680 are located south of the airport. Navigational Aids (NAVAIDS) for use by pilots in the vicinity of the airport consist of the Friday Harbor NDB (284 FHR), the Penn Cove VOR-DME (117.2 CVV), and the Victoria VOR-DME (113.7 YYJ).

The available NAVAIDS, local airspace, and surrounding airports are illustrated in Exhibit 2-8, which shows a portion of the Seattle Sectional Aeronautical Chart (a type of map used by pilots flying with visual flight rules).

Exhibit 2-8. Airspace/NAVAIDS Summary

Applicable Federal/State Plans

FAA National Plan of Integrated Airport Systems

The FAA's National Plan of Integrated Airport Systems (NPIAS) classifies Lopez Island Airport (S31) as a Non-Primary General Aviation Airport. This airport type is the largest single group of airports in the U.S. system. The category also includes privately owned, public use airports that enplane 2500 or more passengers annually and receive scheduled airline service. The NPIAS is used by FAA to identify 3,300 airports nationwide deemed significant to the national air transportation system. Airports listed in the NPIAS are eligible to receive Federal grants under the Airport Improvement Program (AIP) to help fund certain airport improvements

WSDOT LATS/State System Plan – Airport Classification

The Washington State Department of Transportation's (WSDOT) Long-Term Air Transportation Study (LATS) represents WSDOT's perspective on the State's aviation system and the Lopez Island Airport's role in it. In the LATS, S31 is identified as a Local Service General Aviation Airport. As with the NPIAS, airports that are included under this classification serve small to medium-sized communities and are busy enough to warrant aviation support services such as fuel sales.

Brief Airport Development History

Travel by boat was slow and subject to weather delays, and when private aviation began to boom after World War II, all of the major San Juan Islands, including Lopez, became accessible by air. In those early days, floatplanes would simply land on the water and taxi to shore, but wheeled planes had to set down on beaches and farmers' fields, occasionally with unfortunate results. There was a need for well-maintained airfields, and port districts were a logical choice to provide them.

The Lopez Island airport had its start as a cooperative public effort. In 1957, Mr. and Mrs. Bernard J. McConaghy donated a 100- by 2,575-foot strip of land on the island's west side to the Hoey-Kjargaard Post 185 of the American Legion. Using volunteer labor and donated equipment, the Legion post established the island's first purpose-built airstrip on the McConaghy property, and in subsequent years purchased three smaller pieces of land on the airstrip's north end to lengthen the runway. The upkeep of the airport was a financial burden to Post 185, however, and in 1965 it appealed to the residents of the island for additional aid. This was to give impetus to the idea of creating a port district to take over and operate the airport that the Legion and the people had built.

November 5, 1968, voters on Lopez Island approve the creation of a port district, the primary purpose of which is to establish a public airport to serve island residents and visitors. The district covers the entire island and is divided into three commissioner districts. The following year the local American Legion post donates an existing grass landing strip to the Port. Supplemented with other gifts and purchases, this becomes the Lopez Island Airport. Later, the runway will be paved, a parallel taxiway and apron installed, public and private hangars built, and lighting and other safety equipment provided.

The first official act of the new port commission was to seek a loan of $1,825 from the San Juan County Auditor for expenses the Port needed to incur immediately, to be repaid from 1970 tax receipts. "Resolution No. 1," passed on May 27, 1969, authorized this transaction, and noted that the "assessed value of the Lopez Port District," which encompassed all of the nearly 30-square-mile island, was at that time a mere $2,155,833 (Port of Lopez Resolution No. 1). Also in 1969, a small strip of land adjacent to the airport that was owned by San Juan County was quit-claimed to the port district.

In 2003, the Port of Lopez shared the Washington Public Ports Association's “Port of the Year” honors with the much larger Port of Tacoma. In making its award, the association noted the role the public had taken in airport development:

“For the Port of Lopez, marshalling volunteer community support has been a cornerstone of its efforts in maintaining the airport. Volunteers planted 215 drought-tolerant, low-growing evergreen trees; an adjacent property owner donated an easement for a storm water runoff system which enabled the port to proceed with safety and security improvements while helping the drainage for adjacent property owners; and a new rotating beacon was installed, with local help, which is less intrusive into neighbor's properties” (Press Release from WPPA).

The Lopez Island Airport has become an integral part of island life, and it is classified as an Essential Public Facility under the state's Growth Management Act. Three airlines – Kenmore Air, San Juan Airlines, and Island Air – have provided passenger and freight service, and the airport is also used for crucial medevac flights. In addition, volunteer pilots ferry island residents back and forth for non-emergency medical treatments.

Current Aviation Activity

As of February 2016, there were 22 based aircraft at the Lopez Airport, including 20 on Port-owned land and the remaining 2 on adjacent private land. The 2015 FAA Form 5010 lists a total of 31,500 total operations, including 8,000 air taxi operations and 23,500 general aviation operations. Port Commissioners state that the total of 31,500 operations is probably overstated and the Master Record 5010 needs to be adjusted.

San Juan Airlines, the airport's major air taxi operator, confirmed a current total of approximately 1600 annual operations (435 scheduled commercial service operations plus 365 chartered operations) at Lopez using Cessna 172 and 207 aircraft. Aeronautical Services had previously operated a DHC-3 Turbo-Otter, which is a Group II category aircraft, but has stopped using this type to serve Lopez Island. On rare occasions, privately owned Group II aircraft operations were indicated by Port representatives but these do not constitute a number of annual operations to be considered close to critical aircraft requirements.

Current Critical Aircraft

In order to accurately project the facility requirements for an airport (such as runway length and width, runway and taxiway separation, and approach surface and runway protection zone dimensions), identification of the critical aircraft must be made. The critical aircraft is a single aircraft or a family of 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. The critical aircraft should use the facility on a regular basis, considered to be at least 500 annual operations. The airport is classified and inspected for compliance with FAA design standards based upon the current critical aircraft. Plans for the future are based upon the forecast future critical aircraft.

Currently, the airport serves small aircraft (less than 12,500 pounds maximum gross weight), primarily in approach category B with approach speeds less than 121 knots, and airplane design group I with wingspans less than 49 feet. ARC B-I (Small) aircraft currently using the airport includes a Cessna 206 operated by San Juan Airlines for scheduled and chartered passenger service. San Juan Airlines also uses a Cessna 172 for a varying portion of its flights, according to demand and aircraft availability. San Juan Airlines operates in and out of Lopez with regularly scheduled service, resulting in an average 1600 annual air taxi operations (estimates for 800 flights in and out per year).

Due to its wingspan, a privately owned and operated DHC-3 Otter is the most demanding aircraft that occasionally uses Lopez Island Airport but the number of operations do not approach the 500 per year to be considered the critical aircraft. Current runway length is adequate for the Otter, and the owners are accustomed to operating at Lopez as currently configured. The airport designation will remain as the existing ARC B-I (Small), despite occasional operations by the Otter.

Existing Airside/Airfield Facilities

Table 2-2. Runway Dimensions and Specifications

Runway 16/34		
Dimensions:	2904 x 60 ft. / 885 x 18 m	
Surface:	asphalt/grooved, in good condition	
Weight bearing capacity:	12,500 pounds single wheel	
Runway edge lights:	Medium intensity Taxiway is marked with reflectors.	
	Runway 16	**Runway 34**
Latitude:	48-29.273617N	48-28.795883N
Longitude:	122-56.262100W	122-56.259667W
Elevation:	209.0 ft.	163.0 ft.
Gradient:	1.6%	1.6%
Traffic pattern:	right	left
Markings:	basic, in good condition	basic, in good condition
Visual slope indicator:	2-light PAPI on left (4.00 degrees glide path)	2-light PAPI on left (4.00 degrees glide path)
Runway end identifier lights:	Yes	Yes
Obstructions:	62 ft. trees, 1200 ft. from runway, 16:1 slope to clear	60 ft. trees, 900 ft. from runway, 11:1 slope to clear

Airfield Lighting and Navigational Aids

Runway 16/34 is equipped with Medium Intensity Runway Lights (MIRLs) that are pilot controlled. Each runway has a two-box Precision Approach Path Indicator (PAPI) on the left side set to 4º approach slope to aid pilots in avoiding obstacles in the approach environment. Each runway end is also equipped with flashing strobe Runway End Identifier Lights (REILs) to facilitate identifying the runway threshold for night operations.

Signage

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

Review Existing 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. Ideally, airports are designed so the surrounding airspace is free and clear of obstructions that could be hazardous to aircraft on approach or departure paths. Standards set forth in FAR Part 77 are intended to protect airspace in the vicinity of airports by defining a set of imaginary surfaces. Penetrations of these surfaces represent an obstruction to air navigation. The type of approach available to a runway governs the geometry of the imaginary surfaces. Five imaginary surfaces make up the protected airspace around an airport.

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. For S31, Runway 16/34 is a visual flight rules B-I runway with visibility minimums of at least three miles. As a result, the primary surface for this runway is 250 feet wide centered on the runway centerline.

Approach Surface

The approach surface for B-I is an inclined slope extending outward and upward from each end of the runway thresholds, centered on the extended runway centerline. Runway 16/34 is a B-I visual runway with an approach surface starting at the runway threshold with a width of 250 feet then expanding uniformly for 5,000 feet reaching a width of 1,250 feet. The approach surface extends upwards at a 20:1 slope.

Horizontal Surfaces

The horizontal surface is a horizontal plane 150 feet above the established airport elevation. Lopez Island Airport has an established elevation of 209 feet MSL (above Mean Sea Level) so the horizontal surface is 359 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. The runways at Lopez Island Airport are designated as utility or visual and use a radius of 5,000 feet.

Transitional Surfaces

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 4,000 feet. The top of the conical surface for Lopez has an elevation of 409 feet MSL.

These five surfaces together make up the FAR Part 77, Imaginary Surfaces requirements for a civil airport. This regulation defines the criteria for identifying obstructions that could be hazardous to aircraft on approach or departure paths.

Surface Penetrations/Obstacles

As shown on Exhibits 2-9 and 2-10, the FAR Part 77 Approach Surfaces for S31 are penetrated by numerous objects. In 2000, a detailed survey was undertaken to identify each object that penetrated these surfaces to initiate an obstruction clearing program. This survey identified numerous penetrations to the primary, approach and transitional surfaces for Runways 16/34. This survey did not indicate any penetrations of objects in the horizontal or conical surfaces. Most of these penetrations were identified to be trees, with some located on airport property. The remainder of the obstructions are located off airport. In 2012 the Port initiated the obstruction removal process with a tree clearing project in the off- airport portions of the approach and transitional surfaces for both approaches. The Port continued the clearing effort with initial concentration on the trees that are located on airport property, followed by the removal of off-airport obstructions in the approach slopes. The AGIS survey associated with this Master Plan Update will include an updated obstacle map to be presented in the updated ALP drawing set.

Exhibit 2-9. Runway 16 Part 77 Approach Surface

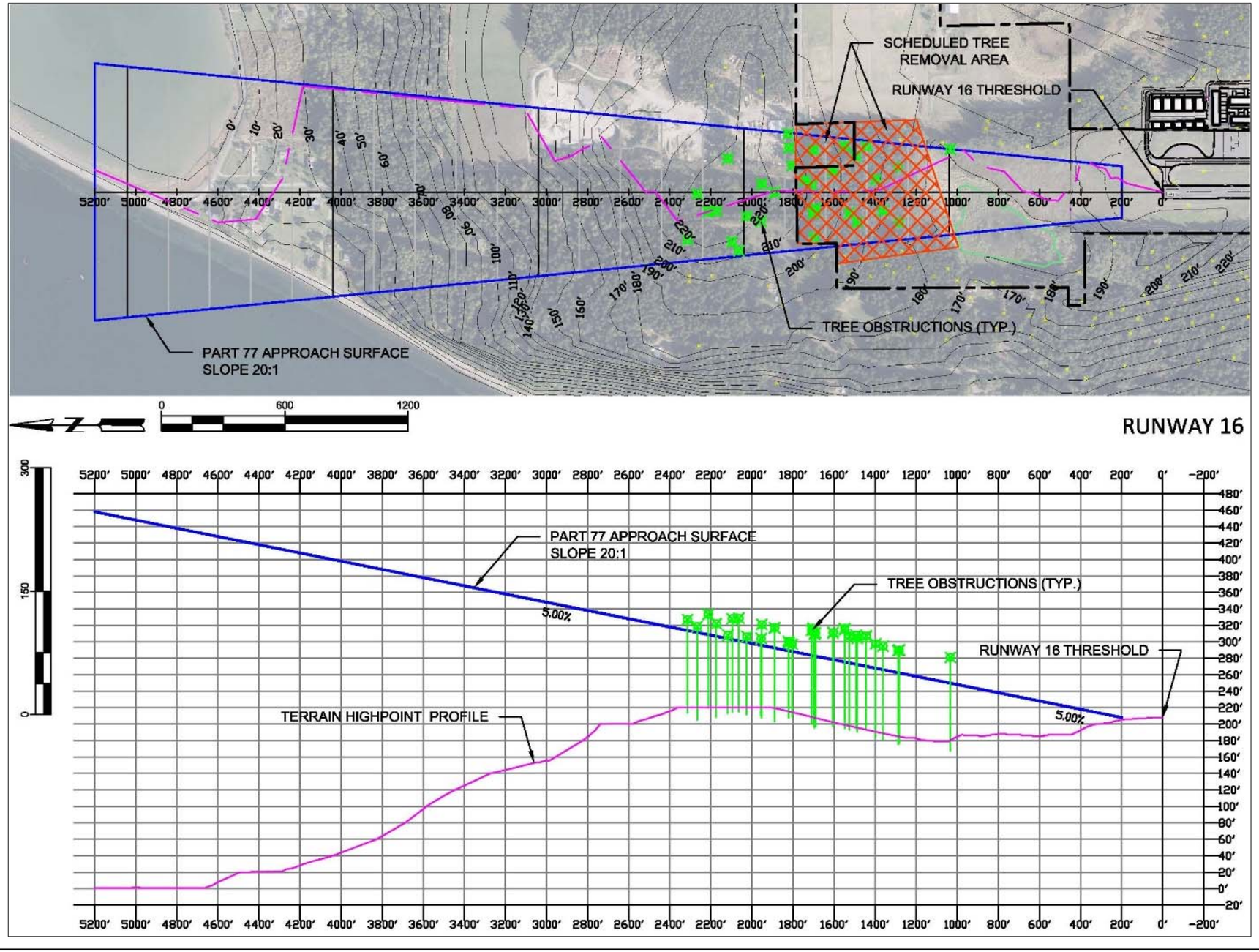
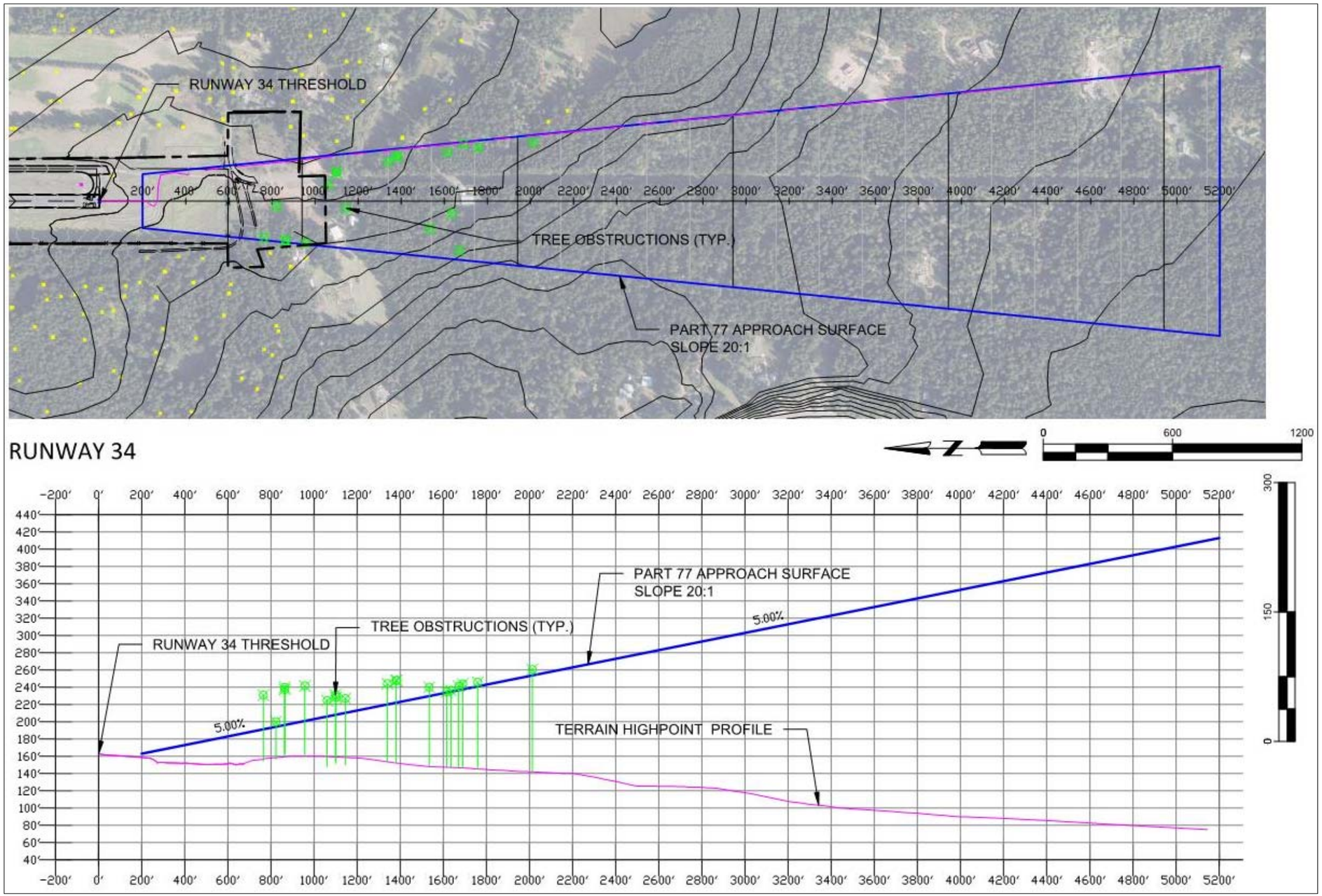


Exhibit 2-10. Runway 34 Part 77 Approach Surface



Environmental Conditions Inventory

Introduction

An Airport Master Plan needs to consider potential environmental impacts of the developments being proposed. The Federal Aviation Administration (FAA) encourages the review of existing environmental conditions at the airport as a foundational understanding of sensitive areas and a basis for estimating potential impacts associated with alternatives proposed later in the master planning process. The purpose and intent are to identify the potential means of avoiding, minimizing, and/or mitigating impacts to sensitive resources at an appropriate level of detail for facility planning. The Environmental Conditions Inventory explores the environmental factors considered in the preparation of the Master Plan. Further environmental review will be conducted for the preferred alternatives chapter and will identify the level of environmental documentation necessary to move forward with any development construction and operations at Lopez Island Airport.

Air Quality

The U.S. Environmental Protection Agency (EPA) has established National Ambient Air Quality Standards (NAAQS) for six criteria air pollutants: carbon monoxide (CO), ozone (O_3), particulate matter ($PM_{2.5}$) sulfur dioxide (SO_2), nitrogen dioxide (NO_x), and lead (Pb). According to the EPA, Lopez Island and all of San Juan County are currently designated as being "in attainment" for all criteria pollutants under the NAAQS. An attainment area is one in which air pollution levels do not exceed the established NAAQS.

Noise

Noise is generally defined as unwanted sound that can disturb routine activities (e.g., sleep, conversation, student learning) and can cause annoyance. As such, the determination of acceptable levels is subjective. The standard unit of measurement of the loudness of sound is the decibel (dB). The FAA has determined that the cumulative noise energy exposure of individuals to noise resulting from aviation activity must be established in terms of yearly day-night average sound level (DNL). DNL is a 24-hour, time-weighted energy average noise level based on the "A" weighted decibel dBA ("A" weighted refers to the sound scale pertaining to the human ear). It is the overall noise energy level experienced during an entire day. Time-weighted refers to the fact that noise occurring between the hours of 10:00 p.m. and 7:00 a.m. is penalized by ten dBA in an attempt to account for the higher sensitivity to noise during nighttime hours and the expected decrease in background noise levels.

Existing levels of operations at Lopez Island Airport currently do not warrant a full noise modeling effort for this Master Plan.

Compatible Land Use

The compatibility of existing and planned land uses in the vicinity of an airport is usually determined in relation to the level of aircraft generated noise. However, it can also include other ramifications related to zoning, relocations, disruptions of communities, and induced

socioeconomic impacts Federal compatible land use guidelines for a variety of land uses are provided in Table 1 in Appendix A of 14 CFR part 150, *Land Use Compatibility with Yearly Day-Night Average Sound Levels*, and are presented in the Table 2-3.

Table 2-3. 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 home parks	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
Governmental 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
Communication	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
Agriculture (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	30	N	N

Numbers in parentheses refer to NOTES.

The designations contained in this table do not constitute a Federal determination that any use of land covered by the program is acceptable or unacceptable under Federal, State or local law. The responsibility for determining the acceptable and permissible land uses and the relationship between specific properties and specific noise contours rests with the local authorities. FAA determinations under Part 150 are not intended to substitute federally determined land uses for those determined to be appropriate by local authorities in response to locally determined needs and values in achieving noise compatible land uses.

TABLE KEY

SLUCM	Standard Land Use Coding Manual.
Y(Yes)	Land Use and related structures compatible without restrictions.
N(No)	Land Use and related structures are not compatible and should be prohibited.
NLR	Noise Level Reduction (outdoor to indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure.
25, 30 or 35	Land Use and related structures generally compatible; measures to achieve NLR of 25, 30 or 35 dB must be incorporated into design and construction of structure.

NOTES

(1) Where the community determines that residential or school uses must be allowed, measures to achieve outdoor to indoor Noise Level Reduction (NLR) 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 a NLR of 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, noise sensitive areas or where the normal noise level is 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 use compatible provided that special sound reinforcement systems are installed.

(6) Residential buildings require an NLR of 25.

(7) Residential buildings require an NLR of 30.

(8) Residential buildings not permitted.

The table identifies land use types as being compatible, incompatible, or compatible if conducted within a sound attenuated structure. The table, developed by the FAA, can act as a guide to local municipalities for land use planning and control, and as a tool to compare relative land use impacts resulting from various planning alternatives.

Historical, Architectural, Archaeological, Tribal, and Cultural Resources

According to the National Register of Historic Places, there is one listed property located on Lopez Island, which is Port Stanley School. It is located approximately four miles northeast of the airport. According to the Washington Department of Archaeology and Historic Preservation (DAHP) Washington Information System for Architectural and Archaeological Records Data (WISAARD), there are two Historic Register Properties Heritage Barns located southeast of the airport on Richardson Road. Steinbrueck's Place Barn is located approximately two miles southeast of the airport; Wilson-Kring Farm's Barn is located approximately 1-3/4 mile southeast of the airport. Additionally, according to data contained in the WISAARD, airport property is designated as either high risk or very high risk of containing archaeological resources and highly advises that a cultural resources survey be conducted prior to any future projects that involve earthwork or ground disturbance.

Section 4(f) Property

There does not appear to be any publicly-owned land from a public park, recreation area, or wildlife and waterfowl refuge of national, state, or local significance within the immediate vicinity of the airport. Nor does there appear to be any publicly or privately owned land from an historic site of national, state, or local significance that could be affected by, or have an effect on, the airport and its daily operation. The nearest park area is Shark Reef Park, a San Juan County owned park approximately 1.5 miles south of the airport.

Threatened and Endangered Species

According to the U.S. Fish and Wildlife Service (USFWS), there is one endangered species, ten threatened species, one species under review, one candidate species, and one species listed as recovery known to occur within San Juan County. The Washington Department of Fish and Wildlife (WDFW) Priority Habitats and Species (PHS) List identifies multiple priority areas for five species occurring on or near airport property. Table 2-4 provides a listing of the species and their status for San Juan County.

According to the USFWS Critical Habitat Mapper, the entire water bodies surrounding Lopez Island are designated as critical habitat for the Killer whale (Orcinus orca).

Table 2-4. San Juan County Threatened, Endangered, Candidate, and Priority Species

Group	Name	Status
Amphibians	Oregon Spotted frog (*Rana pretiosa*)[1]	Federal Threatened
Birds	Brown pelican (*Pelecanus occidentalis*)[1]	Federal Recovery
	Short-tailed albatross (*Phoebastria albastrus*) [1]	Federal Threatened
	Yellow-billed Cuckoo (*Coccyzus americanus*)[1]	Federal Threatened
	Marbled murrelet (*Brachyramphus marmoratus*)[1]	Federal Threatened
	Northern spotted owl (*Strix occidentialis caurina*) [1]	Federal Threatened
	Streaked Horned lark (*Eremophila alpestris strigata*) [1]	Federal Threatened
	Bald eagle (*Haeliaeetus leucocephalus*)[2]	State Sensitive
	Golden eagle (*Aquila chrysaetos*)[2]	State Candidate
Fishes	Bull Trout (*Salvelinus confluentus*)[1]	Federal Threatened
	Dolly Varden (*Salvelinus malma*)[1]	Federal Threatened
Flowering Plants	Golden Paintbrush (*Castilleja levisecta*)[1]	Federal Threatened
Insects	Island large marble Butterfly (*Ehchloe ausonides insulanus*)[1]	Federal Candidate
	Sand-verbena moth (*Copablepharon fuscum*)[1]	Federal Under Review for Potential Listing as Threatened or Endangered
Mammals	Townshend's big-eared bat (*Corynorhinus townsendii*)[2]	State Candidate
Mollusks	Pinto abalone (*Haliotis kamtschatkana*)	State Candidate
Reptiles	Leatherback sea turtle (*Dermochelys coriacea*)[1]	Federal Endangered
	Green sea turtle (*Chelonia mydas*)[1]	Federal Threatened

Sources: [1]U.S. Fish and Wildlife Service 2016.
[2]Washington Department of Fish and Wildlife 2015.

Further research into the USFWS's Information for Planning and Conversation (IPAC) website, reveals that the species listed in Table 2-4 are known to occur within San Juan County, but are not likely to be present in the area of the airport. IPAC also shows that no critical habitat is found within the airport property for the above-mentioned species that are listed as federally threatened or endangered. Migratory birds are known to occur in the area of the airport, but these species are not currently listed as threatened or endangered. According to the IPAC website, it is unlikely that any of the species would be impacted by activities at the airport, however; it would be recommended that future projects be further evaluated for the presence or absence of these listed species.

Water Quality

According to the Environmental Protection Agency (EPA) website NEPAssist (http://nepassisttool.epa.gov/nepassist/entry.aspx), there are no impaired streams, impaired waterbodies, or wild or scenic rivers near the airport. The Washington Department of Natural Resources designates a stream located east of the airport as Type "F" (or Fish) according to the Forest Practices Water Type Classification. This classification is applied to streams and waterbodies that are known to be used by fish, meet the physical criteria to be potentially used by fish, and may or may not have flowing water all year. The stream located west of the airport is classified by the Washington Department of Natural Resources as Type "N" (or Non-Fish). This classification is applied to streams having year round flow, may have spatially intermittent dry reaches downstream of perennial flow, and do not meet the physical criteria of a Type "F" stream, or have been proven not to contain fish.

Wetlands

NEPAssist indicates there are four National Wetlands Inventory (NWI) identified wetland areas on airport property. A freshwater emergent wetland appears to have been filled for the construction of the north Port owned hangar and the south part of the private hangars. Two wetland areas are within the Runway 16 RPZ in the northwest part of airport property, consisting of a large freshwater emergent wetland and a smaller freshwater forested/shrub wetland. A corner of the northeast portion of airport property encompasses another freshwater emergent wetland. Additional freshwater emergent wetlands and freshwater ponds are identified east of airport property. Figure 2-11 provides the location of wetlands and streams within the vicinity of Lopez Island Airport.

Exhibit 2-11. Wetlands and Streams

Farmland

According the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Web Soil Survey, soils on airport property are comprised of four types, which are presented in Table 2-5.

Table 2-5. Prime Farmlands

Soil Type	Acres Within Airport	Percent of Airport Property	Prime Farmland
Shalcar muck, 0-2% slopes	6.2	79%	Prime if drained
Coveland-Michellbay complex, 2-15% slopes	12.2	15.6%	All areas prime
Mitchellbay-Sholander-Bazal complex, 0-8% slopes	44.6	57.0%	Prime if irrigated and drained
Whidbey-Hoypus complex, 2-15% slopes	11.4	14.5%	Prime if irrigated
Everett sandy loam, warm, 3-20% slopes	3.9	5.0%	Farmland of statewide importance

Source: U.S. Department of Agriculture, 2016.

Floodplains

The Federal Emergency Management Administration (FEMA) Flood Insurance Rate Map (FIRM) indicates there are no floodplains or floodways on or in the vicinity of the airport.

Critical Areas

The State of Washington Growth Management Act (GMA) identifies five types of critical areas: geologically hazardous areas, frequently flooded areas, critical aquifer recharge areas, wetlands, and fish and wildlife habitat conservation areas. Local jurisdictions are required by the GMA, at a minimum, to designate and protect critical areas through policies, rules, and regulations.

Geologically Hazardous Areas. The Liquefaction Susceptibility Map of San Juan County, produced by the Washington Division of Geology and Earth Resources, designates the soils within the airport property as primarily a low susceptibility for liquefaction. There is a small area of very low susceptibility in the west part of the airport and a small area of low to moderate susceptibility to the north.

Frequently Flooded Areas. As stated above, the FEMA Flood Insurance Rate Map indicates there are no floodplains or floodways on or in the vicinity of the airport.

Critical Aquifer Recharge Areas. According to San Juan County Community Development and Planning Department maps, all of the land within San Juan County is designated a Critical Aquifer Recharge Area because of its sensitivity and vulnerability to groundwater contamination.

Wetlands. As stated above, NEPAssist identified four wetland areas on airport property.

Fish and Wildlife Habitat Conservation Areas. As stated previously, the USFWS and the WDFW have identified Federal and State species that could potentially occur on or near the airport. However, lacking a formal Critical Habitat designation, a determination of the presence or absence of these species must be made prior to undertaking development projects at the airport.

CHAPTER 3. AVIATION DEMAND FORECASTS

Introduction

The objective of this chapter is to develop forecasts of aviation activity for Lopez Island Airport. Forecasting efforts are a key element in the airport planning process and are essential for analyzing existing airport facilities and identifying future needs and requirements for these facilities. By its very nature, forecasting is not an exact science, but does identify general parameters for development and, when soundly established, provides a defined rationale for various development activities as demands increase. The forecasts presented in this chapter are prepared for the short-, intermediate-, and long-range time frames using 2015 as a base year.

Aviation activity forecasting commences by utilizing the present time as an initial point, supplemented with historic data obtained from various sources, and compared to trends and forecasts. Forecasts used for comparison purposes in this Master Plan Update include the 1999 Airport Layout Plan Report, the WSDOT Aviation Division Long-Term Air Transportation Study (LATS) 2009, the FAA's Terminal Area Forecast (TAF) 2015, and the FAA Aerospace Forecasts 2015-2035.

The forecasts prepared for the 1999 Lopez Airport Layout Plan Report are presented in Table 3-1. The average annual growth rates are also presented. It should be noted that an aircraft operation is defined as a takeoff or a landing; so if an aircraft performs a touch-and-go, it is counted as two operations.

Table 3-1. Summary of the 1999 Lopez Island Airport Layout Plan Report Aviation Forecasts

Activity	1999	2003	2008	2018	Growth Rate
Aircraft Operations					
Commercial Service Operations	8,000	9,100	10,300	13,300	2.7%
General Aviation Operations	24,200	25,800	27,500	31,300	1.4%
Total Operations	32,200	34,900	37,800	44,600	1.7%
Itinerant Operations	26,200	28,400	30,900	36,800	1.8%
Local Operations	6,000	6,500	6,900	7,800	1.4%
Critical Aircraft (DHC-3 Otter)	1,100	1,250	1,410	1,830	2.7%
Based Aircraft	**44**	**47**	**50**	**57**	**1.4%**
Single Engine Piston	44	45	47	53	1.0%
Multi Engine Piston	0	2	3	4	
Multi Engine Turboprop	0	0	0	0	

Source: Lopez Airport Layout Plan Report, November 1999.

Historical and Existing Airport Activity

With no on-site Airport Traffic Control Tower (ATCT), there are limited historical records that provide accurate aviation activity information for Lopez Island Airport. A tabulation of the best

available historical aviation activity occurring at the airport since 2005 is presented in Table 3-2. The data from 2005 through 2014 is obtained from the FAA's Terminal Area Forecasts (TAF). The historic enplanements data is obtained from the U.S. Department of Transportation (DOT) Bureau of Transportation Statistics (BTS) T-100 Market data. The 2015 aircraft operations data is provided by Port of Lopez personnel.

Table 3-2. Historical Aviation Activity, 2005-2015

Year	Enplanements[1]	Air Taxi Operations[2]	GA Operations[2]	Military Operations	Total Operations[2]	Based Aircraft[2]
2005	10	7,500	28,174	0	35,674	34
2006	---	7,500	28,419	0	35,919	34
2007	707	7,500	28,665	0	36,165	34
2008	1,015	8,000	23,500	0	31,500	42
2009	1,098	8,000	23,500	0	31,500	42
2010	891	8,000	23,500	0	31,500	34
2011	750	8,000	23,500	0	31,500	34
2012	445	8,000	23,500	0	31,500	22
2013	60	8,000	23,500	0	31,500	23
2014	658	8,000	23,500	0	31,500	23
2015	396	3,760[3]	9,850[3]	24[3]	13,634[3]	24[3]

Sources: [1]FAA Air Carrier Activity Information System (ACAIS), December 2015.
[2]FAA Terminal Area Forecast (TAF), January 2016. Includes air cargo aircraft operations. Fiscal year.
[3]Estimates provided Port of Lopez personnel, February 2016. Calendar Year.

Air taxi aircraft operations are generally classified as any company or individual performing air passenger and/or air cargo transportation service on a nonscheduled basis over unspecified routes. General aviation aircraft operations are those operations that are not commercial service, air taxi, or military aircraft operations.

It should be noted that the TAF data at non-towered airports is dependent on information contained on the airport's FAA Form 5010, which is typically updated annually from generalized estimates provided by airport sponsors. It is not unusual for 5010 data, and consequently TAF data, to contain inaccurate and repeated data from year to year, as reflected in Table 3-2. Therefore, for this Master Plan Update, it was confirmed by Port of Lopez personnel observations that the aircraft operational data presented for 2015 is an accurate reflection of existing airport activity, and through Port records that the 24 based aircraft is accurate.

Historic enplanements at Lopez Island Airport have primarily been provided by unscheduled, on demand air taxi operations. It is anticipated that the same level of service will continue in the future and no scheduled passenger airline service will be provided at the airport. Therefore, no forecasts of passenger enplanements will be provided in this Master Plan Update.

Existing Aircraft Operations by Aircraft Type

The current level of aviation activity by aircraft type is summarized in Table 3-3.

Table 3-3. Existing Operations by Aircraft Type, 2015

Aircraft Type	Operations[1]	Percentage
Air Taxi[2]	**3,760**	**27.6%**
Single Engine	3,760	100.0%
General Aviation	**9,850**	**72.2%**
Single Engine	9,520	96.6%
Multi-Engine Piston	100	1.0%
Multi-Engine Turboprop	100	1.0%
Business Jet	---	0.0%
Helicopter	130	1.3%
Military	**24**	**0.2%**
Helicopter	24	100%
Total	**13,634**	

Sources: [1]Port of Lopez personnel estimate based on observations and knowledge of activity occurring at the airport, February 2016.
[2]Includes air cargo aircraft operations.

Air Taxi. The existing commercial service at Lopez Island Airport is currently provided by San Juan Airlines with service to Anacortes and Bellingham. However, on a per-flight basis, if no passengers are ticketed to or from Lopez Island Airport, flights to the airport are not made (i.e., conducting air taxi services). The operational counts provided in Table 3-3 also include air cargo aircraft operations conducting one flight per day, five days of the week.

General Aviation. The majority of general aviation aircraft are conducted primarily by single engine aircraft, followed by 130 medevac helicopter operations conducted by the Lopez Fire Department. There are approximately 100 operations each of multi-engine piston and turboprop aircraft operations, as provided by Port of Lopez personnel.

Military. Port of Lopez personnel estimate that Coast Guard helicopters conducted once-monthly practice missions at the airport in 2015.

Factors Affecting Aviation Activity

There are many variables and factors that can affect aviation activity at a particular airport. General aviation airports can be influenced by national, regional, and local (i.e., airport market area) trends in population, income, and employment. Other factors include the overall measure of economic activity [as measured in Gross Domestic Product (GDP], the regulatory climate, tourist destinations, nationwide aviation industry trends, available airport facilities, and even the meteorological conditions under which the airport exists.

Lopez Island Airport is unique in that its island location acts as a "constraint" to growth. The island is, for all intents and purposes, a self-contained system with a limit on future growth (i.e.,

population growth is limited because of the finite land available for development). Population projections available from the state are available at the county-level basis only. San Juan County will be used for purposes of this Master Plan, but it is understood that Lopez Island represents the true "market area" for the airport. Very little seasonal or tourist travel to the island occurs by air. The most popular tourist activities involve hiking, camping, and bicycling, but the vast majority of them travel to the island by ferry, not by air. It is not anticipated that this will change in the future.

Socioeconomic Conditions

Population. Source: U.S. Census Bureau, 2014 American Community Survey (ACS); Washington State Office of Financial Management (OFM).

- San Juan County. 16,015 (ACS), 17,443 by 2040 (OFM), average annual growth rate of 0.3%.
- Washington State. 7,061,530 (ACS), 8,790,981 by 2040 (OFM), average annual growth rate of 0.8%.
- United States. 321369,000 (ACS), 380,219,000 by 2040 (ACS), average annual growth rate of 0.7%.

As indicated, it is not expected that the San Juan County population will exceed the average annual growth rates of Washington State or the United States.

Income. Source: U.S. Census Bureau, 2010-2014 American Community Survey (ACS).

- San Juan County. Per capita income of $38,556.
- Washington State. Per capita income of $31,233.
- United States. Per capita income of $28,555.

As presented, San Juan County exceeds both the state and national levels of per capita income.

Employment. Source: U.S. Census Bureau, 2010-2014 American Community Survey (ACS); Washington State Employment Security Department, 2014 Labor Market and Economic Report (LMER).

- San Juan County. 2014 Employed persons 7,677, Unemployment rate of 6.2% (ACS).
- Northwest Workforce Development Area (WDA, consisting of Island, San Juan, Skagit, and Whatcom Counties). Projected employment growth rate from 2012 to 2017 of 2.15%, and projected employment growth rate from 2017 to 2022 of 1.38% (LMER).
- Washington State. 2014 Employed persons 3,194,382, Unemployment rate of 8.8% (ACS): projected employment growth rate from 2017 to 2022 of 1.94%, and projected employment growth rate from 2017 to 2022 of 1.27% (LMER).

- United States. 2014 Employed persons 143,435,233, Unemployment rate of 9.2%.

San Juan County has a lower unemployment rate than both the state and nation. Major employers in the county by category include: Educational Services, Health Care and Social Assistance (16.7%); Arts, Entertainment, Recreation, and Accommodation and Food Services (15.6%); Professional, Scientific, Management, and Administrative (12.8%); and Construction (12.6%) (ACS). The Northwest WDA, of which San Juan County belongs, is expected to have a higher increase in employment growth from 2012 through 2022 than the State of Washington.

Gross Domestic Product. Source: U.S. Bureau of Economic Analysis, Regional Data (BEA).

- Washington State. $271,676,000 in 2004, $422,877,000 by 2014 (BEA), average annual growth rate of 4.5%.
- United States. $12,206,995,000 in 2005, $17,232,619,000 by 2014 (BEA), average annual growth rate of 3.5%.

Between 2005 and 2014, the State of Washington Gross Domestic Product increased at a greater rate compared to the United States.

Other Transportation Modes

Lopez Island is served by the Washington State Ferry system transporting passengers between the island and Anacortes, Washington. Between 2005 and 2015, the ferries transported approximately 1,666,800 passengers, which is an annual average of 151,530. In 2015, 156,700 approximate passengers traveled between Lopez Island and Anacortes. The island is much more reliant on ferry transportation than air transportation.

Regulatory Climate

For forecasting purposes in this Master Plan Update, it is assumed that the regulatory climate of the aviation industry will not change dramatically during the forecast time period. Specifically, it is assumed that Federal aircraft noise and emission requirements will remain within the bounds prescribed by current rules and regulations, no new Federal or local user fees will be imposed on general aviation aircraft, that access to airports and airspace will not be limited or constrained, and general aviation airports will not be subject to security restrictions that are currently imposed at commercial service airports.

Air Taxi Operations Forecast

As stated previously, the existing air taxi aircraft operations consist of on-demand charter services and once-daily flights by single engine air cargo aircraft. It is assumed that this level of activity will remain fairly constant throughout the planning period of this document, since it is not expected that the cargo demand will exceed the loading potential of the existing single engine aircraft currently providing the service. Additionally, air charter service is expected to remain fairly stable, increasing with the demands of the increasing population base of the island and the county. Therefore, air taxi aircraft operations are expected to increase at an average

annual growth rate of 0.3%, equal to the San Juan County population growth provided by the OFM.

Table 3-4 provides the forecasts for air taxi operations throughout the planning period for the airport, as well as the Trend Projection based on the 10-year historic data, the operations contained in the WSDOT Aviation LATS, the forecasts presented in the 1999 Lopez Airport Layout Plan Report, and the forecast contained in the TAF.

Table 3-4. Air Taxi Aircraft Forecasts, 2015-2035

Year	Trend	LATS	ALP	TAF	Forecast
2015	3,760	5,400	---	8,000	3,760
2016	6,649		---	8,000	3,770
2017	6,511		13,300	8,000	3,779
2018	6,373		---	8,000	3,789
2019	6,235		---	8,000	3,799
2020	6,096	5,600	---	8,000	3,809
2025	5,405	5,800	---	8,000	3,859
2030	4,715	6,000	---	8,000	3,909
2035	4,024	---	---	8,000	3,960
Growth Rate	-2.6%	0.7%	2.7%	0.0%	0.3%

Source: Reid Middleton, Inc. and Mead & Hunt.

General Aviation Activity Forecast

In developing the general aviation forecasts, it is necessary to review and understand the general aviation industry trends and forecasts at the national level, as they have a trickle-down effect on the local level provide insight into potential future aviation activity at Lopez Island Airport. Sources: General Aviation Manufacturers (GAMA), FAA Aerospace Forecast Fiscal Years 2015-2035 (FAA Aerospace).

- U**.S. Economy.** Projected to range between 2.1 to 3.1% on an annual basis for the next two years, 2.6% for the following three-year period, and 2.4% annually through 2035 (FAA Aerospace).

- **Aircraft Shipments.** More turbine-powered aircraft have been manufactured in the United States since 2009 than piston-powered aircraft (GAMA).

- **Aircraft Age.** The average age of single engine and multi-piston-powered aircraft is over 30 years and almost 39 years, respectively. Conversely, the average age of multi-engine turboprop and business jets is just over 25 years and just under 15 years, respectively (GAMA).

- **General Aviation Active Fleet.** The whole general aviation active aircraft fleet is projected to increase from 198,860 aircraft in 2014 to 214,260 in 2035, an average annual growth rate of 0.4% (FAA Aerospace).

- **General Aviation Aircraft Fleet Changes.** As piston-powered aircraft retire in future years (reaching the end of their useful lives), turbine-powered aircraft will increase as a proportion of the total general aviation aircraft fleet. Active turboprop fixed wing aircraft are expected to increase at an annual growth rate of 1.5% through 2035; business jets are projected to increase at an average annual rate of 2.8% (FAA Aerospace).

- **Light Sport Aircraft.** Light sport aircraft (i.e., aircraft with weight, capacity, and performance restrictions) are expected to increase at an annual average growth rate of 4.3% through 2035 (FAA Aerospace).

- **General Aviation Aircraft Hours Flown.** Projected overall increase of an average annual growth rate of 1.4% through 2035. Hours flown by piston-powered fixed wing aircraft (both single-engine and multi-engine) projected to decrease 0.5% per year. By turbine-powered fixed wing aircraft expected to increase at an annual rate of 0.9%. By rotorcraft expected to increase 2.0% annually, and for light sport aircraft expected to increase 5.1% through the year 2035 (FAA Aerospace Forecast).

Based Aircraft Forecast

The number and type of aircraft expected to base at an airport is dependent upon several factors, such as communications, available facilities, airport services, airport proximity and access, aircraft basing capacity available at nearby airports, and other similar considerations. General aviation aircraft operators are particularly sensitive to both the quality and location of their basing facilities, with proximity of home and work often being identified as the primary considerations in the selection of an aircraft basing location. Historic (2005-2014) based aircraft data as contained in the TAF has varied during the time period contained in Table 3-2, with as few as 22 to a high of 42. The existing 22 aircraft currently based at the airport is provided by Port of Lopez personnel.

Table 3-5 presents the various based aircraft forecast scenarios prepared for this Master Plan Update, as well as the trend projection based on historic data (2005-2015), the forecasts developed in the 1999 Lopez Airport Layout Plan Report, and the forecast generated in the TAF for the airport. As shown, the trend growth rate decreases at an annual average rate of 19.0%, the forecasts prepared for the 1999 Lopez Airport Layout Plan Report indicate an average annual growth rate of 1.4%; and the TAF projects a growth rate of 2.5%. It should be noted that the WSDOT-Aviation Division LATS forecasts did not project general aviation activity by individual airport, so no comparison is provided.

Scenario One: Scenario One applies the nationwide growth rate for active general aviation aircraft (0.4% annually) projected in the FAA Aerospace Forecast Fiscal Years 2015-2035. By applying this annual rate to the existing based aircraft at Lopez Island Airport, an increase to 26 aircraft is realized by 2035.

Scenario Two: Scenario Two utilizes the employment growth rates for the Northwest WDA provided by the Washington State Employment Security Department 2014 Labor Market and Economic Report. This publication projected from 2012 through 2017, the employment growth

rate would be 2.15%, decreasing to 1.38% from 2017 through 2022. A trend projection is used to extend the forecast to 2035, resulting in an overall increase to 32 based aircraft and an average annual growth rate of 1.4%.

Scenario Three: Scenario Three applies a slightly lower growth rate than used for the TAF to project based aircraft at Lopez Island Airport, which is thought to be slightly high since the population growth of San Juan County is below the state and national rates. This results in an increase to 36 aircraft reflecting an average annual growth rate of 2.0%.

It is recommended that Scenario Two be selected as the preferred based aircraft forecast. By utilizing the forecasts from the 2014 Labor Market and Economic Report used for the Northwest WDA, this scenario couples the based aircraft projections to an independent variable for which there has historically been an acceptable ten-year correlation coefficient (i.e., 0.66).

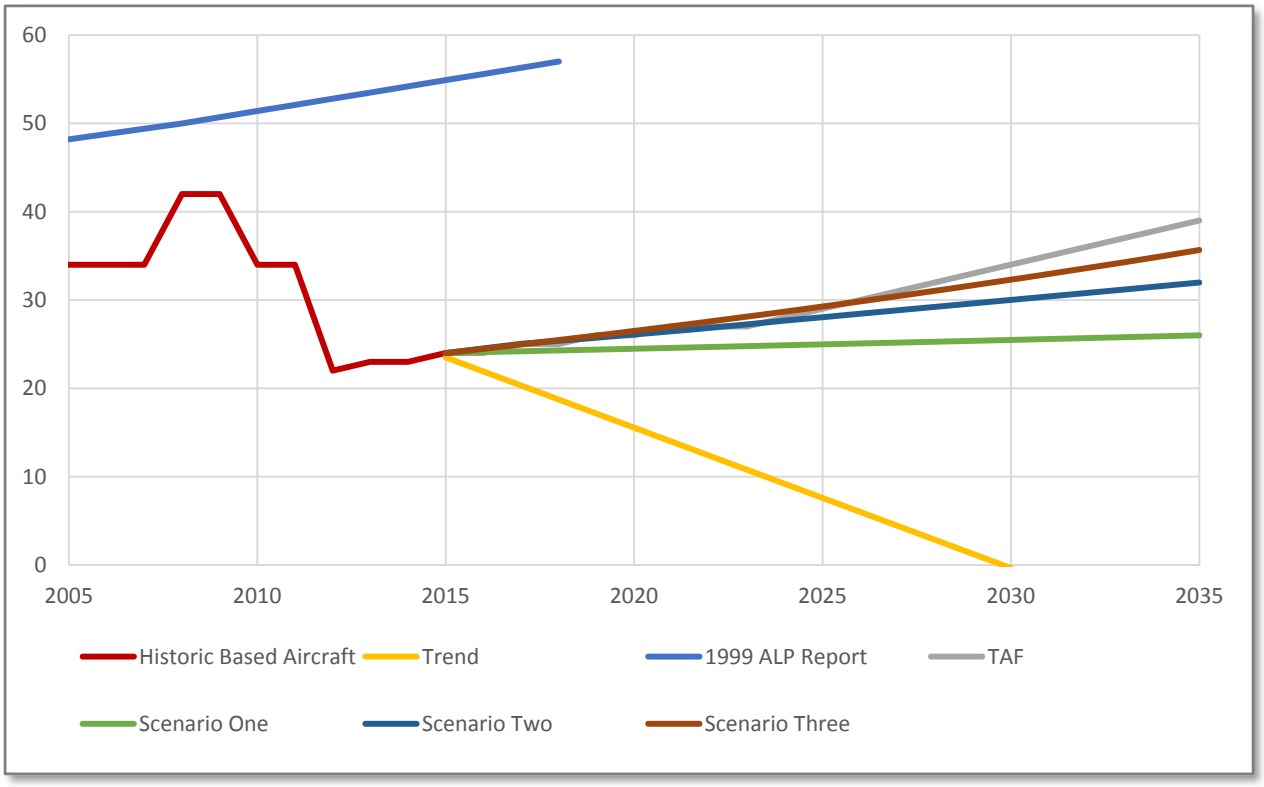
Table 3-5. Based Aircraft Forecasts, 2015-2035

Year	Trend	ALP	TAF	Scenario One	Scenario Two	Scenario Three
2015	24		24	24	**24**	24
2016	22		24	24	**24**	24
2017	20		25	24	**25**	25
2018	19	57	25	24	**25**	25
2019	17		26	24	**25**	26
2020	16		26	24	**26**	26
2025	8		29	25	**28**	29
2030	0		34	25	**30**	32
2035	---		39	26	**32**	36
Growth Rate	-19.0%	1.4%	2.5%	0.4%	1.4%	2.0%

Source: Reid Middleton, Inc. and Mead & Hunt.

Exhibit 3-1 graphically presents the historic based aircraft, the trend projection based on the historic data, the 1999 Lopez Airport Layout Plan Report forecast, the TAF, and the three forecast scenarios prepared for this Master Plan Update.

Exhibit 3-1. Based Aircraft Forecasts



Based Aircraft Forecast by Aircraft Type

The based aircraft fleet mix for incremental periods is shown in Table 3-6. The existing based aircraft fleet mix at Lopez Island Airport consists exclusively of single engine piston powered aircraft. It can be expected that at least one multi-engine turbine-powered aircraft will be based at the airport in the future. This is related to the overall nationwide changes reflected in the aircraft manufacturing, delivery, and use trends discussed earlier. It can also be expected that light sport aircraft will increase as a percentage of future single engine aircraft fleet in the future.

Table 3-6. Based Aircraft Forecast By Type, 2015-2035

Aircraft Type	2015[1]	2020	2025	2030	2035
Single Engine	24	26	28	29	31
Multi-Engine Turboprop	---	---	---	1	1
Total Aircraft	**24**	**26**	**28**	**30**	**32**

Source: Reid Middleton, Inc. and Mead & Hunt.
[1]Actual, as provided by Port of Lopez personnel, February 2016.

General Aviation Aircraft Operations Forecast

Generally, a relationship exists between based aircraft and general aviation aircraft activity, stated in terms of operations per based aircraft (OPBA). Sometimes, a trend can be established from historical information when reliable information for both based aircraft and operations is

available. The national trend has been changing with more aircraft being used for business purposes and less for pleasure flying. This impacts the OPBA in that business aircraft are usually flown more often than recreational or pleasure aircraft. The OPBA for Lopez Island Airport in 2015 is 410, with a historical average OPBA of 776.

Table 3-7 shows the three general aviation operations forecast scenarios prepared for this Master Plan Update, as well as the trend projection based on historical data (2005-2015), the forecasts developed in the 1999 Lopez Airport Layout Plan Report, and the forecast contained in the TAF. As presented, the trend projection indicates a declining average annual growth rate of 20.7%. The 1999 Lopez Airport Layout Plan Report forecast expected an average annual growth rate of 1.4%. The TAF projects an annual growth rate of 0.8% throughout the forecast time period.

Scenario One: Scenario One utilizes the future population forecasts (2015-2040) for San Juan County provided by OFM to forecast general aviation operations. Population has been thought to be a strong indicator of general aviation operations. However, standard regression analysis methodologies relying strictly on population as an independent variable are starting to show this is not the case. When coupled with the unreliable historic aircraft activity data available for non-towered airports like Lopez Island Airport, the correlation values are reduced even more. Therefore, using population as an independent variable for forecasting is considered to be untrustworthy. However, this forecast is included for comparison purposes to reflect the potential local growth conditions. It results in an average annual growth rate of 0.3% and an overall increase to 10,458 general aviation aircraft operations.

Scenario Two: Scenario Two uses the TAF average annual growth rate developed for general aviation aircraft operations specifically for Lopez Island Airport, but applies it to the more accurate estimated 2015 operations. This scenario reflects an average annual growth rate of 0.8% and an overall increase to 11,552 general aviation aircraft operations.

Scenario Three: Scenario Three uses the 2015 OPBA (410) and applies it to the selected based aircraft forecast developed in the preceding section. This scenario results in an increase to 11,552 general aviation aircraft operations and an average annual growth rate of 1.4%. This growth rate mirrors the nationwide forecasted number of hours flown by general aviation aircraft in the *FAA Aerospace Forecasts Fiscal Years 2015-2040*.

It is recommended that Scenario Two be selected as the preferred general aviation aircraft operations forecast. This scenario correlates the FAA's TAF future expectations of general aviation aircraft activity at Lopez Island Airport to a more accurate estimate of actual activity.

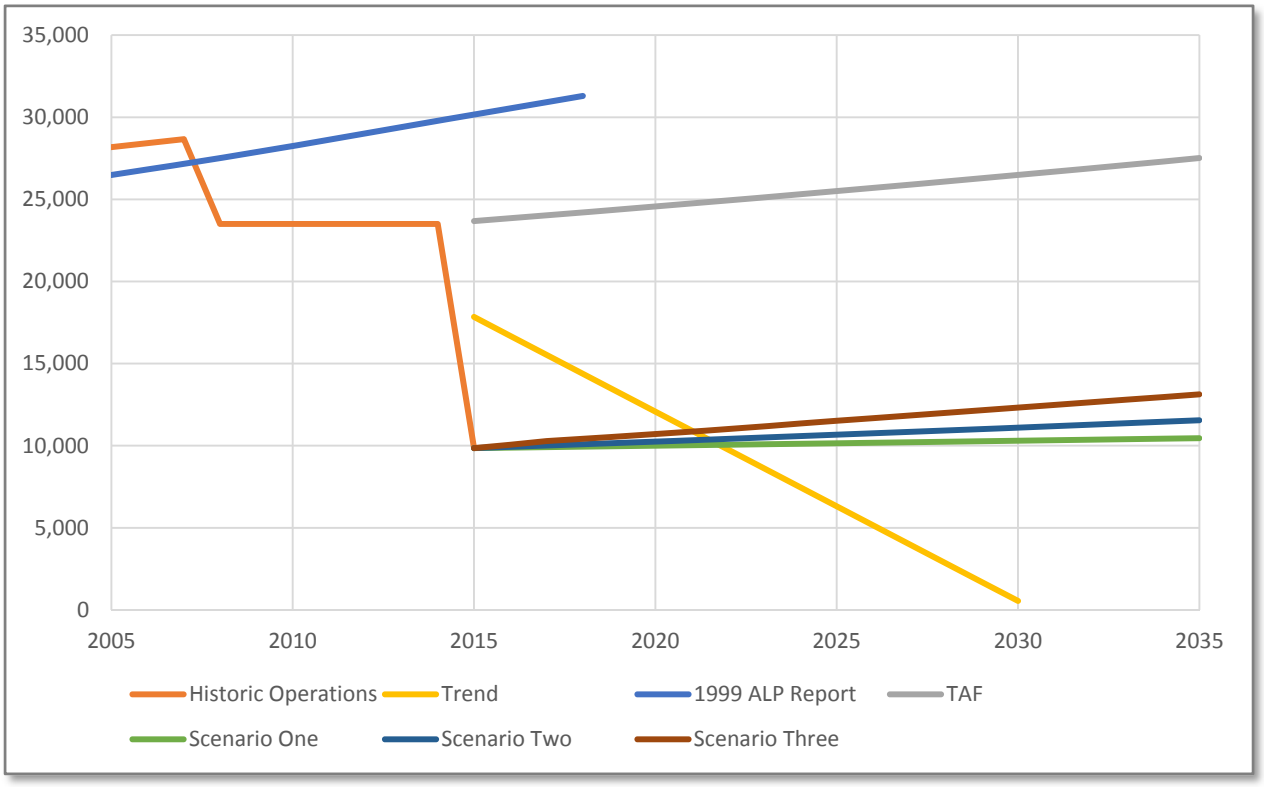
Table 3-7. General Aviation Aircraft Operations Forecasts, 2015-2035

Year	Trend	ALP	TAF	Scenario One	Scenario Two	Scenario Three
2015	---	30,160	23,674	9,850	**9,850**	9,850
2016		30,540	23,849	9,880	**9,929**	10,062
2017		30,920	24,026	9,909	**10,008**	10,278
2018		31,300	24,205	9,939	**10,088**	10,420
2019			24,385	9,969	**10,169**	10,564
2020			24,567	9,999	**10,250**	10,710
2025			25,504	10,150	**10,667**	11,514
2030			26,486	10,303	**11,101**	12,319
2035			27,514	10,458	**11,552**	13,123
Growth Rate	-20.7%	1.4%	0.8%	0.3%	**0.8%**	1.4%

Source: Reid Middleton, Inc. and Mead & Hunt.

Exhibit 3-2 graphically presents the three general aviation aircraft operations forecast scenarios prepared for this Master Plan Update, as well as the trend projection, the 1999 Lopez Airport Layout Plan Report, and the TAF.

Exhibit 3-2. General Aviation Aircraft Forecasts



Military Activity Forecast

Generally, there are three components in determining military aircraft activity at an airport. First is the Department of Defense (DOD) funding, which can vary from year-to-year but has been declining in recent years. Second is a fueling contract the airport or an FBO may have with the DOD. Third is the location, or proximity, of the airport with adjacent aviation-related military bases or training areas.

Presently, no airport entity has a government fueling contract and Lopez Island Airport is not a primary destination training facility for military aircraft, as revealed by historic activity. Military aircraft operations have not historically been recorded at the airport, but Port personnel did report approximately 24 training operations by Coast Guard helicopters (one flight per month). It is likely that military operations will continue to fluctuate in response to changing DOD funding, missions, and training levels, but there are no factors indicating a significant increase or decrease in flight operations is expected at Lopez Island Airport throughout the 20-year forecasting period.

Operations Forecast By Aircraft Type

Table 3-8 depicts the approximate level of use by aircraft types that are projected to use Lopez Island Airport. As expected nationally, the use of turbine-powered general aviation aircraft is forecasted to increase more rapidly than is the use of smaller general aviation aircraft.

Table 3-8. Summary of Operations Forecast By Aircraft Type, 2015-2035

Aircraft Type	2015[1]	2020	2025	2030	2035
Air Taxi	**3,760**	**3,809**	**3,859**	**3,909**	**3,960**
Single Engine	3,760	3,809	3,859	3,909	3,960
General Aviation	**9,850**	**10,250**	**10,667**	**11,101**	**11,552**
Single Engine	9,520	9,900	10,300	10,691	11,112
Multi-Engine Piston	100	105	97	90	80
Multi-Engine Turboprop	100	115	140	190	230
Helicopter	130	130	130	130	130
Military	**24**	24	24	24	24
Helicopter	24	24	24	24	24
Total Operations	**13,634**	**14,083**	**14,550**	**15,033**	**15,536**

Source: Reid Middleton, Inc. and Mead & Hunt.
[1]Actual, as estimated by Port of Lopez personnel, February 2016.

Local and Itinerant Aircraft Operations

Aircraft operations forecasts have also been categorized accordingly into local and itinerant operations. The Air Traffic Control Handbook defines a local operation as any operation performed by an aircraft operating in the local traffic pattern or within sight of a tower, an aircraft known to be departing or arriving from a flight in the local practice area, or an aircraft executing practice instrument approaches at an airport. Existing local operations at Lopez Island Airport are estimated to account for approximately 8% of all aircraft operations. The local operations percentage is expected to remain fairly constant throughout the planning period, although experiencing a slight increase to 10% by 2035. Based on this consideration, the existing and forecast local and itinerant operations are provided in Table 3-9.

Table 3-9. Summary of Local and Itinerant Operations Forecast, 2015-2035

Year	Local	Itinerant	Total
2015	1,084	12,550	13,634[1]
2020	1,127	12,956	14,083
2025	1,237	13,313	14,550
2030	1,353	13,680	15,033
2035	1,554	13,982	15,536

Source: Reid Middleton, Inc. and Mead & Hunt.
[1]Actual, as estimated by Port of Lopez personnel, February 2016.

Critical Design Aircraft

As presented in the previous chapter, in order to accurately determine the airport facility requirements, the types of aircraft presently using and those projected to use Lopez Island Airport are important elements. Runways must be designed in accordance with the Runway Design Code (RDC) standards that are described in AC 150/5300-13A, Change 1, *Airport Design*. The RDC is a coding system used to relate and compare design criteria to the operational and physical characteristics of the aircraft intended to operate on the runway.

The RDC has two components that relates to the airport's "Design Aircraft" or "Critical Aircraft". The first aircraft component, depicted by a letter (i.e., A, B, C, D, or E), is the aircraft approach category and is related to the aircraft approach speed based upon operational characteristics. The second aircraft component, depicted by a roman numeral (i.e., I, II, III, IV, V, or VI), is the airplane design group and is related to the aircraft wingspan and tail height. FAA guidance defines a "substantial use threshold" on federally funded projects for the "Critical Aircraft" to have at least 500 annual itinerant operations by a specific aircraft model or composite of several different aircraft to determine the representative RDC.

Data from based aircraft, FAA records as recorded in the Traffic Flow Management System Counts (TFMSC), and input provided by Port of Lopez personnel were used to determine the RDC aircraft utilization. Currently, all of the based aircraft are general aviation single engine aircraft within the RDC A-I or B-I categories. Input provided by the Port of Lopez personnel indicate that the vast majority (i.e., over 97%) of aircraft activity is conducted by single engine aircraft, also within the A-I or B-I RDC categories.

TFMSC data is compiled from IFR filed flight plans to or from a particular airport, and/or when flights are detected by the National Airspace System usually via RADAR (see Appendix One). It excludes most VFR and some non-enroute IFR traffic. Therefore, it is an incomplete data source, but can provide a rough gauge of the percentage of aircraft types operating at an airport, especially the larger and more sophisticated aircraft that almost always file IFR flight plans regardless of weather conditions. Table 3-10 provides the Lopez Island Airport TFMSC data separated by RDC. According to this data, by percentage, the vast majority of 2015 aircraft operations were by RDC A-I (47.4%) and B-II (41.0%).

Table 3-10. TFMSC Operations By RDC, 2015

RDC	Representative Aircraft	2015	Percentage
A-I	Cessna 172/182, Cessna Super Skymaster, Beech Bonanza 33/36, Cirrus SR 22, Piper Aztec	37	47.5%
A-II	Cessna Caravan	5	6.4%
B-I	Piper Cheyenne 2, Piper Malibu Meridian, Cessna 206	4	5.1%
B-II	Beech Super King Air 200/350, Pilatus PC-12	32	41.0%
Total		**78**	**100.0%**

Source: FAA Traffic Flow Management System Counts (TFMSC), February 2016.

Because the TFMSC data is an imperfect and incomplete data source, assumptions must be made regarding the amount of larger and faster aircraft (i.e., primarily multi-engine piston and turboprop aircraft) that are unaccounted for in the data. Port of Lopez personnel have estimated that 100 annual aircraft operations were conducted by multi-engine piston aircraft, which have a RDC of either A-I or B-I. Port personnel also estimate that there were 100 multi-engine turboprop aircraft operations in 2015, of which the majority are in the B-II category. From a close examination of the TFMSC data, it can be determined that approximately one-third of the multi-engine turboprop aircraft, and approximately 7% of the multi-engine piston aircraft are accounted for in the data. The vast majority of single engine aircraft are not being accounted for in the TFMSC data. Therefore, combining the TFMSC data with estimates provided by the Port of Lopez personnel, Table 3-11 presents the estimate of existing and forecast aircraft operations by RDC throughout the planning period.

Table 3-11. Summary of Operations Forecast By RDC, 2015-2035

RDC	2015[1]	2020	2025	2030	2035
A-I	12,759	13,174	13,581	14,000	14,442
A-II	15	20	30	40	50
B-I	600	620	650	670	690
B-II	106	115	135	170	200
Total[2]	**13,480**	**13,929**	**14,396**	**14,880**	**15,382**

Source: Reid Middleton, Inc. and Mead & Hunt.
[1]Actual, as estimated by Port of Lopez personnel, February 2016.
[2]Does not include helicopter operations, which have no RDC designation.

San Juan Airlines currently provides scheduled and chartered passenger service using a Cessna 206 aircraft, which has a RDC of B-I. San Juan Airlines also uses a Cessna 172 for a varying portion of its flights, according to demand and aircraft availability. This aircraft has a RDC of A-I. San Juan Airlines may consider using larger multi-engine aircraft in the future, depending on growth of its business. However, these aircraft will still be in the RDC B-I category.

Due to its wingspan, the Beech Super King Air 200/350 is the most demanding aircraft that occasionally uses Lopez Island Airport (estimated 75 annual operations), but the number of operations does not approach the 500 annual non-touch and go operations to be considered the "Critical Aircraft". From Table 3-11, it can be surmised that RDC B-I (Small Aircraft) is appropriate for use as the existing and future RDC and the Cessna 206 can be considered the "Critical Aircraft"(estimated 400 annual operations). Small refers to the certificated maximum takeoff weight for aircraft, which is less than 12,500 pounds.

Summary

A summary of the aviation forecasts prepared for this Master Plan Update is presented in Table 3-12.

Table 3-12. Summary of Aviation Activity, 2015-2035

	2015[1]	2020	2025	2030	2035
Aircraft Operations					
Air Taxi	**3,760**	**3,809**	**3,859**	**3,909**	**3,960**
Single Engine	3,760	3,809	3,859	3,909	3,960
General Aviation	**9,850**	**10,250**	**10,667**	**11,101**	**11,552**
Single Engine	9,520	9,900	10,300	10,691	11,112
Multi-Engine Piston	100	105	97	90	80
Multi-Engine Turboprop	100	115	140	190	230
Helicopter	130	130	130	130	130
Military	**24**	**24**	**24**	**24**	**24**
Helicopter	24	24	24	24	24
Total Operations	**13,634**	**14,083**	**14,550**	**15,033**	**15,536**
Local Operations	1,084	1,127	1,237	1,353	1,554
Itinerant Operations	12,550	12,956	13,313	13,680	13,982
Critical Aircraft (Cessna 206)	**400**	**420**	**440**	**450**	**460**
Based Aircraft	**24**	**26**	**28**	**30**	**32**
Single Engine	24	26	28	29	31
Multi-Engine Turboprop	---	---	---	1	1

Source: Reid Middleton, Inc. and Mead & Hunt.
[1]Actual, as estimated by Port of Lopez personnel, February 2016.

Forecast Approval

According to language contained in *Review and Approval of Aviation Forecasts*, regional airports division offices or airports district offices are responsible for aviation forecast approvals at local airports. Local forecasts that are consistent with the FAA's TAF (i.e., the local forecast differs by less than 10% in the first five years, and differs by less than 15% in the ten-year forecast period) do not need to be coordinated with FAA headquarters (APP-400, APO-110). As noted on Tables 3-13 and 3-14, the Master Plan Update forecasts for total operations are not within the specified TAF thresholds for acceptance. The primary reasons for these discrepancies are outlined below.

As stated previously, the Port of Lopez has no data to substantiate how many, if any, of the historic recorded enplanements contained in the Bureau of Transpiration Statistics T-100 Market data occurred at Lopez Island Airport, because a portion of the enplanements were provided by Kenmore Air floatplanes at Fisherman Bay. Therefore, no passenger enplanement forecasts have been provided in this Master Plan Update. This results in a -100% variance from the data presented in the TAF.

The commercial operations forecast contained in the Lopez Island Airport TAF projects flat growth as it relied on the inaccurate historical air taxi aircraft operational numbers, which are thought to be overinflated. The total operations contained in the TAF also relied on the inaccurate historic commercial operations and general aviation operations. The estimated air taxi and general aviation aircraft operations provided by Port of Lopez personnel are deemed to be much more accurate and in line with actual airport activity. Therefore, the starting point for the commercial and total operations presented in this Master Plan Update are well below what is contained in the TAF. The Master Plan Update forecasts do not increase at a sufficient rate to get within the 10% or 15% of the TAF forecasts.

Table 3-13. Summary of Master Plan Update & TAF Comparison

	Year	Airport Forecast	TAF	AF/TAF (% Difference)
Passenger Enplanements				
Base Year	2015	0	457	-100.0%
Base Year + 5 Years	2020	0	457	-100.0%
Base Year + 10 Years	2025	0	457	-100.0%
Base Year + 15 Years	2030	0	457	-100.0%
Commercial Operations				
Base Year	2015	3,760	8,000	-53.0%
Base Year + 5 Years	2020	3,809	8,000	-52.4%
Base Year + 10 Years	2025	3,859	8,000	-51.8%
Base Year + 15 Years	2030	3,909	8,000	-51.1%
Total Operations				
Base Year	2015	13,634	31,674	-57.0%
Base Year + 5 Years	2020	14,083	32,567	-56.8%
Base Year + 10 Years	2025	14,550	33,504	-56.6%
Base Year + 15 Years	2030	15,033	34,486	-56.4%

Source: Reid Middleton, Inc. and Mead & Hunt.
Note: TAF data is based on the U.S. Government fiscal year basis (October through September).

Table 3-14. TAF Summary of Airport Planning Forecasts

	Base Year (2015)	Base Yr. + 1 Yr. (2016)	Base Yr. + 5 Yrs. (2020)	Base Yr. +10 Yrs (2025)	Base Yr. + 15 Yrs. (2030)	Base Yr. to + 1 (2016)	Base Yr. to + 5 (2020)	Base Yr. to + 10 (2025)	Base Yr. to + 15 (2030)
Enplanements									
Air Carrier	0	0	0	0	0				
Commuter	0	0	0	0	0				
TOTAL	0	0	0	0	0				
Operations									
Itinerant									
Air Carrier									
Commuter/Air Taxi	3,760	3,770	3,809	3,859	3,909	0.3%	0.3%	0.3%	0.3%
Total Commercial Operations	3,760	3,770	3,809	3,859	3,909	0.3%	0.3%	0.3%	0.3%
General Aviation	8,767	8,838	9,124	9,430	9,748	0.8%	0.8%	0.9%	0.9%
Military	24	24	24	24	24	0.0%	0.8%	0.7%	0.7%
Local									
General Aviation	1,084	1,092	1,127	1,237	1,353	0.8%	0.8%	1.3%	1.5%
Military	0	0	0	0	0				
TOTAL	13,634	13,724	14,083	14,550	15,033	0.7%	0.7%	0.7%	0.7%
Instrument Operations	---	---	---	---	---	---	---	---	---
Peak Hour Operations	5	5	5	5	5	0.0%	0.0%	0.0%	0.0%
Cargo/Mail (Tons)	---	---	---	---	---				
Based Aircraft									
Single Engine	24	24	26	28	29	1.7%	1.7%	1.6%	1.3%
Multi-Engine Piston	0	0	0	0	0				
Multi-Engine Turboprop	0	0	0	0	1	---	---	---	---
Business Jet	0	0	0	0	0				
Other	0	0	0	0	0				
TOTAL	24	24	26	28	30	1.7%	1.7%	1.6%	1.5%

Source: Reid Middleton, Inc. and Mead & Hunt.

The actual FAA templates for these two tables have been completed and are presented for reference in Appendix Two of this document, as is the forecast approval letter from the FAA.

CHAPTER 4. FACILITY REQUIREMENTS

Introduction

The objective of the facility requirements chapter is to determine whether existing airport infrastructure is sufficient to accommodate current usage and future growth using FAA standards and guidelines. As an analysis of the Airport's capabilities, facility requirements are the result of the inventory and forecasts chapters as well as area planning, research, and analysis. They explain the relevancy of existing airport facilities and determine what facilities may be necessary in the future. Facility needs are based upon forecasted use and evaluation procedures include the analysis of runway length, dimensions of aprons and hangars, and vehicle access.

Although this analysis uses the forecasts presented in the preceding chapter for establishing future development at Lopez Island Airport, it is not intended to dismiss the possibility that either accelerated growth or consistently higher or lower levels of activity may occur. Additionally, as described in the previous chapter, an airport's geometric design is based on the specified Runway Design Code (RDC) standards as specified in FAA AC 150/5300-13A. Although the RDC is based on the "Critical Aircraft" or "Design Aircraft" and is used for planning and design, it does not limit the aircraft that may be able to operate safely at an airport. In addition to the aircraft approach speed and wingspan components comprising the RDC introduced in the previous chapter, a third component is also present and it is related to the lowest instrument approach visibility minimums. The instrument approach visibility minimums are expressed as Runway Visual Range (RVR) values in feet. Table 4-1 provides the instrument approach visibility minimums and corresponding RVR value. Lopez Island Airport has visual approaches only, so the full RDC for it is expressed as B-I-VIS (Small Aircraft). The B is based on the aircraft approach speed, or 1.3 times the aircraft stall speed, in this case "B" is between 91 to 120 knots. The "I" designation is the critical aircraft wingspan, which is less than 49 feet. The Lopez Island Critical Aircraft Design Group as determined in the Forecast chapter is B-I (Small Aircraft), with the small referring to aircraft having certificated maximum takeoff weight less than 12,500 pounds. The "VIS" stands for Visual because there are no instrument approaches and no Runway Visual Range equipment at the airport.

Table 4-1. RVR Values

Instrument Flight Visibility Category (statute mile)	RVR (feet)[1]
Visual	VIS
Not lower than 1 mile	5000
Lower than 1 mile but not lower than ¾ mile	4000
Lower than ¾ mile but not lower than ½ mile Lower than ½ mile but no t	2400
Lower than ½ mile not lower than ¼ mile	1600
Lower than ¼ mile	1200

Source: FAA AC 150/5300-13A, Change 1, *Airport Design.*
Note: [1]RVR values are not exact equivalents.

Facilities at Lopez Island Airport can be divided into two general categories: airside and landside. Airside facilities are those that are related directly with the movement of aircraft (i.e., runway, taxiways, approach areas, lighting systems, and navigational aids). Landside facilities encompass terminal buildings, hangars, aircraft aprons, surface access, automotive parking, etc. The components of landside and airside are determined based upon standards set by the FAA.

Airside Facility Requirements

The airside facility requirements analysis focuses on determining the necessary elements and the spatial relationship of the elements. The evaluation includes the delineation of airfield dimensional criteria, establishment of design parameters for the runway and taxiway systems, runway length and an identification of airfield instrumentation and lighting needs.

Wind Analysis

Climatological conditions specific to the location of an airport not only influence the layout of the airfield, but also affect the use of the runway system. Variations in the weather resulting in limited cloud ceilings and reduced visibility typically restrict the time an airport is available for use by aircraft, while changes in wind direction and velocity typically dictate runway usage. When landing and taking off, aircraft are able to operate on a runway properly and safely as long as the wind velocity perpendicular to the direction of travel (i.e., a crosswind) is not excessive. Wind conditions affect all aircraft to some extent, but the smaller the aircraft, generally the more it is affected by crosswinds. The wind coverage analysis translates the crosswind velocity and direction into a “crosswind component”.

The appropriate crosswind component is dependent upon the RDC for the type of aircraft that utilize an airport on a regular basis. As previously identified, the RDC for Lopez Island Airport is B-I-VIS (Small Aircraft). According to the FAA AC 150/5300-13A, a crosswind component of 10.5 knots is considered maximum for runways with a RDC designation of A-I and B-I. Therefore, for Runway 16/34, a crosswind component of 10.5 knots will be utilized to analyze the adequacy of the runway orientation with the prevailing wind conditions.

To determine wind velocity and direction at Lopez Island Airport, accurate and timely wind data was obtained for the period between January 1, 2006 and December 31, 2015 for Friday Harbor Airport, as wind data for Lopez Island Airport is not available. The data was compiled by the National Oceanic and Atmospheric Administration, National Climatic Data Center. Using this data, an all-weather wind rose was constructed and is presented in Exhibit 4-1.

Exhibit 4-1. All Weather Wind Rose

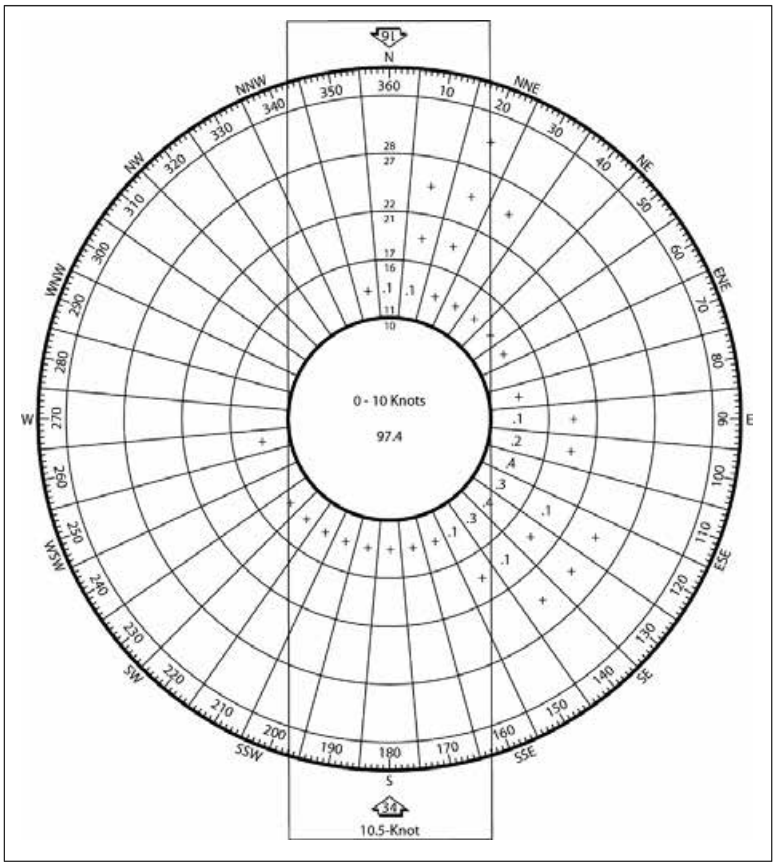


Table 4-2 quantifies the wind coverage provided by the individual runway ends and Runway 16/34 during all weather conditions at the Airport. The desirable wind coverage for a runway is 95 percent, which means that the runway should be oriented so that the maximum crosswind component is not exceeded more than 5 percent of the time. Runway 16/34 provides 95.69% percent wind coverage for 10.5-knot crosswind component, which indicates that the existing runway configuration provides adequate wind coverage for the 10.5-knot crosswind component. A five-knot tailwind component is used in the individual runway end analysis because aircraft can operate with a slight tailwind, so a realistic wind analysis assumes some level of use for each runway end with a tailwind.

Table 4-2. All Weather Wind Coverage Analysis

Runway Designation	10.5-Knot Crosswind Component
Runway 16[1]	90.29%
Runway 34[1]	84.14%
Runway 16/34	95.69%

Source: Wind analysis tabulation provided by Reid Middleton, Inc. and Mead & Hunt utilizing the FAA Airport Design Tools, Wind Analysis. Wind data obtained from the National Oceanic and Atmospheric Administration, National Climate Data Center. Station 727985 Friday Harbor Airport. Period of Record: 2006-2015.
Note: A 5-knot tailwind component was used for the individual runway end analysis.

Airport Design Standards

The airport design standards applicable to Lopez Island Airport are presented in Table 4-3. Airport design standards are based on the appropriate RDC and are contained in Advisory Circular (AC) 150/5300-13A, Change 1. The design standards have been developed to assure that facilities can be operated in a safe and efficient manner and represent a minimum standard to be achieved. As presented, Lopez Island Airport meets or exceeds all the FAA airport design standards associated with RDC B-I-VIS (Small Aircraft), with two exceptions associated with the Runway Safety Area (RSA) at each runway end. The RSA is a defined surface centered on the runway centerline, prepared and suitable for reducing the risk of damage to aircraft in the event of an undershoot, overshoot, or excursion from the runway. It must be cleared and graded and have no potentially hazardous ruts, humps, depressions, or other surface variations; drained by grading or storm sewers to prevent water accumulation; capable under dry conditions of supporting rescue vehicles; and free of objects except those that must be located in the RSA by function (i.e., runway edge lights). If objects higher than three inches must be located within the RSA, then to the extent practical, they must be constructed on frangible mounted structures of the lowest practical height with the frangible point no higher than three inches above grade. The standard maximum RSA gradient within 200 feet of a runway end is 3.0%, with a maximum allowable gradient of 5.0% beyond that.

The existing grade at the northwest corner of the Runway 16 RSA is nearly 8.5%; the existing grade at the southeast corner of the Runway 34 RSA is nearly 9.0%. Exhibit 4-3 graphically presents the grade deficiencies associated with the RSA. It should be noted that the Port of Lopez has programmed a Fiscal Year 2018 project to extend the Runway 16 RSA to the full 240-foot length required.

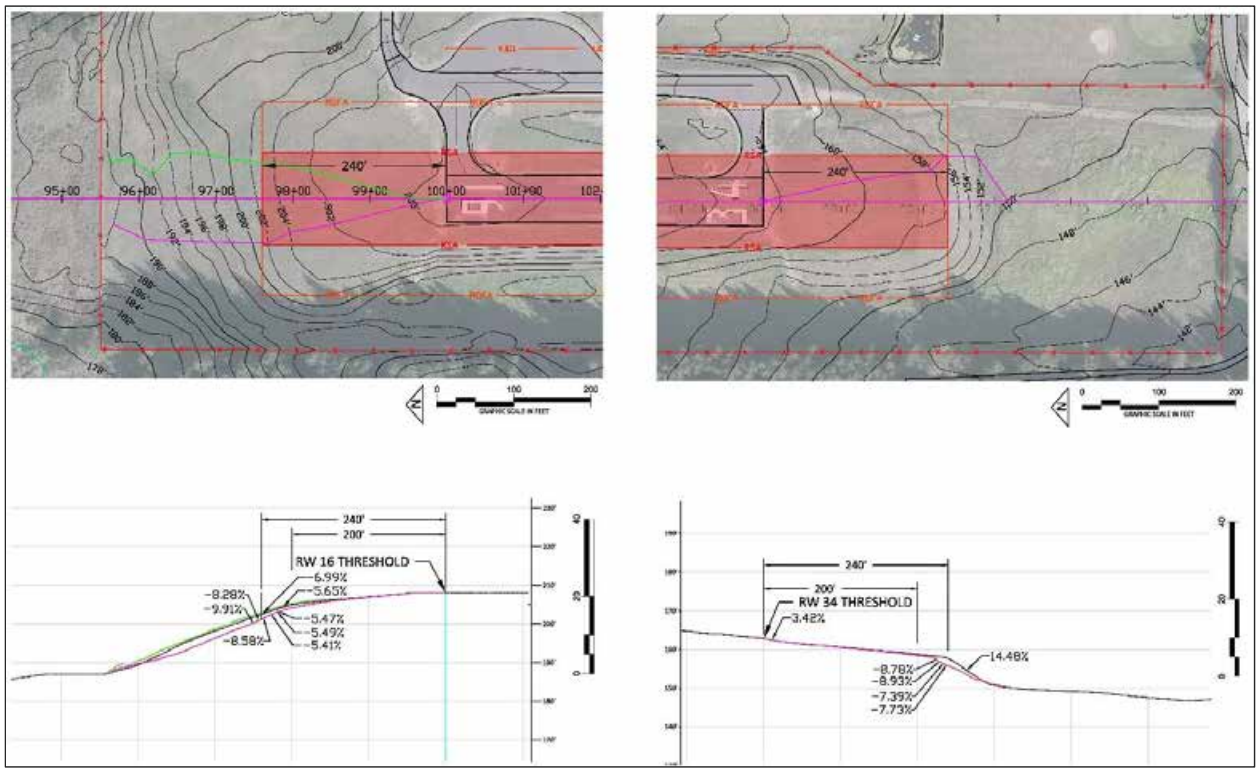
Table 4-3. Runway 16/34 Airport Design Standards

Item	Existing Dimension	B-I-VIS[1]
Runway Width	60’	60’
Runway Safety Area		
Width	120’	120’
Length Beyond Runway End:		
Runway 16	**200’**	240’
Runway 34	**200’**	240’
Length Prior to Landing Threshold		
Runway 16	240’	240’
Runway 34	240’	240’
Runway Object Free Area		
Width	250’	250’
Length Beyond Runway End		
Runway 16	240’	240’
Runway 34	240’	240’
Runway Obstacle Free Zone		
Width	250’	250’
Length		
Runway 16	200’	200’
Runway 34	200’	200’
Runway Centerline To:		
Parallel Taxiway	150’	150’
Aircraft Parking	190’	125’
Holding Position Line	125’	125’

Source: FAA AC 150/5300-13A, Change 1, *Airport Design.*

Note: [1]Airport Design Standards for small aircraft (i.e., aircraft with maximum takeoff weights less than 12,500 pounds).

Exhibit 4-2. Runway 16/34 RSA Non-Standard Conditions



Runway Length Analysis

Generally, for runway design purposes, the determination of appropriate runway length recommendations at general aviation airports is premised upon a combination of factors, which include:

- Airport Elevation
- Mean maximum daily temperature of the hottest month
- Runway gradient
- Family grouping of critical aircraft for runway length purpose

The runway length operational requirements for aircraft are greatly affected by elevation, temperature, and runway gradient. The calculation for runway length requirement at Lopez Island Airport is based on an elevation of 205.2 feet Above Mean Sea Level (AMSL), 68° Fahrenheit Mean Normal Maximum Temperature (MNMT) of the hottest month, and a maximum difference in runway elevation at the centerline of 46 feet.

Runway length determination involves the family grouping of critical aircraft consisting of those aircraft types deemed the most demanding aircraft within the general aviation fleet that are

operating or are projected to operate at the airport. For Lopez Island Airport, this fleet is dominated by small aircraft with maximum takeoff weight of less than 12,500 pounds and having fewer than ten passenger seats, as provided in Table 4-4.

Table 4-4. Critical Design Aircraft for Runway Length

Aircraft	RDC	Maximum Takeoff Weight (MTOW) - pounds	Number of Seats	Estimated 2015 Operations	Runway Length (in feet)
Beech Super King Air 200	B-II	12,500	6	40	2,845[1]
Cessna 206	B-I	3,600	6	400	1,860
Piper Malibu Meridian	B-I	5,092	6	180	2,335
Piper Cheyenne 2	B-I	9,000	6	20	1,980
Pilatus PC-12	B-II	10,500	9	26	2,230
Beech Bonanza 33	A-I	3,650	6	600	1,769
Piper Cherokee	A-I	2,150	4	500	1,759

Source: Aircraft Ground Service Guide, National Air Transportation Association (NATA), 2002.
Note: [1]Landing distance.

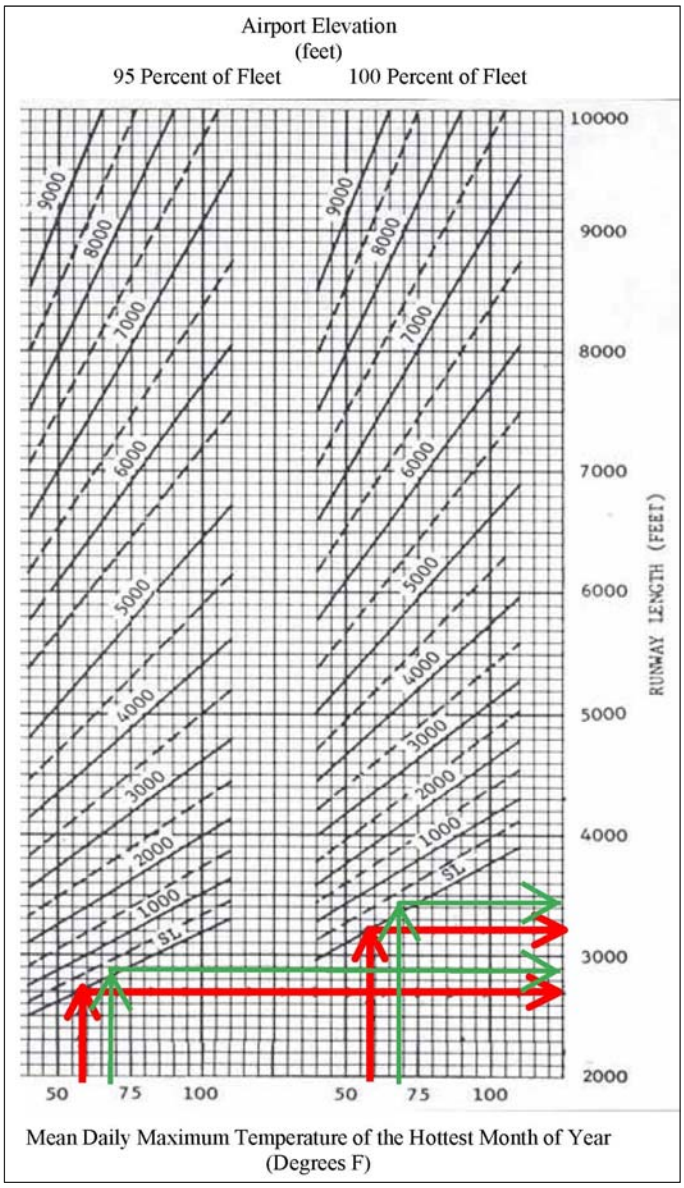
According to FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design*, there are two runway length recommendations for aircraft with less than ten passenger seats based a percentage of the small aircraft fleet, as presented in Table 4-5. Exhibit 4-3 presents the runway length curves provided in AC 150/5325-4B used for calculating the runway length required of aircraft with fewer than ten passenger seats operating at Lopez Island Airport with a mean daily maximum temperature of 68° Fahrenheit and an elevation of 205.2 feet (green arrows). The small aircraft fleet with less than ten passenger seats is further divided into two family groupings according to "percentage of the fleet". According to AC 150/5325-4B, the primary difference between the two categories is the 95% category is intended to serve medium size population communities with a diversity of usage and a greater potential for increased aviation activities. It also includes those airports that are primarily intended to serve low-activity locations, small population communities, and remote recreational areas. The 100% category is primarily intended to serve communities located on the fringe of a metropolitan area or a relatively large population remote from a metropolitan area.

Table 4-5. Runway 16/34 Length Recommendations, In Feet

	Runway Length
Existing Runway 16/34 Length	2,904
Small Airplanes with Fewer than 10 Passenger Seats	
95% of Fleet	2,900
100% of Fleet	3,450

Source: Reid Middleton, Inc. and Mead & Hunt analysis utilizing FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design.*

Exhibit 4-3. Runway Length Curve



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

Because Lopez Island Airport is a low activity airport serving a small population community, the 95% family grouping of small aircraft with less than 10 passenger seats is the appropriate category. The existing runway length of 2,904 accommodates the recommended runway length of approximately 2,900 feet for this aircraft family grouping.

Runway Protection Zones

The function of Runway Protection Zones (RPZ) is to enhance the protection of people and property on the ground beyond the runway ends. This is achieved through airport control of the RPZ areas, and control is preferably exercised through fee simple ownership by the airport within the RPZs. It is desirable to clear all above ground objects from within RPZs; where this is impractical, airport owners, at a minimum, should maintain the RPZ clear of all facilities supporting incompatible activities.

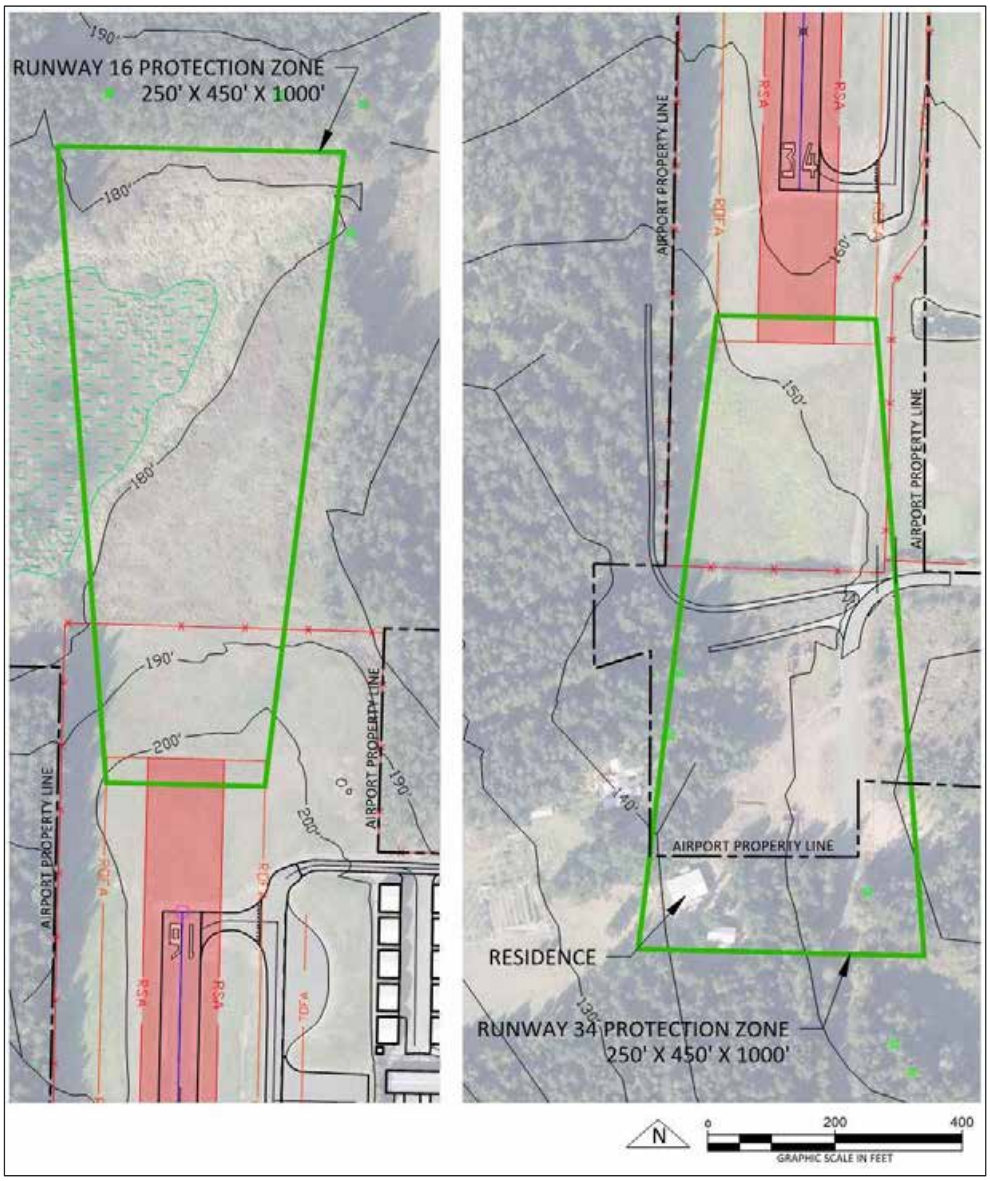
Table 4-6 presents the existing RPZ dimensions and the dimensional requirements for an airport designed to accommodate small aircraft only and having only visual approaches. As can be seen, the existing RPZs meet the dimensional standards associated with these criteria. However, the Runway 34 RPZ extends beyond airport property south of the airport, west and east of Shark Reef Road, into private property containing one residence, as illustrated in Exhibit 4-4. It is recommended that the Port of Lopez continue to program for property acquisition of the remainder of lands within the Runway 34 RPZ beyond airport property.

Table 4-6. Runway Protection Zone Dimensions, In Fee

Runway Protection Zone	Inner Width	Length	Outer Width	Airport Controls Entire Land Area
Existing RPZ Dimensions				
Runway 16	250	1,000	450	Yes
Runway 34	250	1,000	450	No
Standard Approach RPZ Dimensions Applicable to Lopez Island Airport				
Visual and not lower than one statute mile, Small Aircraft Only	250	1,000	450	

Source: FAA AC 150/5300-13A, Change 1, *Airport Design*.

Exhibit 4-4 Runway Protection Zones



Runway End Siting

Criteria contained in AC 150/5300-13A provide guidance for the proper siting of runway ends and thresholds. The criteria are in the form of evaluation surfaces that are typically trapezoidal shaped and extend away from the runway along the centerline at a specific slope, expressed in horizontal feet by vertical feet (e.g., a 20:1 slope rises one unit vertically for every 20 units horizontally). Like RPZs, the specific size, slope, and starting point of the surfaces depend on the visibility minimums and aircraft type associated with the runway end.

Obstructions are one of the most significant issues facing the Port because of the many trees located within the approach areas to both runway ends. In the past year, the Port has been in the process of removing trees on airport-owned property.

Threshold Siting Analysis

Thresholds are located to provide proper clearance over obstacles for landing aircraft on approach to a runway end. When an object beyond an airport owner's ability to remove, relocate, or lower obstructs the airspace required for aircraft to land at the beginning of the runway for takeoff, the landing threshold may require a location other than the end of pavement (i.e., a displaced threshold). The existing criteria for Lopez Island Airport and the requirements for an airport designed to accommodate small aircraft only with approach speeds greater than 50 knots and having only visual approaches are presented in Table 4-7.

Table 4-7. Threshold Siting Surfaces, In Feet

Threshold Siting Surface	Distance From Runway End	Inner Width	Length	Outer Width	Slope	Existing Obstructions
Existing Dimensions						
Runway 16	0	250	5,000	700	20:1	Yes
Runway 34	0	250	5,000	700	20:1	Yes
Standard Threshold Siting Surface Dimensions Applicable to Lopez Island Airport						
Small aircraft only with approach speeds > 50 knots, visual approach	0	250	5,000	700	20:1	

Source: FAA AC 150/5300-13A, Change 1, *Airport Design*.

There are a number of trees that penetrate the threshold siting surfaces for both runway ends, as illustrated in Exhibits 4-5 and 4-6. The Port of Lopez owns most of the property where the trees are located within the approach areas, but several trees are located beyond Port-owned property. The Port is currently scheduled to remove all the trees within the north portion of airport property, as identified on Exhibit 4-4. It is recommended that the Port continue the process of trimming or removing the trees on airport property, and explore options to attain the rights to remove or trim the trees beyond airport property.

Exhibit 4-5. Runway 16 Threshold Siting Surface, Plan and Profile

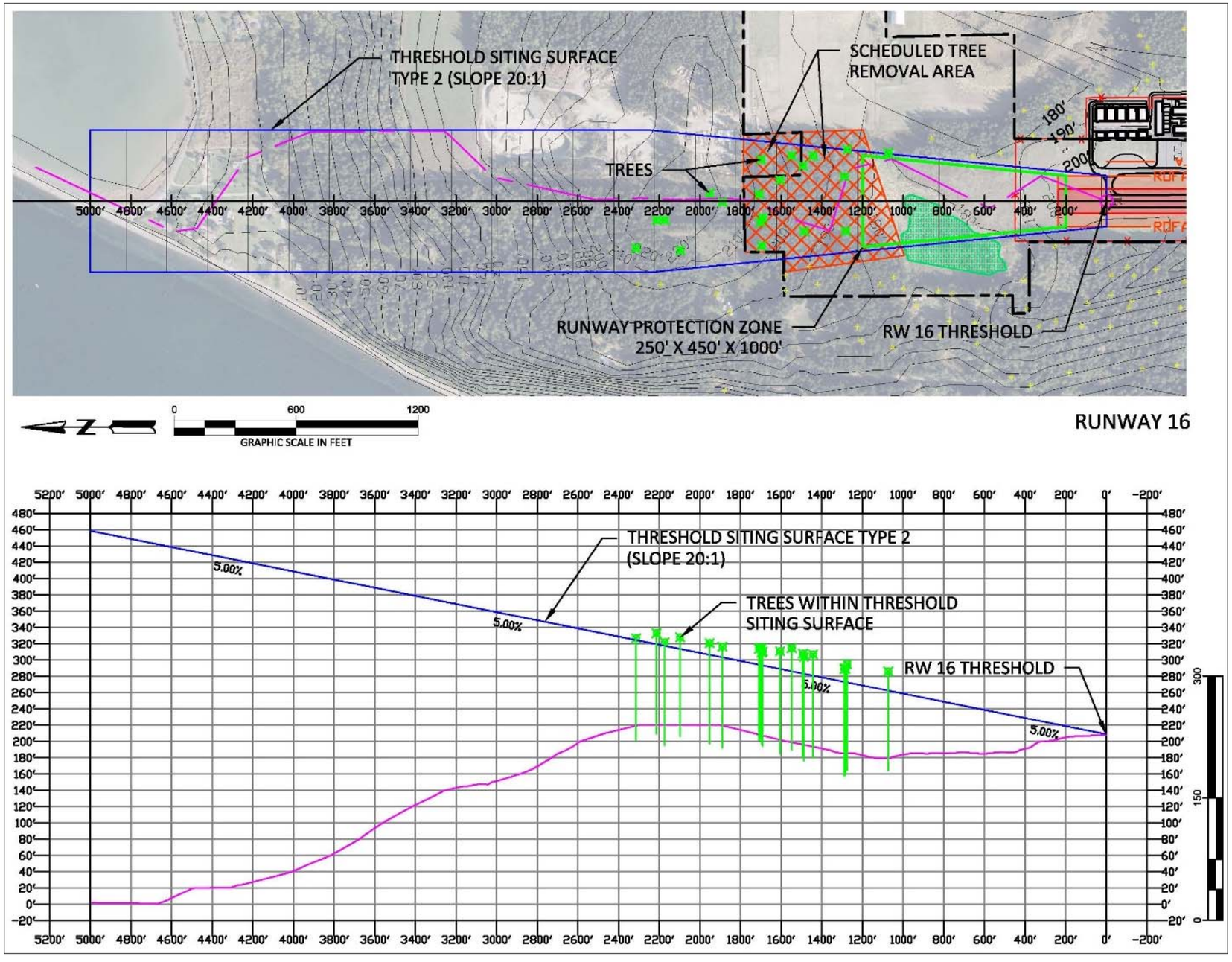
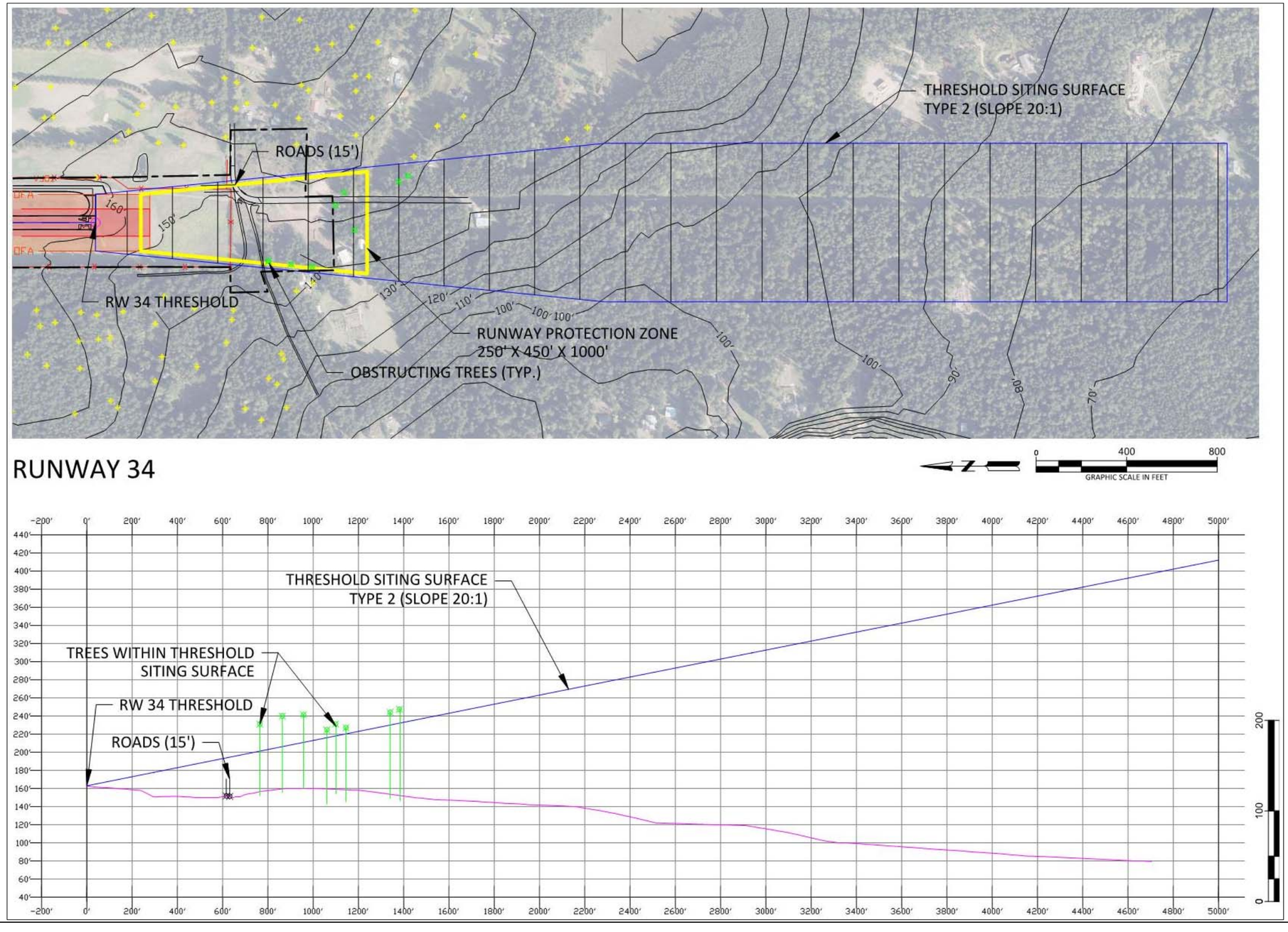


Exhibit 4-6. Runway 34 Threshold Siting Surface, Plan and Profile



Runway Marking, Lighting, and Signage

Runway 16/34 is provided with basic visual markings and is equipped with holding position lines at all taxiway intersections conforming to standards for visual approaches provided in AC 150/5300-13A, Change 1 and AC 150/5340-1L, *Standards for Airport Markings*. The airport's 5010 Form indicates they are in good condition. The runway is equipped with Medium Intensity Runway Lights (MIRLs), two-light Precision Approach Path Indicator (PAPI), and Runway End Identifier Lights (REILs) at each runway end. According to AC 150/5300-13A, Lopez Island Airport is equipped with satisfactory marking, lighting, and signage to meet the current and forecast aircraft fleet requirements. However, the existing MIRL is dated and the Port plans to replace the system in the near future.

Taxiway System

Taxiways facilitate aircraft movement between the various functional landside areas on an airport and the runway system. Taxilanes are designed for low speed and precise taxiing of aircraft that are usually, but not always, located outside the movement area, providing access from taxiways (usually an apron taxiway) to aircraft parking positions or hangar areas. Taxiways and taxilanes are designed for "cockpit over centerline" taxiing with sufficient pavement width to allow for a certain amount of wander. Potential runway incursions should be kept to a minimum by proper taxiway design criteria contained in AC 150/5300-13A. Taxiway and taxilane clearance requirements are based on wingtip clearance, a function of aircraft wingspan, and are determined by the Airplane Design Group (ADG) of the design aircraft, which at Lopez is the "I" in the B-I critical aircraft design group. Taxiway and taxilane pavement design standards are related to the Taxiway Design Group (TDG), which is based on the overall Main Gear Width (MGW) and the Cockpit to Main Gear (CMG) distance of the design aircraft. The existing and forecast aircraft fleet indicate that ADG I and TDG 1A are appropriate for the design of the taxiway system at Lopez Island Airport.

The airport is equipped with a full parallel taxiway and five taxiway connectors providing access between the runway and parallel taxiway. Taxiway widths range from 25 to 30 feet. Table 4-8 provides the existing taxiway conditions and appropriate taxiway design standards.

Table 4-8. Taxiway Design Standards, In Feet

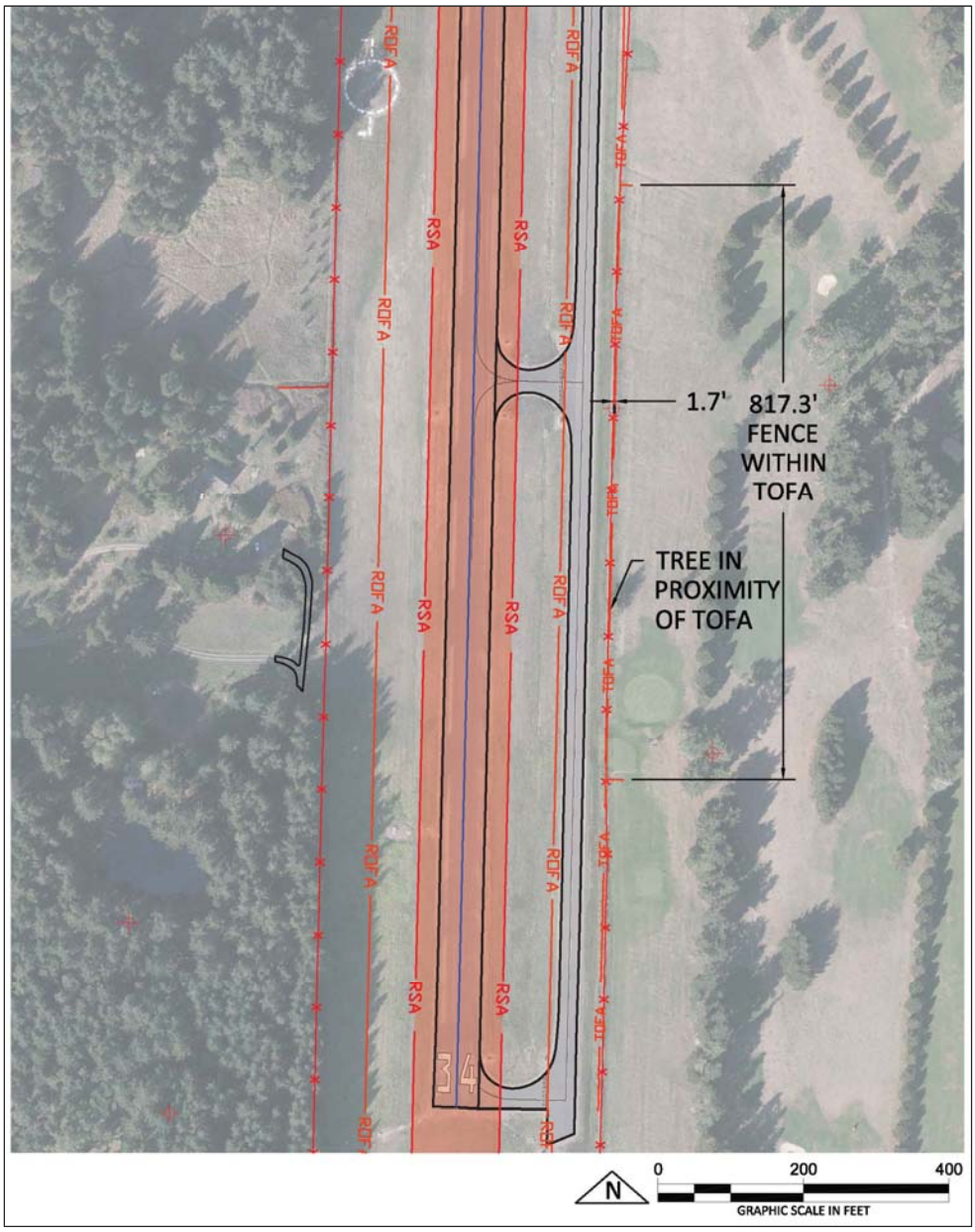
Design Standard	Existing Dimension	Design Standard Dimension
Design Standard Based on ADG		**ADG I**
Taxiway Safety Area	49	49
Taxiway Object Free Area	**87.3**	89
Taxilane Object Free Area	50, 79	79
Taxiway Centerline to:		
Parallel Taxiway/Taxilane Centerline	NA	70
Fixed or Movable Object	**42.8**	44.5
Taxilane Centerline to:		
Parallel Taxilane Centerline	NA	64
Fixed or Movable Object	40	39.5
Design Standard Based on TDG		**TDG 1A**
Parallel Taxiway Width	25	25
Mid-field Taxiway Widths	30	25

Source: FAA AC 150/5300-13A, Change 1, *Airport Design*.

Taxiway Standards Analysis. Applying the appropriate TDG and ADG design standards to the existing taxiway conditions indicates that Lopez Island Airport meets or exceeds most of the taxiway design standards. The lone exception is the Taxiway Object Free Area (TOFA) associated with the parallel taxiway. A tree and the fence separating airport property from the golf course are located approximately 1.7 feet within the standard 44.5 feet from the taxiway centerline. This non-standard condition exists for a stretch of approximately 817 feet along the parallel taxiway. The Port should explore options for removing the tree and relocating the fence beyond the TOFA. Exhibit 4-7 graphically presents the deficiencies associated with the parallel taxiway.

It should be noted that the three mid-field taxiway connectors have widths of 30 feet, exceeding the TDG 1A design standard of 25 feet. FAA policies and guidelines indicate that funding for pavement maintenance and rehabilitation projects are generally limited to that required by the appropriate design standard. If the Port of Lopez decides to retain the extra taxiway connector widths, it must do so utilizing Port monies exclusively for the extra width.

Exhibit 4-7. Parallel Taxiway Object Free Area Non-Standard Conditions



Taxilane Standards Analysis. Applying the appropriate criteria to the existing taxilanes on the airport indicates that the taxilanes providing access to the private and Port-owned hangars, and between the hangars, have Object Free Area widths of approximately 50 feet, 29 feet less than the required TDG 1A design standard of 79 feet. The Port should amend their hangar leases to provide notice of the existing limited distance between the hangars and have lessees sign hold harmless agreements for any and all damages. When age and condition of the hangars warrant replacement, it is recommended that all FAA setback standards be incorporated into the design of future hangars.

The taxilane located at the north end of the parallel taxiway providing access to the private hangars exceeds the 2.0% FAA standard grade for Aircraft Approach Categories A and B. The overall grade is approximately 6.1%, with parts of the existing grade exceeding 7.0%. The Port has a hold harmless agreement with aircraft owners basing their aircraft in the private hangars for any and all damages resulting from the steepness of the taxilane.

The airport incorporates standard taxiway signage that meets all FAA signage standards.

Instrument Approach Requirements

Runway 16/34 currently supports visual approaches only. Any improvements to the current approaches would use satellite based platforms rather than ground based systems. The FAA is currently implementing "NextGen" capabilities nationwide that will allow a higher level of efficiency between airports and provide innovative instrument approach and departures. It is not anticipated that Lopez Island Airport will be provided improved instrument approaches during the planning period.

Electronic Navigational Aids

The Port desires to install an Automated Weather Observing Station (AWOS) on the airport providing local weather reporting services to pilots. These stations require proper siting and ample land area to provide accurate data recording. Typically, stations are sited from 1,000 to 3,000 feet from the runway threshold and a minimum 500 feet from the runway centerline to a maximum of 1,000 feet. Wind sensors should be mounted at 30 to 33 feet above the average ground height within a radius of 500 feet. It is also desirable that all obstructions such as vegetation and buildings be at least 15 feet lower than the sensor within the 500-foot radius, and be no more than 10 feet above the sensor from 500 to 1,000 feet.

Landside Facility Requirements

Landside facilities are those airport facilities that support the airside facilities, but are not actually a part of the aircraft operating surfaces. They consist of such facilities as terminal buildings, hangars, aprons, access roads, and support facilities. At the Lopez Island Airport, landside facilities are the aircraft apron and hangars.

During the planning period, based aircraft are projected to increase from 24 to 32, with at least one multi-engine turboprop powered aircraft expected to be based at the airport. Currently, there are 16 tiedowns on the apron and 34 hangar spaces available for aircraft storage. Eight of the tiedowns are reserved for based aircraft (with two currently being used) and eight reserved for transient aircraft.

Table 4-9 summarizes the required space needs for aircraft storage throughout the planning period. As can be seen, there is more than adequate apron to meet the demand for based aircraft

owners who may not desire to pay the cost for hangar spaces, but there may be a deficiency in tiedown spaces allocated for transient aircraft. However, the total number of tiedown spaces appears adequate to meet the demand if some of the reserved based aircraft spaces are reallocated for transient use.

The amount of hangar spaces available appears capable of accommodating the aircraft storage demand throughout the planning period.

Table 4-9. Aircraft Storage Requirements, 2015-2035

Aircraft Storage Type	2015[1]	2020	2025	2030	2035
Based Aircraft Apron					
Number of Tiedowns	8	1	1	1	2
Square Yards	3,000	360	360	360	720
Transient Apron					
Number of Tiedowns	8	11	12	12	12
Square Yards	3,800	4,600	4,800	4,800	4,800
Total Apron					
Total Number of Tiedowns	16	12	13	13	14
Total Square Yards	7,200	5,840	6,240	6,240	6,240
T-hangar Spaces	33	25	27	29	30

Source: Reid Middleton, Inc. and Mead & Hunt analysis using FAA AC 150/5300-13A, Change 1, *Airport Design*, and actual airport conditions.

Note: [1]Actual.

The Port has had ongoing discussions about the need for a fuel storage and dispensing system at the airport. At this time, it is not thought to be a necessary item to provide. However, this is a market-based business decision and each potential opportunity should be evaluated on its merits and compatibility with Port goals for the airport.

Summary of Facility Requirements

The facility requirements presented in this chapter form the basis of the development plan for the airport. Facility requirements are based upon current operations and future forecasts. Although many of the existing airport facilities are adequate, others will require improvement to accommodate the existing and future aviation demand safely and efficiently. Table 4-10 presents a summary of the facility requirements.

Table 4-10. Summary of Facility Requirements, 2015-2035

Facility	2015[1]	2020	2025	2030	2035
Runway System					
Runway Length and Width	2,904' X 60'	Same	Same	Same	Same
RSA Length					
Runway 16	200'	240'	Same	Same	Same
Runway 24	200'	240'	Same	Same	Same
Runway Protection Zones					
Runway 16	250' x 1000' x 450'	Same	Same	Same	Same
Runway 34	250' x 1000' x 450'	Same	Same	Same	Same
Threshold Siting					
Runway 16	Obstructions	Remove	Same	Same	Same
Runway 34	Obstructions	Remove	Same	Same	Same
Taxiway System					
Taxiway Lights	Reflectors	Same	Same	Same	Same
Parallel Taxiway OFA			Remove Tree and Relocate Fence		
Midfield Taxiway Connector Widths	30'	Same	Same	25'	Same
Electronic Navigational Aids					
Weather Reporting System	None	AWOS	Same	Same	Same

Source: Reid Middleton, Inc. and Mead & Hunt.

CHAPTER 5. ALTERNATIVES ANALYSIS

Introduction

This chapter identifies and evaluates the alternatives for meeting the needs of airport users as well as presenting the strategic vision for airport development in terms of both its concept and reasoning, with a focus on the comprehensive nature of the elements involved. A description of the various factors, influences, concepts, and issues that will form the basis for the ultimate plan and program is provided. The conclusion of this chapter is the selection and presentation of the Conceptual Development Plan for the airport.

Development Assumptions and Goals

The preparation of the future development plan begins with establishing several basic assumptions and goals, the purpose of which is to direct and guide the evaluation process and establish continuity. They allow for several short- and long-term categorical considerations relating to facility needs, including safety, capital improvements, land use compatibility, financial and economic conditions, noise, public interest and investment, and community recognition and awareness. While most are project oriented, some obviously represent more tangible activities than others. However, all are deemed important and appropriate for future airport development.

Development Assumptions

Assumption One: The Airport will continue to be developed and operated in a manner that is consistent with local ordinances and codes, federal and state statutes, federal grant assurances, and FAA regulations.

Assumption Two: The runway will be maintained to FAA defined Runway Design Code (RDC) B-I-VIS (Small Aircraft) dimensional standards.

Assumption Three: Lopez Island Airport will continue in its primary role as a general aviation airport, as it is not expected to accommodate commercial air carrier activity beyond the existing unscheduled, on demand air taxi activity.

Assumption Four: The existing visual approaches will continue to be planned for and protection afforded accordingly. A formal request for an Instrument Approach Procedure (IAP) has been received by FAA Flight Procedures. Flight Procedures has completed an initial analysis of the proposed procedure using existing AGIS data, which is included in the Appendix. Additional FAA analysis may be required prior to implementation of an IAP.

Assumption Five: Lopez Island Airport will be designed, to the maximum extent possible, to enhance the compatibility of airport operations with the surrounding environs.

Development Goals

- Plan the Airport to accommodate the forecasted aircraft fleet safely and efficiently.
- Program the construction of facilities when demand is realized (construction is demand driven, not forecast driven).
- Enhance the self-sustaining capability of the Airport and ensure the financial feasibility of all future development.
- Plan and develop airport facilities to be environmentally compatible with the community, minimizing the potential environmental impacts to both airport property and adjacent properties.
- Provide effective direction for future airport development through the preparation of a rational plan and adherence to the adopted development program.
- Encourage the protection of existing public and private investment in land and facilities, and advocate the resolution of any potential land use conflicts, both on and off airport property.

Airside Development Concepts, Alternatives, and Recommendations

Because all other airport functions are related to and revolve around the basic runway and taxiway layout and configuration (i.e., the airside component of the Airport), airside development alternatives must first be examined. The primary objective of the airside alternatives analysis is to examine options that will result in the best and safest possible aircraft operating environment.

Runway System

There have been three primary runway system issues identified in the previous chapter: the deficient Runway Safety Area (RSA) at both runway ends, the Runway 34 RPZ that extends beyond airport-owned property, and the obstructions to the threshold siting surfaces at each runway end.

Runway Safety Area Alternative. In order to be compliant with the dimensional standards associated with RDC B-I-VIS, the RSAs at both runway ends will need to be extended to attain the proper gradient within the full 240-foot length. FAA Order 5300.1F, *Modification to Agency Airport Design, Construction, and Equipment Standards*, does not allow for a Modification of Standards (MOS) for nonstandard RSAs. Therefore, the only alternative available to the Port is to plan and program for projects that correct the nonstandard RSA conditions that exists at both runway ends. As stated previously, the Port has programmed a Fiscal Year 2020 project to extend the Runway 16 RSA to the full 240-foot length. A similar project will be programmed for the nonstandard Runway 34 RSA.

Recommendation: Extend Runways 16 and 34 RSAs to the full length of 240 feet.

Runway 34 RPZ Alternatives

The Runway 34 RPZ extends beyond airport property to the south into private property. One parcel of property contains a residence in the RPZ. A county road (i.e., Shark Reef Road), and two private roads (i.e., Meadow Lane and Eagles Roost Lane) are also within the RPZ. The Port of Lopez has established road easements with a limited number of property owners granting access to their properties over and across Port property from Shark Reef Road (see easement examples in Appendix Three). The Eagles Roost Lane easement grants perpetual ingress and egress on a 30-foot wide strip of land for property owners located north and west of the airport for private roadway and utility access. The Port has no obligation to maintain this private road. The Meadow Lane easement is a non-exclusive 20-foot wide strip of land for ingress and egress for property owners located west of the airport. There are little to no amenities on the roads such as sidewalks and bike lanes. There are currently no obstructions to the approach in the Runway 34 RPZ.

There are no proposed improvements that would introduce new incompatible land uses or change the size of location of the Runway 34 RPZ. The County has recently purchased a parcel of land located west of the RPZ that is accessed by Meadow Lane through the RPZ, which will be used as a preserve providing the public with access to the beach at the western edge of the parcel. There are no current plans to improve the existing roads, including no plans for widening the roads or adding bike lanes, sidewalks, and other amenities. Since the roads are an incompatible use in the RPZ, any future improvements to the existing roads will require the Port to prepare an RPZ Memo, coordinate with the FAA's National Airport Planning and Environmental Division (APP-400), and may require future studies to address the incompatible use of the roads within the RPZ. However, any changes to relocate the county and private roads outside the RPZ will require a phased and long-term strategy that is outside the scope of this plan.

There is an approximate nine-acre private parcel containing a residence located within the Runway 34 RPZ directly south of existing airport property and west of Shark Reef Road. The property owners have made substantial financial investments in the residence and are unwilling to sell the property at this time. While the existing property owners are unwilling sellers presently, they have been and continue to be cooperative with tree removal and the Port has an easement allowing the Port to remove or top trees on their property. East of Shark Reef Road, there is another private parcel located within the Runway 34 RPZ, of which approximately one acre of land is in the RPZ. The Port is unwilling to condemn the two properties.

For all alternatives, the Port intends to continue to work with the local community to educate citizens on the need and requirements of a RPZ and the purpose of the RPZ to protect people and property on the ground. This will include communication at Port Commission meetings, discussion at future community meetings, and other communication by the Port to emphasize the goals of the RPZ for safety and protection of people and property on the ground.

Runway 34 RPZ Alternative One – No Action. This alternative does not provide for the acquisition of the property located within the Runway 34 RPZ. The FAA Memorandum *Interim Guidance on Land Uses Within a Runway Protection Zone*, provides guidance for determining land use compatibility within RPZs. Residential land uses and roads are defined as incompatible within RPZs. However, the Memorandum only addresses the introduction of new or modified land uses to an RPZ and proposed changes to the RPZ size or location. Since no proposed airport improvements are planned that would introduce new incompatible land uses, or change the size or location of the RPZ, the land use compatibility requirements contained in the Memorandum are not pertinent and no action is required by the Port.

This alternative has the advantage of having no cost to implement and does not require condemnation of property that existing owners are currently unwilling to sell. Maintaining the status quo will not create additional incompatible RPZ land uses. The disadvantage is the Port does not have direct control of land uses within the portion of the Runway 34 RPZ extending beyond airport property, nor does this alternative have a plan to address removing the existing incompatible use (residence).

Runway 34 RPZ Alternative Two – Development Easements, First Right of Refusal, and Ultimate Acquisition. This alternative provides for both short-term and long-term actions to address incompatible uses in the Runway 34 RPZ. This alternative in the short-term provides for the Port pursuing RPZ development easements with the two private property owners in the RPZ on the west and east sides of Shark Reef Road. As stated previously, the property owners have been cooperative with the Port in the past on tree removal and other actions on their property. The RPZ development easements would prohibit future development of any additional incompatible land uses within the RPZ, but would not remove the existing residence.

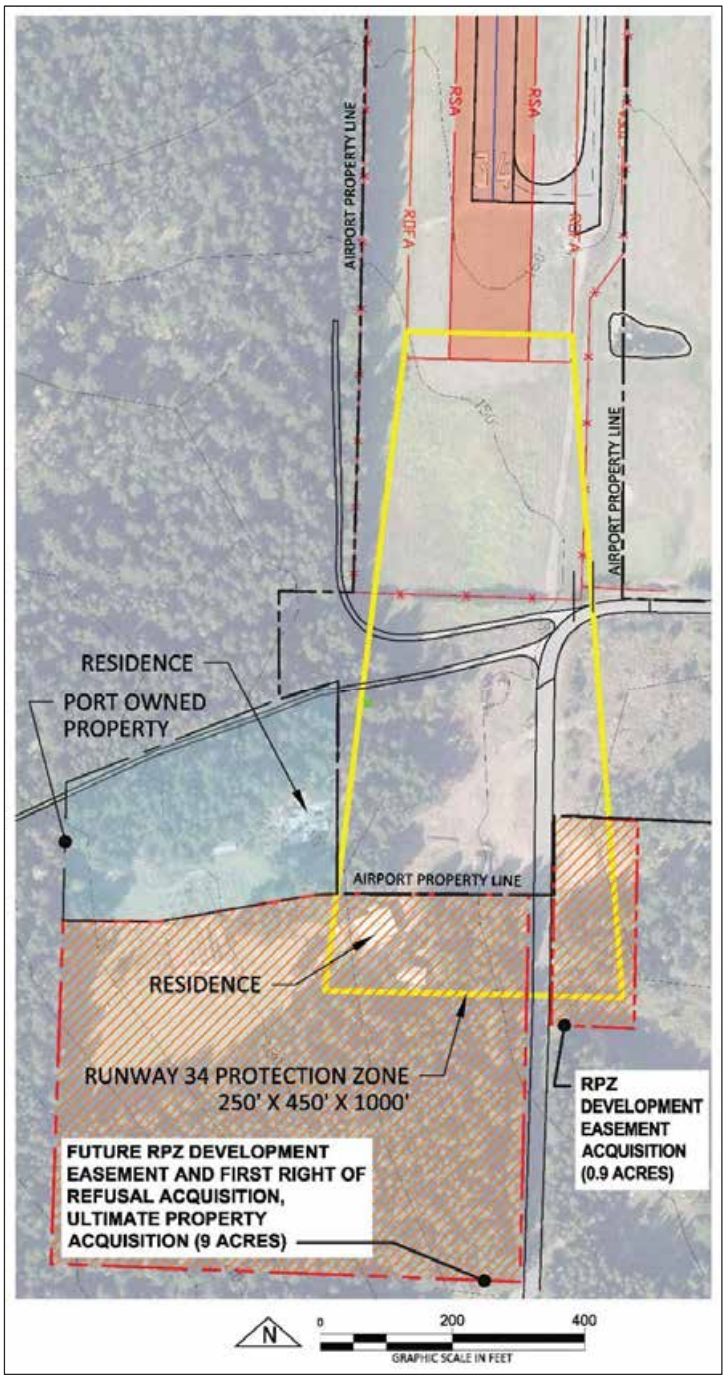
Easements can cost less than fee simple purchase of property, but depending upon the negotiations needed to get the land owner's agreement can be close to the cost of a fee simple purchase. It should be noted that development easements do not equal complete control by the Port over the property as they require ongoing coordination with the land owner. However, a properly negotiated RPZ development easement would prohibit the further development of incompatible land uses as well as limit the height of vegetation and structures. The Port will provide ongoing coordination with these new easements similar to their coordination efforts on existing easements.

This alternative includes the Port pursuing a first right of refusal to purchase the property to the west of Shark Reef Road in the RPZ as part of the development easement process. The first right of refusal would allow the existing residents to remain in their residence until the property is available for purchase. The long-term action of this alternative is to provide for fee simple acquisition when the owner is ready to sell the approximate nine acres of private property and the residence contained within the Runway 34 RPZ directly south of existing airport property and west of Shark Reef Road.

An RPZ development easement purchase without the negotiated first right of refusal to purchase the property east of Shark Reef Road is appropriate given the small amount of property within the RPZ (less than one acre) as well as the need to provide the landowner continued driveway access to Shark Reef Road.

The advantages of this alternative are that development easements would prevent future development of incompatible uses in the RPZ, the Port will have the opportunity to continue to educate the public and adjacent property owners on the importance and function of the RPZ, the Port will have the first right of refusal to purchase the property to the west of Shark Reef Road, the Port will pursue purchase of the property when available allowing for a long term path to compliance. Ultimate airport ownership of the majority of RPZ property and the development easement on a small portion of property east of Shark Reef Road ensures incompatible land uses are removed and are not allowed to develop in the future. The disadvantage is the lack of complete control of the properties in the short term and the required ongoing coordination required from the land owners until fee simple purchase is attained. Exhibit 5-1 illustrates Alternative Two.

Exhibit 5-1. Runway 34 RPZ Alternative Two

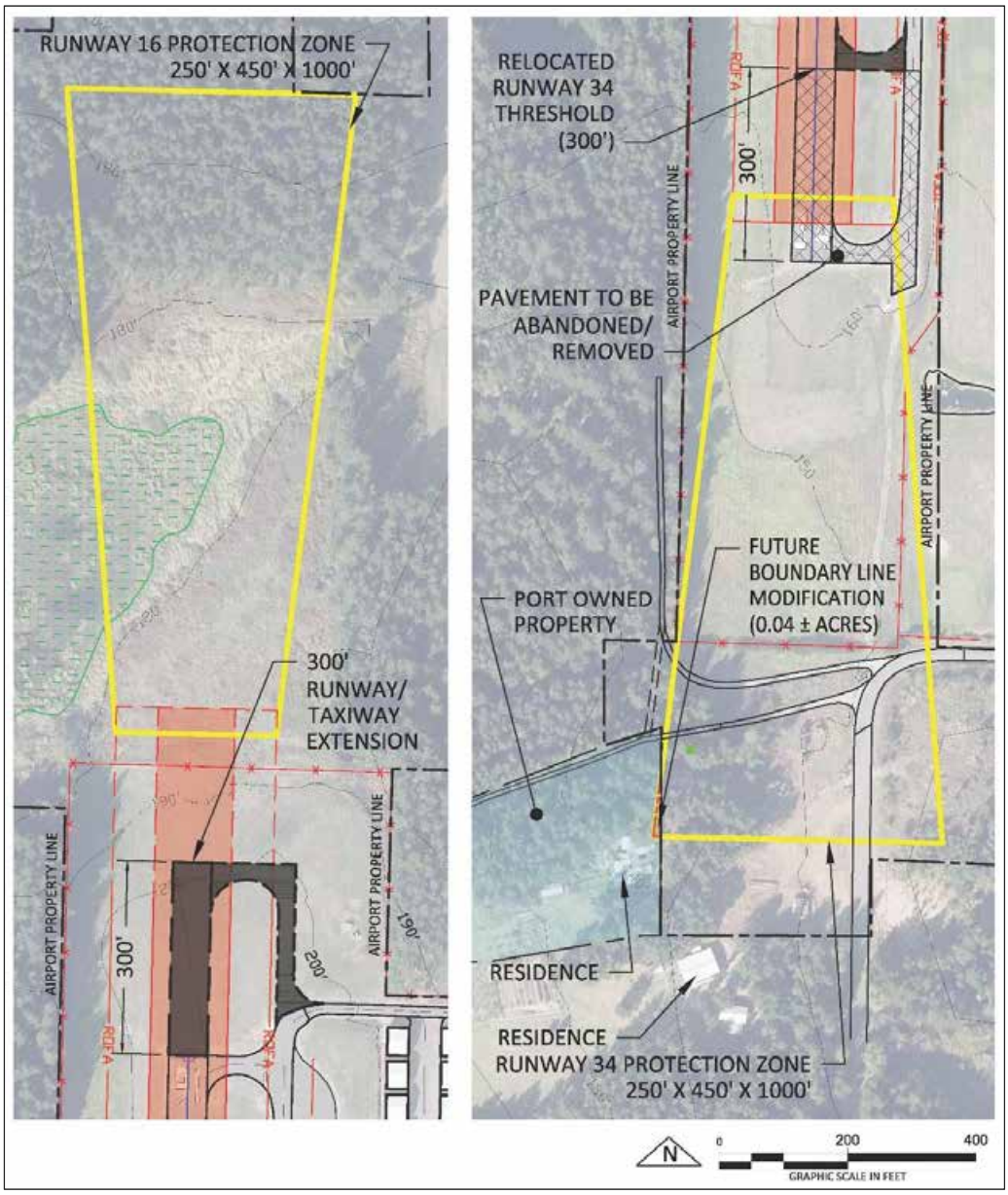


Runway 34 RPZ Alternative Three. Alternative three shifts Runway 16/34 to the north by providing a runway extension of 300 feet to the north and a relocation of the Runway 34 threshold a corresponding amount. With the runway shift, the Runway 34 RPZ no longer encompasses the residence and eliminates the need to acquire additional properties (either fee simple or easement). A Boundary Line Modification (BLM) of approximately 0.04 acres from Port owned property to airport property would be required to facilitate full airport ownership of the relocated Runway 34 RPZ. However, the two private roads and Shark Reef Road would remain within the RPZ, which does not provide a full remedy to the incompatible land uses within the Runway 34 RPZ.

There is sufficient airport property to accommodate the runway extension to the north, including the Runway 16 RPZ shift. However, there is an NWI identified wetland in the northwest portion of airport property. The runway shift, and corresponding extension of the RSA might affect the wetland area. Additionally, the ground slopes downward from the end of the existing RSA significantly, which will require a substantial amount of fill to meet runway and RSA gradient standards associated with Aircraft Approach Category (AAC) A and B runways. The runway shift also encompasses additional trees within the extended Runway 16 Threshold Siting Surface, creating the need for additional tree removal north of the airport.

This alternative has the advantage of no property and residential acquisition cost requirements, and will not intrude on the residences south of the airport. The disadvantage of this alternative is the cost for implementation, as it is expected to be the most expensive of the three alternatives based on the required runway and taxiway pavement, relocation of threshold lights, PAPI, and runway lights, substantial earthwork, and additional tree removal to the north of the airport. Additionally, the potential for wetlands impacts and mitigation measures is a disadvantage for this alternative, as is the inability to remove the existing roads from the Runway 34 RPZ. It should be noted that cost estimates for the alternatives are beyond the scope of this Master Plan Update. Exhibit 5-2 illustrates the components of Alternative Three.

Exhibit 5-2. Runway 34 RPZ Alternative Three



Recommendation: The Port of Lopez selects Alternative Two as the preferred option for rectifying the incompatible land uses within the Runway 34 RPZ. This alternative has both short term and long term actions. The short term action entails the purchase of RPZ development easements for the two properties on the west and east side of Shark Reef Road within the RPZ and a first right of refusal agreement for the property west of Shark Reef Road. The long-term action will be for the Port to exercise the first right of refusal to purchase in fee simple the property on the west side of Shark Reef Road when it becomes available. The small amount of property within the RPZ on the east side of the road can be protected from further incompatible land uses through the development easement acquisition, while continuing to provide the current

landowner with necessary driveway access to Shark Reef Road. This alternative addresses the existing private property and residence within the RPZ by removing the incompatible residence and prevent future incompatible uses. The existing county and private roads within the RPZ will need future study and analysis to determine the feasibility of relocation outside the RPZ. The analysis of relocation of the existing roads is a phased and future long-term strategy that is outside this plan.

Threshold Siting Obstructions

Multiple trees penetrate the threshold siting surfaces at both runway ends.

Threshold Siting Alternative One. This alternative would displace the runway thresholds at both runway ends to provide adequate clearance of the threshold siting surfaces above the trees located beyond existing airport property. This would entail the displacement of the Runway 16 threshold by approximately 350 feet, and the displacement of the Runway 34 threshold by approximately 250 feet.

The advantage provided by this alternative is the Port controls the stages required for implementation; it would not require negotiation with property owners for the purchase of additional property or an easement to remove trees. The disadvantages are the loss of runway landing length associated with the displaced thresholds, the cost to relocate the thresholds (i.e., remarking the runway pavement and relocating runway lights), and the temporary nature of the remedy as the trees will continue to grow.

Threshold Siting Alternative Two. This alternative involves the acquisition of easements granting the Port the rights to remove the trees penetrating the threshold siting surfaces located beyond existing and future airport property. The advantages associated with this alternative are the retention of the full runway landing length and the more permanent nature of the alternative as a properly negotiated easement should stipulate that future trees determined to penetrate the threshold siting surface will be removed at the Port's expense.

Recommendation: Pursue the purchase of easements to grant the Port rights to remove existing trees penetrating the threshold siting surfaces to both runway ends and stipulate the removal of future trees at the Port's expense.

Taxiway System

As identified in the previous chapter, the parallel taxiway TOFA width is deficient by approximately 1.7 feet for a length of roughly 817 feet in length caused by a tree and the fence separating airport property from the golf course.

Taxiway Configuration Alternative One. This alternative proposes to remove or trim the tree on the golf course and relocate the portion of the fence creating the deficiency to the east outside

the TOFA. Before implementing this alternative, the Port should have the airport property line and fence line surveyed for accuracy. If the fence is located on the airport property line, then acquisition of sufficient golf course property will be required to move the fence and remove or trim the tree. If the fence is not located on the property line and the Port owns sufficient property to relocate the fence, then an agreement with the golf course should be decided upon that allows for fence relocation to coincide with the property line and tree removal or trimming.

The advantage of this alternative is it provides a permanent remedy to the nonstandard Taxiway OFA and does not operationally restrict aircraft taxiing on the parallel taxiway. The disadvantage is the associated costs of fence relocation and additional property (if required).

Taxiway Configuration Alternative Two. This alternative proposes that the Port of Lopez request from the FAA a MOS to allow the TOFA deficiency to remain. According to FAA Order 5300.1F, in order to approve an MOS, it must be justified by unusual local conditions and assurance that an acceptable level of safety will be provided. Unusual local conditions that exist include the existing golf course development immediately adjacent to airport property and the very tight fairway, green, and tee box located next to the area of deficiency. Relocating the fence to the east would further restrict the width of the fairway and encroach on the green and tee box.

Engineering Brief No. 78 provides guidance to evaluate proposed MOS on taxiway separation standards and clearance from taxiways to fixed or movable objects (i.e., TOFA). According to this brief, an MOS would have merit by applying ***taxilane*** clearance standards instead of ***taxiway*** clearance standards. As analyzed and presented in the previous chapter, a Taxiway OFA distance for Airplane Design Group (ADG) I aircraft requires 44.5 feet between the taxiway centerline and any fixed or movable objects. However, applying taxilane OFA separation standards to the parallel taxiway would require only 39.5 feet between the taxiway centerline and fixed or movable objects. Thus, the existing dimension of 42.8 feet between the taxiway centerline and the fence and tree would exceed the standard. Approval of the MOS might also depend upon operational restrictions applied to the parallel taxiway, such as limiting taxiing speeds to 10 miles per hour or less to provide the acceptable level of safety.

It should be noted that the preparation and submittal of an MOS to the FAA is beyond the scope of this Master Plan Update.

The advantage of this alternative is it reduces the expense of rectifying the nonstandard Taxiway OFA dimensional standard. The disadvantage is it operationally restricts aircraft taxiing on the parallel taxiway to potentially slower-than-normal speeds.

Recommendation: At this time, the Port of Lopez desires to pursue Alternative Two, a MOS from the FAA that would apply taxilane clearance standards to the parallel taxiway, thus eliminating the deficient object clearing standards, and limit taxiing speeds to 10 miles per hour or less. As a pathway to compliance of the design standard, a future site survey of the property boundary would be needed to determine if property acquisition and fence relocation is required.

Automated Weather Observing Station (AWOS)

As identified in the previous chapter, after requests from the local medevac services the Port desires to investigate the options of installing an Automated Weather Observing Station (AWOS) on the airport.

AWOS Alternative One. According to siting criteria contained in FAA Order JO 6560.20C, *Siting Criteria for Automated Weather Observing Systems*, the preferred siting of the cloud height, visibility, and wind sensors portion of an AWOS III is adjacent to the runway between 1,000 and 3,000 feet from the runway threshold, with a minimum distance from the runway centerline of 500 feet and a maximum distance of 1,000 feet. The minimum distance from the runway centerline assumes flat terrain. If the sensor is above the runway elevation, then the minimum distance is adjusted positively (i.e., the minimum distance is greater than 500 feet) seven feet laterally for every one foot of elevation difference. If the sensor is below the runway elevation, then the minimum distance is adjusted negatively (i.e., the minimum distance is less than 500 feet) by the same ratio. Where the siting requirements prove to be unnecessarily restrictive, Order JO 6560.20C allows the sensors to be sited in an alternate location on the airport provided the site: is approved by an FAA Obstruction Evaluation/Airport Airspace Analysis (OE/AAA) study and an FAA meteorological study when the minimum distance perpendicular from the runway centerline is less than 500 feet; results in observations that are representative of the touchdown zone of the runway; and meets the other sensor exposure criteria outlined in the Order.

The wind sensor is typically mounted 30 to 33 feet above the average ground height within a 500-foot radius. It is desirable that all obstructions (i.e., vegetation, buildings, etc.) be at least 15 feet lower than the sensor within the 500-foot radius, and be at least 10 feet lower than the sensor from 500 to 1,000 feet. Where the desired location is difficult to achieve, the following allowances are provided: an object will not be considered a sheltering obstruction if the distance between the sensor and the object is greater than ten times the height of the object and the lateral angle from the sensor to the ends of the object are less than ten degrees.

AWOS Alternative Two. This alternative involves the purchase and installation of a non-Federal, non-certified AWOS system (e.g., Super AWOS) on the airport, which does not require the siting restrictions presented above. However, the weather reporting capabilities would be advisory only, meaning it is not considered an approved source of weather information.

Recommendation: The Port of Lopez desires to install an AWOS on Port property at a location where the most beneficial data can be provided to pilots. A decision about the weather reporting system and location will be made as more detailed information is gathered and analysis is conducted. The analysis will include a benefit-cost analysis, a site selection study (which would include an OE/AAA study and meteorological analysis confirming that wind observations are representative of the Runway 16 touchdown zone), and an environmental review of the project. The Port will not pursue an AWOS system on private property to the west of the airport due to existing topography, property ownership, and other considerations. If an appropriate site for the

sensors cannot be found on existing airport property meeting the siting criteria and providing accurate meteorological data, then the Port may not pursue the AWOS.

Instrument Approach

A request for instrument approach has been requested to FAA Flight Procedures. Flight Procedures completed an initial analysis of the proposed procedure using existing AGIS data, which is included in the Appendix. Additional analysis may be required prior to implementation of an instrument approach.

Recommendation: The Port of Lopez desires to provide the safest and most efficient airport operating environment as reasonably possible. A decision about an instrument approach will be made as more detailed information is gathered and analysis is conducted at the time of project design. The analysis will require additional FAA studies for the feasibility of implementing the instrument approach, but it is outside the scope of this Master Plan Update. The Airport Layout Plan (ALP) will indicate a one-mile visibility instrument approach as a possible future condition.

Landside Development Concepts, Alternatives and Recommendations

The overall objective of the Lopez Island Airport landside development plan are the provision of facilities that are conveniently located, accessible to the community, maximize the economic viability of the Airport ,and accommodate the specific requirements of airport users and tenants.

Landside Development Concepts

Landside facilities are commonly categorized into three generalized development categories, described in the following text. Because of the limited developable land within or adjacent airport property, the primary category applicable to Lopez Island Airport is aviation use.

Aviation Use. Development areas related to aircraft storage and handling that require direct airfield access, consisting of facilities such as aprons, hangars, and access taxiways. There are two primary concepts that influence the ability to designate areas for aviation use. First, an area must be located beyond protected airfield spaces such as runways, taxiways, and approach protection areas. Second, the areas must have physical attributes that make access to the airfield system economically feasible.

There are two aviation use designated development areas on the airport. The first is the existing hangar and terminal area, which can be re-developed as age and condition of the older hangars warrants. The second area consists of the vacant land directly north of the existing private hangars.

Aviation-Related or Aviation-Compatible Use. Development areas consisting of facilities that may benefit from close proximity to airport facilities, but do not require direct airfield access, such as commercial, office, and/or light industrial facilities that are compatible with airport

operations and surrounding land uses, and which generate revenue to the Airport and should be marketed as potential revenue producing properties. Development concepts used for this designation include areas beyond protected airfield spaces that cannot be feasibly developed for aviation uses because of physical constraints such as topography, floodplains, drainage features, major roadways, or because airfield access would be cost prohibitive.

At Lopez Island Airport, the recently acquired property in the northeast corner of the airport can be designated as Aviation-Related or Aviation-Compatible. It is unlikely that this property will be needed for aviation facilities, as the distance from the airfield system makes it unfeasible to provide taxiway access. Excellent vehicle access from Channel Road can be provided.

Aviation Support. Development areas required for airports to operate properly, but do not relate directly to aircraft storage and handling and are not part of the airfield system. They consist of facilities such as fuel storage and dispensing systems, Airport Traffic Control Tower (ATCT), on and off airport fire protection facilities, and airport maintenance facilities. Development concepts used to designate areas for aviation support facilities include close proximity to the airfield that are economically feasible to develop without encroaching into the prime aviation use development areas.

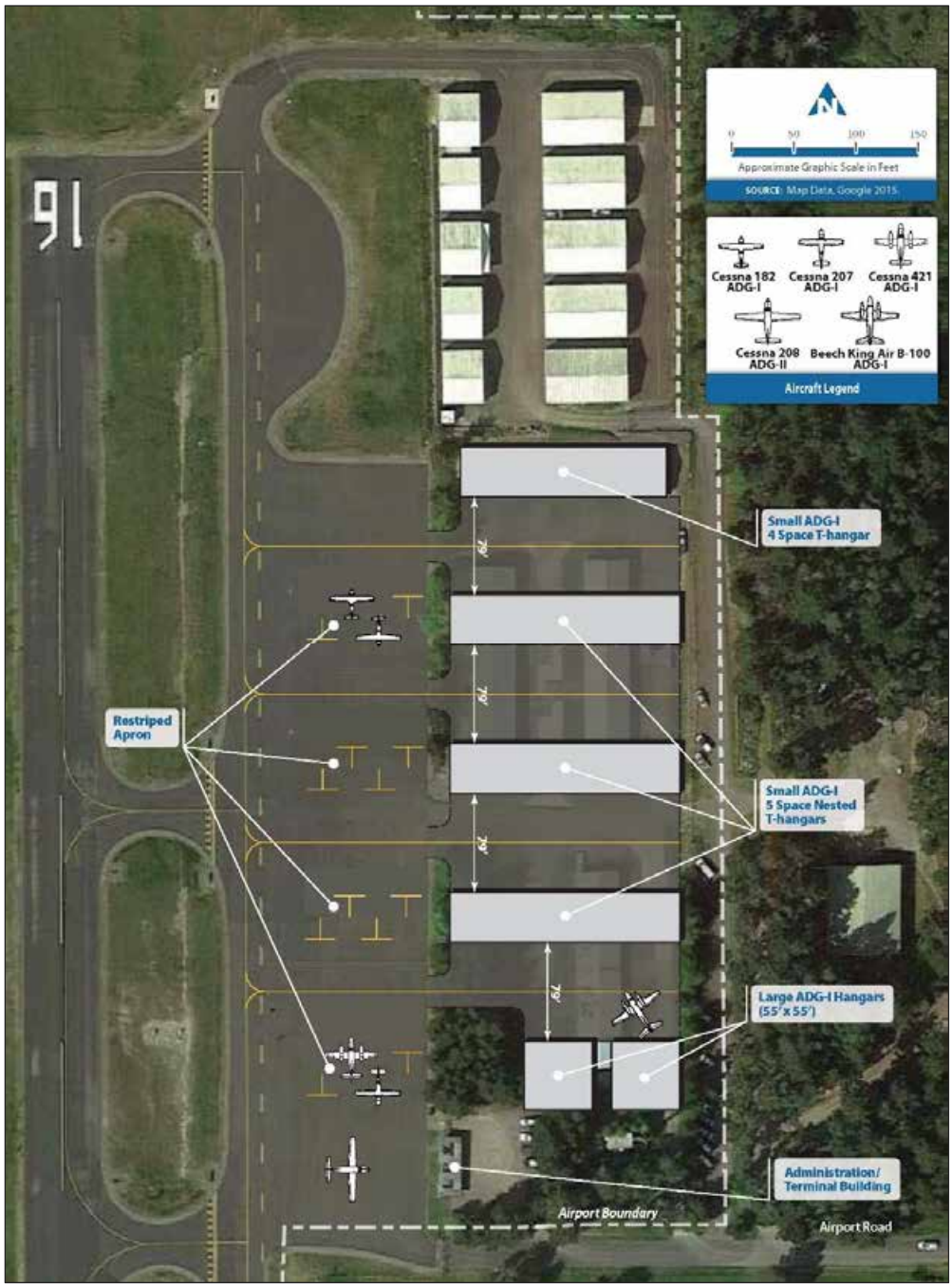
It is unlikely that any Aviation Support facilities will be developed at the airport. As stated in the previous chapter, the Port has had discussions about the need for a fuel storage and dispensing system at the airport, but it is not thought to be a necessary facility at this time.

Landside Development Analysis

South Hangar Development Area: As presented in the previous chapter, Lopez Island Airport currently provides sufficient apron and hangar space for aircraft storage needs throughout the planning period. However, because of age and condition, the older hangars may warrant replacement during the planning period. Exhibit 5-3 presents a conceptual re-development alternative for the southern hangar area and the apron. Because of its location, the entire area is recommended for redevelopment in aviation uses such as hangar, apron, and terminal building.

Replacing the three north-south oriented hangars with east-west oriented nested T-hangars provides for the proper Airplane Design Group (ADG) I taxilane OFA widths (i.e., 79 feet) between hangars. Space is allocated for two individual storage hangars accommodating larger ADG I aircraft. Restriping the apron to coincide with the redeveloped hangars also insures ADG I taxilane OFA dimensional standards are met, and also eliminates the direct access to the runway from the apron by the mid-field taxiway connector striping.

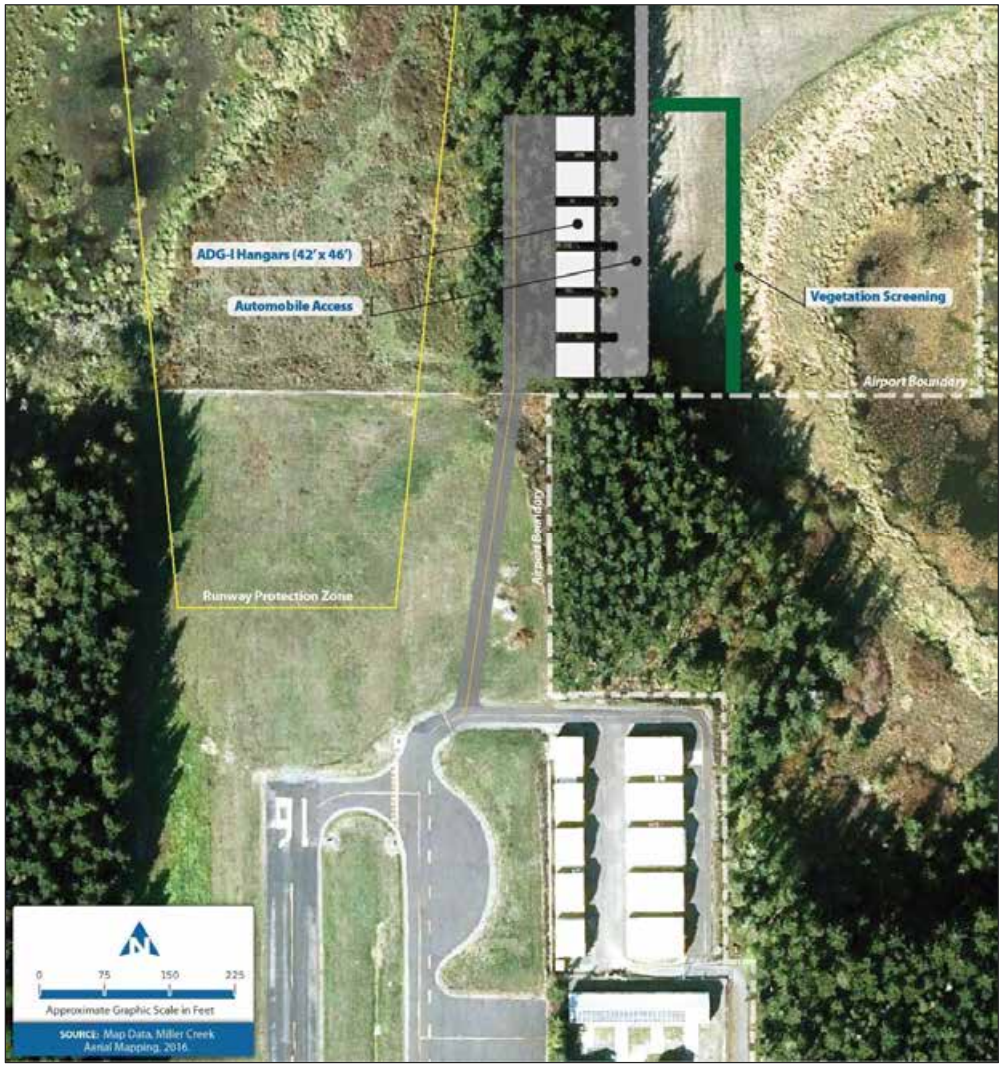
Exhibit 5-3. South Hangar Area Conceptual Redevelopment Alternative



North Hangar Development Area. The Port also desires to explore options for reserving and providing additional hangar development to the north of the existing private hangars. A conceptual development alternative has been prepared, which is presented in Exhibit 5-4. The proposed development places the hangar development approximately 400 feet north of the existing hangar area on Port owned property. In this location, no additional property acquisition is required for hangar development. Following the existing Building Restriction Line (BRL) set

back restriction of 310 feet from the runway centerline, six smaller hangars (32 feet x 42 feet) are illustrated, although larger hangars can be developed. However, caution must be exercised in developing this area regarding hangar height. Because the development area is near the approach area to Runway 16, hangars should be constructed below the approach surfaces so they are not obstructions and thus effect the Runway 16 approach. Taxiway access can be provided through a connection with the taxilane at the north end of the parallel taxiway. Automobile access would be provided from the north via Channel Road. The future development would be screened on the east side by vegetation planted to diminish the visual impact to airport neighbors.

Exhibit 5-4. North Hangar Area Conceptual Development



Recommendation: As age and condition of the existing hangars and apron warrant, the south hangar area will be redeveloped with the east-west oriented hangar layout and apron making that meets ADG-I separation standards and removes the apron to runway direct access, as presented

in Exhibit 5-3. As the need arises for additional hangars at the airport, the north hangar area will be developed as conceptually presented Exhibit 5-4.

Recommended Development Plan

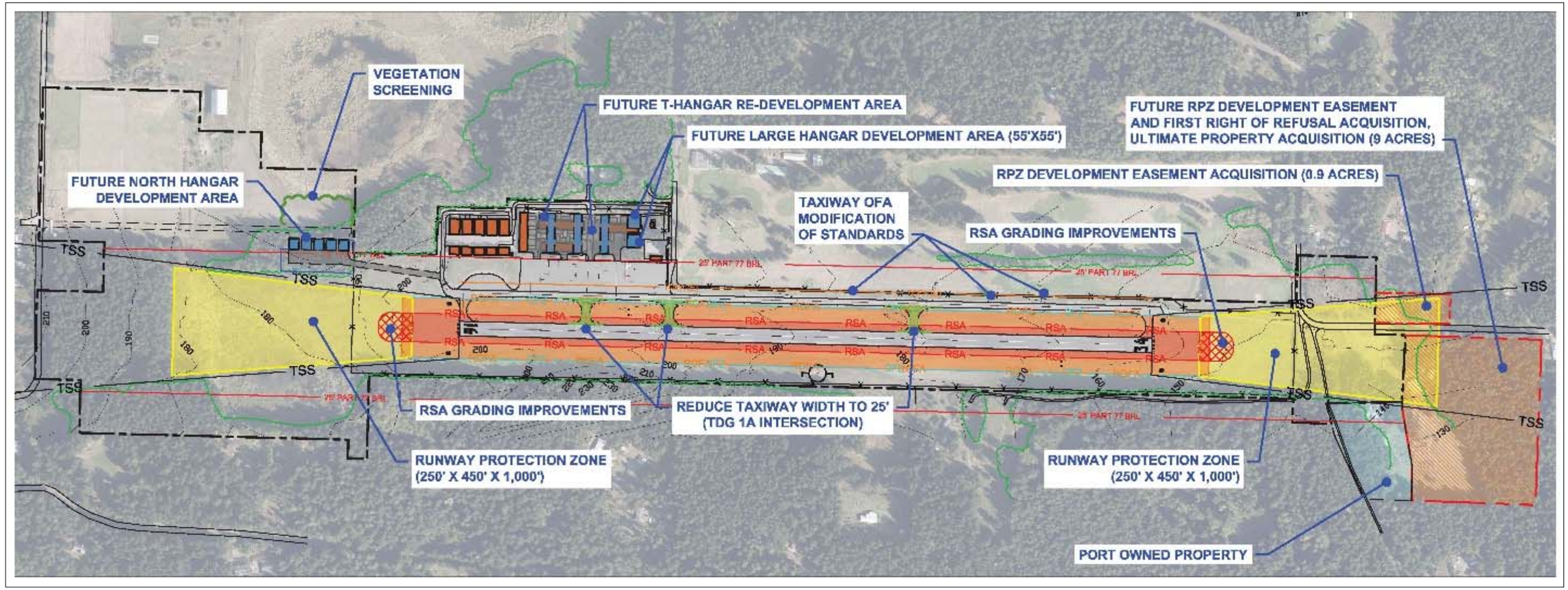
The recommended development plan, presented in Exhibit 5-5, is intended to provide the conceptual future airport development as selected by the Port of Lopez, after careful consideration of the available options. This plan will be confirmed and presented in the next chapter to represent the ultimate airport configuration.

Selected Airside Development. The recommended airside development at Lopez Island Airport involves the extension of the RSAs at both runway ends in accordance with RDC B-I-VIS (Small Aircraft) dimensional standards. On-airport trees that are within the runway threshold siting surfaces will continue to be removed, and easements will be pursued for purchase that allows the Port to remove off-airport trees where existing easements do not currently exist. Additionally, as stated previously, it is recommended that an RPZ development easement be purchased for the property within the Runway 34 RPZ area extending beyond the current airport property boundary and west of Shark Reef Road. A first right of refusal agreement would be included in the easement purchase giving the Port the first opportunity to purchase the property when it becomes available. This will provide the Port the ability to control land uses within the RPZ in the short-term and ultimately to have ownership of the property. The property east of Shark Reef Road within the RPZ is recommended for RPZ development easement purchase only; no first right of refusal is included.

The Port will pursue a MOS from the FAA that applies taxilane clearance standards to the parallel taxiway and limits taxiing speeds to 10 miles per hour or less. As a pathway to eventual compliance for the taxiway object free area, a property boundary survey would be needed to determine if property acquisition is required. Given FAA funding options available to the Port of Lopez at this time, when major pavement reconstruction is required, the taxiway connector widths will be reduced from 30 feet to 25 feet. Additionally, the Port will pursue the implementation of a weather reporting system, but the location and system type will be determined as more detailed information is gathered and analysis is conducted at the time of project design.

Selected Landside Development. The recommended landside development for Lopez Island Airport involves the planned development of hangars within the north hangar area, designed to meet ADG I Taxilane OFA design standards and remove the apron to runway direct access. The south hangar area will be re-developed when age and condition of the existing hangars warrant, as recommend previously.

Exhibit 5-5. Conceptual Development Plan



Conceptual Development Plan Projects and Phasing. The airside and landside projects associated with the recommended development plan, and their proposed implementation timeframe are presented in the Table 5-1. The likely phasing of many of the projects will be demand driven; therefore, the estimated development order of the projects might change as needs are re-analyzed and priorities re-established throughout the planning period.

Table 5-1. Summary of Conceptual Development Plan Projects

Project	1-5 Years	6-10 Years	11-20 Years
Conduct Environmental Assessment (EA) for RSA extensions at both runway ends, continued removal or trimming of on- and off-airport trees within the approach areas to both runway ends, and the purchase of property within the Runway 34 RPZ.	**X**		
Extend RSA at both runway ends	X		
Continued removal or trimming of on- and off-airport trees within approach areas to both runway ends	X	X	
Purchase Runway 34 RPZ development easement and first right of refusal for property south of the airport and west of Shark Reef Road.	X		
Conduct benefit-cost analysis and site selection study for weather reporting station.		X	
Conduct EA for weather reporting station.		X	
Install weather reporting station.		X	
Re-develop south hangar development area (when age and condition warrants).			X
Conduct Cat Ex or EA for construction of north hangar development area.			X
Construct taxilane and hangars in north hangar development area (when demand dictates).			X

Environmental Review of Airside and Landside Development Alternatives

The following will provide a screening of the environmental conditions presented in the Inventory chapter. This evaluation does not address all environmental resource categories that would need to be addressed during a National Environmental Policy Act (NEPA) evaluation, nor is the evaluation intended to support a threshold determination as defined in FAA Order 5050.4B National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions and 1050.1F Environmental Impacts: Policies and Procedures.

A NEPA analysis is usually limited to a three- to five-year timeframe. However, because each recommended project provided in the preceding table is needed to fulfill the long-term development needs of the airport, and will require NEPA analysis, this section addresses all projects and presents the potential environmental impacts. The projects can either be environmentally analyzed singularly for those having independent utility or combined for those

that have connected actions or have independent utility but are linked together by time or funding means.

Air Quality. The airport is located within an area designated as being "in attainment" for all criteria pollutants under the NAAQS. The proposals presented as a part of the recommended development plan are not anticipated to result in substantively different assessments related to Air Quality.

Noise. As presented in the Inventory chapter, the existing and future levels of aircraft operations at the airport do not warrant a full noise modeling effort for this Master Plan Update.

Compatible Land Use. The compatibility of existing and planned land uses in the vicinity of an airport is usually determined in relation to the level of aircraft generated noise. Since the existing and future aircraft operations do not warrant a full noise modeling effort for this Master Plan Update, it can be assumed that land use compatibility associated with aircraft noise will not be an issue.

According to Title 18, Unified Development Code of the San Juan County Code, land use designations are applied as established by the 1998 San Juan County Comprehensive Plan. Four principal land use classes for the County are established (i.e., growth areas, activity centers, rural lands, and resource lands), with each class permitting a different level of activity. Individual land use categories within the classes are referred to as designations. As presented in the Inventory chapter, the land use designations within the properties surrounding the airport are rural in nature (i.e., designated Rural General, Rural Farm Forest, and Rural Industrial), which are intended to maintain and enhance the rural character of Lopez Island. The existing and future land use designations are compatible with normal airport operations. The proposals contained in the recommended development plan will not change the fundamental nature of the airport nor will there be an overall increase in the size or numbers of aircraft currently operating at the airport. Therefore, the proposals are not expected to have a detrimental effect on surrounding land uses. The recommended property acquisition within the Runway 34 RPZ and the ultimate acquisition of the private residence is proposed to improve the compatibility of land uses surrounding the airport.

Historical, Architectural, Archaeological, Tribal, and Cultural Resources. As provided in the Inventory chapter, according to the Washington Department of Archaeological and Historic Preservation (DAHP) Washington Information System for Architectural and Archaeological Records Data (WISAARD), the nearest known historically significant resource, the Wilson-Kring Farm's Barn, is located approximately 1-3/4 mile southeast of the airport. The WISAARD data also indicates that airport property is designated as either high risk or very high risk of containing archaeological resources. Based on this analysis, it is not anticipated that any aboveground historic, architectural, tribal, or cultural resources will be affected by any proposals presented in the recommended development plan. However, it is advised that a cultural resources survey be conducted that analyzes the potential archaeological, tribal, or cultural resources and Section 106 of the National Historic Preservation Act (NHPA) and Government to Government

consultation be completed prior to the earthwork conducted for the extension of the RSAs at both runway ends.

Section 4(f) Property. As presented in the Inventory chapter, the nearest publicly-owned land from a park, recreation area, or wildlife and waterfowl refuge of national, state, or local significance is located approximately 1.5 miles south of the airport, so there are no anticipated impacts to Section 4(f) properties resulting from any proposals contained in the recommended development plan.

Threatened and Endangered Species. As provided in the Inventory chapter, according to the USFWS's Information for Planning and Conservation (IPAC) website, no candidate, threatened, or endangered species are likely to be present on the airport, nor is any critical habitat found within the airport property. Migratory birds are known to occur in the area of the airport, but these species are not currently listed as federally threatened or endangered. Further removal of trees in the approach areas to the runway ends will require FAA consultation with both the USFWS and the Washington Department of Fish and Wildlife (WDFW), with supporting documentation of either a Biological Evaluation or a Biological Assessment, for the presence or absence of the federally listed species or their habitat.

Two threatened fish species are known to occur in San Juan County, the Bull Trout *(Salvelinus confluentus*) and the Dolly Varden (*Salvelinus malma*). Even though these species and their habitat are unlikely to be present on the airport, increased turbidity and pollutants could occur downstream of airport property from the increased impervious surfaces associated with the long-term hangar and apron development in the north hangar development area. It is recommended that a storm water runoff analysis be included in the design of all increased impervious surface projects that includes the provision of facilities such as check basins to slow surface water runoff velocity and provide adequate silt removal before leaving airport property and entering downstream waters.

The Rough Skinned Newt (*Taricha granulosa*) is a species not included in either federal or state threatened, endangered, or candidate species lists. However, it could be in danger of extirpation on Lopez Island and its presence on airport property should be assessed prior to the initiation of any projects.

Water Quality. As presented in the Inventory chapter, according to the EPA website NEPAssist, there are no impaired streams, impaired waterbodies, or wild or scenic rivers near the airport, nor will any streams, waterbodies, or wild or scenic rivers be affected by the proposed airport development. Therefore, it is not anticipated that any proposals contained in the recommended development plan will have adverse effect on water quality.

Wetlands. As provided in the Inventory chapter, according to the EPA website NEPAssist, there are four NWI identified wetland areas located on airport property. However, it is not anticipated that wetlands will be affected by any of the proposals contained in the recommended development plan, with the possible exception of the recommended north hangar development

that is located within approximately 200 feet of the NWI identified wetland area. It is suggested that a qualified wetland biologist classify and delineate the exact extents of the wetland prior to any development within this north hangar area to confirm the presence or absence of jurisdictional wetlands, determine the potential wetland impacts associated with the identified projects, and propose mitigation measures required, if any.

Farmland. As provided in the Inventory chapter, according to the USDA Natural Resources Conservation Service Web Soil Survey, the majority of soils on the airport are classified as prime farmland, or prime if drained and/or irrigated. However, no proposals presented in the recommended development plan would remove land from agricultural production, so no impacts to farmlands are anticipated.

Floodplains. As contained in the Inventory chapter, there are no floodplains or floodways on or in the vicinity of the airport. Therefore, no proposals contained in the recommended development plan would affect these resources.

Critical Areas. Existing baseline conditions for the five GMA-mandated critical areas were provided in the Inventory chapter. No geologically hazardous areas, floodplains or floodways, or fish and wildlife habitat conservation areas will be affected by the recommended airport development. All of San Juan County is designated a Critical Aquifer Recharge Area by the San Juan County Unified Development Code. It is anticipated that the proposals contained in the recommended development plan will be designed in accordance with all local, state, and federal development guidelines and statutes regarding the protection of aquifers, and that best management practices will be implemented during construction that will follow and be consistent with the same guidelines and statutes. As identified previously, there is an existing NWI identified wetland within approximately 200 feet of the recommended north hangar development area, for which it is suggested that a qualified wetland biologist classify and delineate the exact extents of the wetland prior to any development to confirm the presence or absence of jurisdictional wetlands, determine the potential impacts associated with the identified projects, and propose mitigation measures required, if any.

Aquatic Invasive Species. The Washington Department of Fish and Wildlife lists many salamanders and newts as possible invasive species. Prior to project implementation at the airport, an environmental review of the potential impacts from invasive species will be conducted and best management practices will be included in project details and specifications.

Table 5-2 provides a listing of the proposed projects associated with the recommended development plan, the baseline environmental conditions, any potential environmental impacts, and the anticipated environmental studies required.

Table 5-2. Summary of Potential Environmental Impacts of Proposed Projects

Proposed Project/ Environmental Conditions	Baseline Condition	Potential Impacts	Likely Environmental Studies
RSA Extension			
Archaeological, Tribal, Cultural Resources	Airport property designated as high/very high risk of containing archaeological resources	Historic properties	Cultural Resources Survey
Critical Aquifer Recharge Area, Water Quality, Critical Areas	Entire San Juan County designated as a Critical Aquifer Recharge Area	Groundwater contamination	Construction best management practices
Weather Reporting Station	AWOS installation decision requires additional analysis, including a benefit-cost analysis, site selection study, and required environmental review.		
Remove/Trim Trees			
Threatened and Endangered Species	No ESA-listed species or critical habitat known to occur on airport property. Migratory birds known to occur in airport vicinity. Bull Trout (*Salvelinus confluentus*) and Dolly Varden (*Salvelinus malma*) known to occur in San Juan County	None known on airport Threatened fish species potentially impacted off airport by increased turbidity and pollutants	FAA consultation with WDFW/USFWS. Biological Evaluation/ Biological Assessment. Storm water runoff analysis and adequate designs incorporated at time of design and implementation
Purchase Runway 34 RPZ Development Easement and First Right of Refusal, Ultimate Fee Simple Property Acquisition	Existing Residence to be Removed Possible Residential Relocation Assistance	None known	Construction best management practices
Compatible Land Use	Existing residence	None known	Phase I Environmental Due Diligence Audit

Table 5-2 Summary of Potential Environmental Impacts of Proposed Projects (Continued)

Proposed Project/ Environmental Conditions	Baseline Condition	Potential Impacts	Likely Environmental Studies
Construct North Hangar Area			
Wetlands, Water Quality, Critical Areas	NWI-identified wetland within approximately 200 feet of proposed development area	Wetlands	Wetland delineation
Archaeological, Tribal, Cultural Resources	Airport property designated as high/very high risk of containing archaeological resources	Historic properties	Cultural Resources Survey
Critical Aquifer Recharge Area, Water Quality, Critical Areas	Entire San Juan County designated as a Critical Aquifer Recharge Area	Groundwater contamination	Construction best management practices
Threatened and Endangered Species	No ESA-listed species or critical habitat known to occur on airport property. Migratory birds known to occur in airport vicinity. Bull Trout (*Salvelinus confluentus*) and Dolly Varden (*Salvelinus malma*) known to occur in San Juan County	None known on airport Threatened fish species potentially impacted off airport by increased turbidity and pollutants	FAA consultation with WDFW/USFWS. Biological Evaluation/ Biological Assessment. Storm water runoff analysis and adequate designs incorporated at time of design and construction

CHAPTER 6. AIRPORT PLANS

Introduction

The development plan is portrayed as a unified development scheme, representing the long-term, ultimate development of the airport. However, it is recognized that future demand for facilities cannot be accurately predicted, particularly during the latter stages of the planning period. Therefore, emphasis is placed on the initial portion of the planning period where the projections are more definable and the magnitude of the program accomplishment is more pronounced.

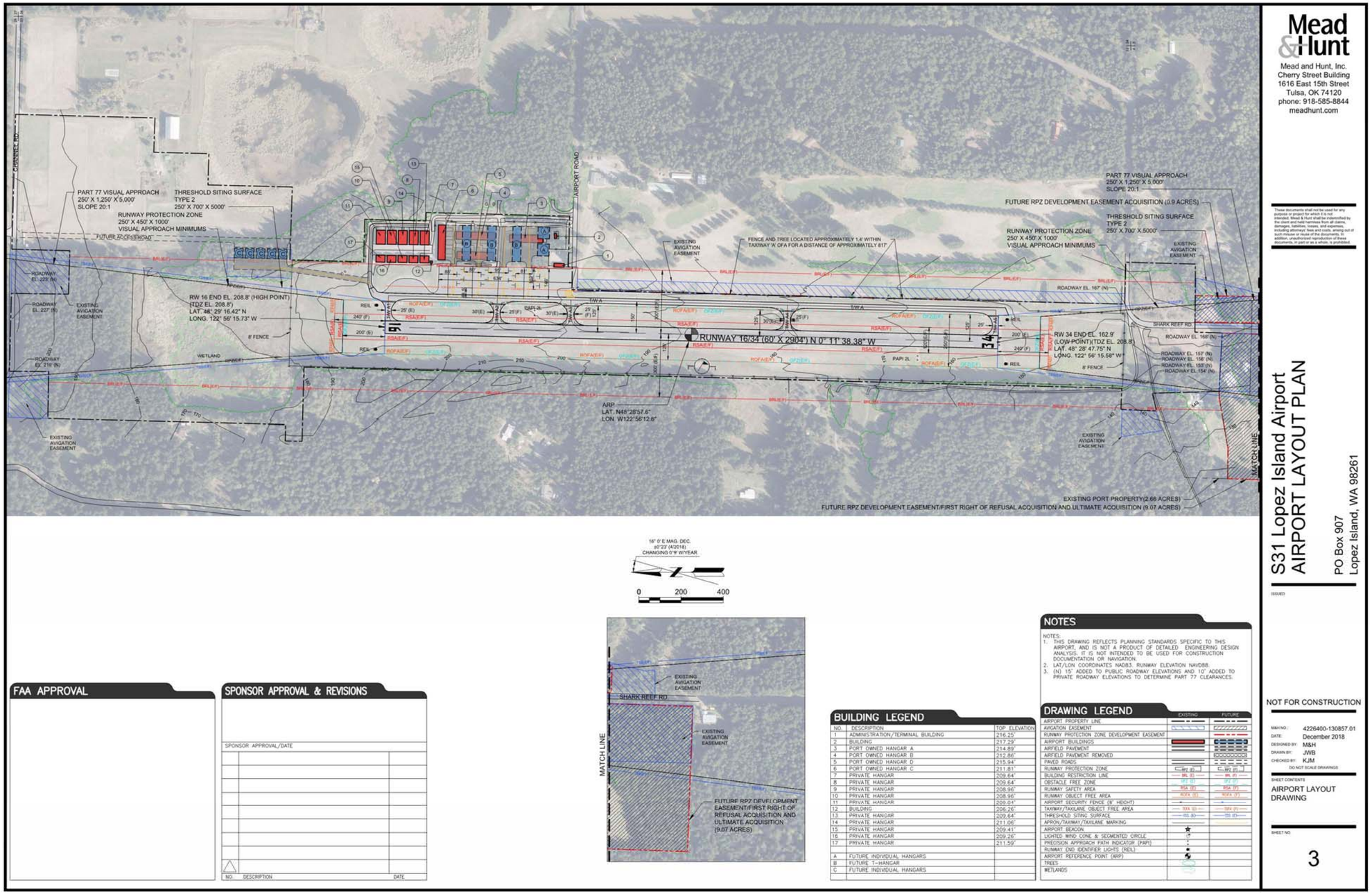
This chapter categorically reviews and presents the various individual drawings associated with the Airport Layout Plan (ALP) drawing set that graphically depicts the proposed facilities expansion and improvements necessary for the Port of Lopez to meet the aviation demand throughout the 20-year planning period.

Airport Layout Drawing

Exhibit 6-1 depicts all existing and ultimate airport facilities required to enable the airport to properly accommodate the forecast future demand. Additionally, it provides detailed information on dimensional standards that define the relationship between airport facilities and applicable FAA design criteria. The major components of the future development for Lopez Island Airport include:

- The Airport's runway configuration will remain structured around Runway 16/34 that is 2,904 feet in length and 60 feet in width.
- Runway 16/34 existing pavement strength of 12,500 pounds single wheel main landing gear configuration will be maintained.
- Runway 16/34 will be maintained to RDC B-I-VIS (Small Aircraft) dimensional standards.
- The existing visual approaches to both runway ends have been maintained. However, as stated in the previous chapter, a formal request for an Instrument Approach Procedure (IAP) has been received by FAA Flight Procedures. Flight Procedures has completed an initial analysis of the proposed procedure using existing AGIS data. Additional analysis will require further FAA studies before a final decision can be made and the IAP implemented.
- The existing RPZs will be maintained at 250 feet at the inner width, 450 feet at the outer width, and 1,000 feet in length.
- The existing MIRL, REIL, and PAPI will be retained, as will the basic runway markings.
- The standard runway and taxiway signage will be maintained. Taxiway reflectors will be retained.

Exhibit 6-1. Airport Layout Drawing



FAA APPROVAL

SPONSOR APPROVAL & REVISIONS

NO.	DESCRIPTION	DATE
	SPONSOR APPROVAL/DATE	

BUILDING LEGEND

NO.	DESCRIPTION	TOP ELEVATION
1	ADMINISTRATION/TERMINAL BUILDING	216.25'
2	BUILDING	217.29'
3	PORT OWNED HANGAR A	214.89'
4	PORT OWNED HANGAR B	212.86'
5	PORT OWNED HANGAR D	215.94'
6	PORT OWNED HANGAR C	211.81'
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16	PRIVATE HANGAR	209.26'
17	PRIVATE HANGAR	211.59'
A	FUTURE INDIVIDUAL HANGARS	
B	FUTURE T-HANGAR	
C	FUTURE INDIVIDUAL HANGARS	

NOTES

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2. LAT/LON COORDINATES NAD83. RUNWAY ELEVATION NAVD88.
3. (N) 15' ADDED TO PUBLIC ROADWAY ELEVATIONS AND 10' ADDED TO PRIVATE ROADWAY ELEVATIONS TO DETERMINE PART 77 CLEARANCES.

DRAWING LEGEND

	EXISTING	FUTURE
AIRPORT PROPERTY LINE		
AVIGATION EASEMENT		
RUNWAY PROTECTION ZONE DEVELOPMENT EASEMENT		
AIRPORT BUILDINGS		
AIRFIELD PAVEMENT		
AIRFIELD PAVEMENT REMOVED		
PAVED ROADS		
RUNWAY PROTECTION ZONE	RPZ (E)	RPZ (F)
BUILDING RESTRICTION LINE	BRL (E)	BRL (F)
OBSTACLE FREE ZONE	OFZ (E)	OFZ (F)
RUNWAY SAFETY AREA	RSA (E)	RSA (F)
RUNWAY OBJECT FREE AREA	ROFA (E)	ROFA (F)
AIRPORT SECURITY FENCE (8' HEIGHT)		
TAXIWAY/TAXILANE OBJECT FREE AREA	TOFA (E)	TOFA (F)
THRESHOLD SITING SURFACE	TSS (E)	TSS (F)
APRON/TAXIWAY/TAXILANE MARKING		
AIRPORT BEACON		
LIGHTED WIND CONE & SEGMENTED CIRCLE		
PRECISION APPROACH PATH INDICATOR (PAPI)		
RUNWAY END IDENTIFIER LIGHTS (REIL)		
AIRPORT REFERENCE POINT (ARP)		
TREES		
WETLANDS		

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S31 Lopez Island Airport
AIRPORT LAYOUT PLAN

PO Box 907
Lopez Island, WA 98261

ISSUED

NOT FOR CONSTRUCTION

M&H NO.: 4226400-130857.01
DATE: December 2018
DESIGNED BY: M&H
DRAWN BY: JWB
CHECKED BY: KJM
DO NOT SCALE DRAWINGS

SHEET CONTENTS
AIRPORT LAYOUT DRAWING

SHEET NO.
3

- As demand dictates, additional hangars will be provided in the north hangar area meeting ADG-I Taxilane OFA design standards. The south hangar development area will be re-developed as age and condition of the existing hangars dictates the need for replacement.

Airport Airspace Drawing

The Airport Airspace Drawing is based on Federal Aviation Regulations (FAR) Part 77, *Objects Affecting Navigable Airspace*. To protect an airport's airspace and approaches from hazards that could affect the safe and efficient operation of aircraft, federal criteria contained in FAR Part 77 have been established to provide guidance in controlling the height of objects near the airport. FAR Part 77 criteria specify a set of imaginary surfaces that, when penetrated, designates an object as being an obstruction. However, some obstructions can be determined to be non-hazardous by an aeronautical study because of their location and/or being marked and lighted as specified in the aeronautical study determination.

Exhibits 6-2 and 6-3 provide plan and profile views depicting the FAR Part 77 criteria as it specifically relates to Lopez Island Airport. FAR Part 77 criteria are based on the ultimate runway configuration and length, the ultimate approach visibility minimums, and the ultimate airport elevation. Therefore, the criteria for Lopez Island Airport are based on utility aircraft category (i.e., runway designed for aircraft weighing less than 12,500 pounds, gross weight) with visual approaches maintained at both runway ends. As stated previously, a formal request for an Instrument Approach Procedure (IAP) has been received by FAA Flight Procedures, which has completed an initial analysis of the proposed procedure using existing AGIS data. Additional analysis will require further FAA studies before a final decision can be made and the IAP implemented.

Five imaginary surfaces are specified by FAR Part 77 criteria, which are detailed below.

- Primary Surface. A longitudinal surface centered on the runway extending 200 feet beyond each runway end. The elevation of any point of that surface is equal to the elevation of the nearest point on the runway centerline. For Lopez Island Airport, the primary surface is 500 feet wide.

- Transitional Surface. Surfaces that extend upward and outward at right angles to the runway centerline, and the extended runway centerline, at the edges of the primary surface, having a slope of 7:1. Transitional surfaces end where they intersect the horizontal surface.

- Horizontal Surface. A horizontal plane established at an elevation of 150 feet above the airport elevation. Lopez Island Airport has an established elevation of 208.8 feet MSL (above Mean Sea Level) so the horizontal surface is 358.8 feet MSL. The perimeter of the surface is determined by arcs extending from the center of each end of the primary surface and connected the arcs with tangent lines. At Lopez Island Airport, the radii of the arcs are 5,000 feet.

Exhibit 6-2. Airport Airspace Drawing Plan View

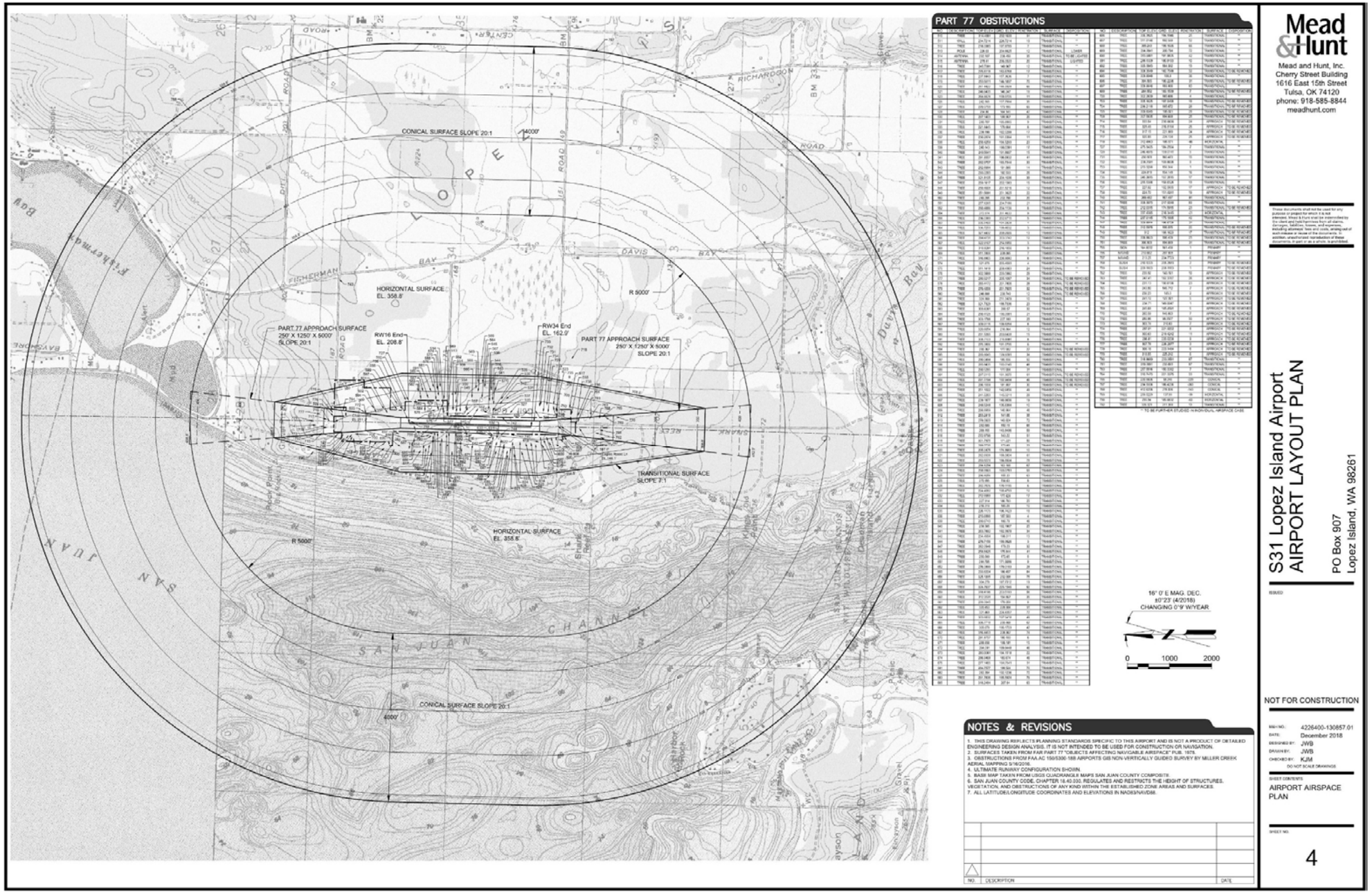
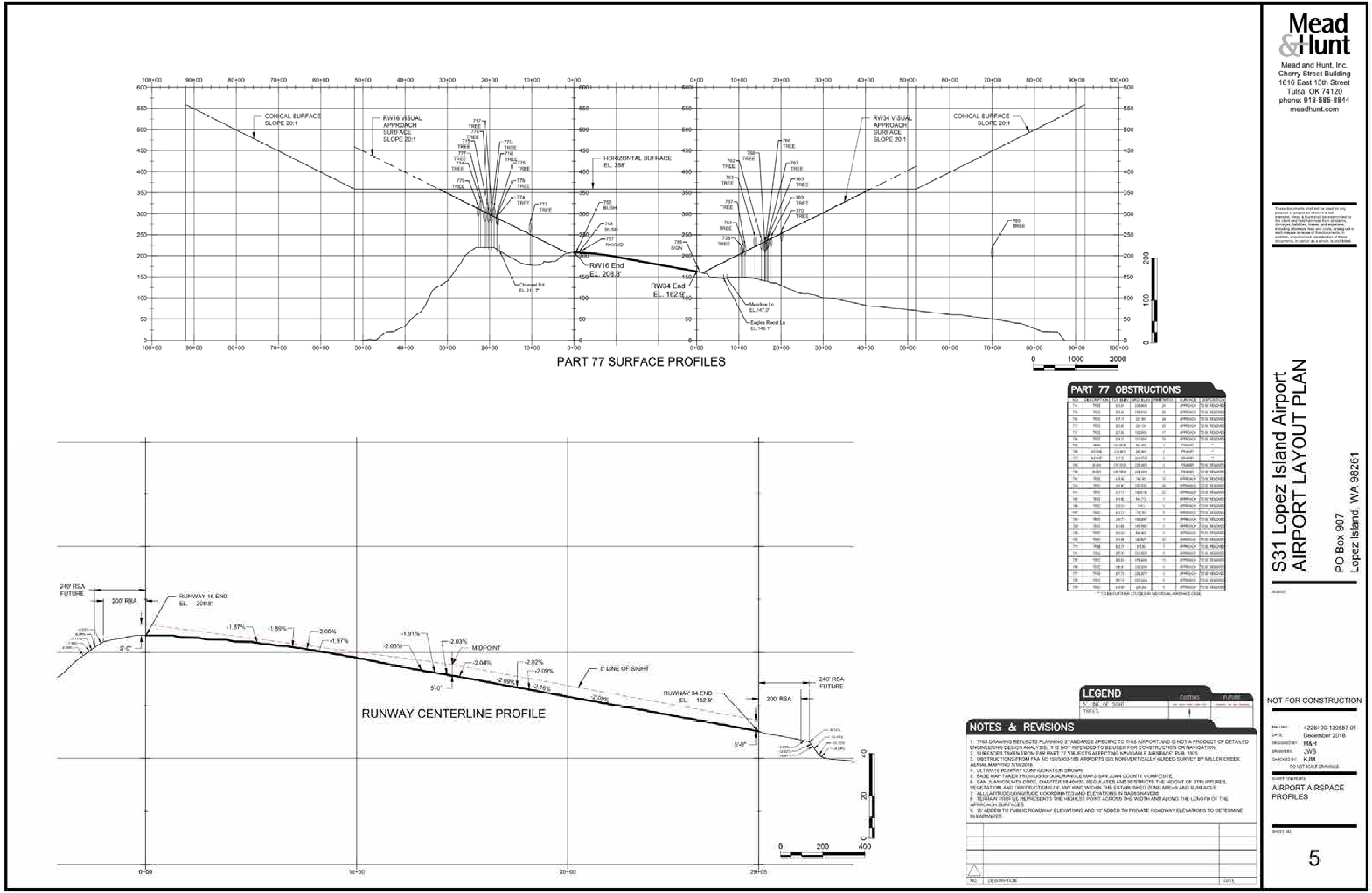


Exhibit 6-3. Airport Airspace Drawing Profile View



- Conical Surface. This surface extends upward and outward from the horizontal surface at a slope of 20:1 for a horizontal distance of 4,000 feet. At Lopez Island Airport, the top elevation of the conical surface is 558.8 feet.

- Approach Surface. A surface longitudinally centered on the extended runway centerline, extended outward and upward form each end of the primary surface. The inner edges are the same width as the primary surface. The horizontal distances, slopes, and outer edge widths are based on the visibility minimums of each runway. For Lopez Island Airport, the horizontal distances are 5,000 feet and the slopes are 20:1. The outer edge width associated with Runway 16 is 2,000 feet; the outer edge width associated with Runway 34 is 1,250 feet.

Inner Portion of the Approach Surface Drawing

Exhibit 6-4 presents a more detailed view of the inner portions of the FAR Part 77 imaginary approach surfaces at each runway end. The drawing provides large-scale plan and profile delineation of the approach surface to a distance where the surface reaches 100 feet above the runway end elevation. It is intended to facilitate identification of roadways, utility lines, structures, and other possible obstructions that may exist within the confines of, or near, the approach surface area near the runway thresholds.

Terminal Area Plan

Exhibit 6-5 provides a detailed drawing of the hangar and apron development areas of the airport. It is intended to provide dimensional data for apron sizes, layout of aircraft parking spaces, and clearance distances between runway, taxiway, and taxilane centerlines with hangars, buildings, aircraft parking, and other objects.

Airport Land Use Plan

Exhibit 6-6 depicts existing and recommended use of all land within the ultimate airport property line and near the airport. The purpose of the on-airport land use designations is to provide the Port of Lopez with a guide for leasing potential revenue-producing areas on the airport. All existing and future development will be compatible with the primary purpose and function of the airport and will generate lease revenue to support the operation of the airport. The off-airport land use designations provide guidance to local authorities for establishing appropriate land use zoning near the airport. FAA Grant Assurance #21, entitled *Compatible Land Use*, states, “The Airport Sponsor will take appropriate action, to the extent reasonable including the adoption of zoning laws, to restrict the use of land adjacent to or in the immediate vicinity of the airport to activities and purposes compatible with normal airport operations, including landing and takeoff of aircraft.”

Airport Property Map

Exhibit 6-7 indicates how various parcels of land within the airport property line were acquired (e.g., federal funds, surplus property, local funds, etc.) and the dates of acquisition. The purpose of the drawing is to provide documentation of the current and future aeronautical use of land acquired with federal funds and to identify parcels recommended for future property or easement acquisition, or release. According to the existing property records, there are a total of 88.82 acres of fee simple property owned by the Port of Lopez designated as airport property, with an ultimate 97.89 acres of fee simple property proposed for ownership.

Exhibit 6-4. Inner Portion of the Approach Surface Drawing

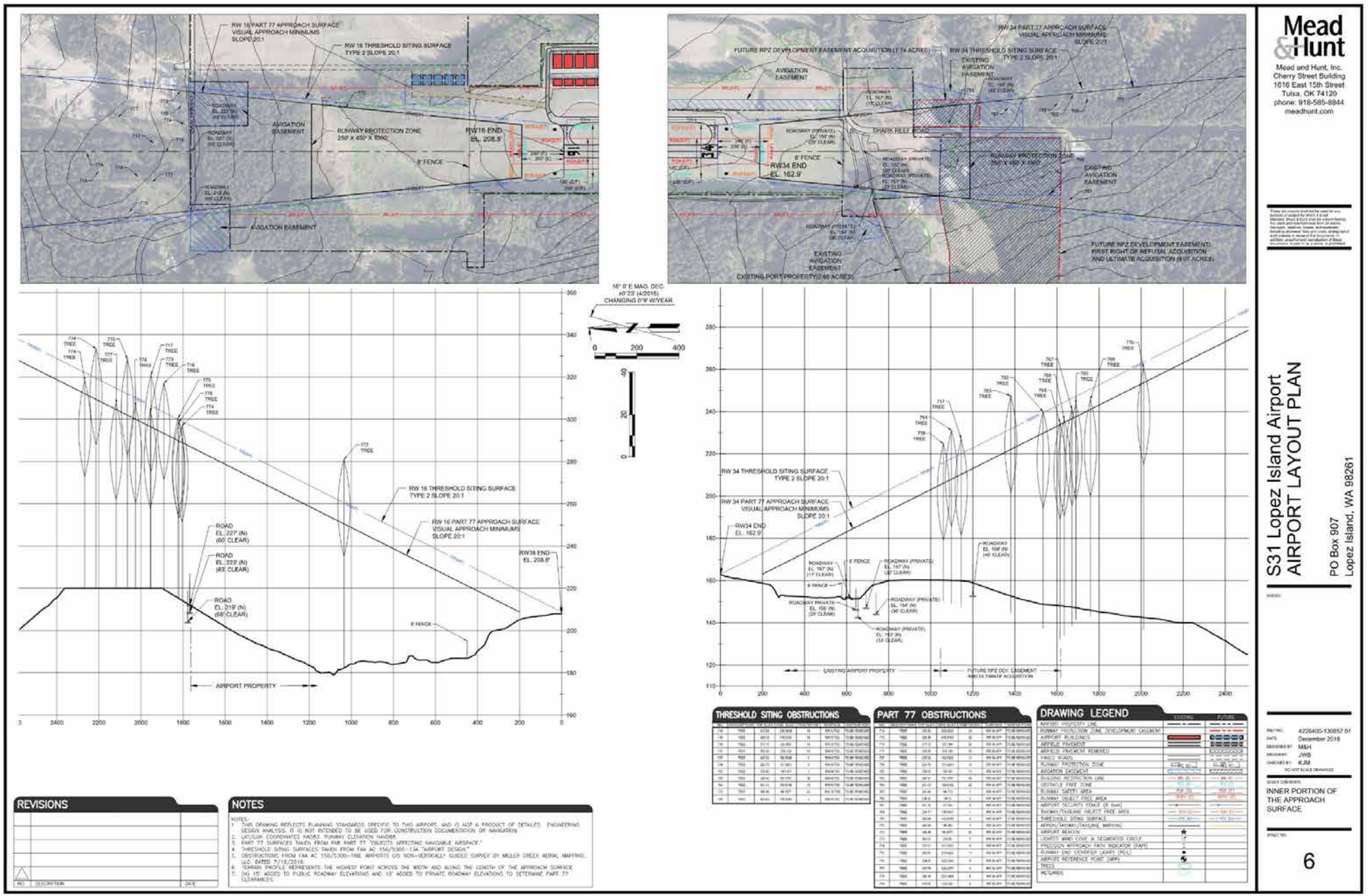
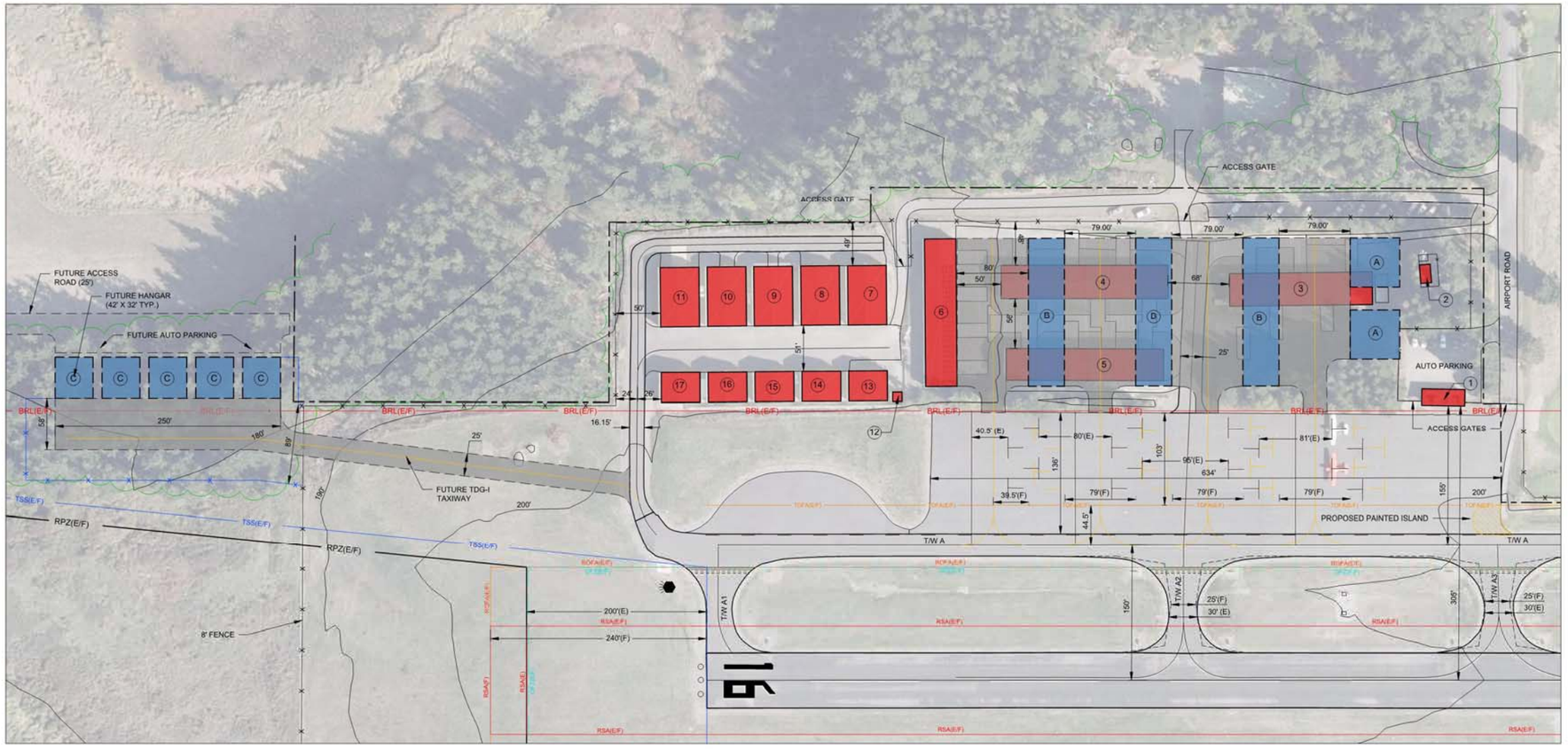


Exhibit 6-5. Terminal Area Plan



16° 0' E MAG. DEC.
±0°23' (4/2018)
CHANGING 0°9' W/YEAR

0 60 120

NOTES

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REVISIONS

NO.	DESCRIPTION	DATE

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NO.	DESCRIPTION	TOP ELEVATION
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4	PORT OWNED HANGAR B	212.86'
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DRAWING LEGEND

	EXISTING	FUTURE
AIRPORT PROPERTY LINE		
AVIGATION EASEMENT		
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AIRPORT BUILDINGS		
AIRFIELD PAVEMENT		
AIRFIELD PAVEMENT REMOVED		
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RUNWAY OBJECT FREE AREA	ROFA (E)	ROFA (F)
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LIGHTED WIND CONE & SEGMENTED CIRCLE		
PRECISION APPROACH PATH INDICATOR (PAPI)		
RUNWAY END IDENTIFIER LIGHTS (REIL)		
AIRPORT REFERENCE POINT (ARP)		
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S31 Lopez Island Airport
AIRPORT LAYOUT PLAN

PO Box 907
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ISSUED

NOT FOR CONSTRUCTION

M&H NO:	4226400-130857.01
DATE:	December 2018
DESIGNED BY:	M&H
DRAWN BY:	JWB
CHECKED BY:	KJM

DO NOT SCALE DRAWINGS

SHEET CONTENTS:
TERMINAL AREA PLAN

SHEET NO:
7

Exhibit 6-6. Land Use Plan

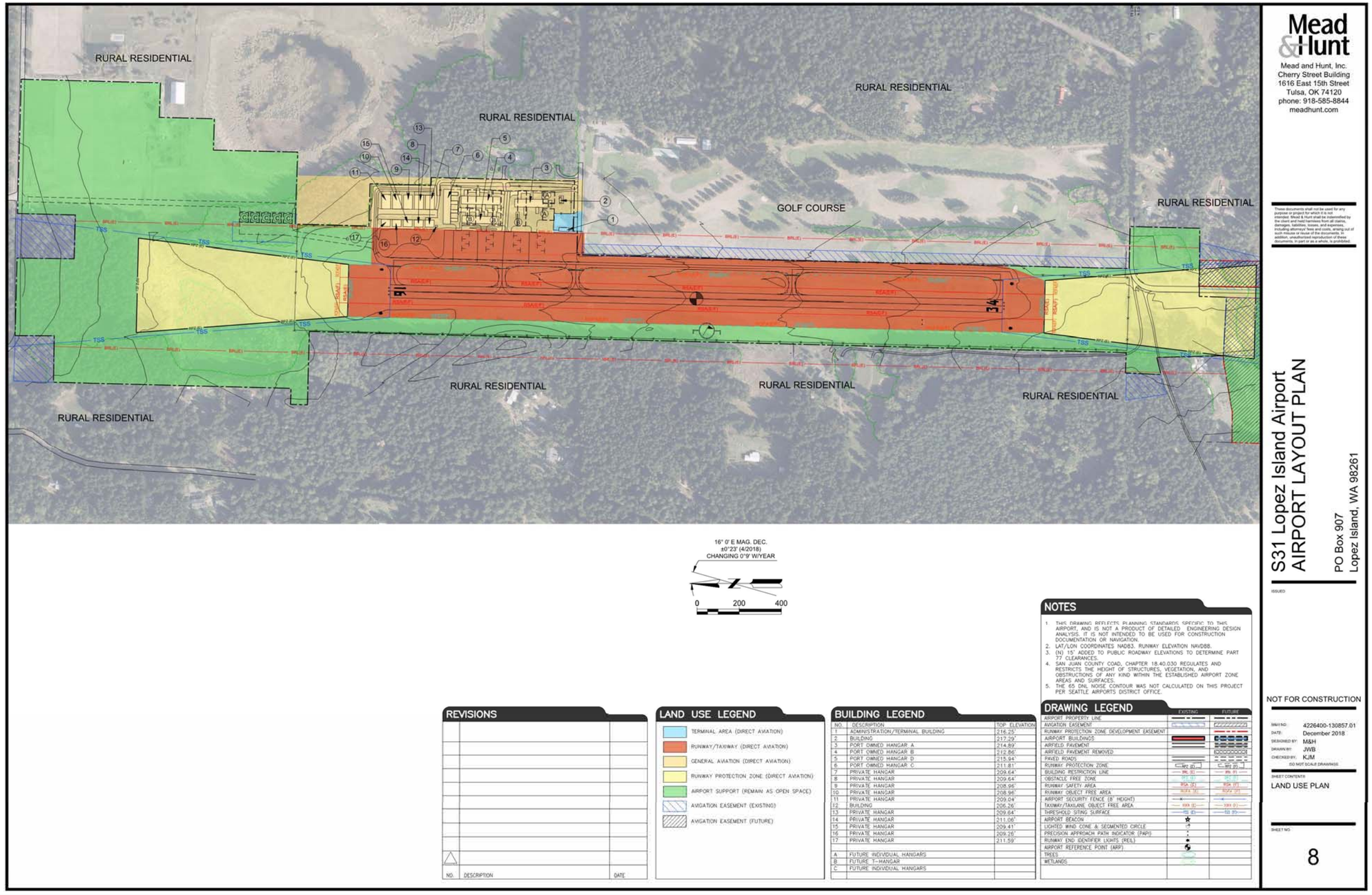
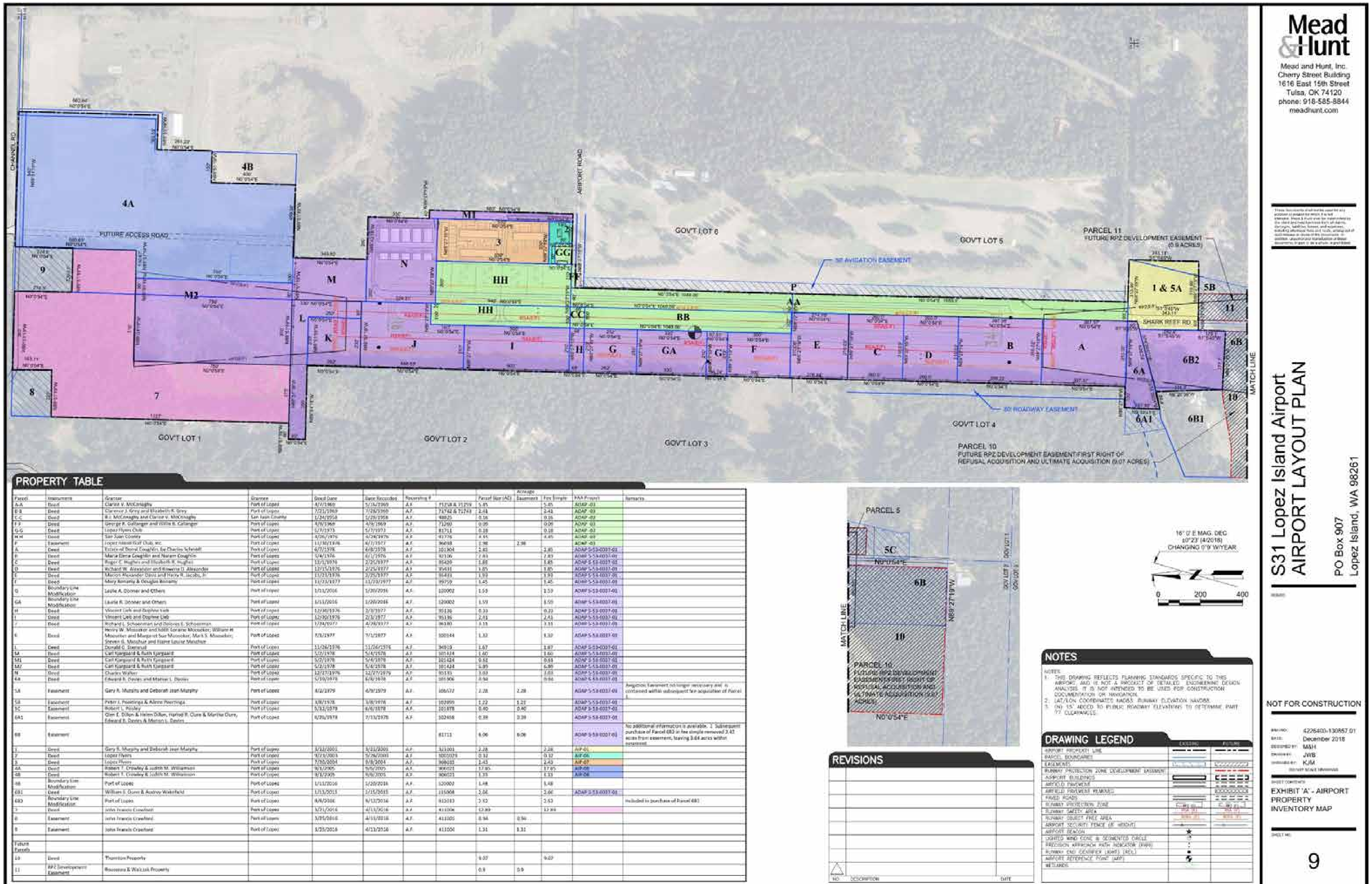


Exhibit 6-7. Airport Property Map



CHAPTER 7. FACILITIES IMPLEMENTATION PLAN

Introduction

The facilities implementation plan is intended to establish a strategy for funding the necessary airport improvements, maximize the potential to receive federal and state grants, assess the financial feasibility of the proposed airport improvements, and assist in establishing economic viability. This programming effort is a critical component of the Master Plan Update for the Federal Aviation Administration (FAA), Washington State Department of Transportation (WSDOT) Aviation, and the Port of Lopez. From the FAA and WSDOT Aviation's perspective, the detailed listing of projects and costs is critical for their use in establishing priorities and budgeting expenditures at the airport. From the Port's perspective, the improvement needs are identified, and budgeting and financial decisions can be made with a comprehensive understanding of financial implications.

The future demand for airport facilities is difficult to accurately predict during the latter stages of the 20-year planning period. Therefore, emphasis is placed on the initial portion of the planning period – the first five years. In this time period, projections are more definable, and the magnitude of program accomplishment is more pronounced.

When the scope of work was originally prepared for this Master Plan Update, an evaluation of implementing an Instrument Approach Procedure (IAP) to the airport was not included as it was considered not necessary. However, while preparing the plan, a formal request for an IAP was submitted to FAA Flight Procedures. Due to recent changes in emergency medical procedures on Lopez Island, the airport has become a vital link for emergency off island transport, resulting in more medical evacuation flights recently. An IAP would increase the amount of time these flights can occur at the airport during adverse weather conditions. Additionally, the installation of the Automated Weather Observing Station (AWOS) is also considered an integral, complementary component of the IAP.

The Port now considers the IAP and AWOS a vital component of its mission for serving the citizens of Lopez Island. Using data gathered during the Master Plan Update, the Port has begun clearing trees on airport property in preparation for the IAP. However, additional study is required to fully implement the procedure and locate the AWOS on airport property. Therefore, the following tables include two short-term projects that will enable the Port to program for the implementation of these important pieces of future airport development. The projects are an Airport Layout Plan (ALP) Update with Narrative Report and an Environmental Assessment (EA). A Benefit Cost Analysis will also be required if an AWOS III or greater is desired for installation. This project is also identified in the following tables.

Projects List, Cost Estimates, and Funding Sources

A list of capital improvement projects needed to fulfill the airport development needs has been assembled and presented in Tables 7-1, 7-2, and 7-3. The list is a result of the facility requirements analysis and the selected conceptual development plan, coupled with the existing

Capital Improvement Program (CIP). The project list is divided into three phases: short-term (1-5 years), intermediate-term (6-10 years) and long-term (11-20 years). The short-term projects are listed in priority order by year; the intermediate- and long-term projects are listed in priority order without year designators.

Individual project costs have been prepared using unit prices extended by the size of the project and tempered with specific considerations related to the region, the airport, and the individual development sites. The estimates are intended for planning purposes only and should not be taken as construction costs estimates, which can only be provided following the preparation of engineering plans and specification. The cost estimates are based on 2018 costs with no escalation made based on inflationary factors for future year estimates.

The costs have been categorized by the total project cost, that part anticipated to be funded from the FAA, the amount potentially funded by WSDOT Aviation, that amount anticipated to be borne locally by the Port of Lopez, and that amount anticipated to be funded through private entities (i.e., individual tenants, business enterprises, or other private third-party sources). However, in some cases justified by projected revenue streams, the anticipated privately-funded projects might be financed by revenue bonds or special tax assessments. Additionally, other local funding sources can include state or local economic development funds, regional commissions and organizations, or other governmental units.

Capital Improvement Program

To assist in the preparation of the WSDOT Aviation and FAA's efforts to provide grant funding to the most needed projects, the Port of Lopez keeps an up-to-date State Capital Improvement Program (SCIP) on file with WSDOT Aviation. The purpose is to provide reasonable projections of capital needs, which can then be used in fiscal programming to test for financial feasibility. To assist the Port of Lopez with its preparation of the SCIP, the first phase of the projects list and cost estimates have been organized in a format similar to that used by WSDOT Aviation.

Table 7-1. Phase I (1-5 Years) Development Plan Project Costs

	Project Description	Total Cost[1]	Federal[2]	State	Local/ Private[3]
2019 Projects					
A.1	Conduct ALP Update with Narrative Report for Evaluation of Instrument Approach Procedure (IAP) and AWOS Installation	$180,000	$162,000	$9,000	$9,000
A.2	Purchase Runway 34 RPZ Development Easements and First Right of Refusal	$5,000	$4,500	$250	$250
	Sub-Total 2019 Total	**$185,000**	**$166,500**	**$9,250**	**$9,250**
2020 Projects					
A.3	Conduct Benefit Cost Analysis if AWOS III is Desired	$20,000	$18,000	$1,000	$1,000
A.4	Conduct EA for RSA Extensions, AWOS Installation, IAP Implementation, and Ultimate Land Acquisition Within Runway 34 RPZ West of Shark Reef Road	$285,000	$256,500	$14,250	$14,250
	Sub-Total 2020 Total	**$305,000**	**$274,500**	**$15,250**	**$15,250**
2021 Projects					
A.5	Continued Removal/Trimming of Trees Within Existing Visual Approach Areas to Runway Ends	$18,000			$18,000
	Sub-Total 2021 Total	**$18,000**			**$18,000**
2022 Projects					
A.6	Design RSA Extensions, AWOS Installation, and Instrument Approach	$275,000	$247,500	$13,750	$13,750
	Sub-Total 2022 Total	**$275,000**	**$247,500**	**$13,750**	**$13,750**
2023 Projects					
A.7	Construct RSA Extensions, Install AWOS, and Implement IAP (Including Remarking Pavement, Possible Land or Easement Acquisition, and Tree Removal)	$865,000	$778,500	$43,250	$43,250
	Sub-Total 2023 Total	**$865,000**	**$778,500**	**$43,250**	**$43,250**
Total Phase I (2019-2023)		**$1,648,000**	**$1,467,000**	**$81,500**	**$99,500**

Notes: [1]Cost estimates based on 2018 data, are intended for planning purposes only, and do not reflect a detailed engineering evaluation.
[2]Eligible for FAA AIP, Non-Primary Entitlement (NPE) and Discretionary grants.
[3]Local match requirements from current revenues, cash reserves, bonds, and other sources. Can include private monies, funding from revenue bond, or special tax assessments.

Table 7-2. Phase II (6-10 Years) Development Plan Project Costs

	Project Description	Total Cost[1]	Federal[2]	State	Local/ Private[3]
B.1	Fee Simple Land Acquisition of Property Within Runway 34 RPZ West of Shark Reef Road	$480,000	$432,000	$24,000	$24,000
B.2	Property Development (Residential Structure Removal, Tree Removal, and Storm Water Facilities)	$100,000	$90,000	$5,000	$5,000
B.3	Preparation of Modification of Standards for the Taxiway A Object Free Area Deficiency	$20,000	$18,000	$1,000	$1,000
B.4	Restripe Apron and All Airport Pavement Markings	$20,000	$18,000	$1,000	$1,000
B.5	Runway and Taxiway Slurry/Crack Sealing	$90,000	$81,000	$4,500	$4,500
Total Phase II (2024-2028)		**$710,000**	**$639,000**	**$35,500**	**$35,500**

Notes: [1]Cost estimates based on 2018 data, are intended for planning purposes only, and do not reflect a detailed engineering evaluation.
[2]Eligible for FAA AIP, Non-Primary Entitlement (NPE) and Discretionary grants.
[3]Local match requirements from current revenues, cash reserves, bonds, and other sources. Can include private monies, funding from revenue bond, or special tax assessments.

Table 7-3. Phase III (11-20 Years) Development Plan Project Costs

	Project Description	Total Cost[1]	Federal[2]	State	Local/ Private[3]
C.1	Conduct EA for North Hangar Development Area	$120,000	$108,000	$6,000	$6,000
C.2	Construct North Hangar Development Area (Private Funding)[4]	$3,244,000			$3,244,000
C.3	Construct Two Large Individual Hangars with Pavement (Private Funding)[4]	$1,364,000			$1,364,000
C.4	Remove Hangars A, B and D and Construct Three Five-Space Nested T-hangars with Taxilanes (Private Funding)[4]	$2,046,000			$2,046,000
Total Phase III (2029-2038)		**$6,774,000**	**$108,000**	**$6,000**	**$6,660,000**
GRAND TOTAL		**$9,132,000**	**$2,214,000**	**$123,000**	**$6,795,000**

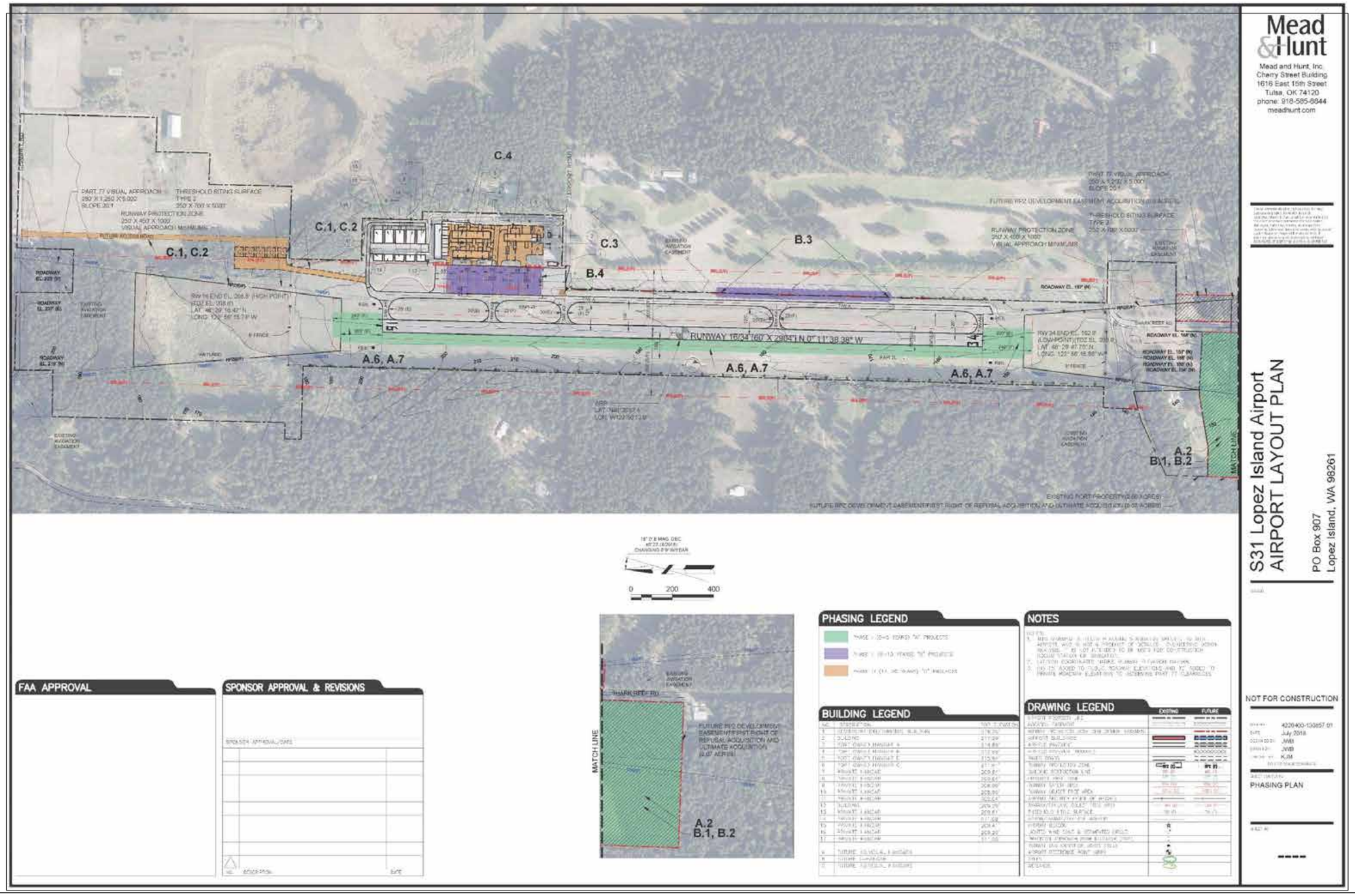
Notes: [1]Cost estimates based on 2018 data, are intended for planning purposes only, and do not reflect a detailed engineering evaluation.
[2]Eligible for FAA AIP, Non-Primary Entitlement (NPE) and Discretionary grants.
[3]Local match requirements from current revenues, cash reserves, bonds, and other sources. Can include private monies, funding from revenue bond, or special tax assessments.
[4]Anticipated to be spread over multiple years.

Phasing Plan

The proposed improvement projects for each phase are illustrated graphically in Exhibit 7-1. The proposed scheduling of the projects is merely a suggestion and variance from the them will almost certainly be necessary, especially during the later phases. The demand for certain facilities and the economic reality of their development are prime factors influencing the timing of individual project implementation. Care must be taken to provide for adequate lead time for detailed planning and construction of facilities to meet the aviation demand. It is also important to minimize disruptive scheduling where a portion of the facility may become inoperative due to construction, and to prevent extra cost resulting from improper project scheduling. It is

anticipated the project phasing will invariably be altered as local, state, and federal priorities evolve in the future.

Exhibit 7-1. Phasing Plan



Financial Plan Strategy

As presented in the preceding tables, the project cost estimates total approximately $9,132,000 for the entire 20-year period, which is an average annual amount of $456,600. The anticipated FAA total share is some $2,214,000, an average annual amount of $110,700. An estimated $123,000 is eligible for WSDOT Aviation funding, which equals an average amount of $6,150 annually. Local expenditures are approximated at $6,795,500, with an average annual amount equaling $339,750.

Of the total project costs, approximately $1,648,000 is projected to be spent during the first five years, $710,000 during the second five years, and $6,774,000 during the last ten years. The FAA share of expenditures is anticipated to be $1,467,000 during the first phase, $639,000 during the second phase, and $108,000 during the third phase. WSDOT Aviation funding by phase is anticipated at $81,500 during the first phase, $35,500 during the second phase, and $6,000 during the third phase. Local funding of the total project costs includes expenditures of $99,500 during the first phase, $35,500 during the second phase, and $6,660,000 during the third phase.

Funding sources for the development projects depend on many factors, including AIP project eligibility, the ultimate type and use of facilities to be developed, debt capacity of the Airport, the availability of other financing sources, and the priorities for scheduling project completion. For planning purposes, assumptions were made related to the funding sources of each capital improvement. For instance, some portions of projects estimated with local funding sources only may be eligible for FAA and WSDOT Aviation grants, depending on future policies at time of implementation. Additionally, those projects estimated with local funding sources only may include private third-party financing for the hangar construction portion of the project.

Sources of Capital Funding

Following is a short description of capital improvement funding sources to provide background and context when reviewing the project costs tables. In the past, the airport has utilized AIP Non-Primary Entitlement (NPE) grants, WSDOT Aviation Airport Aid Grant Program funds, and cash reserves/net revenues to fund capital improvements. It is anticipated that the airport will continue to utilize these funding sources for capital improvement projects.

Federal AIP Grants. The predominant funding source for the proposed improvement projects is anticipated to be provided by the FAA's Airport Improvement Program (AIP). FAA Order 5100.38D Airport Improvement Program Handbook, explains how the federal share is calculated in states with large amounts of publicly owned land. In the State of Washington, non-primary general aviation airports such as Lopez Island Airport are eligible to receive 90 percent of the project costs from federal funds. Under current funding conditions and guidelines, the Airport is eligible to receive $150,000 annually in NPE grants

Discretionary grant funds are also available through the AIP, which are over and above NPE funding. The approval of discretionary funding is based on a project eligibility ranking method the FAA uses to award grants, at their prerogative, based on a project's priority and importance to the national air transportation system. They are provided to airports for projects that have a

high federal priority for enhancing safety, security, and capacity of the airport, and would be difficult to fund otherwise. The dollar amounts of individual grants vary and can be significant in comparison to NPE funding.

Eligibility for FAA funding does not insure that funds will be available or granted for specific projects. Airport sponsor's must apply for FAA funding on a project by project basis. The level of FAA funding is governed by congressional appropriations to the AIP and the amount dedicated to any one airport is determined by demonstrated and documented need that is compared to the needs at other airports within the regional and national airport system.

WSDOT Aviation Airport Aid Grant Program. WSDOT Aviation provides crucial financial assistance in the preservation of public-use airports through the Airport Aid Grant Program. This program is eligible to any public-use airport included in the Washington Aviation System Plan, but the projects must be included in WSDOT Aviation's SCIP. The maximum amount awarded in a single grant is $750,000. Local sponsor's must contribute a minimum five percent match of the entire project cost. For projects receiving federal funds, WSDOT Aviation supports grants to airports for up to half their local match requirement.

Local Sources. Local sources for funding airport improvement projects primarily come from two sources, airport revenues and private third-party financing. The airport generates revenue through hangar or ground leases. At many airports, including Lopez Island Airport, generating the necessary cash flow to balance the operations and maintenance can be a difficult task, and generating money to adequately fund capital costs associated with project development is even more of a challenge. Private third-party financing is useful when the planned improvements will be primarily used by a private business or other entity. Such projects are not ordinarily eligible for federal funding. Projects of this kind typically include hangars, FBO facilities, exclusive aircraft parking aprons, fuel storage, industrial aviation use facilities, non-aviation office, commercial, or industrial developments, and various other projects. Often, airport funds for infrastructure, preliminary site work, and site access are required to facilitate privately developed projects on airport property.

Summary

The development plan and program presented in this chapter are aggressive; the monetary commitments are significant. However, it is a solid plan that represents the Airport's best opportunity for meeting its potential and obligations. The plan also represents a series of choices and alternatives for the Port of Lopez. The ultimate success of the airport does not rely upon the completion of every single capital project contained in the development plan. To meet realistic funding expectations, it may be necessary to weigh the capital projects in a thoughtful and global manner. In other words, to keep from being short-sighted in its choices, the Port of Lopez may be required to selectively implement the capital projects. Knowing the full scope of development possibilities enables the Port to capitalize on opportunities, respond to financial realities, and select development items that are in harmony with the overall development plan.

The projects represented as potentially needed are based on *forecast demand*; only those projects that are required by *actual demand* should be proposed for construction. If the actual demand

does not materialize as anticipated, some of the proposed projects will have to be revised, delayed, or potentially eliminated. The object of this Master Plan Update is to provide a flexible planning document that is useful for directing airport development that meets the future aviation demand safely, efficiently, and properly as it occurs.

It is recognized that maintenance and operating expenses will increase as the airport develops and additional facilities are completed. Airport revenues generated by the additional facilities should also increase and help defray the increased maintenance and operating expenses. It is a worthy and feasible goal that operational expenses and revenues should balance. FAA Grant Assurances indicate that an airport sponsor maintains a fee and rental structure for facilities and services that make them as self-sustaining as possible given local circumstances. This relationship must be constantly monitored so that future imbalances can be anticipated and provided for in the budgeting and capital improvement process.

If aviation demands continue to indicate that improvements are required, and if the proposed improvements prove to be environmentally acceptable, the financial implications presented in this chapter are likely to be acceptable for the FAA, WSDOT Aviation, and the Port of Lopez. However, it must be remembered that this is only a programming analysis and not a financial commitment on the part of any entity (i.e., FAA, WSDOT Aviation, or the Port of Lopez). If the cost of an improvement project is not financially feasible, it should not be pursued.

APPENDIX 1

TFMSC REPORT

TFMSC Report (City Pair)

2015 Arrivals

	Arrival Date	Departure Date	Arrival Airport	Departure Airport	User Class	Weight Class	Physical Class	Aircraft	Flights	Statute Miles Flown		Seats Per Flight
784	Feb-15	Feb-15	S31 - Lope	BFI - Seattle	General Aviation	Small Eqpt	Piston	C182 - Cessna Skylane 182	1	72	4	4
785	Feb-15	Feb-15	S31 - Lope	BFI - Seattle	General Aviation	Small Eqpt	Turbine	B350 - Beech Super King Air 350	1	72	6	6
786	Feb-15	Feb-15	S31 - Lope	PAE - Everett	General Aviation	Small Eqpt	Piston	C337 - Cessna Turbo Super Skymaster	1	50	4	4
787	Mar-15	Mar-15	S31 - Lope	BFI - Seattle	General Aviation	Small Eqpt	Piston	BE36 - Beech Bonanza 36	1	72	4	4
788	Mar-15	Mar-15	S31 - Lope	BFI - Seattle	General Aviation	Small Eqpt	Turbine	B350 - Beech Super King Air 350	1	72	6	6
789	Apr-15	Apr-15	S31 - Lope	BFI - Seattle	General Aviation	Small Eqpt	Turbine	PAY2 - Piper Cheyenne 2	1	72	6	6
790	May-15	May-15	S31 - Lope	BOI - Boise	General Aviation	Small Eqpt	Turbine	PC12 - Pilatus PC-12	1	467	9	9
791	May-15	May-15	S31 - Lope	YKM - Yakim	General Aviation	Small Eqpt	Turbine	B350 - Beech Super King Air 350	2	346	12	6
792	Jun-15	Jun-15	S31 - Lope	BFI - Seattle	General Aviation	Small Eqpt	Piston	DA40 - Diamond Star DA40	1	72	6	6
793	Jun-15	Jun-15	S31 - Lope	PAE - Everett	General Aviation	Small Eqpt	Piston	BE33 - Beech Bonanza 33	1	50	5	5
794	Jun-15	Jun-15	S31 - Lope	S50 - Auburn	General Aviation	Small Eqpt	Piston	C150 - Cessna 150	1	86	2	2
795	Jun-15	Jun-15	S31 - Lope	YKM - Yakim	General Aviation	Small Eqpt	Turbine	B350 - Beech Super King Air 350	3	519	18	6
796	Jul-15	Jul-15	S31 - Lope	BFI - Seattle	Air Carrier	Small Eqpt	Turbine	C208 - Cessna 208 Caravan	1	72	14	14
797	Jul-15	Jul-15	S31 - Lope	CLL - College	General Aviation	Small Eqpt	Piston	C172 - Cessna Skyhawk 172/Cutlass	1	1,860	4	4
798	Jul-15	Jul-15	S31 - Lope	YKM - Yakim	General Aviation	Small Eqpt	Turbine	BE20 - Beech 200 Super King	1	173	5	5
799	Aug-15	Aug-15	S31 - Lope	1S5 - Sunnys	General Aviation	Small Eqpt	Piston	C172 - Cessna Skyhawk 172/Cutlass	1	203	4	4
800	Aug-15	Aug-15	S31 - Lope	BDN - Bend	General Aviation	Small Eqpt	Piston	SR22 - Cirrus SR 22	1	314	4	4
801	Aug-15	Aug-15	S31 - Lope	BDN - Bend	General Aviation	Small Eqpt	Piston	SR22 - Cirrus SR 22	1	314	4	4
802	Aug-15	Aug-15	S31 - Lope	BFI - Seattle	General Aviation	Small Eqpt	Piston	C182 - Cessna Skylane 182	1	72	4	4
803	Aug-15	Aug-15	S31 - Lope	PAE - Everett	General Aviation	Small Eqpt	Piston	BE33 - Beech Bonanza 33	1	50	5	5
804	Aug-15	Aug-15	S31 - Lope	RNT - Rentor	Other	Small Eqpt	Piston	-1 - unknown	1	76	0	0
805	Aug-15	Aug-15	S31 - Lope	S50 - Auburn	General Aviation	Small Eqpt	Piston	C150 - Cessna 150	1	86	2	2
806	Sep-15	Sep-15	S31 - Lope	BFI - Seattle	Air Carrier	Small Eqpt	Piston	AA5 - American AA-5 Traveler	1	72	3	3
807	Sep-15	Sep-15	S31 - Lope	PAE - Everett	General Aviation	Small Eqpt	Piston	BE33 - Beech Bonanza 33	1	50	5	5
808	Sep-15	Sep-15	S31 - Lope	YKM - Yakim	General Aviation	Small Eqpt	Turbine	B350 - Beech Super King Air 350	1	173	6	6
809	Oct-15	Oct-15	S31 - Lope	PAE - Everett	General Aviation	Small Eqpt	Piston	C337 - Cessna Turbo Super Skymaster	1	50	4	4
810	Oct-15	Oct-15	S31 - Lope	YKM - Yakim	General Aviation	Small Eqpt	Turbine	B350 - Beech Super King Air 350	4	692	24	6
811	Dec-15	Dec-15	S31 - Lope	BFI - Seattle	Air Carrier	Small Eqpt	Piston	AA5 - American AA-5 Traveler	1	72	3	3
812	Dec-15	Dec-15	S31 - Lope	PNE - Philad	General Aviation	Small Eqpt	Piston	P28A - Piper Cherokee	1	2,396	4	4
813	Dec-15	Dec-15	S31 - Lope	YKM - Yakim	General Aviation	Small Eqpt	Turbine	B350 - Beech Super King Air 350	2	346	12	6

TFMSC Report (City Pair)

2015 Departures

	Arrival Date	Depar Date	Arrival Airport	Departure Airport	User Class	Weight Class	Physical Class	Aircraft	Flights	Statute Miles Flown		Seats Per Flight
1041	Jan-15	Jan-15	PAE - Ever	S31 - Lopez	General Aviation	Small Eqpt	Piston	C337 - Cessna Turbo Super Skymaster	1	50	4	4
1042	Feb-15	Feb-15	BFI - Seatt	S31 - Lopez	General Aviation	Small Eqpt	Piston	C182 - Cessna Skylane 182	1	72	4	4
1043	Feb-15	Feb-15	BFI - Seatt	S31 - Lopez	General Aviation	Small Eqpt	Turbine	B350 - Beech Super King Air 350	1	72	6	6
1044	Feb-15	Feb-15	VUO - Van	S31 - Lopez	General Aviation	Small Eqpt	Piston	C337 - Cessna Turbo Super Skymaster	1	198	4	4
1045	Mar-15	Mar-15	BFI - Seatt	S31 - Lopez	General Aviation	Small Eqpt	Piston	BE36 - Beech Bonanza 36	2	144	8	4
1046	Mar-15	Mar-15	YKM - Yaki	S31 - Lopez	General Aviation	Small Eqpt	Turbine	B350 - Beech Super King Air 350	1	173	6	6
1047	Apr-15	Apr-15	BFI - Seatt	S31 - Lopez	General Aviation	Small Eqpt	Turbine	P46T - Piper Malibu Meridian	1	72	6	6
1048	May-15	May-15	BFI - Seatt	S31 - Lopez	General Aviation	Small Eqpt	Piston	C182 - Cessna Skylane 182	1	72	4	4
1049	May-15	May-15	BFI - Seatt	S31 - Lopez	General Aviation	Small Eqpt	Piston	DA40 - Diamond Star DA40	1	72	6	6
1050	May-15	May-15	BFI - Seatt	S31 - Lopez	General Aviation	Small Eqpt	Turbine	B350 - Beech Super King Air 350	1	72	6	6
1051	May-15	May-15	BFI - Seatt	S31 - Lopez	General Aviation	Small Eqpt	Turbine	PC12 - Pilatus PC-12	1	72	9	9
1052	May-15	May-15	PAE - Ever	S31 - Lopez	General Aviation	Small Eqpt	Piston	C337 - Cessna Turbo Super Skymaster	1	50	4	4
1053	May-15	May-15	YKM - Yaki	S31 - Lopez	General Aviation	Small Eqpt	Turbine	B350 - Beech Super King Air 350	1	173	6	6
1054	Jun-15	Jun-15	BFI - Seatt	S31 - Lopez	General Aviation	Small Eqpt	Piston	DA40 - Diamond Star DA40	1	72	6	6
1055	Jun-15	Jun-15	BFI - Seatt	S31 - Lopez	General Aviation	Small Eqpt	Turbine	B350 - Beech Super King Air 350	1	72	6	6
1056	Jun-15	Jun-15	YKM - Yaki	S31 - Lopez	General Aviation	Small Eqpt	Turbine	B350 - Beech Super King Air 350	2	346	12	6
1057	Jul-15	Jul-15	BFI - Seatt	S31 - Lopez	Air Carrier	Small Eqpt	Turbine	C208 - Cessna 208 Caravan	1	72	14	14
1058	Jul-15	Jul-15	BFI - Seatt	S31 - Lopez	Air Carrier	Small Eqpt	Turbine	C208 - Cessna 208 Caravan	1	72	14	14
1059	Jul-15	Jul-15	BFI - Seatt	S31 - Lopez	General Aviation	Small Eqpt	Turbine	P46T - Piper Malibu Meridian	1	72	6	6
1060	Jul-15	Jul-15	S12 - Alba	S31 - Lopez	General Aviation	Small Eqpt	Piston	PA27 - Piper Aztec	1	265	4	4
1061	Jul-15	Jul-15	YKM - Yaki	S31 - Lopez	General Aviation	Small Eqpt	Turbine	BE20 - Beech 200 Super King	1	173	5	5
1062	Aug-15	Aug-15	BDN - Ben	S31 - Lopez	General Aviation	Small Eqpt	Piston	SR22 - Cirrus SR 22	1	314	4	4
1063	Aug-15	Aug-15	BFI - Seatt	S31 - Lopez	General Aviation	Small Eqpt	Piston	C182 - Cessna Skylane 182	1	72	4	4
1064	Aug-15	Aug-15	MAN - Nan	S31 - Lopez	General Aviation	Small Eqpt	Piston	SR22 - Cirrus SR 22	1	457	4	4
1065	Aug-15	Aug-15	TIW - Taco	S31 - Lopez	General Aviation	Small Eqpt	Piston	C150 - Cessna 150	1	86	2	2
1066	Aug-15	Aug-15	UAO - Aur	S31 - Lopez	General Aviation	Small Eqpt	Piston	PA32 - Piper Cherokee Six	1	223	6	6
1067	Sep-15	Aug-15	BFI - Seatt	S31 - Lopez	Other	Small Eqpt	Turbine	C208 - Cessna 208 Caravan	1	72	14	14
1068	Sep-15	Sep-15	BFI - Seatt	S31 - Lopez	General Aviation	Small Eqpt	Turbine	P46T - Piper Malibu Meridian	1	72	6	6
1069	Sep-15	Sep-15	PAE - Ever	S31 - Lopez	General Aviation	Small Eqpt	Piston	C337 - Cessna Turbo Super Skymaster	1	50	4	4
1070	Sep-15	Sep-15	YKM - Yaki	S31 - Lopez	General Aviation	Small Eqpt	Turbine	B350 - Beech Super King Air 350	1	173	6	6
1071	Oct-15	Oct-15	BFI - Seatt	S31 - Lopez	General Aviation	Small Eqpt	Piston	C182 - Cessna Skylane 182	1	72	4	4
1072	Oct-15	Oct-15	BFI - Seatt	S31 - Lopez	General Aviation	Small Eqpt	Turbine	B350 - Beech Super King Air 350	1	72	6	6
1073	Oct-15	Oct-15	PAE - Ever	S31 - Lopez	General Aviation	Small Eqpt	Piston	BE33 - Beech Bonanza 33	1	50	5	5
1074	Oct-15	Oct-15	YKM - Yaki	S31 - Lopez	General Aviation	Small Eqpt	Turbine	B350 - Beech Super King Air 350	1	173	6	6
1075	Oct-15	Oct-15	YKM - Yaki	S31 - Lopez	General Aviation	Small Eqpt	Turbine	B350 - Beech Super King Air 350	2	346	12	6
1076	Dec-15	Dec-15	BFI - Seatt	S31 - Lopez	Air Carrier	Small Eqpt	Piston	AA5 - American AA-5 Traveler	1	72	3	3
1077	Dec-15	Dec-15	BLI - Bellin	S31 - Lopez	General Aviation	Small Eqpt	Turbine	C208 - Cessna 208 Caravan	1	28	14	14
1078	Dec-15	Dec-15	YKM - Yaki	S31 - Lopez	General Aviation	Small Eqpt	Turbine	B350 - Beech Super King Air 350	2	346	12	6

APPENDIX 2

AVIATION FORECAST AND APPROVAL

Template for Comparing Airport Planning and TAF Forecasts

AIRPORT NAME: Lopez Island Airport

	Year	Airport Forecast	TAF	AF/TAF (% Difference)
Passenger Enplanements				
Base yr.	2015	0	457	-100.0%
Base yr. + 5yrs.	2020	0	457	-100.0%
Base yr. + 10yrs.	2025	0	457	-100.0%
Base yr. + 15yrs.	2030	0	457	-100.0%
Commercial Operations				
Base yr.	2015	3,760	8,000	-53.0%
Base yr. + 5yrs.	2020	3,809	8,000	-52.4%
Base yr. + 10yrs.	2025	3,859	8,000	-51.8%
Base yr. + 15yrs.	2030	3,909	8,000	-51.1%
Total Operations				
Base yr.	2015	13,634	31,674	-57.0%
Base yr. + 5yrs.	2020	14,083	32,567	-56.8%
Base yr. + 10yrs.	2025	14,550	33,504	-56.6%
Base yr. + 15yrs.	2030	15,033	34,486	-56.4%

NOTES: TAF data is on a U.S. Government fiscal year basis (October through September).
AF/TAF (% Difference) column has embedded formulas.

Template for Summarizing and Documenting Airport Planning Forecasts

A. Forecast Levels and Growth Rates

AIRPORT NAME: Lopez Island Airport **Specify base year:** 2015

	Base Yr. Level	Base Yr. + 1yr.	Base Yr. + 5yrs.	Base Yr. + 10yrs.	Base Yr. + 15yrs.	Average Annual Compound Growth Rates: Base yr. to +1	Base yr. to +5	Base yr. to +10	Base yr. to +15
Passenger Enplanements									
Air Carrier	0	0	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Commuter	0	0	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
TOTAL	0	0	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Operations									
Itinerant									
Air carrier	0	0	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Commuter/air taxi	3,760	3,770	3,809	3,859	3,909	0.3%	0.3%	0.3%	0.3%
Total Commercial Operations	3,760	3,770	3,809	3,859	3,909	0.3%	0.3%	0.3%	0.3%
General aviation	8,767	8,838	9,124	9,430	9,748	0.8%	0.8%	0.7%	0.7%
Military	24	24	24	24	24	0.0%	0.0%	0.0%	0.0%
Local									
General aviation	1,084	1,092	1,127	1,237	1,353	0.8%	0.8%	1.3%	1.5%
Military	0	0	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
TOTAL OPERATIONS	13,634	13,724	14,083	14,550	15,033	0.7%	0.7%	0.7%	0.7%
Instrument Operations	Unknown	Unknown	Unknown	Unknown	Unknown	0.0%	0.0%	0.0%	0.0%
Peak Hour Operations	5	5	5	5	5	0.0%	0.0%	0.0%	0.0%
Cargo/mail (enplaned+deplaned tons)	0	0	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Based Aircraft									
Single Engine (Nonjet)	24	24	26	28	29	1.7%	1.7%	1.6%	1.3%
Multi Engine (Nonjet)	0	0	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Turboprop	0	0	0	0	1	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Jet Engine	0	0	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Other	0	0	0	0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
TOTAL	24	24	26	28	30	1.7%	1.7%	1.6%	1.5%

B. Operational Factors

	Base Yr. Level	Base Yr. + 1yr.	Base Yr. + 5yrs.	Base Yr. + 10yrs.	Base Yr. + 15yrs.
Average aircraft size (seats)					
Air carrier	0.0	0.0	0.0	0.0	0.0
Commuter	0.0	9.0	9.0	9.0	9.0
Average enplaning load factor					
Air carrier	0.0%	0.0%	0.0%	0.0%	0.0%
Commuter	0.0%	60.0%	65.0%	77.0%	78.0%
GA operations per based aircraft	410	407	393	380	370

Note: Show base plus one year if forecast was done. If planning effort did not include all forecast years shown interpolate years as needed, using average annual compound growth rates.

NOTE: Right hand side of worksheet has

U.S. Department
of Transportation
**Federal Aviation
Administration**

Northwest Mountain Region
Seattle Airports District Office
1601 Lind Avenue S.W., Suite 250
Renton, Washington 98055-4056

September 19, 2016

Mr. Kenn Aufderhar
Airport Commission
Port of Lopez
PO Box 907
Lopez Island, WA 98261

Lopez Island Airport (S31)
Aviation Forecast Approval

Dear Mr. Aufderhar:

The Federal Aviation Administration (FAA), Seattle Airports District Office has reviewed the aviation forecast for the Lopez Island Airport (S31) Master Plan Update, submitted September 8, 2016. The FAA approves these forecasts for airport planning purposes, including Airport Layout Plan (ALP) development. The FAA approval is based on the following:

1. The difference between the FAA Terminal Area Forecast (TAF) and S31's forecast for based aircraft and operations is not within the 10 percent and 15 percent allowance for the 5 and 10 year planning horizons for reasons contained within the forecast. We concur with these reasons and believe the differences have been resolved.
2. The forecast is based on reasonable planning assumptions, current data and appropriate forecasting methodologies.

Based on the approved forecast, the FAA also approves the Cessna 206 (RDC B-I) for the existing and future critical aircraft.

The approval of the forecast and critical aircraft does not automatically constitute a commitment on the part of the Unites States to participate in any development recommended in the master plan or shown on the ALP. All future development will need to be justified by current activity levels at the time of proposed implementation. Further, the approved forecasts may be subject to additional analysis or the FAA may request a sensitivity analysis if this data is to be used for environmental or Part 150 noise planning purposes.

The ADO will initiate the process to request that the FAA Office of Aviation Policy and Plans (APO) modify the TAF to reflect this current forecast. It may take some time before these changes are officially reflected in the TAF.

If you have any questions about this forecast approval, please call me at (425) 227-1654.

Sincerely,

Jennifer I. Kandel
Airport Planner, FAA Seattle Airports District Office

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