FRIDAY HARBOR
AIRPORT











AIRPORT MASTER PLAN

AIRPORT MASTER PLAN

For

FRIDAY HARBOR AIRPORT
Friday Harbor, Washington

Prepared for

The Port of Friday Harbor

By

Coffman Associates, Inc.
And
Precision Approach Engineering

Accepted and Adopted by the Port of Friday Harbor Commission on December 11, 2019

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FRIDAY HARBOR AIRPORT









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FRIDAY HARBOR AIRPORT









Introduction

AIRPORT MASTER PLAN



INTRODUCTION

The Federal Aviation Administration (FAA) recommends that airports update their long-term planning documents every seven to 10 years, or as necessary to address local changes at the airport. The last master plan update for Friday Harbor Airport was completed in 2015 with a base forecast year of 2011. The Port of Friday Harbor (Port), as sponsor of the Airport, has received a grant from the FAA to update the Airport Master Plan. The FAA grant covers 90 percent of the fixed fee project cost, with the Port providing a ten percent match.

Following federal guidelines for consultant selection based on qualifications, the Port selected Coffman Associates to undertake the Master Plan Update. Coffman Associates is an aviation consulting firm that specializes in airport master planning and environmental studies. Coffman Associates has worked for numerous airports in the FAA's Northwest Mountain Region, including Washington State. After project scope negotiations and an independent review of study costs, a contract was approved by the Port in August 2017.

The study is designed to provide guidance for future development and updated justification for projects for which the Airport may request funding participation through federal and state airport improvement programs. Potential projects are a function of aviation demand (forecasts), meeting federal regulations (design standards), pavement maintenance, and support facility needs.

The FAA has directed that a primary focus of this master plan study be the ability of the Airport to meet current and future design standards for the runway/taxiway system. The design standards for any airport define various safety surfaces surrounding the runway/taxiway system as well as required separation distances. Applicable design standards are a function of the critical design aircraft, which is the largest aircraft conducting 500 or more annual operations at the airport. There is a preliminary indication that slightly more restrictive design standards should be applied to the runway/taxiway system. This study will determine what the baseline design standards should be and examine in detail

the potential impacts to applying those standards at the Airport. Ultimately, the master plan will include a course of action to bring the Airport into compliance with the applicable design standards to the greatest degree feasible.

The Airport Master Plan Update will be prepared in accordance with FAA requirements, including Advisory Circular (AC) 150/5300-13A, *Airport Design* (as amended), and AC 150/5070-6C, *Airport Master Plans* (as amended). The scope of services, budget, and schedule was approved by the Port, following review by the FAA.

Friday Harbor Airport is a non-hub primary commercial service airport, which means it has more than 10,000 annual passenger enplanements (boardings). The Airport is included in the FAA's *National Plan of Integrated Airport Systems* (NPIAS). As such, the Airport is eligible for federal development grants. The Port of Friday Harbor owns and operates the Airport, which is located within walking distance to the central business district of Friday Harbor, Washington. The Airport is home to approximately 150 based aircraft. Services and facilities available include: hangar storage, tie-downs, fixed base operator (FBO) services, flight instruction, aircraft maintenance, and fueling. The Airport encompasses approximately 203 acres of land.

The Airport has one runway, designated Runway 16-34, that is oriented in a north to south manner. The runway is 3,402 feet long and 75 feet wide and it is constructed of grooved asphalt.

MASTER PLAN OBJECTIVES

The overall objective of the Airport Master Plan Update is to provide the sponsor with guidance for future development of the Airport, meeting the needs of existing and future users, while also being compatible with the environment. The most recent planning effort related to the Airport is the 2015 Airport Master Plan. This Airport Master Plan Update will identify and provide justification for new priorities. This plan will be closely coordinated with other existing and on-going planning studies in the area, and with aviation plans developed by the FAA and the state. Specific objectives of the study include:

- Research factors likely to affect air transportation demand in the Friday Harbor area over the next 20 years and develop new operational and basing forecasts.

- Determine projected needs of airport users as it relates to the airside (runways, taxiways, etc.) and the landside facilities (hangar layout and mix).

- Recommend improvements that will enhance the airport's ability to satisfy future aviation needs.

- Establish a schedule of development priorities and a financial program for implementation and analyze potential funding sources, consistent with FAA planning.

- Provide specific recommendations for aviation and non-aviation related land uses on airport property and review existing or proposed land use, economic development, and zoning documents to ensure future compatibility with off-airport development.

- Develop active and productive public involvement throughout the planning process.

MASTER PLAN ELEMENTS AND PROCESS

To achieve the objectives described above, the Airport Master Plan Update is prepared in a systematic fashion pursuant to the scope of services that was coordinated with the airport sponsor and the FAA. The study has nine elements:

1.0 **Study Initiation and Organization** - Development of the scope of services, budget, and schedule. A kickoff meeting will be held with the planning advisory committee (PAC), comprised of various airport stakeholders, at the study's initiation to obtain a more comprehensive understanding of local issues.

2.0 **Inventory** - Inventory of facility and operational data, wind data, environmental data, population and economic data, airport financial data, and new aerial photography and mapping. All of the inventory data is organized as draft Chapter One.

3.0 **Forecasts** - Forecasts of based aircraft, operations, and passenger enplanements for the airport over a 20-year period. The forecasts are organized into draft Chapter Two and are delivered to the FAA for review and approval.

4.0 **Demand Capacity/Facility Requirements** - After establishing the critical design aircraft and physical planning criteria, airport needs will be developed for airside and landside facilities. The facility requirements are organized into draft Chapter Three. The first three chapters are distributed to the PAC and the material is also presented at a meeting. A public information workshop is held to engage and inform the public.

5.0 **Airport Development Alternatives** - Potential airside and landside alternatives are developed for meeting long-term needs. Each of the alternatives is subjected to engineering and environmental analysis and summarized in draft Chapter Four. Draft Chapter Four is distributed to the PAC and the material is also presented at a meeting. A public information workshop is held to engage and inform the public.

6.0 **Airport Layout Plans and Land Use Compatibility** - Airport layout plans (ALPs) (the technical drawings) are developed to depict existing and proposed facilities. The drawing set is developed to meet the requirements of FAA Standard Operating Procedures 2.0 for the ALP. In addition, noise exposure contours are developed for existing and future conditions to determine the extent of critical noise exposure in the airport vicinity. An environmental overview utilizing guidelines provided in the *National Environmental Policy Act* (NEPA) is included. Land use plans are developed to identify the recommended highest and best use of airport property.

7.0 **Recycling Plan and Drainage Plan** - Develop a recycling plan that meets FAA requirements. Develop a site-specific drainage study update to the existing 2012 Storm Drainage Study. Updates will consist of field investigation, revisions of pipe sizes and capacities, and existing exhibit updates and will be limited to north drainage basin areas identified for short term development in conjunction with this planning project and areas of known pipe failure.

8.0 **Capital Improvement Program and Financial Plan** - A 20-year capital improvement program that is phased over time to various demand milestones is developed. Cost estimates for each project are developed in current (2018) dollars. A second public information workshop is held at this stage to encourage citizens to participate in the master plan process.

9.0 **Coordination Meetings –** Two coordination meetings with the FAA have been included in the fixed-fee contract. These will be scheduled at appropriate times during the study to actively engage the FAA on the solutions being developed. These meetings may take place in person at FAA's Seattle offices or via video-conference.

10.0 **Final Reports** – A draft final report is compiled that will include appropriate revisions suggested by the PAC and the public throughout the process. The draft report is utilized during the sponsor approval process. A final report includes any remaining minor updates. An executive summary is developed as well.

STUDY COORDINATION

The study process includes local participation through the formation of a PAC. The PAC consists of federal, state, and local agencies, airport tenants, and other airport stakeholders. The airport sponsor determines the final makeup of the committee. The PAC meets four times to discuss draft working papers. A kickoff meeting will be held on August 24, 2017, during the initial inventory process. All study materials are made available online for the duration of the study.

Three "open-house" public information workshops are held to present the preliminary findings and to solicit public comment. **Exhibit IA** presents the key study elements, meeting intervals, project schedule, and documentation for the Airport Master Plan Update.

PAC #1

INVENTORY
- Airport Facilities
- Airspace and Air Traffic Activity
- Airport Access and Parking, Utilities, and Aerial Photography
- Area Socioeconomic Data
- Local Planning and Land Use

Working Papers

FORECASTS
- Based Aircraft and Fleet Mix
- Annual Operations
- Commercial Service

Working Papers

FACILITY REQUIREMENTS
- Design Categories
- Runway Length and Strength
- Support Facilities
- Taxiways
- Airfield Capacity
- Hangar Facilities
- Terminal Building
- Aprons
- Navigational Aids

Working Papers

PAC #2

PIW #1

AIRPORT ALTERNATIVES
- Evaluate Development Scenarios
  - Airside
  - Landside
  - Support

Working Papers

PAC #3

PIW #2

RECOMMENDED MASTER PLAN CONCEPT/ ENVIRONMENTAL REVIEW
- Detailed Master Plan Facility and Land Use Plans
- Review/Evaluation of NEPA Environmental Categories
- Noise Exposure

Working Papers

FINANCIAL PLAN/CAPITAL IMPROVEMENTS
- Airport Development Schedule
- Cost Estimates
- Funding Sources

Working Papers

AIRPORT LAYOUT PLANS/LAND USE COMPATIBILITY
- Airport Layout Plan
- Landside Drawing
- Recycling Plan
- Airspace/Approach Drawings
- On-Airport Land Use Plan
- Property Map
- Land Use Plans

Working Papers

PAC #4

PIW #3







FRIDAY HARBOR AIRPORT









CHAPTER ONE

Inventory

AIRPORT MASTER PLAN



Chapter One

INVENTORY

The initial step in the preparation of the master plan for Friday Harbor Airport (Airport) is the collection of information pertaining directly to or influencing the Airport and the area it serves. The information summarized in this chapter will be used in subsequent analyses within this study and includes:

- Background information related to the Friday Harbor region, including descriptions of the local geography, regional climate, and surface transportation systems.

- Physical inventories and descriptions of current facilities and services offered at the Airport. The analysis will include airfield and landside infrastructure and services, as well as local and regional airspace, competing airport facilities, air traffic control, and aircraft operating procedures.

- Friday Harbor Airport's role in regional, state, and national aviation systems. Development at the Airport since the completion of the previous master plan will also be discussed.

- Socioeconomic data, including population, employment, and income activity sectors, will be analyzed. These sectors typically offer an indication of future trends that could influence commercial and general aviation activity at the Airport.

- A review of existing local and regional plans and studies which will be utilized later in the process to determine their potential influence on the development and implementation of the Airport Master Plan.

- Review of existing environmental conditions and sensitivities, on or near the Airport, so as to be factored in the recommended development plan.

The information outlined in this chapter provides a foundation for all subsequent chapters. Much of the information was obtained through on-site inspections of the Airport and personal interviews with airport staff and tenants of the Airport. Information was also obtained from outside resources, including documents prepared by the Federal Aviation Administration (FAA), Washington State Department of Transportation –Aviation Division (WSDOT), Town of Friday Harbor, San Juan County, and other pertinent regional planning and economic agencies.

REGIONAL SETTING



The Town of Friday Harbor was incorporated in 1909. Friday Harbor is located midway along the eastern shore of San Juan Island, second largest in a chain of 172 islands in the northernmost stretch of Puget Sound, and situated between Canada's Vancouver Island and the Washington State mainland. Friday Harbor is the seat of San Juan County government and is the only incorporated town in the county. Friday Harbor has a Mayor/Council non-partisan form of government. Voters elect the mayor and five council members to four-year terms. All represent the community-at-large rather than individual districts or areas of town.

In 2010, the U.S. Census Bureau indicated the population of the Town of Friday Harbor was 2,162; San Juan Island had a population of 6,894; and San Juan County had a population of 15,944. **Exhibit 1A** shows the regionl setting for Friday Harbor Airport.

San Juan County, located in northwest Washington State includes four large islands: San Juan, Orcas, Lopez and Shaw, and hundreds of smaller islands, reefs, and rocks. About 20 islands are inhabited. San Juan County is the smallest county in Washington by total landmass.

San Juan County is located in the Salish Sea to the west of Skagit and Whatcom counties and east of lower Vancouver Island, Canada. The islands are spectacularly scenic. Consequently, the archipelago is a popular tourism destination. Tourists arrive via ferry, private boat, float plane, helicopter and fixed-wing plane throughout the year. The county has, in turn, attracted many retirees. The San Juan islands are regularly included on lists of America’s most desirable places to live. Today, tourism-related industries and retirement communities form the economic base of the San Juan County economy.

LOCAL ECONOMY

Fishing and farming formed the economic mainstay for most inhabitants until the already well-established tourism economy took off in the 1970s. However, some more colorful parts of the economic


WASHINGTON
FRIDAY HARBOR AIRPORT
Friday Harbor
Lynden
Bellingham
Anacortes
Mount Vernon
Oak Harbor
Arlington
Darrington
Granite Falls
Everett
Mukilteo
Port Angeles
Port Townsend
Sequim
Forks
Seattle
Bellevue
Bremerton
Burien
Issaquah
Federal Way
Tacoma
Shelton
Olympia
Lacey
Aberdeen
Westport
Rochester
Tenino
Eatonville
Centralia
South Bend
Chehalis
Morton
Winlock
Astoria
Longview
Kelso
Kalama
Woodland
Vancouver
Camas
White Salmon
Goldendale
Oroville
Tonasket
Republic
Colville
Okanogan
Newport
Deer Park
Grand Coulee
Waterville
Davenport
Spokane
Cheney
Wenatchee
Ephrata
Cle Elum
Moses Lake
Ritzville
Warden
Ellensburg
Othello
Colfax
Connell
Yakima
Pomeroy
Sunnyside
Dayton
Asotin
Prosser
Kennewick
Pasco
Walla Walla
Roche Harbor
Deer Harbor
Orcas
Orcas Island
★ Friday Harbor
FRIDAY HARBOR AIRPORT
Lopez Island
San Juan Island
Victoria, BC
VICINITY MAP
Guard Ave
Park St
Blair Ave
Friday Harbor
San Juan Valley Rd
FRIDAY HARBOR AIRPORT
Douglas Rd
Mullis St
Cattle Point Rd

history of the San Juan Islands includes smuggling, rum running, and trade and manufacturing of other illicit commodities.

Due to a large tourism component in the economy, employment levels are highly seasonal. Using a 10-year average from 2004 through 2014, the following pattern emerges – peak private nonfarm employment occurs each year in July and August, with an average gain of about 1,700 jobs (34 percent) from the January low point of the jobs cycle. As of July 2015, peak employment to date reached 6,410. This is the highest summer employment level since 2013.

Similar to the national economy, San Juan County's largest jobs-providing sector is private services, accounting for about 70 percent of all jobs. In 2014, the largest industry in terms of employment was leisure and hospitality. This is consistent with the county's orientation toward tourism. In 2014, leisure and hospitality hosted an average of 1,400 jobs or 25.8 percent. Other large industries include trade, transportation and utilities—which includes retail trade (16.6 percent), government (15.1 percent), education and health services (11.1 percent), and construction (10.9 percent). (*Source: Employment Security Department – Washington State)*

AIRPORT HISTORY

The current site of the airport was chosen and owned by legendary bush pilot and WWII veteran, Roy Franklin. Mr. Franklin's original motivation for building an airport at Friday Harbor was to facilitate medical emergency flights and commercial passenger service. The original paved 2,300-foot long runway was constructed in the early 1960s. A 1,300-foot long grass crosswind runway was also constructed. A small terminal building (current day Ernie's Café), T-hangars for 18 aircraft, and fueling facilities were also constructed at this time.

In 1981, the Port of Friday Harbor purchased the Friday Harbor Airport from Roy Franklin. With the assistance of grants from the Federal Aviation Administration (FAA) and private donations (most notably from local philanthropist, Mr. Paul Whittier), the Port undertook a major reconstruction of the entire airfield. Completed in 1985, the new runway was 3,402 feet long. A new terminal building was also constructed at this time and was subsequently named in honor of Roy Franklin in 2006.

Passenger air service has been available to Friday Harbor since 1947, when a small grass strip was used. In the 1960s and 1970s, Roy Franklin operated a commercial air carrier at the airport. Today, airlines provide service to Seattle, Bellingham, Anacortes, other San Juan County islands and Victoria, Canada from this aviation hub. The airport currently encompasses approximately 203 acres of land.

AIRPORT ADMINISTRATION

The Friday Harbor Airport is a public use facility owned and operated by the Port of Friday Harbor. The Port is a quasi-governmental body in that it has taxing authority and is charged with operating its assets (which include the marina, seaplane base, and Jackson Beach) in accordance with various regulations.

The Port is governed by a three-member Board of Commissioners elected to overlapping six-year terms. The Commissioners meet twice a month (once in summer) on the second and fourth Wednesdays of each month. The Port employs 18 staff members year-round, with an additional 10 summer staff members. The Airport staff includes a professional airport manager and two maintenance persons.

RECENT AIRPORT DEVELOPMENT

The FAA and the State of Washington have continued to support development and maintenance of the Airport primarily through the Airport Improvement Program (AIP) and the state AIP matching programs. Since the last master plan grant (2010), the Port has received approximately $8.4 million in grants from the FAA and another $236,000 from WSDOT. Through these grants, the Airport has updated the electrical systems, implemented some drainage improvements, and rehabilitated several primary pavement areas. The most significant project was the relocation of Taxiway A. **Table 1A** presents the federal grants received since the last master plan was begun in 2010.

TABLE 1A
Federal Development Grants Since Last Master Plan
Friday Harbor Airport

FAA Grant Number	Project	FAA Share	State Share	Port Share	Project Total
34	Master Plan	$479,790	$0	$53,310	$533,100
33	Obstruction Removal (Trees)	$800,000	$0	$88,889	$888,889
32	Environmental Assessment (Obstruction Removal)	$193,500	$10,750	$10,750	$215,000
31	OFA Grading for Drainage Improvements	$286,200	$7,500	$7,500	$301,200
30	Electrical Upgrade, Tie-Down Relocation, PAPI	$1,195,800	$66,400	$66,400	$1,328,600
	AGIS Survey	$171,700	$9,550	$9,550	$190,800
29	Rehabilitate Runway, Edge Lights, Beacon	$185,400	$10,100	$10,100	$205,600
28	Twy A Realignment, Drainage, Edge Lights (Construct)	$3,781,800	$102,200	$318,000	$4,202,000
27	Generator, Vault, Gate Update	$935,000	$21,100	$28,100	$984,200
	Tree Obstruction Aerial Survey	$70,500	$1,850	$1,850	$74,200
	Twy A Rehab, Drainage, Light Signage (Design)	$338,600	$6,500	$11,300	$365,400
TOTAL		**$8,438,290**	**$235,950**	**$605,749**	**$9,288,989**

Source: Airport Records

REGIONAL CLIMATE

Weather conditions are important to the planning and development of an airport. Temperature is an important factor in determining runway length requirements, while wind direction and speed are used to determine optimum runway orientation. The need for navigational aids and lighting is determined by the percentage of time that visibility is impaired due to cloud coverage or other conditions.

Friday Harbor is an island community in the San Juan Islands in northwest Washington State. Its proximity to the Pacific Ocean provides a moderate to cool climate. The average high temperatures range from 45 degrees Fahrenheit (F) in December to 72 degrees in August. The area receives approximately 25 inches of precipitation during an average year, with the largest share being received in the winter months. **Table 1B** lists climate data for Friday Harbor, Washington.

TABLE 1B
Historic Climate Data
Friday Harbor, WA

Period	Average Precipitation (in.)[1]	Normal Daily Max Temp (F) (in.)[1]	Average Wind Speed (mph)[2]
January	4.2	46.3	6.8
February	2.1	47.7	6.9
March	2.0	51.7	6.8
April	1.6	56.5	6.5
May	1.5	62.0	6.2
June	1.1	66.9	6.0
July	0.8	70.6	5.7
August	0.9	71.7	5.4
September	1.4	66.5	5.1
October	2.7	57.4	5.5
November	4.0	49.8	6.5
December	2.8	44.8	6.8
Total	***24.9***		***6.2***

[1] Source: [1]National Oceanic and Atmospheric Administration (NOAA) -Climatography of the United States No. 81 (30-years of data from 1981-2010), as sourced from Friday Harbor Airport automated surface observation system (ASOS).
[2] *Source: www.city-data.com.*

KEY:
In. – Inches
MPH – Miles per hour
F – Degrees Fahrenheit

AIRPORT SYSTEM PLANNING ROLE

Airport planning exists on many levels: national, state, and local. Each level has a different emphasis and purpose. On the national level, the Friday Harbor Airport is included in the *National Plan of Integrated Airport Systems* (NPIAS). On the regional and state levels, the airport is included in the *Washington Aviation System Plan (WASP)* - 2015. The most recent local planning document is the Airport Master Plan, which was finalized in 2015 and has a base forecast year of 2011.

FEDERAL AIRPORT PLANNING

The role of the federal government in the development of airports cannot be overstated. Many of the nation's existing airports were either initially constructed by the federal government or their development and maintenance was partially funded through various federal grant-in-aid programs to local communities. The system of airports existing today is due, in large part, to the existence of federal policy that promotes the development of civil aviation. As part of a continuing effort to develop a national airport system to meet the needs of civil aviation and to promote air commerce, the United States Congress has continually maintained a national plan for the development and maintenance of airports.

There are 19,536 public and private aviation facilities in the U.S. The NPIAS identifies 3,332 public use airports which are considered significant to the national air transportation system. This total includes 382 primary commercial service airports and 2,950 non-primary general aviation airports. The NPIAS is published and used by the FAA in administering the Airport Improvement Program (AIP), which is the source of federal funds for airport improvement projects across the country. The AIP program is funded exclusively by user fees and user taxes, such as those on fuel and airline tickets. The 2017-2021 NPIAS estimates that $32.5 billion worth of needed airport improvements are eligible for AIP funding across the country over the next five years. An airport must be included in the NPIAS to be eligible for federal funding assistance through the AIP.

The NPIAS supports the FAA's strategic goals for safety, system efficiency, and environmental compatibility by identifying specific airport improvements. The current issue of the NPIAS identifies approximately $5.5 million in development needs at Friday Harbor Airport for the five-year planning horizon. This figure is not a guarantee of federal funding; instead, this figure represents development needs as presented to the FAA by the airport administration in the annual airport capital improvement program. **Table 1C** shows the classification of the NIPIAS airports.

TABLE 1C
NPIAS Airport Distribution

Number of Airports	Airport Category	Percent of Total Enplanements	Percent of All Based Aircraft	Percent of NPIAS Cost
30	Large Hub	72	0.7	20.9
31	Medium Hub	15	1.7	9.6
72	Small Hub	8	4.7	12.8
249	Nonhub	4	11.6	16.2
382	***Primary Subtotal***	***-***	***18.6***	***59.4***
89	National - GA	-	11.5	5.4
531	Regional - GA	-	25.6	12.2
1,261	Local - GA	-	21.2	15.3
813	Basic - GA	-	3.2	6.6
256	Unclassified	-	1	0.03
2,950	***Nonprimary Subtotal***	***-***	***62.6***	***39.5***
3,332	**Total NPIAS Airports**	**99**	**81.2**	**99**

Note: Friday Harbor is a nonhub commercial service airport.
Source: National Plan of Integrated Airport Systems (2017-2021)

The Friday Harbor Airport is included in the NPIAS as a nonhub primary commercial service airport. Primary commercial service airports have more than 10,000 annual enplanements (passenger boardings). Airports with more than 10,000 annual enplanements receive an annual entitlement from the FAA of at least $1 million for capital development projects. Airports with fewer than 10,000 enplanements may receive an entitlement of $150,000. Airports with fewer than 2,500 enplanements are considered nonprimary general aviation airports.

Airports that apply for and accept AIP grants must adhere to various grant assurances. These assurances include maintaining the airport facility safely and efficiently in accordance with specific conditions. The duration of the assurances depends on the type of airport, the useful life of the facility being developed, and other factors. Typically, the useful life for an airport development project is a minimum of 20 years. Thus, when an airport accepts AIP grants, they are obligated to maintain that facility in accordance with FAA standards for at least that long.

Part 139 Certification

An airport must have an Airport Operating Certificate (AOC) if it is serving scheduled air carrier aircraft with more than nine seats or serving unscheduled air carrier aircraft with more than 30 passenger seats. 14 CFR Part 139 (Part 139) describes the requirements for obtaining and maintaining an AOC. This includes meeting various Federal Aviation Regulations (FARs) now codified under the CFR.

Part 139 regulations (which implement provisions of the *Airport and Airway Development Act of 1970*, as amended on November 27, 1971) set standards for: the marking and lighting of areas used for operations; firefighting and rescue equipment and services; the handling and storing of hazardous materials; the identification of obstructions; and safety inspection and reporting procedures. In addition, certificated airports must have in place passenger and baggage screening by the Transportation Security Administration (TSA).

Friday Harbor Airport is quite unique in that it is a commercial service airport, but it is not a certificated airport. This means it is limited to offering scheduled commercial passenger service by aircraft with nine or fewer passenger seats. Most airports limited to these smaller aircraft do not achieve the 10,000-enplanement threshold for the primary commercial service designation.

STATE AIRPORT PLANNING

Friday Harbor Airport is included in the WASP. The WASP includes 136 public use airports, 65 of which are included in the federal NPIAS (including Friday Harbor Airport). The WASP classifies airports according to their roles in the state air transportation system in the following manner:

- **Major:** Major airports service the general population's travel needs through commercial service activities and most likely provides aircraft or aerospace manufacturing. There may be other activities on the airfield, such as corporate travel, emergency medical, or flight training, but the primary role is commercial travel. As such, the main aircraft will tend to be larger transport aircraft and the runways will be paved. The service area population must be a minimum of 40,000 but is more likely between 55,000 and 2.2 million. There are 10 airports classified as Major Airports in the state (all of which are included in the NPIAS).

- **Regional:** Regional airports primarily serve as a base for corporate and business travel via general aviation aircraft and commuter passenger service through the airlines. These trips are typically in smaller aircraft and may or may not include scheduled commercial airline service. The population served is typically between 34,000 and 2.1 million. There are 20 airports classified as Regional airports in the state (all of which are included in the NPIAS). **Friday Harbor is classified as a Regional Airport in the WASP**.

- **Community:** Community airports provide a facility for larger scale general aviation activities that are important to aviation, such as business and personal transportation, recreation, and pilot training. There may be fewer corporate flights for business activities than at a Regional airport, but they will still be active at this type of airport. The typical aircraft serving these airports are turboprops and pistons. A Community airport serves a population range of 5,000 to 1.8 million. Community airports have paved runways and should have a minimum of 15 based aircraft to be included in this classification. There are 35 airports classified as Community airports in the state (18 of which are included in the NPIAS).

- **Local:** Local airports primarily serve GA activities, such as personal transportation, recreation, pilot training, and agricultural uses. It is like a Community airport but has less activity or serves a smaller community. Community airports are differentiated by having paved runways with less than 15 based aircraft. The aircraft will be similar in size to a Community airport. The population served may range from as little as 3,500 to 1 million people. There are 37 airports classified as Local airports in the state (14 of which are included in the NPIAS).

- **General Use:** All airports without a paved surface are classified as General Use. This classification includes seaplane bases and those airports with turf or other surfaces that are not paved. The same type of aircraft that operate at Community and Local airports typically operate at these airports, but they are primarily for personal transportation and backcountry activities. There are no minimums for population or based aircraft for this classification, but the population can range dramatically from 2,400 to 2.1 million depending on the airport's location. There are 34 airports classified as General Use airports in the state (two of which are included in the NPIAS).

LOCAL AIRPORT PLANNING

The airport master plan is the primary local planning document. The master plan is intended to provide a 20-year vision for airport development based on aviation demand forecasts. The most recent update to the airport planning document is the 2015 Airport Master Plan (base year of 2010). Over time, the forecast element of an airport master plan typically becomes less reliable due to changes in aviation activity and/or the economy. As a result, the FAA recommends that airports update their master plans every seven to ten years, or as necessary, to address any significant changes.

During the development of the previous master plan for the Airport, the FAA published Advisory Circular (AC) 150/5300-13A, *Airport Design*, which was a major rewrite of the primary airport planning guidance. The previous master plan was unable to take into consideration all the revised design standards contained in the new AC. The FAA has directed that the Airport undertake this master plan update in order to have a plan in place that accounts for these design standard changes.

AIRFIELD FACILITIES

Airfield facilities are those which facilitate aircraft movements between the air and ground. Generally, these facilities include runways, taxiways, airport lighting and markings, and navigational aids. **Exhibit 1B** summarizes and depicts airfield facility information atop an aerial photograph for visual reference.



RUNWAYS

Field Elevation: 113' Above Mean Sea Level (MSL)		
	Runway 16	Runway 34
Runway Length (feet)	3,402'	
Runway Width (feet)	75'	
Pavement Type	Asphalt	
Pavement Treatment	Grooved	
Pavement Condition (FAA Reported)	Good	
Gradient	0.80%	
Runway Load Bearing Strength (lbs.) Single Wheel (S)	12,500	
Runway Pavement Markings	Basic	Non-Precision
Runway Edge Lighting	Medium Intensity	
Traffic Pattern	Right	Right

Source: Airport/Facility Directory - (Effective August 2017); Airport records.

TAXIWAYS

Designation	Width
Taxiway A (Parallel)	25'
Taxiway A1 (Rwy 34 Threshold - West)	30'
Taxiway A2 (Connector)	30'
Taxiway A3 (Connector - Acute Angle)	35'
Taxiway A4 (Rwy 16 Threshold - West)	30'
Taxilane B (Apron and Hangar Access)	25'/30'
Taxiway C (South Apron Connection)	30'
Taxiway D (Rwy 16 Threshold - East)	35'
Taxiway E (East Transient Apron)	30'
Taxiway F (North Connector)	25'
Taxiway G (North Hangar Access)	30'

INSTRUMENT AND VISUAL APPROACH AIDS

	Runway 16	Runway 34
Global Positioning System (GPS)		
RNAV (LPV)	NA	Yes
RNAV (LNAV/VNAV)	NA	Yes
NDB	NA	Yes
Precision Approach Path Indicator (PAPI)	PAPI-2R	PAPI-4R
Visual Glide Angle	4.00°	3.50°
Runway End Identifier Lights (REIL)	Yes	Yes

WEATHER, COMMUNICATION, AND NAVIGATIONAL AIDS

Airport Beacon
Windsocks (3)
Automated Surface Observation System (ASOS) - 135.675 MHz/360-378-8491
Common Traffic Advisory Frequency (CTAF) - 128.25 Mhz

KEY

ASOS - Automated Surface Observing System
GPS - Global Positioning System
RNAV/LNAV/VNAV - Area Navigation (GPS variants)
LPV - Localizer Performance with Vertical Guidance (GPS variant)
NDB - Non-directional Radio Beacon
PAPI - Precision Approach Path Indicator
REIL - Runway End Identifier Lights

Aerial Photo: Google Earth 5-2-15

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RUNWAY 16-34

Friday Harbor Airport is served by a single runway, Runway 16-34, which is generally oriented in a north/south manner. The runway is 3,402 feet long and 75 feet wide. The runway is constructed of asphalt and is grooved to facilitate storm water runoff, thus reducing the potential for aircraft hydroplaning. FAA data indicates that the runway is in good condition. The runway has basic markings on the Runway 16 end, which include the runway designation and centerline stripe. Non-precision markings on the Runway 34 end additionally has runway threshold bars, which help pilots quickly identify the runway threshold.

Runway 16-34 is 3,402 feet long.

Runway 16-34 has a pavement strength of 12,500 pounds single wheel loading (S), which refers to the design of certain aircraft landing gear that has a single wheel on each main landing gear strut. The gradient of the runway is 0.8 percent with the high point being at the Runway 16 threshold. The elevation at the Runway 16 threshold is 112.7 feet and at the Runway 34 threshold it is 83.9 feet.

TAXIWAYS/TAXILANES

Taxiways are generally those providing direct access to the runway. This includes parallel taxiways and connecting taxiways. Taxilanes are those providing access to hangar or aircraft tie-down areas.

Taxiway A is a full-length parallel taxiway serving Runway 16-34. It is 25 feet wide and separated from the runway by 156 feet, centerline to centerline. This taxiway is in excellent condition having been recently reconstructed in 2012.

Taxiway A1 provides access to the Runway 34 threshold and is 30 feet wide. Taxiway A2 is a connecting taxiway that is 30 feet wide. Taxiway A3 is a connecting taxiway that is 35 feet wide. This taxiway is at an acute angle to facilitate rapid exits from the runway. Taxiway A4 is the threshold taxiway to Runway 16 and it is 30 feet wide.

Taxiway B is an interior circulation taxiway that is 30 feet wide where designated, and 25 feet wide where it crosses apron areas. Taxiway B provides access to hangar development areas north and south of the terminal building and some portions are parallel to Taxiway A. At the terminal building, Taxiway B is interrupted by the terminal area aircraft apron. Taxiway C connects from Taxiway A to Taxiway B at the south end of the hangars. Taxiway C is 30 feet wide.

Taxiway D extends from the Runway 16 threshold to intersect with Taxiway E and is 35 feet wide. Taxiway D is only for exiting the runway. Aircraft are not to approach the runway from Taxiway D because of the steep grade. Instead, aircraft are to loop around using Taxiway F.



Taxiway D – Steep Grade

Taxiway E is the partial parallel taxiway on the east side of the runway and it is 30 feet wide. At its closest point, it is 255 feet from the runway centerline. Taxiway E provides access to numerous transient aircraft parking positions. This taxiway has a steep grade that exceeds typical taxiway grade standards.

Taxiway F provides connectivity from Taxiway B to Taxiway E approximately 750 feet from the Runway 16 threshold. Taxiway F is 25 feet wide. Taxiway F is intended as a one-way taxiway with aircraft moving from east to west.

Taxiway G extends from the north end of Taxiway B to serve the north end hangars. Taxiway G is 30 feet wide.

Taxilanes provide access to hangar areas and extend from the primary taxiways.

All taxiways and taxilanes are identified with a continuous solid yellow centerline. Aircraft hold position markings are on those taxiways leading to the runway and they are located 125 feet from the runway centerline. Parallel Taxiway A also has double, solid yellow edge markings.

AIRCRAFT APRON AREAS

Aircraft aprons are wide expanses of paved surfaces necessary for parking of local and transient aircraft.

Terminal Apron

An aircraft parking apron designated for commuter operations is immediately in front of the terminal building. This apron encompasses approximately 3,800 square yards of pavement. It is delineated by a solid and dashed yellow line. As noted previously, this apron truncates Taxiway B. The east edge of the terminal apron is 93 feet from the Taxiway A centerline. The terminal apron abuts the terminal building. As a result, the available space for aircraft to park is somewhat limited in order to provide for wingtip clearance. Typically, two small commuter aircraft can use the terminal apron at the same time.

The terminal apron has a designated customs parking position that is outlined with a solid white line and the word “CUSTOMS” on each side of the square. An aircraft wash rack and de-icing station occupy the south portion of the terminal apron.

Tie-Down Aprons

Aircraft parking positions are at a premium at the Airport. The relocation/reconstruction of Taxiway A in 2012 required the removal of 17 aircraft tie-down positions. **Table 1D** presents the aircraft parking apron detail. In total, there is approximately 20,700 square yards of aircraft parking apron, which includes the transient terminal apron. The apron areas provide parking positions for 54 small single engine piston aircraft and 20 positions for larger twin engine, turboprops, and small jets.

TABLE 1D
Aircraft Parking Aprons
Friday Harbor Airport

Apron Name	Proximate Location	Square Yards	Aircraft Positions/ Aircraft Size
Terminal Apron	Terminal Building	3,800	2 / Large
North Apron	South of Fuel Island	2,400	4 / small
Center Apron 1	East of Hangar E	1,700	8 / small
Center Apron 2	East of Hangar D	1,200	3 / Large
South Apron 1	Adjacent Admin Building	800	4 / Large
South Apron 2	East of Twy B	3,500	19 / Small
Northeast Apron 1	West of Twy E	1,900	9 / Small
Northeast Apron 2	East of Twy E (North)	3,100	10 / Large
Northeast Apron 3	East of Twy E (South)	1,800	14 Small
Cargo Apron	South Taxilane B	500	1 / Large
Total Apron Size		**20,700**	
Total Small Aircraft Positions			*54*
Total Large Aircraft Positions			*20*
Total Tie-Down Positions			**74**

Notes: Small = single engine piston; Large = twins, turboprops, and small jets.

Hold Aprons

Hold aprons are specific locations on the airfield where pilots can pull their aircraft off a taxiway in order to perform final pre-flight checks and engine run-ups. These are typically located in proximity to the runway thresholds. There is a hold apron on the west side of the Runway 16 threshold and a hold apron on the west side of the Runway 34 threshold. In addition, there is a bypass hold apron on the north side of Taxiway F, which is planned to be removed in 2018.

HELIPAD

Immediately south of the airport administration offices is a designated helipad for use by emergency services. This is a lighted 35' x 35' concrete pad. An entrance road provides access to the helipad, primarily for ambulances to transfer patients to a life flight helicopter.



Helipad

PAVEMENT CONDITION

Approximately every five years, Washington State Department of Transportation (WSDOT) Aviation conducts a system-wide study of pavement to assess the relative condition of pavements for selected Washington airports. The program serves as a tool to identify system pavement needs, shape programming decisions for federal and state grant aid, provide information for legislative decision-making, and assist airport sponsors in making informed planning decisions. The program also develops accurate pavement inventories and identifies necessary maintenance, repair, rehabilitation, and reconstruction projects.

The surveys are conducted using the pavement condition index (PCI) procedure documented in the following publications:

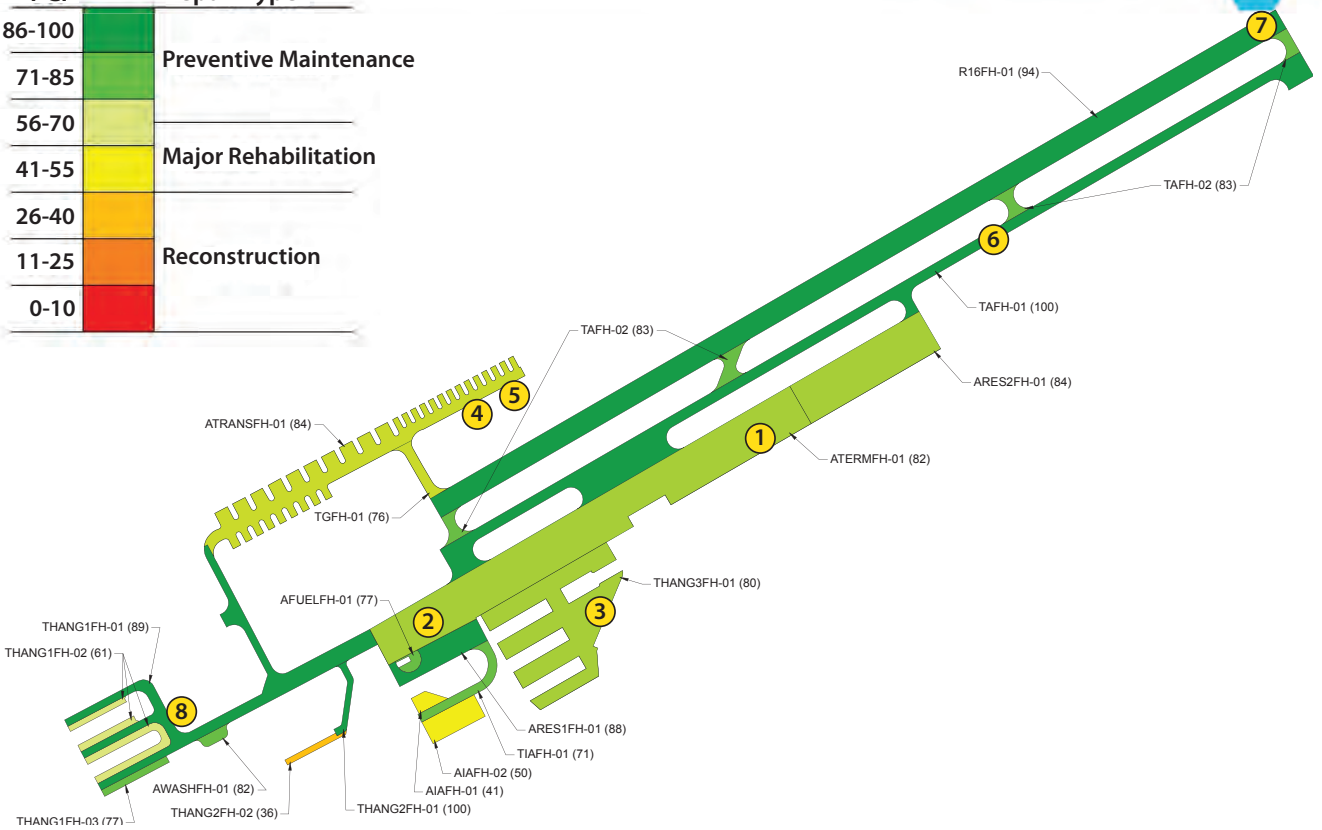
1. The Federal Aviation Administration's (FAA's) Advisory Circular 150/5380-6B, *Guidelines and Procedures for Maintenance of Airport Pavements*.
2. The American Society for Testing and Material's (ASTM's) D-5340, *Standard Test Method for Airport Pavement Condition Index Surveys*.

The PCI procedure is the standard used by the aviation industry to visually assess pavement condition. It was developed to provide engineers with a consistent, objective, and repeatable tool to represent the overall pavement condition. During a PCI survey, visible signs of deterioration within a selected sample area are identified, recorded, and analyzed.

The results of a PCI evaluation provide an indication of the structural integrity and functional capabilities of the pavement. However, it should be recognized that during a PCI inspection, only the top layer of the pavement is examined and that no direct measure is made of the structural capacity of the pavement system. Nevertheless, the PCI does provide an objective basis for determining maintenance and repair needs, as well as for establishing rehabilitation priorities in the face of constrained resources. Furthermore, the results of repeated PCI monitoring over time can be used to determine the rate of deterioration and to estimate the time at which certain rehabilitation measures can be implemented.

Exhibit 1C shows the PCI map produced for the airport following the 2012 inspections. The map has been updated based on additional inspections from August 2017 by the master plan project team. There

PCI	Repair Type
86-100	Preventive Maintenance
71-85	
56-70	Major Rehabilitation
41-55	
26-40	Reconstruction
11-25	
0-10	



PCI Legend:	0-10	11-25	26-40	41-55	56-70	71-85	86-100

1 - Alligator Cracking (Medium)



2 - Block Cracking and Longitudinal Cracking (High)



3 - Longitudinal Cracking (Medium)



4 - Transverse Cracking (High)



5 - Longitudinal Cracking (High)



6 - Excellent Condition



7 - Excellent Condition



8 - Longitudinal Cracking (Medium)



are several pavement areas showing distress, as documented in the photos included on the exhibit. Recommendations for various pavement maintenance projects will be included in the capital improvement program associated with this master plan.

AIRFIELD LIGHTING SYSTEMS

Airfield lighting systems extend an airport's usefulness into periods of darkness and/or poor visibility. A variety of lighting systems are installed at the Airport for this purpose. These lighting systems, categorized by function, are summarized as follows.

Identification Lighting: The location of the Airport at night is universally identified by a rotating beacon. The rotating beacon projects two beams of light, one white and one green, 180 degrees apart. The rotating beacon is located atop a structure in proximity to the airport restaurant. The beacon operates sunset to sunrise.

Runway and Taxiway Lighting/Signage: Runway and taxiway edge lighting utilize light fixtures placed near the edge of the pavement to define the lateral limits of the pavement. This lighting is essential for safe operations during night and/or times of low visibility to maintain safe and efficient access to and from the runways and aircraft parking areas.

Runway 16-34 is equipped with medium intensity runway lights (MIRL). All taxiways are equipped with medium intensity taxiway edge lighting (MITL), except Taxiway G.

The Airport also has a runway/taxiway signage system. The presence of runway/taxiway signage is an essential component of a surface movement guidance control system necessary for the safe and efficient operation of the airport. The signage system installed at the airport includes runway and taxiway designations, holding positions, routing/directional, runway end and exits, and runway distance remaining. All airfield signs are lighted with LED lighting.

Visual Glide Slope Approach Aids: Both ends of the runway are equipped with precision approach path indicator (PAPI) systems. The PAPI system consists of light boxes that shine either a red or white light that the pilot is able to interpret to determine if they are on the correct glide path to the runway. The PAPI-2R serving Runway 16 is located on the right side of the runway approximately 700 feet from the runway threshold. It is set to a glide path of 4.00 degrees. Due to terrain, it is baffled and, therefore, not usable beyond three degrees to the right of centerline. The four-box PAPI-4R serving approaches to Runway 34 is on the right side of the runway, approximately 700 feet from the runway threshold. The glide path to this PAPI is set at 3.5 degrees.

Runway End Identifier Lights (REIL): Both ends of the runway are equipped with REILs, which are located adjacent to each side of the runway threshold. These flashing, strobe lights, provide rapid identification of the runway threshold up to 20 miles.

After-Hours Lighting: At night, the airfield lights are turned off. Pilots can activate airfield lights utilizing the pilot-controlled lighting (PCL) system. The PCL will activate the various elements on the airfield via a series of clicks with their microphone transponder on the common traffic advisory channel (CTAF) frequency 128.25 MHz. Three clicks will activate the runway, taxiway, and PAPI lights to low intensity. Five clicks will increase the intensity of the runway, taxiway, and PAPI lights to medium intensity. Seven clicks will increase the lighting intensity of the runway, taxiway, and PAPI lights to high intensity and it will turn on the REILs to high intensity.

The airport owns all lighting systems and navigational aids.

WEATHER AND COMMUNICATION AIDS

Wind Indicators: Friday Harbor Airport is equipped with three windsocks. The windsocks provide information to pilots regarding wind conditions, such as direction and intensity. The primary windsock is located on the east side of the runway, approximately 1,100 feet from the Runway 34 end. This windsock is situated within a segmented circle, which provides traffic pattern information to pilots. The second windsock is located between Taxiway B and runway near the Runway 16 threshold. The third windsock is located immediately adjacent to the helipad. This wind sock is intended to aid helicopter pilots using the helipad.

Automated Surface Observing System (ASOS): Friday Harbor Airport is served by an ASOS, which automatically records weather conditions, such as temperature, dew point, wind speed, altimeter setting, visibility, sky condition, and precipitation. The ASOS updates observations each minute, 24 hours a day, and this information is transmitted to pilots in the vicinity via a very high frequency (VHF) ground-to-air radio transmitter via frequency 135.675 MHZ or via a local telephone number (360-378-8491). A computer monitor is available in the terminal building for pilots to check weather and ASOS data.

Common Traffic Advisory Frequency (CTAF): The Friday Harbor Airport CTAF radio frequency is 128.25 MHz. CTAF is used by pilots in the vicinity of the airport to communicate with each other about approaches to or departures from the airport, as well as for PCL.

LANDSIDE FACILITIES

Landside facilities support the aircraft and pilot/passenger transition between air and ground. Typical landside facilities include the passenger terminal complex, on-airport buildings and hangars, general aviation facilities, and support facilities (i.e., fuel storage, vehicle parking, roadway access, and aircraft rescue and firefighting). An overview of the landside facilities and building inventory are depicted on **Exhibit 1D**.

AVIATION BUSINESSES

There are several aviation and non-aviation businesses based at the airport. Aeronautical Services is a multi-faceted business that provides aviation fuel and package delivery services for FedEx, UPS, and Airborne Express. San Juan Air Maintenance is a full-service aircraft maintenance provider based at the airport. Island Air provides air ambulance services using both helicopter and fixed-wing aircraft. They recently acquired a Cessna Caravan outfitted for life flight. Commercial carriers and charter flights also operate at the airport.

Many airports will have a fixed based operator (FBO) that provides direct aviation services to the general aviation community. These services may include fuel, line service, aircraft maintenance, pilot lounge facilities, weather reporting stations, and other services. These pilot and passenger services are available from different sources at Friday Harbor Airport.

The non-aviation businesses include an animal shelter, restaurant, college, and others. **Table 1E** lists the businesses on the airport.

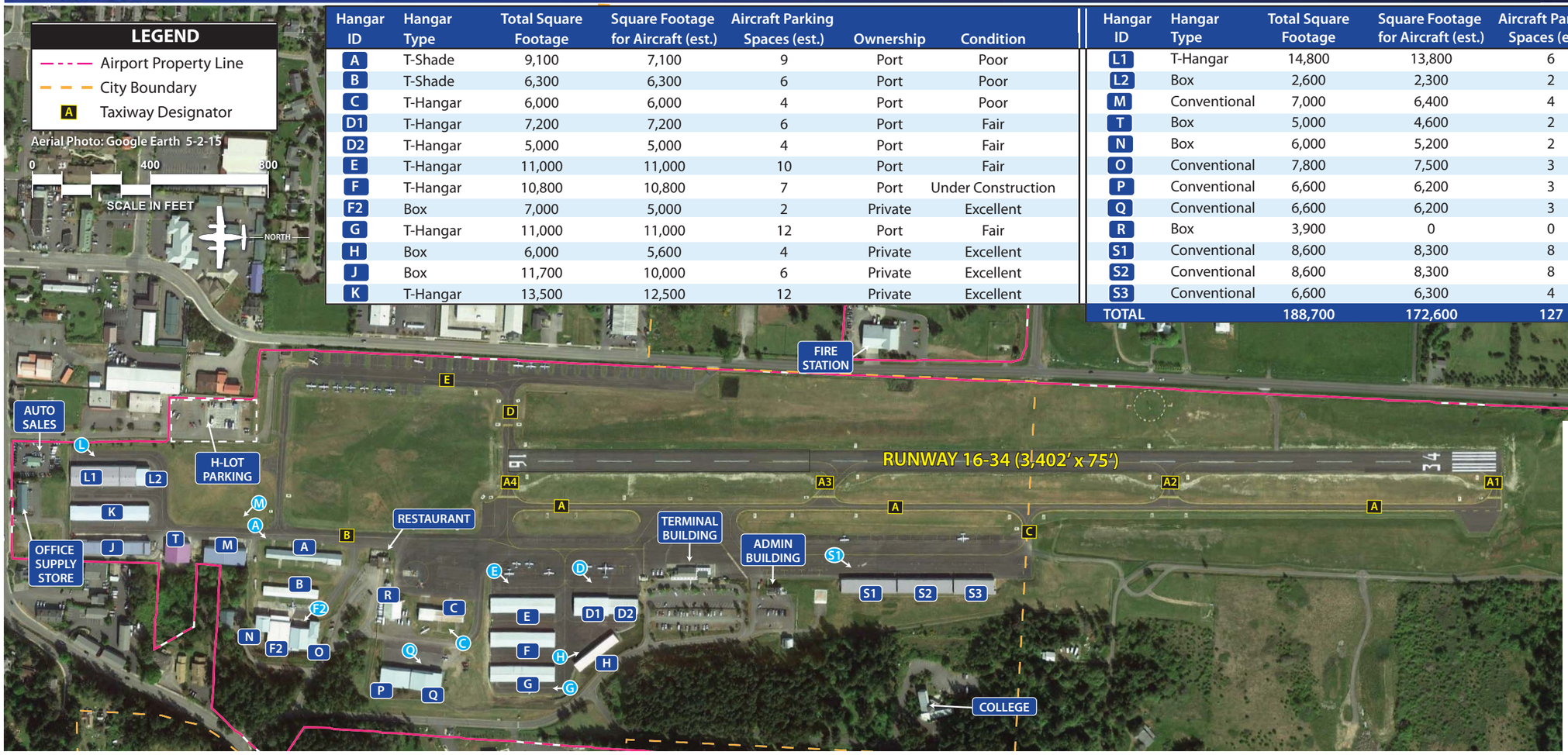
TABLE 1E
Airport Businesses
Friday Harbor Airport

Aviation Business Name	Business Function
Aeronautical Services	Package receiving and distribution for FedEx, UPS, and Airbourne Express. Fuel island management.
AeroClassic Aviation	Flight school, aerial tours
Friday Harbor Helicopters	Aerial tours, utility survey, aerial inspection
Island Air	Air ambulance, charter, pilot services, aircraft management
Kenmore Air	Commercial carrier
Northstar Air Tours	Commercial carrier (begin 2018)
San Juan Airlines	Commercial carrier
San Juan Air Maintenance	Aircraft maintenance
Sound Maintenance	Aircraft maintenance
Westwind Aviation	Charter carrier and flight school
Non-Aviation Business Name	**Business Function**
Animal Protection Society	Animal shelter
Ernie's Café	Restaurant
H-Parking Lot	Public parking/bus transfer
M & W Auto Sales	Auto sales
Office Center NW Inc.	Office supplies
San Juan Fire Department	Fire station
Skagit Valley College	Education

Source: Port of Friday Harbor

Hangar ID	Hangar Type	Total Square Footage	Square Footage for Aircraft (est.)	Aircraft Parking Spaces (est.)	Ownership	Condition
A	T-Shade	9,100	7,100	9	Port	Poor
B	T-Shade	6,300	6,300	6	Port	Poor
C	T-Hangar	6,000	6,000	4	Port	Poor
D1	T-Hangar	7,200	7,200	6	Port	Fair
D2	T-Hangar	5,000	5,000	4	Port	Fair
E	T-Hangar	11,000	11,000	10	Port	Fair
F	T-Hangar	10,800	10,800	7	Port	Under Construction
F2	Box	7,000	5,000	2	Private	Excellent
G	T-Hangar	11,000	11,000	12	Port	Fair
H	Box	6,000	5,600	4	Private	Excellent
J	Box	11,700	10,000	6	Private	Excellent
K	T-Hangar	13,500	12,500	12	Private	Excellent

Hangar ID	Hangar Type	Total Square Footage	Square Footage for Aircraft (est.)	Aircraft Parking Spaces (est.)	Ownership	Condition
L1	T-Hangar	14,800	13,800	6	Private	Excellent
L2	Box	2,600	2,300	2	Private	Excellent
M	Conventional	7,000	6,400	4	Private	Excellent
T	Box	5,000	4,600	2	Private	Excellent
N	Box	6,000	5,200	2	Private	Excellent
O	Conventional	7,800	7,500	3	Private	Excellent
P	Conventional	6,600	6,200	3	Private	Excellent
Q	Conventional	6,600	6,200	3	Private	Excellent
R	Box	3,900	0	0	Private	Fair
S1	Conventional	8,600	8,300	8	Private	Excellent
S2	Conventional	8,600	8,300	8	Private	Excellent
S3	Conventional	6,600	6,300	4	Private	Excellent
TOTAL		188,700	172,600	127		



WELCOME CENTER



TERMINAL BUILDING









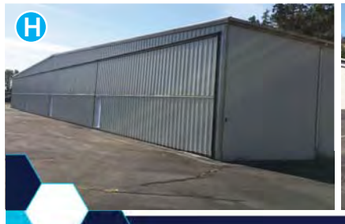


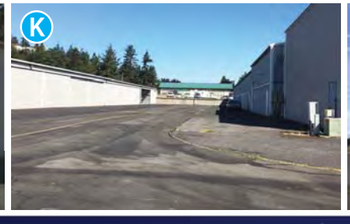




ADMINISTRATION BUILDING















FIRE STATION



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AIRCRAFT HANGARS

It is important to identify those hangars that may be used for storage/parking of active aircraft. By having a reasonable estimate of the baseline hangar capacity, a determination of future hangar needs can be made based upon forecast hangar demand. It is estimated that there is approximately 172,600 square feet of hangar space providing approximately 125 aircraft parking spaces at the airport. There is an additional 16,100 square feet of space in hangars that is dedicated to aircraft maintenance or office space functions.

Table 1F presents a list of the hangars at the Airport. The airport has available a variety of aircraft storage options. These include T-shade hangars, which are covered aircraft parking positions without hangar doors. T-Hangars are multiple individual aircraft storage units within a larger single structure. Box hangars are somewhat larger hangars, typically between 2,000 and 6,000 square feet in size. Conventional hangars are clear-span hangars that are typically larger than 6,000 square feet. Conventional hangars are often utilized for aviation businesses.

TABLE 1F
Aircraft Hangars
Friday Harbor Airport

Hangar ID	Hangar Type	Total Square Footage	Square Footage for Aircraft (est.)	Aircraft Parking Spaces (est.)	Ownership	Condition
A	T-Shade	9,100	7,100	9	Port	Poor
B	T-Shade	6,300	6,300	6	Port	Poor
C	T-Hangar	6,000	6,000	4	Port	Poor
D1	T-Hangar	7,200	7,200	6	Port	Fair
D2	T-Hangar	5,000	5,000	4	Port	Fair
E	T-Hangar	11,000	11,000	10	Port	Fair
F	T-Hangar	10,800	10,800	7	Port	Under Construction
F2	Box	7,000	5,000	2	Private	Excellent
G	T-Hangar	11,000	11,000	12	Port	Fair
H	Box	6,000	5,600	4	Private	Excellent
J	Box	11,700	10,000	6	Private	Excellent
K	T-Hangar	13,500	12,500	12	Private	Excellent
L1	T-Hangar	14,800	13,800	6	Private	Excellent
L2	Box	2,600	2,300	2	Private	Excellent
M	Conventional	7,000	6,400	4	Private	Excellent
T	Box	5,000	4,600	2	Private	Excellent
N	Box	6,000	5,200	2	Private	Excellent
O	Conventional	7,800	7,500	3	Private	Excellent
P	Conventional	6,600	6,200	3	Private	Excellent
Q	Conventional	6,600	6,200	3	Private	Excellent
R	Box	3,900	0	0	Private	Fair
S1	Conventional	8,600	8,300	8	Private	Excellent
S2	Conventional	8,600	8,300	8	Private	Excellent
S3	Conventional	6,600	6,300	4	Private	Excellent
TOTAL		**188,700**	**172,600**	**127**	-	

Source: Airport records.

COMMERCIAL TERMINAL COMPLEX

The passenger terminal complex is centrally located adjacent to Taxiway A. The major elements include a terminal building, terminal loop road, vehicle parking, and aircraft parking apron.

Terminal Building

The terminal building, constructed in 1985, is a single level, simple design, encompassing approximately 3,800 square feet of space. There are two aircraft gates designated for ground level boarding. Upon entering the terminal building, travelers can proceed to the two ticket counters to check in for their flight. A waiting room with seating for approximately 25 is available for travelers. Current tenants of the terminal building include Kenmore Air, San Juan Airlines, FedEx, and U.S. Customs. A flight planning office is also available.



Aircraft Access Gate



Waiting Lounge



Ticketing Counters



Public Entrance

Terminal Access Roadways

The terminal building is located on Franklin Drive, which is a two-lane terminal loop road, until it reaches the terminal building, where it is a one-way road. The loop road circles the primary terminal parking lot. Franklin Drive extends to San Juan Valley Road on the west side of the airport.

In front of the terminal building is the terminal curb which is available for passenger drop-off and pick-up. The terminal curb extends a distance of approximately 140 feet.

Vehicle Parking

The passenger terminal complex has a vehicle parking lot situated within the terminal loop road. The lower half of the lot, nearest the terminal building is paved and provides approximately 50 parking spaces. The upper half of the parking lot is unpaved and provides an additional 57 spaces.

SUPPORT FACILITIES

The previous sections addressed airside and landside facilities. This section discusses other related facilities that support airport operations.

Airport Rescue and Firefighting (ARFF)

Airports that have regularly scheduled commercial service utilizing aircraft with ten or more passenger seats are required to have available aircraft rescue and firefighting (ARFF) services. These airports must follow regulations outlined in 14 CFR Part 139, which includes the ability of ARFF responders to reach the center of the runway within three minutes of an emergency.

Since Friday Harbor is not a Part 139 airport and does not have commercial activity by aircraft with ten or more passenger seats, they are not required to meet this standard. However, emergency response is important for all airports and Friday Harbor is well-positioned for a rapid response. San Juan Island Fire Department Station #31 is located just east of the airfield on the east side of Mullis Street. This fire station is physically located on airport property for which they have an annual ground lease with the airport.

Airport Maintenance and Snow Removal

Airport operations personnel handle most airport maintenance and snow removal operations. Maintenance equipment is primarily stored in a small building located at the northwest end of the airport adjacent to several aircraft hangars. The building is outside the perimeter fence and is on higher terrain than the airfield.

Fuel Storage

Aviation fuel (AvGas) is available at the airport via self-serve pumps located in the north apron area. The storage of fuel is in two 10,000-gallon underground tanks, located below the pump system. Jet A fuel is not currently available at the airport. Over the last five years, an average of 35,000 gallons of fuel was sold. This underground fuel system is original to the 1960s and is in need of modernization.

Port of Entry

The airport is certified as a port of entry. U.S. Customs and Border Protection provides screening of all foreign visitors, returning American citizens, and imported cargo that enters the U.S. at the airport.

Security Fencing

The entirety of the airfield is enclosed with security fencing topped with three strands of barbed/razor wire. There is over 12,700 linear feet of fencing which is regularly inspected. The fencing also serves as a barrier to wildlife.

AIRPORT DOCUMENTS

There are a number of additional documents that the Airport maintains. The following briefly discusses each of these documents.

Minimum Standards and Rules and Regulations: This document outlines the minimum requirements for potential tenants and business operators. The standards outlined in this document are intended to encourage and ensure the provision of adequate services and facilities, economic health, and orderly development of aviation and related aeronautical activities.

Spill Prevention, Control, and Countermeasure Plan: This document provides guidance and regulations for the prevention and control of spills of potentially hazardous materials, particularly oil and fuel. It outlines procedures, including training, inspections, and storage requirements, for spill prevention. It provides a methodology for reporting and responding to spills.

Fly Friendly Program: The airport has an active fly friendly program. Pilots are suggested to climb to at least 1,100 feet MSL and turn after passing the marina to the north and the golf course to the south. A right-hand traffic pattern has been established for both runways. Pilots are asked to reduce aircraft power as safety and performance allow, when departing from the airport. Takeoffs between 10 p.m. and 7:00 a.m. are to be avoided. Pilots to and from the airport are asked to adhere to the fly friendly program suggestions; however, flight safety is the first priority and supersedes any of the fly friendly program suggestions.

HISTORICAL AERONAUTICAL ACTIVITY

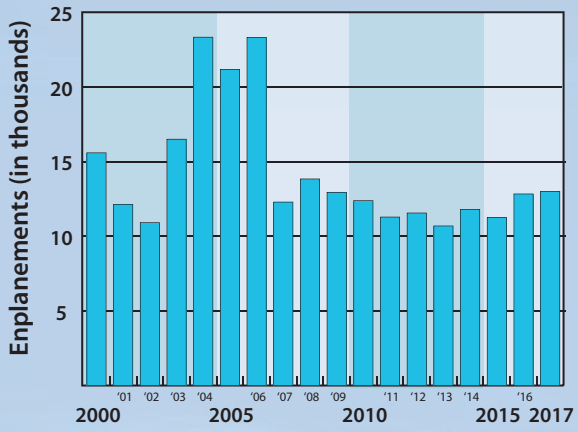
A key aspect of the master planning process is the documentation of historical activity levels for various aviation demand indicators. For Friday Harbor Airport, these include based aircraft, annual operations (takeoffs and landings), and enplanements (passenger boardings). Historical aeronautical activity is shown on **Exhibit 1E.** In the chapter to follow, forecasts of each of the aviation demand indicators will be developed, submitted to the FAA for review and approval, and will serve as the basis for future facility needs.

			Operations[2]		
Year	Enplanements[1]	Based Aircraft[2]	Local	Itinerant	Total
2000	15,585	123	NA	NA	NA
2001	12,129	123	NA	NA	NA
2002	10,911	123	NA	NA	NA
2003	16,497	128	19,019	53,674	72,693
2004	23,329	123	19,361	51,180	70,541
2005	21,172	123	18,791	48,110	66,901
2006	23,317	142	19,110	49,502	68,612
2007	12,287	142	19,429	50,491	69,920
2008	13,835	142	21,135	42,270	63,405
2009	12,940	145	24,715	34,131	58,846
2010	12,381	145	24,715	34,131	58,846
2011	11,283	145	20,478	28,288	48,766
2012	11,555	145	20,478	28,288	48,766
2013	10,688	145	20,478	28,288	48,766
2014	11,798	148	24,134	21,793	45,927
2015	11,254	148	24,134	21,793	45,927
2016	12,831	151	24,537	22,229	46,766
2017	13,000*	152	24,944	22,673	47,617

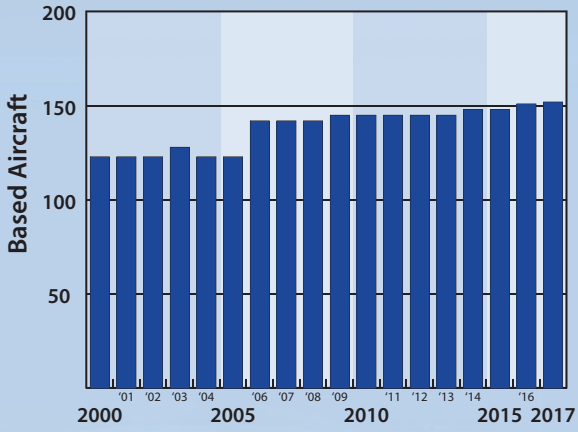
*Estimate based enplanements through September 2017.
[2]FAA Terminal Area Forecast (2017) - Fiscal Year

Source: [1]Air Carrier Activity Information System (ACAIS) - Calendar Year (CY)

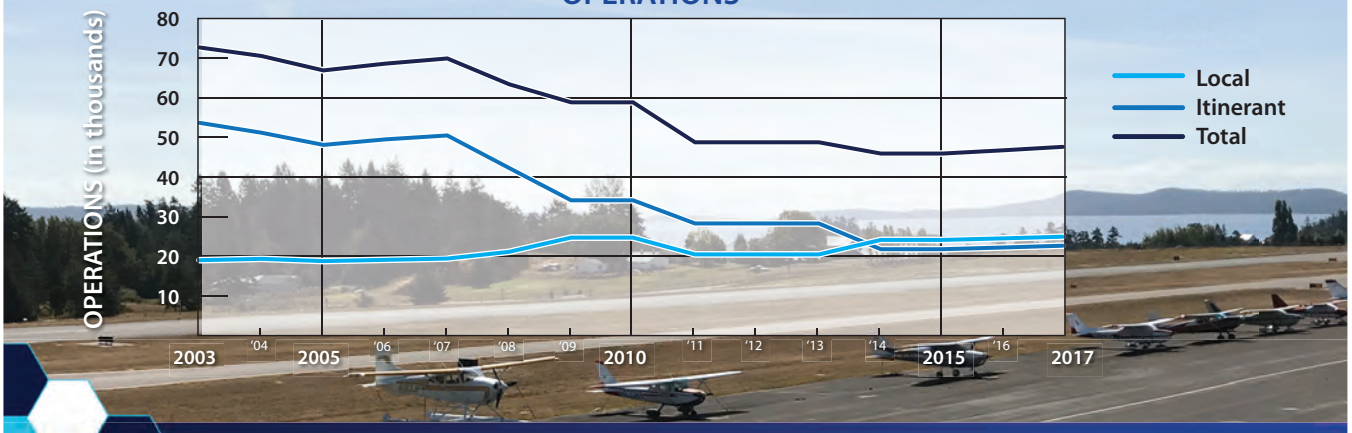
ENPLANEMENTS



BASED AIRCRAFT



OPERATIONS



BASED AIRCRAFT

Identifying the current number of based aircraft is important to master plan analysis, yet it can be challenging because of the transient nature of aircraft storage. This is especially difficult for an airport serving as a tourist/resort destination or a seasonal destination, like Friday Harbor. It is not unusual for aircraft owners to lease a hangar at the airport but only base there for a few months out of the year. At Friday Harbor, a physical count was undertaken that included only those aircraft based at the airport for at least six months of the year. Currently, there are 152 aircraft based at the Airport, which are comprised of 135 single engine piston planes, seven (7) multi-engine piston aircraft, four (4) turboprops, and six (6) helicopters.

The largest based aircraft are the turboprops, which are comprised of three (3) Cessna 208 Caravans and one (1) TBM 850. Four of the six helicopters are turboshaft as well.

AIRCRAFT OPERATIONS

Aircraft operations, being a take-off or landing, are classified as either local or itinerant. Local operations consist mostly of aircraft training operations conducted within the airport traffic pattern and are primarily characterized by touch-and-go and stop-and-go operations. Itinerant operations are arriving or departing aircraft which have an origin or destination away from an airport.

Aircraft operations are further sub-classified into four general categories: air carrier, air taxi, general aviation, and military. Air carrier operations are defined as those conducted commercially by aircraft having a seating capacity of 60 or more and/or a maximum payload capacity of 18,000 pounds. There are no air carrier operations at the airport. Air taxi operations can include small commercial service aircraft operations, air cargo, air ambulance, as well as general aviation aircraft used for the "on-demand" commercial transport of persons and property in accordance with 14 Code of Federal Regulations (CFR) Part 135 and Subchapter K of 14 CFR Part 91. There are frequent air taxi/commuter operations at the airport. All air taxi operations are itinerant in nature.

General aviation operations comprise the largest portion of activity at the airport. These are characterized by recreational and business aviation. The vast majority of general aviation activity is by piston engine aircraft. These operators perform both local and itinerant operations.

Military operations are by military aircraft and can be either local or itinerant in nature. The number of military operations is very low and primarily related to providing emergency services if conditions are too poor for civilian air ambulance operations. Occasionally, military helicopters will practice approaches using the NDB or provide life flight in poor weather conditions.

There is not an airport traffic control tower (ATCT) at the Airport; therefore, there is not a precise count of aircraft operations. The FAA estimates that in 2016, there were 46,766 total operations. This was comprised of 9,695 air taxi operations, 12,534 itinerant general aviation operations, and 24,537 local

general aviation operations. Approximately 48 percent of operations have been itinerant in nature with the remaining 52 percent being local.

PASSENGER ENPLANEMENTS

Commercial service airports provide local and regional access to the national and international aviation systems. As such, these airports are vital to interstate commerce, as well as a key component to local and regional economic infrastructure. These facilities support and can even drive growth in all socioeconomic categories.

An enplanement includes any revenue passengers that board an aircraft for a fare at an airport. This statistic is important in that it is utilized by the FAA to determine the annual level of entitlement funding dedicated to an airport under the Airport Improvement Program (AIP). As noted previously, an airport that exceeds 10,000 annual enplanements is eligible for a minimum one million dollars in annual entitlement funds. Airline passenger enplanements will typically be influenced by many factors, including number of airlines serving the airport, frequency of daily departures, types of aircraft used, and diversity of number of non-stop destinations.

Friday Harbor Airport has had regular commercial service for many years and they have consistently exceeded the 10,000-enplanement threshold. In 2016, there were 12,831 enplanements reported to the FAA. The peak enplanement levels were experienced in 2004, 2005, and 2006 when levels exceeded 20,000. In 2004, there were 23,329, which is the high level over the past 20 years.

In 2016, there were five carriers that reported enplanements. Kenmore Air (9,063 enplanements), Island Air (480 enplanements), West Wind Aviation (368 enplanements), Rite Brothers (27 enplanements), and San Juan Airlines (2,872). Each of these carriers utilized aircraft with nine or fewer seats. Kenmore Air utilized the largest aircraft, the nine-seat Cessna Caravan, to provide regularly scheduled service to and from Boeing Field in Seattle.

AREA AIRSPACE

The *Federal Aviation Administration Act of 1958* established the FAA as the responsible agency for the control and use of navigable airspace within the United States. The FAA has established the National Airspace System (NAS) to protect persons and property on the ground and to establish a safe and efficient airspace environment for civil, commercial, and military aviation. The NAS covers the common network of U.S. airspace including: air navigation facilities; airports and landing areas; aeronautical charts; associated rules, regulations, and procedures; technical information; and personnel and material. The system also includes components shared jointly with the military.

AIRSPACE STRUCTURE

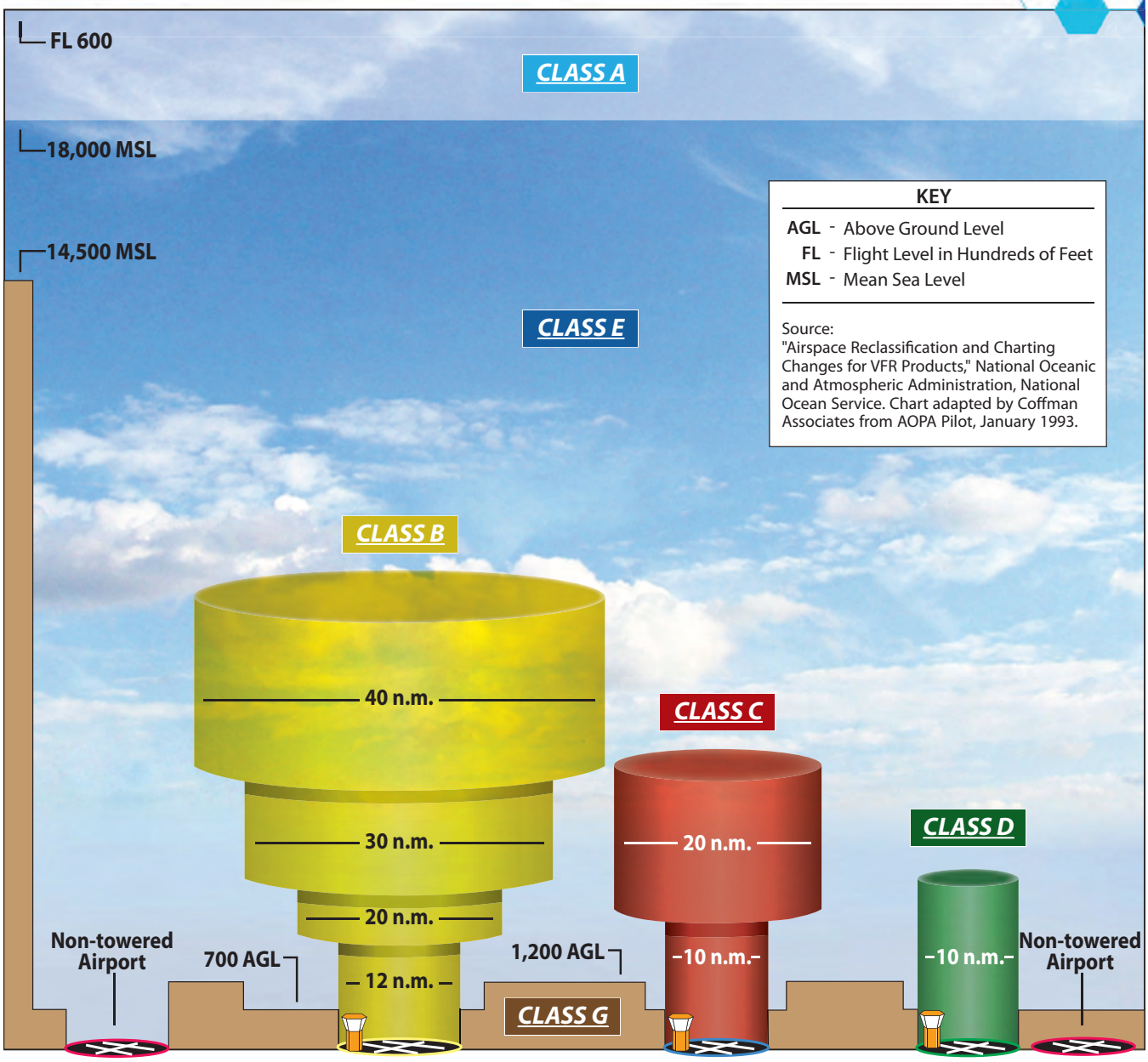
Airspace within the United States is broadly classified as either "controlled" or "uncontrolled." The difference between controlled and uncontrolled airspace relates primarily to requirements for pilot qualifications, ground-to-air communications, navigation and air traffic services, and weather conditions. Six classes of airspace have been designated in the United States, as shown on **Exhibit 1F**. Airspace designated as Class A, B, C, D, or E is considered controlled airspace. Aircraft operating within controlled airspace are subject to varying requirements for positive air traffic control.

Class A Airspace: Class A airspace includes all airspace from 18,000 feet mean sea level (MSL) to flight level (FL) 600 (60,000 feet MSL). This airspace is designated in FAR Part 71.193 for positive control of aircraft. The Positive Control Area (PCA) allows flights governed only under Instrument Flight Rule (IFR) operations. The aircraft must have special radio and navigation equipment, and the pilot must obtain clearance from an Air Traffic Control (ATC) facility to enter Class A airspace. In addition, the pilot must possess an instrument rating.

Class B Airspace: Class B airspace has been designated around some of the country's busiest commercial service airports, such as the Seattle-Tacoma International Airport (SEA). Class B airspace is designed to regulate the flow of uncontrolled traffic, above, around, and below the arrival and departure airspace required for high-performance, passenger-carrying aircraft at busy commercial service airports. This airspace is the most restrictive controlled airspace encountered by pilots operating under Visual Flight Rule (VFR). To the west of San Juan Island is the Haro Strait, which denotes the U.S./Canadian border. The Class B airspace surrounding Victoria International Airport extends to this border.

In order to fly within Class B airspace, an aircraft must be equipped with special radio and navigation equipment and must obtain clearance from air traffic control. Moreover, a pilot must have at least a private pilot's certificate or be a student pilot who has met the requirements of F.A.R. Part 61.95, which requires special ground and flight training for Class B airspace. Helicopters do not need special navigation equipment or a transponder if they operate at or below 1,000 feet and have made prior arrangements in the form of a Letter of Agreement with the FAA controlling agency. Aircraft are also required to have and utilize a Mode C transponder within a 30-nautical mile (NM) range of the center of Class B airspace. A Mode C transponder allows the ATCT to track the altitude of the aircraft.

Class C Airspace: The FAA has established Class C airspace at 120 airports around the country as a means of regulating air traffic in these areas. Class C airspace is designed to regulate the flow of uncontrolled traffic above, around, and below the arrival and departure airspace required for high-performance, passenger-carrying aircraft at some commercial service airports. In order to fly inside Class C airspace, the aircraft must have a two-way radio, an encoding transponder, and have established communication with the ATC. Aircraft may fly below the floor of the Class C airspace, or above the Class C airspace ceiling without establishing communication with ATC. The closest Class C airspace surrounds Whidbey Island Naval Air Station (NUW); however, this is not a public use airport. The closest public use airport with Class C airspace is Portland International Airport (PDX).



DEFINITION OF AIRSPACE CLASSIFICATIONS

CLASS A Generally airspace above 18,000 feet MSL up to and including FL 600.

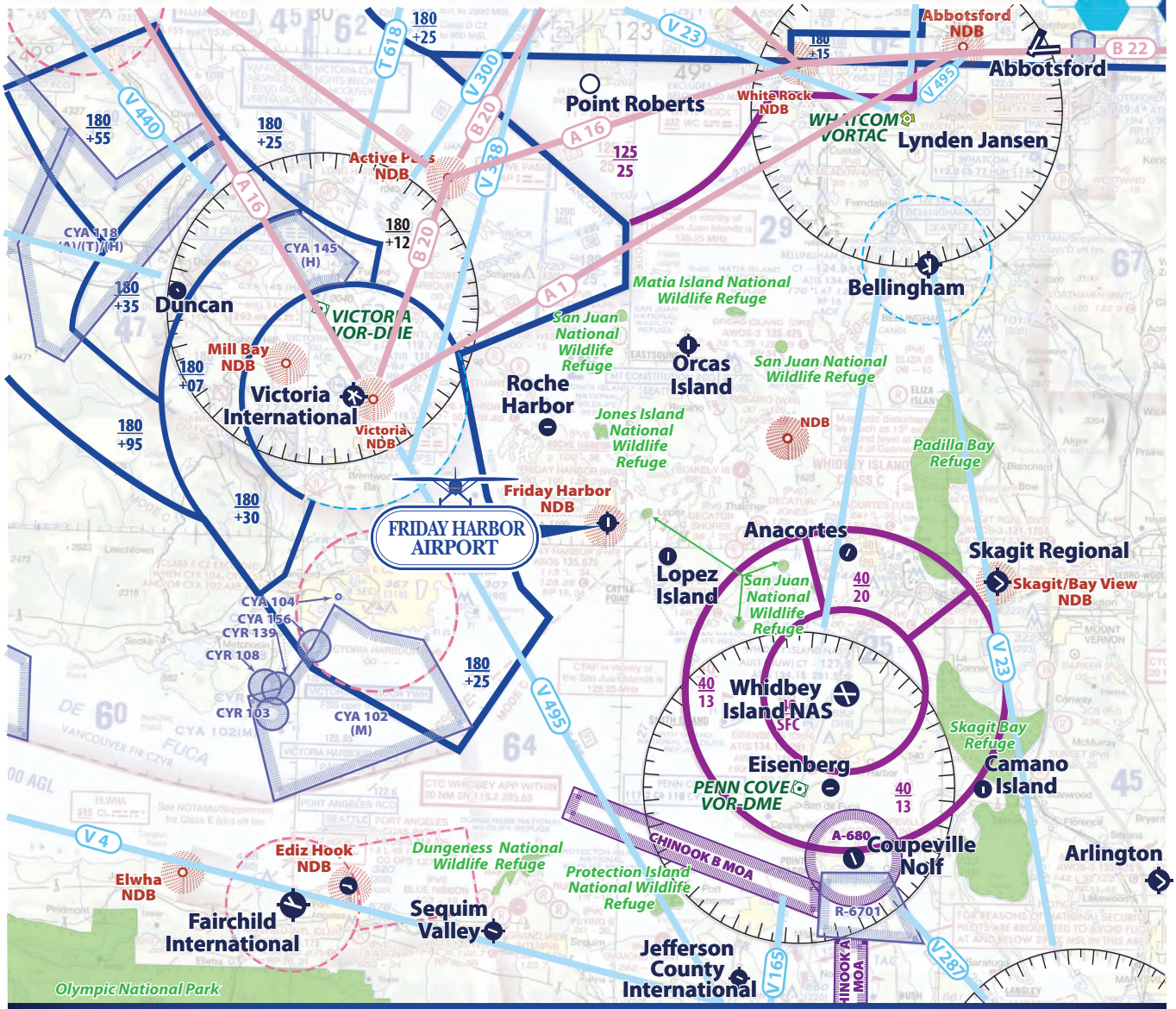
CLASS B Generally multi-layered airspace from the surface up to 10,000 feet MSL surrounding the nation's busiest airports.

CLASS C Generally airspace from the surface to 4,000 feet AGL surrounding towered airports with service by radar approach control.

CLASS D Generally airspace from the surface to 2,500 feet AGL surrounding towered airports.

CLASS E Generally controlled airspace that is not Class A, Class B, Class C, or Class D.

CLASS G Generally uncontrolled airspace that is not Class A, Class B, Class C, Class D, or Class E.



LEGEND

- Airport with other than hard-surfaced runway
- Airport with hard-surfaced runways 1,500' to 8,069' in length
- Airports with hard-surfaced runways greater than 8,069' or some multiple runways less than 8,069'
- Non-directional Radio Beacon (NDB)
- VORTAC
- VOR-DME
- Compass Rose
- Wilderness Area
- Victor Airways/Canadian Victor Airways?
- Class B Airspace
- Class C Airspace
- Class D Airspace
- Class E Airspace
- Class E (sfc) Airspace with floor 700 ft. above surface that laterally abuts 1200 ft. or higher Class E airspace
- Alert Area and MOA
- Prohibited, Restricted, and Warning Area; Canadian Advisory, Danger, and Restricted Areas

N

NOT TO SCALE

Source: Seattle Sectional Chart, US Department of Commerce, National Oceanic and Atmospheric Administration, 5/25/17

Class D Airspace: Class D airspace is controlled airspace surrounding airports with an Airport Traffic Control Tower (ATCT). Often, but not always, the ATCT at these airports is not open 24 hours a day. Bellingham International Airport (BLI) is the closest Class D airspace. The Class D airspace typically constitutes a cylinder with a designated horizontal radius from the airport, extending from the surface up to a designated vertical limit, above the airport elevation. If an airport has an instrument approach or departure, the Class D airspace sometimes extends along the approach or departure path. During periods when the airport's ATCT is closed, Class D airspace typically reverts to Class E airspace.

Class E Airspace: Class E airspace consists of controlled airspace designed to contain IFR operations near an airport, and while aircraft are transitioning between the airport and en route environments. Unless otherwise specified, Class E airspace terminates at the base of the overlying airspace. Only aircraft operating under IFR are required to be in contact with air traffic control when operating in Class E airspace. While aircraft conducting visual flights in Class E airspace are not required to be in radio communications with air traffic control facilities, visual flight can only be conducted if minimum visibility and cloud ceilings exist. Friday Harbor Airport falls within Class E airspace.

Class G Airspace: Airspace not designated as Class A, B, C, D, or E is considered uncontrolled, or Class G, airspace. Air traffic control does not have the authority or responsibility to exercise control over air traffic within this airspace. Class G airspace lies between the surface and the overlaying Class E airspace (700 to 1,200 feet above ground level [AGL]).

SPECIAL USE AIRSPACE

Special use airspace is defined as airspace where activities must be confined because of their nature or where limitations are imposed on aircraft not taking part in those activities. The designation of special use airspace identifies for other users the areas where military activity occurs, provides for segregation of that activity from other fliers, and allows charting to keep airspace users informed.

Military Operating Areas (MOAs): This special use airspace is established outside positive control areas to separate/segregate certain nonhazardous military activities from IFR traffic and to identify for VFR traffic where these activities are conducted. MOAs are established to contain certain military activities, such as air combat maneuvers, air intercepts, acrobatics, etc. The Chinook B MOA is the closest to Friday Harbor and is approximately 20 miles to the south.

Military Training Routes: Military training routes (MTRs) are designated airspace that has been generally established for use by high performance military aircraft to train below 10,000 feet AGL and in excess of 250 knots. There are VR (visual) and IR (instrument) designated MTRs. MTRs with no segment above 1,500 feet AGL will be designated with the VR or IR, followed by a four-digit number (e.g., VR1257). MTRs with one or more segments above 1,500 feet AGL are identified by the route designation followed by a three-digit number (e.g., VR540). The arrows on the route show the direction of travel. The closest MTR is IR348, beginning approximately 40 miles to the east and extending eastward.

Victor Airways: For aircraft arriving or departing the area using very high frequency omni-directional range (VOR) facilities, a system of Federal Airways, referred to as Victor Airways, has been established. Victor Airways are corridors of airspace eight miles wide that extend upward from 1,200 feet AGL to 18,000 feet MSL and extend between VOR navigational facilities. There are several Victor Airways in proximity to Friday Harbor, including V495 to the south and west, and V165 to the east.

Restricted Airspace: No person may operate an aircraft within a restricted area between the designated altitudes and during the time of designation without advanced permission of the using and controlling agency. The closest restricted airspace is R-6701 Admiralty Inlet, which is approximately 20 miles to the southeast. This restricted airspace is from the surface to 5,000 feet MSL. Restrictions are only in effect when a Notice to Airmen (NOTAM) has been issued. The controlling agency is Whidbey Island NAS Approach Control.

Exhibit 1F shows the airspace structure and the vicinity airspace (aeronautical sectional chart) surrounding Friday Harbor Airport.

AREA NAVIGATIONAL AIDS

Navigational aids are electronic devices that transmit radio frequencies, which pilots of properly equipped aircraft can translate into point-to-point guidance and position information. The types of electronic navigational aids available for aircraft flying to or from Friday Harbor Airport include a very high frequency omni-directional range (VOR) facility, the global positioning system (GPS), and a non-directional beacon (NDB).

The VOR, in general, provides azimuth readings to pilots of properly equipped aircraft, transmitting a radio signal at every degree to provide 360 individual navigational courses. Frequently, distance measuring equipment (DME) is combined with a VOR facility (VOR-DME) to provide distance as well as direction information to the pilot. Military tactical air navigation aids (TACANs) and civil VORs are commonly combined to form a VORTAC. The VORTAC provides distance and direction information to both civil and military pilots. The Penn Cove VOR-DME is located approximately 17 miles to the southeast on Whidbey Island. Other proximate facilities include the Victoria VOR-DME, the Whatcom VORTAC, and the Vancouver VOR-DME.

GPS is an additional navigational aid for pilots. GPS was initially developed by the United States Department of Defense for military navigation around the world. GPS differs from a VOR in that pilots are not required to navigate using a specific facility. GPS uses satellites placed in orbit around the earth to transmit electronic radio signals, which pilots of properly equipped aircraft use to determine altitude, speed, and other navigational information. With GPS, pilots can directly navigate to any airport in the country and are not required to navigate to a specific ground-based navigation facility.

A non-directional beacon (NDB) is a radio transmitter at a known location, used as an aviation or marine navigational aid. The signal transmitted does not include *inherent* directional information, in contrast to

other navigational aids, such as a VOR. NDB signals follow the curvature of the Earth, so they can be received at much greater distances at lower altitudes, a major advantage over VOR. The Friday Harbor NDB is located at the airport.

INSTRUMENT APPROACH PROCEDURES

Instrument approach procedures are a series of predetermined maneuvers established by the FAA, using electronic navigational aids that assist pilots in locating and landing at an airport, especially during instrument flight conditions. There are currently two published instrument approach procedures for Friday Harbor Airport. Instrument approach procedures are either precision in nature or non-precision. Precision instrument approaches provide both horizontal course guidance and vertical guidance. Non-precision instrument approaches provide only horizontal course guidance to the pilot; however, the relatively new GPS localizer performance with vertical guidance (LPV) approaches are currently categorized by the FAA as a non-precision approach, even though they provide both horizontal and vertical guidance.

The capability of an instrument approach procedure is defined by the visibility and cloud ceiling minimums associated with the approach. Visibility minimums define the horizontal distance the pilot must be able to see in order to complete the approach. Cloud ceilings define the lowest level a cloud layer (defined in feet above the ground) can be situated for the pilot to complete the approach. If the observed visibility or cloud ceilings are below the minimums prescribed for the approach, the pilot cannot complete the instrument approach. **Table 1G** summarizes FAA approved and published instrument approach procedures, including associated weather minimums for Friday Harbor Airport.

TABLE 1G
Instrument Approach Procedures
Friday Harbor Airport

	WEATHER MINIMUMS BY AIRCRAFT TYPE		
	Category A	**Category B**	**Category C**
RNAV (GPS) Runway 34			
LPV DA	359'/1⅛-mile		
LNAV/VNAV DA	405'/1¼-mile		
LNAV MDA	512'/1-mile		512'/1½-mile
Circling	607'/1-mile		707'/2-mile
NDB Runway 34			
Straight-In	692'/1-mile		700'/2-mile
Circling	687'/1-mile		800'/2-mile

Aircraft categories are based on the approach speed of aircraft, which is determined as 1.3 times the stall speed in landing configuration as follows:

Category A:	0-90 knots (e.g., Cessna 172)
Category B:	91-120 knots (e.g., Beechcraft KingAir)
Category C:	121-140 knots (e.g., Canadair Challenger, Boeing 737)
Category D:	141-166 knots (e.g., Gulfstream IV, Boeing MD-88)
Category E:	Greater than 166 knots (e.g., certain large military or cargo aircraft)

Abbreviations:
GPS - Global Positioning System
LPV - A technical variant of GPS (Localizer Performance with Vertical Guidance)
LNAV/RNAV/VNAV - A technical variant of GPS (Lateral, Area, Vertical Navigation)
DA - Decision Altitude (Used for non-precision approaches)
MDA - Minimum Decision Altitude
Note: (xxx'/ x-mile) = Cloud ceiling height/Visibility minimum

Source: U.S. Terminal Procedures (Effective September 14, 2017)

Instrument approaches based on the global positioning system (GPS) have become very common across the country. GPS is inexpensive, as it does not require a significant investment in ground-based systems by the airport or FAA. Runway 34 has a GPS/LPV instrument approach with visibility minimums as low as 1⅛-mile. There is an NDB instrument approach to Runway 34 with 1-mile visibility minimums as well. The current instrument approach plates are shown on **Exhibit 1G**.

LOCAL CONDITIONS AND PROCEDURES

Various pilot information services alert pilots to local conditions and procedures and identify potential obstructions in the vicinity of the airport which pilots should be aware:

- Noise abatement procedures are in effect;
- Runway 16 is the preferred calm wind runway;
- Ground is soft between the east side transient aircraft tie-down positions;
- Aircraft landing lights/forward lights should be turned on when in vicinity of the airport;
- Aircraft with wingspans greater than 55 feet must contact the airport manager for prior permission to operate;
- 32-foot tall building located 904 feet from Runway 16, 150 feet left of centerline, use 22:1 slope to clear; and
- 70-foot tall trees, 2,650 feet from Runway 34, use 34:1 slope to clear.

RUNWAY USE AND TRAFFIC PATTERNS

The Airport elevation is 112.7 feet above mean sea level. Both runway ends utilize non-standard right-hand traffic patterns with a traffic pattern altitude of 1,100 feet MSL. For noise abatement purposes, pilots are to use reduced power settings as safety and performance allow and climb to 1,100 feet MSL before turning when possible, and only after passing the marina for north flow, and the golf course for south flow. All operations should be avoided between 10:00 p.m. and 7:00 a.m., where feasible. Runway 16 is the prevailing runway and the calm wind runway, accounting for approximately 70 percent of operations. Runway 34 is typically used during summer months, when wind patterns change, and it accounts for approximately 30 percent of overall operations.

REGIONAL AIRPORTS/AIRPORT SERVICE AREA

The service area for an airport is typically defined by its proximity to other airports providing a similar level of service. However, as an island airport, physical geography is likely a larger influence. The service area for the Friday Harbor Airport is considered the whole of San Juan County. Other airports in the county will share this service area; however, as the county seat of government, with the largest and the only incorporated town, the Friday Harbor Airport is the most capable of the airports in the county. The

FRIDAY HARBOR, WASHINGTON | AL-6598 (FAA) | 17117

RNAV (GPS) RWY 34

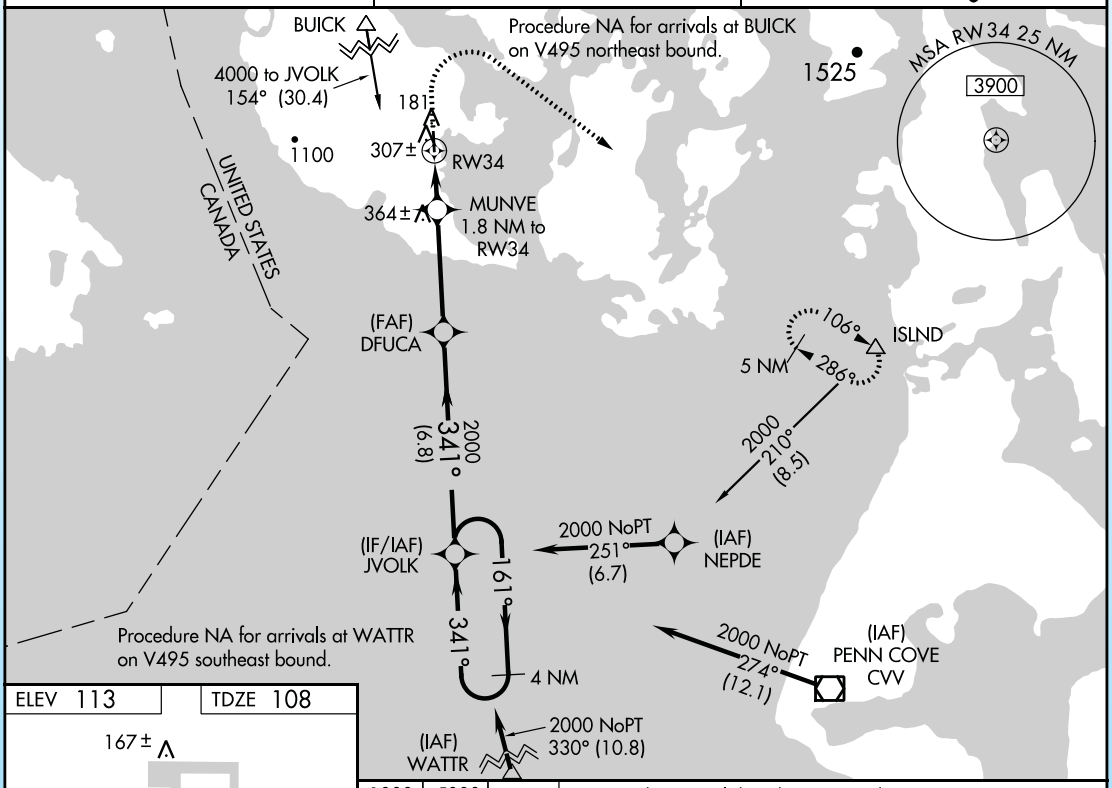
FRIDAY HARBOR (FHR)

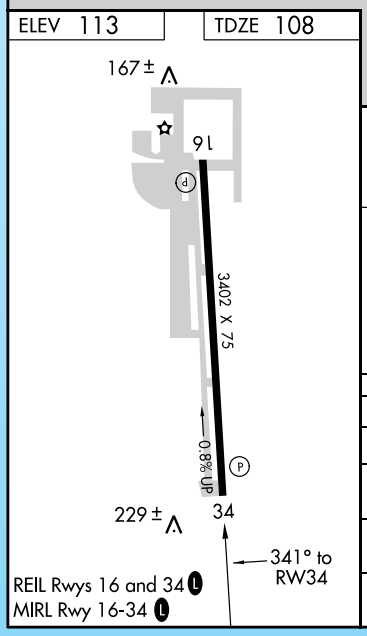
WAAS	APP CRS	Rwy Idg	3402
CH 40024	341°	TDZE	108
W34A		Apt Elev	113

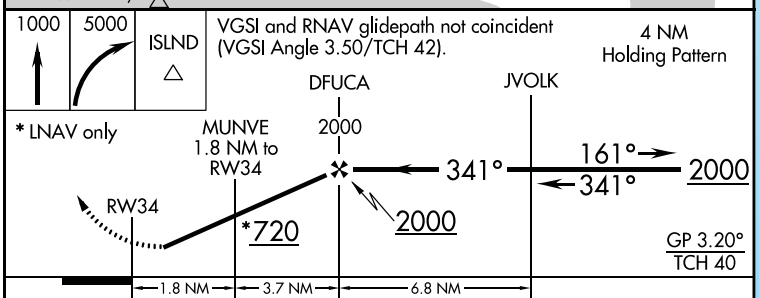
When VGSI inop, Circling Rwy 16 NA at night. Baro-VNAV NA when using Burlington/Mount Vernon altimeter setting. For uncompensated Baro-VNAV systems, LNAV/VNAV NA below -15°C (5°F) or above 43°C (109°F). When VGSI inop, Straight-in/Circling Rwy 34 procedure NA at night. Circling NA west of Rwy 16-34. DME/DME RNP-0.3 NA. Helicopter visibility reduction below 1 SM NA. When local altimeter setting not received, use Burlington/Mount Vernon altimeter setting; increase all DA 61 feet and all MDA 80 feet; increase LPV visibility all Cats ¼ mile, LNAV/VNAV visibility all Cats ¼ mile, LNAV visibility Cat C ¼ mile, and Circling visibility Cat C ¼ mile.

MISSED APPROACH: Climb to 1000, then climbing right turn to 5000 direct ISLND and hold, continue climb-in-hold to 5000.

ASOS	WHIDBEY APP CON	CTAF
135.675	118.2 285.65	128.25 L







CATEGORY	A	B	C	D
LPV DA	467-1⅛ 359 (400-1⅛)			NA
LNAV/VNAV DA	513-1¼ 405 (400-1¼)			NA
LNAV MDA	620-1 512 (600-1)		620-1½ 512 (600-1½)	NA
CIRCLING	720-1 607 (700-1)		820-2 707 (800-2)	NA

FRIDAY HARBOR, WASHINGTON
Amdt 2A 24JUL14

48°31'N-123°01'W

FRIDAY HARBOR (FHR)

RNAV (GPS) RWY 34

NW-1, 14 SEP 2017 to 12 OCT 2017

NW-1, 14 SEP 2017 to 12 OCT 2017

FRIDAY HARBOR, WASHINGTON | AL-6598 (FAA) | 17117

NDB RWY 34

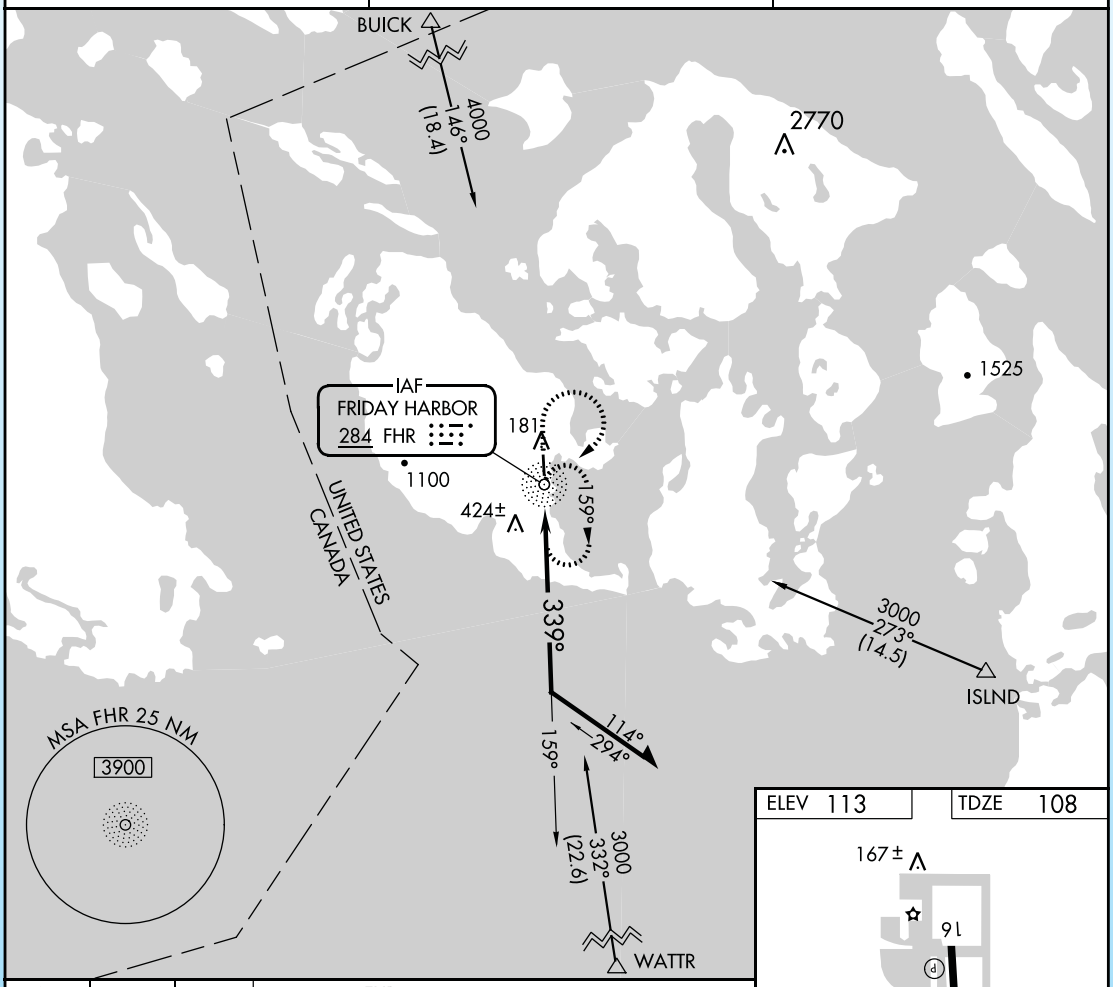
FRIDAY HARBOR (FHR)

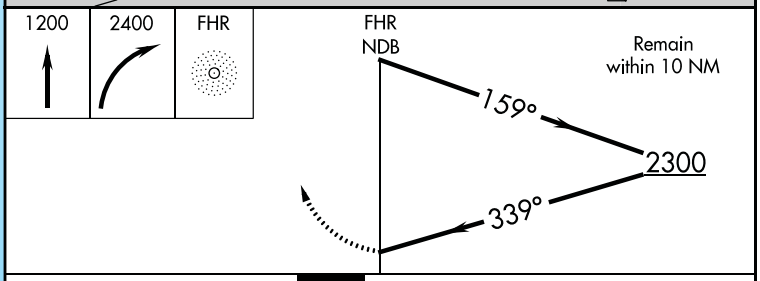
NDB FHR	APP CRS	Rwy Idg	3402
284	339°	TDZE	108
		Apt Elev	113

Circling NA west of Rwy 16-34.
Visibility reduction by helicopters NA.

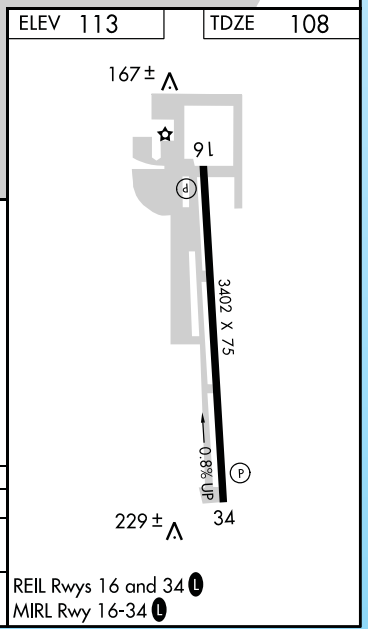
MISSED APPROACH: Climb to 1200 then climbing right turn to 2400 direct FHR NDB and hold, continue climb-in-hold to 2400.

ASOS	WHIDBEY APP CON	CTAF
135.675	118.2 285.65	128.25 (L)





CATEGORY	A	B	C	D
S-34	800-1	692 (700-1)	800-2 692 (700-2)	NA
CIRCLING	800-1	687 (700-1)	820-2 707 (800-2)	NA



REIL Rwys 16 and 34 (L)
MIRL Rwy 16-34 (L)

FRIDAY HARBOR, WASHINGTON
Amdt 2 23SEP10

48°31'N-123°01'W

FRIDAY HARBOR (FHR)
NDB RWY 34

NW-1, 14 SEP 2017 to 12 OCT 2017

NW-1, 14 SEP 2017 to 12 OCT 2017

next most significant airport is the Orcas Island Airport, located 12 nautical miles to the northeast, on Orcas Island. This airport has a 2,901-foot long paved runway and approximately 74 based aircraft. **Table 1H** presents summary information for public use airports within 30 miles of Friday Harbor.

TABLE 1H
Regional Airports

Airport	Air Miles/ Direction from FHR[1]	FAA Service Level[2]	State Service Level[3]	Based Aircraft[1]	Annual Operations[1]	Longest Runway (ft.)[1]	Lowest Visibility Minimum[1]
Friday Harbor Airport (FHR)	0	CS	Regional	152	46,800	3,402	1⅛-mile
Lopez Island Airport (S31)	5/SE	GA-Local	Community	24	9,900	2,904	NA
Roche Harbor Airport (WA09)	7/NW	NA	NA	20 (est.)	5,000 (est.)	3,593	NA
Orcas Island Airport (ORS)	12/NNE	CS/GA-Local	Community	74	41,600	2,901	1-mile
Anacortes Airport (74S)	17 / E	GA-Local	Community	53	9,100	3,015	NA
Skagit Regional (BVS)	28 / E	GA-Regional	Regional	124	61,700	5,478	⅞-mile
Bellingham Intl. Airport (BLI)	29 / NE	CS	Major	190	82,100	6,701	½-mile

CS: Commercial Service; GA: General Aviation
Source: [1]www.airnav.com; [2]NPIAS; [3]WASP

AREA LAND USE

Land uses in the vicinity of the Airport can have an impact on airport operations and growth potential. The following section identifies baseline land use zoning in the vicinity of Friday Harbor Airport. By understanding the land use issues surrounding the Airport, more appropriate recommendations can be made for the future of the Airport.

Exhibit 1H presents the current land use zoning in the vicinity of the Airport. The north half of the airport is in the Town of Friday Harbor. The southern half of the airport is in San Juan County. The airport property in the Town of Friday Harbor is zoned as Public Service for the areas accessible by aircraft, and commercial or industrial for remaining lands. The portion of airport property in San Juan County is zoned as Rural General. County lands adjacent and to the east, south, and west are zoned primarily as Agricultural Resource. Lands adjacent and to the north and northeast are zoned as Commercial, Industrial, and Light Manufacturing. A short distance to the northwest and east from the airport is residential areas.

SOCIOECONOMIC CHARACTERISTICS

For an airport planning study, socioeconomic characteristics are collected and examined to derive an understanding of the dynamics of growth within the study area. Socioeconomic information related to the approximate airport service area is an important consideration in the master planning process. The primary service area for Friday Harbor Airport is San Juan County. Other nearby counties and communities may influence aviation demand at the airport but will serve as a secondary service area.

The historic trend in elements, such as population, employment, and income, provides insight into the long-term socioeconomic condition of the region. This information is essential in determining aviation service level requirements, as well as forecasting aviation demand elements for airports. Aviation forecasts are typically related to the population base, economic strength of the region, and the ability of the region to sustain a strong economic base over an extended period of time.

Historical socioeconomic data was obtained from two primary sources:

- San Juan County – 2036 Comprehensive Plan Update Population Projections.
- Woods & Poole Economics - *Complete Economic and Demographic Data Source*, 2017 for employment and income. Woods & Poole utilizes information from the U.S. Census Bureau, as well as other national and state organizations for historic data to project future conditions. This is an FAA-approved source for socioeconomic data.

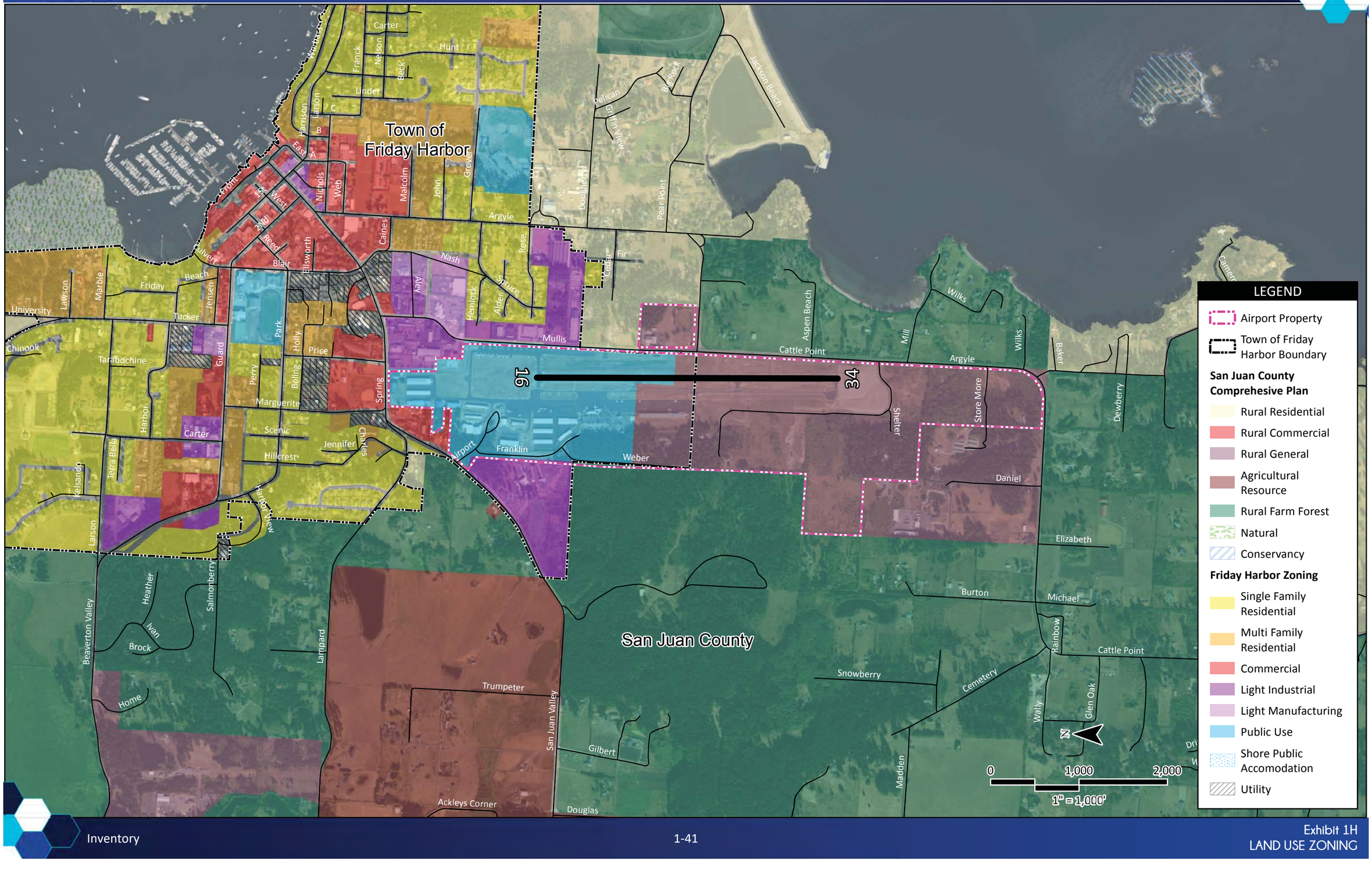
Table 1J presents historical socioeconomic data for San Juan County and the State of Washington. The population of San Juan County has grown at an annual rate of 0.89 percent since 2000. This population growth is primarily attributable to migration to the area, as the death rate exceeds the birth rate in the county. The population growth rate is somewhat lower than the state of Washington.

TABLE 1J
Area Socioeconomic Statistics
Friday Harbor Airport

	San Juan County			State of Washington		
Year	**Population[1]**	**Employment[2]**	**Income[2]**	**Population[2]**	**Employment[2]**	**Income[2]**
2000	14,120	9,282	51,392	5,910,512	3,531,556	39,435
2010	15,770	10,369	49,427	6,743,060	3,774,032	41,509
2011	15,859	10,340	51,170	6,823,229	3,818,125	42,437
2012	15,949	10,468	57,183	6,897,292	3,911,695	44,595
2013	16,040	10,519	55,962	6,973,281	3,993,878	44,431
2014	16,131	10,685	60,238	7,063,166	4,094,030	46,135
2015	16,222	10,979	60,489	7,170,351	4,197,153	47,381
2016	16,314	11,145	60,030	7,256,632	4,266,135	47,903
2017*	16,406	11,320	60,805	7,349,289	4,335,175	48,534
CAGR 2000-2017	**0.89%**	**1.17%**	**0.99%**	**1.29%**	**1.21%**	**1.23%**

[1] San Juan County Comprehensive Plan Update Population Projections 2017, as interpolated.
[2] Woods&Poole Economics - Complete Economic and Demographic Data Source (CEDDS)
* Estimate
CAGR: Compound Annual Growth Rate

Employment grew at an annual rate of 1.17 percent from 2000-2017, which is similar to that of the state as a whole. Employment in the area is heavily influenced by the tourism industry. Income in San Juan


Town of Friday Harbor
San Juan County
16
34
Carter
Hunt
Linder
Franck
Nelson
Beck
Warbass
Harrison
Larson
B
C
A
East
Front
1st
West
2nd
Reed
Blair
Ellsworth
Nichols
Web
Malcolm
John
Grover
Argyle
Caines
Nash
Rose
Spruce
Alder
Hemlock
Alley
Mullis
Fir
Cedar
Pear Point
Dougherty
Griffin View
Pelican
Bell Rock
Jackson Beach
Aspen Beach
Cattle Point
Wilks
Mill
Baker
Dewberry
Store More
Shelter
Daniel
Elizabeth
Burton
Michael
Rainbow
Cattle Point
Snowberry
Cemetery
Wally
Glen Oak
Madden
Gilbert
San Juan Valley
Trumpeter
Ackleys Corner
Douglas
Weber
Franklin
Airport
Jennifer
Charles
Scenic
Hillcrest
Carter
Harbor
Marguerite
Spring
Price
Holly
Park
Perry
Boling
Guard
Jensen
Beach
Friday
Marble
Lawson
University
Tucker
Chinook
Tarabochine
Terra Bella
Kelsando
Larson
Harbor View
Salmonberry
Heather
Ivan
Brock
Beaverton Valley
Home
Lampard
Camero
LEGEND
Airport Property
Town of Friday Harbor Boundary
San Juan County Comprehesive Plan
Rural Residential
Rural Commercial
Rural General
Agricultural Resource
Rural Farm Forest
Natural
Conservancy
Friday Harbor Zoning
Single Family Residential
Multi Family Residential
Commercial
Light Industrial
Light Manufacturing
Public Use
Shore Public Accomodation
Utility
N
0
1,000
2,000
1" = 1,000'

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County is quite high as compared to the state. This picturesque town attracts many people who may purchase a second home or are retirees. These groups tend to have more expendable income, which is an important consideration when forecasting aviation demand.

ENVIRONMENTAL INVENTORY

The Environmental Inventory addresses existing conditions at an airport and its environs. This inventory identifies relevant environmental resources that should be considered during preparation of the Airport Master Plan for Friday Harbor Airport. The inventory is organized using the resource categories contained in FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures* (2015). Available information regarding the environmental conditions at the Airport and within the surrounding area has been derived from internet resources, agency maps, and existing literature.

AIR QUALITY

The United States (U.S.) Environmental Protection Agency (EPA) established National Ambient Air Quality Standards (NAAQS) based on health risks for six pollutants:

- Carbon monoxide (CO)
- Nitrogen dioxide (NO_2)
- Sulfur dioxide (SO_2)
- Lead (Pb)
- Ozone (O_3)
- Two classifications of particulate matter (PM): PM measuring 10 micrometers in diameter or less (PM_{10}), and PM measuring 2.5 micrometers or less in diameter ($PM_{2.5}$)

An area with ambient air concentrations exceeding the NAAQS for a criteria pollutant is said to be a nonattainment area for the pollutant's NAAQS, while an area where ambient concentrations are below the NAAQS is considered an attainment area. The U.S. EPA requires that areas designated as nonattainment demonstrate how they will attain the NAAQS by an established deadline. To accomplish this, states are required to prepare State Implementation Plans (SIPs). SIPs are typically a comprehensive set of reduction strategies and emissions budgets designed to bring the area into attainment.

The Airport is in San Juan County, Washington. According to the U.S. EPA's *Green Book – National Area and County-Level Multi-Pollutant Information*, San Juan County is in attainment for all federal criteria pollutants.[1]

[1] U.S. EPA data current as of September 30, 2017 (https://www3.epa.gov/airquality/greenbook/anayo_wa.html)

BIOLOGICAL RESOURCES

U.S. Fish and Wildlife Service (USFWS) is charged with overseeing the requirements of the *Endangered Species Act* (ESA), specifically Section 7, which sets forth requirements for consultation to determine if a proposed action "may affect" a federally endangered or threatened species. If an agency determines that an action "may affect" a federally protected species, then Section 7(a)(2) requires the agency to consult with USFWS to ensure that any action the agency authorizes, funds, or carries out is not likely to jeopardize the continued existence of any federally-listed endangered or threatened species, or result in the destruction or adverse modification of critical habitat. If a species has been listed as a candidate species, Section 7(a)(4) states that each agency must confer with USFWS.

Given the Airport's coastal location, the *Fish and Wildlife Coordination Act* (1934)*, Marine Mammal Protection Act* (1972)*,* and *Magnuson-Stevens Fishery Conservation and Management Act* (1976) are also relevant. The *Fish and Wildlife Coordination Act* requires Federal agencies to consult with USFWS, National Marine Fisheries Service (NMFS), and appropriate state fish and wildlife agencies regarding the conservation of wildlife resources when proposed Federal projects may result in control or modification of the water of any stream or other water body. The *Marine Mammal Protection Act* protects all marine mammals and prohibits, with some exceptions, the taking of marine mammals in U.S. waters and by U.S. citizens on the high seas. The *Magnuson-Stevens Fishery Conservation and Management Act* governs the conservation and management of ocean fishing, including essential fish habitat.

Additional federal laws protecting wildlife and plants include the *Migratory Bird Treaty Act,* which prohibits activities that would harm migratory birds, their eggs, or nests, and the *Bald and Golden Eagle Protection Act*, which prohibits the taking (defined as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb") of bald and golden eagles, including their parts, nests, or eggs, without a permit. Executive Order (E.O.) 13312, *Invasive Species,* aims to prevent the introduction of invasive species because of a proposed action. E.O. 11990, *Protection of Wetlands* is discussed under the *Water Resources* section of this environmental inventory.

A USFWS Information for Planning and Consultation (IPaC) report indicates that there are five protected species and one candidate species potentially occurring at the Airport. In addition, the Biological Assessment for Friday Harbor Airport (ESA, July 2016) discovered species protected by the National Marine Fisheries Service that may be impacted by activities at the Airport. These species are listed in **Table 1K**, some of which have critical habitat[2] that could be impacted by Airport activities. Note that the designation of critical habitat does not mean the critical habitat is on Airport property, rather that the species has habitat that has been designated as critical.

[2] Critical habitat is the specific areas within the geographic area, occupied by the species at the time it was listed, that contain the physical or biological features that are essential to the conservation of endangered and threatened species and that may need special management or protection. Critical habitat may also include areas that were not occupied by the species at the time of listing but are essential to its conservation (USFWS).

TABLE 1K
Endangered Species Act and National Marine Fisheries Service Protected Species
Friday Harbor Airport

Species Name	Scientific Name	Federal Status	Species Effect Determination	Critical Habitat on Airport Property	Critical Habitat Effect Determination
Birds					
Marbled murrelet	*Brachyramphus marmoratus*	Threatened	NE	No	N/A
Streaked horned lark[1]	*Eremophila alpestris strigata*	Threatened	NE	No	N/A
Yellow-billed cuckoo[1]	*Coccyzu americanus*	Threatened	NE	N/A	N/A
Fishes					
Bull trout	*Salvelinu confluentus*	Threatened	NLAA	No	N/A
Southern (DPS) Pacific eulachon	*Thaleichthys pacifi-cus*	Threatened	NE	No	N/A
Puget Sound Chinook salmon	*Oncorhynchus tshawytscha*	Threatened	NLAA	Yes	NLAA
Steelhead trout	*Oncorhynchus mykiss*	Threatened	NLAA	No	N/A
Yelloweye rockfish	*Sebastes ruberrimus*	Threatened	NLAA	Yes	NE
Bocaccio rockfish	*Sebastes paucispinis*	Endangered	NLAA	Yes	NE
Canary rockfish	*Sebastes pinniger*	Threatened	NLAA	Yes	NE
Mammals					
Southern Resident Killer Whale	*Orcinus orca*	Endangered	NLAA	Yes	N/A
Flowering Plants					
Golden paintbrush[1]	*Castilleja levisecta*	Threatened	NE	No	N/A

[1] Extirpated from San Juan Island
DPS: Distinct Population Segment
N/A: Not Applicable because there is no critical habitat designated for this species
NE: No Effect
NLAA: May Affect, Not Likely to Adversely Affect
Source: Biological Assessment for Friday Harbor Airport (ESA, July 2016)

As listed in **Table 1K**, the Airport overlaps the critical habitats for several protected species, including the Puget Sound Chinook salmon, southern resident killer whale, [3] yelloweye rockfish, boraccio rockfish, and canary rockfish. Although these species do not occur directly on Airport property, their critical habitats in the North Bay could be impacted by activities on Airport property.

[3] Note that in addition to being protected by the *Endangered Species Act*, the Puget Sound Chinook salmon and killer whale are also protected species under the *Marine Mammal Protection Act* of 1972.

More specifically, there are four areas designated as critical habitat for the Puget Sound Chinook salmon in addition to the North Bay, including the Upper Willamette River, Lower Columbia River, Upper Columbia Spring, and Puget Sound. In addition to the critical habitats present for the Puget Sound Chinook salmon and the southern resident killer whale, there is suitable (not critical) habitat on and nearby Airport property for the marbled murrelet, as seen on **Exhibit 1J** (ESA, July 2016).

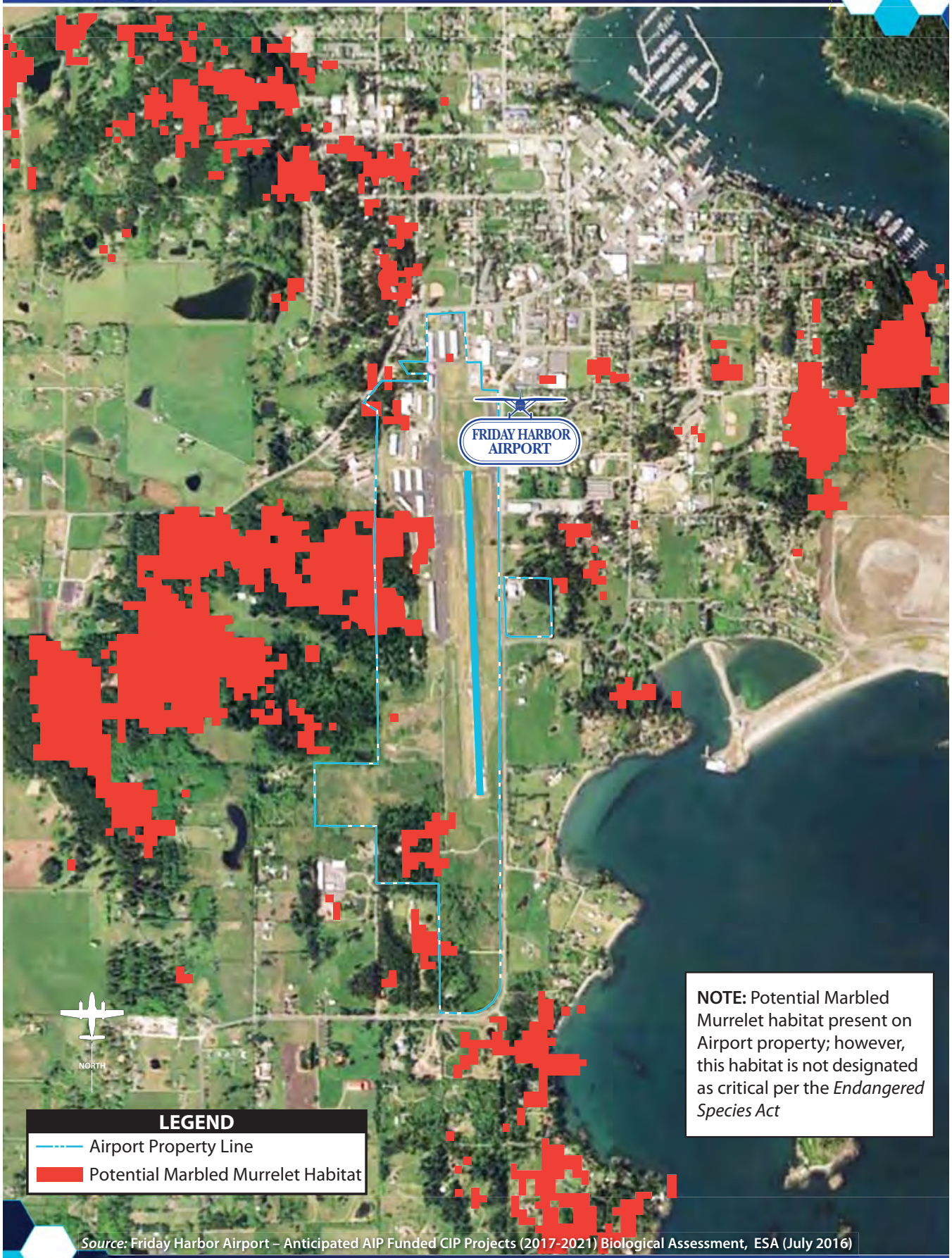
Other protected habitats near the Airport include the waters surrounding it (listed below), which are in the San Juan County/Cypress Island Marine Biological Preserve. These waters are overseen by the University of Washington Friday Harbor Laboratories (House Bill 68, R.C.W.28.77.230, 1969 Revision R.C.W.28B.20.320). Marine plants and animals within this marine biological preserve are collected for scientific purposes; however, many precautions are taken to minimize harm to the organisms and populations.[4] The San Juan County/Cypress Island Marine Biological Preserve includes five marine preserves,[5] only some of which are shown on **Exhibit 1K** given the scale of the exhibit:

1. Argyle Lagoon Biological Preserve, San Juan Island: This area is approximately 0.45 miles east of the Airport
2. Friday Harbor Biological Reserve, San Juan Island: This area is approximately 0.85 miles northeast of the Airport and consists of 476 acres.
3. False Bay Biological Preserve, San Juan Island: This area is approximately 2.60 miles southwest of the Airport. False Bay includes most of the approximately 300 acres of tidelands and 23.3 acres of upland property.
4. Cedar Rock Biological Preserve, Shaw Island: This area is approximately 3.90 miles northeast of the Airport. It is a 370-acre property composed of 10 contiguous parcels.
5. Fred and Marilyn Ellis Biological Preserve, Shaw Island: This area is approximately 2.30 miles northeast of the Airport and consists of 496 acres in three large, non-contiguous properties.

At its closest point, the San Juan Channel and Upright Channel Special Management Fishery Area is approximately one-half mile northeast; however, this special management district extends into the north and farther east, covering a total area of just over 10,000 acres.[6] This specially managed area was created in 1972 to protect the sea urchin and the sea cucumber. This reserve area prohibits non-tribal commercial fishers from harvesting these species in this area, and, by treaty, the tribes do not harvest the species in this area either.[7] The southern portion of this special management area can be seen on **Exhibit 1K**.

Table 1L lists bird species protected under the *Migratory Bird Treaty Act* and *Bald and Golden Eagle Protection Act* that may be affected by activities at the Airport. It is not an exhaustive list of every bird species potentially found at this location.

[4] Atlas of Marine Protection (http://www.mpatlas.org/mpa/sites/9016/)
[5] University of Washington, San Juan Archipelago Biological Preserves (https://faculty.washington.edu/cemills/UWSanJuanPreserves.html)
[6] Total area includes intertidal (93.5 acres) and subtidal areas (9,922.8 acres)
[7] Washington Department of Fish and Wildlife, Fishing and Shellfishing (http://wdfw.wa.gov/fishing/mpa/sanjuan_upright_channels.html)



Source: Friday Harbor Airport – Anticipated AIP Funded CIP Projects (2017-2021) Biological Assessment, ESA (July 2016)

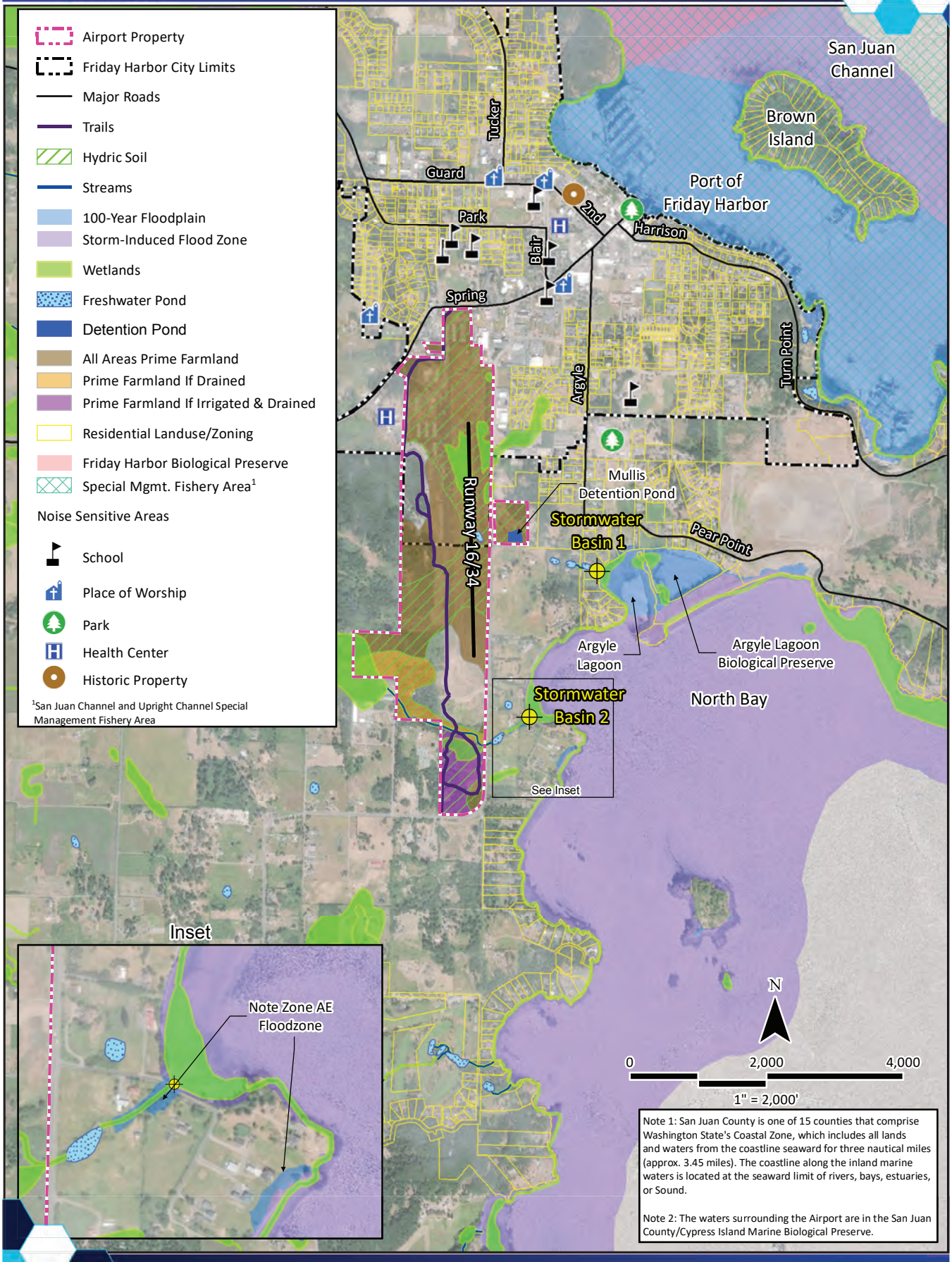

Airport Property
Friday Harbor City Limits
Major Roads
Trails
Hydric Soil
Streams
100-Year Floodplain
Storm-Induced Flood Zone
Wetlands
Freshwater Pond
Detention Pond
All Areas Prime Farmland
Prime Farmland If Drained
Prime Farmland If Irrigated & Drained
Residential Landuse/Zoning
Friday Harbor Biological Preserve
Special Mgmt. Fishery Area[1]
Noise Sensitive Areas
School
Place of Worship
Park
Health Center
Historic Property
[1]San Juan Channel and Upright Channel Special Management Fishery Area
San Juan Channel
Brown Island
Port of Friday Harbor
Tucker
Guard
Park
2nd
Harrison
Blair
Spring
Argyle
Turn Point
Runway 16/34
Mullis Detention Pond
Stormwater Basin 1
Pear Point
Argyle Lagoon
Argyle Lagoon Biological Preserve
Stormwater Basin 2
North Bay
See Inset
Inset
Note Zone AE Floodzone
N
0
2,000
4,000
1" = 2,000'
Note 1: San Juan County is one of 15 counties that comprise Washington State's Coastal Zone, which includes all lands and waters from the coastline seaward for three nautical miles (approx. 3.45 miles). The coastline along the inland marine waters is located at the seaward limit of rivers, bays, estuaries, or Sound.
Note 2: The waters surrounding the Airport are in the San Juan County/Cypress Island Marine Biological Preserve.

TABLE 1L
Birds Protected Under the *Migratory Bird Treaty Act* and *Bald and Golden Eagle Protection Act*
Friday Harbor Airport

Protected Species	Scientific Name	Breeding Season
Black oystercatcher	*Haematopus bachmani*	Apr 15 – Oct 31
Black turnstone	*Arenaria melanocephala*	Breeds elsewhere
Great blue heron	*Ardea Herodias*	March 15 – Aug 15
Lesser yellowlegs	*Tringa flavipes*	Breeds elsewhere
Marbled godwit	*Limosa fedoa*	Breeds elsewhere
Olive-sided flycatcher	*Contopus cooperi*	May 20 – Aug 31
Red-throated loon	*Galvia stellate*	Breeds elsewhere
Rufous hummingbird	*Selasphorus rufus*	Apr 15 – Jul 15
Semipalmated sandpiper	*Calidris pusilla*	Breeds elsewhere
Short-billed dowitcher	*Limnodromus griseus*	Breeds elsewhere
Whimbrel	*Numenius phaeopus*	Breeds elsewhere

Source: U.S. Fish and Wildlife Service Information for Planning and Consultation (accessed Sept. 2017)

CLIMATE

Carbon dioxide equivalent, or CO_2e, is used to describe different greenhouse gases (GHG) in a common unit. For any quantity and type of GHG, CO_2e represents the amount of CO_2 that would have the equivalent global warming potential.

The EPA's *Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990-2015*, found that the transportation sector, which includes aviation, accounted for 27 percent of U.S. greenhouse gas (GHG) emissions in 2015. Of this, aviation contributed 160.7 million metric tons (MMT) of carbon dioxide equiv lent (CO_2e), or nearly nine percent of all transportation emissions.[8, 9] Transportation sources include cars, trucks, ships, trains, and planes. Most of the GHG emissions from transportation are CO_2 emissions resulting from the combustion of petroleum-based products in internal combustion engines. Relatively insignificant amounts of methane (CH_4), hydrofluorocarbon (HFC) and nitrous oxide (N_2O) are emitted during fuel combustion.

From 1990 to 2015, total transportation emissions increased. The upward trend is largely due to increased demand for travel; however, much of this travel was done in passenger cars and light-duty trucks. In addition to transportation-related emissions, **Figure 1** shows all GHG emissions sources in the U.S. in 2015.

[8] Aviation activity consists of emissions from jet fuel and aviation gasoline consumed by commercial aircraft, general aviation, and military aircraft.
[9] Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2015, Table 2-13 (available: https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2015)

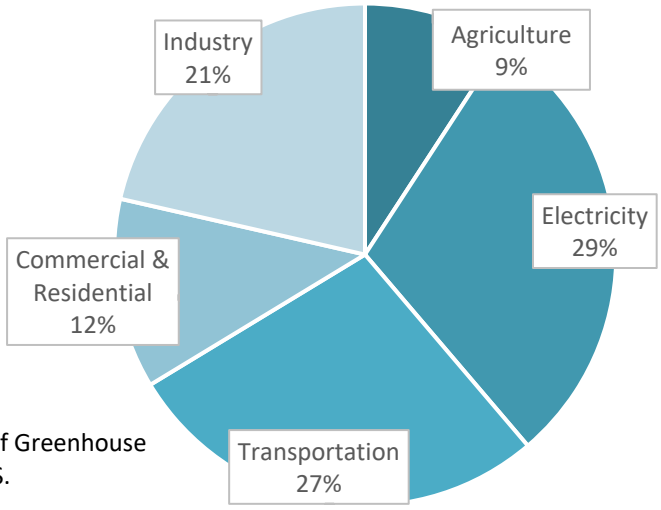


Figure 1 2015 Sources of Greenhouse Gas Emissions in the U.S.
Source: U.S. EPA (2017)

Increasing concentrations of GHGs can affect global climate by trapping heat in the Earth's atmosphere. Scientific measurements have shown that Earth's climate is warming, with concurrent impacts, including warmer air temperatures, rising sea levels, increased storm activity, and greater intensity in precipitation events. This climate change is a global phenomenon that can also have local impacts (Intergovernmental Panel on Climate Change, 2014). GHGs, such as water vapor (H_2O), carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and ozone (O_3), are both naturally occurring and anthropogenic (man-made).

Research has also shown a direct correlation between fuel combustion and GHG emissions. GHGs from anthropogenic sources include CO_2, CH_4, N_2O, hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). CO_2 is the most important anthropogenic GHG because it is a long-lived gas that remains in the atmosphere for up to 100 years.

The State of Washington has a mandatory Greenhouse Gas Reporting Program[10] that requires certain large facilities and transportation fuel suppliers to report GHG emissions to the Washington Department of Ecology. Owners or operators of the following are required to report:

- Facilities that emit at least 10,000 metric tons of carbon dioxide equivalent (CO_2e) of GHGs per year in Washington; and,
- Supplier of liquid motor vehicle fuel, special fuel, or aircraft fuel that supply products equivalent to at least 10,000 metric tons of CO_2 per year in Washington.

In the most recent report from May 2017, the closest airport facility listed as being required to report is the Seattle-Tacoma International Airport in Seattle.[11]

[10] Washington Department of Ecology (http://www.ecy.wa.gov/programs/air/permit_register/ghg/ghg.html)
[11] Washington Mandatory Greenhouse Gas Reporting Program – Reported Emissions for 2012 – 2015 (May 2017, http://www.ecy.wa.gov/programs/air/permit_register/ghg/PDFs/WA_GHG_Reporting_Data_2012-2015_ADA.pdf)

COASTAL RESOURCES

Federal activities involving or affecting coastal resources are governed by the *Coastal Barriers Resource Act*, the *Coastal Zone Management Act*, and E.O. 13089, *Coral Reef Protection*.

Fifteen counties make up the State of Washington's coastal zone, one of which is San Juan County, where the Airport is located. The coastal zone includes all lands and waters from the coastline seaward for three nautical miles (approximately 3.45 miles). The coastline along the inland marine waters is located at the seaward limit of rivers, bays, estuaries, or Sound. The *Coastal Zone Management Act* regulations provide that states must exclude from their coastal zone designations the lands that the federal government owns, leases, holds in trust, or otherwise has sole discretion to determine their use.

Although the Airport is only one-tenth of a mile west of the North Bay – which is where the protections of the *Coastal Zone Management Act* begin – the Airport is not located within a coastal zone.

DEPARTMENT OF TRANSPORTATION (DOT) ACT: SECTION 4(f)

Section 4(f) of the DOT Act, which was recodified and renumbered as Section 303(c) of Title 49 United States Code (USC), states that the Secretary of Transportation shall not approve any program or project that requires the use of any publicly owned land from a historic site, public park, recreation area, or waterfowl or wildlife refuge of national, state, regional, or local importance unless there is no feasible and prudent alternative to the use of such land, and the project includes all possible planning to minimize harm resulting from the use.

The term "use" includes not only the physical taking of such lands, but "constructive use" of such lands. "Constructive use" of lands occurs when "a project's proximity impacts are so severe that the protected activities, features, or attributes that qualify a resource for protection under Section 4(f) are substantially impaired" (Title 23 Code of Federal Regulations [CFR] Section 771.135).

Table 1M lists all nationally registered historic places, public parks, recreational facilities, and wildlife refuges within five miles of the Airport. There are no wilderness areas within five miles of the Airport. Section 4(f) resources in view are shown on **Exhibit 1K**.

On airport property, the Airport Walking Trail is located along the west side of the Airport. This trail is managed and maintained by the San Juan Island Trails Committee. The trail begins on West Spring Street and continues south through airport property just past Skagit Valley College. Part of the trail is a narrow path along the airport fence and through the woods, and it loops back on a paved road, open for emergency vehicles only, which goes all the way to Shelter road south of the runway.

TABLE 1M
Section 4(f) Protected Resources

Name	Distance from Airport	Direction from Airport
National Register of Historic Places		
San Juan County Courthouse	0.44 miles	Northeast
Tharald Homestead	3.10 miles	Northeast
Public Parks		
County Fairgrounds	0.25 miles	East
Circle Park	0.61 miles	Northeast
Recreation Facility		
Clark McAlpine Airport Walking Trail	0.00 miles	On-Airport
Wildlife Refuge		
Turn Island State Park[1]	2.13 miles	East

[1] Turn Island is a small island in the San Juan Islands. The entire island is preserved as Turn Island State Park and is located within the San Juan Islands National Wildlife Refuge.
Source: U.S. Geological Survey (accessed Sept. 2017)

In addition to properties registered with the National Register of Historic Places (NRHP), the Town of Friday Harbor[12] has several local, historic landmarks, two of which are also listed on the Washington State Heritage Register (WSHR). These include:

- Odd Fellows Hall (now Whale Museum), 0.50 miles northeast from Airport (listed on WSHR)
- Emmanuel Church, 1.0 miles southwest from Airport (listed on WSHR)
- Friday Harbor Town Hall, 0.47 miles northeast from Airport
- Vic's Drive Inn Restaurant, 0.40 miles northeast from Airport
- Old County Jail, 0.15 miles north from Airport
- Memorial Park, 0.55 miles northeast from Airport
- St. Francis Parish Church, 0.10 miles north from Airport
- Friday Harbor Brick and Tile Company (today Brickworks), 0.50 miles northeast from Airport
- Kirk / D'Arcy House, 0.27 miles northeast from Airport, 0.25 miles north from Airport
- San Juan County Bank (now Coldwell Banker building), 0.50 miles northeast from Airport
- Saloon Best, 0.50 miles northeast from Airport
- The Cannery Managers' Home (today The Doctor's Office), 0.50 miles northeast from Airport

FARMLANDS

The *Farmland Protection Policy Act* (FPPA) is intended to minimize the impact federal programs have on the unnecessary and irreversible conversion of farmland to nonagricultural uses. For FPPA, farmland includes prime farmland, unique farmland, prime farmland if drained, and land of statewide or local

[12] Historic Friday Harbor (http://historicfridayharbor.org/historic-landmarks/friday-harbor/)

importance. Farmland subject to FPPA requirements does not have to be currently used for cropland. It can also be forest land, pastureland, or other land, but not water or urban built-up land.

The U.S. Department of Agriculture, Natural Resources Conservation Service (USDA-NRCS) Web Soil Survey is a common source of information for soil types within mapped areas. According to the tool, 16 percent of Airport property is not prime farmland. Almost 17 acres of Airport property (8.2 percent) is considered prime farmland if drained and almost 15 acres in the southernmost portion of the Airport are prime farmland if irrigated and drained. Most of Airport property – 155.6 acres, or 77 percent – is considered prime farmland. These soils are shown on **Exhibit 1K**.

HAZARDOUS MATERIALS, SOLID WASTE, AND POLLUTION PREVENTION

Federal, state, and local laws, including the *Resource Conservation Recovery Act* (RCRA) and the *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA), as amended (also known as the Superfund), regulate hazardous materials use, storage, transport, and disposal. These laws may extend to past and future landowners of properties containing these materials. Disturbing areas that contain hazardous materials or contaminants can cause significant impacts to soil, surface water, groundwater, air quality, and the organisms using these resources.

According to the EPA's EJSCREEN, there are no brownfields[13], Superfund[14] sites, or facilities handling hazardous and/or toxic waste near the Airport. The closest solid waste transfer station and recycling facility is the San Juan Transfer Station, located approximately two miles north of the Airport, at 212 Sutton Street.

HISTORICAL, ARCHITECTURAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

Determination of a project's environmental impact to historic and cultural resources is made under guidance in the *National Historic Preservation Act* (NHPA) *of 1966*, as amended, the *Archaeological and Historic Preservation Act* (AHPA) *of 1974*, the *Archaeological Resources Protection Act* (ARPA), and the *Native American Graves Protection and Repatriation Act* (NAGPRA) *of 1990*, among others. Impacts can occur when a proposed project causes an adverse effect on a property which has been identified (or is unearthed during construction) as having historical, architectural, archaeological, or cultural significance.

[13] A brownfield is a property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutants, or contaminant (U.S. EPA).
[14] A Superfund site is any land in the U.S. that has been contaminated by hazardous waste and identified by the EPA as a candidate for cleanup as it poses a human health risk and/or the environment (U.S. Department of Health and Human Services).

As mentioned previously, there are two sites listed on the NRHP near the Airport, the San Juan County Courthouse (0.44 miles northeast) and Tharald Homestead (3.10 miles northeast).

The nearest Indian/Native American tribal lands belong to the Samish Indian Nation. The Tribe's traditional territory stretches over a wide, seven-county region of the Salish Sea in Northwest Washington, from the tops of the Cascades Mountains to the far western shores of the San Juan Islands, which includes lands around the Airport. The Samish Indian Nation has continuously existed as a functioning tribal government since 1792.[15] Federally-recognized Native American tribes are acknowledged as independent sovereign nations with their own government process. E.O. 13175, *Consultation and Coordination with Indian Tribal Governments*[16], requires federal agencies to make a reasonable and good faith effort to identify Native American tribes that may attach a religious and/or cultural significance to a resource that might be affected by an airport action as part of analysis of historic, architectural, archaeological, and cultural consultation process. The federal agency is required to invite all affected tribes as a consulting party to assist in identifying resources in the study area.

In the instance a non-federally recognized tribe is affected by an airport undertaking, those tribes that have expressed interest in the airport action should be invited to participate in the consultation process.

LAND USE

Existing zoning and land use around the Airport are discussed earlier in this chapter and illustrated on **Exhibit 1H**. In addition to the residential, commercial, and industrial/manufacturing uses surrounding the lands north of Airport property, there are recreational walking trails on Airport property that connect to the greater trail network of Friday Harbor. The Clark McAlpine Trail, which is along the west side of the Airport, was built by the Port of Friday Harbor. This trail begins on West Spring Street and continues through Airport property near Skagit Valley College. Part of it is a narrow path along the Airport fence and through the woods before it loops back onto a paved road open for emergency vehicles only that goes all the way to Shelter Road south of the Airport. In 2005, the San Juan Islands Trail Committee added a loop trail south of Shelter Road connecting to Cattle Point Road near its intersection with Golf Course Road. These trails are shown on **Exhibit 1K**.[17]

Additionally, in the *Town of Friday Harbor Comprehensive Plan* (2002), the Transportation and Land Use Chapters have the following goals related to the Airport and land use compatibility.

[15] Samish Indian Nation (https://www.samishtribe.nsn.us)
[16] Executive Order 13175, *Consultation and Coordination with Indian Tribal Governments*. 65 Federal Register 67249, November 9, 2000.
[17] San Juan Islands Trails (http://sanjuanislandtrails.org/trailsw/airport/)

Transportation

Goal TE-32

"To achieve the greatest compatibility between air transportation facilities and operation and adjacent land uses while assuring adequate, safe and convenient service."

Goal TE-33

"Friday Harbor should cooperate with Washington Department of Transportation (WSDOT), San Juan County and Port of Friday Harbor to provide air transportation facilities that:

- *Are scaled to serve the needs of Town and island residents;*
- *Are planned in a coordinated and comprehensive manner;*
- *Are planned to protect the character of the Town and its neighborhoods; and*
- *Are consistent with the goals and policies in the Land Use Element."*

Goal TE-35

"Friday Harbor should help mitigate the impacts of air transportation facilities by… minimizing the adverse impacts of lights and noise on adjacent properties."

Goal TE-36

"Friday Harbor should coordinate with the Port of Friday Harbor to ensure that long term operation of the Friday Harbor Airport is compatible with surrounding land uses and consistent with the Comprehensive Plan by: identifying land use types and intensities that are compatible with the airport."

Land Use

Goal PS-3

"Ensure that the quality of life of neighboring areas is not diminished by the siting of public schools or public airports."

Goal PS-5

"Protect public airports from encroachment by incompatible development or uses."

NATURAL RESOURCES AND ENERGY SUPPLY

Energy usage at the Airport, including aviation fuel consumption and utility providers, are discussed in greater detail earlier in the chapter.

NOISE AND COMPATIBLE LAND USE

Federal land use compatibility guidelines are established under 14 CFR 150, *Airport Noise Compatibility Planning*. Per 14 CFR 150, residential land uses and schools are noise-sensitive land uses that are not

considered compatible with a 65 decibel (dB) Day-Night Average Sound Level (DNL).[18] Other noise-sensitive land uses (such as religious facilities, hospitals, or nursing homes), if located within a 65 dB DNL contour, are generally compatible when an interior noise level reduction of 25 dB is incorporated into the design and construction of the structure. Special consideration also needs to be given to noise-sensitive areas within Section 4(f) properties where the land use compatibility guidelines in 14 CFR 150 do not account for the value, significance, and enjoyment of the area in question (FAA 2015).

As noted in **Table 1N**, there are several noise-sensitive land uses near the Airport (uses in **Table 1N** are shown on **Exhibit 1K**). To reduce unwanted noise in the community, the Port of Friday Harbor has published noise abatement procedures for pilots to adhere to when safe. This "Fly Friendly Program" assists pilots and minimizes aircraft noise on San Juan Island by maintaining the highest FAA-advised altitude over the noise-sensitive residential areas around the Airport. The identified noise-sensitive areas that are published on the Noise Abatement Handout are shown on **Exhibit 1L**.

TABLE 1N
Noise-Sensitive Uses

Name	Distance from Airport[1]	Direction from Airport
Medical Facilities		
San Juan County Health Services	0.40 miles	Northeast
Peace Island Medical Center (shares a fence line w/airport)	0.1 mile	West
Places of Worship		
The Church of Jesus Christ of Latter-Day Saints	0.25 miles	Northwest
Seventh Day Adventist Church	0.15 miles	Northwest
St. David's Episcopal Church	0.30 miles	North
Calvary Chapel San Juan	0.20 miles	North
Christian Science Society	0.45 miles	Northeast
Friday Harbor Presbyterian	0.30 miles	Northeast
Schools and Daycares		
Friday Harbor Elementary School	0.40 miles	East
Spring Street International School	0.30 miles	Northeast
Alphabet Soup Child Care	0.20 miles	North
Children's House Montessori	0.25 miles	North
Christ the King Community Church Paideia School	0.20 miles	North
Friday Harbor High School	0.40 miles	Northeast
Residential		
Rural, Single-Family, and Multi-Family Residential	0.00 to 0.05 miles	Northwest, north and northeast

[1] An approximate measurement from the closest point of Airport property to a given noise-sensitive use
Source: U.S. Geological Survey (accessed Sept 2017)

[18] Noise-sensitive land uses are generally residences, places of worship, hospitals and health care facilities, and educational facilities. Places of worship are defined as permanently established facilities intended solely for use as places of worship and not meant to be converted to other potential uses. For a hospital and/or health care facility to be considered a noise-sensitive medical facility, it must provide for overnight stays or provide for longer recovery periods, where rest and relaxation are key considerations for use of the facility. Schools are facilities that provide full time use for instruction and training to students.



Source: Port of Friday Harbor Airport (2005)

In addition to being cognizant of the noise-sensitive areas surrounding the Airport, the Town of Friday Harbor Comprehensive Plan promotes compatibility in Goal TE-34 that says, "Friday Harbor should promote recognition by pilots and other air transportation users of their roles in minimizing air traffic safety hazards, **noise**, traffic and other adverse impacts on surrounding land uses." Goal TE-35 reiterates the importance of mitigating noise impacts on adjacent properties. However, note that mitigating noise impacts on noise-sensitive uses is not a component of the airport master planning process.

SOCIOECONOMIC IMPACTS, ENVIRONMENTAL JUSTICE, AND CHILDREN'S ENVIRONMENTAL HEALTH AND SAFETY RISKS

This resource category relates to the socioeconomics of the community surrounding an airport, any potential environmental justice areas[19], and a focus on children's well-being as it relates to environmental health and safety risks.

There are 2,075 people in the Town of Friday for whom the poverty status has been determined, which is broken out by age and by race in **Table 1P**. The most affected demographic is those who are White alone (10.9 percent) and between the ages of 18 to 64 years (8.3 percent).

As previously discussed, there are residential land uses, elementary schools, public parks, and a hospital located within one mile of the Airport. The closest landfill is two miles away from the Airport.

TABLE 1P
Population Demographics
Town of Friday Harbor

Race	Total
Poverty Status by Age	
Under 18 years	56 (2.7%)
18 to 64 years	173 (8.3%)
65 years and older	31 (1.5%)
Total population[1]	**2,075**
Poverty Status by Race	
White alone	226 (10.9%)
Black or African American alone	0 (0%)
American Indian and Alaska Native alone	0 (0%)
Asian alone	0 (0%)
Native Hawaiian and other Pacific Islander alone	0 (0%)
Some other race alone	20 (0.96%)
Two or more races	8 (0.39%)
Total Population[1]	**2,075**

[1] For whom poverty status is determined
Source: 2011-2015 American Community Survey Five-year Estimates (Table S1701: Poverty Status in the Last 12 Months).

[19] Environmental justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.

VISUAL EFFECTS

Visual effects deal broadly with the extent to which the proposed action or alternative(s) would either: 1) produce light emissions that create annoyance or interfere with activities (Light Emissions); or 2) contrast with, or detract from, the visual resources and/or the visual character of the existing environment (Visual Resources and Visual Character).

Visual, or scenic resources, are discussed in three sections of the Town of Friday Harbor's Municipal Code: Chapter 13.16 (Water Use Restrictions), Chapter 14.04 (Regulations), and Chapter 19.04 (Shoreline Master Program).

Chapter 13.16. Water Use Restrictions

Section B, Number 7, states that use of water for aesthetic or scenic purposes is prohibited, except where necessary to support fish life.

Chapter 14.04. Regulations

Section 14.04.010, in the context of signage throughout the Town, this section encourages advertising signs that enhance and protect the natural scenic beauty of the town and using signs that are in harmony with buildings, natural settings, neighborhoods, and other signs.

Chapter 19.04. Shoreline Master Program

Section 19.04.160 has a policy that says any development near or on a shoreline should be designed to do minimal damage to the scenic and ecological qualities of the area.

Section 19.04.270, Section B, Number 2, states that any area that is considered to have a high scenic value in its natural states the criteria to be designated as a natural area.
Section 19.04.270, Section C, Number 1 designates a management policy that says natural areas should be kept free of all development that would adversely affect their character and scenic value.

Section 19.04.460, Section B, Numbers 3 and 4 specifically regulate residential development standards that are near the shoreline, stating that scenic qualities should be protected.

In addition to the Town of Friday Harbor's Municipal Code, the *Town of Friday Harbor Comprehensive Plan* (2002) Goal TE-35 states that "Friday Harbor should help mitigate the impacts of air transportation facilities by… minimizing the adverse impacts of lights and noise on adjacent properties." Further, it is a general goal of the transportation portion of the plan to protect the character of the Town and its neighborhoods (TE-1).

WATER RESOURCES

Water resources are shown on **Exhibit 1K** and include the following types:

Wetlands: Certain drainages (both natural and human-made) that are considered "waters of the U.S." come under the purview of the U.S. Army Corps of Engineers (USACE) under Sections 401 and 404 of the *Clean Water Act*; wetlands are also protected. In addition, E.O. 11990, *Protection of Wetlands* provides definitions and calls for safeguarding wetlands. Wetlands typically exhibit three characteristics: hydrology, hydrophytes (plants able to tolerate various degrees of flooding or frequent saturation), and poorly drained or "hydric" soils.

According to the USFWS National Wetlands Inventory, there are several wetlands on Airport property.[20] There are three freshwater emergent wetlands,[21] and one freshwater forested/shrub wetland.[22] In addition to wetlands, there are hydric soils on Airport property.

Floodplains: E.O. 11988, *Floodplain Management* directs federal agencies to act to reduce the risk of flood loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by the floodplains. The limits of base floodplains are determined by Flood Insurance Rate Maps (FIRMs) prepared by Federal Emergency Management Agency (FEMA).

Based on review of the most current FIRM panel for the Town of Friday Harbor and unincorporated areas of San Juan County (dated June 20, 2018 - panel number 53055C0270C), airport property is located outside a designated flood zone. However, two floodplains have been identified approximately 0.10 miles east of the airport. The first is along the coast of North Bay and has been identified as a Special Flood Hazard Area - Zone VE, which is subject to a 1% or greater chance of flooding with an additional hazard associated with storm waves. The second floodplain is more inland and located along an estuary, identified on Exhibit 1K in the general location of "Stormwater Basin 2". This floodplain is identified as Special Flood Hazard Area – Zone AE, which is subject to flooding by a 100-year flood event, however, no Base Food Elevations have been determined.

Surface Waters: Surface waters include rivers, streams, creeks, lakes, and reservoirs. The primary uses of surface water are for drinking water and other public uses, irrigation, and for industrial purposes (i.e., cooling electricity-generating equipment at a power plant).

The nearest surface waters are North Bay, Argyle Lagoon, Friday Harbor Marina, and the San Juan Channel. There is also a small pond on Airport property.

Friday Harbor's water is supplied from three surface water sources:

[20] Aerial wetlands data from USFWS National Wetlands Inventory is from August 1981
[21] Herbaceous march, fen, swale and wet meadow (USFWS, National Wetlands Inventory)
[22] Forested swamp or wetland shrub bog or wetland (USFWS, National Wetlands Inventory)

- Trout Lake Drainage Basin;
- Overflow from Lake 310 (pumped into Trout Lake watershed); and,
- Seasonal diversion of water from a creek in Section 17 east of Trout Lake.[23]

Stormwater on the Airport ultimately discharges to North Bay through two stormwater outfalls (Basins 1 and 2) east of the Airport (shown on **Exhibit 1K**). A network of ponds, pipes, and ditches conveys stormwater from the Airport to North Bay. Stormwater pollutants are a source of potential adverse effects to endangered species living in the North Bay.

Stormwater runoff leading to Basin 1 drains across the northern portion of the Airport in a southerly and easterly direction, discharging to a constructed stormwater detention pond on the east side of Mullis Street (Mullis Pond). In addition to Airport runoff, Mullis Pond also receives runoff from the adjacent fire station and areas upstream. Discharges from Mullis Pond are conveyed approximately 0.25 miles to Argyle Lagoon through a series of pipes, ditches, and three manmade ponds on private property.

Stormwater runoff leading to Basin 2 drains eastward and southward across the southern portion of the Airport, leaving Airport property in a southerly direction in a roadside ditch along Cattle Point Road. From Cattle Point Road, stormwater flows eastward approximately 600 feet to North Bay in a roadside ditch along Mill Street. Basin 2 does not include stormwater detention facilities.

The Port of Friday Harbor currently manages Airport stormwater discharges under the regulation of a Washington State Department of Ecology-issued National Pollutant Discharge Elimination System (NPDES) Industrial Stormwater General Permit. The Port implements a Stormwater Pollution Control Plan (SWPCP) as a requirement of that permit that includes site-specific operational source controls, structural source controls, treatment best management practices (BMPs), and sediment and erosion control measures.

The Airport is in the San Juan Island subwatershed (hydrologic unit code [HUC-12]: 171100030300).

Groundwater: The nearest sole source aquifer, which is an aquifer that has been designated by the EPA as the primary source of drinking water for an area, is the Guemes Island Aquifer (17 miles east of the Airport). Generally, a sole source aquifer provides a minimum of 50 percent of the drinking water that is consumed in the area overlying the aquifer.

Wild and Scenic Rivers: Wild and scenic rivers refer to designations within the National Park Services' Nationwide Rivers Inventory. Public Law 90-542 states that such rivers are free flowing and possess "outstanding remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural or other similar values".[24] The nearest resource in the National River Inventory is the Dungeness River, which is 32 miles south of the Airport. Note that designated segments do *not* need to include the entire river.

[23] *Town of Friday Harbor Comprehensive Plan*, Chapter 6: Capital Facilities Element (updated August 2016)
[24] www.rivers.org

DOCUMENT SOURCES

A variety of sources were used during the inventory process. The following listing reflects a partial compilation of these sources. In addition, considerable information was provided directly to the consultant by Friday Harbor Airport.

Airport/Facility Directory, U.S. Department of Transportation, Federal Aviation Administration, National Aeronautical Charting Office. Effective September 2017.

Seattle Sectional Chart, U.S. Department of Transportation, Federal Aviation Administration, National Aeronautical Charting Office. Effective May 25, 2017.

U.S. Terminal Procedures, U.S. Department of Transportation, Federal Aviation Administration, National Aeronautical Charting Office. Effective September 14, 2017.

National Plan of Integrated Airport Systems (NPIAS), U.S. Department of Transportation, Federal Aviation Administration, 2017-2021.

Friday Harbor Airport Master Plan – Final Report, 2015. Prepared by Barnard Dunkelberg Co.

A number of internet websites were also used to collect information for the inventory chapter. These include the following:

Friday Harbor Airport:
http://www.portfridayharbor.org/airport/

WSDOT- Aviation:
https://www.wsdot.wa.gov/aviation

Various FAA Websites:
Historical FAA Grants:
http://www.faa.gov/airports/aip/grant_histories/

Terminal Area Forecast:
http://aspm.faa.gov/main/taf.asp

Traffic Flow Management System Counts (TFMSC):
https://aspm.faa.gov/tfms/sys/main.asp

FAA 5010 Data:
http://www.airnav.com and http://www.gcr1.com/5010Web

U.S. Census Bureau:
http://www.census.gov

U.S. Bureau of Labor Statistics:
http://www.bls.gov

Town of Friday Harbor:
http://www.fridayharbor.org/

San Juan County:
http://www.sanjuanco.com/

U.S. Fish and Wildlife Service Information, Planning, and Conservation System:
http://ecos.fws.gov/ipac/

FEMA Map Service Center:
https://msc.fema.gov/portal/

EPA MyWaters Mapper:
http://watersgeo.epa.gov/

FRIDAY HARBOR AIRPORT









CHAPTER TWO

Aviation Demand Forecasts

AIRPORT MASTER PLAN



Chapter Two

AVIATION DEMAND FORECASTS

The definition of demand that may reasonably be expected to occur during the useful life of an airport's key components (e.g., runways, taxiways, terminal buildings, etc.) is an important factor in facility planning. In airport master planning, this involves projecting potential aviation activity for at least a 20-year timeframe. Aviation demand forecasting for Friday Harbor Airport will focus on demand indicators, such as passenger enplanements (boardings), based aircraft, and operations.

The Federal Aviation Administration (FAA) has oversight responsibility to review and approve aviation forecasts developed in conjunction with airport planning studies. In addition, aviation activity forecasts may be an important input to future benefit-cost analyses associated with future airport development, and FAA reviews these analyses when federal funding requests are submitted.

The FAA will review individual airport forecasts with the objective of comparing them to its *Terminal Area Forecasts* (TAF) and the *National Plan of Integrated Airport Systems* (NPIAS). Even though the TAF is updated annually, in the past there was almost always a disparity between the TAF and master planning forecasts. This was primarily because the TAF forecasts did not consider local conditions or recent trends. In recent years, however, the FAA has improved its forecast model to be a demand-driven forecast for aviation services based upon local and national economic conditions, as well as conditions within the aviation industry.

As stated in FAA Order 5090.3C, *Field Formulation of the National Plan of Integrated Airport Systems* (NPIAS), forecasts should be:

- Realistic;
- Based on the latest available data;
- Reflective of current conditions at the airport (as a baseline);
- Supported by information in the study; and
- Able to provide adequate justification for airport planning and development.

The forecast process for an airport master plan consists of a series of basic steps that vary in complexity depending upon the issues to be addressed and the level of effort required. The steps include a review of previous forecasts, determination of data needs, identification of data sources, collection of data, selection of forecast methods, preparation of the forecasts, and evaluation and documentation of the results. FAA Advisory Circular (AC) 150/5070-6C, *Airport Master Plans*, outlines seven standard steps involved in the forecast process, including:

1) **Identify Aviation Activity Measures**: The level and type of aviation activities likely to impact facility needs. For general aviation, this typically includes based aircraft and operations.
2) **Review Previous Airport Forecasts**: May include the FAA *Terminal Area Forecast*, state or regional system plans, and previous master plans.
3) **Gather Data**: Determine what data are required to prepare the forecasts, identify data sources, and collect historical and forecast data.
4) **Select Forecast Methods**: There are several appropriate methodologies and techniques available, including regression analysis, trend analysis, market share or ratio analysis, exponential smoothing, econometric modeling, comparison with other airports, survey techniques, cohort analysis, choice and distribution models, range projections, and professional judgment.
5) **Apply Forecast Methods and Evaluate Results**: Prepare the actual forecasts and evaluate for reasonableness.
6) **Summarize and Document Results**: Provide supporting text and tables as necessary.
7) **Compare Forecast Results with FAA's TAF**: For non-hub commercial service airports, such as Friday Harbor Airport, forecasts for total enplanements, based aircraft, and total operations are considered consistent with the TAF if they meet the following criteria:
    - Forecasts differ by less than 10 percent in the 5-year forecast period, and 15 percent in the 10-year forecast period, or
    - Forecasts do not affect the timing or scale of an airport project, or
    - Forecasts do not affect the role of the airport as defined in the current version of FAA Order 5090.3, *Field Formulation of the National Plan of Integrated Airport Systems*.

If the master plan forecast is not consistent with the TAF, differences must be resolved if the forecast is to be used in FAA decision-making. This may involve revisions to the forecasts submitted, adjustment to the TAF, or both. FAA decision-making includes key environmental issues (e.g., purpose and need, air quality, noise, land use, noise compatibility planning) for approval of development on an airport layout

plan, and initial financial decisions, including issuance of Letters of Intent (LOI) and calculation of Benefit-Cost Analyses.

Aviation activity can be affected by many influences on the local, regional, and national levels, making it virtually impossible to predict year-to-year fluctuations of activity over 20 years with any certainty. Therefore, it is important to remember that forecasts serve only as guidance, and planning must remain flexible to respond to unforeseen developments.

The forecasts are considered "unconstrained," meaning they reflect the level of demand that could be reasonably expected at the airport over the next 20 years. The forecasts are Airport-specific and do not consider the constraints of the area airspace, hangar limitations, airport policies on growth, or other development scenarios that may or may not materialize. Essentially, the forecasts represent what might be reasonably expected were the airport to pursue policies to accommodate the forecast growth. For example, the forecasts may show growth in the number of based aircraft; however, if additional hangar space is not available, then the growth figures may not materialize.

The following forecast analysis for Friday Harbor Airport was produced following these basic guidelines. Existing forecasts are examined and compared against current and historical activity. The historical aviation activity is then examined along with other factors and trends that can affect demand. The intent is to provide an updated set of aviation-demand projections for the Airport that will permit Airport management to make planning adjustments as necessary to maintain a viable, efficient, and cost-effective facility.

The base year for these forecasts is the calendar year of 2017. These forecasts were developed in October 2017; therefore, some assumptions, based on historical activity, have been made to establish the base line figure for operations, enplanements, and based aircraft.

SOCIOECONOMIC TRENDS

The socioeconomic conditions provide an important baseline for preparing aviation demand forecasts. Local socioeconomic variables, such as population, employment, and income, are indicators for understanding the dynamics of the community and can relate to local trends in aviation activity. Analysis of the demographics of the airport service area will give a more comprehensive understanding of the socioeconomic situations affecting the region which supports Friday Harbor Airport. The following is a summary of the historical demographic trends presented in Chapter One - Inventory, as well as forecasts of those socioeconomic characteristics.

Table 2A summarizes historical and forecast population, employment, and income estimates for San Juan County and the State of Washington. Over the next 20 years, the population of San Juan County is projected to add approximately 3,136 people. This equates to an average annual growth rate of 0.88 percent. Employment is projected to grow at 1.54 percent annually. Income for San Juan County is

projected to grow at 1.08 percent annually. The same data is available for the State of Washington as a point of comparison.

TABLE 2A
Socioeconomic Forecasts

	San Juan County			State of Washington		
Year	Population[1]	Employment[2]	Income[2]	Population[2]	Employment[2]	Income[2]
2000	14,120	9,282	$51,392	5,910,512	3,531,556	$39,435
2010	15,770	10,369	$49,427	6,743,060	3,774,032	$41,509
2017	16,457	11,320	$60,805	7,349,289	4,335,175	$48,534
CAGR 2000-2017	**0.91%**	**1.17%**	**0.99%**	**1.29%**	**1.21%**	**1.23%**
2022	17,190	12,253	$64,818	7,829,546	4,676,738	$51,774
2027	17,957	13,263	$68,761	8,334,956	5,022,278	$55,012
2037	19,593	15,365	$75,451	9,362,395	5,686,763	$60,553
CAGR 2017-2037	**0.88%**	**1.54%**	**1.08%**	**1.22%**	**1.37%**	**1.11%**

[1] *San Juan County Comprehensive Plan Update* Population Projections 2017
[2] Woods & Poole Economics - Complete Economic and Demographic Data Source (CEDDS)
CAGR: Compound annual growth rate
Income: Per Capita Personal Income ($2009)

AIRPORT SERVICE AREA

The airport service area is a geographical area where the airport will influence aviation demand. The service area is typically defined by the proximity and capability of other airports. Friday Harbor is the airport with the highest level of capabilities in San Juan County having the longest runway, most aircraft storage hangars, and instrument approaches. The service area will cross over the service area of other airports. The service area is typically defined along political boundaries, such as a county, because supporting information to be used in forecasting, such as population, employment and income are typically documented in this manner.

The service area for Friday Harbor Airport can be defined as San Juan County. San Juan County is comprised of 172 islands. The Airport is physically located on San Juan Island, which is where the Town of Friday Harbor is located.

NATIONAL AVIATION TRENDS

Each year, the FAA updates and publishes a national aviation forecast. Included in this publication are forecasts for the large air carriers, regional/commuter air carriers, general aviation, and FAA workload measures. The forecasts are prepared to the meet budget and planning needs of the FAA and to provide information that can be used by state and local authorities, the aviation industry, and the general public.

The current edition when this chapter was prepared was FAA *Aerospace Forecasts – Fiscal Years 2017-2037*, published in March 2017. The FAA primarily uses the economic performance of the United States as an indicator of future aviation industry growth. Similar economic analyses are applied to the outlook for aviation growth in international markets. The following discussion is summarized from the FAA Aerospace Forecasts.

Since its deregulation in 1978, the U.S. commercial air carrier industry has been characterized by boom-to-bust cycles. The volatility that was associated with these cycles was thought by many to be a structural feature of an industry that was capital-intensive but cash-poor. However, the Great Recession of 2008-2009 marked a fundamental change in the operations and finances of U.S. airlines. Air carriers fine-tuned their business models to minimize losses by lowering operating costs, eliminating unprofitable routes, and grounding older, less fuel-efficient aircraft. To increase operating revenues, carriers initiated new services that customers were willing to purchase and started charging separately for services that were historically bundled in the price of a ticket. The industry experienced an unprecedented period of consolidation with four major mergers in five years. These changes, along with capacity discipline exhibited by carriers, resulted in a seventh consecutive year of profitability for the industry in 2016. Looking ahead, there is optimism that the industry has been transformed from that of a boom-to-bust cycle to one of sustainable profits.

ECONOMIC ENVIRONMENT

According to the FAA forecast report, as the economy recovers from the most serious economic downturn and slow recovery since the Great Depression, aviation will continue to grow over the long run. Fundamentally, demand for aviation is driven by economic activity. As economic growth picks up, so will growth in aviation activity. The FAA forecast calls for Gross Domestic Product (GDP) growth over the next 20 years to average 2.1 percent annually. The steep decline in the price of oil in 2015-16 was a catalyst for a short-lived uptick in passenger growth; however, growth is anticipated to be somewhat muted, primarily due to the uncertainty that surrounds the U.S. and global economies.

Employee wages in 2016 continued to stagnate, household income growth was weak, the housing market's recovery was patchy across the country, and government spending at the federal and local levels remained stagnant and are projected to remain so for the next few years. Despite these dire statistics, the unemployment rate fell, consumer spending was up, and many urban housing markets have been strongly revived. U.S. economic performance in 2016 is estimated to have grown in real GDP to 16.3 trillion (inflation adjusted to 2009 dollars) and is forecast to grow at an average annual growth rate of 2.3 percent through 2036. Oil prices should remain below $50 per barrel through 2017 but are projected to grow at an annual average growth rate of 4.8 percent, reaching over $150 per barrel by 2036. Although the U.S. economy has managed to avoid a recession, a prolonged period of faster economic growth (e.g., > 3.0 percent) may not be forthcoming.

U.S. TRAVEL DEMAND

Mainline and regional carriers offer domestic and international passenger service between the U.S. and foreign destinations, although regional carrier international service is confined to the border markets in Canada, Mexico, and the Caribbean.

According to FAA, three distinct trends are shaping today's commercial air carrier industry: (1) continuing industry consolidation and restructuring; (2) continued capacity discipline in response to external shocks; and (3) the proliferation of ancillary revenues.

The restructuring and consolidation of the U.S. airline industry that began in the aftermath of the 2008-09 recession continued in 2016. American and US Airways completed their merger near the end of 2015. In April 2016, Alaska Airlines announced their intended merger with Virgin America, which will create the fifth largest airline. There are now only six dominant airlines in the U.S. – American, Delta, Southwest, United, Alaska/Virgin, and Jet Blue – controlling approximately 85 percent of the domestic market (compared to 12 mainline airlines in 2005). Further significant airline mergers are considered unlikely due to anti-trust regulations.

One of the most striking outcomes of industry restructuring has been the unprecedented period of capacity discipline (achieving higher passenger loads through scheduled flight and fleet mix consolidation primarily), especially in domestic markets. Between 1978 and 2000, available seat miles (ASMs) in domestic markets increased at an average annual rate of four percent per year, recording only two years of decline. Even though domestic ASMs shrank by 6.9 percent in FY 2002, following the events of September 11, 2001, growth resumed and by FY 2007, domestic ASMs were 3.6 percent above the FY 2000 level. Since 2009, U.S. domestic ASMs have increased at an average annual rate of 2.0 percent. This growth has been experienced primarily by the mainline carriers. In 2016, the mainline carriers provided five percent more capacity than it did in 2007, while carrying eight percent more passengers. Capacity flown by the regional group has shrunk by 2.6 percent, with passengers carried down 3.0 percent, over the same period.

The regional market has continued to shrink as the regionals compete for even fewer contracts with the remaining dominant carriers; this has meant slow growth in enplanements and yields. The regionals have less leverage with the mainline carriers than they had in the past and are facing large pilot shortages and tighter regulations regarding pilot training. Their capital costs have increased in the short-term as they continue to replace their 50-seat regional jets with more fuel efficient 70+ seat jets. The regional airlines believe the move to larger aircraft will prove beneficial in the future, since their operating costs are lower.

Another continuing trend is that of ancillary revenues. Carriers generate ancillary revenues by selling products and services beyond that of an airplane ticket to customers. This includes the un-bundling of services previously included in the ticket price, such as checked bags and on-board meals, and by adding

new services, such as boarding priority and seat selection. As a result of very low oil prices and ancillary revenue sources, U.S. passenger carriers posted net profits for the seventh consecutive year in 2016.

FAA COMMERCIAL AIR CARRIER FORECASTS

U.S. commercial air carriers' total number of domestic departures rose in 2016 for the first time since 2007, but still remain 17.3 percent below 2007 levels. Available seat miles (ASMs), revenue passenger miles (RPMs), and enplanements, all showed a rebound; these trends underlie the expanding size of aircraft and higher load factors. In 2016, the domestic load factor reached a historic high of 84.7 percent for commercial air carriers.

Over the 20-year forecast period, the FAA indicates that domestic ASMs will grow 1.9 percent annually and RPMs will grow 2.0 percent. Domestic passenger enplanements are projected to grow 1.7 percent annually through 2037. In 2016, there were 726 million enplanements, which are forecast to reach 1.04 billion in 2037. Planes will remain crowded, with load factors projected to grow moderately during the forecast period, reaching 86.4 percent in 2037 (up 1.7 percent compared to the beginning of the forecast period in 2017).

FAA COMMERCIAL AIRCRAFT FLEET FORECAST

The commercial passenger carrier fleet is undergoing transformation. The mainline carriers are retiring older, less fuel-efficient aircraft (e.g., 737-300/400/500, 757/767, and MD-80) and replacing them with more technologically advanced A319/320 and 737-700/800/900 aircraft. The regional carriers are growing their fleet of 70-90 seat regional jet aircraft and reducing their fleet of 50-seat jet aircraft. Between 2017 and 2037, the number of jets in the U.S. mainline carrier fleet is forecast to grow from 4,006 to 5,199, an average of 60 aircraft a year.

The regional carrier fleet is forecast to decline slightly from 2,045 aircraft in 2017 to 2,027 in 2037, as the fleet shrinks by 198 aircraft between 2017 and 2024, then begins to slowly grow. The particular interest to Friday Harbor Airport is the forecast decline in the number of commercial passenger aircraft with nine or fewer seats. In 2017, there were 352 of these aircraft and by 2037, only 99 are forecast to remain in service, a decline of 6.0 percent annually.

FAA GENERAL AVIATION FORECASTS

The FAA forecasts the fleet mix and hours flown for single engine piston aircraft, multi-engine piston aircraft, turboprops, business jets, piston and turbine helicopters, light sport, experimental, and others (gliders and balloons). The FAA forecasts "active aircraft," not total aircraft. An active aircraft is one that is flown at least one hour during the year. From 2010 through 2013, the FAA undertook an effort

to have all aircraft owners re-register their aircraft. This effort resulted in a 10.5 percent decrease in the number of active general aviation aircraft, mostly in the piston category.

The long-term outlook for general aviation is stable to optimistic, as growth at the high-end offsets continuing retirements at the lower end segment. The active general aviation fleet is forecast to increase 0.1 percent per year between 2017 and 2037, equating to an absolute increase in the fleet of about 3,400 units. While steady growth in both GDP and corporate profits results in continued growth of the turbine and rotorcraft fleets, the largest segment of the fleet – fixed-wing piston aircraft – continues to shrink over the FAA's forecast.

In 2017, the FAA estimated there were 138,915 piston-powered aircraft in the national fleet. The total number of piston-powered aircraft in the fleet is forecast to decline by 0.9 percent from 2017-2037, resulting in 117,520 by 2037. This includes declines of 0.9 percent annually for single engine pistons and 0.5 percent for multi-engine pistons.

Total turbine aircraft are forecast to grow at an annual growth rate of 1.9 percent through 2037. The FAA estimates there were 30,895 turbine-powered aircraft in the national fleet in 2017, and there will be 45,305 by 2037. This includes annual growth rates of 1.4 percent for turboprops, 2.3 percent for business jets, and 1.8 percent for turbine helicopters.

While comprising a much smaller portion of the general aviation fleet, experimental aircraft, typically identified as home-built aircraft, are projected to grow annually by 1.0 percent through 2037. The FAA estimates there were 28,970 experimental aircraft in 2017, and these are projected to grow to 35,310 by 2037. Sport aircraft are forecast to grow 4.1 percent annually through the long term, growing from 2,685 in 2017 to 5,885 by 2037.

The FAA also forecasts total operations based upon activity at control towers across the U.S. Operations are categorized as air carrier, air taxi/commuter, general aviation, and military.

General aviation operations, both local and itinerant, declined significantly as a result of the 2008-2009 recession and subsequent slow recovery. Through 2037, total general aviation operations are forecast to grow 0.3 percent annually. Air taxi/commuter operations are forecast to decline by 3.0 percent through 2026, and then increase slightly through the remainder of the forecast period. Overall, air taxi/commuter operations are forecast to decline by 0.9 percent annually from 2017 through 2037.

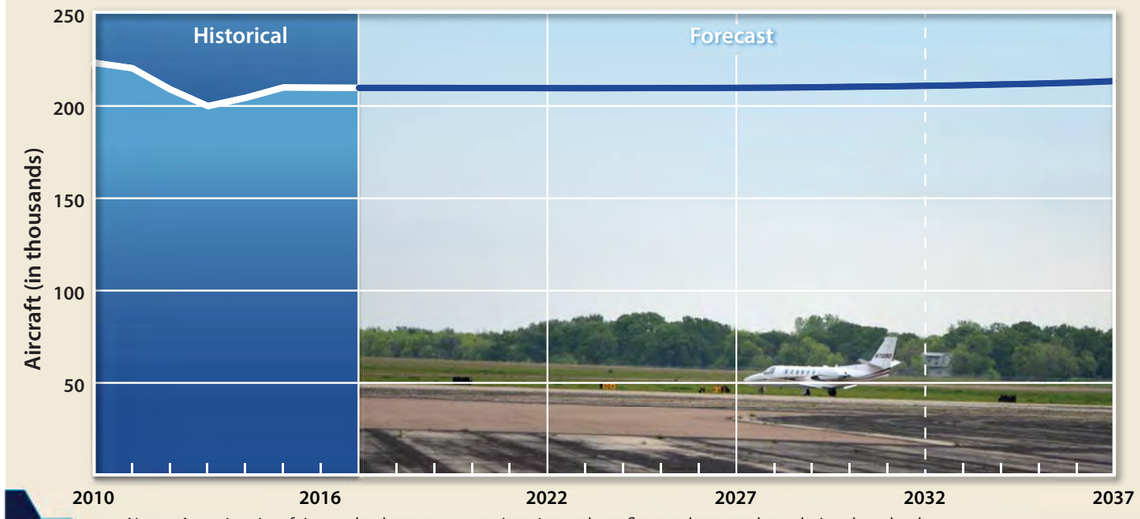
Exhibit 2A presents the historical and forecast U.S. active general aviation aircraft, general aviation operations, and air taxi operations.

General Aviation Aircraft Shipments and Revenue

As previously discussed, the 2008-2009 economic recession had a negative impact on general aviation aircraft production, and the industry has been slow to recover. Aircraft manufacturing declined for three

U.S. ACTIVE GENERAL AVIATION AIRCRAFT

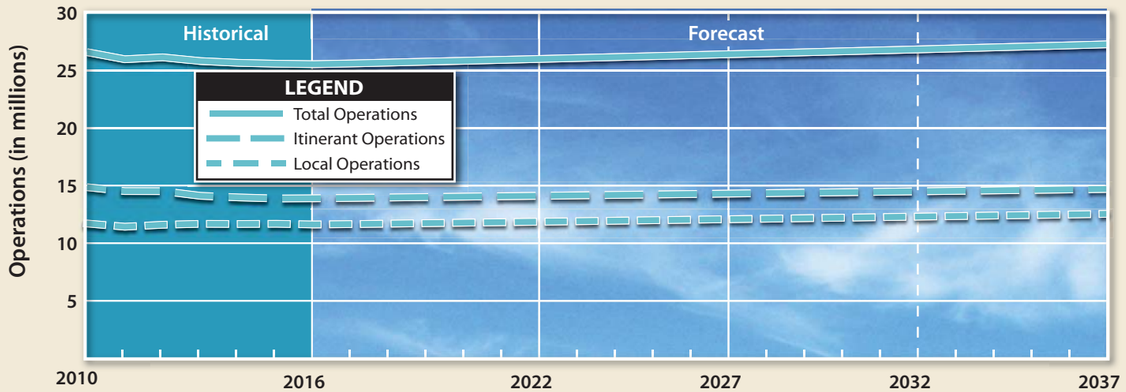
	2016E	2022	2027	2037	AAGR 2016-2037
Fixed Wing					
Piston					
Single Engine	126,820	120,600	115,245	105,550	-0.9%
Multi-Engine	13,200	12,965	12,705	11,970	-0.5%
Turbine					
Turboprop	9,460	9,115	9,755	12,585	1.4%
Turbojet	13,770	15,845	17,745	22,040	2.3%
Rotorcraft					
Piston	3,335	3,605	3,835	4,385	1.3%
Turbine	7,365	8,195	8,925	10,680	1.8%
Experimental					
	28,475	30,895	32,345	35,310	1.0%
Sport Aircraft					
	2,530	3,480	4,285	5,885	4.1%
Other					
	4,950	4,955	4,965	5,015	0.1%
Total Pistons	**143,355**	**137,170**	**131,785**	**121,905**	**-0.8%**
Total Turbines	**30,595**	**33,155**	**36,425**	**45,305**	**1.9%**
Total Fleet	**209,905**	**209,655**	**209,805**	**213,420**	**0.1%**



Notes: An active aircraft is one that has a current registration and was flown at least one hour during the calendar year.
Source: *FAA Aerospace Forecast - Fiscal Years 2017-2037*

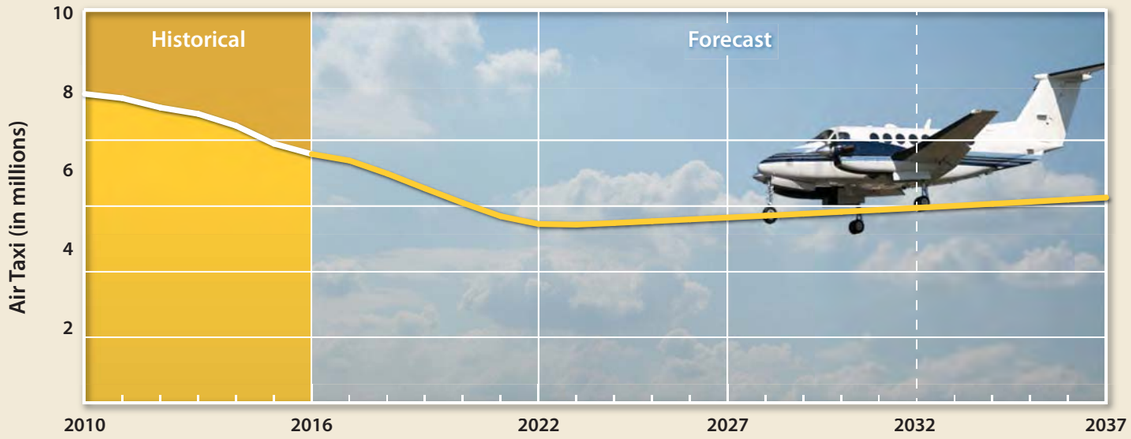
U.S. GENERAL AVIATION OPERATIONS

	2016E	2022	2027	2037	AAGR 2016-2037
Itinerant					
	13,904,397	14,121,057	14,312,108	14,713,479	0.3%
Local					
	11,632,078	11,873,443	12,090,250	12,548,870	0.4%
Total GA Operations	**25,536,475**	**25,994,500**	**26,402,358**	**27,262,349**	**0.3%**



U.S. GENERAL AVIATION AIR TAXI

	2016E	2022	2027	2037	AAGR 2016-2037
Air Taxi/Commuter Operations					
Itinerant	7,579,584	5,450,873	5,649,185	6,256,918	-0.9%



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straight years from 2008 through 2010. According to the General Aviation Manufacturers Association (GAMA), there is optimism that aircraft manufacturing will stabilize and return to growth, which has been evidenced since 2011; however, total production did see declines in 2015 and 2016. **Table 2B** presents historical data related to general aviation aircraft shipments.

Worldwide shipments of general aviation airplanes decreased in 2016, with a total of 2,262 units delivered around the globe compared to 2,331 units in 2015. Worldwide general aviation billings were also lower than the previous year. In 2016, $20.7 billion in new general aviation aircraft were shipped, but yearend results were mixed across the market segments. Results were impacted by economic uncertainty in key markets, including Brazil, Europe, and China; however, the U.S. experienced stronger delivery numbers, which is cause for cautious optimism.

TABLE 2B
Annual General Aviation Airplane Shipments
Manufactured Worldwide and Factory Net Billings

Year	Total	SEP	MEP	TP	J	Net Billings ($millions)
1994	1,132	544	77	233	278	3,749
1995	1,251	605	61	285	300	4,294
1996	1,437	731	70	320	316	4,936
1997	1,840	1043	80	279	438	7,170
1998	2,457	1508	98	336	515	8,604
1999	2,808	1689	112	340	667	11,560
2000	3,147	1,877	103	415	752	13,496
2001	2,998	1,645	147	422	784	13,868
2002	2,677	1,591	130	280	676	11,778
2003	2,686	1,825	71	272	518	9,998
2004	2,962	1,999	52	319	592	12,093
2005	3,590	2,326	139	375	750	15,156
2006	4,054	2,513	242	412	887	18,815
2007	4,277	2,417	258	465	1,137	21,837
2008	3,974	1,943	176	538	1,317	24,846
2009	2,283	893	70	446	874	19,474
2010	2,024	781	108	368	767	19,715
2011	2,120	761	137	526	696	19,042
2012	2,164	817	91	584	672	18,895
2013	2,353	908	122	645	678	23,450
2014	2,454	986	143	603	722	24,499
2015	2,331	946	110	557	718	24,129
2016	2,262	890	129	582	661	20,719

SEP - Single Engine Piston; MEP - Multi-Engine Piston; TP - Turboprop; J - Turbofan/Turbojet

Source: General Aviation Manufacturers Association *2015 General Aviation Statistical Databook & 2016 Industry Outlook*

Business Jets: General aviation manufacturers delivered 661 business jets in 2016, as compared to 718 units in 2015. The industry's continued investment in new products helped maintain the delivery rate for business jets.

Turboprops: In 2016, 582 turboprop airplanes were delivered to customers around the world, an increase from the 557 that were delivered in 2015. Overall, the turboprop market is still significantly stronger over the past five years compared to years prior to 2011.

Pistons: Piston deliveries declined from 946 units during 2015 to 890 in 2016. Two-thirds of piston shipments were to North American customers.

FORECASTING APPROACH

The development of aviation forecasts proceeds through both analytical and judgmental processes. A series of mathematical relationships is tested to establish statistical logic and rationale for projected growth. However, the judgment of the forecast analyst, based upon professional experience, knowledge of the aviation industry, and assessment of the local situation, is important in the final determination of the preferred forecast. The most reliable approach to estimating aviation demand is through the utilization of more than one analytical technique. Methodologies frequently considered include trend line/time-series projections, correlation/regression analysis, and market share analysis.

Trend line/time-series projections are probably the simplest and most familiar of the forecasting techniques. By fitting growth curves to historical data, then extending them into the future, a basic trend line projection is produced. A basic assumption of this technique is that outside factors will continue to affect aviation demand in much the same manner as in the past. As broad as this assumption may be, the trend line projection does serve as a reliable benchmark for comparing other projections.

Correlation analysis provides a measure of direct relationship between two separate sets of historic data. Should there be a reasonable correlation between the data sets, further evaluation using regression analysis may be employed.

Regression analysis measures statistical relationships between dependent and independent variables, yielding a "correlation coefficient." The correlation coefficient (Pearson's "r") measures association between the changes in the dependent variable and the independent variable(s). If the "r^2" value (coefficient determination) is greater than 0.95, it indicates good predictive reliability. A value less than 0.95 may be used, but with the understanding that the predictive reliability is lower.

Market share analysis involves a historical review of the airport activity as a percentage, or share, of a larger regional, state, or national aviation market. A historical market share trend is determined, providing an expected market share for the future. These shares are then multiplied by the forecasts of the

larger geographical area to produce a market share projection. This method has the same limitations as trend line projections but can provide a useful check on the validity of other forecasting techniques.

Forecasts will age and the further one is from the base year, the less reliable a forecast may become, particularly due to changing local and national conditions. Nonetheless, the FAA indicates that a Master Plan include a 20-year forecast for an airport. Facility and financial planning usually require at least a ten-year view, since it often takes more than five years to complete a major facility development program. However, it is important to use forecasts which do not overestimate revenue-generating capabilities or understate demand for facilities needed to meet public (user) needs.

A wide range of factors is known to influence the aviation industry and can have significant impacts on the extent and nature of air service provided in both the local and national markets. Technological advances in aviation have historically altered, and will continue to change, the growth rates in aviation demand over time. The most obvious example is the impact of jet aircraft on the aviation industry, which resulted in a growth rate that far exceeded expectations. Such changes are difficult, if not impossible, to predict, and there is simply no mathematical way to estimate their impacts.

Future facility requirements, such as airline terminal complex component spaces and general aviation hangars and apron areas, are derived from projections of various aviation demand indicators. Using a broad spectrum of local, regional, and national socioeconomic and aviation information, and analyzing the most current aviation trends, forecasts are presented for the following aviation demand indicators:

COMMERCIAL PASSENGER SERVICE
- Annual Enplaned Passengers
- Commuter/Air Taxi Operations and Fleet Mix

GENERAL AVIATION
- Based Aircraft
- Based Aircraft Fleet Mix
- General Aviation Operations
- Other Air Taxi and Military Operations

PEAKING CHARACTERISTICS
- Operational Peaks

FAA TERMINAL AREA FORECAST (TAF)

On an annual basis, the FAA publishes the TAF for each airport included in the NPIAS. The TAF is a generalized forecast of airport activity used by FAA for internal planning purposes. It is available to airports and consultants to use as a baseline projection and important point of comparison while developing local

forecasts. The TAF is published annually in January and is based on the federal fiscal year (October-September).

Table 2C presents the 2018 TAF for the airport (published in January 2018). The TAF estimates that there were 9,850 scheduled carrier enplanements in 2017, which is forecast to grow to 15,800 by 2037 for an annual growth rate of 2.39 percent. The TAF enplanement figure reflects enplanements from scheduled air carriers and does not include enplanements from on-demand/unscheduled carriers. At Friday Harbor Airport, more than 30 percent of enplanements are on-demand/unscheduled.

TABLE 2C
2018 FAA Terminal Area Forecast, issued January 2018
Friday Harbor Airport

	2017	2022	2027	2037	CAGR 2017-2037
ENPLANEMENTS					
Commuter	9,850	11,084	12,478	15,800	2.39%
Total	***9,850***	***11,084***	***12,478***	***15,800***	2.39%
ANNUAL OPERATIONS					
Itinerant					
Air Taxi	9,695	10,703	11,817	14,402	2.00%
General Aviation	12,533	13,841	15,277	18,619	2.00%
Total Itinerant	22,228	24,544	27,094	33,021	2.00%
Local					
General Aviation	24,534	26,644	28,929	34,098	1.66%
Total Local	24,534	26,644	28,929	34,098	1.66%
Total Operations	***46,762***	***51,188***	***56,023***	***67,119***	1.82%
BASED AIRCRAFT					
Based Aircraft	***149***	***161***	***171***	***191***	1.25%

Source: FAA Terminal Area Forecast (TAF), January 2018 – Federal Fiscal Year

The 2018 TAF also includes estimates of annual operations and based aircraft. According to the 2018 TAF, in 2017 there were approximately 46,762 total operations. Of this total, 9,695 are classified as air taxi/commuter. Air taxi/commuter include operations by the commuter airlines, air cargo carriers (FedEx and UPS), and most air ambulance flights. All other activity is considered general aviation. By 2037, total annual operations are forecast to grow to 67,119 for a compound annual growth rate of 1.82 percent.

The 2018 TAF shows 149 based aircraft for the airport. This is a figure that will fluctuate throughout the year, especially in the spring/summer months when several aircraft owners will position their aircraft at the airport. The TAF shows a 2037 based aircraft figure of 191 for a compound annual growth rate of 1.25 percent.

The forecasts developed in this master plan will be compared to these TAF figures for consistency. For some aviation demand elements, the TAF projection may be used when it is determined through this analysis that the TAF best represents potential activity at the airport. Where the TAF is not representative, a new master plan forecast will be selected and supported by the analysis. If the master plan forecasts are determined by the FAA to be consistent with the TAF, they will be approved for planning purposes.

COMMERCIAL SERVICE FORECASTS

To evaluate commercial service potential at the airport and the facilities necessary to properly accommodate present and future airline activity, two basic elements must be forecast: annual enplaned passengers and annual airline operations. Annual enplaned passengers serve as the most basic indicator of demand for commercial passenger service activity. The combination of enplanements and deplanements generally equals the total passengers using an airport. The annual number of enplanements is the figure utilized by the FAA to determine various entitlement funding levels for commercial service airports.

Enplanements are passenger boardings and they are the basis for FAA entitlement funding for commercial service airports.

The term "enplanement" refers to a passenger boarding an airline flight. Enplaning passengers are then described in terms of either "originating" or "connecting/transferring." Originating passengers depart a specific airport for a destination or hub airport to connect/transfer to another flight. Connecting/transferring passengers are those who have departed from another location and are using the airport as an intermediate stop. These passengers may disembark their originating flight to wait in the terminal for their next flight or could simply remain on the aircraft at an intermediate stop as a "through" passenger. Friday Harbor Airport and airports similar to it have mostly originating passengers, while larger hubs like those in Seattle or Portland, will have a more significant percentage of passengers who are connecting/transferring.

As indicated earlier, an important resource utilized in aviation demand forecasting is the annual FAA aviation forecasts. The most recent available version is *Aerospace Forecasts – Fiscal Years 2017-2037*, published in March 2017. The FAA forecasts a variety of aviation demand indicators on an annual basis. In the most current edition, fiscal year 2015 is presented as the baseline, with 2016 showing as an estimate and years 2017 through 2037 as projections. Many forecasting elements utilized in this analysis will consider the history and projections presented by the FAA in its annual forecast.

As noted previously, the forecasts will be compared against the FAA TAF for consistency. Consistency is defined as being within 10 percent in the five-year timeframe and 15 percent in the 10-year timeframe. The TAF is published in January of each year and reflects federal fiscal years (October-September). For

enplanements, the TAF only captures those enplanements that are revenue passengers on a regularly scheduled commercial carrier. At Friday Harbor, this category represents approximately 70 percent of total enplanements at the airport. In order to compare 'apples-to-apples' the following enplanement forecast will only address scheduled carrier enplanements on regularly scheduled airlines. **For clarity, the following enplanement forecast discussion will refer to "scheduled carrier enplanements".**

The enplanement forecast impacts facility needs related to passenger activity. Elements such as terminal building size, terminal curb length, terminal parking, and commercial aircraft apron, relate to the number of total enplanements. As a result, a forecast of total enplanements has been developed separately and is at the end of this section. These enplanement forecasts will be utilized to identify facility needs related to total enplanements.

HISTORICAL SCHEDULED CARRIER ENPLANEMENT ACTIVITY

Table 2D provides a history of scheduled carrier enplanements at the Friday Harbor Airport since the year 2004. Over the past 13 years, the airport has experienced scheduled carrier enplanement activity ranging from a period low of 3,482 in 2013 to high of 22,552 in 2006. The airport has shown growth in scheduled carrier enplanements for each of the last four years.

An important benchmark for any airport is the number of total enplanements. Those airports that exceed 10,000 annual total enplanements receive a minimum entitlement of $1.0 million in capital development grant funds from the Airport Improvement Program (AIP) as administered by the FAA.

While **Table 2D** shows that scheduled carrier enplanements have been below the 10,000-enplanement level at times, total enplanements are sourced from the FAA's Air Carrier Activity Information System (ACAIS) database. Essentially, air carriers that operate in an on-demand or charter capacity report their enplanements to the FAA and those validated totals are then added to the ACAIS database to provide a total enplanement count. As noted, the forecast of total enplanements is included in at the end of this section and various facility requirements related to total enplanements will be based on that forecast.

As can be seen in **Table 2D**, scheduled carrier enplanements have been steadily increasing since 2013. This is a common trend across the country and is primarily attributable to the gradually improving economy. The table also shows a significant spike or bubble from 2004 to 2006 when scheduled carrier enplanements were above 20,000 each year. Airport staff has indicated that this bubble was primarily the result of local economic development grants which were used to subsidize airfares. During this time flights to/from Friday Harbor were subsidized so that the cost of a one-way ticket was as low as $25 when a normal ticket price was $100 or more.

TABLE 2D
Historical Scheduled Carrier Enplanements
Friday Harbor Airport

Year	Annual Scheduled Carrier Enplanements (FY)[1]	% Change Year-over-Year
2017	9,972[2]	9.13%
2016	9,101	15.20%
2015	7,815	1.43%
2014	7,704	75.49%
2013	3,482	84.01%
2012	8,526	26.86%
2011	11,171	7.59%
2010	12,052	6.48%
2009	12,859	10.04%
2008	14,218	6.68%
2007	15,201	38.94%
2006	22,552	8.57%
2005	20,699	4.20%
2004	21,586	NA

[1]Bureau of Labor Statistics - Revenue Passengers on Scheduled Carriers - https://www.transtats.bts.gov/Data_Elements.aspx?Data=1
[2]Dec. 2016-Nov. 2017
Red text indicates a year-over-year decline in enplanements
FY: Federal fiscal year

AIRLINE SERVICE HISTORY

The Town of Friday Harbor has had continuous commercial passenger service since 1947. Back then, activity was to a smaller grass landing strip. Since the 1960s, activity has occurred at the current airport site. Commercial service to the airport has been provided by smaller piston and turboprop aircraft, typically using aircraft with less than 10 passenger seats. **Table 2E** shows the last five years of passenger enplanements reported by the airlines to the airport. This is not an official data source for enplanements and is provided to help the reader understand what level of passenger activity is occurring at the airport.

Kenmore Air has provided regularly scheduled passenger service to the airport for many years. Currently, they operate from their hub at Boeing Field in Seattle to Friday Harbor and other San Juan Island airports. They utilize the nine-seat Cessna Caravan single engine turboprop aircraft.

San Juan Airlines provides inter-island service to Roche Harbor, Eastsound, Lopez Island, and Blakely, as well as mainland destinations of Bellingham, Anacortes, and Point Roberts in Canada. San Juan Airlines utilizes the three-seat Cessna 172 and the five-seat Cessna 206.

TABLE 2E
Historical Enplanements by Airline
Friday Harbor Airport

	2012	2013	2014	2015	2016
Kenmore Air	5,635	6,902	7,808	7,185	9,063
San Juan Airlines	958	1,423	2,129	2,724	2,872
Island Air	1,504	894	1,053	575	480
Westwind Aviation	541	541	508	670	368
Rite Bros.	15	18	14	13	27
NW Sky Ferry	1,550	0	315	0	0
West Isle Air	0	910	0	0	0
Alaska Air	97	0	0	0	0
Total	**10,300**	**10,688**	**11,827**	**11,167**	**12,810**

Note: Insignificant variances exist between what the airlines report to the airport and what the FAA documents.

Source: Calendar year airline records reported to the Friday Harbor Airport

Island Air, Westwind Aviation, and Rite Brothers all provide aerial tours of the San Juan Islands using smaller single engine aircraft.

ENPLANEMENT FORECAST

As discussed in this chapter's introduction, the first step involved in updating an airport's forecasts includes reviewing previous forecasts. After that comes the consideration of any new factors that could impact the forecasts, such as changes in the socioeconomic climate or the effects of changes in air carrier services.

Previous Enplanement Forecasts

There are three existing forecasts of enplanement activity at the airport to consider:

- Those generated for the previous Master Plan (base year 2011)
- Those generated for the *Washington Aviation System Plan* (WASP) (2017)
- FAA's *Terminal Area Forecast* (Jan. 2018)

The enplanement forecasts from these three sources are listed in **Table 2F**. The forecast from the previous master plan had a baseline year of 2011. The forecasts from the WASP had a baseline year of 2014 and were derived from FAA TAF from 2014. The TAF is from January 2018, and it reflects fiscal year scheduled carrier enplanements, not total enplanements.

While the actual enplanement numbers are important, especially because of the significance of exceeding the 10,000-enplanement threshold, the real value in examining previous enplanement forecasts is the projected annual growth rate. Knowledge of previous growth rates can be applied to current data and projected into the future or the growth rates of new forecasts can be checked for reasonableness.

TABLE 2F
Previous Enplanement Forecasts
Friday Harbor Airport

Year	Previous Master Plan
2011	10,242
2016	10,770
2021	11,880
2031	15,060
CAGR 2011-2031	1.95%
Year	**WASP**
2014	11,827
2019	13,306
2024	14,975
2034	18,958
CAGR 2014-2034	2.39%
Year	**FAA 2018 TAF**
2017	9,850
2022	11,084
2027	12,478
2037	15,800
CAGR 2017-2037	2.39%

CAGR: Compound Annual Growth Rate
WASP: Washington Aviation System Plan (2017)
TAF: Terminal Area Forecast – published January 2018

Travel Propensity Factor – Scheduled Carrier Enplanement Forecast

There are a variety of local factors that affect the potential for passengers within an area. A key statistic to consider is the relationship of the airport's scheduled carrier enplanements with the population it serves. The ratio of scheduled carrier enplanements to population is termed the Travel Propensity Factor (TPF).

The TPF is predominantly impacted by the proximity of an airport to other regional airports with higher levels of service or "hub" airports. Regional airports with higher TPF ratios tend to be located farther from hub airports in relatively isolated areas. These airports generally have a service area that extends into adjacent, well-populated regions or have some type of air service advantage that attracts more of those passengers that might otherwise choose to drive to a more distant hub airport. Generally, the higher the travel propensity factor, the more likely air travelers are to utilize the local airport.

Table 2G presents the historical TPF from 2004-2017 as well as two forecasts derived from this data. The first forecast is the constant share projection which considers the airport maintaining a constant share of the 2017 TPF (0.6078). By carrying this ratio forward to the plan years, a forecast emerges. This forecast results in an annual growth rate of 0.89 percent and a long-term forecast of 11,909 scheduled carrier enplanements. While this forecast is considered reasonable, it is likely on the low range of possibilities because the TPF has been increasing over the last several years, primarily due to the recovering economy.

The second forecast included in **Table 2G** reflects an increasing TPF from 0.6 currently to 0.8 over the next 20-years. Not since 2009 has the TPF been over 0.8, however, each year prior to that it was over 0.8. In the years after 2009, the TPF declined, likely the result of the economic recession and subsequent slow recovery. This is considered a reasonable forecast because of the recent increasing TPF trend and

the corresponding improving economy. The increasing TPF forecast results in a long-term forecast of 15,674 scheduled carrier enplanements and a compound annual growth rate of 2.29 percent.

TABLE 2G
Historical Travel Propensity Factor (TPF)
Friday Harbor Airport

Year	FHR Scheduled Carrier Enplanements (FY)[1]	San Juan County Population[2]	Travel Propensity Factor
2004	21,586	14,758	1.4627
2005	20,699	14,922	1.3871
2006	22,552	15,088	1.4947
2007	15,201	15,256	0.9964
2008	14,218	15,425	0.9218
2009	12,859	15,597	0.8245
2010	12,052	15,770	0.7642
2011	11,171	15,859	0.7044
2012	8,526	15,949	0.5346
2013	3,482	16,040	0.2171
2014	7,704	16,131	0.4776
2015	7,815	16,222	0.4818
2016	9,101	16,314	0.5579
2017	9,972	16,406	0.6078
Constant Share of 2017 TPF (CAGR = 0.89%)			
2022	10,449	17,190	0.6078
2027	10,915	17,957	0.6078
2037	11,909	19,593	0.6078
Increasing Share of TPF (CAGR = 2.29%)			
2022	11,174	17,190	0.6500
2027	12,570	17,957	0.7000
2037	15,674	19,593	0.8000

[1]*Bureau of Labor Statistics - Revenue Passengers on Scheduled Carriers - https://www.transtats.bts.gov/Data_Elements.aspx?Data=1*
[2]*Source: San Juan County Comprehensive Plan Update - Population Projections 2017*
CAGR: Compound Annual Growth Rate
FY: Federal fiscal year

Market Share of National Enplanements – Scheduled Carrier Enplanement Forecast

The next forecasting method employed considers the airport's historic market share of U.S. domestic airline enplanements. National forecasts of U.S. domestic airline enplanements are compiled each year by the FAA and consider the state of the economy, fuel prices, and prior year developments. According to the most recent publication, FAA *Aerospace Forecasts, Fiscal Years 2017-2037*, domestic passenger

enplanements are forecast to increase at an average annual rate of 1.7 percent over the 20-year forecast period.

One scheduled carrier enplanement forecast has been developed utilizing the FAA forecast of U.S. domestic airline enplanements, as shown in **Table 2H**. By maintaining a constant share of 2017 U.S. domestic airline enplanements (0.001334%), a forecast emerges. This forecast results in 10,872 scheduled carrier enplanements in 2022, 11,699 scheduled carrier enplanements in 2027, and 13,834 scheduled carrier enplanements in 2037. The compound annual growth rate for this forecast is 1.69 percent. This is a reasonable forecast because the market share percent is consistent with recent years past; however, it may be on the low end of the planning envelope because prior to the 2008-2009 recession, the airport captured up to 0.003 percent of U.S. domestic enplanements. This forecast will be considered with the several others produced, to inform the selection of a preferred forecast.

TABLE 2H
Market Share of US Domestic Enplanements – Scheduled Carrier Enplanement Forecast
Friday Harbor Airport

Year (FY)	FHR Scheduled Carrier Enplanements (FY)[1]	U.S. Domestic Enplanements (Millions)[2]	FHR Market Share of U.S. Domestic Enplanements
2004	21,586	628.5	0.003435%
2005	20,699	669.5	0.003092%
2006	22,552	668.4	0.003374%
2007	15,201	688.5	0.002208%
2008	14,218	680.7	0.002089%
2009	12,859	630.8	0.002039%
2010	12,052	634.8	0.001899%
2011	11,171	650.1	0.001718%
2012	8,526	653.8	0.001304%
2013	3,482	654.4	0.000532%
2014	7,704	668.4	0.001153%
2015	7,815	696.0	0.001123%
2016	9,101	726.0	0.001254%
2017	9,972[3]	742.0	0.001334%
Constant Market Share of U.S. Domestic Enplanements (CAGR = 1.69%)			
2022	10,872	815.0	0.001334%
2027	11,699	877.0	0.001334%
2037	13,834	1,037.0	0.001334%

[1]Bureau of Labor Statistics - Revenue Passengers on Scheduled Carriers - https://www.transtats.bts.gov/Data_Elements.aspx?Data=1
[2]*Source: FAA Aerospace Forecasts, Fiscal Years 2017-2037*
[3]Dec. 2016-Nov. 2017
FY: Federal fiscal year
FHR: Friday Harbor Airport
CAGR: Compound annual growth rate

SELECTED SCHEDULED CARRIER ENPLANEMENT FORECAST

A total of three new scheduled carrier enplanement forecasts have been developed. Prior to determining a final selected scheduled carrier enplanement forecast, the three new forecasts and the 2018 TAF (published January 2018) are examined in detail in **Table 2J.**

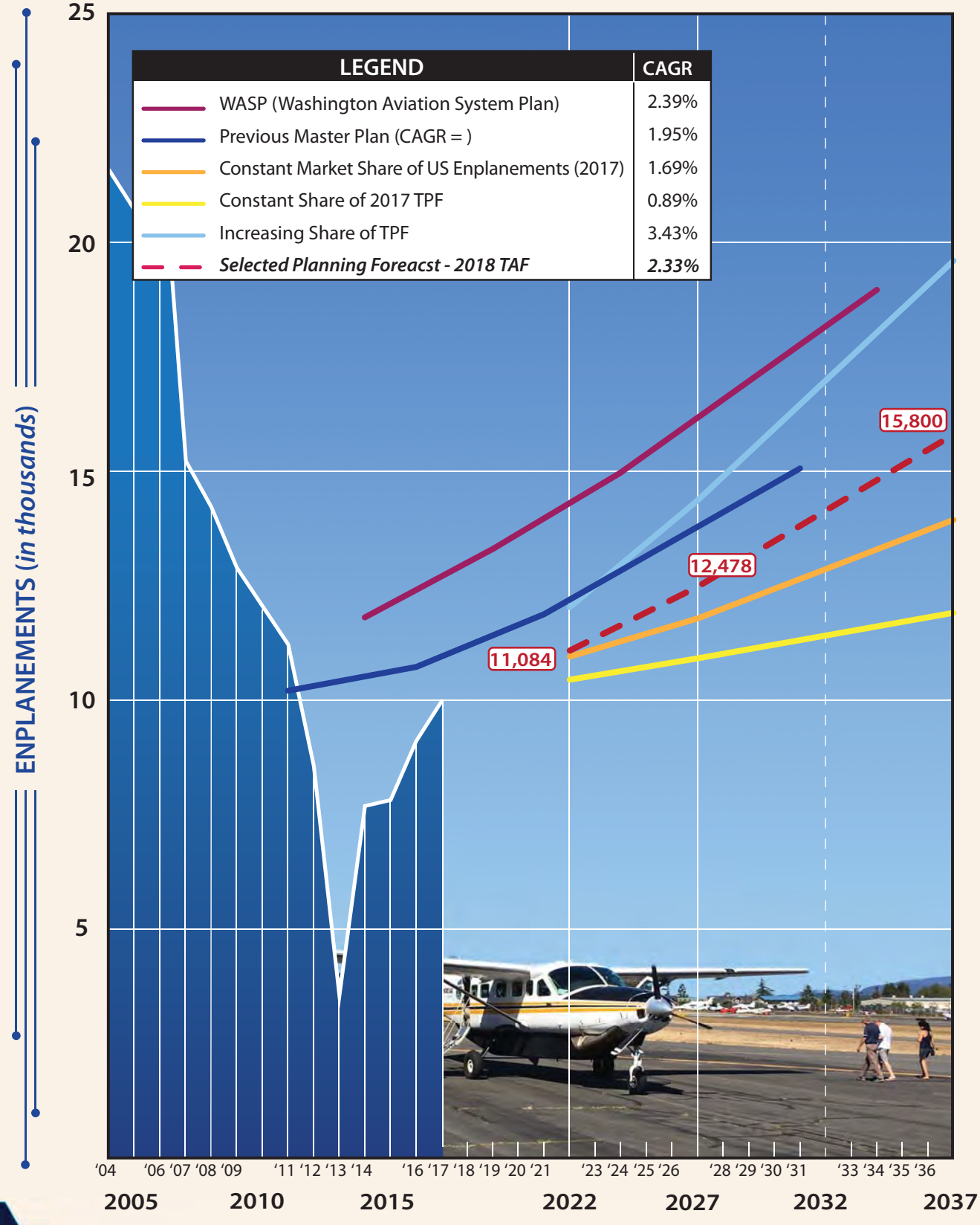
It is with the combined data shown on **Table 2J**, that the analysts' judgement is employed to determine a selected forecast. When examining the combined data, it is possible to see how each forecast related to historical trends. In **Table 2J**, the columns for population and U.S. domestic enplanements are fixed forecast figures from other data sources. The variables are scheduled carrier enplanements, TPF, and market share of U.S. domestic enplanements. When examining these columns, the analyst is looking for consistency with the historical trends for the forecast of each of these variables.

The constant TPF forecast results in a decrease in the market share of U.S. domestic enplanements. This would be a trend reversal from the previous several years. With the now growing economy, it seems unreasonable to select this forecast. The same is true of the market share forecast of U.S. domestic enplanements in that the TPF of this forecast declines, reversing the recent trend. Each of these two forecasts represent the low end of the planning envelope.

The increasing TPF forecast does appear to better reflect the recent trends at the airport. When examining this forecast, the resulting market share of U.S. domestic enplanements increases in a similar fashion to recent past years. For example, when examining the far-right column (market share of U.S. domestic enplanements) for the increasing TPF forecast, the market share percent increases to 0.001512 percent. This is consistent with recent trends (see same column years 2015-2017) and it is still lower than the market share percent from 2004-2011.

Also included in **Table 2J** is the 2018 TAF as published in January 2018. The TAF is very similar to the increasing TPF forecast. The same modest growth rate, when compared to the TPF and market share of U.S. domestic enplanements, is seen. When the TAF is reasonable, which this one is, the forecast analyst may determine that the TAF is the best representation of potential growth at the airport. Therefore, the 2018 TAF is the selected forecast of scheduled carrier enplanements.

Exhibit 2B presents in graphical form the scheduled carrier enplanement forecasts. The graph includes the 13 years of history, the three new forecasts that make up the planning envelope, and the selected forecast, which is the same as the 2018 TAF (published in January 2018). For reference the previous master plan forecast and the WASP forecast are also included.



CAGR: Compound Annual Growth Rate (2017-2037) **TAF:** Terminal Area Forecast

TABLE 2J
Scheduled Carrier Enplanement Forecast Comparison
Friday Harbor Airport

Year	FHR Scheduled Carrier Enplanements (FY)[1]	San Juan County Population[2]	Travel Propensity Factor	U.S. Domestic Enplanements (Millions)[3]	FHR Market Share of U.S. Enplanements
2004	21,586	14,758	1.4627	628.5	0.003435%
2005	20,699	14,922	1.3871	669.5	0.003092%
2006	22,552	15,088	1.4947	668.4	0.003374%
2007	15,201	15,256	0.9964	688.5	0.002208%
2008	14,218	15,425	0.9218	680.7	0.002089%
2009	12,859	15,597	0.8245	630.8	0.002039%
2010	12,052	15,770	0.7642	634.8	0.001899%
2011	11,171	15,859	0.7044	650.1	0.001718%
2012	8,526	15,949	0.5346	653.8	0.001304%
2013	3,482	16,040	0.2171	654.4	0.000532%
2014	7,704	16,131	0.4776	668.4	0.001153%
2015	7,815	16,222	0.4818	696.0	0.001123%
2016	9,101	16,314	0.5579	726.0	0.001254%
2017	9,972	16,406	0.6078	742.0	0.001344%
Constant Travel Propensity Factor (CAGR = 0.89%)					
2022	10,449	17,190	0.6078	815.0	0.001282%
2027	10,915	17,957	0.6078	877.0	0.001245%
2037	11,909	19,593	0.6078	1,037.0	0.001148%
Increasing Travel Propensity Factor (CAGR = 2.29%)					
2022	11,174	17,190	0.6500	815.0	0.001371%
2027	12,570	17,957	0.7000	877.0	0.001433%
2037	15,674	19,593	0.8000	1,037.0	0.001512%
Constant Market Share of U.S. Domestic Enplanements (CAGR = 1.69%)					
2022	10,953	17,190	0.6372	815.0	0.001344%
2027	11,786	17,957	0.6564	877.0	0.001344%
2037	13,937	19,593	0.7113	1,037.0	0.001344%
Selected Planning Forecast - FAA TAF 2018 (CAGR = 2.33%)					
2022	11,084	17,190	0.6448	815.0	0.001360%
2027	12,478	17,957	0.6949	877.0	0.001423%
2037	15,800	19,593	0.8064	1,037.0	0.001524%

[1] Bureau of Labor Statistics - Revenue Passengers on Scheduled Carriers - https://www.transtats.bts.gov/Data_Elements.aspx?Data=1
[2]*Source: San Juan County Comprehensive Plan Update - Population Projections 2017*
[3]FAA Aerospace Forecasts - Published March 2017
CAGR: Compound Annual Growth Rate (2017-2037)
TAF: Terminal Area Forecast, Published January 2018
FY: Federal fiscal year

Enplanement Comparison to the Terminal Area Forecast

As discussed at the outset, the FAA will consider the master plan forecasts in comparison to the TAF. The FAA prefers the short-term forecast to be within 10 percent of the TAF and the intermediate to be within 15 percent. While several new forecasts of scheduled carrier enplanements were developed, it was determined by the forecast analyst that the 2018 TAF best represents the recent trends at the airport and is a reasonable forecast for planning purposes. **Table 2K** shows that the selected scheduled carrier enplanement forecast falls within FAA tolerances.

TABLE 2K
Scheduled Carrier Enplanement Forecast Comparison to the TAF
Friday Harbor Airport

Year	TAF 2018 (FY)	Master Plan Forecast (FY)	% Change
2022	11,084	11,084	0.0%
2027	12,478	12,478	0.0%
2037	15,800	15,800	0.0%

FY: Federal fiscal year
TAF: FAA Terminal Area Forecast - January 2018

TOTAL ENPLANEMENT FORECAST

Enplanement activity at Friday Harbor Airport is somewhat unique in that a large percent of their total enplanements is serviced by on-demand/charter carriers. The number of passengers utilizing this method of air transportation, as opposed to utilizing a regularly scheduled air carrier (i.e. Kenmore Air), are not counted in the TAF. However, these additional enplanements do contribute toward the total number of enplanements the airport. Total enplanements are a critical input to various airport planning models used to determine future facility needs, particularly terminal building needs, vehicle parking needs, and commercial aircraft apron needs. In addition, airports that exceed 10,000 annual enplanements receive at least $1.0 million in FAA development funding, while those below 10,000 enplanements, are limited to $150,000. Therefore, it is critical to recognize and plan for the actual total number of enplanements at the airport, not just the scheduled carrier enplanements.

Airports that exceed 10,000 annual enplanements receive at least $1.0 million in FAA funding.

Table 2L shows the history of scheduled carrier enplanements versus total enplanements. The difference between the two is the number of enplanements utilizing unscheduled on-demand/charter carriers. Total enplanements are sourced from the FAA Air Carrier Activity Information System (ACAIS) database. This is the official calendar year total enplanement count source that the FAA uses.

TABLE 2L
Total Enplanement Forecast
Friday Harbor Airport

Year (FY)	Scheduled Carrier Enplanements (FY)[1]	Total Enplanements (CY)[2]	Unscheduled On-Demand/Charter Enplanements	Percent of Total Enplanements	Percent Difference from Scheduled Carrier Enplanements
2004	21,856	23,329	1,473	6.31%	6.74%
2005	20,699	21,172	473	2.23%	2.29%
2006	22,552	23,317	765	3.28%	3.39%
2007	15,201	12,287	-2,914	-23.72%	-19.17%
2008	14,218	13,835	-383	-2.77%	-2.69%
2009	12,859	12,940	81	0.63%	0.63%
2010	12,052	12,381	329	2.66%	2.73%
2011	11,171	11,283	112	0.99%	1.00%
2012	8,526	11,555	3,029	26.21%	35.53%
2013	3,482	10,688	7,206	67.42%	206.95%
2014	7,704	11,798	4,094	34.70%	53.14%
2015	7,815	11,254	3,439	30.56%	44.01%
2016	9,101	12,831	3,730	29.07%	40.98%
2017	9,972	13,000[3]	3,028	23.29%	30.37%
TOTAL ENPLANEMENT FORECAST (CAGR = 2.02%)					
2022	11,084	**14,500**	3,416	23.56%	30.82%
2027	12,478	**16,300**	3,822	23.45%	30.63%
2037	15,800	**19,400**	3,600	18.56%	22.78%

[1]Bureau of Labor Statistics - Revenue Passengers on Scheduled Carriers - https://www.transtats.bts.gov/Data_Elements.aspx?Data=1
[2]*FAA Air Carrier Activity Information System (ACAIS) database - calendar year.*
[3]December 2016-November 2017

As can be seen in **Table 2L**, there has been at least 3,000 unscheduled enplanements each year since 2012. In 2013, there were over 7,200 unscheduled enplanements. For this analysis, 2013 data and all data prior to 2012 is not utilized because of the variability. Utilizing five years of data (years 2012, 2014, 2015, 2016, 2017) allows analysis of the more recent trends and it is more consistent, leading to more reliable conclusions.

Since 2012, excluding 2013, the number of unscheduled enplanements has represented between 23-34 percent of total enplanements and an increase of between 30-53 percent in enplanements over scheduled carrier enplanements. In 2017, there were 3,028 unscheduled enplanements which represented 23 percent of total enplanements and was a 30 percent increase over scheduled carrier enplanements.

Utilizing the judgement of the forecast analyst, a conservative approach has been taken to forecasting total enplanements. The number of unscheduled enplanements is projected to remain at or near 2017 levels (constant) in the five and ten-year timeframes. In the 20-year timeframe, the number of unscheduled enplanements is projected to decrease slightly as a percent of the total. The selected total enplanement forecast considers an increase from approximately 13,000 enplanements in 2017 to 14,500 by 2022. By 2027, total enplanements are forecast at 16,300, and by the long-term total enplanements is forecast to reach 19,400. This represents an annual growth rate of 2.02 percent, which is slightly less than the TAF scheduled carrier enplanement growth rate of 2.33 percent for the same period.

This total enplanement forecast is not the official forecast to be submitted for FAA review and approval. This forecast is only intended to allow the airport to properly plan for projections of increasing total enplanements. If the airport were to plan for only scheduled carrier enplanements, then facilities would be undersized. It will be critical for the airport to continue to regularly monitor and track total enplanements at the airport.

COMMUTER/AIR TAXI OPERATIONS FORECAST

As noted previously, operations at an airport are categorized as air carrier, commuter/air taxi, general aviation, and military. This section presents a forecast for commuter/air taxi operations which are considered commercial in nature. There are two commercial carriers providing a regular flight schedule: Kenmore Air and San Juan Airlines. There are two other airlines providing aerial tours of the Pacific Northwest: Westwind Aviation and Island Air. Rite Brothers Aviation, accounting for the smallest number of operations, is another carrier providing on-demand air transportation service to/from the island. **Table 2M** presents the history of commuter/air taxi operations at Friday Harbor Airport. This data is derived from the landing fee reports maintained by the airport administration.

TABLE 2M
Commuter Operations History
Friday Harbor Airport

Source	2012	2013	2014	2015	2016	2017[1]
Kenmore Air	2,954	2,962	3,132	3,242	3,440	3,438
San Juan Airlines	1,112	1,166	3,064	3,782	4,120	3,640
Westwind Aviation	652	680	584	838	498	650
Island Air (Tours)	2,636	2,082	2,316	1,276	970	1,198
Rite Bros.	38	28	36	38	56	64
Total	**7,392**	**6,918**	**9,132**	**9,176**	**9,084**	**8,990**

[1] Operations from August 2016-July 2017
Source: Airport landing reports for PFC collection

The forecast of commuter/air taxi operations is a function of the anticipated flight schedule for the air carriers, aircraft used or projected to be used, and the forecast number of passenger enplanements. **Table 2N** presents this information.

TABLE 2N
Commercial Airline Fleet Mix and Operations Forecast
Friday Harbor Airport

Fleet Mix Aircraft Seats	Projected Aircraft	Baseline 2017	Forecast 2022	Forecast 2027	Forecast 2037
9	Caravan	38.0%	40.0%	42.0%	44.0%
9	Islander	0.0%	10.0%	10.0%	10.0%
5	C-206	20.0%	17.0%	15.0%	15.0%
3	C-172	42.0%	33.0%	33.0%	31.0%
Total		100.0%	100.0%	100.0%	100.0%
Average Seats per Departures		5.7	6.3	6.4	6.5
Boarding Load Factor		50.9%	52.0%	54.0%	58.0%
Enplanements per Departure		2.9	3.3	3.5	3.8
Annual Enplanements		13,000	14,500	16,300	19,400
Annual Departures		4,495	4,398	4,702	5,114
Annual Operations		8,990	8,796	9,404	10,228

The number of commuter/air taxi operations is forecast to increase over the next 20 years, from approximately 8,990 in 2017 to 10,228 in 2037. This equates to an annual growth rate of 0.65 percent in the number of operations. Impacting growth in operations significantly is the fleet mix used. For example, a new carrier to the airport is planning to utilize a Brittan-Norman Islander nine-seat aircraft for service in the northwest and parts of Canada. Because of the planned introduction of this aircraft, the total number of commuter/air taxi operations is projected to decline slightly by 2022 because when more seats are available, fewer flights are needed to achieve the forecast level of enplanements.

The commercial service aircraft fleet mix defines a number of key parameters in airport planning, including terminal complex layout, maximum stage length capabilities (affecting runway length evaluations), and, in some cases, the critical aircraft (for pavement design and apron geometry). Kenmore Air utilizes the nine-seat Cessna Caravan 208 aircraft. San Juan Airlines utilizes the three-seat Cessna 172 and the five-seat Cessna 206/207. Island Air and Westwind Aviation use smaller three- and five-passenger-seat aircraft.

Predicting the aircraft to be used, available seats, and loading factors is inherently challenging because of the changing nature of the aircraft being utilized by small regional carriers. However, we can reasonably assume that only aircraft with fewer than nine seats will continue to operate at the airport since it is not a Part 139 certificated aircraft and because of the limited available runway length. The future commuter/air taxi fleet mix is not anticipated to change significantly at Friday Harbor Airport.

GENERAL AVIATION FORECASTS

General aviation encompasses all portions of civil aviation except commercial service (including commuter/air taxi) and military operations. To determine the types and sizes of facilities that should be planned to accommodate general aviation activity at the airport, certain elements of this activity must

be forecast. These indicators of general aviation demand include based aircraft, aircraft fleet mix, and annual operations.

BASED AIRCRAFT FORECASTS

The number of based aircraft is the most basic indicator of general aviation demand. By first developing a forecast of based aircraft for the airport, other general aviation activity and demand can be projected. The process of developing forecasts of based aircraft begins with an analysis of aircraft ownership in the primary general aviation service area through a review of historical aircraft registrations.

Area Aircraft Ownership (Registered Aircraft)

Analysis presented earlier indicates that the primary service area for general aviation demand is San Juan County. Aircraft ownership trends for the primary service area typically dictate the based aircraft trends for an airport. As such, an analysis of the San Juan County aircraft registrations was made.

Table 2P presents the history of registered aircraft in San Juan County from 1993 through 2017. These figures are derived from the FAA aircraft registration database that categorize registered aircraft by county based on the zip code of the registered aircraft. Although this information generally provides a correlation to based aircraft, it is not uncommon for some aircraft to be registered in the county but based at an airport outside the county or vice versa.

In 2017, there were 240 aircraft registered in San Juan County. From 2001-2009, there were more than 300 registered aircraft. Like most of the country, aircraft ownership declined significantly based on two significant factors: 1) the national recession of 2009-2009; and 2) the process of aircraft re-registration by the FAA that took place from 2010-2013. With the number of registered aircraft identified, several projections of future registered aircraft are considered.

Table 2Q presents three different projections of registered aircraft for San Juan County. The first is a simple growth rate scenario where the growth rate (0.96 percent) from 1993 through 2017 was extended to the plan years. This resulted in a long-term forecast of 291 registered aircraft. This forecast is influenced by the growth years prior to the recession of 2008-2009 when registered aircraft began declining. As a result, the long-term forecast appears to be somewhat on the high range and is viewed with some caution considering the recent declining trend.

The next forecast of registered aircraft considers the relationship between registered aircraft and the county population. In 2017, there were 14.6288 registered aircraft per 1,000 people in the county. By keeping this ratio constant, a forecast emerges with a 2037 projection of 287 registered aircraft. The annual growth rate for this forecast is 0.89 percent. This is considered a reasonable forecast because the indicators (percent of U.S. active aircraft and population ratio) are all in line with recent past trends.

TABLE 2P
Registered Aircraft Fleet Mix in San Juan County, WA

Year	Single Engine Piston	Multi-Engine Piston	Jet	Turboprop	Helicopter	Total
1993	172	12	1	2	4	191
1994	180	11	1	3	5	200
1995	197	14	1	3	3	218
1996	213	13	2	3	4	235
1997	226	11	2	5	6	250
1998	244	15	3	3	6	271
1999	265	15	2	4	8	294
2000	280	13	2	3	8	306
2001	284	17	3	14	8	326
2002	285	17	3	14	8	327
2003	276	16	3	17	8	320
2004	276	17	4	16	11	324
2005	276	20	4	13	8	321
2006	289	19	3	3	9	323
2007	282	15	1	3	9	310
2008	280	14	0	6	10	310
2009	288	14	0	6	9	317
2010	275	14	0	6	11	306
2011	268	13	1	7	10	299
2012	248	12	1	7	7	275
2013	237	10	1	7	7	262
2014	229	10	1	7	5	252
2015	223	9	1	5	4	242
2016	224	9	1	5	3	242
017	221	7	1	7	4	240
Compound Annual Growth Rate from 1993 to 2017:						**0.96%**

Source: FAA Aircraft Registry Database; FAA Census of U.S. Civil Aircraft

The last forecast considers the relationship between the number of registered aircraft and the FAA's forecast of active general aviation aircraft. By keeping this ratio constant with 2017 levels (0.1144), a long-term forecast of 244 registered aircraft results. This is a low range forecast because it considers the addition of only four registered aircraft in the next 20 years. With the growing economy, most aviation demand indicators have stabilized and/or returned to growth. Therefore, a moderate growth scenario is the judgement of this analyst.

Each of these three forecasts takes into account variables in relation to registered aircraft, those being the historical trend, population, and active aircraft in the national fleet. The three of these forecasts create a reasonable planning envelope. The selected forecast is in the mid-range of the planning envelope. The selected forecast is closest to the constant population ratio forecast; however, it is tempered in the long-term slightly because generally there is not a 1-to-1 relationship between aircraft ownership and population growth. Typically, over time, the ratio of aircraft ownership to population will decrease. By 2022, registered aircraft are projected to reach 250 and by 2037, a total of 280 registered aircraft are

projected. The annual growth rate is 0.77 percent. **Exhibit 2C** is a graphical presentation of the registered aircraft planning envelope and the selected forecast.

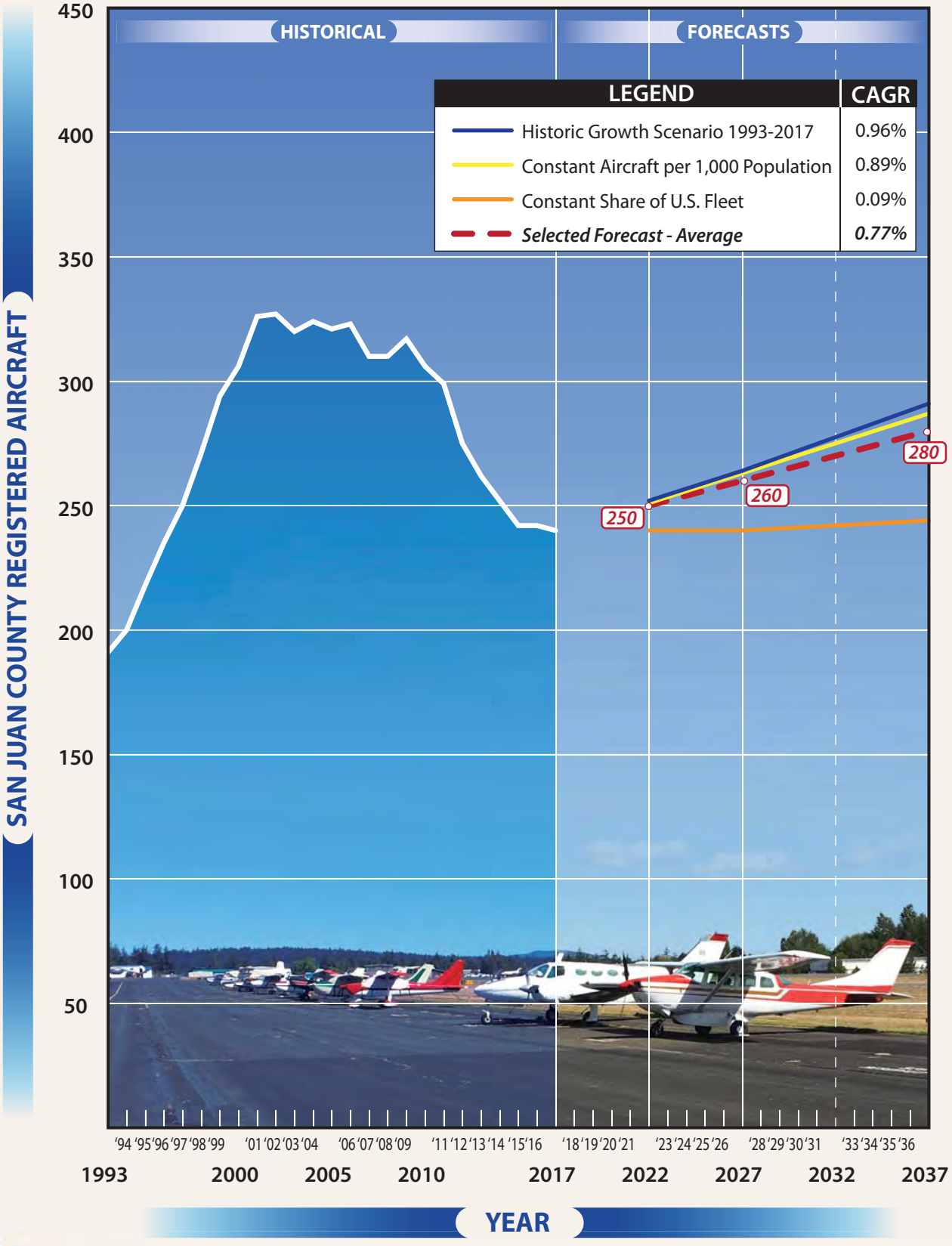
TABLE 2Q
San Juan County Registered Aircraft Forecast

Year	County Registrations[1]	U.S. Active Aircraft[2]	Percent of U.S. Active Aircraft	County Population[3]	Aircraft Per 1,000 Population
2005	321	224,257	0.1431%	14,922	21.5119
2006	323	221,942	0.1455%	15,088	21.4077
2007	310	231,606	0.1338%	15,256	20.3199
2008	310	228,664	0.1356%	15,425	20.0972
2009	317	223,876	0.1416%	15,597	20.3244
2010	306	223,370	0.1370%	15,770	19.4039
2011	299	220,453	0.1356%	15,859	18.8536
2012	275	209,034	0.1316%	15,949	17.2425
2013	262	199,927	0.1310%	16,040	16.3342
2014	252	204,408	0.1233%	16,131	15.6221
2015	242	210,031	0.1152%	16,222	14.9180
2016	242	209,905	0.1153%	16,314	14.8339
2017	240	209,800	0.1144%	16,406	14.6288
Historic Growth Scenario 1993-2017 (CAGR = 0.96%)					
2022	252	209,655	0.1202%	17,190	14.6597
2027	264	209,805	0.1258%	17,957	14.7018
2037	291	213,420	0.1364%	19,593	14.8522
Constant Aircraft Per 1,000 Population (CAGR= 0.89%)					
2022	251	209,655	0.1199%	17,190	14.6288
2027	263	209,805	0.1252%	17,957	14.6288
2037	287	213,420	0.1343%	19,593	14.6288
Constant Share of U.S. Fleet (CAGR = -0.09%)					
2022	240	209,655	0.1144%	17,190	13.9520
2027	240	209,805	0.1144%	17,957	13.3656
2037	244	213,420	0.1144%	19,593	12.4606
Selected Forecast - Average (CAGR = 0.77%)					
2022	250	209,655	0.1192%	17,190	14.5433
2027	260	209,805	0.1239%	17,957	14.4790
2037	280	213,420	0.1312%	19,593	14.2908

[1] FAA Aircraft Registration Database
[2] FAA *Aerospace Forecasts Fiscal Years 2017-2037*
[3] *San Juan County Comprehensive Plan Update* (2017).
CAGR: Compound Annual Growth Rate

Source: Coffman Associates analysis.

The registered aircraft projection is one data point to be used in the development of a based aircraft forecast. The following section will present several potential based aircraft forecasts, as well as the selected based aircraft forecast, to be utilized in this study.



CAGR: Compound Annual Growth Rate
Source: Coffman Associates analysis.

Existing Based Aircraft Forecasts

Determining the number of based aircraft at an airport can be a challenging task. Aircraft storage can be somewhat transient in nature, meaning aircraft owners can and do move their aircraft. Some aircraft owners may store their aircraft at an airport for only part of the year. For many years, the FAA did not require based aircraft records; therefore, historical records are often incomplete or non-existent. The airport administration has been diligent in providing based aircraft numbers on FAA Form 5010. The FAA TAF for the airport is also reasonably reflective of the history of based aircraft. For this master plan, airport management did a physical count of based aircraft and entered them into the FAA's database via www.basedaircraft.com. The FAA uses this database for official based aircraft counts at general aviation airports across the country. Table 1G previously presented the historical based aircraft counts. In 2017, there were 152 aircraft based at the airport.

The previous master plan projected based aircraft growing from 143 in 2011 to 162 in 2031, for an annual growth rate of 0.63 percent. Since 2011, the airport has experienced an annual growth rate of 1.02 percent, thus currently exceeding the previous master plan projection.

The FAA TAF is a second based aircraft forecast available for consideration. The TAF, as noted previously, identified 151 based aircraft in 2017 and 193 in 2037, for an annual growth rate of 1.23 percent.

Regression Analysis

The historical increase, over time, in based aircraft at the airport is an indication that a variety of statistical analyses may produce meaningful projections. Regression analysis was performed that considered the following independent variables: registered aircraft in the county, U.S. active aircraft, population, employment, and income. The inputs to the regression model are shown on **Table 2R**. A total of 18 years of data were used.

The time-series regression is shown at the top of **Table 2S** and the regressions that consider the independent variables are shown below that. The time-series is a statistical analysis that considers the history of based aircraft and "fits" a line over the data and then projects that line into the future. This results in an r^2 value of 0.834, which is lower than the desired level of 0.95 but may still be considered for its reasonableness. When projected the time-series results in a long-term forecast of 192 based aircraft.

TABLE 2R
Regression Analysis - Based Aircraft
Friday Harbor Airport

	Dependent Variable	Independent Variables Considered				
Year	Y1 - Based Aircraft[1]	X1 - Registered Aircraft[2]	X2 - U.S. Active Aircraft[3]	X3 - County Population[4]	X4 - County Employ-ment[5]	X5 - County Income[5]
2000	123	306	217,533	14,120	9,282	$51,392
2001	123	326	211,446	14,277	9,681	$48,689
2002	123	327	211,244	14,436	9,548	$47,932
2003	128	320	209,606	14,596	9,842	$49,097
2004	123	324	219,319	14,758	10,079	$52,442
2005	123	321	224,257	14,922	10,265	$54,036
2006	142	323	221,942	15,088	10,392	$56,072
2007	142	310	231,606	15,256	10,837	$59,484
2008	142	310	228,664	15,425	11,042	$60,787
2009	145	317	223,876	15,597	10,624	$49,848
2010	145	306	223,370	15,770	10,369	$49,427
2011	143	299	220,453	15,859	10,340	$51,170
2012	145	275	209,034	15,949	10,468	$57,183
2013	145	262	199,927	16,040	10,519	$55,962
2014	148	252	204,408	16,131	10,685	$60,238
2015	148	242	210,031	16,222	10,979	$60,489
2016	150	242	209,905	16,314	11,145	$60,030
2017	152	240	209,800	16,406	11,320	$60,805
FORECAST YEARS						
2022	TBD	250	209,655	17,190	12,253	$64,818
2027	TBD	260	209,805	17,957	13,263	$68,761
2037	TBD	280	213,420	19,593	15,365	$75,451

[1]2000-2016 sourced from the Terminal Area Forecast. 2017 sourced from basedaircraft.com.
[2]FAA aircraft registration database
[3]FAA Aerospace Forecasts - Fiscal Years 2017-2037
[4]San Juan County Comprehensive Plan Update Population Projections 2017
[5]Woods & Poole Economics - Complete Economic and Demographic Data Source (CEDDS)

Below the time-series is the top five regressions. All five have the same r^2 value of 0.886, again lower than the desired 0.95, but still to be considered. As one can see in **Table 2S**, these five regressions result in nearly identical based aircraft projections.

TABLE 2S
Based Aircraft Forecasts - Top 5 Regressions and Time-Series
Friday Harbor Airport

2017 Based Aircraft: 152	r^2	FORECAST 2022	2027	2037	CAGR 2017-2037
TIME-SERIES	0.834	164	173	192	1.17%
REGRESSION VARIABLES					
Registered Aircraft, US Active Aircraft, Pop., Emp., Income	0.886	164	176	202	1.44%
Registered Aircraft, US Active Aircraft, Pop., Income	0.886	164	176	201	1.41%
US Active Aircraft, Pop., Emp., Income	0.886	164	175	200	1.38%
Registered Aircraft, US Active Aircraft, Pop., Emp.	0.886	164	176	202	1.43%
US Active Aircraft, Pop., Income	0.886	164	176	201	1.42%

CAGR: Compound annual growth rate
Notes: Pop., Emp., Income = San Juan County.

Market Share of Registered Aircraft Projections

Previously, a projection of registered aircraft for San Juan County was completed. These figures are now utilized to develop a forecast of based aircraft to be considered. In 2017, the airport had 152 based aircraft, which accounted for 63.3 percent of the registered aircraft in the county. By maintaining this market share as a constant through the planning period a forecast emerges as shown in **Table 2T**. This forecast results in a long-term forecast of 177 based aircraft. This is likely a low range forecast because history shows that the airport has been trending toward capturing a larger percent of the registered aircraft in the county.

Statewide TAF Growth Rate Projection

For non-towered airports, FAA Order 5090.3C, *Field Formulation of the NPIAS* provides a method for estimating future based aircraft at an airport by applying the statewide TAF growth rate. For all NPIAS airports in Washington, the FAA projects an annual growth rate of 0.99 percent. By applying this growth rate to the current based aircraft number of 152 a forecast emerges. This forecast results in a long-term based aircraft projection of 185. This is a reasonable forecast because the airport has experienced a growth rate that exceeds this over the last 18 years (1.06 percent).

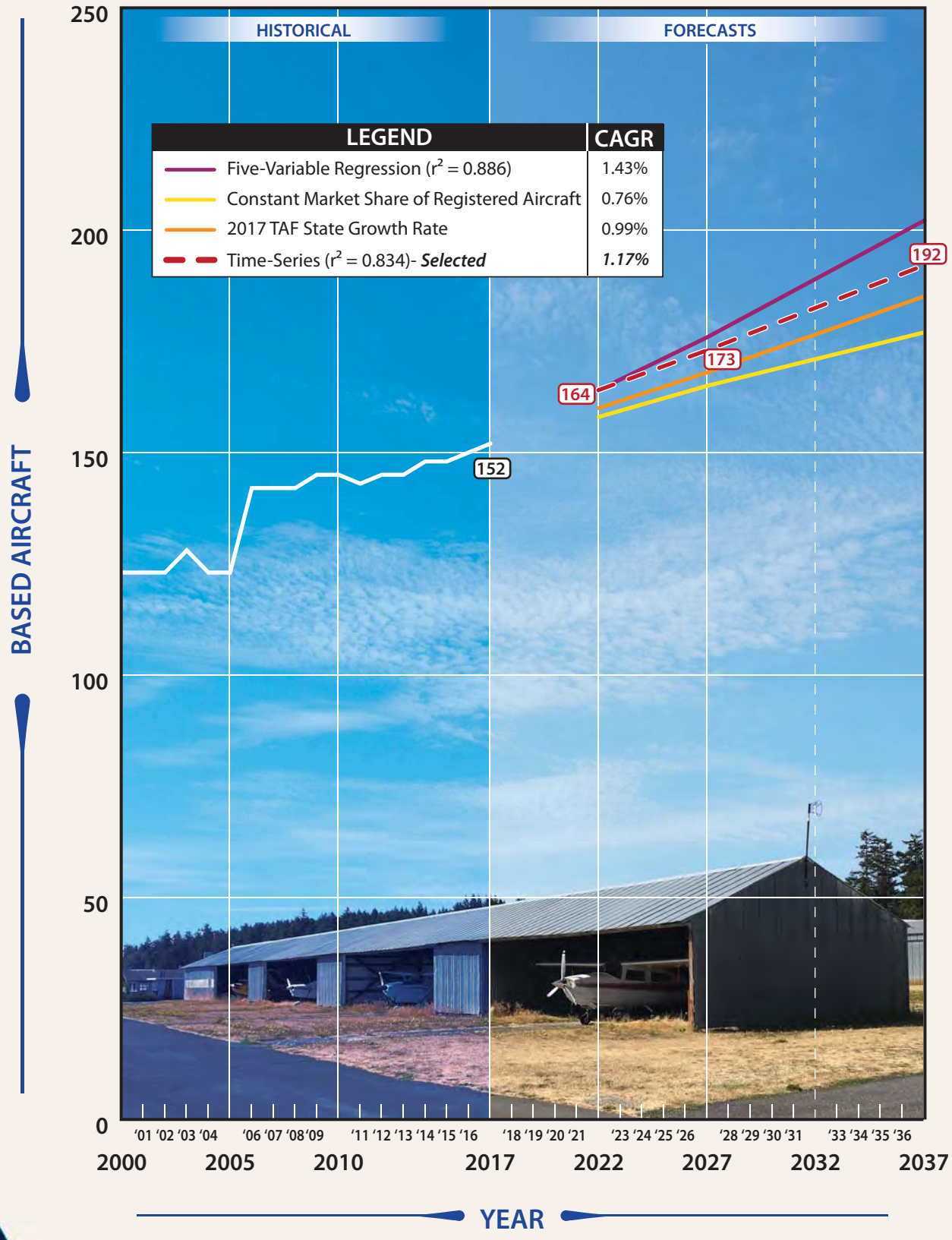
TABLE 2T
Based Aircraft Market Share of Registered Aircraft Forecast
Friday Harbor Airport

Year	San Juan County Registered Aircraft	Aircraft Based at FHR	Percent of County Registered Aircraft Based at FHR
2000	306	123	40.20%
2001	326	123	37.73%
2002	327	123	37.61%
2003	320	128	40.00%
2004	324	123	37.96%
2005	321	123	38.32%
2006	323	142	43.96%
2007	310	142	45.81%
2008	310	142	45.81%
2009	317	145	45.74%
2010	306	145	47.39%
2011	299	143	47.83%
2012	275	145	52.73%
2013	262	145	55.34%
2014	252	148	58.73%
2015	242	148	61.16%
2016	242	150	61.98%
2017	240	152	63.33%
Constant Market Share (CAGR = 0.71%)			
2022	250	158	63.33%
2027	260	165	63.33%
2037	280	177	63.33%

Source: Coffman Associates analysis

Based Aircraft Forecast Summary

Table 2U summarizes the based aircraft analysis and **Exhibit 2D** graphically presents the four based aircraft forecasts that comprise the planning envelope. Unpredictable future variables may cause based aircraft to trend toward the high end or toward the low end. It is the judgement of the forecast analyst that the time-series analysis is the most appropriate forecast. Time-series analysis is an analytical technique that takes into consideration the history of growth at the airport. By 2022 the airport is forecast to see an additional 12 based aircraft for a total of 164. By 2027 a total of 173 are forecast and by the long-term the total number of based aircraft is forecast as 192.



CAGR: Compound Annual Growth Rate
Source: Coffman Associates analysis.

TABLE 2U
Based Aircraft Forecast Summary
Friday Harbor Airport

Projection Sources	2022	2027	2037	CAGR 2017-2037
Time-Series (r^2 = 0.834)	164	173	192	1.17%
Five-Variable Regression (r^2 = 0.886)	164	176	202	1.43%
Constant Market Share of Registered Aircraft	158	165	177	0.76%
2017 TAF State Growth Rate	160	168	185	0.99%
SELECTED BASED AIRCRAFT FORECAST	**164**	**173**	**192**	**1.17%**

CAGR: Compound annual growth rate
Source: Coffman Associates analysis

Based Aircraft Fleet Mix

It is important to have an understanding of the current and projected based aircraft fleet mix at an airport. This will ensure the proper planning of facilities in the future.

The forecast mix of based aircraft was determined by comparing existing and forecast U.S. general aviation fleet trends to the fleet mix at the airport. The national trend in general aviation is toward a greater percentage of larger, more sophisticated aircraft as part of the national fleet. However, Friday Harbor Airport is limited in terms of aircraft size because of the length and strength of the runway. Therefore, future based aircraft are forecast to be similar to the mix currently using the airport. One notable addition to the fleet mix is two business jets in the intermediate and long terms. These would likely be smaller business jets. In fact, airport management has already had discussions with small business jet owners about the capability of the airport to accommodate those aircraft. **Table 2V** presents the current and forecast based aircraft fleet mix.

TABLE 2V
Based Aircraft Fleet Mix
Friday Harbor Airport

Aircraft Type	2017	Percent	2022	Percent	2027	Percent	2037	Percent
Single Engine Piston	135	88.8%	144	87.8%	148	85.5%	161	83.9%
Multi-Engine Piston	7	4.6%	7	4.3%	8	4.6%	8	4.2%
Turboprop	4	2.6%	6	3.7%	8	4.6%	12	6.3%
Jet	0	0.0%	0	0.0%	1	0.6%	2	1.0%
Helicopters	6	3.9%	7	4.3%	8	4.6%	9	4.7%
Total	**152**	**100.0%**	**164**	**100.0%**	**173**	**100.0%**	**192**	**100.0%**

Source: Coffman Associates analysis of FAA Registered Aircraft Database

ANNUAL OPERATIONS

Operations are categorized as air carrier, air taxi/commuter, general aviation, and military. They are further classified as local or itinerant. A local operation is a take-off or landing performed by an aircraft that operates within sight of an airport, or which executes simulated approaches or touch-and-go operations at an airport. Itinerant operations are those performed by aircraft with a specific origin or destination away from an airport. Generally, local operations are characterized by training operations. Itinerant operations increase with business and commercial use, since business aircraft operate on a high frequency and are not typically utilized for local training operations.

Determining general aviation operations can be challenging at airports that do not have an airport traffic control tower, such as Friday Harbor Airport. It is therefore necessary to rely, to some degree, on operations projections that were previously completed. The FAA TAF appears to provide an acceptable baseline which has been used in the following general aviation operations projections. Commercial operations, previously forecast, have been developed with more specificity because the airport tracks those as part of their landing fee collection process.

Other traditional sources of operational activity for the airport proved inadequate. For example, FBO fueling records can be used to extrapolate an operations estimate. Unfortunately, this is not a good measure at Friday Harbor Airport because fuel prices are very high. There is a premium on fuel costs because of the additional cost to deliver fuel to the island. Most folks will buy fuel on the mainland, where it is less expensive. Therefore, fuel records were not utilized to assist in estimating operations.

The FAA's Traffic Flow Management Activity System County (TFMSC) database can provide very good data regarding IFR operations but VFR data is very limited. For example, the CY 2016 TFMSC total ops count was 3,973 while the TAF has 45,927 total ops for 2016. The TFMSC database is better for determining the critical aircraft and is not used to facilitate the operations forecast.

Following the established methodology, existing operations forecasts will first be examined. Then several new operations forecasts will be developed which will create a reasonable planning envelope from which a specific forecast will be selected. The operations forecasts will be developed for each segment of aviation and then combined to form a total operations forecast.

The 2017 total operations baseline is 46,762 which is sourced from the 2018 TAF published in January 2018. **Table 2W** shows the history of operations at the airport. Air carrier (60+ passenger seats) and military operations are the two other categories of operations that an airport may experience. The TAF does not document any of these types of operations for the airport.

TABLE 2W
Historical Operations
Friday Harbor Airport

Year	ITINERANT OPERATIONS			LOCAL OPERATIONS	TOTAL OPERATIONS
	Air Taxi/ Commuter	General Aviation	Subtotal	General Aviation	
2003	20,934	32,716	53,650	19,019	72,669
2004	17,804	33,326	51,130	19,361	70,491
2005	15,588	32,474	48,062	18,791	66,853
2006	16,328	33,124	49,452	19,110	68,562
2007	16,655	33,786	50,441	19,429	69,870
2008	21,135	21,135	42,270	21,135	63,405
2009	17,655	16,476	34,131	24,715	58,846
2010	17,655	16,476	34,131	24,715	58,846
2011	14,636	13,652	28,288	20,478	48,766
2012	14,636	13,652	28,288	20,478	48,766
2013	14,636	13,652	28,288	20,478	48,766
2014	9,505	12,288	21,793	24,134	45,927
2015	9,505	12,288	21,793	24,134	45,927
2016	9,505	12,288	21,793	24,134	45,927
2017	9,695	12,533	22,228	24,534	46,762

Source: 2018 Terminal Area Forecast, published January 2018

Existing Total Operations Forecasts

Table 2Y presents existing operations forecasts for the Friday Harbor Airport. The 2015 master plan, with a base year of 2011, projected an annual growth rate of 1.18 percent. Operations were forecast to reach 68,630 by 2031.

The FAA TAF (published in January 2018) projects operations to grow from 46,762 in 2017 to 67,119 in 2037 for an annual growth rate of 1.82 percent.

The *Washington Aviation System Plan* (2017), with a base year of 2014, includes airport-specific information related to commercial operations but only projects systemwide general aviation operations. Therefore, general aviation operations numbers are not available from this source.

TABLE 2Y
Existing Operations Forecasts
Friday Harbor Airport

Year	Air Taxi/ Commuter/ Cargo	General Aviation	Total
2015 Master Plan (2011 base year)			
2011	9,168	45,080	54,248
2016	9,310	46,030	55,340
2021	9,460	49,100	58,560
2031	10,510	58,120	68,630
CAGR 2011-2031	**0.69%**	**1.28%**	**1.18%**
2018 Terminal Area Forecast (published January 2018)			
2017	9,695	37,067	46,762
2022	10,703	40,485	51,188
2027	11,817	44,156	56,023
2037	14,402	52,717	67,119
CAGR 2017-2037	**2.00%**	**1.78%**	**1.82%**
Washington Aviation System Plan (WASP) (2014 base year)			
2014	13,400	NA	NA
2019	14,796	NA	NA
2024	16,335	NA	NA
2034	19,909	NA	NA
CAGR 2014-2034	**2.00%**	NA	NA

Itinerant General Aviation Operations Forecast

Table 2Z considers the relationship between itinerant general aviation operations and the FAA national forecast of itinerant general aviation operations. In 2017, it is estimated the airport has 12,533 itinerant general aviation operations which was 0.0899 percent of national itinerant general aviation operations.

This forecast maintains the 2017 market share percent of 0.0899 and applies that constant share ratio to the plan years. This results in a long-term forecast of 13,258 itinerant general aviation operations. For the last three years, the airport has seen relatively steady itinerant general aviation operations during a time when national itinerant general aviation operations have been increasing. Therefore, this growth scenario is considered reasonable, however it may be on the lower range of the planning envelope because it only considers national itinerant operations.

TABLE 2Z
Itinerant General Aviation Operations Forecast
Market Share of National Itinerant General Aviation Operations
Friday Harbor Airport

Year	FHR Itinerant GA Operations[1]	U.S. Itinerant GA Operations[2]	FHR Market Share
2008	21,135	17,493,000	0.1208%
2009	16,476	15,571,000	0.1058%
2010	16,476	14,864,000	0.1108%
2011	13,652	14,528,000	0.0940%
2012	13,652	14,522,000	0.0940%
2013	13,652	14,117,000	0.0967%
2014	12,288	13,979,000	0.0879%
2015	12,288	13,887,000	0.0885%
2016	12,288	13,904,000	0.0884%
2017	12,533	13,936,000	0.0899%
Constant Market Share of National Itinerant GA Operations (CAGR = 0.28%)			
2022	12,683	14,103,000	0.0899%
2027	12,868	14,309,000	0.0899%
2037	13,258	14,742,000	0.0899%

[1]*History from the FAA TAF (published January 2018)*
[2]*FAA Aerospace Forecasts – Fiscal Years 2017-2037*
FHR = Friday Harbor Airport; GA = General Aviation; CAGR = Compound annual growth rate

A second market share forecast has been developed which consider the relationship between itinerant general aviation operations and based aircraft (as projected previously). This are shown in **Table 2AA**. Over the last four years, the airport has realized a relatively consistent 82 to 83 itinerant general aviation operations per based aircraft. By maintaining a constant ratio at 82 itinerant general aviation operations per based aircraft, a forecast emerges as can be seen in **Table 2AA**. This forecast results in a long-term forecast of 15,744 itinerant general aviation operations per based aircraft. This forecast is considered reasonable in the judgement of the forecast analyst because in years prior, the airport has a higher ratio of itinerant general aviation operations to based aircraft. For example, in 2010 and 2011, the ratio was 114 itinerant general aviation operations per based aircraft.

A statistical regression model was also employed to examine if there is a correlation between select variables and itinerant general aviation operations. The variables that were considered are: FAA itinerant general aviation operations, San Juan County population, and San Juan County Income. **Table 2BB** shows the 10-years of history used in the regression analysis and as well as the forecast years.

TABLE 2AA
Itinerant General Aviation Operations forecast - Market Share of Based Aircraft
Friday Harbor Airport

Year	FHR Itinerant GA Operations[1]	FHR Based Aircraft	Itinerant GA Ops per Based Aircraft
2008	21,135	142	149
2009	16,476	145	114
2010	16,476	145	114
2011	13,652	145	94
2012	13,652	145	94
2013	13,652	145	94
2014	12,288	148	83
2015	12,288	148	83
2016	12,288	150	82
2017	12,533	152	82
Constant Itinerant GA Operations Per Based Aircraft (CAGR = 1.15%)			
2015	13,448	164	82
2016	14,186	173	82
2017	15,744	192	82

[1]*History from the FAA TAF (published January 2018)*
FHR = Friday Harbor Airport; GA = General Aviation; CAGR = Compound annual growth rate

TABLE 2BB
Regression Variables

Year	X1 - FAA Itinerant GA Operations[1]	X2 - Population[2]	X3 – Income[2]
2008	17,492,700	15,425	$60,787
2009	15,571,100	15,597	$49,848
2010	14,864,000	15,770	$49,427
2011	14,528,000	15,859	$51,170
2012	14,522,000	15,949	$57,183
2013	14,117,000	16,040	$55,962
2014	13,979,000	16,131	$60,238
2015	13,887,000	16,222	$60,489
2016	13,904,000	16,314	$60,030
2017	13,936,000	16,406	$60,805
2022	14,121,000	17,190	$64,818
2027	14,312,000	17,957	$68,761
2037	14,713,000	19,593	$75,451

[1]*FAA Aerospace Forecasts – Fiscal Years 2017-2037*
[2]*Source: San Juan County Comprehensive Plan Update - Population Projections 2017*

Table 2CC presents the two regressions that had the highest r^2 value. As noted previously, r^2 values above 0.95 tend to indicate a high degree of statistical reliability. The first of the regressions utilized three variables (as noted in **Table 2CC**) and resulted in a long-term forecast of 18,351 itinerant general aviation operations and an annual growth rate of 1.92 percent. The r^2 value is 0.965. The second regression considers a single variable (FAA itinerant general aviation operations) which resulted in 14,525 itinerant general aviation operations in the long-term. The r^2 value is 0.951 and the annual growth rate is 0.74 percent.

TABLE 2CC
GA Itinerant Operations Forecasts - Regression Analysis
Friday Harbor Airport

		FORECAST			
2017 GA Itinerant Operations: 12,533	**r^2**	**2022**	**2027**	**2037**	**CAGR 2017-2037**
REGRESSION VARIABLES					
FAA Itinerant GA Ops., Pop., Income	0.965	13,953	15,030	18,351	**1.92%**
FAA Itinerant GA Ops.	0.951	13,068	13,538	14,525	**0.74%**

Notes: Analysis conducted with 2008-2017 annual data.
Pop., Income = San Juan County
CAGR: Compound Annual Growth Rate

Exhibit 2E presents the four forecasts of itinerant general aviation operations that have been discussed, for comparison. The 2018 TAF (published in January 2018) is also included for comparison. It is at this stage that the judgement of the forecast analyst is applied to select a preferred planning forecast of itinerant general aviation operations.

Compared to the other forecasts of itinerant general aviation operations, the 2018 TAF and the 3-variable regression appear to be on the high end. Indicators of this conclusion are the relatively high number of itinerant general aviation operations per based aircraft, which is nearly 100 for these two forecasts. While the airport has reached this level before, it has not been achieved since 2010.

The constant market share of U.S. itinerant general aviation operations forecast appears to be in the low range. The calculated number of itinerant general aviation operations per based aircraft results in a declining number down to 69. The recent history (since 2011) has shown that the number of itinerant general aviation operations per based aircraft has been steady, right around 82-83.

The constant share of itinerant general aviation operations per based aircraft appears to be the most reasonable of the four forecasts. This follows the trend at the airport since 2011.

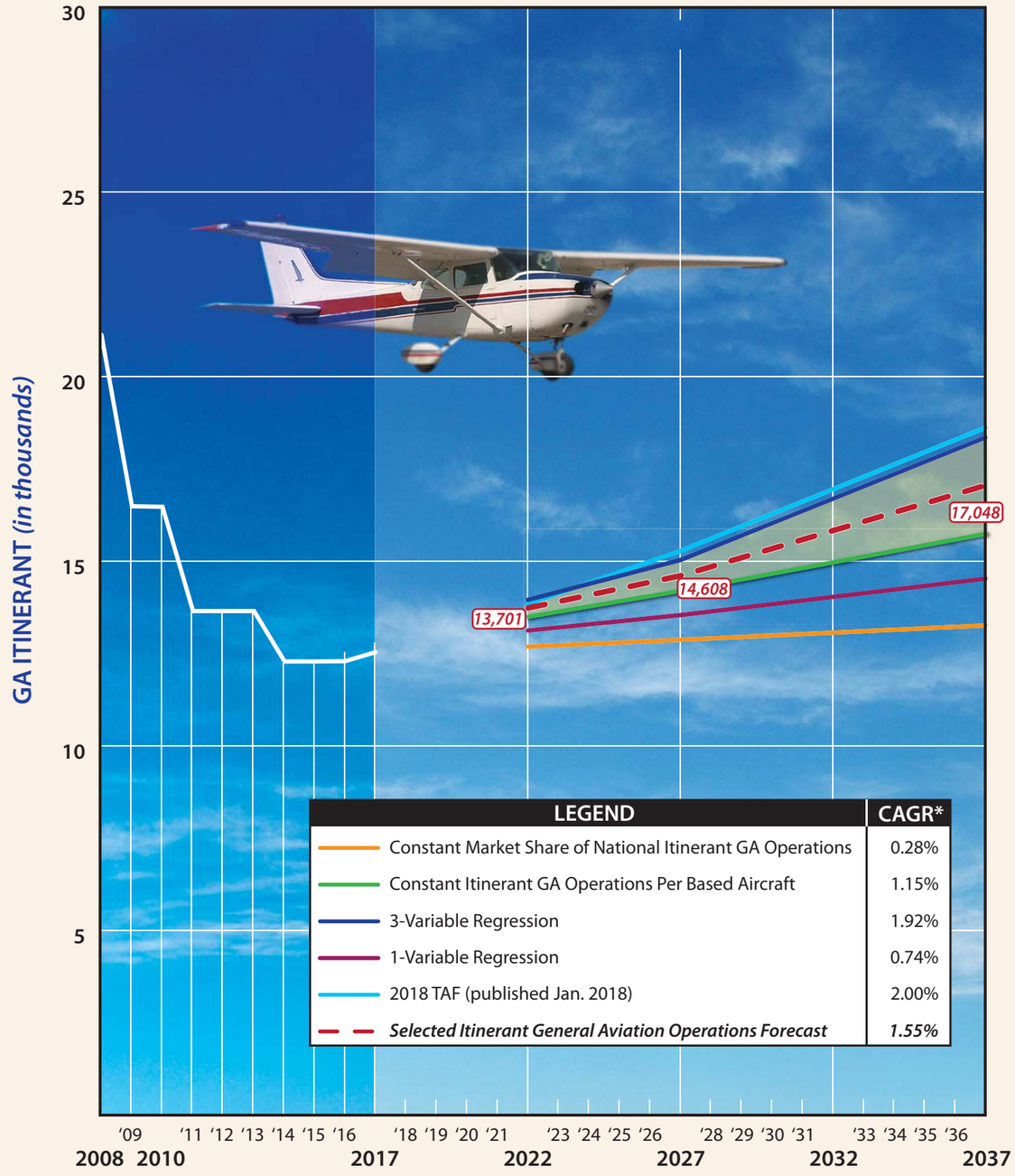
It is the judgement of the forecast analyst that the best forecast of itinerant general aviation operations is in the range created by the constant itinerant general aviation operations forecast and the 3-variable

Year	FHR Itinerant GA Operations[1]	U.S. Itinerant GA Operations[2]	FHR Market Share	FHR Based Aircraft	Itinerant GA Ops per Based Aircraft
2008	21,135	17,493,000	0.1208%	142	149
2009	16,476	15,571,000	0.1058%	145	114
2010	16,476	14,864,000	0.1108%	145	114
2011	13,652	14,528,000	0.0940%	145	94
2012	13,652	14,522,000	0.0940%	145	94
2013	13,652	14,117,000	0.0967%	145	94
2014	12,288	13,979,000	0.0879%	148	83
2015	12,288	13,887,000	0.0885%	148	83
2016	12,288	13,904,000	0.0884%	150	82
2017	12,533	13,936,000	0.0899%	152	82
Constant Market Share of National Itinerant GA Operations (CAGR = 0.28%)					
2022	12,683	14,103,000	0.0899%	164	77
2027	12,868	14,309,000	0.0899%	173	74
2037	13,258	14,742,000	0.0899%	192	69
Constant Itinerant GA Operations Per Based Aircraft (CAGR = 1.15%)					
2022	13,448	14,103,000	0.0954%	164	82
2027	14,186	14,309,000	0.0991%	173	82
2037	15,744	14,742,000	0.1068%	192	82
3-Variable Regression (CAGR = 1.92%)					
2022	13,953	14,103,000	0.0989%	164	85
2027	15,030	14,309,000	0.1050%	173	87
2037	18,351	14,742,000	0.1245%	192	96
1-Variable Regression (CAGR = 0.74%)					
2022	13,068	14,103,000	0.0927%	164	80
2027	13,538	14,309,000	0.0946%	173	78
2037	14,525	14,742,000	0.0985%	192	76
2018 TAF (published Jan. 2018) (CAGR = 2.00%)					
2022	13,841	14,103,000	0.0981%	164	84
2027	15,277	14,309,000	0.1068%	173	88
2037	18,619	14,742,000	0.1263%	192	97
Selected Itinerant General Aviation Operations Forecast (CAGR = 1.55%)					
2022	13,701	14,103,000	0.0971%	164	84
2027	14,608	14,309,000	0.1021%	173	84
2037	17,048	14,742,000	0.1156%	192	89

[1] History from the FAA TAF
[2] FAA Aerospace Forecasts – Fiscal Years 2017-2037

***CAGR** = Compound Annual Growth Rate
FHR = Friday Harbor Airport; **GA** = General Aviation

ITINERANT GENERAL AVIATION OPERATIONS

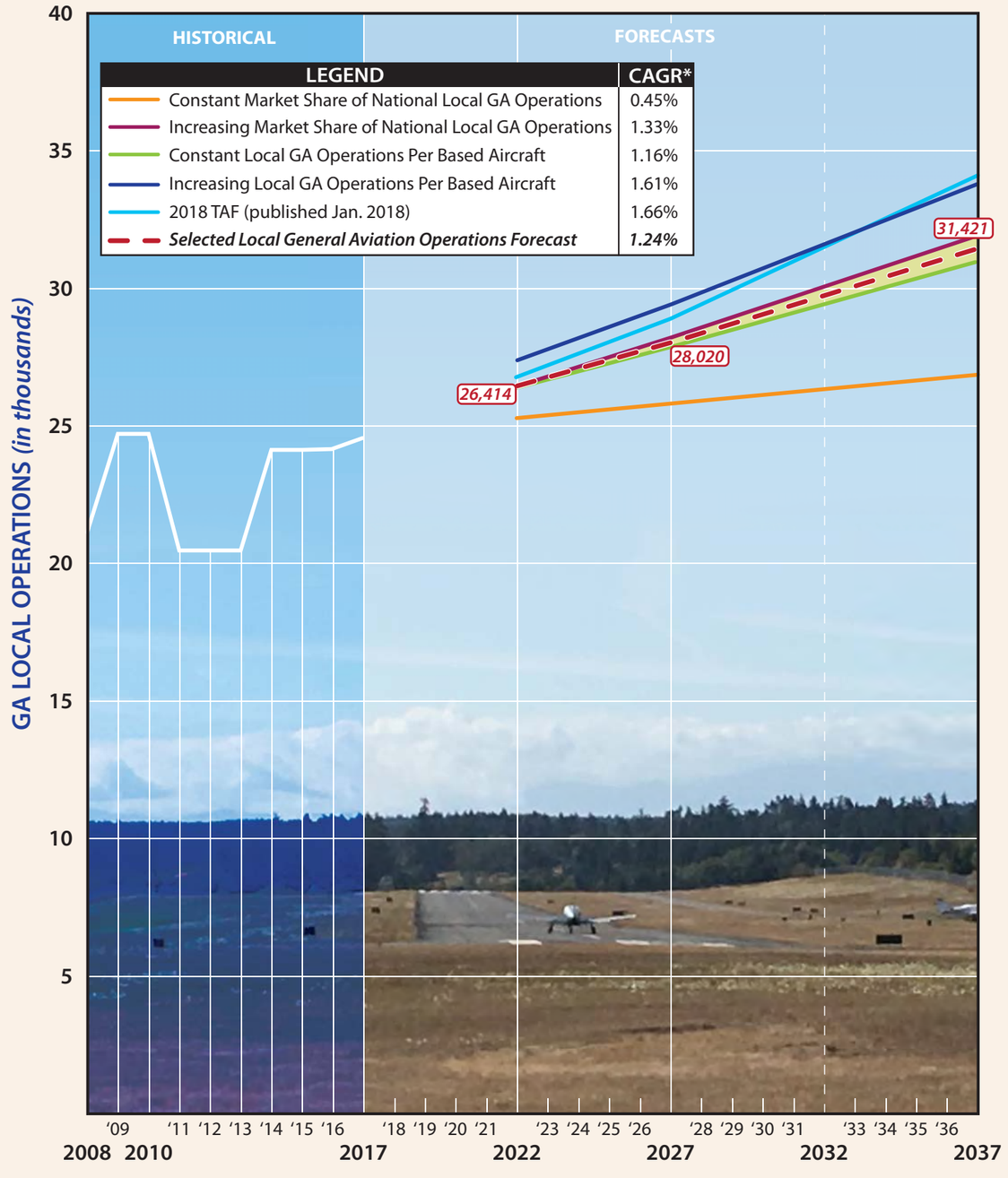


Year	FHR Local GA Operations[1]	U.S. GA Local Operations[2]	FHR Market Share	FHR Based Aircraft	Local GA Ops per Based Aircraft
2008	21,135	14,081,000	0.1501%	142	149
2009	24,715	12,448,000	0.1985%	145	170
2010	24,715	11,716,000	0.2110%	145	170
2011	20,478	11,437,000	0.1791%	145	141
2012	20,478	11,608,000	0.1764%	145	141
2013	20,478	11,688,000	0.1752%	145	141
2014	24,134	11,675,000	0.2067%	148	163
2015	24,134	11,691,000	0.2064%	148	163
2016	24,134	11,632,000	0.2075%	150	161
2017	24,534	11,664,000	0.2103%	152	161
Constant Market Share of National Local GA Operations (CAGR = 0.45%)					
2022	25,264	12,011,000	0.2103%	164	154
2027	25,777	12,255,000	0.2103%	173	149
2037	26,865	12,772,000	0.2103%	192	140
Increasing Market Share of National Local GA Operations (CAGR = 1.33%)					
2022	26,424	12,011,000	0.2200%	164	161
2027	28,187	12,255,000	0.2300%	173	163
2037	31,930	12,772,000	0.2500%	192	166
Constant Local GA Operations Per Based Aircraft (CAGR = 1.16%)					
2022	26,404	12,011,000	0.2198%	164	161
2027	27,853	12,255,000	0.2273%	173	161
2037	30,912	12,772,000	0.2420%	192	161
Increasing Local GA Operations Per Based Aircraft (CAGR = 1.61%)					
2022	27,388	12,011,000	0.2280%	164	167
2027	29,410	12,255,000	0.2400%	173	170
2037	33,792	12,772,000	0.2646%	192	176
2018 TAF (published Jan. 2018) (CAGR = 1.66%)					
2022	26,644	12,011,000	0.2218%	164	162
2027	28,929	12,255,000	0.2361%	173	167
2037	34,098	12,772,000	0.2670%	192	178
Selected Itinerant General Aviation Operations Forecast (CAGR = 1.24%)					
2022	26,414	12,011,000	0.2199%	164	161
2027	28,020	12,255,000	0.2286%	173	162
2037	31,421	12,772,000	0.2460%	192	164

[1] History from the FAA TAF
[2] FAA Aerospace Forecasts – Fiscal Years 2017-2037

***CAGR** = Compound Annual Growth Rate
FHR = Friday Harbor Airport; **GA** = General Aviation

LOCAL GENERAL AVIATION OPERATIONS



regression forecast. The table contained on **Exhibit 2E** shows the selected forecast, which is an average of these two forecasts for each of the plan years. In the long-term, itinerant general aviation operations are forecast to reach 17,048 and the annual growth rate is 1.55 percent.

Local General Aviation Operations Forecast

A similar methodology was utilized to generate a planning forecast for local general aviation operations. As shown in **Table 2DD**, two forecasts were developed that consider the market share that the airport captures of national local general aviation operations. The first forecast maintains the 2017 market share of 0.2103 percent and extends that to the plan years. This results in a long-term forecast of 26,865 local operations and an annual growth rate of 0.45 percent. While reasonable as a as a low range forecast, it is not reflective of the trend over the last few years where the airport has seen an increasing share.

TABLE 2DD
Local General Aviation Operations Forecasts
Market Share of National Local General Aviation Operations
Friday Harbor Airport

Year	FHR Itinerant GA Operations[1]	U.S. Itinerant GA Operations[2]	FHR Market Share
2008	21,135	14,081,000	0.1501%
2009	24,715	12,448,000	0.1985%
2010	24,715	11,716,000	0.2110%
2011	20,478	11,437,000	0.1791%
2012	20,478	11,608,000	0.1764%
2013	20,478	11,688,000	0.1752%
2014	24,134	11,675,000	0.2067%
2015	24,134	11,691,000	0.2064%
2016	24,134	11,632,000	0.2075%
2017	24,534	11,664,000	0.2103%
Constant Market Share of National Local GA Operations (CAGR = 0.45%)			
2022	25,264	12,011,000	0.2103%
2027	25,777	12,255,000	0.2103%
2037	26,865	12,772,000	0.2103%
Increasing Market Share of National Local GA Operations (CAGR = 1.33%)			
2022	26,424	12,011,000	0.2200%
2027	28,187	12,255,000	0.2300%
2037	31,930	12,772,000	0.2500%

[1]*History from the FAA TAF (published January 2018)*
[2]*FAA Aerospace Forecasts – Fiscal Years 2017-2037*
FHR = Friday Harbor Airport; GA = General Aviation; CAGR = Compound annual growth rate

The second forecast, therefore, considers an increasing market share of national location general aviation operations. In the long term this forecast results in 31,930 local operations at the airport. Considering the past trend this too is a reasonable forecast and will be considered further. The annual growth rate is 1.33 percent which is not unreasonable.

Two additional forecasts of local general aviation operations as a function of based aircraft were developed. These are shown in **Table 2EE**. The first considers maintaining at 161 the number of local operations per based aircraft from 2017, through the plan years. This results in a long-term forecast of 30,912 local operations with an annual growth rate of 1.16 percent. This is a reasonable forecast to be considered, however, as recently as 2010, the airport had 170 local operations per based aircraft. Therefore, an increasing market share forecast is also considered.

TABLE 2EE
Itinerant General Aviation Operations Forecast
Market Share of Based Aircraft
Friday Harbor Airport

Year	FHR Local GA Operations[1]	FHR Based Aircraft	Local GA Ops per Based Aircraft
2008	21,135	142	149
2009	24,715	145	170
2010	24,715	145	170
2011	20,478	145	141
2012	20,478	145	141
2013	20,478	145	141
2014	24,134	148	163
2015	24,134	148	163
2016	24,134	150	161
2017	24,534	152	161
Constant Local GA Operations Per Based Aircraft (CAGR = 1.11%)			
2022	26,387	164	161
2027	27,835	173	161
2037	30,892	192	161
Increasing Local GA Operations Per Based Aircraft (CAGR = 1.61%)			
2022	27,388	164	167
2027	29,410	173	170
2037	33,792	192	176

[1]*History from the FAA TAF (published January 2018)*
FHR = Friday Harbor Airport; GA = General Aviation; Compound annual growth rate

The increasing market share forecast is also presented on **Table 2EE**. This forecast considers the airport's potential to once again reach 170 local operations per based aircraft within 10 years and ultimately reach 176 local operations per based aircraft within 20-years. This forecast results in 33,792 local operations

by 2037 and has an annual growth rate of 1.61 percent. In the judgement of this forecast analyst, while the annual growth rate is reasonable, the number of local operations per based aircraft may be somewhat high. This forecast will be considered as a high range of the planning envelope.

Exhibit 2E shows the four new forecasts of local general aviation operations that have been discussed, for comparison. The 2018 TAF (published in January 2018) is also included for comparison as well. It is at this stage that the judgement of the forecast analyst is applied to select a preferred planning forecast of local general aviation operations.

The forecasts presented reflect a reasonable planning envelope, as there are no glaring outliers. It is the judgement of the forecast analyst that the best forecast of local general aviation operations is below the TAF but above the two constant market share forecasts. The table contained on **Exhibit 2E** shows the selected forecast which is an average of the increasing share of national local general aviation operations and the constant share of local general aviation operations per based aircraft. In the long-term, local general aviation operations are forecast to reach 31,421 and the annual growth rate is 1.24 percent.

"Other Air Taxi" Operations Forecast

Air taxi/commuter operations are those with authority to provide "on-demand" transportation of persons or property via aircraft with fewer than 90 passenger seats. Air taxi includes a broad range of operations, including some smaller commercial service aircraft, some charter aircraft, air cargo aircraft, many fractional ownership aircraft, and air ambulance services.

Those air taxi/commuter operations that are related to passenger service were previously forecast in this chapter. Therefore, this section will focus on "other air taxi" operations. These include air cargo, air ambulance, and fractional-ownership operations.

The air ambulance operator at the airport indicated that they operate at least once every other day. The air cargo carrier operates on a regular schedule. Flight plan data was examined to identify historical fractional-ownership operations, which represent a very small portion of activity at the airport. **Table 2FF** presents the forecast of "Other Air Taxi" operations for the airport.

Military Operations Forecast

Some airports may experience operations by military aircraft; however, there are so few of them using Friday Harbor that no forecast of military operations is considered.

TABLE 2FF
"Other Air Taxi" Forecast Operations
Friday Harbor Airport

Segment	2017	2022	2027	2037	CAGR 2017-2037
Empire Air (FedEx)[1]	660	670	680	700	0.29%
Island Air Ambulance[2]	360	370	380	400	0.53%
Other Air Taxi[3]	100	164	236	272	5.13%
Total	**1,120**	**1,204**	**1,296**	**1,372**	1.02%

[1] Estimate based on flight schedule.
[2] Estimate based on interview with owners
[3] Estimate based on GCR, Inc. flight plan data
CAGR: Compound annual growth rate

OPERATIONS FLEET MIX

Developing an understanding of the operational fleet mix, including the approximate volume of operations by aircraft type, is utilized in airfield capacity analysis, fuel storage capacity analysis, and pavement utilization determination. The FAA Traffic Flow Management System Count (TFMSC) database captures a portion of operations by aircraft type utilizing flight plan data. However, most flights are not required to file a flight plan and, therefore, this database represents a minimum level of activity. Other sources of operations data include airport landing reports, which are maintained for commercial operations in order to level landing fees, commuter and air cargo flight schedules, and interviews with various operators at the airport.

By identifying a baseline number of operations by aircraft type, it is then possible to produce an estimate of future operations by aircraft category. Experience at other airports has shown that general operational estimates can be made by multiplying the number of based aircraft by utilization factors. For this analysis, multi-engine piston aircraft are estimated to account for approximately 200 operations annually. Turboprops are estimated at approximately 250 annual operations per based aircraft, and based business jets and helicopters are estimated at 300 annual operations. All other operations are considered to be by single engine piston aircraft. It should be noted that these operational estimates account for all operations by that aircraft category, not just those based at an airport.

Table 2GG presents the fleet mix operations forecast for the Airport.

TABLE 2GG
Fleet Mix Operations Forecast
Friday Harbor Airport

	2017	%	2022	%	2027	%	2037	%
Local Operations								
Piston	24,434	99.59%	26,214	99.24%	27,720	98.93%	30,921	98.41%
Helicopter	100	0.41%	200	0.76%	300	1.07%	500	1.59%
Total Local	24,534	100.00%	26,414	100.00%	28,020	100.00%	31,421	100.00%
Itinerant Operations								
Single Piston	13,685	60.44%	13,517	57.03%	13,546	53.52%	14,454	50.45%
Multi-Piston	1,400	6.18%	1,400	5.91%	1,600	6.32%	1,600	5.59%
Turboprop	5,658	24.99%	6,584	27.78%	7,462	29.48%	9,194	32.09%
Jet	200	0.88%	300	1.27%	600	2.37%	1,200	4.19%
Helicopters	1,700	7.51%	1,900	8.02%	2,100	8.30%	2,200	7.68%
Total Itinerant	22,643	100.00%	23,701	100.00%	25,308	100.00%	28,648	100.00%
Total Operations	47,177		50,115		53,328		60,069	

Source: Coffman Associates analysis

PEAKING CHARACTERISTICS

Many airport facility needs are related to the level of activity during peak periods for both operations and enplanements. The periods used in developing facility requirements for this study are as follows:

- **Peak Month –** The calendar month when peak activity occurs.
- **Design Day –** The average day in the peak month.
- **Busy Day –** The busy day of a typical week in the peak month.
- **Design Hour –** The peak hour within the design day.

It is important to realize that only the peak month is an absolute peak within the year. Each of the other periods will be exceeded at various times during the year. However, each provides reasonable planning standards that can be applied without overbuilding or being too restrictive.

Because there is no control tower at the airport, it is necessary to estimate the peak periods. It is known that Friday Harbor Airport experiences significant summertime peaks which correlate to the tourist season. This is confirmed from a review of landing fee reports maintained by the airport. In addition, the analyst's experience with other similar type airports has informed the peaking calculations.

The peak month for operations is estimated to represent 14.5 percent of annual operations. The design day is simply the peak month divided by the number of days in that month, which is estimated at 30 days. The busy day is calculated as 36 percent higher than the design day, which is derived based on the average of the peak day for each week of the peak month. The design hour is the peak hour of the design

day, which is estimated as 10.3 percent of the design day. **Table 2HH** presents the peaking characteristics for the airport.

TABLE 2HH
Peaking Characteristics
Friday Harbor Airport

Peak Period	2017	2022	2027	2037
Peak Month (14.5%)	6,841	7,267	7,733	8,710
Busy Day (1.36%)	310	329	351	395
Design Day (30)	228	242	258	290
Design Hour (10.3%)	23	25	27	30

FORECAST SUMMARY AND COMPARISON TO THE *TERMINAL AREA FORECAST*

A summary of the selected forecast for each aviation demand indicator is presented on **Exhibit 2F**.

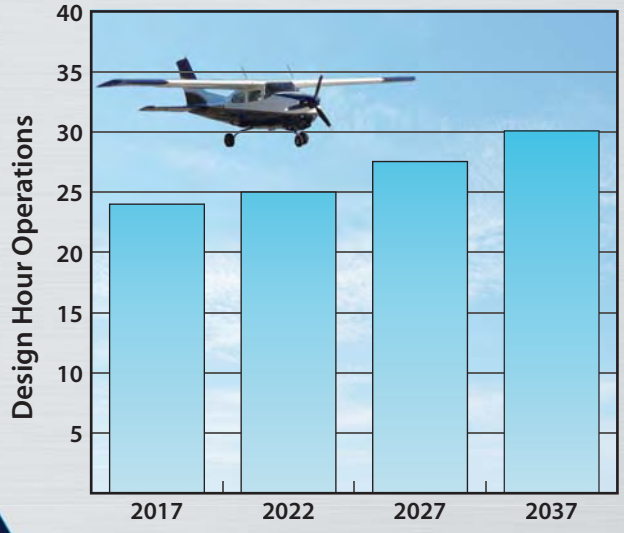
The FAA will review the forecasts presented in this Master Plan for consistency with the *Terminal Area Forecast*. The local FAA Airport District Office (ADO) or Regional Airports Division (RO) is responsible for forecast approvals. When reviewing a sponsor's forecast, FAA must ensure that the forecast is based on reasonable planning assumptions, uses current data, and is developed using appropriate forecast methods. Forecasts of enplanements, operations, and based aircraft are considered consistent with the TAF if they differ by less than 10 percent in the five-year period and 15 percent in the 10-year forecast period. The reason the FAA allows this differential is because the TAF forecasts are not meant to replace forecasts developed locally (i.e., in this Master Plan). While the TAF can provide a point of reference or comparison, their purpose is much broader in defining FAA national workload measures. If the master plan forecast is not consistent with the TAF, differences must be resolved if the forecast is to be used for FAA decision-making. **Table 2JJ** presents the direct comparison of the master planning forecasts with the TAF published in January 2018. The master plan forecasts for scheduled carrier enplanements, total operations, and based aircraft are consistent with the TAF.

AIRCRAFT/AIRPORT/RUNWAY CLASSIFICATION

The FAA has established several aircraft classification systems that group aircraft types based on their performance (approach speed in landing configuration) and design characteristics (wingspan and landing gear configuration). These classification systems are used to determine the appropriate airport design standards for specific airport elements, such as runways, taxiways, taxilanes, and aprons.

	BASE YEAR	FORECAST			CAGR
	2017	2022	2027	2037	2017-37
ENPLANEMENTS					
Total Enplanements	9,972	11,084	12,478	15,800	2.33%
ANNUAL OPERATIONS					
Commercial Operations					
Air Taxi/Commuter	8,990	8,796	9,404	10,228	0.65%
Other Commercial Ops (Air Ambulance, Cargo)	1,020	1,040	1,060	1,100	0.38%
Total Commercial Operations	***10,010***	***9,836***	***10,464***	***11,328***	***0.62%***
Other Air Taxi (Fractionals, Other charters)	100	164	236	272	5.13%
General Aviation Operations					
Itinerant	12,533	13,701	14,608	17,048	1.55%
Local	24,534	26,414	28,020	31,421	1.24%
Total General Aviation Operations	***37,067***	***39,751***	***41,952***	***47,108***	***1.21%***
Total Local Operations	***24,534***	***26,414***	***28,020***	***31,421***	***1.24%***
Total Itinerant Operations	***22,643***	***23,701***	***25,308***	***28,648***	***1.18%***
Total Annual Operations	**47,177**	**50,115**	**53,328**	**60,069**	**1.22%**
BASED AIRCRAFT					
Single-engine piston	135	144	148	161	N/A
Multi-engine piston	7	7	8	8	N/A
Turboprop	4	6	8	12	N/A
Jet	0	0	1	2	N/A
Helicopter	6	7	8	9	N/A
Total Based Aircraft	**152**	**164**	**173**	**192**	**1.17%**
PEAKING CHARACTERISTICS					
Peak Month (14.5%)	6,841	7,267	7,733	8,710	1.22%
Busy Day (1.36%)	310	329	351	395	1.22%
Design Day (30)	228	242	258	290	1.22%
Design Hour (10.3%)	23	25	27	30	1.22%

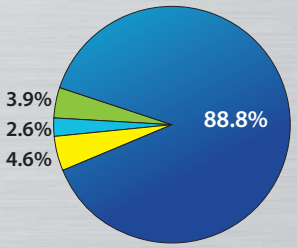
DESIGN HOUR



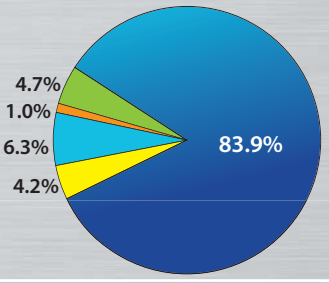
FLEET MIX



2017



2037



CAGR: Compound annual growth rate

TABLE 2JJ
Forecast Comparison to the Terminal Area Forecast
Friday Harbor Airport

	BASE YEAR	FORECAST			
	2017	2022	2027	2037	CAGR 2017-2037
Scheduled Carrier Enplanements					
Master Plan Forecast	9,972	11,084	12,478	15,800	2.33%
2018 FAA TAF	9,850	11,084	12,478	15,800	2.39%
% Change	1.2%	0.0%	0.0%	0.0%	
Total Operations					
Master Plan Forecast	47,177	50,115	53,328	60,069	1.22%
2018 FAA TAF	46,762	51,188	56,023	67,119	1.82%
% Change	0.9%	-2.1%	-4.8%	-10.5%	
Based Aircraft					
Master Plan Forecast	152	164	173	192	1.17%
2018 FAA TAF	149	161	171	191	1.25%
% Change	2.0%	1.9%	1.2%	0.5%	

CAGR: Average annual growth rate
TAF: Terminal Area Forecast (published January 2018)

AIRCRAFT CLASSIFICATION

The selection of appropriate FAA design standards for the development and location of airport facilities is based primarily upon the characteristics of the aircraft which are currently using, or are expected to use, an airport. The critical design aircraft is used to define the design parameters for an airport. The design aircraft may be a single aircraft type or a composite aircraft representing a collection of aircraft with similar characteristics. The critical design aircraft is defined by three parameters: Aircraft Approach Category (AAC), Airplane Design Group (ADG), and Taxiway Design Group (TDG). FAA AC 150/5300-13A, *Airport Design*, describes the following airplane classification systems, the parameters of which are presented on **Exhibit 2G**.

Aircraft Approach Category (AAC): A grouping of aircraft based on a reference landing speed (V_{REF}), if specified, or if V_{REF} is not specified, 1.3 times stall speed (V_{SO}) at the maximum certificated landing weight. V_{REF}, V_{SO}, and the maximum certificated landing weight are those values as established for the aircraft by the certification authority of the country of registry.

The AAC generally refers to the approach speed of an aircraft in landing configuration. The higher the approach speed, the more restrictive the applicable design standards. The AAC, depicted by a letter A through E, is the aircraft approach category and relates to aircraft approach speed (operational charac-

AIRCRAFT APPROACH CATEGORY (AAC)

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

AIRPLANE DESIGN GROUP (ADG)

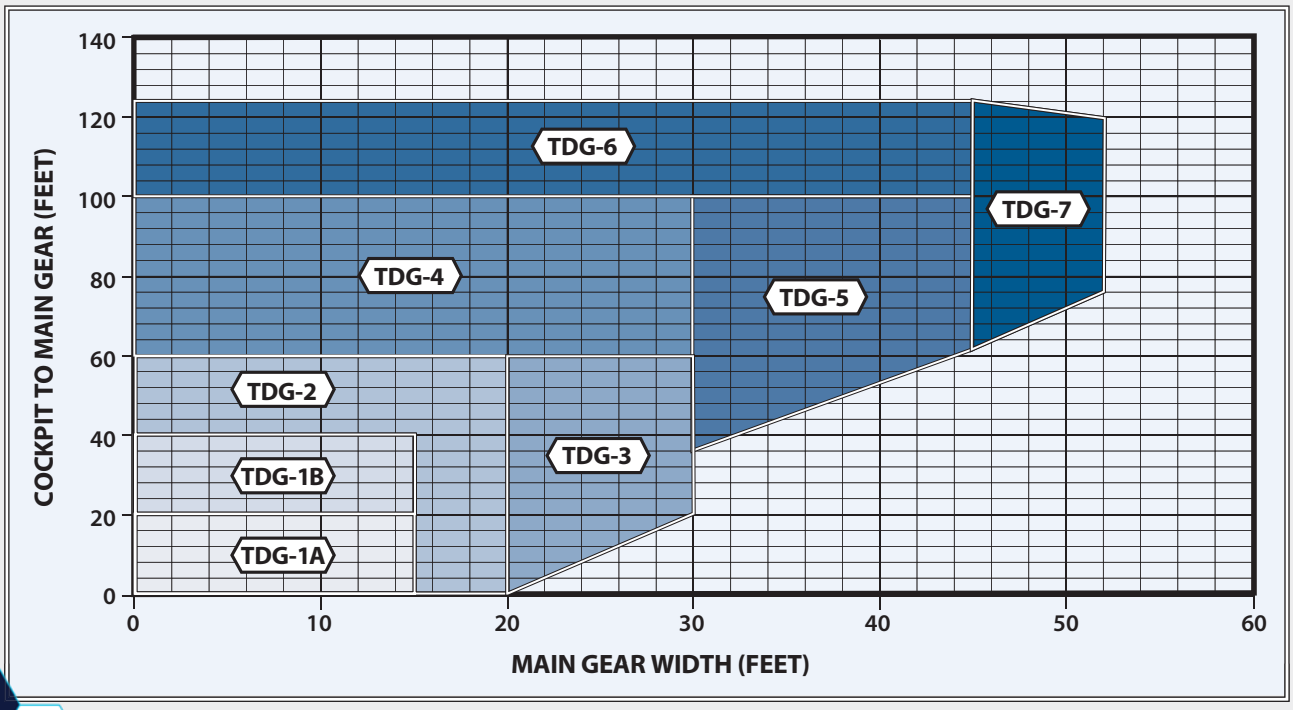
Group #	Tail Height (ft)	Wingspan (ft)
I	<20	<49
II	20-<30	49-<79
III	30-<45	70-<118
IV	45-<60	118-<171
V	60-<66	171-<214
VI	66-<80	214-<262

VISIBILITY MINIMUMS

RVR* (ft)	Flight Visibility Category (statute miles)
VIS	3-mile or greater visibility minimums
5,000	Not lower than 1-mile
4,000	Lower than 1-mile but not lower than ¾-mile
2,400	Lower than ¾-mile but not lower than ½-mile
1,600	Lower than ½-mile but not lower than ¼-mile
1,200	Lower than ¼-mile

***RVR**: Runway Visual Range

TAXIWAY DESIGN GROUP (TDG)



Source: FAA AC 150/5300-13A, Airport Design

teristic). The AAC generally applies to runways and runway-related facilities, such as runway width, runway safety area (RSA), runway object free area (ROFA), runway protection zone (RPZ), and separation standards.

Airplane Design Group (ADG): The ADG, depicted by a Roman numeral I through VI, is a classification of aircraft which relates to aircraft wingspan or tail height (physical characteristic). When the aircraft wingspan and tail height fall in different groups, the higher group is used. The ADG influences design standards for taxiway safety area (TSA), taxiway object free (TOFA), taxilane object free area, apron wingtip clearance, and various separation distances.

Taxiway Design Group (TDG): A classification of airplanes based on outer-to-outer Main Gear Width (MGW) and Cockpit to Main Gear (CMG) distance. The TDG relates to the undercarriage dimensions of the design aircraft. The taxiway design elements determined by the application of the TDG include the taxiway width, taxiway edge safety margin, taxiway shoulder width, taxiway fillet dimensions, and, in some cases, the separation distance between parallel taxiways/taxilanes. Other taxiway elements, such as the taxiway safety area (TSA), taxiway/taxilane object free area (TOFA), taxiway/taxilane separation to parallel taxiway/taxilanes or fixed or movable objects, and taxiway/taxilane wingtip clearances are determined solely based on the wingspan (ADG) of the design aircraft utilizing those surfaces. It is appropriate for taxiways to be planned and built to different TDG standards based on expected use.

Exhibit 2H presents the classification of most common aircraft in operation today. Those that are shaded do not currently and are not expected to operate at the airport.

AIRPORT AND RUNWAY CLASSIFICATION

These classifications, along with the aircraft classifications defined previously, are used to determine the appropriate FAA design standards to which the airfield facilities are to be designed and built.

***Airport Reference Code (ARC)*:** An airport designation that signifies the airport's highest Runway Design Code (RDC), minus the third (visibility) component of the RDC. The ARC is used for planning and design only and does not limit the aircraft that may be able to operate safely on the airport. The current ALP for the Airport, which will be updated as part of this planning effort, identifies an ARC of B-I(s).

Runway Design Code (RDC): A code signifying the design standards to which the runway is to be built. The RDC is based upon planned development and has no operational component. The AAC, ADG, and runway visual range (RVR) are combined to form the RDC of a particular runway. The RDC provides the information needed to determine certain design standards that apply. The first component, depicted by a letter, is the AAC and relates to aircraft approach speed (operational characteristics). The second component, depicted by a Roman numeral, is the ADG and relates to either the aircraft wingspan or tail

A-I



- Beech Baron 55
- **Beech Bonanza**
- Cessna 150
- Cessna 172
- Cessna Citation Mustang
- Eclipse 500/550
- Piper Archer
- Piper Seneca

B-I



- Beech Baron 58
- Beech King Air A90/100
- Cessna 402
- **Cessna 421**
- Piper Navajo
- Piper Cheyenne
- Swearingen Metroliner
- Cessna Citation I (525)

B-II



- Super King Air 200
- Cessna 441
- DHC Twin Otter
- Super King Air 350
- **Cessna Caravan**
- Citation Excel (560), Sovereign (680)
- Falcon 50, 900, 2000
- **Citation Bravo (550)**
- Embraer 120

A-III, B-III



- DHC Dash 7
- **DHC Dash 8**
- DC-3
- Convair 580
- Fairchild F-27
- ATR 72
- ATP

C-I, D-I



- Beech 400
- **Lear 31, 35,** 45, 60
- Israeli Westwind

C-II, D-II



- **Cessna Citation X (750)**
- Gulfstream 100, 200,300
- Challenger 300/600
- ERJ-135, 140, 145
- CRJ-200/700
- Embraer Regional Jet
- Lockheed JetStar
- Hawker 800

C-III, D-III *less than 100,000 lbs.*



- ERJ-170
- CRJ 705, 900
- Falcon 7X
- **Gulfstream 500**, 550, 650
- Global Express, Global 5000
- Q-400

C-III, D-III *over 100,000 lbs.*



- ERJ-90
- Boeing Business Jet
- B-727
- **B-737**-300, **700,** 800
- MD-80, DC-9
- A319, A320

C-IV, D-IV



- **B-757**
- B-767
- C-130 Hercules
- DC-8-70
- MD-11

D-V



- **B-747-400**
- B-777
- B-787
- A-330, A-340

Note: Aircraft pictured is identified in bold type.

height (physical characteristics), whichever is most restrictive. The third component relates to the visibility minimums expressed by RVR values in feet of 1,200 (⅛-mile); 1,600 (¼-mile); 2,400 (½-mile); 4,000 (¾-mile); and 5,000 (1-mile). The RVR values approximate standard visibility minimums for instrument approaches to the runways. The third component should read "VIS" for runways designed for visual approach use only.

Approach Reference Code (APRC): A code signifying the current operational capabilities of a runway and associated parallel taxiway with regard to landing operations. Like the RDC, the APRC is composed of the same three components: the AAC, ADG, and RVR. The APRC describes the current operational capabilities of a runway under particular meteorological conditions where no special operating procedures are necessary, as opposed to the RDC, which is based upon planned development with no operational component. The APRC for a runway is established based upon the minimum runway-to-taxiway centerline separation.

Departure Reference Code (DPRC): A code signifying the current operational capabilities of a runway and associated parallel taxiway with regard to take-off operations. The DPRC represents those aircraft that can take off from a runway while any aircraft are present on adjacent taxiways, under particular meteorological conditions with no special operating conditions. The DPRC is composed of two components: AAC and ADG. A runway may have more than one DPRC depending on the parallel taxiway separation distance.

CRITICAL DESIGN AIRCRAFT

The selection of appropriate FAA design standards for the development and location of airport facilities is based primarily upon the characteristics of the aircraft which are currently using, or are expected to use, an airport. The critical design aircraft is used to define the design parameters for an airport. The design aircraft may be a single aircraft or a composite aircraft representing a collection of aircraft classified by the three parameters: AAC, ADG, and TDG. In the case of an airport with multiple runways, a design aircraft is selected for each runway.

The first consideration is the safe operation of aircraft likely to use an airport. Any operation of an aircraft that exceeds design criteria of an airport may result in either an unsafe operation or a lesser safety margin; however, it is not the usual practice to base the airport design on an aircraft that uses the airport infrequently.

The critical design aircraft is defined as the most demanding aircraft type, or grouping of aircraft with similar characteristics, that make regular use of the airport. Regular use is 500 annual operations, local and itinerant, but excluding touch-and-go operations. Planning for future aircraft use is of particular importance since the design standards are used to plan separation distances between facilities. These future standards must be considered now to ensure that short term development does not preclude the reasonable long-range potential needs of the airport. Therefore, if the critical design aircraft

is anticipated to change within the next five years, that aircraft (or family of aircraft) should be used as the current critical design aircraft.

AIRPORT CRITICAL DESIGN AIRCRAFT

The FAA maintains the Traffic Flow Management System Count (TFMSC) database which documents aircraft operations at most NPIAS airports. Information is added to the TFMSC database when pilots file flight plans and/or when flights are detected by the National Airspace System, usually via radar. As a result, the database is quite accurate at capturing IFR activity but not VFR activity. The database includes documentation of commercial traffic (air carrier and air taxi), general aviation, and military aircraft. Most VFR and some non-enroute IFR traffic is excluded. Therefore, there are more operations at an airport than are captured by this methodology. Nonetheless, this is a valid source to determine if the number of documented IFR operations exceed the FAA threshold. TFMSC data is available for activity at Friday Harbor Airport and was utilized in this analysis. The data has been normalized meaning that the number of arrivals and departure has been manually adjusted to be equal.

Current Critical Design Aircraft

Exhibit 2J presents the TFMSC operational mix at the airport for turboprops and jets for the last ten years. As can be seen, the airport experiences activity by a range of turboprops and several small business jets. Each year over the last ten years, those in aircraft approach category B and airplane design group II have exceeded the 500 operations threshold. **Table 2KK** summarizes this information. Very few operations are conducted by aircraft in aircraft approach category C or D.

TABLE 2KK
Jet and Turboprop Operations by Design Category
Friday Harbor Airport

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
AIRCRAFT APPROACH CATEGORY										
A	214	190	224	202	154	232	248	198	284	324
B	3,860	3,194	3,124	2,584	2,380	2,264	2,364	2,880	2,860	2,798
C/D	2	2	6	0	6	8	4	8	6	0
AIRPLANE DESIGN GROUP										
I	322	310	296	298	258	354	280	288	324	362
II	3,754	3,076	3,058	2,488	2,282	2,150	2,336	2,798	2,826	2,760

Source: Traffic Flow Management System Count (TFMSC) - Normalized

While several aircraft types contribute to the cumulative total for B-II operations, by far the most prevalent aircraft type is the Cessna Grand Caravan 208B. This aircraft is utilized by Kenmore Air for passenger service, Empire Air for FedEx air cargo, and Island Air for air ambulance service.

ARC[1]	Aircraft Type	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
A-I	EA50 - Eclipse 500	6	4	2	2	0	2	0	2	8	4
	KODI - Quest Kodiak	0	0	0	0	0	10	2	8	18	18
	MU2 - Mitsubishi Marquise/Solitaire	0	2	0	0	0	0	0	0	0	0
	P46T - Piper Malibu Meridian	26	18	48	58	34	58	42	38	74	72
	Socata TBM-7/850/9	80	60	76	50	52	46	72	72	90	134
	EPIC - Dynasty	0	2	2	0	0	0	0	0	0	2
	LC20 - Lancair 235/320/360/2000/Evolution	2	6	2	0	0	0	0	2	0	0
	TOTAL	**114**	**92**	**130**	**110**	**86**	**116**	**116**	**122**	**190**	**230**
A-II	DHC6 - DeHavilland Twin Otter	0	0	6	2	4	8	0	0	0	0
	PC12 - Pilatus PC-12	100	98	88	90	64	108	132	76	94	94
	TOTAL	**100**	**98**	**94**	**92**	**68**	**116**	**132**	**76**	**94**	**94**
B-I	AC90 - Gulfstream Commander	12	6	16	32	36	34	14	10	8	0
	BE40 - Raytheon/Beech Beechjet 400/T-1	12	0	0	0	0	0	0	0	0	0
	Beech King Air 90/100	58	54	44	52	20	52	26	46	38	22
	C25M - Cessna Citation M2	0	0	0	0	0	0	0	0	0	2
	C425 - Cessna 425 Corsair	12	0	0	0	8	10	0	6	2	8
	C500 - Cessna 500/Citation I/SP	4	2	0	18	20	14	4	4	8	6
	C510 - Cessna Citation Mustang	36	118	66	64	36	58	54	24	14	8
	Cessna Citation Jet/CJ1/CJ2	54	14	8	6	40	34	42	56	44	68
	E50P - Embraer Phenom 100	0	0	0	0	0	2	6	2	4	4
	P180 - Piaggio P-180 Avanti	2	2	0	0	0	2	4	0	0	0
	PAY2 - Piper Cheyenne 2	10	12	22	8	2	16	8	0	0	2
	PRM1 - Raytheon Premier 1/390 Premier 1	4	6	4	8	4	8	2	10	10	12
	TEX2 - Raytheon Texan 2	2	0	0	0	0	0	0	0	0	0
	DA10 - Dassault Falcon/Mystère 10	0	2	0	0	0	0	0	0	0	0
	TOTAL	**206**	**216**	**160**	**188**	**166**	**230**	**160**	**158**	**128**	**132**
B-II	B350 - Beech Super King Air 350	2	0	0	0	2	34	74	86	92	86
	BE20 - Beech 200 Super King	186	166	136	178	112	146	108	66	16	12
	BE30 - Raytheon 300 Super King Air	26	82	50	68	60	42	0	2	0	0
	C208 - Cessna 208 Caravan	3,384	2,662	2,728	2,088	1,994	1,742	1,918	2,464	2,512	2,472
	C25B - Cessna Citation CJ3/CJ4	2	10	8	20	6	4	36	28	30	2
	C441 - Cessna Conquest	4	2	6	0	0	0	2	0	0	0
	C550 - Cessna Citation II/Bravo/SP	22	36	18	24	32	38	20	22	30	20
	C560 - Cessna Citation V/Ultra/Encore	6	16	10	16	8	6	22	30	26	36
	C56X - Cessna Excel/XLS	0	0	0	0	0	22	22	24	22	30
	C650 - Cessna III/VI/VII/Sovereign/X	0	0	4	2	0	0	2	0	0	0
	E55P - Embraer Phenom 300	0	0	0	0	0	0	0	0	2	0
	FA50 - Dassault Falcon/Mystère 50	0	0	0	0	0	0	0	0	2	8
	B19 - Raytheon 1900	2	4	4	0	0	0	0	0	0	0
	B200 - Hawker Beechcraft	20	0	0	0	0	0	0	0	0	0
	TOTAL	**3,654**	**2,978**	**2,964**	**2,396**	**2,214**	**2,034**	**2,204**	**2,722**	**2,732**	**2,666**
C-I/D-I	LJ31/L60 - Learjet 31/60	2	0	4	0	4	8	2	4	2	0
	LJ35/F15/F18/F22	0	2	2	0	2	0	2	4	4	0
	TOTAL	**2**	**2**	**6**	**0**	**6**	**8**	**4**	**8**	**6**	**0**

ARC CODE SUMMARY

ARC	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
A-I	114	92	130	110	86	116	116	122	190	230
A-II	100	98	94	92	68	116	132	76	94	94
B-I	206	216	160	188	166	230	160	158	128	132
B-II	3,654	2,978	2,964	2,396	2,214	2,034	2,204	2,722	2,732	2,666
C-I/D-I	2	2	6	0	6	8	4	8	6	0
Total	**3,962**	**3,386**	**3,354**	**2,786**	**2,540**	**2,504**	**2,616**	**3,086**	**3,150**	**3,122**

[1]**ARC** - Airport Reference Code
Source - Traffic Flow Management System Count (TFMSC)

For airport design, there is a distinction between aircraft with a maximum takeoff weight (MTOW) above or below 12,500 pounds. The MTOW of the Cessna Grand Caravan is 8,750 pounds; therefore, the small aircraft category will apply and is typically represented as (s). The cockpit to main gear length is 11.67 feet, which falls in TDG 1A. The wing span is 52.1 feet, which falls in AAC B. **Therefore, the current critical design aircraft for the airport is the Cessna Grand Caravan 208B and is best described as B-II(s)-1A**.

The current critical design aircraft for the airport is the Cessna Grand Caravan 208B and is best described as B-II(s)-1A.

Future Design Aircraft

The future design aircraft is expected to remain unchanged over the next 20 years. Therefore, the future design aircraft will continue to be classified as B-II-1A (small).

There are three primary impediments to the airport seeing enough activity by larger aircraft to transition to the next ACC - C, which are jet aircraft:

- The airport is not Part 139 certificated for commercial service aircraft with more than nine seats. This will limit the usable aircraft to turboprops, which are in ACC B.
- The available runway length limits the capability of larger jet aircraft to operate at the airport.
- The passenger market may not be able to support regular service by a larger aircraft.

RUNWAY DESIGN CODE

Runways are assigned a RDC. The RDC relates to specific FAA design standards that should be met in relation to each runway. The RDC takes into consideration the AAC, ADG, and the RVR. In most cases, the critical design aircraft will also be the RDC for the primary runway.

Runway 16-34 RDC

The RDC for Runway 16-34 is B-II(s)-5000.

Runway 16-34 should be designed to accommodate the critical design aircraft. This runway is 3,402 feet long and 75 feet wide. This runway has a non-precision instrument approach with the lowest visibility minimum being 1-mile. **Therefore, the RDC for Runway 16-34 is B-II(s)-5000**.

CRITICAL AIRCRAFT SUMMARY

Several classification systems combine to form the nomenclature which identifies the various airport design standards. As noted previously, the AAC is represented by the letters A-E and it relates to the

Several classification systems combine to form the nomenclature which identifies the various airport design standards. As noted previously, the AAC is represented by the letters A-E and it relates to the aircraft approach speed. The ADG is represented by the Roman numerals I-VI and it represents the aircraft wing span or tail height, whichever is more restrictive. The TDG is represented by a number 1-7, and it is a function of the main landing gear width and cockpit-to-wheel distance. The RVR is a representation of the lowest instrument approach visibility minimum at an airport, and it is represented by an approximate measurement in feet.

Table 2LL presents a summary of the current and future design standards to be applied at the Airport. The overall airport reference code for the Airport is B-II(s), which is best represented by the Cessna Grand Caravan 208B aircraft.

TABLE 2LL
Design Aircraft and Airport Classification
Friday Harbor Airport

Airport Reference Code (ARC)	Runway Design Code (RDC)	Airport Design Aircraft	Approach Reference Code (APRC)[1]	Departure Reference Code (DPRC)[1]	Representative Aircraft
B-II	B-II(s)-5000	B-II(s)-1A	B-II(s)-5000	B-II(s)	Cessna Grand Caravan 208B

[1]The APRC and DPRC are based on a future condition when the parallel taxiway is shifted to a separation distance of 240 feet from the runway.
Source: Coffman Associates analysis utilizing FAA AC 150/5300-13A, Airport Design.

It should be noted that the current airport layout plan (ALP) and the previous master plan applied ARC B-I(s) design standards to the airport. Now that the number of operations by B-II(s) aircraft exceeds the 500 operations threshold, the airport has transitioned to ARC B-II(s). The facility requirements needed to meet the new design standards will be examined in detail in the next chapter.

FORECAST SUMMARY

This chapter has outlined the various activity levels by demand indicators that might reasonably be anticipated over the planning period. Based aircraft are forecast to increase from 152 in 2017 to 192 in 2037, for an average annual growth rate of 1.17 percent. The based aircraft fleet mix is anticipated to remain much the same over the planning period, with piston-powered aircraft representing most aircraft. Modest increases in turboprops are projected, as is the addition of up to two small business jets. Total annual operations are forecast to grow from approximately 47,177 in 2017 to 58,708 in 2037, for a growth rate of 1.10 percent.

Scheduled Carrier Enplanements are forecast to increase from 9,972 in federal fiscal year 2017 to 15,800 in 2037 for an annual growth rate of 2.33 percent. Total enplanements, which includes passengers utilizing unscheduled/on-demand/charter flights, is also an important consideration because this will translate to certain facility needs such as the terminal building size, vehicle parking, and commercial aircraft apron. In addition, total enplanements is the metric used by FAA to determine eligibility for primary commercial service airport entitlement grants of at least $1 million, which occurs when airports enplane more than 10,000 passengers in a calendar year. Therefore, a separate total enplanement forecast was provided which resulted in total enplanements increasing from approximately 13,000 in 2017 to 19,400 in 2037, for an annual growth rate of 2.02 percent.

The current and future critical design aircraft is the Cessna Grand Caravan 208B, which is the aircraft currently utilized by Kenmore Air, Island Air (air ambulance), and Empire Air (FedEx). The FAA classification for the design aircraft is B-II(s)-1A.

The next step in the planning process is to assess the capabilities of the existing facilities to determine what upgrades may be necessary to meet future demands. The range of forecasts developed here will be taken forward in the next chapter as planning horizon activity levels that will serve as milestones or activity benchmarks in evaluating facility requirements.

FRIDAY HARBOR AIRPORT







CHAPTER THREE

Facility Requirements

AIRPORT MASTER PLAN



Chapter Three

FACILITY REQUIREMENTS

To properly plan for the future of the Friday Harbor Airport, it is necessary to identify specific types and quantities of facilities required or desired to adequately serve the Airport over the next 20 years. Facilities are broadly classified as airside (i.e., runways, taxiways, navigational aids, marking and lighting) and landside (i.e., hangars, aircraft parking apron, and automobile parking). There are four primary sources from which to examine and determine facility requirements:

- Aviation Demand Forecasts: The forecasts of aviation demand developed in the previous chapter serve as data inputs to various models, which have been constructed following Federal Aviation Administration (FAA) guidance, to generate facility needs.
- Design Standards Review: Various design standards that apply to the airport are reviewed as they can change based on modifications to FAA guidance or activity changes at the airport. Design standards primarily relate to the numerous imaginary safety related surfaces and separation distances.
- Facility Maintenance: Airports are required to maintain their pavement surfaces for the useful life of those pavements. The pavements require routine maintenance and occasionally must be rehabilitated or reconstructed. This category includes maintenance of airport structures and landside facilities.
- Support Facilities: This category includes all airport related facilities that do not naturally fall into the airside and landside categories, including elements such as fuel facilities, access and circulation, and general on-airport land use.

The objective of this effort is to identify the adequacy of existing airport facilities and outline what new facilities may be needed, and when these may be needed, to accommodate forecast demands. Having established these facility requirements, alternatives for providing these facilities will be evaluated in the next chapter.

The facility requirements at Friday Harbor Airport were evaluated using guidance contained in several Federal Aviation Administration (FAA) publications, including the following:

- Advisory Circular (AC) 150/5300-13A, *Airport Design*
- AC 150/5060-5, *Airport Capacity and Delay*
- AC 150/5325-4B (and Draft 4C), *Runway Length Requirements for Airport Design*
- AC 150/5360-13 *Planning and Design Guidelines for Airport Terminal Facilities*,
- Federal Aviation Regulation (FAR) Part 77, *Objects Affecting Navigable Airspace*
- FAA Order 5090.3C *Field Formulation of the National Plan of Integrated Airport Systems (NPIAS)*

PLANNING HORIZONS

An updated set of aviation demand forecasts for the Airport has been established, with a summary of the primary forecasting elements presented previously on Exhibit 2F. These activity forecasts include annual operations, based aircraft, fleet mix, and enplanements. With this information, specific components of the airfield and landside systems can be evaluated to determine their capacity to accommodate future demand.

Cost-effective, efficient, and orderly development of an airport should rely more upon actual demand at an airport than on a time-based forecast figure. In order to develop a master plan that is demand-based rather than time-based, a series of planning horizon milestones have been established that take into consideration the reasonable range of aviation demand projections. The planning horizons presented in **Table 3A** are segmented as the Short Term (approximately years 1-5), the Intermediate Term (approximately years 6-10), and the Long Term (years 11-20 and possibly beyond).

It is important to consider that actual activity at the Airport may be higher or lower than what the annualized forecast portrays. By planning according to activity milestones, the resultant plan can accommodate unexpected shifts or changes in the area's aviation demand. It is important for the plan to accommodate these changes so that airport officials can respond to unexpected changes in a timely fashion.

The most important reason for utilizing milestones is it allows airport management the flexibility to make decisions and develop facilities according to needs generated by actual demand levels. The demand-based schedule provides flexibility in development, as development schedules can be slowed or expedited according to demand at any given time over the planning period. The resultant plan provides airport officials with a financially responsible and needs-based program.

TABLE 3A
Planning Horizon Activity Levels
Friday Harbor Airport

		PLANNING HORIZON		
	Base Year 2017	Short Term	Intermediate Term	Long Term
Enplanements	13,000	14,500	16,300	19,400
Itinerant Operations				
Commuter	10,010	9,836	10,464	11,328
Other Air Taxi	100	164	236	272
General Aviation	12,533	13,701	14,608	17,048
Local Operations				
General Aviation	24,534	26,414	28,020	31,421
Total Annual Operations	47,177	50,115	53,328	60,069
Based Aircraft	152	164	173	192

Source: Coffman Associates analysis

AIRFIELD CAPACITY

Airfield capacity is measured in a variety of different ways. The **hourly capacity** measures the maximum number of aircraft operations that can take place in an hour. The **annual service volume (ASV)** is an approximate annual operations figure that is used to define airfield capacity needs. The ASV is a common matrix used to define the overall annual capacity of a runway system. **Aircraft delay** is the total delay incurred by aircraft using the airfield during a given timeframe. FAA Advisory Circular 150/5060-5, *Airport Capacity and Delay*, provides a methodology for examining the operational capacity of an airfield for planning purposes. This analysis takes into account specific factors about the airfield. The following describes the input factors as they relate to Friday Harbor Airport:

- **Runway Configuration** – Runway 16-34 is 3,402 feet long. Runway 34 has instrument approaches with visibility minimums as low as 1-mile and circle to land capability to both runway ends.

- **Runway Use** – Safe operations are the highest priority, so the runway's ability to accommodate the current and planned fleet mix is important. Runway 16 is the calm wind runway and the optimal runway for departures. It is estimated that Runway 16 accounts for 70 percent of operations.

- **Exit Taxiways**– Based upon the aircraft mix using the airport, taxiways located between 2,000 feet and the end of the runway are factored in the exit rating for the airfield. Including the threshold taxiways, there are two exits in each direction. The greater the number of taxiway exits that are appropriately spaced, the lower the runway occupancy time for an aircraft, which contributes to a higher overall capacity for the airfield.

- **Weather Conditions** – Visual meteorological conditions are defined as conditions when cloud ceilings are 1,000 feet or above and/or visibility is at least three statute miles (also referred to as visual flight rules [VFR]). Instrument meteorological conditions occur when cloud ceilings are between 500 and 1,000 feet and visibility is between one and three statute miles (also referred to as instrument flight rules [IFR]). Poor visibility conditions (PVC) apply for minimums below 500 feet and one mile.

  As shown in **Table 3B**, weather data indicates that the Airport is in VFR approximately 92.6 percent of the year, IFR approximately 3.9 percent of the year, and PVC 3.5 percent of the year.

TABLE 3B
Meteorological Conditions
Friday Harbor Airport

Condition	Cloud Ceiling & Visibility	Time in Minutes	Percent
Visual (VFR)	≥ 1,000' Ceiling AND ≥3 miles Visibility	4,871,560	92.61%
Instrument (IFR)	<1,000' to ≥500' Ceiling AND/OR <3 to ≥1 mile Visibility	205,760	3.91%
Poor Visibility (PVC)	<500' Ceiling AND/OR <1 mile Visibility	182,940	3.48%
	TOTAL	**5,260,260**	**100.00%**

Source: On-airport Automated Surface Observing System (ASOS)

- **Aircraft Mix** - This classification system is based on aircraft weight and not the aircraft approach speed as used in the critical aircraft determination. Nearly all operations are forecast to be by aircraft weighing less than 12,500 pounds. This includes all aircraft used in providing commuter air service.

- **Percent Arrivals** - Generally follows the typical 50-50 percent split.

- **Touch-and-Go Activity** – This activity percentage is derived by dividing total local general aviation operations by total general aviation operations. The result is that approximately 60 percent of total general aviation operations are touch-and-go in nature. This factor will influence overall capacity as runway dwell times are reduced for touch-and-go operations, thus increasing capacity.

- **Operational Levels** – Operations and peaking characteristics are taken into consideration for the capacity model. Peak month operations average approximately 14.5 percent of the year. The design hour averages approximately 10.3 percent of the design day operations.

ANNUAL SERVICE VOLUME

The weighted hourly capacity is utilized to determine the annual service volume in the following equation:

Annual Service Volume (ASV) = C x D x H
C = weighted hourly capacity
D = ratio of annual demand to the average daily demand during the peak month
H = ratio of average daily demand to the design hour demand during the peak month

Following this formula, the current and future annual service volume for Friday Harbor Airport has been calculated between 215,000 and 218,000 operations through the long-term planning horizon as shown in **Table 3C**. By the long-term planning horizon, total operations are forecast to represent approximately 28 percent of the ASV. The ASV is the point at which delay grows exponentially, thereby constraining capacity.

TABLE 3C
Airfield Demand/Capacity Summary
Friday Harbor Airport

	PLANNING HORIZON			
	2017	Short Term	Intermediate Term	Long Term
Operational Demand				
Annual	47,177	50,115	53,328	60,069
Design Hour	23	25	27	30
Capacity				
Annual Service Volume	218,000	217,000	216,000	215,000
Percent Capacity	21.64%	23.09%	24.69%	27.94%
Weighted Hourly Capacity	108	108	107	107
Delay				
Per Operation (Seconds)	13	14	16	18
Total Annual (Hours)	102	117	142	180

Source: FAA AC 150/5060-5, Airport Capacity and Delay

AIRCRAFT DELAY

As the number of annual aircraft operations approaches the airfield's capacity, increasing amounts of delay to aircraft operations begin to occur. Delays occur to arriving and departing aircraft in all weather conditions. Arriving aircraft delays may result in aircraft holding outside the airport traffic area. Departing aircraft delays result in aircraft holding at the runway end until the runway and airspace is cleared for takeoff.

Annual delay at the Airport now and into the forecast planning horizons is negligible. Over the course of a year, it is estimated that a total of 102 hours of delay are experienced. This equates to approximately 13 seconds per operation. Some individual operations may experience a significant delay, but overall, potential delay is a minor factor at the Airport.

CAPACITY ANALYSIS CONCLUSION

According to FAA Order 5090.3C, *Field Formulation of the National Plan of Integrated Airport Systems* (NPIAS), consideration should be given to projects specifically designed to increase airfield capacity when operations reach 60-75 percent of the ASV. Since this range is not anticipated to be reached at the Airport, projects specifically designed to improve capacity, such as additional taxiway exits and additional runways, are not necessary over the course of the planning horizons.

Projects specifically designed to improve capacity, such as additional taxiway exits and additional runways, are not necessary.

AIRFIELD REQUIREMENTS

As indicated earlier, airport facilities include both airfield and landside components. Airfield facilities are those related to the arrival, departure, and ground movement of aircraft. The FAA has established various dimensional design standards related to the airfield to ensure the safe operations of aircraft.

The FAA design standards impact the design of each of the airfield components to be analyzed. The following airfield components are analyzed for compliance to FAA design standards in detail:

- Runway Design Standards
- Runway Elements
- Taxiways
- Navigational and Weather Aids
- Instrument Approaches

RUNWAY DESIGN STANDARDS

The FAA has established several design standards to protect aircraft operational areas and keep them free from obstructions that could affect their safe operation. These include the runway safety area (RSA), runway object free area (ROFA), runway obstacle free zone (OFZ), and runway protection zone (RPZ).

The entire RSA and OFZ must be under the direct ownership of the airport sponsor to ensure these areas remain free of obstacles and can be readily accessed by maintenance and emergency personnel. The

ROFA should also be under the ownership of the airport sponsor but is not required provided the clearance standards are met. The RPZ for each runway end should also be under airport ownership; however, an alternative to outright ownership of the RPZ is the purchase of avigation easements (acquiring control of designated airspace within the RPZ) or having sufficient land use control measures in place which ensure the RPZ remains free of incompatible development.

The FAA has established several design standards to protect aircraft operational areas and keep them free from obstructions that could affect their safe operation.

As discussed in the previous chapter, the applicable design standards are primarily based upon the critical design aircraft and the instrument approach visibility minimums. The critical design aircraft is that aircraft or group of aircraft types with similar characteristics, accounting for 500 or more annual operations. Currently, aircraft in ARC B-II(s) exceed the 500 operations threshold. Per FAA criteria, the Airport should be designed to meet the standards associated with ARC B-II(s). This is a change from the previous master plan when ARC B-I(s) design standards were applied.

The applicable design standards for an airport can and do change periodically. Often, this change is out of the control of the airport sponsor as they cannot restrict aircraft operations. When a change does occur, and it is sustained (typically for at least three years), the airport sponsor should have a plan to meet the design standards to the greatest degree practicable. This master plan will present a plan to meet the newly applicable B-II(s) design standards.

The applicable design standards for the Airport have changed from B-I(s) to B-II(s).

Exhibit 3A presents the ARC B-II(s) runway design standards. The significant changes are that the RSA and ROFA become wider and longer. The runway to taxiway separation standard changes from 150 feet to 240 feet (156 feet is the current condition). The current runway to taxiway separation distance was originally supported by an FAA approved Modification to Design Standard (MOS).

Runway Safety Area (RSA)

The RSA is defined in FAA Advisory Circular (AC) 150/5300-13A, *Airport Design,* as a "surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of undershoot, overshoot, or excursion from the runway." The RSA is centered on the runway and dimensioned in accordance to the approach speed of the critical design aircraft using the runway. The FAA requires the RSA to be cleared and graded, drained by grading or storm sewers, capable of accommodating the design aircraft and fire and rescue vehicles, and free of obstacles not fixed by navigational purpose, such as runway edge lights or approach lights.

AIRPORT DATA CATEGORY	B-II(s) STANDARDS	CURRENT CONDITION
Design Aircraft	**B-II(s)-1A**	**Same**
Runway Design Code	**B-II(s)-5000**	**Same**
Visibility Minimums	**VIS(16)/1-mile(34)**	**Same**
RUNWAY DESIGN		
Runway Width	75	Meets standard
Runway Shoulder Width	10	Meets standard
RUNWAY PROTECTION		
Runway Safety Area (RSA)		
Width	150	Non-standard grade
Length Beyond Departure End	300	Non-standard grade
Length Prior to Threshold	300	Non-standard grade
Runway Object Free Area (ROFA)		
Width	500	Non-standard penetrations: east perimeter fence, windsock, and road
Length Beyond Departure End	300	Non-standard penetrations: terrain on Rwy 16 end, 1 aircraft parking position.
Length Prior to Threshold	300	Non-standard penetration: terrain on Rwy 16 end.
Runway Obstacle Free Zone (ROFZ)		
Width	250	Meets standard
Length Beyond End	200	Meets standard
Runway Protection Zone (RPZ)		
Length	1,000	Non-standard compatibility: existing buildings, roads, parking lots
Inner Width	250	
Outer Width	450	
RUNWAY SEPARATION		
Runway Centerline to:		
Holding Position	125	Meets standard
Parallel Taxiway	240	Non-standard: Taxiway A at 156 feet separation
Aircraft Parking Area	250	Meets standard

Note: All dimensions in feet



Source: FAA AC 150/5300-13A, Airport Design

The B-II(s) RSA is 150 feet wide, as centered on the runway, and it extends 300 feet beyond the runway end. The maximum gradient allowable is five percent. Because the RSA has traditionally been maintained at 120 feet in width to correspond to B-I(s) design standards, an additional analysis was conducted to examine if the currently applicable wider B-II(s) RSA width of 150 feet meets grade standard. **Exhibit 3B** presents this analysis and shows that there are areas at the edge of the existing RSA that need to be brought up to proper grade.

Runway Object Free Area (ROFA)

The ROFA is a two-dimensional ground area surrounding runways, which is clear of objects except for objects whose location is fixed by function (i.e., airfield lighting). The ROFA does not have to be graded and level like the RSA; instead, the primary requirement for the ROFA is that no object in the ROFA penetrates the nearest lateral elevation of the RSA. The ROFA is centered on the runway, extending out in accordance to the critical design aircraft utilizing the runway.

The B-II(s) ROFA is 500 feet wide as centered on the runway and it extends 300 feet beyond the runway ends. The ROFA at the southeast end of the runway does extend beyond airport property and over Mullis Street; however, the road and perimeter fence are below the elevation of the RSA in this location. The lateral RSA elevation is 81 feet MSL and ground elevation at the outer edge of the ROFA is 59 feet MSL. Therefore, the ground elevation of the outer edge of the ROFA is 21 feet below the ground elevation of the RSA (at its lowest and nearest point to the lowest ROFA point). The perimeter fence does penetrate the ROFA to the immediate east of the segmented circle.

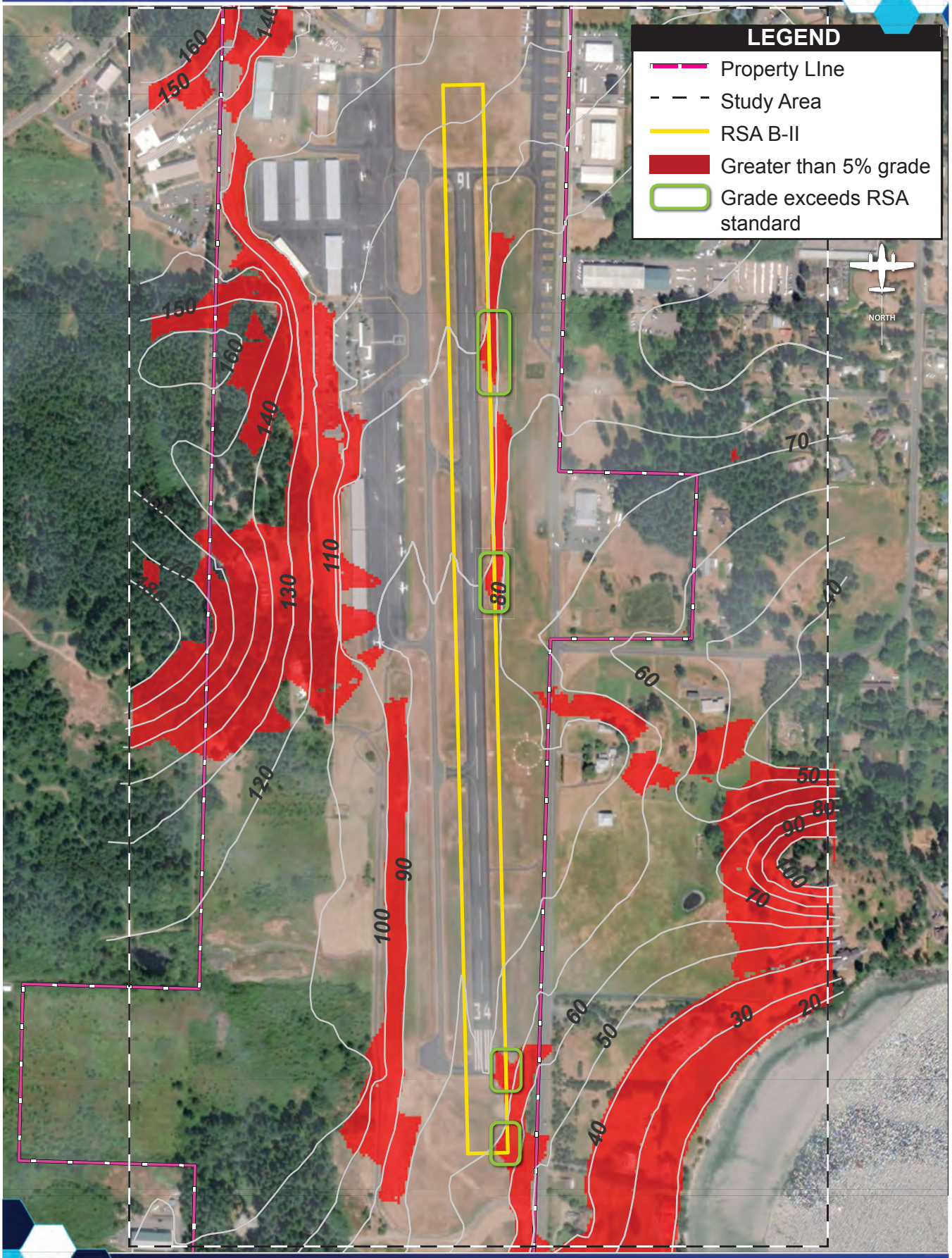
The lighted windsock situated within the segmented circle is approximately 16 feet tall and 180 feet from the runway centerline. This is a penetration to the ROFA and should be relocated.

One of the transient aircraft parking positions on the east side of the airfield is situated within the ROFA. This location is only two feet lower than the lateral edge of the RSA; therefore, if an aircraft parks here, it would be a ROFA penetration.

Obstacle Free Zone (OFZ)

The OFZ is an imaginary volume of airspace which precludes object penetrations, including taxiing and parked aircraft. The only allowance for OFZ obstructions is navigational aids mounted on frangible bases which are fixed in their location by function, such as airfield signs. The OFZ is established to ensure the safety of aircraft operations. If the OFZ is obstructed, the Airport's instrument approaches may be removed, or approach minimums could be increased.

The OFZ extends 200 feet beyond the runway ends and the width is established by approach characteristics of the critical design aircraft. For small aircraft with approach speeds of greater than 50 knots or more, the OFZ width is 250 feet. The OFZ at the Airport meets the design standard.


LEGEND
Property LIne
Study Area
RSA B-II
Greater than 5% grade
Grade exceeds RSA standard
NORTH
91
34
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20

Runway Protection Zones (RPZ)

The RPZ is a trapezoidal area centered on the runway, beginning 200 feet beyond the runway end. The RPZ has been established by the FAA to provide an area clear of obstructions and incompatible land uses in order to enhance the protection of people and property on the ground. The RPZ is comprised of the central portion of the RPZ and the controlled activity area. The central portion of the RPZ extends from the beginning to the end of the RPZ, is centered on the runway, and is the width of the ROFA. The controlled activity area is any remaining portions of the RPZ. The dimensions of the RPZ vary according to the visibility minimums serving the runway and the type of aircraft (design aircraft) operating on the runway.

While the RPZ is intended to be clear of incompatible objects or land uses, some uses are permitted with conditions and other land uses are prohibited. According to AC 150/5300-13A, *Airport Design*, the following land uses are permissible within the RPZ:

- Farming that meets the minimum buffer requirements;
- Irrigation channels as long as they do not attract birds;
- Airport service roads, as long as they are not public roads and are directly controlled by the airport operator;
- Underground facilities, as long as they meet other design criteria, such as RSA requirements, as applicable; and
- Unstaffed navigational aids (NAVAIDs) and facilities, such as required for airport facilities that are fixed by function in regard to the RPZ.

Any other land uses considered within RPZ land owned by the airport sponsor must be evaluated and approved by the FAA Office of Airports. The FAA has published *Interim Guidance on Land Uses within a Runway Protection Zone* (9.27.2012), which identifies several potential land uses that must be evaluated and approved prior to implementation. The specific land uses requiring FAA evaluation and approval include:

- Buildings and structures (examples include, but are not limited to: residences, schools, churches, hospitals or other medical care facilities, commercial/industrial buildings, etc.)
- Recreational land use (examples include, but are not limited to: golf courses, sports fields, amusement parks, other places of public assembly, etc.)
- Transportation facilities. Examples include, but are not limited to:
  - Rail facilities - light or heavy, passenger or freight
  - Public roads/highways
  - Vehicular parking facilities
- Fuel storage facilities (above and below ground)
- Hazardous material storage (above and below ground)
- Wastewater treatment facilities
- Above-ground utility infrastructure (i.e., electrical substations), including any type of solar panel installations.

The *Interim Guidance* states, "RPZ land use compatibility also is often complicated by ownership considerations. Airport owner control over the RPZ land is emphasized to achieve the desired protection of people and property on the ground. Although the FAA recognizes that in certain situations the airport sponsor may not fully control land within the RPZ, the FAA expects airport sponsors to take all possible measures to protect against and remove or mitigate incompatible land uses."

Currently, the RPZ review standards are applicable to any new or modified RPZ. The following actions or events could alter the size of an RPZ, potentially introducing an incompatibility:

- An airfield project (e.g., runway extension, runway shift),
- A change in the critical design aircraft that increases the RPZ dimensions,
- A new or revised instrument approach procedure that increases the size of the RPZ, and/or
- A local development proposal in the RPZ (either new or reconfigured).

Since the *Interim Guidance* only addresses new or modified RPZs, existing incompatibilities are not subject to the new guidance. It is still necessary for the airport sponsor to take all reasonable actions to meet the RPZ design standard, FAA funding priority for certain actions, such as relocating existing roads in the RPZ, will be determined on a case-by-case basis.

Table 3D presents detail regarding the existing RPZs at the Airport. Because the approach RPZs to each runway end encompass the departure RPZs as well, the following discussion addresses the RPZs as a whole.

TABLE 3D
Runway Protection Zone Detail
Friday Harbor Airport

Runway	RPZ Dimensions (ft.)		RPZ Size (ac.)	Owned in Fee (ac.) / % Owned	Existing Incompatible Land Uses	% Incompatible
16	Inner Width:	250	8.035	7.835 / 97.5%	Commercial Building	15.4%
	Outer Width:	450			Parking Lot	
	Length:	1,000				
34	Inner Width:	250	8.035	7.385 / 91.9%	Mullis Street	9.7%
	Outer Width:	450			Shelter Rd.	
	Length:	1,000				

The northeast corner of the Runway 16 RPZ (0.2 acres) extends beyond airport property and crosses over a portion of a privately-owned commercial building and parking lot. A portion of the parking lot and the access road (1.05 acres) to the parking lot is on airport property but is outside the perimeter fence.

The southeast corner of the Runway 34 RPZ (0.65 acre) extends beyond airport property and crosses over Mullis Street. The Airport does not own this property. Shelter Road crosses the Runway 34 RPZ to provide public access to Port-owned property.

Alternatives for mitigating the incompatible land uses within the RPZs will be examined in the alternatives chapter of this master plan.

Runway/Taxiway Separation

The design standards for the separation between runways and parallel taxiways are a function of the critical design aircraft and the instrument approach visibility minimum. Currently, parallel Taxiway A is 156 feet from the runway, centerline to centerline. The separation design standard for B-II(s) aircraft is 240 feet. The FAA has indicated that an important outcome of this master plan is a long-term resolution of the current non-standard runway to taxiway separation distance.

An important outcome of this master plan is a long-term resolution of the current non-standard runway to taxiway separation distance.

Existing Modification of Airport Design Standards (MOS)

The FAA approved a modification to design standard (MOS) for the runway to taxiway separation standard on September 12, 2011. At the time, a project was proposed to shift Taxiway A from 150 feet to 156 feet. This distance was chosen as it would meet the safety intent of the separation standard as applied to the wingspan (52 feet) of the critical design aircraft (Cessna Grand Caravan 208B), which is the same design aircraft as today. This project was completed by 2014.

According to FAA Order 5300.1G (issued 9.29.17), a Modification to Standards is "any deviation from, or addition to standards, applicable to airport design, material, and construction standards, or equipment projects resulting in an acceptable level of safety, useful life, lower costs, greater efficiency, or the need to accommodate an unusual local condition on a specific project through approval on a case-by-case basis."

An MOS for design standards expires no later than five years from the approval date. The airport must re-submit the MOS for review and approval if an extension is requested. All MOS associated with design standards must be reviewed whenever there is an opportunity to meet standards, when situations change, or if an MOS is no longer required.

At the time that the MOS was considered, the applicable design standards were ARC B-I(s). While the existing 150-foot runway to taxiway separation did meet the B-I(s) airport design standard, it was known that the commercial/air cargo aircraft in operation had a wing span that exceeded the maximum ARC B-I standard of 49 feet by approximately 3 feet. Therefore, to accommodate this aircraft, a MOS was approved.

It has been more than five years since the MOS approval; therefore, FAA review is required. Other potential projects have been considered by the Airport in the interim; however, the FAA has indicated that a full review of the MOS and the overall airport design standards must be made prior to pursuing these projects in conjunction with this master plan to ensure that the Airport's ability to meet runway to taxiway separation standards in the future is not impeded.

In the alternatives chapter, an examination of the options for meeting the runway to taxiway separation standard will be considered.

Hold Line Separation

The standard for hold line location for ARC B-II(s) is 125 feet from the runway centerline. No change is necessary, and the hold lines should be maintained at 125 feet.

Aircraft Parking Area Separation

For B-II(s) standards, aircraft parking areas should be at least 250 feet from the Runway 16-34 centerline. All aircraft parking areas at the Airport meet this standard and should be maintained.

RUNWAY ELEMENTS

The adequacy of the existing runway system at Friday Harbor Airport has been analyzed from a number of perspectives, including runway orientation and adherence to safety area standards. From this information, requirements for runway improvements were determined for the Airport. Runway elements, such as configuration, length, width, and strength, are now presented.

Runway Configuration

The Airport has a single runway, oriented in a north to south manner. The runway is 3,402 feet long and 75 feet wide. For the operational safety and efficiency of an airport, it is desirable for the primary runway to be oriented as close as possible to the direction of the prevailing winds. This reduces the impact of wind components perpendicular to the direction of travel of an aircraft that is landing or taking off.

FAA AC 150/5300-13A, *Airport Design,* recommends that a crosswind runway be made available when the primary runway orientation provides for less than 95 percent wind coverage for specific crosswind components. The 95 percent wind coverage is computed on the basis of not exceeding a 10.5-knot (12 mph) component for runway design code (RDC) A-I and B-I, 13-knot (15 mph) component for RDC A-II

and B-II, 16-knot (18 mph) component for RDC A-III, B-III, C-I through C-III, and D-I through D-III, and 20 knots for larger wingspans.



Runway 34 looking north.

Exhibit 3C presents the all-weather wind rose for the Airport. A wind rose is a graphic tool that gives a succinct view of how wind speed and direction are historically distributed at a particular location. The table at the top of the wind roses indicates the percent of wind coverage for the runway at specific wind intensities.

As can be seen, Runway 16-34 provides greater than 95 percent wind coverage at 10.5 knots and all intensities above that; therefore, a crosswind runway is not needed and the current runway orientation should be maintained.

Runway Length

AC 150/5325-4B, *Runway Length Requirements for Airport Design*, provides guidance for determining runway length needs.

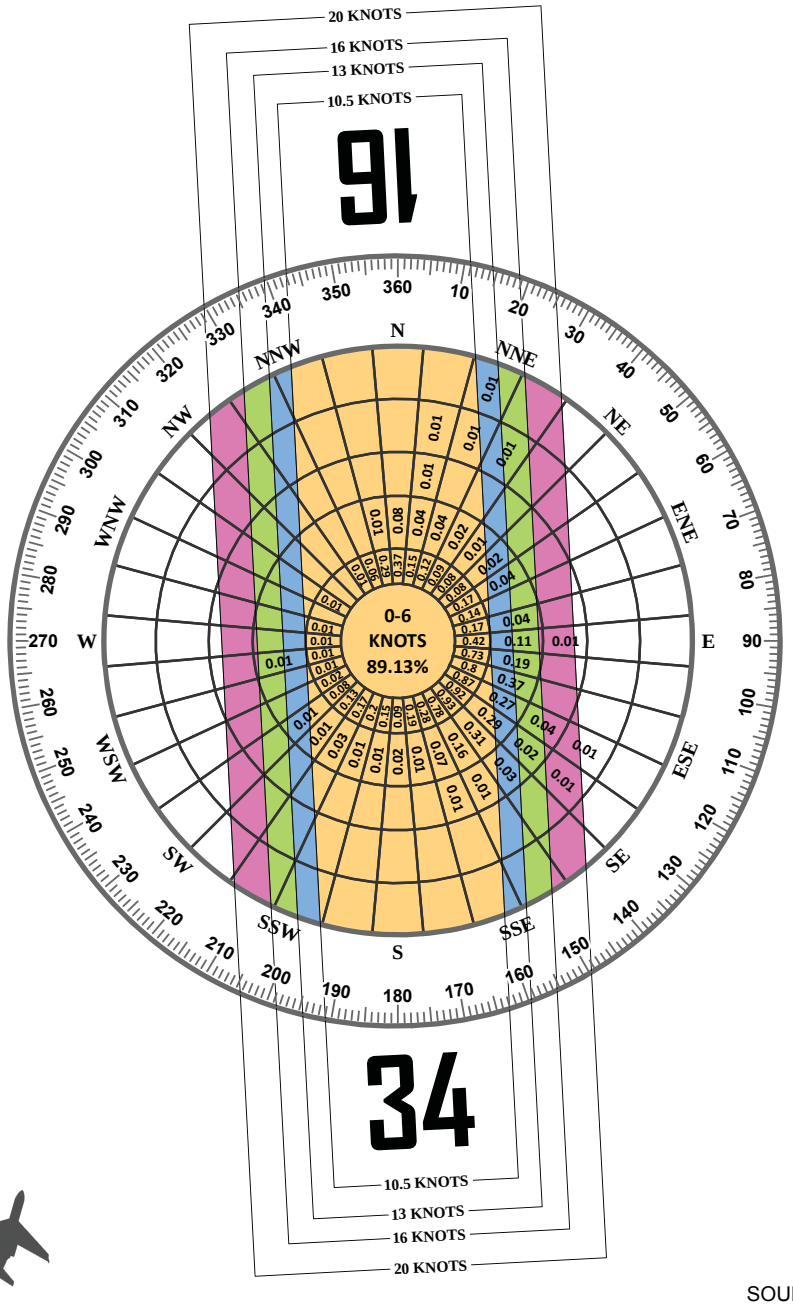
There is not a direct relationship between the classification of the design aircraft (e.g., B-I, B-II) and runway length as airplanes operate on a wide variety of available runway lengths. The suitability of the runway length is governed by many factors, including elevation, temperature, wind, aircraft weight, wing flap settings, runway condition (wet or dry), runway gradient, vicinity airspace obstructions, useful load, and any special operating procedures.

Aircraft performance declines as elevation, temperature, and runway gradient factors increase. For the Airport, the mean maximum daily temperature of the hottest month is 71.7 degrees Fahrenheit (F), which occurs in August. The Airport elevation is 113 feet above mean sea level (MSL). The gradient of Runway 16-34 is 0.8 percent. The RDC for Runway 16-34 is B-II(s)-5000.

Airport sponsors can pursue policies that can maximize the suitability of the runway length. Policies, such as area zoning and height and hazard restrictions, can protect an airport's runway length. Airport ownership (fee simple or easement) of land leading to the runway ends can reduce the possibility of natural growth or man-made obstructions. Planning of runways should include an evaluation of aircraft types expected to use the Airport now and in the future. Future plans should be realistic and supported by the FAA-approved forecasts and should be based on the critical design aircraft (or family of aircraft).

IFR WIND COVERAGE

Runways	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 16-34	98.84%	99.47%	99.93%	99.99%



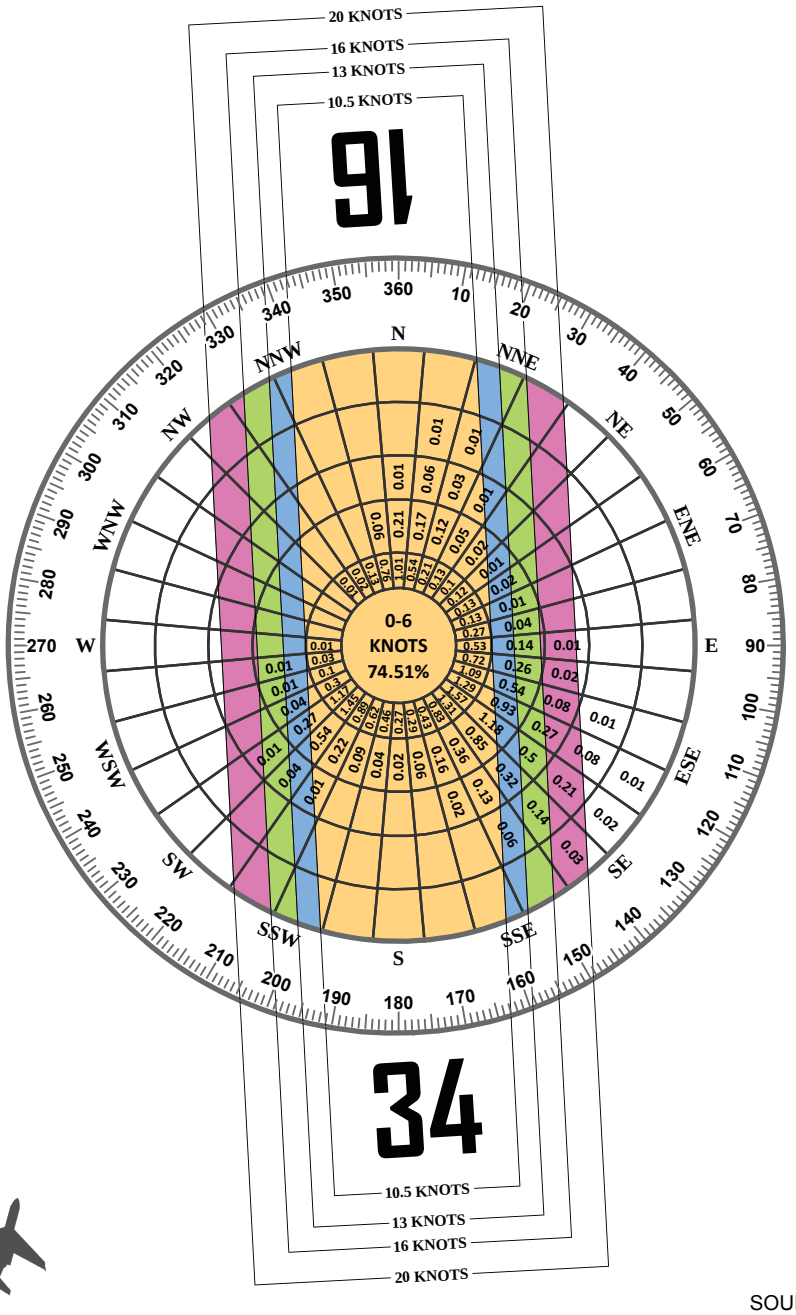
NORTH

Magnetic Declination
16° 08' 00" East (August 2017)
Annual Rate of Change
00° 09' 00" West (August 2017)

SOURCE:
NOAA National Climatic Center
Asheville, North Carolina
Friday Harbor Airport
Friday Harbor, WA

OBSERVATIONS:
15,829 IFR Observations
Jan. 1, 2007 - Dec, 31 2016

ALL WEATHER WIND COVERAGE				
Runways	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 16-34	95.86%	97.95%	99.35%	99.87%



NORTH

Magnetic Declination
16° 08' 00" East (August 2017)
Annual Rate of Change
00° 09' 00" West (August 2017)

SOURCE:
NOAA National Climatic Center
Asheville, North Carolina
Friday Harbor Airport
Friday Harbor, Washington

OBSERVATIONS:
108,657 All Weather Observations
Jan. 1, 2007 - Dec, 31 2016

Small Aircraft (<12,500 lbs.) Runway Length Requirements

FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design*, provides a five-step process for determining the recommended runway length. The design procedure for small airplanes requires the following information: the critical design airplanes under evaluation, approach speed in knots (1.3 x stall speed), number of passenger seats, airport elevation above mean sea level, and the mean maximum temperature of the hottest month at the airport.

- Step 1: Identify the critical design airplanes or airplane group.
- Step 2: Identify the airplanes that require the longest length at maximum takeoff weight (MTOW).
- Step 3: Determine the method to be used for establishing the recommended runway length.
- Step 4: Select the recommended runway length through application of the appropriate methodology as outlined in FAA AC 150/5325-4B.
- Step 5: Make any necessary adjustment to arrive at the recommended runway length.

The key factors that influence the runway length calculation and the specific data input used for this analysis are:

- Airport Elevation: 113 feet above mean sea level
- Mean Maximum Temperature: 71.7 degrees F (August)

Step 1: Identify the critical design airplane or airplane group.

The first step in determining a recommended runway length is to identify the critical design aircraft or family of aircraft with similar design characteristics that meet the operational threshold of 500 annual operations. In Chapter Two – Forecasts, the critical aircraft was determined to be those in airport reference code (ARC) B-II(s) which are best represented by the Cessna Caravan 208B. According to the FAA Traffic Flow Management System Count (TFMSC), this aircraft accounted for a minimum of 2,472 operations in calendar year 2017 (See Exhibit 2J). No larger or heavier aircraft or grouping of aircraft exceeded the 500 operations threshold for critical aircraft determination. Therefore, the critical design aircraft is the Cessna Caravan 208B.

Step 2: Identify the airplanes that require the longest length at maximum takeoff weight (MTOW).

Based on the TFMSC operations count, the Cessna Caravan 208B is the critical aircraft requiring the longest potential runway length. The Cessna Caravan 208B has a MTOW of approximately 8,800 pounds which places it is the small aircraft category (those weighing 12,500 pounds and less).

Step 3: Determine the method to be used for establishing the recommended runway length.

FAA AC 150/53225-4B, provides three methodologies for evaluating the runway length requirements for a critical design aircraft with a MTOW of 12,500 pounds or less. The three methodologies are:

- 95 percent of the small aircraft fleet.
- 100 percent of the small aircraft fleet.
- Small aircraft having 10 or more passenger seats.

The Cessna Caravan 208B falls within the family grouping of small airplanes category with an approach speed of more than 50 knots in landing configuration and with less than 10 passengers. Therefore, Chapter 2, Paragraph 205, Figure 2-1 from the AC is the selected methodology. When selecting the percentage of the fleet for Figure 2-1, it is reasonable to assume 100% of the fleet when considering Friday Harbor is located on the fringe of a metropolitan area, the Puget Sound Region, and the airport accommodates aircraft in IMC conditions with a relatively high number of air taxi operations. The 'small aircraft having 10 or more passenger seats' chart is not utilized because these aircraft operate infrequently at the airport.

Step 4: Select the recommended runway length through application of the appropriate methodology as outlined in FAA AC 150/5325-4B.

Figure 1 shows the selected chart methodology, which has been reproduced directly from the AC. The chart on the left side should be ignored as this represents the '95 percent of small aircraft' category. The chart on the right side is the '100 percent of small aircraft' category, which is employed for this analysis. The red line is an example that was included on the figure by the FAA and it should be ignored.

The vertical line is positioned at the bottom of the chart (x-axis) and it represents the mean maximum temperature of the hottest month at the airport (71.7 Degrees F). As that vertical line intersects the airport field elevation curves (approximately 113' MSL), a horizontal line is drawn to the right, or y-axis,

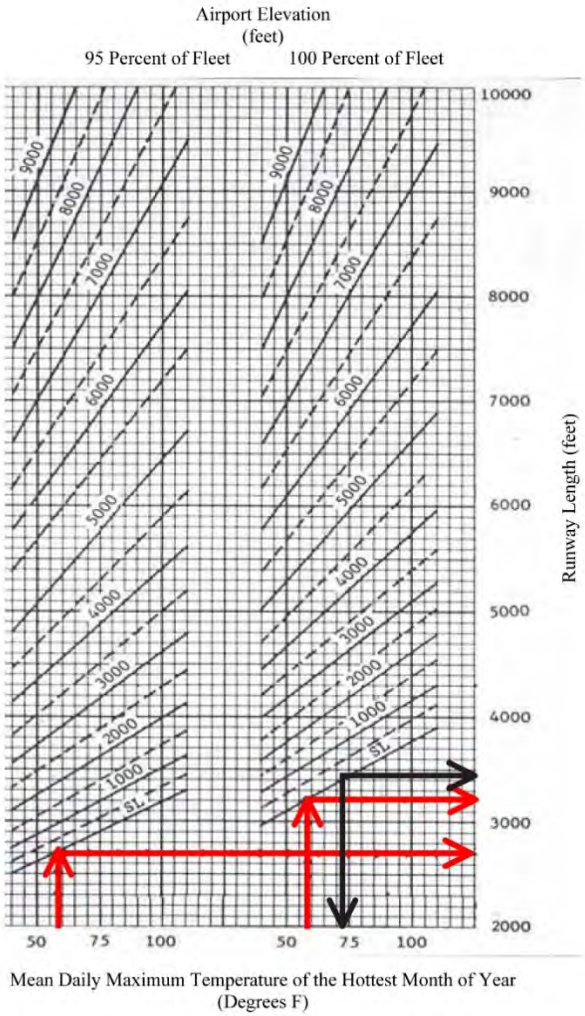


Figure 1 Runway Length Chart

which results in the recommended runway length determination (see black arrows). The recommended runway length at Friday Harbor Airport is approximately 3,440 feet. After rounding, the recommended runway length for the airport is 3,500 feet for aircraft in the '100 percent of small aircraft' category.

Step 5: Make any necessary adjustment to arrive at the recommended runway length.

Other factors such as the runway gradient or wet conditions may influence the recommended runway length, however the AC specifically states that these factors are not to be considered for a critical aircraft weighing 12,500 pounds or less. Therefore, no additional adjustment is necessary and **the recommended runway length at Friday Harbor Airport is 3,500 feet**.

Runway Length Conclusion

At 3,402 feet in length, the runway is approximately 100 feet short of the ideal recommended length. Prudent planning will consider the feasibility of extending the runway to 3,500 feet in the alternatives chapter.

Runway Width

Runway 16-34 is currently 75 feet wide which meets the standard for the current critical design aircraft. The current runway width should be maintained.

Runway Strength

An important feature of airfield pavement is its ability to withstand repeated use by aircraft. Runway 16-34 is strength rated for aircraft weighing 12,500 pounds or less for regular operations. This is the appropriate pavement strength rating for the runway and should be maintained. Occasional operations by aircraft weighing more than 12,500 pounds is permissible; however, they do not represent the critical design aircraft now or into the future.

Runway Markings

Runway 16 currently has basic markings that include the runway designation and a centerline marking. The Runway 34 end has non-precision markings which include the runway designation, threshold stripes, and the centerline. These markings should be maintained.

TAXIWAYS AND TAXILANES

The design standards associated with taxiways/taxilanes are determined by the ADG of the critical design aircraft and the taxiway design group (TDG). **Table 3E** presents the taxiway design standards. Those standards based on ADG II and TDG 1A are applicable today.

TABLE 3E
Taxiway Dimensions and Standards
Friday Harbor Airport

STANDARDS BASED ON WINGSPAN	ADG II	Current Condition
Taxiway Protection		
Taxiway Safety Area (TSA) width	79'	Meets Standard
Taxiway Object Free Area (TOFA) width	131'	Existing TOFA Penetrations
Taxilane Object Free Area width	115'	Existing Taxilane OFA Penetrations
Taxiway Separation		
Taxiway Centerline to:		
Fixed or Movable Object	65.5'	Existing Penetrations
Parallel Taxiway/Taxilane	105'	Meets Standard
Taxilane Centerline to:		
Fixed or Movable Object	57.5'	Existing Penetrations
Parallel Taxilane	97'	NA
Taxiway Centerline to:		
Runway 16-34 Centerline (1-mile visibility)	240'	156' to Runway 16-34
Wingtip Clearance		
Taxiway Wingtip Clearance	26'	Meets Standard
Taxilane Wingtip Clearance	18'	Meets Standard
STANDARDS BASED ON TDG	**TDG 1A**	
Taxiway Width Standard	25'	Meets Standard
Taxiway Edge Safety Margin	5'	Meets Standard
Taxiway Shoulder Width	10'	Meets Standard

ADG: Airplane Design Group
TDG: Taxiway Design Group
Source: FAA AC 150/5300-13A, Airport Design

Taxiway Protection and Separation

Historically the airport has been designed to B-I design standards which are less restrictive than the currently applicable B-II standards. This change impacts the clearing surfaces surrounding taxiways and taxilanes. Taxiway safety areas (TSA) increase in width from 49 feet to 79 feet. Taxiway object free areas (TOFA) increase from 89 feet in width to 131 feet. Taxilane object free areas increase from 79 feet in width to 115 feet. Numerous facilities including hangars, movement area centerlines, and aircraft tie-down positions were located based on the old standards. **Exhibit 3D** shows the application of the B-II TOFA standards for the taxiways and taxilanes.

Over time, the airport should expect to meet the B-II taxiway protection and separation standards. The alternatives chapter will address methods to resolve this issue.

Taxiway Design Group

The applicable Taxiway Design Group (TDG) is determined by the aircraft or group of aircraft with the same TDG that account for 500 or more annual operations at the airport. Referring once again to the TFMSC data, **Table 3F** presents the number of operations by TDG. As can be seen, the vast majority of operations captured in the TFMAS are by aircraft with a TDG of 1A. There are some operations by TDG 2 aircraft, but these do not reach the threshold of significance. Therefore, TDG 1A is the applicable taxiway design standard for all primary taxiways at the airport. However, the airport should design taxilanes and facility separations for the most demanding ADG using a particular area. The alternatives chapter will explore which hangar/taxilane development areas may remain at TDG 1A.

Table 3F
Operations by Taxiway Design Group (TDG)
Friday Harbor Airport

Operations 2017[1]	TDG[2]
2,952	1A
126	2
42	1B

[1]*Traffic Flow Management System Count (TFMSC)*
[2]*FAA AC 150/5300-13A, Airport Design, Appendix 1 - Aircraft Characteristics (revised 1.16.2018)*

As noted in Chapter One – Inventory, the existing taxiways at Friday Harbor Airport vary in width. The applicable width standard is 25 feet. Planning for any new taxiways should be to a width of 25 feet.

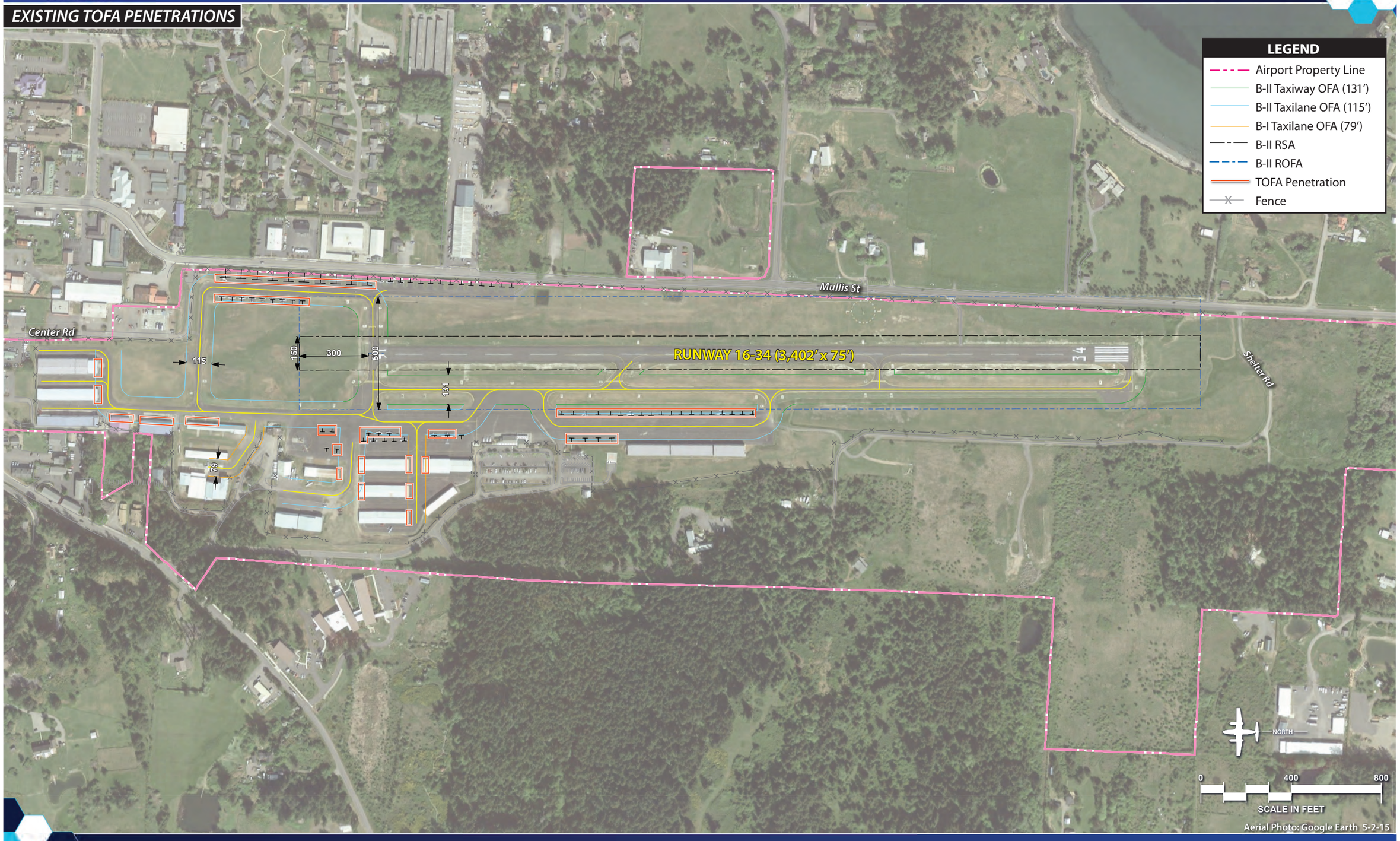
Taxiway Design Considerations

FAA AC 150/5300-13A, *Airport Design*, and Engineering Brief 75 provide guidance on recommended taxiway and taxilane layouts to enhance safety by avoiding runway incursions. A runway incursion is defined as "any occurrence at an airport involving the incorrect presence of an aircraft, vehicle, or person on the protected area of a surface designated for the landing and takeoff of aircraft."

The taxiway system at the Airport generally provides for the efficient movement of aircraft; however, recently published AC 150/5300-13A, *Airport Design*, provides recommendations for taxiway design. The following is a list of the taxiway design guidelines and the basic rationale behind each recommendation:

1. **Taxi Method**: Taxiways are designed for "cockpit over centerline" taxiing with pavement being sufficiently wide to allow a certain amount of wander. On turns, sufficient pavement should be provided to maintain the edge safety margin from the landing gear. When constructing new taxiways, upgrading existing intersections should be undertaken to eliminate "judgmental oversteering," which is where the pilot must intentionally steer the cockpit outside the marked centerline in order to assure the aircraft remains on the taxiway pavement.
2. **Steering Angle**: Taxiways should be designed such that the nose gear steering angle is no more than 50 degrees, the generally accepted value to prevent excessive tire scrubbing.

EXISTING TOFA PENETRATIONS



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3. **Three-Node Concept**: To maintain pilot situational awareness, taxiway intersections should provide a pilot a maximum of three choices of travel. Ideally, these are right- and left-angle turns and a continuation straight ahead.
4. **Intersection Angles**: Design turns to be 90 degrees wherever possible. For acute-angle intersections, standard angles of 30, 45, 60, 120, 135, and 150 degrees are preferred.
5. **Runway Incursions**: Design taxiways to reduce the probability of runway incursions.
   - *Increase Pilot Situational Awareness*: A pilot who knows where he/she is on the airport is less likely to enter a runway improperly. Complexity leads to confusion. Keep taxiway systems simple using the "three node" concept.
   - *Avoid Wide Expanses of Pavement*: Wide pavements require placement of signs far from a pilot's eye. This is especially critical at runway entrance points. Where a wide expanse of pavement is necessary, avoid direct access to a runway.
   - *Limit Runway Crossings*: The taxiway layout can reduce the opportunity for human error. The benefits are twofold – through simple reduction in the number of occurrences and through a reduction in air traffic controller workload.
   - *Avoid "High-Energy" Intersections*: These are intersections in the middle third of runways. By limiting runway crossings to the first and last thirds of the runway, the portion of the runway where a pilot can least maneuver to avoid a collision is kept clear.
   - *Increase Visibility*: Right-angle intersections between taxiways and runways provide the best visibility. Acute-angle runway exits should be avoided unless there is a capacity issue (no capacity issue at Friday Harbor). A right-angle turn at the end of a parallel taxiway is a clear indication of approaching a runway.
   - *Avoid "Dual Purpose" Pavements*: Runways used as taxiways and taxiways used as runways can lead to confusion. A runway should always be clearly identified as a runway and only a runway.
   - *Indirect Access*: Do not design taxiways to lead directly from an apron to a runway. Such configurations can lead to confusion when a pilot typically expects to encounter a parallel taxiway.
   - *Hot Spots*: Confusing intersections near runways are more likely to contribute to runway incursions. These intersections must be redesigned when the associated runway is subject to reconstruction or rehabilitation. Other "hot spots" should be corrected as soon as practicable.
6. **Runway/Taxiway Intersections**:
   - *Right-Angle*: Right-angle intersections are the standard for all runway/taxiway intersections, except where there is a need for a high-speed exit. Right-angle taxiways provide the best visual perspective to a pilot approaching an intersection with the runway to observe aircraft in both the left and right directions. They also provide optimal orientation of the runway holding position signs so they are visible to pilots.

- *Acute-Angle*: Acute angles should not be larger than 45 degrees from the runway centerline. A 30-degree taxiway layout should be reserved for high-speed exits. The use of multiple intersecting taxiways with acute angles creates pilot confusion and improper positioning of taxiway signage.
- *Large Expanses of Pavement*: Taxiways must never coincide with the intersection of two runways. Taxiway configurations with multiple taxiway and runway intersections in a single area create large expanses of pavement, making it difficult to provide proper signage, marking, and lighting.

7. **Taxiway/Runway/Apron Incursion Prevention**: Apron locations that allow direct access into a runway should be avoided. Increase pilot situational awareness by designing taxiways in such a manner that forces pilots to consciously make turns. Taxiways originating from aprons and forming a straight line across runways at mid-span should be avoided.
8. **Wide Throat Taxiways**: Wide throat taxiway entrances should be avoided. Such large expanses of pavement may cause pilot confusion and makes lighting and marking more difficult.
9. **Direct Access from Apron to a Runway**: Avoid taxiway connectors that cross over a parallel taxiway and directly onto a runway. Consider a staggered taxiway layout that forces pilots to make a conscious decision to turn.
10. **Apron to Parallel Taxiway End**: Avoid direct connection from an apron to a parallel taxiway at the end of a runway.
11. **End-Around Taxiways (EAT):** To improve efficiency and provide a safe means of movement from one side of a runway to the other, an EAT may be desired. EATs must be at least 1,500 feet from the runway end and clear of any runway imaginary surfaces.
12. **Taxiway Gradient**: The maximum longitudinal grade is 2.0 percent for Aircraft Approach Categories A and B. Taxiway D at Friday Harbor Airport exceeds the grading standard.

Taxiway Geometry Issues

Taxiway A3 is an exit taxiway from the runway leading to parallel Taxiway A. Taxiway A3 is situated at an angle. The preferred geometry is for connecting taxiways to be at a 90-degree angle.

Taxiway D is an exit taxiway from the Runway 16 threshold to the east side transient apron area. The grade of Taxiway D is 4.0 percent which exceeds the 2.0 percent grade standard. As a result, it is primarily used to exit the runway but rarely used to access the runway. Instead, aircraft leaving the east apron area will typically utilize Taxiway F to the north to travel around the runway and then use Taxiway A to access the runway.

Taxiway F is 750 feet from the end of Runway 16, thus not meeting end-around-taxiway design standards, which require at least 1,500 feet. As a result, Taxiway F should be considered a runway crossing taxiway which require properly situated hold lines and signage for approach holds. Currently, there are no hold lines on Taxiway F. There is also a run-up apron off this taxiway which needs to be removed.

The Runway 16 threshold taxiway leading to the terminal area (west of the runway) currently allows direct access from the apron area to the runway.

There is a wide expanse of pavement to the east of the terminal apron. There is a taxilane centerline that is not at a right angle.

Alternatives will be considered to remedy any taxiway geometry issues for the airport.

VISUAL NAVIGATION AIDS

The airport beacon provides for rapid identification of the Airport with a rotating light that is green on one side and white on the opposite side. The beacon is located adjacent to Ernies Café and is a penetration to the imaginary Transitional Surface emanating from the sides of the runway. Alternative locations for the beacon will be evaluated in the alternatives analysis.

Runway 16 is equipped with a two-light precision approach path indicator light system (PAPI), and Runway 34 has a four-light PAPI system. These visual lighting systems indicate to a pilot if they are on the correct glide path to the runway. These systems should be maintained at the Airport.

Runway end identification lights (REIL) are strobe lights set to either side of the runway. These lights provide rapid identification of the runway threshold to pilots at a distance of up to 20 miles. The REILs serving both ends of Runway 16-34 should be maintained at the Airport.

WEATHER AND COMMUNICATION AIDS

Friday Harbor Airport has a lighted windsock located approximately 1,200 feet from the Runway 34 threshold and 180 feet to the east of the runway centerline. This windsock is approximately 16 feet tall. The windsock is outside the B-II(s) RSA but is a penetration to the ROFA. Windsocks are not considered fixed by function and should be located outside of the ROFA. In the alternatives analysis options including relocation or installing a frangible base as an interim solution will be considered.



Windsock penetrating the ROFA.

Supplementary windsocks are located to the west of Taxiway A near the Runway 16 threshold and near the helipad. These windsocks should be maintained.

Friday Harbor Airport is equipped with an Automated Surface Observing System (ASOS). This is an important system that automatically records weather conditions, such as wind speed, wind gust, wind direction, temperature, dew point, altimeter setting, visibility, fog/haze condition, precipitation, and cloud height. This information can be accessed by pilots and individuals via an automated voice recording on a published telephone number. This system should be maintained through the planning period.

INSTRUMENT NAVIGATIONAL AIDS

The airport has two instrument approaches to Runway 34. The GPS instrument approach provides visibility minimums as low as 1-mile. This approach has an LPV (localizer performance with vertical guidance) component which provides for both vertical and horizontal GPS guidance. This is a very important instrument approach procedure that extends the opportunity for landing into times of poor visibility.

The NDB non-precision instrument approach provides for 1-mile visibility minimums.

As a primary commercial service airport, the lowest possible visibility minimums should be considered. Visibility minimums as low as ¾-mile or ½-mile are common. Some large hub commercial service airport may have even lower visibility minimums, but that is not appropriate for this airport.

Visibility minimums of ¾-mile are recommended to have an approach lighting system (ALS) and ½-mile minimums are required to have an ALS. This is a significant investment that may cost $1 million or more. The size of the RPZs increase dramatically with lower visibility minimums. The RPZ associated with ¾-mile visibility minimums encompass nearly 49 acres and 79 acres for ½-mile. These new RPZs would have to be cleared of any incompatible land uses, including roads and buildings, which is a significant obstacle for Friday Harbor Airport. While lower visibility minimums are likely not feasible for these reasons, it may be feasible to reduce the vertical (cloud ceiling) component.

An instrument approach to Runway 16 that provides a vertical or horizontal guidance element may be considered, provided the size of the RPZ does not change to such a degree that more incompatibilities would be introduced. A GPS (RNAV, VNAV, LPV) instrument approach to Runway 16 with 1-mile visibility minimums may be feasible, as the RPZ size will not change; however, terrain northwest of the airport may impact the visibility minimums.

FAR PART 77 AIRSPACE IMAGINARY SURFACES

Federal Aviation Regulation (F.A.R.) Part 77, *Objects Affecting Navigable Airspace*, was established for use by local authorities to analyze the impact of and control the height of objects near airports. The airport sponsors should do all in their power to ensure development stays below the FAR Part 77 surfaces to protect the role of the airport. The following discussion will describe those surfaces that make up the FAR Part 77 surfaces at Friday Harbor Airport.

Penetrations to any of the FAR Part 77 surfaces are considered to be obstructions. If there are obstructions, additional evaluation criteria are examined by the FAA to determine if an obstruction is a hazard to air navigation. This determination is typically done during an airspace determination conducted by the FAA.

The FAR Part 77 criteria assign three-dimensional imaginary surfaces associated with the airport. These imaginary surfaces emanate from the runway centerline(s) and are dimensioned according to the visibility minimums associated with the approach to the runway end and size of aircraft to operate on the runway. The FAR Part 77 imaginary surfaces include the primary surface, approach surface, transitional surface, horizontal surface, and conical surface. Each surface is described as follows.

Primary Surface: The primary surface is an imaginary surface longitudinally centered on the runway. The primary surface extends 200 feet beyond each runway end. The elevation of any point on the primary surface is the same as the elevation along the nearest associated point on the runway centerline. Due to weight limitations, the runway is classified as "utility." There is a non-precision instrument approach leading to Runway 34. The primary surface for Runway 16-34 is 500 feet wide as centered on the runway. The ground area north of the runway slopes gently upward, which means the terrain is a penetration of the primary surface.

Approach Surface: An approach surface is established for each runway end. The approach surface begins at the end of the primary surface, extends upward and outward from the primary surface end, and is centered along an extended runway centerline. The approach surface leading to each runway is based upon the type of approach available (instrument or visual) or planned.

The current approach surface leading to the Runway 16 end (visual approach) extends out and up at a 20:1 ratio to 5,000 feet with an outer width of 1,250 feet. Runway 34 has a non-precision instrument approach; therefore, the inner width of the approach surface is 500 feet, the length is 5,000 feet, and the outer width is 2,000 feet.

The ground north of Runway 16 is a penetration to the existing approach surface since the inner edge of the approach surface starts at the end of the primary surface.

Transitional Surface: The transitional surface begins at the outside edge of the primary surface at the same elevation as the runway. The surface rises at a slope of 7:1, up to a height 150 feet above the highest runway elevation. At that point, the transitional surface is replaced by the horizontal surface. There are numerous transitional surface penetrations consisting of terrain and trees to the sides of the airport. Transitional surface penetrations are common at airports but should be mitigated where feasible.

Horizontal Surface: The horizontal surface is established at 150 feet above the highest elevation of the runway surface. Having no slope, the horizontal surface connects the transitional and approach surfaces to the conical surface 5,000 feet from the end of the primary surface.

Conical Surface: The conical surface begins at the outer edge of the horizontal surface. The conical surface then continues for an additional 4,000 feet horizontally at a slope of 20:1. Therefore, at 4,000 feet from the horizontal surface, the elevation of the conical surface is 350 feet above the highest airport elevation.

As part of this Master Plan project, a new FAR Part 77 Airspace map will be included as a drawing within the Airport Layout Plan (ALP) set. All penetrations to the FAR Part 77 surfaces will be identified. The FAA will review the ALP and conduct an airspace review of the plan. Additional mitigation for airspace penetrations may be required based on the FAA airspace study.

APPROACH SURFACE

The approach surface (often referred to as the threshold siting surface (TSS)) is another imaginary surface applied to the approach to runway ends. The TSS is different than the Part 77 approach surface. The TSS is typically a trapezoidal shape that extends along the runway centerline at a specific slope. The specific size and starting point of the TSS is a function of the visibility minimums and the type of procedure associated with the runway end.

The existing TSS for Runway 16 begins at the runway threshold where it is 250 feet wide as centered on the runway. It extends outward and upward at a 20:1 slope measured in horizontal to vertical feet. It extends to a width of 2,250 feet, then extends at that width for an additional 2,750 feet for a total length of 5,000 feet.

As noted previously, an instrument approach with visibility minimums not lower than 1-mile is considered for Runway 16. The TSS changes in size under this future scenario. It begins 200 feet from the runway threshold where it is 400 feet wide. It extends 10,000 feet at a 20:1 slope to a width of 3,400 feet.

The TSS for Runway 34 begins 200 feet from the runway threshold at a width of 400 feet, as centered on the runway. It extends outward and upward at a slope of 20:1. The outer width is 3,400 feet and the length is 10,000 feet.

The TSS should be clear of penetrations. When penetrations exist, certain mitigating actions may be taken by the FAA which include lighting of penetrations, adjustment to vertical glide path slopes, increasing minimums, and/or displacing landing thresholds. The airport layout plan associated with this master plan will include analysis of the current and planned TSS for the airport.

AIRSIDE SUMMARY

The Friday Harbor Airport has a nice complement of airside systems, including a runway that is 3,402 feet in length, a full parallel taxiway, full airfield edge lighting, instrument approach procedures, and various visual approach aids.

The most significant change at the Airport since the completion of the last master plan is the need to plan for a change in the applicable design standards. The previous master plan applied ARC B-I(s) design standards associated with small aircraft (<12,500 lbs.) and wingspans less than 49 feet. It has been determined that the number of operations by aircraft in ARC B-II(s) exceeds the FAA threshold of 500 annual operations. Aircraft in ARC B-II(s) have wing spans between 49 and 79 feet, which triggers more restrictive design standards.

Potentially, the most significant of the newly applicable design standards is the runway to taxiway separation standard which goes from 150 feet to 240 feet. The existing parallel taxiway is 156 feet from the runway. The alternatives chapter to follow will examine several options to meet design standards that are deficient. Also significant are the object free areas surrounding the runway and taxiways which are wider under B-II standards. A graphical representation of the airfield areas of interest is presented on **Exhibit 3E**.

The recommended runway length at the Airport is 3,500 feet. The alternatives chapter will examine the feasibility of extending the runway an additional 100 feet in addition to a no-action alternative.

The FAA places a high priority on airports having control over land uses within RPZs. There are portions of airport-owned RPZ lands that have current incompatible land uses (e.g., parking lot), and there are other portions of the RPZs that the Airport does not own that have incompatible land uses as well (e.g., Mullis Street). Opportunities to reduce or eliminate incompatible land uses in the RPZs will be explored in the alternatives chapter.

A summary of the airside needs at Friday Harbor Airport is presented on **Exhibit 3F**.

LANDSIDE REQUIREMENTS

Landside facilities are those necessary for handling aircraft and passengers while on the ground. These facilities provide the essential interface between the air and ground transportation modes. The capacities of the various components of each area were examined in relation to projected demand to identify future landside facility needs. This analysis covers facility needs to support general aviation activity and commercial passenger service. The landside components include:

General Aviation
- Aircraft Hangars
- Aircraft Parking Apron
- Auto Parking and Access
- General Aviation Terminal Building Services

Commercial Passenger Service
- Commercial Passenger Terminal Building Services
- Commercial Aircraft Apron

AIRCRAFT HANGARS

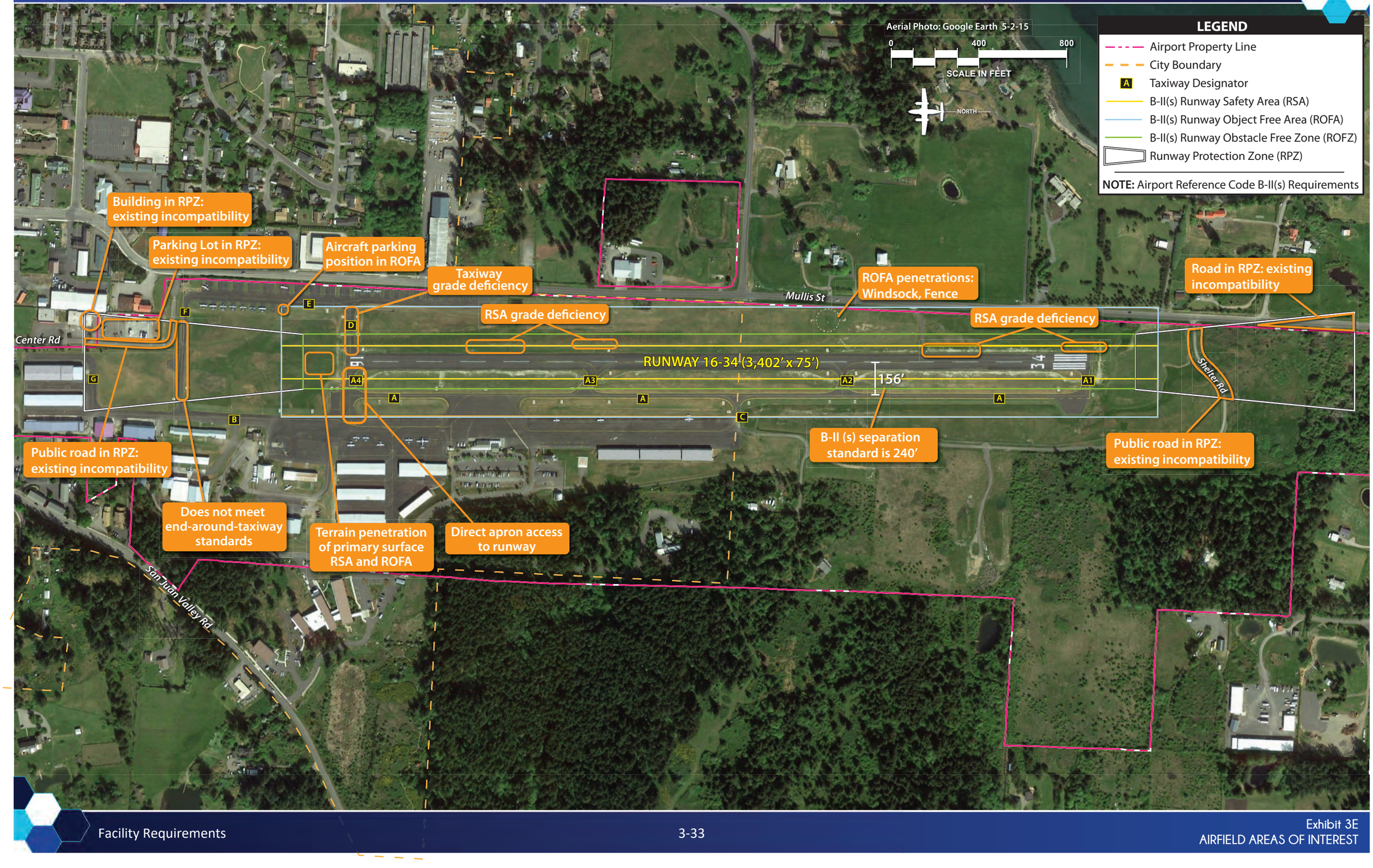
Owning an aircraft represents a significant financial investment. Most aircraft owners prefer to store their aircraft in an enclosed hangar space as opposed to utilizing outside aircraft tie-down positions. This is especially true in climates with frequent precipitation. Enclosed hangar space provides protection from the elements and an increased level of security. At Friday Harbor Airport, approximately 85 percent of based aircraft are stored in an enclosed hangar, which is forecast to remain constant through the planning period.

There are three general types of aircraft storage hangars: T-hangars, box hangars, and conventional hangars. T-hangars are similar in size and will typically house a single engine piston-powered aircraft. Some multi-engine aircraft owners may elect to utilize these facilities as well. There are typically many T-hangar units "nested" within a single structure. Box hangars are larger, open space hangars typically used to store somewhat larger personal/business aircraft and/or to house aviation businesses. Conventional hangars are the familiar large hangars with open floor plans that can store several aircraft.

Baseline hangar information was previously presented in Chapter One – Inventory (Table 1F). There are approximately 76 T-hangar positions, 18 box hangar positions, and 33 conventional hangar positions. There is a total of approximately 172,600 square feet of hangar space dedicated to aircraft storage needs. There is an additional 16,100 square feet of hangar space that is used for aircraft maintenance functions or office space.

Calculations of current and future hangar needs by hangar type have been developed. Currently, there is approximately 90,700 square feet of T-hangar aircraft storage space at the Airport. Future estimates are based on providing 1,400 square feet per T-hangar unit. Approximately 36,300 square feet of additional T-hangar space is needed to meet the short-term demand. By the long-term planning horizon, a total of 50,300 square feet of additional T-hangar space is estimated to be needed.

Executive/box hangars are a popular storage option. Estimates of future needs are based on providing 2,500 square feet per aircraft. Approximately 22,800 square feet of additional box hangar space is needed to meet the short-term demand. By the long-term planning horizon, an additional 35,800 square feet of box hangar space is estimated to be needed.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400
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SCALE IN FEET
NORTH
LEGEND
Airport Property Line
City Boundary
A Taxiway Designator
B-II(s) Runway Safety Area (RSA)
B-II(s) Runway Object Free Area (ROFA)
B-II(s) Runway Obstacle Free Zone (ROFZ)
Runway Protection Zone (RPZ)
NOTE: Airport Reference Code B-II(s) Requirements
Building in RPZ: existing incompatibility
Parking Lot in RPZ: existing incompatibility
Aircraft parking position in ROFA
Taxiway grade deficiency
RSA grade deficiency
ROFA penetrations: Windsock, Fence
RSA grade deficiency
Road in RPZ: existing incompatibility
Public road in RPZ: existing incompatibility
Does not meet end-around-taxiway standards
Terrain penetration of primary surface RSA and ROFA
Direct apron access to runway
B-II (s) separation standard is 240'
Public road in RPZ: existing incompatibility
Center Rd
Mullis St
Shelter Rd
San Juan Valley Rd
RUNWAY 16-34 (3,402' x 75')
16
34
156'
A
B
C
D
E
F
G
A1
A2
A3
A4

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CATEGORY	AVAILABLE	POTENTIAL IMPROVEMENT/CHANGE
RUNWAY 16-34		
	RDC: B-II(s)-5000	Maintain
	Runway length/width: 3,402' x 75'	Consider extension to 3,500' or maintain current length
	Pavement strength:12,500 lbs. single wheel	Maintain
	Runway to taxiway separation: 156'	Meet 240-foot standard to greatest degree feasible
	RSA: 150' wide x 300' beyond runway ends	Maintain
	RSA Grade of 0-5%	Grade as needed to meet standard (Rwy 16 end)
	ROFA: 500' wide x 300' beyond runway ends	Maintain
	ROFA Penetrations: windsock, 1 aircraft parking spot, Perimeter fence and road	Relocate windsock or install frangible base; remove aircraft parking spot, remove road and fence from ROFA
	OFZ: 250' wide x 200' beyond runway ends	Meets standard - maintain
	RPZ ownership: partial ownership	Acquire if feasible.
	RPZ Incompatibilities: roads, parking lot, commercial building	Remove RPZ incompatibilities if feasible
	Basic markings and Rwy 34 threshold stripes	Meets standard - maintain
	Medium intensity runway lighting (MIRL)	Meets standard - maintain
TAXIWAYS		
	TDG-1A	Meets standard - maintain
	Centerline markings	Meets standard - maintain
	Width standard is 25 feet	Implement uniform 25' taxiway width
	Medium intensity taxiway lighting (MITL)	Maintain
	Taxiway layout/geometry deficiencies	Consider adding hold lines on Twy F
INSTRUMENT NAVIGATION AND WEATHER AIDS		
	ASOS	Maintain
	Beacon	Maintain
	Three Windsocks	Maintain three; relocate one windsock out of ROFA or install frangible base
	1-mile non-precision GPS	Maintain
VISUAL AIDS		
	PAPI-4L (Rwy 34)	Maintain
	PAPI-2L (Rwy 16)	Maintain
	REILs	Maintain

KEY

ASOS - Automated Surface Observing System
MIRL - Medium Intensity Runway Lighting
MITL - Medium Intensity Taxiway Lighting
OFZ - Obstacle Free Zone
PAPI - Precision Approach Path Indicator
RDC - Runway Design Code
REIL - Runway End Identification Lights
ROFA - Runway Object Free Area
RPZ - Runway Protection Zone
RSA - Runway Safety Area
TDG - Taxiway Design Code

Conventional hangar aircraft parking space is estimated by providing 2,500 square feet per aircraft. This results in a short term need for an additional 10,300 square feet of space, and a long term need for an additional 29,300 square feet of space.

Table 3G presents aircraft storage needs based on the demand forecasts. Estimates indicate a long-term need for a total of 115,400 square feet of additional aircraft storage space to accommodate the forecast growth in based aircraft. An additional 6,000 square feet of space is reserved for dedicated maintenance and office space functions, which is estimated as 15 percent of box and conventional hangar space.

Hangar space requirements are general in nature and are based on standard hangar size estimates and typical user preferences. If a private developer desires to construct or lease a large hangar to house one aircraft, any extra space in that hangar may not be available for other aircraft. The actual hangar area needs will be dependent on the usage within each hangar.

TABLE 3G
Hangar Needs
Friday Harbor Airport

	Currently Available	Current Need	Short Term	Intermediate Term	Long Term	Total Need
Based Aircraft	152	152	164	173	192	
Aircraft to be Hangared	129	129	139	147	163	34
T-Hangar Positions	76	85	91	93	101	25
Box Hangar Positions	18	27	29	31	34	16
Conventional Hangar Positions	33	17	20	23	28	0
Hangar Area Requirements						
T-Hangar Area	90,700	120,000	127,000	130,000	141,000	50,300
Box Hangar Area	49,200	67,000	72,000	77,000	85,000	35,800
Conventional Hangar Area	32,700	37,000	43,000	51,000	62,000	29,300
Total Storage Area (s.f.)	**172,600**	**224,000**	**242,000**	**258,000**	**288,000**	**115,400**
Maintenance Area	16,100	15,600	17,250	19,200	22,100	6,000

Source: Coffman Associates analysis.

GENERAL AVIATION AIRCRAFT APRON

Designated aircraft apron areas were identified previously on Exhibit 1B and total apron area was summarized on Table 1D. Because of the narrow footprint of the Airport, apron areas are numerous and spread throughout the Airport. An important consideration when planning aircraft apron space is to distinguish between the space needed for small and large aircraft. The current supply for transient apron space is estimated at 14 spaces for small aircraft and 11 spaces for large aircraft (excludes commercial terminal apron). Local tie-down positions are estimated at 40 for small aircraft and 7 for larger aircraft.

Transient Apron Requirements

FAA AC 150/5300-13A, *Airport Design*, suggests a methodology by which transient apron requirements can be determined from knowledge of busy-day operations. At the Airport, the number of itinerant spaces required is estimated at 36 percent of the busy-day itinerant landings. Busy day operations are calculated by multiplying the design day by 1.36. This results in a current need for 26 transient aircraft positions and a long term need for 33 positions.

A planning criterion of 400 square yards per small aircraft and 700 square yards for large aircraft was applied to determine current and future transient apron area requirements. These area estimates do not include circulation areas and access taxilanes. Small aircraft are estimated to account for 70 percent of transient operations and larger aircraft account for the remaining 30 percent. When factored, there is a current need for 18 transient positions for small aircraft and 8 for large aircraft. By the long-term planning horizon, there is a need for 23 small aircraft and 10 large aircraft transient positions.

Local Apron Requirements

Local tie-down positions are assumed to be utilized by owners of small single engine aircraft. Local tie-down positions tend to be more closely spaced since they may be tied-down for long periods of time. Therefore, a planning criterion of 275 square yards per aircraft is utilized. In addition, it is common for hangered aircraft to periodically use local tie-down positions on a temporary basis. To accommodate this typical usage pattern, an additional 10 local tie-down spaces are planned above the calculated need.

It is estimated that there is a current need for 33 local tie-down spaces, which is less than the current capacity of 47. By the long-term planning period, a total of 39 local tie-down spaces are forecast to be needed. In terms of apron area, there is approximately 11,500 square feet of local tie-down area and a long-term need for 10,700 square feet of space.

General Aviation Aircraft Apron Summary

The availability of local aircraft apron is adequate in size through the long-term planning period. Care should be given to maintaining an adequate space for local tie-down needs.

There is a calculated shortage of transient apron. A total of 9,200 square yards is currently available, and it is estimated that 12,900 square yards is what is currently required. By the long-term planning period, a total of 16,100 square yards of transient apron is forecast to be needed. Alternatives will be examined to identify potential locations for additional transient apron area. It is also important that the transient apron be in proximity to general aviation terminal services (pilot lounge, restrooms, flight planning center, etc.).

In total, there is a long-term need for 26,800 square yards of aircraft apron area to accommodate itinerant and local aircraft parking needs. **Table 3H** summarizes the aircraft apron needs at the Airport.

TABLE 3H
Aircraft Apron Requirements
Friday Harbor Airport

			FORECAST		
	Currently Available	Current Need	Short Term	Intermediate Term	Long Term
Local Apron Positions	47	33	35	36	39
Local Apron Area (s.y.)	11,500	9,000	9,500	9,900	10,700
Transient Apron Positions	25	26	28	29	33
Piston Transient Positions	14	18	19	20	23
Turbine Transient Positions	11	8	8	9	10
Transient Apron Area (s.y.)	9,200	12,900	13,500	14,300	16,100
Total Apron Area (s.y)	20,700	21,900	23,000	24,200	26,800

Source: Coffman Associates analysis

GENERAL AVIATION VEHICLE ACCESS AND PARKING

General aviation parking needs are attributable to locally based users, transient airport users, and aviation businesses. Locally based users primarily include those attending to their based aircraft. As with many airports with a significant general aviation component, most based aircraft owners at the Airport will park their vehicles in or adjacent to their hangar when attending to or flying their aircraft. Current planning standards suggest that dedicated vehicle parking lots and access roads be made available to hangar owners/ occupants where feasible. This has the positive effect of removing vehicular traffic from aircraft movements areas.

Vehicle parking needs for locally based aircraft operators is estimated at half the total number of based aircraft. If dedicated vehicle parking were made available for local aircraft owners, then there would be a need for 76 current spaces and 95 spaces in the long term.

Transient users will require vehicle parking lots as they are short term, often same day, visitors. This space is typically provided by the airport businesses and fixed base operators (FBO). At Friday Harbor Airport, transient apron area is provided by the Airport.

Calculations of future transient vehicle parking needs are a function of the number of potential general aviation passengers during the design hour. The number of design hour itinerant passengers is multiplied by 2.0 (average vehicle occupants), which results in a total number of vehicle parking spaces needed. Calculations of vehicle parking area (in square feet) needed are estimated at 150 square feet per parking space (excludes circulation). Calculations of the number of spaces needed for airport businesses are estimated at one space per 1,000 operations.

Table 3J summarizes the vehicle parking needs for transient and airport business users. It is estimated that there are 79 parking spaces currently available and a need for 104 spaces by the long-term planning period. The total parking lot area currently available is estimated at 10,600 square feet with a long-term need for 17,600 square feet. Future hangar development should consider dedicated road access and parking lots to accommodate the needs of transient visitors and airport businesses.

TABLE 3J
GA Vehicle Parking Requirements
Friday Harbor Airport

	Currently Available	Current Need	Short Term	Intermediate Term	Long Term
Design Hour GA Itinerant Passengers	23	18	24	25	29
GA VEHICLE PARKING SPACES					
GA Itinerant Spaces	40	36	48	51	57
Airport Business Parking	39	47	50	53	60
Total Parking Spaces	79	83	98	104	117
GA VEHICLE PARKING AREA (s.f.)					
GA Itinerant Parking Area (FBO)	5,400	5,400	7,200	7,600	8,600
Airport Business Parking Area	5,200	7,100	7,500	8,000	9,000
Total Parking Area (s.f.)	10,600	12,500	14,700	15,600	17,600

Source: Coffman Associates analysis

GENERAL AVIATION TERMINAL SERVICES

Typically, certain services will be made available to general aviation users. This may include a pilot's lounge, flight planning station, line services, conference room, and restrooms. These facilities may be provided by a dedicated facility and/or shared with FBO facilities. There is no singular FBO at the Airport; however, several aviation businesses provide some of these services for their customers. For transient airport users, the east side welcome center provides some of these services. The commercial terminal building has a computer available for pilots to check weather and flight plans. It is estimated that GA service functions currently account for approximately 1,200 square feet in the terminal building. The dual functional areas include the restrooms and lobby area.

General aviation terminal needs are a function of the average number of general aviation passengers that may use the facilities during the design hour. Assuming two people per design hour itinerant operations, it is estimated that there is a need to accommodate up to 23 people within any single hour. Calculating 120 square feet of space per person results in the general aviation terminal building space requirements of 2,200 square feet currently and 3,400 square feet in the long-term planning horizon. **Table 3K** presents the calculation for general aviation terminal space needs at the Airport.

The current arrangement of the Airport terminal building being used by transient users and airport businesses providing space for their customers has met the demand for general aviation services. If new or

expanded airport businesses are able to cater to transient users (typically with fuel delivery and line services), then the dual use need of the commercial terminal building will be lessened.

TABLE 3K
General Aviation Terminal Area Facilities
Friday Harbor Airport

	Currently Available	Current Need	Short Term	Intermediate Term	Long Term
Design Hour GA Operations	23	19	25	27	30
Design Hour GA Itinerant Operations	11	9	12	13	14
Multiplier	2.0	2.0	2.0	2.0	2.0
Total Design Hour Itinerant Passengers	23	18	24	25	29
GA Terminal Building Public Space (s.f.)[1]	1,200*	2,200	2,900	3,100	3,400

*Estimated dual GA use in commercial terminal building
Source: Coffman Associates analysis

PASSENGER TERMINAL BUILDING

Components of the terminal area complex include the terminal building, terminal curb, aircraft apron, and vehicle parking lot. This section identifies the facilities required to meet the Airport's needs through the 20-year planning period. The current terminal building is approximately 3,800 square feet and is a single-story design with ground level passenger boarding.

The terminal building analysis is based on guidance provided in FAA AC 150/5360-13A, *Airport Terminal Planning and Design Guidelines for Airport Terminal Facilities*. In addition, the Airport Cooperative Research Program (ACRP), Report 25, *Airport Passenger Terminal Planning and Design, Volume 1: Guidebook* was also consulted. Forecast annual enplanement levels is the most basic factor utilized when analyzing terminal complex requirements. The forecast enplanement levels of 14,500, 16,300, and 19,300 for each planning horizon were utilized.



Terminal building as seen from the airside.

Many of the terminal building elements are primarily a function of peak hour enplanements and aircraft utilization assumptions. **Table 3L** presents the baseline assumptions utilized to determine the terminal building requirements.

TABLE 3L
Airline Activity Peaks
Friday Harbor Airport

COMMERCIAL ELEMENT	2017	Short Term	Intermediate Term	Long Term
ENPLANEMENTS				
Annual	13,000	14,500	16,300	19,400
Peak Month	1,895	2,114	2,377	2,829
Design Day	61	68	77	91
Peak Hour	17	17	19	21
Design Hour	14	14	16	18
PASSENGER PEAKS				
Design Day Total Passengers	122	136	153	182
Design Hour Total Passengers	28	28	32	36
Design Hour Visitors	14	14	16	18
AIRLINE OPERATIONS				
Annual	8,990	8,796	9,404	10,228
Peak Month	1,146	1,121	1,199	1,304
Design Day	37	36	39	42
Design Hour	4	4	5	6
Average Seats per Departures	5.7	6.3	6.4	6.5
Boarding Load Factor	50.9%	52.0%	54.0%	58.0%
Enplanements per Departure	2.9	3.3	3.5	3.8

Source: Airline records provided by the Airport, analysis by Coffman Associates.

The design day and design hour for enplanements assumes that the commercial aircraft are full. While this is not typical as a yearly average, it occurs frequently during the peak summer tourist months. The peak hour enplanement figure assumes a fully loaded Cessna Grand Caravan (9 seats), Cessna 172 (3 seats), and a Cessna 205 (5 seats) on the ground during the same hour. Other terminal building space calculations are based on current and forecast boarding load factors over the course of a full year.

Certain functional elements that are traditionally included with terminal buildings were specifically excluded from this analysis because Friday Harbor Airport does not require them. The excluded elements are administration space (provided in a separate dedicated building), rental cars (none on-site), security (screening not required at this airport), restaurant (provided at a separate designated building), and conference room facilities (not available).

Terminal building requirements were developed for the following functional areas:

- Airline Operations
- Passenger Waiting Lounge
- Baggage Claim
- Revenue Spaces
- Public Waiting and Circulation
- Support Facilities

Exhibit 3G presents calculated current needs for a passenger terminal building and the future need based on forecast passenger levels.

Airline Operations: The first destination for enplaning passengers in the terminal building is usually the airline ticket counter. The ticketing functional area consists of the ticket counter area, queuing area for passengers in line at the counters, airline office area, and passenger baggage make-up area.

The ticket lobby should be arranged so that the enplaning passenger has immediate access and clear visibility to the individual airline ticket counters upon entering the building. Circulation patterns should allow the option of bypassing the counters with minimum interference. Provisions for seating should be minimal to avoid congestion and to encourage passengers to proceed to the gate area.

The terminal building has two ticket counters that are available immediately to the left upon entering the building. Airline office space and bag make up area is located behind the counters. The ticket queue is co-located with a hall way. This has been adequate and has not caused undue congestion.

All passenger loading operations are from the ground level. This is appropriate through the long-term planning period as aircraft larger than what is currently available are not anticipated to be used in regular service at the Airport.

Passenger Waiting Lounge: The main public lobby is where passengers or visitors may comfortably relax while waiting for arrivals or departures. The main lobby is located to the right upon entering the terminal building. Approximately 25 seats are available.

Airports that are Part 139 certified are required to have security screening and a secure passenger hold room. Friday Harbor Airport is not Part 139 certified and is not anticipated to be Part 139 certified in the future. Therefore, passenger and bag screening, as well as a secure passenger hold room, are not required.

Baggage Claim: The terminal building does not have formal bag claim services within the building and there is no bag claim carousel. Instead, passengers will claim their bags planeside or, more commonly, bags are delivered on a rolling cart to the outdoor covered vestibule located at the north end of the terminal building. This method of delivery works during the peak summer months, but indoor bag delivery would be more appropriate for cooler times.

Revenue Spaces: Many terminal buildings will have space available for concessions or leasable office space. Other than the commercial airlines, FedEx leases space in the terminal building currently. Space is also available for vending machines.

Public Waiting and Circulation: The passenger lobby also serves the needs of visitors or other persons using the terminal building. There is also a small space with a seating table that can accommodate an

FUNCTIONAL AREA	Estimated Existing Area (sf)	Current Need (2017)	Short Term	Intermediate Term	Long Term
AIRLINE OPERATIONS					
Counter Frontage (l.f.)	10	6	6	6	6
Counter Area	90	66	66	66	66
Ticket Queue Area	300	310	340	390	460
Office Area	180	126	126	126	126
Bag Make Up Area	270	288	288	288	288
PASSENGER WAITING LOUNGE					
Passenger Hold Room Area	0	560	560	590	620
BAGGAGE CLAIM					
Pax Claiming Bags (85%)	0	12	12	14	15
Claim Display (l.f)	0	8	8	10	11
Public Claim Area	0	131	131	150	168
Claim Delivery Area	0	302	302	346	389
WAITING AND CIRCULATION					
Main Lobby/Seating Area (s.f.)	900	784	784	896	1,008
REVENUE SPACES					
Lease Office Area	250	156	174	196	233
Vending Area	0	10	10	10	25
SUPPORT AREAS					
Restroom Area	400	530	655	736	876
Storage/Janitorial Area	150	120	46	51	57
Circulation Areas	860	1,085	1,085	1,225	1,365
HVAC Area	400	363	371	411	461
GROSS TERMINAL AREA	3,800	4,831	4,937	5,480	6,142
GROSS TERMINAL AREA (s.f.) (Rounded)	**3,800**	**4,800**	**4,900**	**5,500**	**6,100**

Sources: FAA AC 150/5360-13, *Planning and Design Guidelines for Airport terminal Facilities*; ACRP Report 25, *Airport Passenger Terminal Planning and Design*



additional four people beyond the 25-person seating capacity of the lounge area. Hallways and outside covered walkways provide for circulation.

Support Facilities: These include restrooms, storage/janitorial, additional circulation, mechanical/HVAC components, and a back-up generator.

Customs Services: The Airport is a Port of Entry allowing for customs clearance for international flights. The terminal apron has a location marked for securing of these aircraft. A room in the terminal building is dedicated for customs activity.

Terminal Building Requirements Summary: As can be seen on **Exhibit 3G**, a terminal building encompassing approximately 4,800 square feet would be recommended to support current activity. The additional 1,000 square feet would best be considered for an enclosed bag claim area and additional passenger and visitor seating. By the long-term planning period, a total building size of 6,100 square feet of space would be recommended.

Additional terminal building space would be needed if other traditional elements such as administrative offices, rental car facilities, restaurant, or conference room were to be considered. Including these elements, a terminal building size of approximately 10,000 square feet would be recommended in the short term and 13,000 square feet in the long term.

TERMINAL ROADWAY, CURB, AND PARKING

The capacity of the airport access road and terminal area roadways is the maximum number of vehicles that can pass over a given section of a lane or roadway during a given time period. It is normally preferred that a roadway operates below capacity to provide reasonable flow and minimize delay to the vehicles using it. The existing terminal roadway is of optimal design. It provides ready access to the parking lot and to the front of the terminal building. It is a one-way road, which limits potential crossing movements. It expands to two lanes at the terminal building for the length of the terminal building. This terminal access roadway design is ideal and should be maintained.

The existing terminal curb is approximately 140 feet long. Calculations of both enplaning and deplaning curb length requirements are a function of peak hour enplanements. In the long-term planning period, the minimum enplaning curb length required is 17 feet and the deplaning curb is 22 feet. The terminal curb is adequate through the long-term planning period.

Terminal vehicle parking is a function of peak hour visitors and peak hour passengers and the average modal split at the airport. At Friday Harbor Airport, some passengers drive their own car and park at the Airport and other passengers will be dropped off at the terminal curb. The terminal parking lot has approximately 107 spaces, of which seven are assumed to be for people working in the terminal building.

In the long term, a total of 127 spaces would be needed. **Table 3M** presents the terminal curb and parking needs by planning horizon.

TABLE 3M
Airline Terminal Automobile Requirements
Friday Harbor Airport

	Existing	Short Term	Intermediate Term	Long Term
Terminal Curb				
Enplane Curb (ft)	70	15	15	17
Deplane Curb (ft)	70	18	20	22
Total Curb (ft)	140	33	35	39
Auto Parking				
Total Public Parking	100	93	105	117
Employee	7	7	8	10
Total All Parking	**107**	**100**	**113**	**127**

COMMERCIAL AIRCRAFT APRON

The primary consideration for assessing the adequacy of the commercial aircraft apron are the characteristics of the aircraft using the apron. This includes the size and engine type of the aircraft. The need for ground loading or loading bridges will also be factors. Other considerations may include movement of ground servicing equipment and personnel.

At 3,800 square yards, the existing apron can accommodate two large aircraft (Cessna Caravans) or one large aircraft and two smaller aircraft (Cessna 172, 206) at the same time. It is common for there to be more than one aircraft utilizing the commercial apron and congestion on the apron is an issue. A portion of the apron has been marked for customs inspections, which can further limit the space available for commercial aircraft.

The depth of the apron is of particular concern. There is approximately 100 feet from the edge of the terminal building to the edge of the commercial apron. It is not uncommon for commercial aircraft to park in such a manner that their wings extend over the fence surrounding the terminal building.

The commercial apron is highly active, accommodating more than 5,000 operations annually with a design day of 18 arrivals and peak hourly arrivals count of four. In the long term, the peak hour for commercial arrivals is projected to increase



Commercial aircraft in close proximity to the terminal building.

six aircraft. By the long-term planning period, the commercial apron should be increased to at least 4,300 square yards if feasible.

AIRPORT ADMINISTRATION

The airport administration building is a stand-alone structure located to the immediate south of the terminal building. It is approximately 500 square feet on the ground level and has an office and a small conference room. There is a dedicated parking lot with approximately 33 parking spaces. This structure has a non-public airfield observation deck on the second floor that allows airport administration to survey the airfield as needed.



Airport administration building.

LANDSIDE SUMMARY

An analysis of the required landside facilities necessary to meet projected demand has been presented. Currently, it is estimated that there is approximately 172,600 square feet of aircraft storage space in existing hangars. By the long-term planning period, an additional 115,400 square feet is forecast to be needed. An additional 6,000 square feet is estimated to be needed for dedicated aircraft maintenance/office space in the hangars.

Transient general aviation aircraft apron area is shown to be deficient, currently. There is approximately 9,200 square yards of transient general aviation apron area and the current need has been calculated at 12,900 square yards. By the long term, a total of 16,100 square yards is required. Apron area designated for local tie-down needs is adequate currently and through the long-term planning period. In total, approximately 6,900 square yards of additional transient apron area is needed in the long term.

General aviation vehicle parking space was analyzed. Parking spaces are needed for local aircraft owners, transient aircraft users, and airport businesses. Vehicle parking spaces for local aircraft owners is estimated at one-half of the number of based aircraft. The analysis showed a need for 25 more vehicle parking spaces to accommodate growth in transient users and airport businesses. Local aircraft owners will typically park in their hangar when using their aircraft. If dedicated parking were provided for local aircraft owners, then approximately 96 spaces would be needed.

General aviation terminal services were calculated separately from the commercial terminal needs. Dedicated general aviation terminal services can be provided in a public terminal space or by airport businesses, or a separate facility such as the Welcome Center on the northeast of the Airport. By the long-term planning period, general aviation terminal services should provide approximately 3,400 square feet of space as shared between public facilities and airport businesses.

An analysis of the size of the passenger terminal building was also undertaken. The current building is approximately 3,800 square feet in size. As a non-Part 139 airport, certain terminal functional areas are not needed, such as baggage screening and a secure passenger hold room. Assuming the airport will continue to operate as a non-Part 139 airport, it is estimated that an additional 1,000 square feet of space is needed currently, and a total area of 6,100 square feet will be needed in the long-term planning period.

Those landside facilities necessary to meet current and future demand should be maintained to a high standard. To this end, the Airport should prioritize ongoing maintenance needs and pay attention to aesthetics, as the Airport is an important entrance to the island.

Exhibit 3H presents a summary of the landside requirements, as well as the support requirements that are discussed in the next section.

AIRPORT SUPPORT REQUIREMENTS

Various facilities that do not logically fall within the classifications of airside or landside facilities have also been analyzed for their adequacy through the long-term planning period. These other areas provide certain support functions related to the overall operation of the Airport.

MAINTENANCE BUILDING

The Airport utilizes a small building at the northwest end of the Airport for maintenance functions. This building is undersized and showing its age. Considerations should be given to replacing this structure.

FUEL STORAGE

An on-airport business owns the underground fuel storage tanks located on the north apron. There are two storage tanks, each with a 10,000-gallon capacity, that are used for AvGas. These tanks were installed in the early 1960s. Consideration should be given to replacing them with double-walled, above-ground tanks, which are much easier to monitor for leaks and to maintain.

Fuel sales records were provided by the Airport. Over the past five years, the Airport has sold, on average, approximately 35,000 gallons of AvGas per year. The future fuel consumption estimate is a function of the forecast of piston aircraft operations. Additional fuel storage capacity should be planned when the Airport is unable to maintain an adequate supply and reserve (commonly up to a 14-day reserve). Additional fuel storage capacity is not projected to be needed during the 20-year forecast period. **Table 3N** presents this analysis.



	Available	Current Need	Short Term	Intermediate Term	Long Term
Based Aircraft	**152**	**152**	**164**	**173**	**192**
Tie-Down Aircraft	23	23	25	26	29
Hangared Aircraft	129	129	139	147	163
Hangar Positions					
T-Hangars	76	85	91	93	101
Executive/Box Hangars	18	27	29	31	34
Conventional Hangar Positions	33	17	20	23	28
Hangar Area					
T-Hangars (s.f.)	90,700	120,000	127,000	130,000	141,000
Executive/Box Hangars (s.f.)	49,200	67,000	72,000	77,000	85,000
Conventional Hangar (s.f.)	32,700	37,000	43,000	51,000	62,000
Total Hangar Area (s.f)	172,600	224,000	242,000	258,000	288,000
Maintenance Area (s.f.)	16,100	15,600	17,250	19,200	22,100
Aircraft Parking Positions					
GA Local Positions	47	33	35	36	39
GA Transient Piston Positions	14	18	19	20	23
GA Transient Turbine Positions	11	8	8	9	10
Aircraft Parking Apron					
GA Local Apron Area (s.y.)	11,500	9,100	9,500	9,900	10,700
GA Transient Apron Area (s.y.)	9,200	12,900	13,500	14,300	16,100
GA Total Apron (s.y.)	20,700	22,000	23,000	24,200	26,800
Auto Parking					
Total GA Parking Spaces	79	83	98	104	117
GA Total Parking Area (s.f.)	10,600	12,500	14,700	15,600	17,600
GA Terminal Building					
Area (s.f.)	1,200*	2,200	2,900	3,100	3,400
Fuel Storage					
Storage Type	Below Ground	Above Ground	Above Ground	Maintain	Maintain
Jet A Capacity	NA	Add as needed	Add as needed	Add as needed	Add as needed
AvGas Capacity	20,000 gal.	Maintain	Maintain	Maintain	Maintain
Support Facilities					
Perimeter Fencing	12,700 linear feet	Maintain/Replace As Needed	Maintain/Replace As Needed	Maintain/Replace As Needed	Maintain/Replace As Needed
Maintenance Building	Consolidate into a replacement building	Maintain	Maintain	Maintain	Maintain

*Estimated GA services provided by airport businesses, passenger terminal, and NE Welcome Center. RED - Calculated Need

TABLE 3N
Fuel Storage Requirements
Friday Harbor Airport

	Current Capacity	Baseline Consumption (5-year average)[1]	Planning Horizon		
			Short Term	Intermediate Term	Long Term
Avgas Requirements	20,000				
Annual Usage (gal.)		35,000	35,546	37,195	40,687
Daily Usage (gal.)		96	97	102	111
14-Day Storage (gal.)		1,342	1,363	1,427	1,561

Source: [1]fuel sales records;

The Airport does not currently have Jet A fuel available, which is used by all aircraft with turbine engines. According to the operations fleet mix, approximately 30 percent of current operations are by turbine aircraft (includes turbine helicopters). This is forecast to grow to approximately 40 percent by the long-term planning period. Consideration should be given to installing a Jet A fuel tank or making a Jet A fuel delivery truck available.

PERIMETER FENCING

Perimeter fencing is used at airports primarily to secure the aircraft operational area and reduce wildlife incursions. The physical barrier of perimeter fencing has the following functions:

- Gives notice of the legal boundary of the outermost limits of a facility or security-sensitive area.
- Assists in controlling and screening authorized entries into a secured area by deterring entry elsewhere along the boundary.
- Supports surveillance, detection, assessment, and other security functions by providing a zone for installing intrusion-detection equipment and closed-circuit television (CCTV).
- Deters casual intruders from penetrating a secured area by presenting a barrier that requires an overt action to enter.
- Demonstrates the intent of an intruder by their overt action of gaining entry.
- Causes a delay to obtain access to a facility, thereby increasing the possibility of detection.
- Creates a psychological deterrent.
- Optimizes the use of security personnel, while enhancing the capabilities for detection and apprehension of unauthorized individuals.
- Demonstrates a corporate concern for facility security.
- Limits inadvertent access to the aircraft operations area by wildlife.

The Airport has full perimeter fencing which serves both operational security and as a deterrent to wildlife accessing the airfield movement areas. There is over 12,700 linear feet of fencing which is regularly inspected. This fencing should be maintained.

SUMMARY

This chapter has outlined the facilities required to meet potential aviation demands projected for the Airport for the next 20 years. The next chapter, Chapter Four - Alternatives, examines potential improvements to the airfield system and the landside area. Most of the discussion focuses on those capital improvements that would be eligible for federal grant funds. Other projects of local concern are also presented on a limited basis. Several facility layouts that meet the forecast demands over the next 20 years are presented and an overall Airport Layout Plan (ALP) that presents a long-term vision will ultimately be developed.

FRIDAY HARBOR AIRPORT







CHAPTER FOUR

Airport Alternatives

AIRPORT MASTER PLAN



Chapter Four

AIRPORT ALTERNATIVES

In the previous chapter, airside and landside facilities required to satisfy aviation demand through the long-range planning period were identified. In addition, the various FAA design standards were discussed. The next step in the planning process is to evaluate reasonable ways these facilities can be provided and the design standards met. There can be numerous combinations of design alternatives, but the alternatives presented here are those with the perceived greatest potential for implementation.

Any development proposed for a master plan is evolved from an analysis of projected needs for a set period of time. Though the needs were determined by utilizing industry-accepted statistical methodologies, unforeseen future events could impact the timing of the needs identified. The master planning process attempts to develop a viable concept for meeting the needs caused by projected demands for the next 20 years. However, no plan of action should be developed which may be inconsistent with the future goals and objectives of the Port of Friday Harbor and its citizens, as represented through elected officials, who have a vested interest in the development and operation of the Airport.

PLANNING OBJECTIVES

A set of basic planning objectives has been established to guide the alternatives development process. It is the goal of this master planning effort to produce a development plan for the Airport that addresses forecast aviation demand and to meet FAA design standards to the greatest degree possible. As owner and operator, the Port of Friday Harbor provides the overall guidance for the operation and development of the Airport. It is of primary concern that the Airport is marketed, developed, and operated for the

betterment of the community and its users. The following basic planning objectives have been defined for this planning effort:

- To develop a safe, attractive, and efficient aviation facility in accordance with applicable federal, state, and local regulations.
- To develop a facility that is responsive to the current and long-term needs of all aviation users.
- To be reflective and supportive of the long-term planning efforts currently applicable to the region.
- To develop a facility with a focus on self-sufficiency in both operational and developmental cost recovery.
- To ensure that future development is environmentally compatible.
- To preserve and protect public and private investments in existing airport facilities.

Exhibit 4A presents a summary of the primary planning considerations for the alternatives analysis. These include non-development options, airside considerations, and landside considerations. The non-development alternatives include a no-build option, a replacement airport option, and a transfer services option.

The airside considerations relate to those airfield/airspace elements that contribute to the safe and efficient transition of aircraft and passengers from air transportation to the landside facilities at an airport. This includes consideration of the established design standard for the airport, the instrument approach capability, the capacity of the airfield, the length and strength of the runway, navigational aids, and the layout of the taxiways and aprons. Each of these elements was introduced in previous chapters and various needs established.

The landside considerations relate to those facilities providing support to the aviation function of an airport. This includes terminal services, hangars, and fueling. The previous chapter introduced these elements and identified specific needs based on the forecast future aviation demand. The goal now is to identify alternatives for locating these facilities.

Each functional area (airside and landside) interrelates and affects the development potential of the others. Therefore, all areas are examined individually and then coordinated to ensure the final plan is functional, efficient, and cost-effective. The total impact of all these factors on the existing airport must be evaluated to determine if the investment in Friday Harbor Airport will meet the needs of the community over the 20-year planning period.

The alternatives considered are compared using environmental, economic, and aviation factors to determine which of the alternatives will best fulfill the local aviation needs. With this information, as well as input from various airport stakeholders, a final airport concept can evolve into a realistic development plan.

AIRSIDE CONSIDERATIONS

- Examine the applicability of ARC B-II(s) design standards including the Runway Safety Area (RSA), Runway Obstacle Free Zone (OFZ), Runway Object Free Area (ROFA), Runway Protection Zones (RPZs).
- Consider alternatives that would meet B-II(s) design standards which will include:
  - Reorienting the runway
  - Removing/relocating any penetrations to various safety surfaces.
- Consider the impacts to relocating Taxiway A to the B-II(s) standard separation distance of 240 feet.
- Consider alternate development options if it is not feasible to apply ARC B-II(s) design standards.



LANDSIDE CONSIDERATIONS



- Identify locations for additional hangar development.
- Examine capability to expand the commercial aircraft apron.
- Consider aviation development of the undeveloped southwest area of the airport.
- Identify any airport land, not needed for future aviation development, which could be used for non-aviation revenue generation.

Not all airside or landside elements will require a detailed alternatives analysis. The alternatives analysis is reserved for presenting viable solutions to specific problems or challenges. For those airside or landside elements where only one solution is reasonable or where no alternative is necessary, an explanatory narrative is provided.

NON-DEVELOPMENT ALTERNATIVES

Prior to the presentation of development alternatives for the existing Friday Harbor Airport, the following non-development option is considered:

- No-Build: This alternative considers stopping all new investments at the Airport except for routine maintenance and safety-related projects.

While the non-development alternatives are being introduced in this master plan, FAA, the airport sponsor (Port of Friday Harbor), and the consulting team, are all contractually obligated to complete this master plan for the existing airport. If the airport sponsor desires to pursue a non-development alternative, then additional and separate planning studies would need to be undertaken after completion of this master plan.

NO-BUILD ALTERNATIVE

The no-build alternative essentially considers making no new capital investments in the Airport. Limited maintenance and upkeep would continue so that the Airport remains safe for aviation activity and continues to meet its grant assurances. No new hangars or apron area would be planned to be built by the airport sponsor; however, this would not and could not include the prohibition of hangar construction by a private entity. The obvious result of the no-build alternative is that the Airport would be unable to meet the current and forecast demand for aviation services in the area.

The primary reason a community might choose a no-build alternative is to ultimately not be bound by the grant assurances (See Appendix C) associated with the acceptance of airport development grants. Grant assurances are part of the grant package contract that the airport sponsor commits to when accepting a development grant from FAA. As such, airport sponsors are bound to maintain the useful life of the facilities developed or equipment acquired for an airport development project. Useful life is defined in FAA Order 5100.38D, *Airport Improvement Handbook*, Table 3-8, which varies from a minimum of three years to in perpetuity from the date of acceptance of a grant offer of federal (FAA) funds for a project. There is no limit on the duration of the terms, conditions, and assurances with respect to real property acquired with federal (FAA) funds. All airport property was acquired with federal assistance.

Under a "no-build" alternative, the most likely scenario would involve the Port letting development grant assurances run out, but the Port would still be bound by assurances tied to federally-purchased land. The Port would still have to maintain the Airport in a safe manner, likely without FAA financial participation.

As outlined in Table 1A previously, the Airport has received more than $9 million in development grants since 2011. These grants represent a direct economic stimulus that has lasting positive economic impacts. The no-build alternative means that the Port of Friday Harbor would forgo future grants for airport development, which would have a negative economic impact which, over time, would become more noticeable.

The Port of Friday Harbor has a vested interest in maintaining and improving airport facilities for both recreational and business aviation users. This is especially true since this is an island community without a surface road connection to the mainland. Without a commitment to ongoing improvement of the Airport, users of the Airport will be constrained from taking full advantage of the Airport's air transportation capabilities.

The unavoidable consequence of the no-build alternative is that the capability of the Airport would diminish over time. Its ability to serve both commercial passenger service and general aviation markets would deteriorate. This would lead to fewer people flying to the island and would ultimately negatively impact the local economy, especially the vitally important tourism industry. Safety concerns would arise, especially if necessary routine maintenance were deferred, and the liability for damage to aircraft or accidents would increase. The long-term consequences of the no-build alternative would be to reduce the quality of the existing Airport facilities over time, producing undesirable results. This scenario would result in an overall unpleasant experience for regular users and visitors.

REVIEW OF THE PREVIOUS AIRPORT PLAN

The last master plan was completed in 2015 (forecast year of 2011). At the time, operational counts indicated that the airport should be classified as a B-II (small) facility because the number of operations by aircraft in this category exceeded the FAA threshold of 500 operations. The combination of A-II aircraft operations (Kenmore Air and FedEx operations of the Cessna Caravan 208B) and B-I (general aviation aircraft) combine to identify the B-II (small) critical aircraft.

All airside facilities had previously (prior to 2011) been designed to B-I (small aircraft) standards. Analysis in the previous master plan showed the significant and negative impact to fully meeting B-II (small) design standards. This included potentially relocating parallel Taxiway A from 150 feet from the runway to 240 feet, which would mean much of the commercial apron and tie-down aprons would have been lost, effectively preventing the airport from meeting its aviation demand.

A solution was developed in which the runway/taxiway separation was planned to be changed from 150 feet to 156 feet. This planned separation distance would preserve the safety intent of the separation standard and allow a Cessna Caravan 208B to be on the runway and the parallel taxiway at the same time. In 2012, Taxiway A was reconstructed at a separation distance of 156 feet and the FAA approved the Modification to Standard. All other airport design standards were maintained at the B-I standards.

In addition to the relocation of Taxiway A, a variety of other projects were identified as part of that master plan. The following summarizes those projects.

- Drainage improvements
- Electrical upgrades, LED installation (completed)
- Obstruction removal (In progress)
- Fuel tank replacement
- Conduct Wildlife Hazard Management Plan
- Construct pilot welcome center (completed)
- Develop southwest area with access taxilanes and aprons
- Pavement maintenance (all surfaces)
- Make access and grounds improvements to support non-aviation uses (southwest area)

AIRPORT LAND USE

The objective of airport land use planning is to coordinate future uses of the airport property in a manner that is both functional with the design of the airport and compatible with the airport environs. There are two primary considerations for on-airport land use planning. The first is to secure those areas essential to the safe and efficient operation of the airport. The second is to determine compatible land uses for the balance of the property which would be most economically advantageous to the airport and the community.

Prior to presenting development alternatives, it is important to have a basic understanding of the land use guidelines. With this understanding, facilities can be located to ensure the highest and best use of airport property. There are also certain design standards that affect facility location options. For example, future structures should be planned so that they do not compromise safe and efficient aircraft operations.

Any property, when described as part of an airport in an agreement with the United States or defined by an airport lay-out plan (ALP) or listed in the Exhibit “A” property map, is considered to be “dedicated” or obligated property for airport purposes. The primary purpose of airport property is for aeronautical use. Land on the ALP designated for aeronautical use may not be used for non-aeronautical purposes without FAA approval.

If it has been determined that obligated land on the airport is no longer needed for civil aviation, because it exceeds the forecasted need or is inaccessible by aircraft, the property may be considered for compatible non-aeronautical use. The revenue from this use can provide supplemental funds to the airport with the goal of making the airport as self-sustaining as possible.

By categorizing the entirety of airport property, Airport management can plan and direct any development proposals to the appropriate locations. There are three major land use categories on an airport: airfield operations, aviation development, and non-aeronautical revenue support. The non-aeronautical revenue support category is only available to those airports with property that is not and will not be needed for airfield operations or aviation development or cannot be utilized for those purposes. Often these categories are further subdivided to provide a better understanding of current or intended uses of airport property. **Exhibit 4B** presents baseline land use classifications for the airport to guide the alternatives analysis. Once a long-term plan for the airport is established in subsequent chapters, a formal land use plan will be developed and included in the Airport Layout Plan set.

AIRFIELD OPERATIONS

Airfield operations is that portion of airport property that encompasses the major airside elements, such as the runways, taxiways, runway safety area (RSA), runway object free area (ROFA), runway obstacle free zone (OFZ), runway protection zone (RPZ) (on airport property), taxiway safety area, taxiway object free area (TOFA), and navigational aid critical areas. Airfield operations are intended for the safe and efficient movement of aircraft to and from the airfield. This land use designation includes the various object clearing areas and only elements necessary for aircraft navigation can be located here.

AVIATION DEVELOPMENT

The Aviation Development land use category includes those areas that should be reserved for development that requires access to the airfield operations area such as aircraft hangars and aviation businesses. A rule of thumb is that all land immediately adjacent to the runway and taxiway system should be reserved for aviation development. For undeveloped areas in this classification, a depth of approximately 1,000 feet, when feasible, from the runway centerline is ideal as it allows for future taxiways, taxilanes, aprons, hangars, and access roads. This land use category will also include airport support elements that may not require taxiway access such as drainage infrastructure.

NON-AVIATION REVENUE SUPPORT

This land use classification includes development that is compatible with aviation activities but is unlikely to require access to the runway and taxiway system. Typically, it is preferable that activities in these areas will complement airport activities to some degree, but that is not required. It is required that any

non-aviation facilities be compatible with airport operations so development such as houses would be excluded. Examples of potential uses include research facilities, laboratories, manufacturing and processing facilities, warehouses, and other facilities compatible with an airport environment.

AIRSIDE ALTERNATIVES

Generally, airside issues relate to those airport elements that contribute to the safe and efficient transition of aircraft and passengers from air transportation to the landside facilities at an airport. This includes runways, taxiways, aprons, hold bays, instrument approaches, and navigational aids. Each of these elements was introduced in previous chapters. This chapter will examine all airside issues specific to the Airport and will present a reasonable range of alternatives. **Exhibit 4A** presents a summary of the major airside considerations.

DESIGN STANDARDS

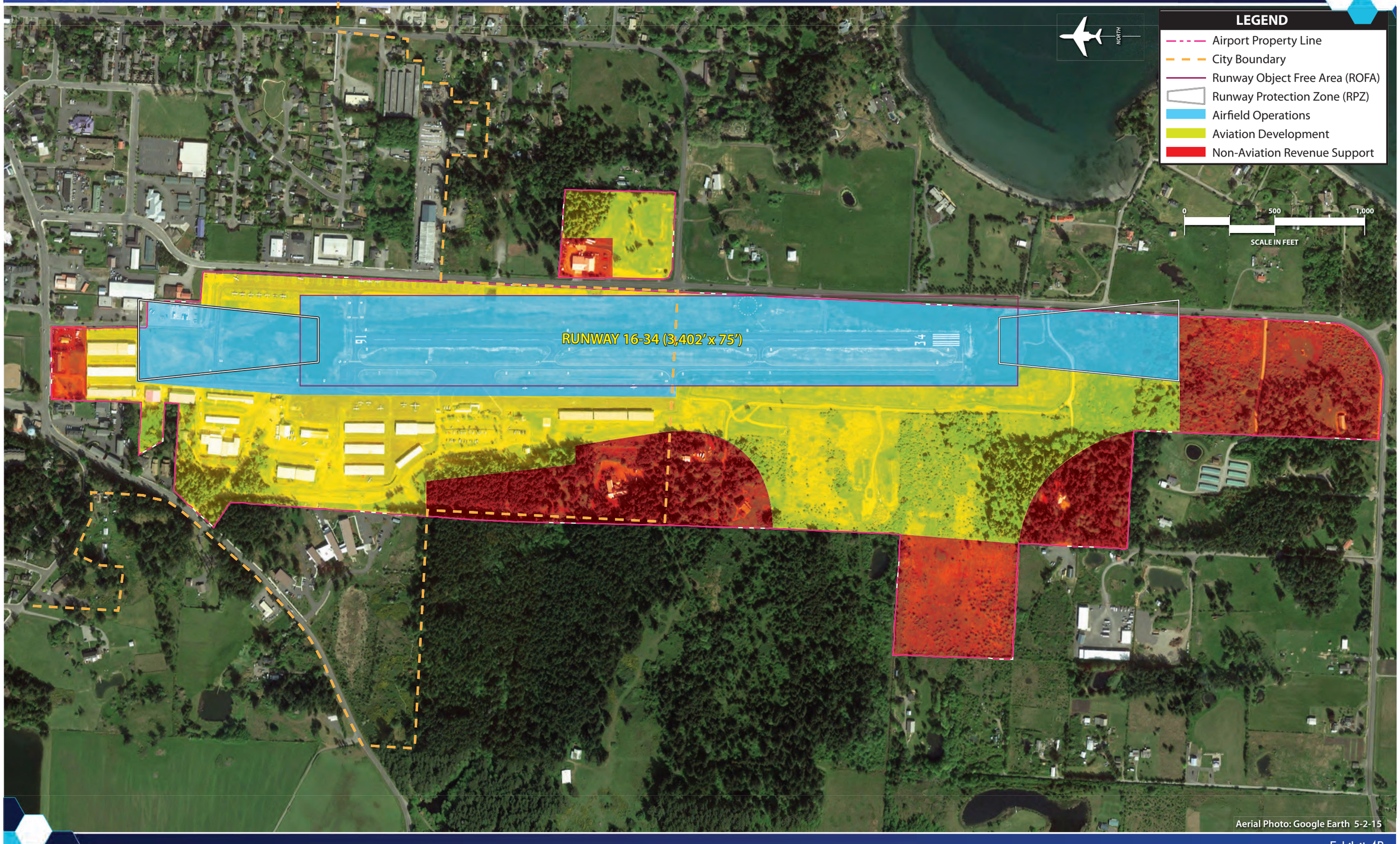
The Friday Harbor Airport has historically been designed to Airport Reference Code (ARC) B-I(s) design standards; however, it has been determined that there are more than 500 annual operations by existing and forecasted aircraft in ARC B-II(s). Therefore, during this master plan, it is necessary to examine the capability of the Airport to meet B-II(s) design standards to the greatest degree feasible. When transitioning to B-II(s), there are several areas where the airfield is deficient as documented previously in Chapter Three – Facility Requirements. The following subsections summarize the non-standard conditions related to design standards and document potential solutions. These alternatives will then be combined into three airport development alternatives that allow holistic analysis.

Runway Safety Area

The B-II(s) RSA is 30 feet wider than B-I(s), which introduces downward sloping terrain on the east side of the runway, making the RSA non-standard. FAA Order 5200.8, *Runway Safety Area Program*, outlines an alternatives analysis methodology for examining non-standard RSAs. **Table 4A** summarizes those alternatives as well as an initial feasibility determination.

The first alternative to be considered is to examine what it would take to bring the condition up to the current standard. To meet B-II(s) standards for the RSA, the airport would need to properly grade the east edge of the RSA to meet grading standards.

Alternative 2 would involve major reconstruction of all or part of the runway. Alternative 3 would not solve the issue because the non-standard portions of the B-II(s) RSA are on the sides, so reducing the runway length would not address the issue. Alternative 4 allows for a combination of runway shifting,


LEGEND
Airport Property Line
City Boundary
Runway Object Free Area (ROFA)
Runway Protection Zone (RPZ)
Airfield Operations
Aviation Development
Non-Aviation Revenue Support
NORTH
0
500
1,000
SCALE IN FEET
RUNWAY 16-34 (3,402' x 75')
16
34
Aerial Photo: Google Earth 5-2-15

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relocation, and reduction. Alternative 5 considers declaring the runway to be shorter. This would not solve the issue because the non-standard portions of the RSA are on the east edge and declaring the runway shorter would not mitigate the non-standard RSA. Alternative six address only the RSA beyond the runway ends and would not mitigate the grading issue on the east edges of the RSA.

These options for mitigating the non-standard RSA will be considered in the overall airport development alternatives which follow because mitigation options for one design standard can impact the feasible options for the other design standards.

TABLE 4A
Runway Object Free Area Alternatives
Friday Harbor Airport

	Alternative to Consider
1	Construct the traditional graded area surrounding the runway
2	Relocation, shifting, or realignment of the runway
3	Reduction in runway length where the current runway length exceeds that which is required for the existing or proposed design aircraft
4	A combination of runway relocation, shifting, grading, realignment, or reduction
5	Declared distances
6	Engineered Materials Arresting Systems (EMAS)

Source: FAA Order 5200.8, Runway Safety Area Program

Runway Object Free Area

The B-II(s) ROFA is 250 feet wider than B-I(s). This introduces a number of object penetrations as described in Chapter Three – Facility Requirements. This includes portions of the east side perimeter fence, the road parallel to the airport, the segmented circle and wind sock. The wider ROFA also impacts the commercial terminal aircraft apron because aircraft are not permitted to park in the ROFA.

The ROFA standard, as described in Chapter Three – Facility Requirements, requires no penetrating objects above the lateral elevation of the RSA. This means that objects can be below the ROFA. Three options are considered for mitigating the non-standard B-II(s) ROFA.

Option 1 – ROFA: As with all design standard analysis, the first option is to simply meet the standard. In this case, that will require slightly rerouting Mullis Street and the perimeter fence around the ROFA, as shown on **Exhibit 4C**. Approximately 1,200 feet of roadway would need to be rerouted and reconstructed. Including acquisition of private property, it is estimated that it would cost $1.1 million.

Option 2 – ROFA: The second option is to depress the road and the perimeter fence below the lateral elevation of the RSA. This alternative is estimated to cost $1.4 million.

Option 3 – ROFA: The third option is to shift or relocate the runway so that the ROFA no longer extends beyond the perimeter fence. This alternative is discussed in greater detail later in this chapter and is estimated to cost a minimum of $14.7 million.

Concerning the windsock penetration, there are two alternatives available. The first is to relocate the windsock outside the ROFA. The second is to replace the windsock pole with a frangible base. Once a preferred airfield geometry is established, a determination on how best to address the windsock OFA penetration will be made.

Obstacle Free Zone

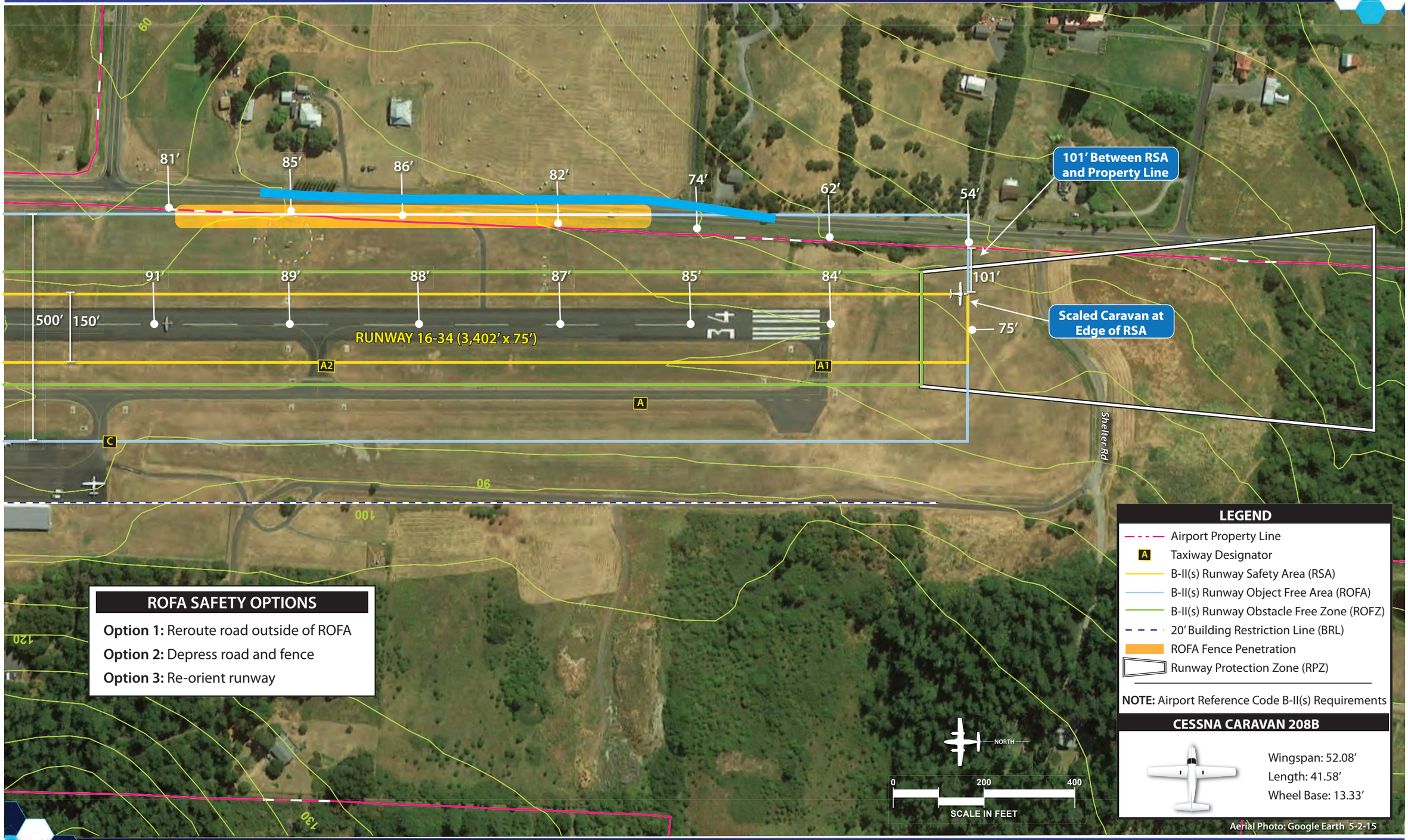
The OFZ at Friday Harbor Airport is 250 feet wide, as centered on the runway, and it extends 200 feet beyond the runway ends. The OFZ differs from the RSA in that it does not have a ground grading component; therefore, the OFZ meets the design standard. The OFZ at Friday Harbor Airport is wider than the RSA and will therefore be the controlling surface for consideration of surface penetrations.

Runway Protection Zones

The function of the RPZ is to enhance the protection of people and property on the ground which is best achieved through airport owner control over RPZs. Control is preferably exercised through the acquisition of sufficient property interest in the RPZ and includes clearing the RPZ areas of incompatible objects and activities. A significant challenge to clearing RPZ land is that RPZs are not always owned by the airport, as is the case at Friday Harbor Airport.

As discussed at length in Chapter Three – Facility Requirements, there are existing incompatible land uses in both RPZs. At the north end, the RPZ crosses slightly over a commercial building, a public access road, and a vehicle parking lot. On the south end, the RPZ crosses over Mullis Street. FAA Memorandum, *Interim Guidance on Land Uses Within a Runway Protection Zone*, published in 2012, indicates that these existing land uses are considered incompatible. However, the Interim Guidance only addresses new incompatible land uses within an RPZ. Therefore, the airport must follow RPZ guidance contained in FAA AC 150/5300-13A, *Airport Design*.

Because the incompatible land uses existed prior to the 2012 Interim Guidance, no immediate action is required regarding coordination with FAA HQ; however, the Port must clear incompatible land uses to the best extent practicable, and it is still incumbent upon the airport to seek opportunities to provide clear, compatible RPZs. Development alternatives to follow in this chapter will consider opportunities to provide compatible land uses within the RPZs.



ROFA SAFETY OPTIONS

Option 1: Reroute road outside of ROFA

Option 2: Depress road and fence

Option 3: Re-orient runway

LEGEND

- Airport Property Line
- A — Taxiway Designator
- B-II(s) Runway Safety Area (RSA)
- B-II(s) Runway Object Free Area (ROFA)
- B-II(s) Runway Obstacle Free Zone (ROFZ)
- 20′ Building Restriction Line (BRL)
- ROFA Fence Penetration
- Runway Protection Zone (RPZ)

NOTE: Airport Reference Code B-II(s) Requirements

CESSNA CARAVAN 208B

Wingspan: 52.08′
Length: 41.58′
Wheel Base: 13.33′

Aerial Photo: Google Earth 5-2-15

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Runway to Taxiway Separation

The existing runway to parallel taxiway separation is 156 feet. The B-II(s) standard is a separation distance of 240 feet. The 240-foot standard separation distance is based on a critical aircraft with a wingspan between 49 and 79 feet (ADG II) and instrument visibility minimums of greater than ¾-mile. The critical aircraft at Friday Harbor Airport is classified as B-II(s) and the lowest instrument visibility minimum currently is 1-mile. The critical aircraft is best represented by the Cessna Caravan 208B, which is used by the predominant commercial carrier, Kenmore Air, and FedEx.

ALTERNATIVE 1 – MAINTAIN CURRENT RUNWAY

The first alternative considered is presented on **Exhibit 4D**. The primary focus of this alternative is to identify the impacts of relocating Taxiway A from its existing separation of 156 feet to 240 feet. Surrounding the relocated taxiway is the TOFA. The B-II(s) TOFA is 131 feet wide as centered on the taxiway. The following impacts would be felt by relocating Taxiway A.

A total of 2,300 square yards of the existing 3,800-square yard commercial apron would have to be removed from service. Only 1,500 square yards would remain which includes the existing de-icing/wash rack south of the terminal building. The analysis in the Facility Requirements chapter indicated there is a need for a total of at least 4,300 square yards of commercial apron.

The distance remaining from the edge of the TOFA to the airside edge of the terminal building would be 47 feet. This distance is not enough to accommodate the predominant commercial service aircraft (Cessna Caravan 208B). Therefore, the Cessna Caravan 208B would have to park either to the north or the south of the terminal building. The south side is the existing de-icing/wash rack facility. Thus, only one parking space would remain to accommodate the Cessna Caravan 208B. It is common in the summer months for there to be up to five aircraft using the commercial apron. The photograph on this page shows an instance when there were three Cessna Caravans parked on the commercial apron. In the photo, space is so tight that one of the aircraft (nearest in the photo) is positioned on the de-icing/wash rack location, thus taking that functionality out of service.



Commercial apron with three commercial Cessna Caravans.

In addition to the loss of a significant portion of the commercial apron, all 19 of the aircraft tie-down positions on the east side of Taxiway B would have to be removed. This would mean that the airport

would not be able to accommodate the current and forecast need for aircraft tie-down positions. It should be noted that the previous project that shifted Taxiway A to 156 feet necessitated the loss of approximately 20 tie-down positions north of the terminal building. If Taxiway A is to be shifted to 240 feet from the runway, then replacement commercial apron and aircraft tie-down positions would be required to meet the existing demand.

Taxiway B currently provides critical circulation routes to aircraft hangars, tie-down locations, and the fuel island. If Taxiway A were to be shifted to 240 feet from the runway, then Taxiway B, south of the Runway 16 threshold, would no longer meet separation standards to serve as a taxiway. This important circulation element would have to be designated as apron as applicable taxiway clearances would be lost. The result is all aircraft would have to utilize Taxiway A for circulation movements creating congestion and an increased risk for head-to-head incidents.

Advantages

- Meets ARC B-II(s) standards for runway/taxiway separation
- Meets ARC B-II(s) design standards for RSA, OFZ, and ROFA (assumed to be mitigated by either depressing or re-routing Mullis Road.

Disadvantages

- Loss of 60 percent of the existing commercial apron
- Loss of 19 aircraft tie-down positions
- Loss of Taxiway B (from Runway 16 threshold to the south)
- Does not address non-standard ROFA on the east side of the runway
- RPZ land use incompatibilities (Mullis Street and commercial building)
- Likely limits the runway to its current length.

ALTERNATIVE 2 - REORIENT RUNWAY

Exhibit 4E presents an alternative that would reorient the entire runway/taxiway system so that it can meet ARC B-II (small) design standards. The axis of the reorientation is the end of the Runway 34 RPZ, which is shifted so that it would be contained fully on airport property. The runway is shifted to the south in order to bring the Runway 16 RPZ onto airport property and to remove it from an existing commercial building. The Runway 16 end is shifted south approximately 100 feet and to the west approximately 25 feet. The Runway 34 end would be shifted approximately 100 feet south and approximately 90 feet west.

Taxiway A is shown shifting with the runway and at a separation distance of 240 feet. The impact to the existing infrastructure on the west side of the runway would be significant. The available commercial apron would be reduced from 3,800 square yards to only 1,000 square yards. In fact, the TOFA would be only 12 feet from the airside face of the terminal building. Commercial aircraft will have to park to

LEGEND

- Airport Property Line
- B-II(s) Runway Safety Area (RSA)
- B-II(s) Runway Object Free Area (ROFA)
- B-II(s) Runway Obstacle Free Zone (ROFZ)
- 20′ Building Restriction Line (BRL)
- Taxiway Object Free Area (TOFA)
- Runway Protection Zone (RPZ)
- Airfield Pavement

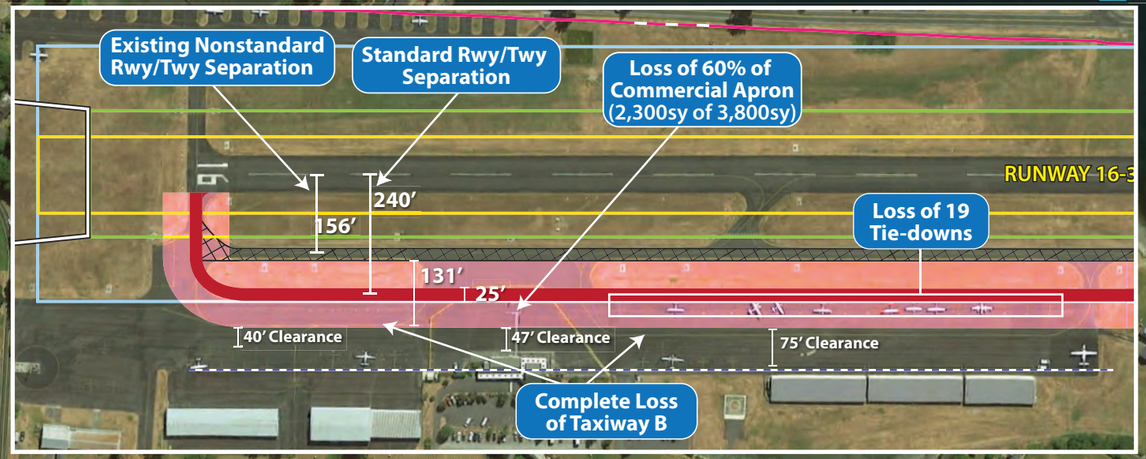
NOTE: Airport Reference Code B-II(s) Requirements

Aerial Photo: Google Earth 7-24-17

0 400 800

SCALE IN FEET

NORTH



Existing Nonstandard Rwy/Twy Separation

Standard Rwy/Twy Separation

Loss of 60% of Commercial Apron (2,300sy of 3,800sy)

1-mile RPZ

Mullis St

16

240′

156′

RUNWAY 16-34 (3,402′ x 75′)

Loss of 19 Tie-downs

131′

25′

40′ Clearance

47′ Clearance

75′ Clearance

Complete Loss of Taxiway B

500′

150′

34

300′

Shelter Rd

1-mile RPZ

San Juan Valley Rd

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LEGEND

- Airport Property Line
- B-II(s) Runway Safety Area (RSA)
- B-II(s) Runway Object Free Area (ROFA)
- B-II(s) Runway Obstacle Free Zone (ROFZ)
- 20' Building Restriction Line (BRL)
- Taxiway Object Free Area (TOFA)
- Runway Protection Zone (RPZ)
- Airfield Pavement

NOTE: Airport Reference Code B-II(s) Requirements

Aerial Photo: Google Earth 7-24-18

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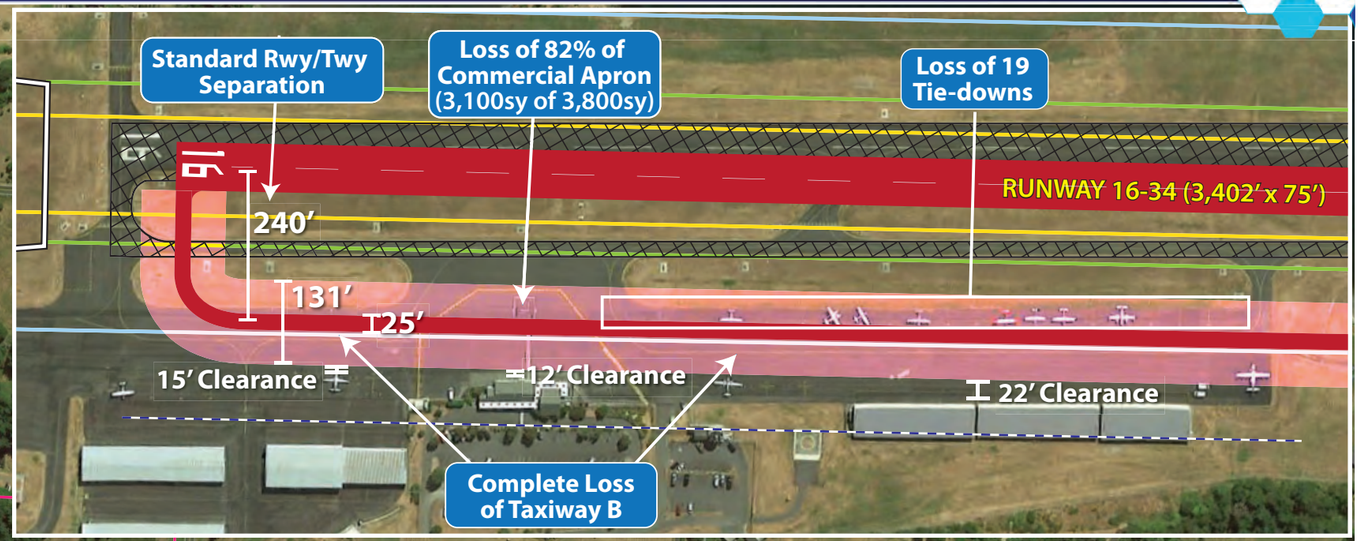
SCALE IN FEET

NORTH



Runway Relocation Removes RPZ from Building

Runway Relocation 100'

Standard Rwy/Twy Separation

Loss of 82% of Commercial Apron (3,100sy of 3,800sy)

Loss of 19 Tie-downs

Relocate Runway 87'

Runway Relocation Brings ROFA and RPZ onto Airport Property

Mullis St

16

RUNWAY 16-34 (3,402' x 75')

34

240'

131'

25'

15' Clearance

12' Clearance

22' Clearance

Runway Relocation Removes RPZ from Taxilane

Complete Loss of Taxiway B

San Juan Valley Rd

Shelter Rd

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the north or south of the terminal building, adding to the walking distance of passengers. This would also require use of the de-icing/wash rack for passenger loading and unloading.

Taxiway B would no longer be usable from the south to the north, adjacent to the Runway 16 threshold. Taxiway A would provide the only circulation south of the Runway 16 threshold. As such, 19 tie-down positions would have to be removed. In addition, there is only 22 feet remaining between the TOFA and the south hangars. This is not enough space for pilots to pull their aircraft out of the hangar, which is common practice prior to using their aircraft.

Advantages

- Meets design standards for runway/taxiway separation
- Meets ARC B-II(s) design standards for RSA, ROFA, OFZ and RPZ

Disadvantages

- Loss of most of the commercial apron
- Loss of all 19 tie-downs south of the terminal building
- Loss of Taxiway B south of Runway 16 threshold
- Loss of all apron south of terminal building
- High cost due to need to reconstruct the runway.
- Likely limits the runway to its current length.

ALTERNATIVE 3 - REORIENT AND EXTEND RUNWAY

This alternative considers a longer-term view of the runway/taxiway system including a runway extension at the current airport site. As noted previously, the current runway length of 3,402 feet is too short to accommodate most business jets. Due to the tourist industry in the San Juan Islands, there is a desire by operators of smaller business jets to access the islands, and in particular, Friday Harbor. This alternative considers a total runway length of 4,100 feet.

Exhibit 4F presents a depiction of the longer runway alternative that could be located on the current airport site while meeting all B-II design standards. The runway/taxiway system would have to be reoriented in a similar manner to Alternative 2; however, the south end would be shifted slightly more to the west in order to maintain the ROFA and RPZ at the south end on airport property.

This alternative has even greater impacts to the existing facilities on the west side of the airfield than either of the previous two alternatives. Nearly all of the existing commercial apron would be lost due to the location of Taxiway A and the associated TOFA. In fact, the TOFA would extend to the airside face of the terminal building. The existing 19 aircraft tie-down positions would be lost, as with the other two alternatives. Taxiway B would no longer serve its existing circulation purpose and Taxiway A would have

to serve circulation and access to the runway. Only 10 feet would be available between the south hangars and the TOFA, which is not enough space for pilots to pull aircraft out of their hangar for preflight checks.

Advantages

- Meets design standards for runway/taxiway separation
- Meets ARC B-II(s) design standards for RSA, ROFA, OFZ and RPZ
- Provides a long-term option for a future extension of the runway to 4,100 feet.

Disadvantages

- Loss of entire commercial apron
- Loss of all 23 tie-downs south of the terminal building
- Loss of Taxiway B south of Runway 16 threshold
- Loss of all apron south of terminal building
- High cost due to need to reconstruct the runway.

TAXIWAY/TAXILANE OBJECT FREE AREA ALTERNATIVE

As documented in Chapter Three – Facility Requirements, the B-II taxiway object free areas (TOFA) encroach upon numerous existing facilities including hangars, apron areas, and tie-down positions. For those taxiways that have a designation (A, B, C, D, E, F, G) the taxiway OFA (131' width) is assumed to apply currently. Two taxilanes that lead to T-hangar areas are assumed to have a taxilane OFA (115' width).

Consideration is given to more appropriately differentiating between taxiways and taxilanes. Taxilanes service aircraft at lower speeds, are outside the movement areas, and have a smaller TOFA requirement. **Exhibit 4G** shows both the existing TOFA condition (top of exhibit) and the proposed future TOFA condition (bottom of exhibit).

Parallel Taxiway A would remain a taxiway. That portion of Taxiway B extending from the fuel island south to the terminal building would continue as a taxiway. All other portions of current Taxiway B would be designated as taxilane because these portions meet the definition. Taxiway C, which leads to the south hangar area, would be re-designated as a taxilane. Taxiway D will be a threshold taxiway with an ADG I TOFA because it serves the east side ADG I transient tie-down apron. Taxiway E is the east transient apron circulation taxilane and should be designated as a taxilane. Taxiway F provides access from the east transient apron to the west side and the runway and is considered for re-designation as a taxilane. Taxiway G provides access to T-hangar areas at the north end of the airport and should be designated as a taxilane.

LEGEND

- Airport Property Line
- B-II(s) Runway Safety Area (RSA)
- B-II(s) Runway Object Free Area (ROFA)
- B-II(s) Runway Obstacle Free Zone (ROFZ)
- 20′ Building Restriction Line (BRL)
- Taxiway Object Free Area (TOFA)
- Runway Protection Zone (RPZ)
- Airfield Pavement

NOTE: Airport Reference Code B-II(s) Requirements

Aerial Photo: Google Earth 7-24-17

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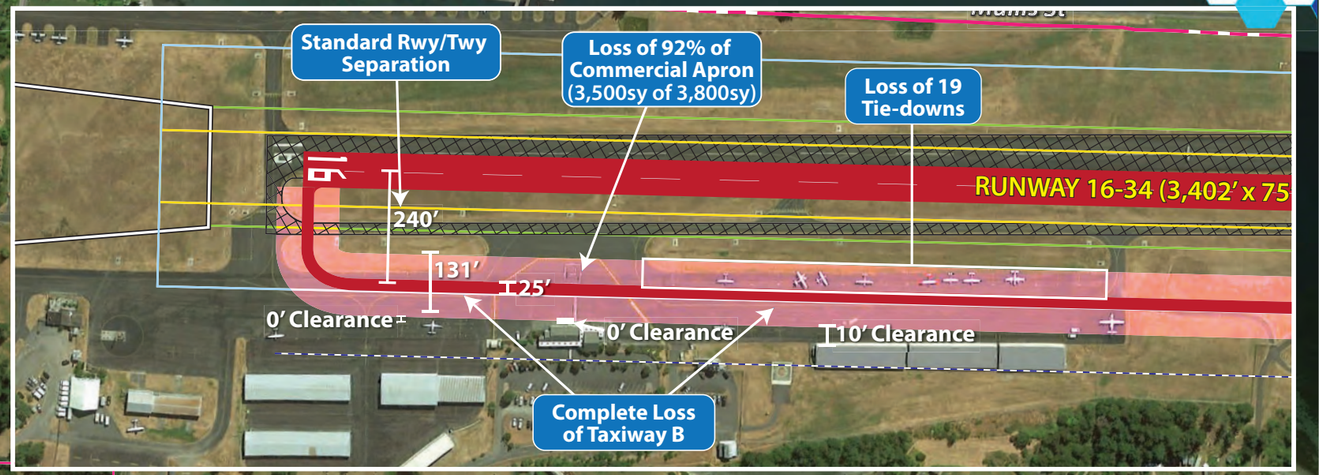
SCALE IN FEET
NORTH



Runway Relocation 100′
Runway Relocation Removes RPZ from Building
Standard Rwy/Twy Separation
Loss of 92% of Commercial Apron (3,500sy of 3,800sy)
Loss of 19 Tie-downs
Relocate Runway 105′
Runway Relocation Brings ROFA and RPZ onto Airport Property
1-mile RPZ
Mullis St
Shelter Rd
16
RUNWAY 16-34 (3,402′ x 75′) ULTIMATE RUNWAY 16-34 (4,100′ x 75′)
105′
500′
150′
34
240′
131′
125′
0′ Clearance
0′ Clearance
10′ Clearance
Runway Relocation Removes RPZ from Taxilane
Complete Loss of Taxiway B
1-mile RPZ
San Juan Valley Rd

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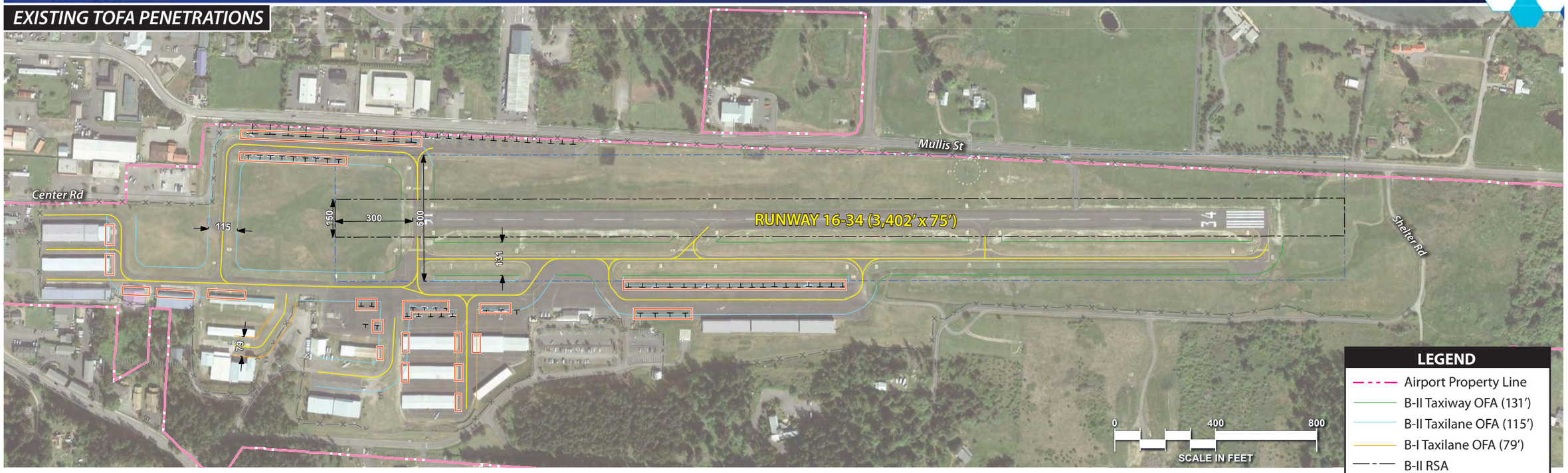
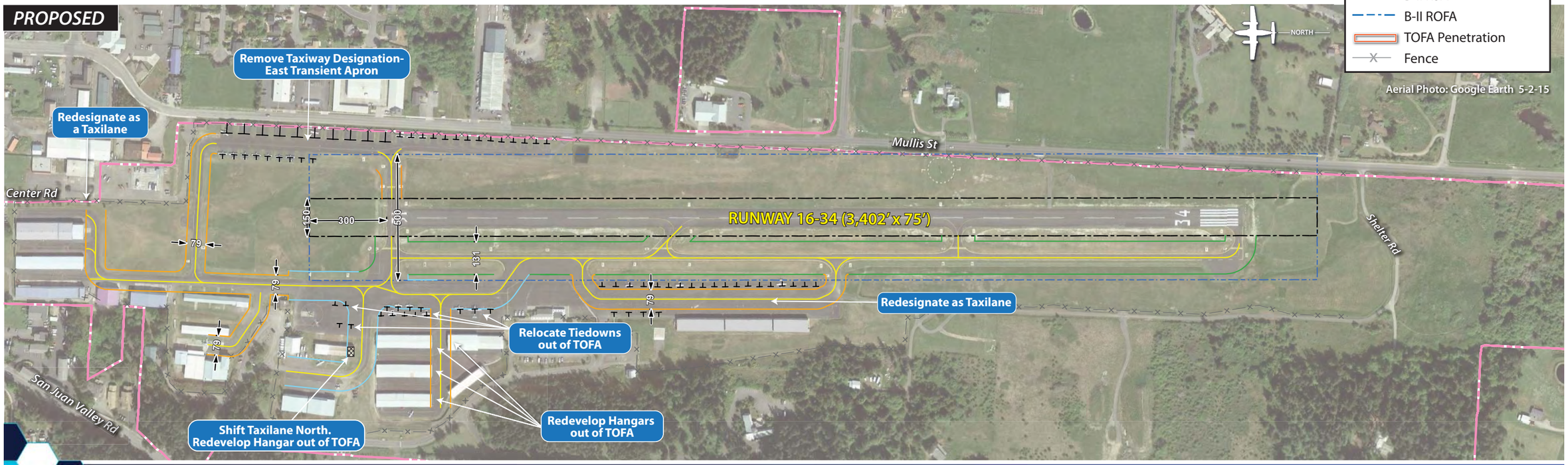
EXISTING TOFA PENETRATIONS



PROPOSED



LEGEND

- Airport Property Line
- B-II Taxiway OFA (131')
- B-II Taxilane OFA (115')
- B-I Taxilane OFA (79')
- B-II RSA
- B-II ROFA
- TOFA Penetration
- Fence

Aerial Photo: Google Earth 5-2-15

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OTHER CONSIDERATIONS

During consultation with airport staff and the planning advisory committee, some questions arose regarding some other potential alternatives. The following discussion covers four mitigation options to consider.

Shift Runway East 84 feet

This option considers the possibility of shifting the runway to the east 84 feet, which would bring the runway to taxiway separation to the B-II(s) standard of 240 feet. The following impacts would be realized:

- Runway 16 RPZ would extend over three more commercial buildings
- The Runway 34 RPZ would extend over more of Mullis Street
- The ROFA would extend over more of Mullis Street
- Lose 20 east side itinerant tie-down spots due to ROFA
- More significant RSA grade issues
- OFZ goes outside property for 525 feet at south east end

This option would exacerbate the non-standard conditions and is not considered viable.

Eastside Parallel Taxiway

Another possibility considered is the feasibility of adding a parallel taxiway to the east side of the airfield. **Exhibit 4H** shows this option. The TOFA would become the important axis, requiring the runway to be shifted to the south and canted to a greater degree than the other options considered. The following impacts would be realized:

- Loss of 19 aircraft tie down position on the southwest apron
- Loss of 44 percent of the commercial apron (1,650 s.y. of 3,800 s.y.)
- Loss of existing Taxiway A
- Significant amount of fill material to bring the taxiway up to grading standard
- Forces numerous runway crossings to use the east side parallel taxiway

This option would be very costly due to the amount of fill material needed, and the benefit would be limited. While the design standards for RSA, ROFA, OFZ and RPZ would be met with this option, the previous alternatives which maintain a west side taxiway are considered more viable and cost-effective.

FAA guidance does not force sponsors to spend capital improvement funds to meet design standards, even if the identified critical aircraft is in the more restrictive airport reference code (B-II, in this case).

The practical effect is that pilots would have to make a determination that it is safe for them to operate at the airport, which is what happens currently. The potential negative consequence is the question of liability in case of an accident. This option should only be considered if it is determined that it is not practicable to meet the required design standards.

Shift South Portion of Taxiway A to 240 Feet

The alternatives presented on **Exhibits 4D, 4E, and 4F** each considered the feasibility of relocating Taxiway A to the standard B-II(s) separation distance of 240 feet. Each of these identified numerous disadvantages that would disrupt existing operations at the airport, including the loss of much needed commercial apron space, aircraft tie-down positions, and the loss of Taxiway B.

It is common to consider incremental steps toward meeting design standards. One step that should be considered is the possibility of relocating the southern portion of Taxiway A to 240 feet from the runway. By shifting that portion of Taxiway A that is south of Taxiway C, the airfield would be in a position to preserve existing facilities north of Taxiway C until such a time that those facilities might be relocated.

Exhibit 4J presents this consideration in graphic form. As can be seen, the area south of Taxiway C is undeveloped currently and could accommodate a shift in Taxiway A. The most significant challenge is the terrain immediately west of Taxiway A that slopes upward rapidly. It is estimated that the hillside would have to be dug out to a depth of at least 10 feet to accommodate the taxiway and the associated TOFA.

There is approximately 20 feet of terrain rise to the west of Taxiway A before there is developable level ground. To facilitate development of this land, a taxiway that meets grading standards would need to be considered and is included on subsequent alternatives.

LANDSIDE ALTERNATIVES

Generally, landside issues relate to those airport facilities necessary or desired for the safe and efficient parking and storage of aircraft, movement of passengers and pilots to and from aircraft, and overall revenue support functions. In addition, elements, such as fueling capability, availability of services, and emergency response are also considered in the landside functions.

Landside planning issues, summarized on **Exhibit 4A**, will focus on facility locating strategies following a strategy of separating activity levels. To maximize airport efficiency, it is important to locate facilities intended to serve similar functions close together. For example, larger hangars supporting airport businesses should be centrally located, while smaller box and T-hangars should be set farther to the sides.

LEGEND

- Airport Property Line
- B-II(s) Runway Safety Area (RSA)
- B-II(s) Runway Object Free Area (ROFA)
- B-II(s) Runway Obstacle Free Zone (ROFZ)
- 20′ Building Restriction Line (BRL)
- Taxiway Object Free Area (TOFA)
- Runway Protection Zone (RPZ)
- Airfield Pavement

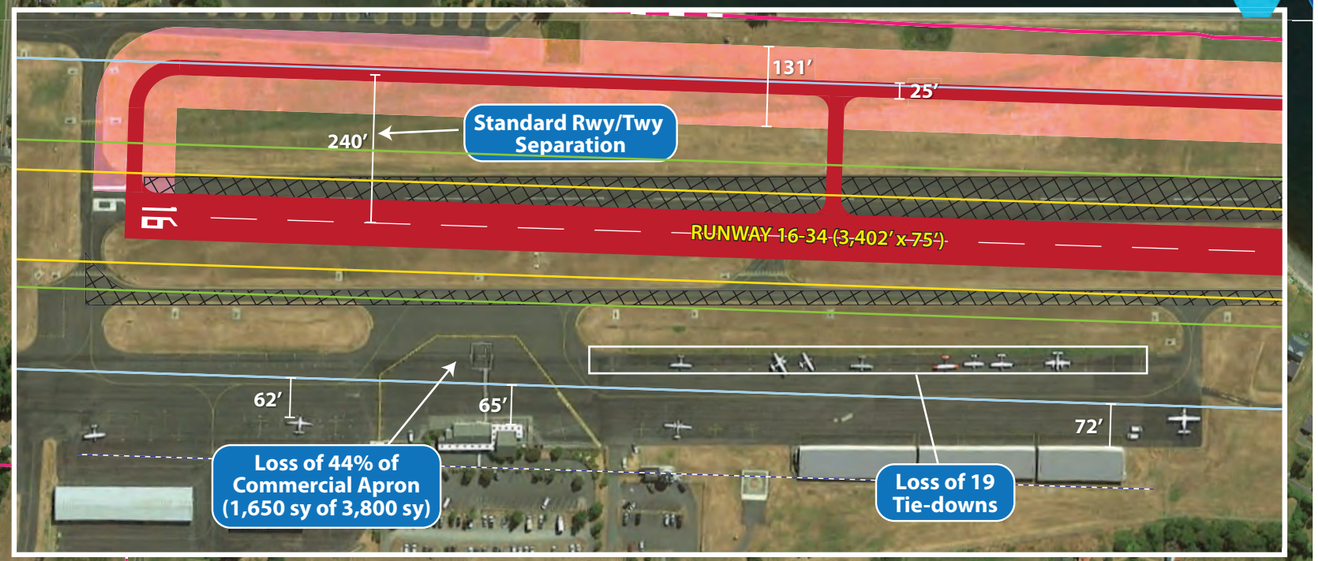
NOTE: Airport Reference Code B-II(s) Requirements

Aerial Photo: Google Earth 7-24-17

0 400 800

SCALE IN FEET

NORTH



Standard Rwy/Twy Separation

Mullis St

131′

25′

240′

16

RUNWAY 16-34 (3,402′ x 75′)

34

62′

65′

72′

Loss of 44% of Commercial Apron (1,650 sy of 3,800 sy)

Loss of 19 Tie-downs

San Juan Valley Rd

Shelter Rd

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LEGEND

- Airport Property Line
- B-II(s) Runway Safety Area (RSA)
- B-II(s) Runway Object Free Area (ROFA)
- B-II(s) Runway Obstacle Free Zone (ROFZ)
- 20' Building Restriction Line (BRL)
- Taxiway Object Free Area (TOFA)
- Runway Protection Zone (RPZ)
- Airfield Pavement

NOTE: Airport Reference Code B-II(s) Requirements

Aerial Photo: Google Earth 7-24-17

0 200 400
SCALE IN FEET

NORTH

Mullis St

Shelter Rd

Existing Nonstandard Rwy/Twy Separation

RUNWAY 16-34 (3,402' x 75')

Standard Rwy/Twy Separation

240'

156'

131'

25'

A3 A2 A1 A C

16 34

60 06 100 110 120 140

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Allowing new facilities to be constructed haphazardly on the next available spot at the airport may preclude the highest and best use of limited and valuable airport land. It is also important to plan for facilities that airport users desire and to group those facilities together, whether they are T-hangars, box hangars, or larger conventional hangars.

The orderly development of the airport terminal area (those areas parallel to the runway and along the flight line) can be the most critical, and probably the most difficult, development to control on the airport. A development approach of "taking the path of least resistance" can have a significant effect on the long-term viability of an airport. Allowing development without regard to a functional plan can result in a haphazard array of buildings and small ramp areas, which will eventually preclude the most efficient use of valuable space along the flight line.

Activity in development areas should be divided into three categories at an airport. The high activity area should be planned and developed as the areas providing aviation services on the airport. An example of a high activity area is the aircraft parking apron, which provides outside storage and circulation of aircraft. Large conventional hangars housing fixed base operators (FBOs), other airport businesses, or those used for bulk aircraft storage would be considered high activity uses. A conventional hangar structure in the high activity area should be a minimum of 6,400 square feet (80 feet by 80 feet). If space is available, it is more common to plan these hangars for up to 200 feet by 200 feet. The best location for high activity areas is along the flight line near midfield, for ease of access to all areas of the airfield.

The medium activity category defines the next level of airport use and primarily includes corporate aircraft operators that may desire their own box or conventional hangar storage on the airport. A hangar in the medium activity use area should be at least 50 feet by 50 feet, or a minimum of 2,500 square feet. The best location for medium activity use is off the immediate flight line, but still with ready access to the runway/taxiway system. Typically, these areas will be adjacent to the high activity areas. Parking and utilities, such as water and sewer, should also be provided in this area.

The low activity use category defines the area for storage of smaller single and twin-engine aircraft. Low activity users are personal or small business aircraft owners who prefer individual space in T-hangars or small box hangars. Low activity areas should be in less conspicuous areas or to the ends of the flight line. This use category will require electricity but may not require water or sewer utilities.

In addition to the functional compatibility of the terminal area, the proposed development concept should provide a first-class appearance for Friday Harbor Airport. Consideration to aesthetics should be given high priority in all public areas, as many times the airport can serve as the first impression a visitor may have of the community.

Generally, the existing development at the Airport has followed the strategy of separating activity levels. Larger conventional hangars are located centrally to the main apron areas. Somewhat smaller hangars are located farther from the center. Future development along the active aprons should be restricted to larger hangars intended to support aviation-related businesses.

The number of potential landside alternatives can be infinite. The following alternatives are those that best meet design standards, while maximizing the efficiency of aircraft storage and movement. The landside element of the recommended master plan concept, to be presented in the next chapter, may be one of these alternatives or, more likely, is a combination of elements from each of them. Input from the planning advisory committee (PAC) and the public is integral to determining the landside vision for the Airport.

TERMINAL BUILDING/NORTH HANGAR DEVELOPMENT ALTERNATIVE

Exhibit 4K presents future development options for the west area extending from the existing terminal building north to Taxiway G. The development considered is premised on the relocation of Taxiway A to a separation distance of 240 feet. The first consideration is the feasibility of continuing to accommodate commercial operations utilizing the existing or a replacement terminal building in the north area. Also considered is the potential redevelopment of several hangars, infill hangars on currently undeveloped land, and the potential for property acquisition to facilitate additional hangars.

Terminal Building Alternatives (North Area)

If Taxiway A is relocated to 240 feet from the runway, then the commercial apron is reduced by approximately 60 percent. As a result, a replacement commercial apron will be needed immediately. Due to the narrow development space available, the only viable direction is to the north of the existing terminal. In this location, approximately 3,500 square yards could be claimed for commercial aircraft. This still represents a loss of 300 square yards and is 800 square yards less than what is projected to be needed over the long term. In addition, this potential commercial apron is a longer walk for passengers, which would place them in the elements for a longer period of time. **Exhibit 4K** includes the following two terminal building options:

Option 1: The first terminal building option considered is to remove hangars D1 and D2 (immediately north of the existing terminal building) and construct a replacement terminal building in their place. This location is considered because it will allow continued utilization of the terminal parking lot. It would also allow commercial aircraft to park in a similar proximity to the terminal building, thus continuing to provide a relatively short walk for passengers. As depicted, the replacement terminal building is approximately 13,000 square feet in size to meet the long-term need that would accommodate traditional terminal amenities such as administrative offices, rental car facilities, restaurant, and conference room.

Advantages:

- Able to size the building to meet the long-term need
- Able to utilize the existing vehicle parking lot
- Could continue to house certain amenities in the old terminal building such as customs

LEGEND

- Existing Airport Property Line
- Ultimate Airport Property Line
- A — Taxiway Designator
- B-II(s) Runway Safety Area (RSA)
- B-II(s) Runway Object Free Area (ROFA)
- Taxiway Object Free Area (TOFA)
- Runway Protection Zone (RPZ)
- Airfield Pavement
- Building
- Road/Parking

NOTE: Airport Reference Code B-II(s) Requirements

Aerial Photo: Google Earth 7-24-17

0 200 400
SCALE IN FEET

NORTH

Mullis St

E

F

D

G

B

A4

A3

A

A

Standard Rwy/Twy Separation

RUNWAY 16-34 (3,402' x 75')

240'

131'

25'

Hangar Redevelopment

Hangar Redevelopment

Commercial Apron

Maintain for Customs/Cargo/Lease

Replacement Terminal Option 2

Replacement Terminal Option 1

New Hangar

San Juan Valley Rd

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Disadvantages:

- Commercial aircraft apron is too small
- Loss of three existing aircraft tie-down positions intended for transient turboprops
- Co-mingles local aircraft owners and the commercial apron, potentially causing congestion
- Loss of sound, revenue-producing hangars

Option 2: The second option considered is to continue to utilize the existing terminal building but to construct a north end addition encompassing approximately 2,800 square feet. This would bring the total terminal building size to 6,600 square feet. This would accommodate the long-term need if other traditional terminal building elements such as those listed in the previous paragraph are not included. The purpose of the building addition is to meet the long-term minimum terminal building size and to reduce the outdoor exposure of passengers as they transition from the building to the aircraft.

Advantages:

- Able to size the building to meet the long-term need
- Able to utilize the existing vehicle parking lot
- Could continue to house certain amenities in the old terminal building, such as customs

Disadvantages:

- Commercial aircraft apron is too small
- Loss of three existing aircraft tie-down positions intended for turboprops
- Co-mingles local aircraft owners and the commercial apron, potentially causing congestion
- Creates a long terminal building that would have to be reconfigured with the passenger waiting room on the north end and would likely require a complete renovation of the existing terminal building
- Building size does not include traditional amenities such as administrative offices, rental car facilities, restaurant, conference room

Option 3*:* A third option is considered for a replacement terminal building to be located in the undeveloped southwest area of the airport. This option will be discussed further in the section below presenting the southwest development alternatives.

North Area Hangar Development

There are numerous aircraft storage hangar facilities located to the north of the current terminal building. Some of these facilities are old and in need of replacement, particularly hangars A, B and C. Hangar A is a shade hangar with no hangar doors. Hangars B and C are some of the oldest on the airfield and should be considered for replacement. Redevelopment of hangar C can be accommodated on its current footprint. Hangars A and B are shown being replaced by slightly smaller hangars in terms of length. The reason for this is to 1) provide a 90-degree taxilane that extends from Taxiway B, and 2) to allow for the

expansion of the restaurant parking lot. The conceptual hangar layout for the north area assumes this area will continue to be used by ADG I aircraft, therefore a taxilane OFA of 79 feet is used.

SOUTHWEST AREA DEVELOPMENT ALTERNATIVES

With the possible relocation of Taxiway A to 240 feet from the runway, many existing facilities would need to be relocated and/or reconstructed in order to maintain the existing capability of the airport. A viable option is to relocate/reconstruct facilities at the southwest end of the airport. The following facilities would need to be constructed:

1) A terminal building encompassing at least 6,100 square feet of space with the capability of expanding up to 13,000 square feet
2) A commercial apron of at least 4,300 square yards
3) A general aviation tie-down apron to accommodate at least 19 positions, or approximately 16,000 square yards, which includes circulation pavement
4) An itinerant general aviation apron of at least 6,900 square yards
5) Vehicle access roads
6) Utility extension
7) Earthworks to accommodate Taxiway A at 240 feet and an access taxilane

Two development alternatives are considered for the southwest area. The first is planned around the area accommodating future hangar development, while the second is planned around the potential relocation of the terminal building to the southwest area. Both are described below.

Southwest Area Alternative 1

Exhibit 4L presents a hangar development scenario for the southwest area. This alternative assumes that the terminal building will remain in the northwest area of the airfield. Only the south portion of Taxiway A is shown at a separation distance of 240 feet.

As noted previously, the undeveloped land in the southwest area is at a higher elevation than the runway, approximately 30 feet higher in most places. To access this area, a taxilane that slopes gradually upward is necessary. While a geology study has not been undertaken of the southwest area, knowledgeable Port staff have indicated that there is a rock subsurface that would make excavation challenging and expensive.

The taxilane would then reach an aircraft apron area and provide access to hangars. The hangar layout plan shown on **Exhibit 4L** follows the methodology outlined previously, where high activity conventional hangars are facing the aircraft apron and the runway system. Medium activity box hangars are set back from there and T-hangars are still farther back.

Mullis St
Shelter Rd
Existing Nonstandard Rwy/Twy Separation
RUNWAY 16-34 (3,402′ x 75′)
Standard Rwy/Twy Separation
240′
156′
131′
25′
ASOS Critical Area 300′
Relocate ASOS
A1
A2
A3
A
C
D
34
06
60
50
80
110
120
130
140
150

LEGEND

- Airport Property Line
- A — Taxiway Designator
- B-II(s) Runway Safety Area (RSA)
- B-II(s) Runway Object Free Area (ROFA)
- 20′ Building Restriction Line (BRL)
- Taxiway Object Free Area (TOFA)
- Runway Protection Zone (RPZ)
- Airfield Pavement
- Roads/Parking
- Building
- To Be Removed
- Non-Aviation Parcel

NOTE: Airport Reference Code B-II(s) Requirements

NORTH

0 300 600
SCALE IN FEET

Aerial Photo: Google Earth 7-24-17

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The existing automated surface observation system (ASOS), which currently sits on the undeveloped plateau, is planned to be relocated to accommodate the development plan. A new access road is planned which would extend from Mullis Street around the RPZ to the development area. The new access road utilizes a portion of an existing road and would allow closure of Shelter Road, which currently passes through the RPZ.

The hangar space depicted encompasses approximately 309,000 square feet. The projected need is approximately 120,000 square feet. Therefore, the layout shown exceeds that which is needed through the long-term planning period. The important concept is to position larger, high activity hangars toward the front and lower activity hangars to the back. The area shown with hangars should be preserved for aviation development beyond the 20-year term of this master plan.

Exhibit 4L also shows airport land that might be considered for non-aviation revenue support development. This is only one potential parcel layout, and the individual parcels could be combined to make a larger parcel.

Southwest Area Alternative 2

The second alternative considered for the southwest area is shown on **Exhibit 4M**. This alternative considers relocating parallel Taxiway A to 240 feet from the runway. Under this scenario, the functionality and utilization of the terminal building and commercial apron would be so severely impacted that a replacement terminal building and commercial apron is planned.

Similar to **Exhibit 4M**, a taxilane extends from the parallel taxiway and up the slope at an acceptable grade and connects to the aircraft apron. The aircraft apron is segregated with the south portion dedicated to commercial and transient operations and the northern portion dedicated to aviation businesses and other general aviation needs.

The hangars fronting the apron area are reserved for large conventional hangars intended for FBO type businesses, corporate usage, and/or bulk aircraft storage. Set back from the conventional hangars is a row of box hangars, and farther back is a T-hangar structure.

The hangar space depicted encompasses approximately 181,000 square feet. The projected need is approximately 120,000 square feet. Therefore, the layout shown exceeds that which is needed through the long-term planning period. The important concept is to position larger, high activity hangars toward the front and lower activity hangars to the back. The area shown with hangars should be preserved for aviation development beyond the 20-year term of this master plan.

The terminal building is situated to the south of the general aviation hangars. The building depicted occupies a 15,200 square yard footprint which would meet the long-term forecast need for a terminal that includes all amenities (administration offices, rental cars, restaurant space, conference room).

There is space on either side of the terminal building for future expansion which could include passenger screening facilities should that ever be required at the airport. A primary aesthetic benefit to relocating the terminal building to this location is the incredible vistas of North Bay, the San Juan Channel and Lopez Island.

Exhibit 4M also shows airport land that might be considered for non-aviation revenue support development. This is only one potential parcel layout and the individual parcels could be combined to make a larger parcel.

ALTERNATIVES SUMMARY

The alternatives chapter of a master plan is intended to present analysis of various options that may be considered for specific airport elements. The need for alternatives is typically spurred by projections of aviation demand growth and/or by the need to resolve non-standard airport elements. FAA design standards are frequently updated with the intent of improving the safety and efficiency of aircraft movements on and around airports, which can lead to certain pavement geometries now being classified as non-standard when previously they did meet standard.

The following three major elements have been discussed in this alternatives chapter:

- Non-Development Alternatives
- Airside Alternatives
- Landside Alternatives

Among the non-development alternatives considered were: 1) No-Build; 2) Relocate Airport; and 3) Transfer Services. Each of these was analyzed and supporting information, such as impacts and costs, was presented. This analysis is not intended as a recommendation to pursue one of these alternatives; instead, it is for informational purposes only. If the airport sponsor were to pursue one of these alternatives, additional study beyond the scope of this master plan would be required.

On the airside, the most significant discussion is related to the impacts of applying B-II(s) design standards including the 240-foot standard runway to taxiway separation. Simply relocating Taxiway A from 156 feet to 240 feet has significant and negative impacts to the operation of the airport. To effectively relocate Taxiway A, the terminal building and commercial apron should be relocated, most likely to the undeveloped southwest area of the airport.

Two other alternatives were considered which require re-positioning the runway so that all safety surfaces related to B-II(s) design standards are located on airport property. These, too, would negatively impact the existing terminal and commercial apron operations. Development of the southwest area would alleviate these potential negative impacts.

Mullis St

Existing Nonstandard Rwy/Twy Separation

RUNWAY 16-34 (3,402′ x 75′)

Standard Rwy/Twy Separation

240′

156′

131′

25′

Shelter Rd

ASOS Critical Area 300′

Relocate ASOS

Terminal

LEGEND

- Airport Property Line
- Taxiway Designator
- B-II(s) Runway Safety Area (RSA)
- B-II(s) Runway Object Free Area (ROFA)
- 20′ Building Restriction Line (BRL)
- Taxiway Object Free Area (TOFA)
- Runway Protection Zone (RPZ)
- Airfield Pavement
- Roads/Parking
- Building
- To Be Removed
- Non-Aviation Parcel

NOTE: Airport Reference Code B-II(s) Requirements

NORTH

0 300 600

SCALE IN FEET

Aerial Photo: Google Earth 7-24-17

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On the landside, various areas for potential future aviation development have been identified. A potential hangar layout has been presented to maximize the developable land. The future planned facility layout may be one of the specific alternatives or a combination of elements from each of the alternatives.

The next step in the master plan development process is to arrive at a recommended development concept. Participation of the planning advisory committee (PAC) and the public will be important considerations. Additional consultation with the FAA may also be required. Once a consolidated development plan is identified, a 20-year capital improvement program, with a list of prioritized projects tied to aviation demand and/or necessity, will be presented. Finally, a financial analysis will be presented to identify potential funding sources and to show Airport management what local funds will be necessary to implement the plan.

FRIDAY HARBOR AIRPORT







CHAPTER FIVE

Recommended Development Plan

AIRPORT MASTER PLAN



Chapter Five

RECOMMENDED DEVELOPMENT PLAN

The airport master planning process for Friday Harbor Airport (FHR) has evolved through the development of forecasts of future demand, an assessment of future facility needs, and an evaluation of airport development alternatives to meet those future facility needs. The planning process has included the development of three sets of draft working papers, which were presented to the Planning Advisory Committee (PAC) and discussed at several coordination meetings. The draft material has also been presented at three public information workshops.

In the previous chapter, several alternatives were analyzed to explore options to accommodate growth and development of the airport. The development alternatives have been refined into a single recommended development plan. This chapter describes, in narrative and graphic form, the recommended direction for the future use and development of Friday Harbor Airport. Where appropriate, the alternatives are summarized and a rationale for the selected alternative is presented.

The recommended master plan concept reflects two important goals for the Port of Friday Harbor:

- The budget reality of the Port of Friday Harbor in which they must prioritize potential projects.
- The Port's desire to advance economic development without adversely impacting the character and nature of the island community.

As such, the recommended concept focuses on the assets the airport already has and maintaining them to the highest standards feasible. Safety is the number one concern and the recommended concept includes meeting the FAA design standards, while maintaining a functional commercial service airport.

AIRPORT REFERENCE CODE (ARC)

Friday Harbor Airport experiences more than 500 annual operations by aircraft in ARC B-II(s). This is a change from the previous master plan where the ARC was B-I(s). As a result of the change to B-II(s), more restrictive design standards apply for runway and taxiway protection.

AIRSIDE CONCEPT

The airside concept generally relates to planned improvements to the runway and taxiway system. **Exhibit 5A** presents the long-term master plan development concept for Friday Harbor Airport. The following sections will discuss the recommended concept, including resolution of the issues addressed in the alternatives chapter.

The following four airport development alternatives were considered:

No-Build Alternative: This alternative means that the airport sponsor is not planning to make new investments in the airport. The sponsor would continue to be obligated to meet its grant assurances, including maintaining the facility as an airport, because the land was purchased with federal funds. It is likely that future federal grant funds for the airport would be severely curtailed or may stop altogether under a no-build scenario. By choosing the no-build alternative, the airport sponsor would also be assuming all potential liability.

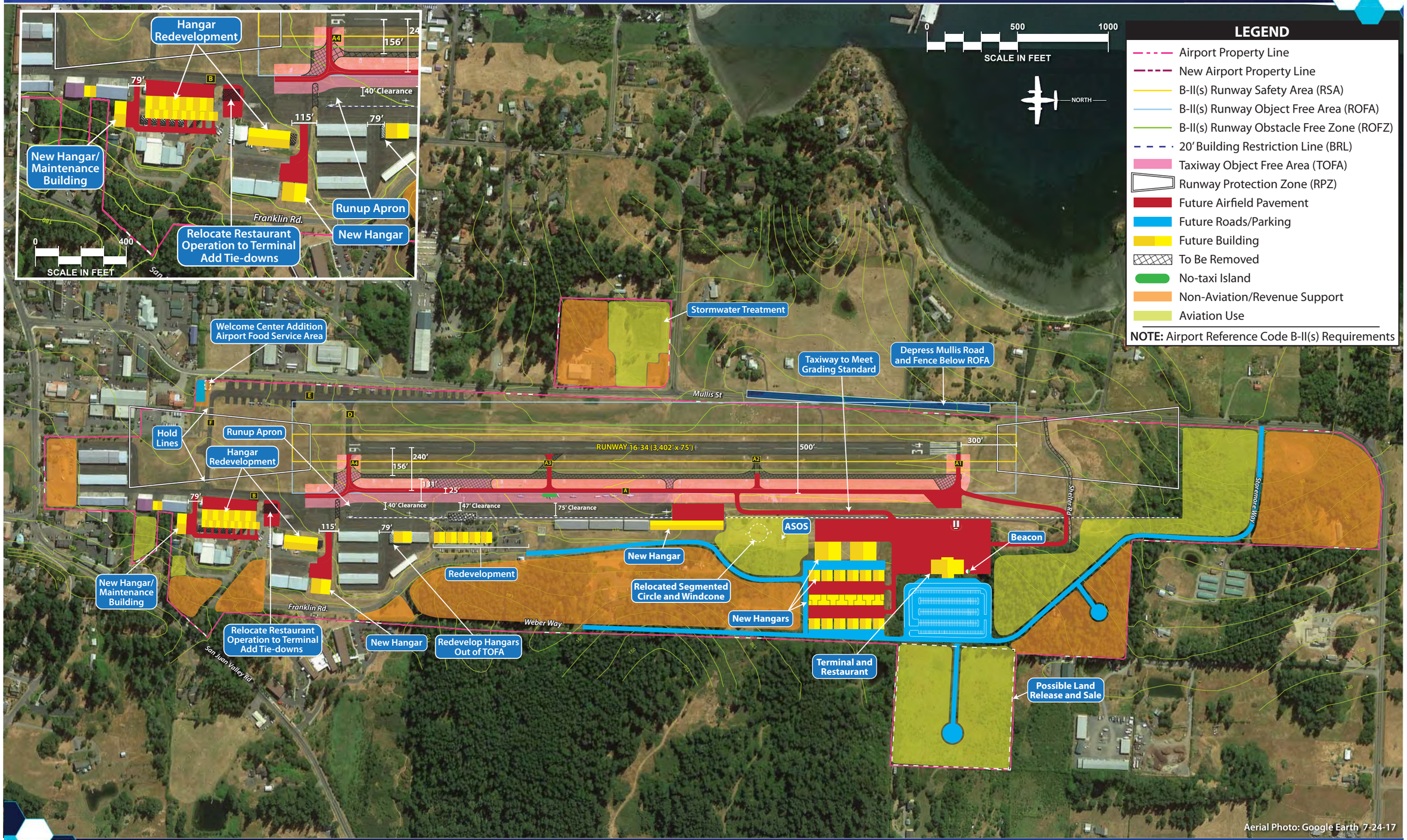
The airport sponsor understands the economic importance of the airport. They also plan to continue to improve the airport with financial assistance from FAA. The no-build alternative does not align with the goals and objectives of the airport sponsor; therefore, the no-build alternative is no longer considered.

The following three additional alternatives were considered:

Alternative 1 – Maintain Current Runway Length and Orientation: This alternative considers the gradual improvement of the airport to meet applicable design standards based on the current orientation of the runway system.

Alternative 2 – Maintain Current Runway Length and Reorient Runway: This alternative considers the gradual improvement of the airport to meet applicable design standards by reorienting the runway system to the south and west.

Alternative 3 – Reorient and Extend Runway: This alternative considers shifting the runway system to the south and to the west to such a degree that a future extension of the runway could be planned. All applicable design standards would be met.



Aerial Photo: Google Earth 7-24-17

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RECOMMENDED ALTERNATIVE

Following extensive review by the airport sponsor, the planning advisory committee (PAC), the public, the FAA, and the consultant team, Alternative 1 is the recommended master plan concept. Alternative 1 presents a feasible option for meeting the critical design standards, while maintaining the current runway footprint.

Alternatives 2 and 3 both considered reorienting the runway to bring the runway object free area (ROFA) and runway protection zones (RPZs) onto airport property. The challenge with these alternatives is both would require reconstruction and relocation of the runway, an expense that the airport sponsor does not feel is affordable given tight budgets. Reorienting the runway would also add a significant expense to the relocation and reconstruction of Taxiway A, especially on the southern portion where the terrain is especially rocky and sloped. To avoid these significant costs, the airport sponsor has chosen to maintain the existing runway footprint as outlined in Alternative 1.

Table 5A presents a summary of the impacts for the three alternatives to the potential runway length, the runway safety area (RSA), ROFA, obstacle free zone (OFZ), and RPZ. Each of these design elements is discussed in further detail in the following subsections.

TABLE 5A
Alternatives Comparison
Friday Harbor Airport

Design Element	Alternative 1 (Recommended)	Alternative 2	Alternative 3
Potential Runway Length	3,402'	3,500'	4,100'
Runway Orientation	Maintain current footprint.	Reconstruct runway and shift southwest.	Reconstruct runway and shift farther southwest.
RSA	Grade to Standard	Grade to Standard	Grade to Standard
ROFA	Depress Mullis St. so that fence and passing cars/trucks do not penetrate ROFA.	Brings ROFA onto airport property and meets standard.	Brings ROFA onto airport property and meets standard.
OFZ	Meets standard	Meets standard	Meets standard
RPZ	Existing incompatibilities to be removed when/if feasible.	Brings RPZs onto airport property eliminating incompatible land uses.	Brings RPZs onto airport property eliminating incompatible land uses.
Notes	Difference between depressing Mullis St. and reconstructing runway.	Reconstruction of runway. No Mullis St. construction.	Reconstruction of runway. No Mullis St. construction.
		Greater excavation of southwest hillside for relocated Taxiway A.	Greater excavation of southwest hillside for relocated Taxiway A.
		More expensive to extend a taxiway to new terminal area due to grade.	More expensive to extend a taxiway to new terminal area due to grade.

RSA: Runway Safety Area
ROFA: Runway Object Free Area
OFZ: Obstacle Free Zone
RPZ: Runway Protection Zone

RUNWAY LENGTH

Issue: The runway at Friday Harbor Airport is 3,402 feet long. Analysis in Chapter Three – Facility Requirements resulted in a recommended runway length of 3,500 feet.

Alternatives Considered: Adding length to either end would increase incompatible land uses in the RPZs. A special study would then be required that would analyze the potential alternatives to this action. The alternatives to be considered would include removing the incompatible land uses. On the north end, this would include acquisition of private property and removal of a commercial building. On the south end, this could include acquisition of private property on the east side of Mullis Street and relocation of the road outside the RPZ. Other alternatives include reorientation of the runway so that the RPZ remains on airport property, as outlined in Alternatives 2 and 3, which would require reconstruction of the runway.

Recommendation: The Port of Friday Harbor has examined the runway length issue. A significant consideration is the additional cost of reconstructing and extending the runway, which is estimated at $8.2 million. Assuming full FAA financial participation at 90 percent, the Port would be responsible for the remaining 10 percent or $820,000. The Port has indicated that this level of financial participation would be challenging considering their annual budget and considering that there are other priority projects to which they would like to direct limited resources (e.g., relocation of Taxiway A to the standard separation distance of 240 feet). In addition, the Port has indicated that there is no public appetite for extending the runway. Therefore, the Port supports maintaining the current runway length.

The Port of Friday Harbor believes that the existing runway length adequately serves the economic development interests of the community. They do not desire to pursue a plan that would invite larger aircraft, such as medium and large business jets. Alternative 1 reflects the desire of the Port of Friday Harbor to maintain the runway at 3,402 feet in length now and into the future. It should be recognized that any future consideration of a runway extension would likely require a new planning effort and update to the airport layout plan.

RUNWAY ORIENTATION

Issue: Runway 16-34 is oriented in the ideal direction, providing 98.84 percent wind coverage (see Chapter Three for detail).

Alternatives Considered: Based on wind coverage, there is no need to reorient the runway. Alternatives 2 and 3 would reorient the runway to address other concerns, namely the existing incompatible land uses within the RPZs and the non-standard ROFA. Reorienting the runway as considered in Alternatives 2 and 3 would reduce the wind coverage slightly to 97.87 percent. More importantly, reorienting the runway means reconstructing the runway, an expense the Port of Friday Harbor does not feel is necessary. Additional costs would be incurred for other priority projects, such as the relocation of Taxiway A.

Recommendation: Alternative 1 is the recommended concept that maintains the current runway footprint.

RUNWAY SAFETY AREA (RSA)

Issue: The RSA is an object clearing surface surrounding runways. Providing for full RSA is a high priority for FAA. The RSA surrounding Runway 16-34 does not fully meet the design standard because of grading issues that exceed the five percent design standard.

Alternatives Considered: The RSA alternatives analysis procedure in FAA Order 5800.8, *Runway Safety Area Program*, was utilized to examine alternatives for meeting RSA standards. The alternatives considered included:

1. Grade the RSA to meet standard.
2. Relocation, shift, or realignment of the runway.
3. Reduction in runway length.
4. Combination of relocation, shift, or realignment of the runway.
5. Implementation of declared distances.
6. Installation of Engineered Materials Arresting Systems (EMAS).

Recommendation: The RSA for the airport should be graded to standard. This is the most economical method to bring the RSA up to standard. Alternative 2 was considered, however, the cost to reconstruct the runway is believed to be prohibitive for the Port of Friday Harbor. Alternative 3 is not considered feasible because it would reduce the runway to a length less than what is needed to accommodate the design aircraft. Alternative 4 is not considered because it combines elements of Alternatives 2 and 3. Alternative 5 is not feasible because it would not resolve the RSA grading issue. Alternative 6 is not applicable because EMAS, which is crushable concrete blocks that can stop aircraft overruns, is intended for airports with a high percentage of jet traffic.

Assuming the runway is not planned to be reconstructed, the only feasible alternative for meeting the RSA grading standard is Alternative 1.

RUNWAY OBJECT FREE AREA (ROFA)

Issue: The ROFA surrounding runways should not have any object penetrations at the lateral elevation of the RSA. Currently, the ROFA is penetrated by a portion of the southeast perimeter fence, the windsock, and passing cars/trucks on Mullis Street.

Alternatives Considered: Three alternatives were considered for bringing the ROFA up to standard.

1. Remove ROFA penetrations by rerouting Mullis Street, relocating the perimeter fence, and relocating the windsock.
2. Depress Mullis Street, the fence, and either relocate the windsock or install a frangible base.
3. Shift or relocate the runway.

Recommendation: Alternative 1 would require rerouting approximately 1,200 feet of Mullis Street outside the ROFA. This requires acquisition of approximately 3.0 acres of private property. Airport staff have indicated that acquiring private property should be a last resort. Alternative 2 considered depressing Mullis Street so that the road (i.e., passing cars/trucks) and the perimeter fence would be below the ROFA. This condition would meet the ROFA design standard and is included in the recommended concept. Alternative 3 would require shifting the runway so that the ROFA no longer crosses Mullis Street. As discussed in the RSA section, the airport does not wish to relocate the runway if feasible.

OBSTACLE FREE ZONE (OFZ)

The OFZ is a volume of airspace centered above the runway centerline that must be clear of object penetrations other than NAVAIDS necessary for the operations of the airport (such as edge lights). The OFZ extends 200 feet beyond the runway end. The OFZ at the airport meets the design standard and no additional alternatives were considered.

RUNWAY PROTECTION ZONE (RPZ)

The function of the RPZ is to enhance the protection of people and property on the ground, which is best achieved through airport ownership of the RPZ land. The airport does not own all the RPZ land. On the north end, approximately 0.2 acres of the RPZ extends beyond airport property. This portion of the RPZ also extends over the corner of a commercial building, which is considered an existing incompatible land use. On the south end, approximately 0.65 acres of RPZ land extends beyond airport property. This portion of the RPZ extends over Mullis Street, which is considered an existing incompatible land use.

It is the responsibility of the airport to pursue policies and strategies that ultimately lead to positive control over RPZ lands. However, the ownership status of RPZ lands can present challenges. With this understanding, the FAA has published guidance (FAA Memorandum – *Interim Guidance on Land Uses Within a Runway Protection Zone*) regarding any changes to the RPZ size or location, as well as the introduction of new incompatible land uses. Under any of these circumstances, airports must document methods to achieving positive control of RPZ lands (e.g., property acquisition, removal of incompatibilities), which is then reviewed by FAA headquarters.

In the recommended concept, the runway footprint is planned to remain the same as it is today, and the instrument approach minimums are planned to remain at not lower than one mile. The size and location

of the RPZs will remain the same and no new incompatibilities are introduced as a result of the recommended concept. Therefore, the *Interim Guidance on Land Uses Within a Runway Protection Zone* does not apply to the RPZs considered in the recommended concept. The airport must still abide by the RPZ standards outlined in FAA AC 150/5300-13A, *Airport Design*, which indicates that airports should seek opportunities to own RPZ lands and maintain them clear of incompatible objects and activities.

Two alternatives were considered that would have brought the RPZs onto airport property. Both would have required the runway to be shifted (i.e., reconstructed) to the south and west. Airport management has chosen not to pursue a relocation of the runway primarily because of the anticipated cost to do so. Because there are existing incompatible land uses in the RPZs, the airport is still required to pursue options to ultimately remove the incompatible land uses.

PARALLEL TAXIWAY A

Issue: Taxiway A is currently separated from the runway by 156 feet. The standard for the airport is 240 feet.

Recommendation: All three of the airport development alternatives considered relocating the parallel taxiway to a separation distance of 240 feet. A significant challenge to relocating Taxiway A is the reduced terminal apron capacity. This project may need to be phased into two separate projects in order to preserve the current terminal apron until such time that the terminal building and apron are relocated (discussed later in this chapter).

TAXIWAY B

Issue: Taxiway B provides access to areas both north and south of the terminal building. When parallel Taxiway A is relocated, portions of Taxiway B will be impacted.

Recommendation: Taxiways generally serve aircraft ground movements at higher speeds, are part of the primary movement areas to and from the runway, and have wider object free areas (TOFA). Taxiway A meets this definition, but Taxiway B does not. Therefore, it is recommended that Taxiway B be redesignated as a taxilane. Exhibit 4G previously presented this concept.

The portion of Taxiway B that extends from the terminal building to the fuel island to the north would be designated as a taxilane that would continue to serve the B-II(s) design aircraft, and it would have a TOFA width of 115 feet. Since the fuel island is currently the only source of fuel at the airport, it is reasonable to assume that the design aircraft would use this portion of Taxiway B and it should, therefore, be protected with the B-II taxilane OFA.

The portion of Taxiway B extending to the south of the terminal building serves aircraft tie-down positions and hangars. This is a taxilane function that serves smaller aircraft in the B-I designation. Therefore, it is recommended that the south portion of Taxiway B be re-designated as a taxilane with a B-I TOFA width of 79 feet.

TAXIWAY C

Issue: Taxiway C is a connector between Taxiway A and Taxiway B. It provides access to the south end of Taxiway B (to be re-designated Taxilane B).

Recommendation: Since Taxiway C serves as a taxilane, it should be designated as such. The applicable TOFA would be 79 feet wide, which is the same as re-designated Taxilane B.

TAXIWAY D

Issue: Taxiway D extends from the Runway 16 threshold to the east transient apron area. Taxiway D has a steep four percent (4%) grade where the taxiway grading standard is not to exceed two percent (2%). As a result, pilots will use Taxiway D to exit the runway but rarely use it to enter the runway. Therefore, pilots will use Taxiway F, which has a more moderate grade, to access the runway from the east apron.

Alternatives: Three alternatives were considered to address the grade issue for Taxiway D.

1. Maintain the current non-standard condition. Aircraft are still able to exit from the runway using Taxiway D, however, it is difficult to enter the runway, and most would continue to use Taxiway F to exit the east apron.
2. Consider closing Taxiway D, which would remedy the non-standard grade by eliminating Taxiway D.
3. Raise both Taxiway D and the east apron area to meet grading standard.

Recommendation: The east transient apron is critically important to the airport. It provides 33 transient aircraft parking positions. Previous improvements on the west side of the airport, including the 2012 reconstruction of Taxiway A, required the elimination of numerous tie-down positions. It is, therefore, recommended that Alternative 3 be pursued. Taxiway D and the east apron are planned to be elevated to meet grading standard.

Alternative 1 is not considered further because it does not present a plan to meet design standard, which is a goal of any planning effort. Alternative 2 is not considered further because access to the east apron should be maintained for efficiency of movement reasons. Without Taxiway D, the chance for aircraft head-on incidents is elevated.

TAXIWAY E

Issue: Taxiway E is the current designation for the circulation area on the east transient apron. The B-II taxilane OFA is 115 feet wide and it crosses over the marked transient tie-down positions, which would make any parked aircraft penetrations to the taxilane OFA.
Alternatives: Two alternatives were considered.

1. Apply B-I TOFA (79 feet wide). Even with the narrower dimensions, the taxilane OFA still extends over the aircraft parking positions.
2. Re-designate Taxiway E as an apron area, thus removing the requirement for a TOFA.

Recommendation: Operationally, this area is a tie-down apron. It is recommended to apply Alternative 2 which re-designates this area as a tie-down apron, which does not require a TOFA. As with any apron area, pilots would have to use caution when using the apron to avoid any unsafe movements.

TAXIWAY F

Issue: Taxiway F extends from the east transient apron to an intersection with Taxiway B. There is 13 feet of clearance from Taxiway F to the FAR Part 77 approach surface. The tail height of the critical aircraft (Cessna Caravan) is 15 feet; therefore, it would be a penetration to the approach surface.

The design standard for end-around-taxiways (EAT) requires a distance of at least 1,500 feet from the runway threshold. Since Taxiway F is only 750 feet from the runway threshold, it cannot be considered an EAT. It is more accurately described as a runway crossing taxiway.

Alternatives: Three alternatives were considered.

1. Relocate Taxiway F to a minimum distance of 1,500 feet from the Runway 16 threshold.
2. Close Taxiway F.
2. Mark Taxiway F as a runway crossing taxiway.

Recommendation: Relocating Taxiway F is not feasible as there is not enough space to do so. Closing Taxiway F is not feasible because it is currently the only taxilane used to exit the east transient apron area because of the steep grade of Taxiway D. The most viable option is to mark hold lines on Taxiway F outside the approach surface and RPZ. Pilots would then understand that when an aircraft is on approach to land on Runway 16 or departing from Runway 34, they would hold at the hold lines until the operation is complete.

Taxiway F is more accurately described as a taxilane because it does not allow for higher taxing speeds, and it provides access to the transient apron and not directly to the runway. As a result, the ADG I TOFA of 79 feet is applied. It is 38 feet from the centerline to the north fence line, which means that the TOFA

is penetrated by 1.5 feet. The fence is thus planned to be shifted 1.5 feet to the north to allow for unrestricted Taxilane F access by ADG I aircraft.

Taxiway D is recommended to be elevated to meet grading standard. Even when this project is complete, Taxiway F should remain in place because of the ground movement efficiencies it provides. Not all aircraft leaving the east apron are planning an immediate takeoff. Some will fuel up first at the west side fuel island or perform preflight checks and engine run-ups on the west side hold apron. Still others may taxi to the west side to pick up passengers. Therefore, it is prudent to maintain two access points for the east transient apron.

TAXIWAY G

Taxiway G provides access to the north hangar area. It is clearly utilized as a taxilane and should be designated as such. The taxilane OFA is 79 feet wide, which is appropriate for the smaller aircraft utilizing these hangars.

TAXIWAY EDGE SAFETY MARGIN

The Taxiway Edge Safety Margin (TESM) is the distance between the outer edge of the landing gear of an airplane with its nose gear on the taxiway centerline and the edge of the taxiway pavement. The TESM standard for the critical aircraft (Cessna Caravan) is five feet on both sides. The wheel base of the Caravan is 11.67 feet; therefore, the standard taxiway width of 25 feet will accommodate the critical aircraft.

The airport does occasionally have activity by aircraft with a wider wheel base. For example, King Air models have a wheel base of 17.7 feet. When adding ten feet of TESM, the total width is 27.7 feet, which exceeds the taxiway width of 25 feet.

When Taxiway A is reconstructed at 240 feet from the runway, the design engineer, in consultation with the FAA engineer, should determine if the fillets for Taxiways A1, A2, A3, and A4 should be slightly wider to accommodate these infrequent operations by aircraft with wide wheel bases. The airport layout plan will reflect this recommendation.

HOLD APRON RUNWAY 16

Issue: The hold apron serving the Runway 16 threshold is currently of non-standard design because it extends beyond the runway threshold. When Taxiway A is relocated to the west, the hold apron will also be on the runway side of the taxiway which is also a non-standard geometry.

Alternatives: Several alternatives were discussed to relocate the hold apron. These included relocating the hold apron to the west side of the relocated taxiway, constructing a new hold apron at another location in proximity to the runway threshold, and removing and not replacing the existing hold apron.

Recommendation: Following consultation with FAA it was determined to relocate the hold apron to the west side of Taxiway A parallel to the runway threshold. This is the typical location for a hold apron as pilots can proceed directly to the runway following pre-flight engine run-ups and safety checks. At least two existing aircraft tie-down position will have to be removed to accommodate the hold apron.

HANGAR TAXILANES

The taxilanes used to access hangar development areas should have enough clearance to accommodate the appropriate taxilane OFA. There are three taxilanes on the west side of the airfield, north of the existing terminal building. Each of these is examined independently.

The taxilane immediately north of the terminal building (#1 in Figure 1) is approximately 64 feet in width between Hangars D1 and E. The minimum separation distance is 79 feet. This hangar development area houses only aircraft with narrow wingspans in ADG I thereby requiring a 79-foot wide TOFA. In the future, when Hangar D1 is at the end of its useful life and needs to be replaced, a narrower hangar should be considered.

The middle taxilane (#2 in Figure 1) provides access to hangars which house ADG II aircraft. Therefore, the taxilane OFA should be a minimum of 115 feet wide. The existing space between Hangar E and Hangar C is 85 feet. Hangar C is old and nearing the end of its useful life. When this hangar is redeveloped, the replacement hangar should allow for the proper 115-foot taxilane OFA.

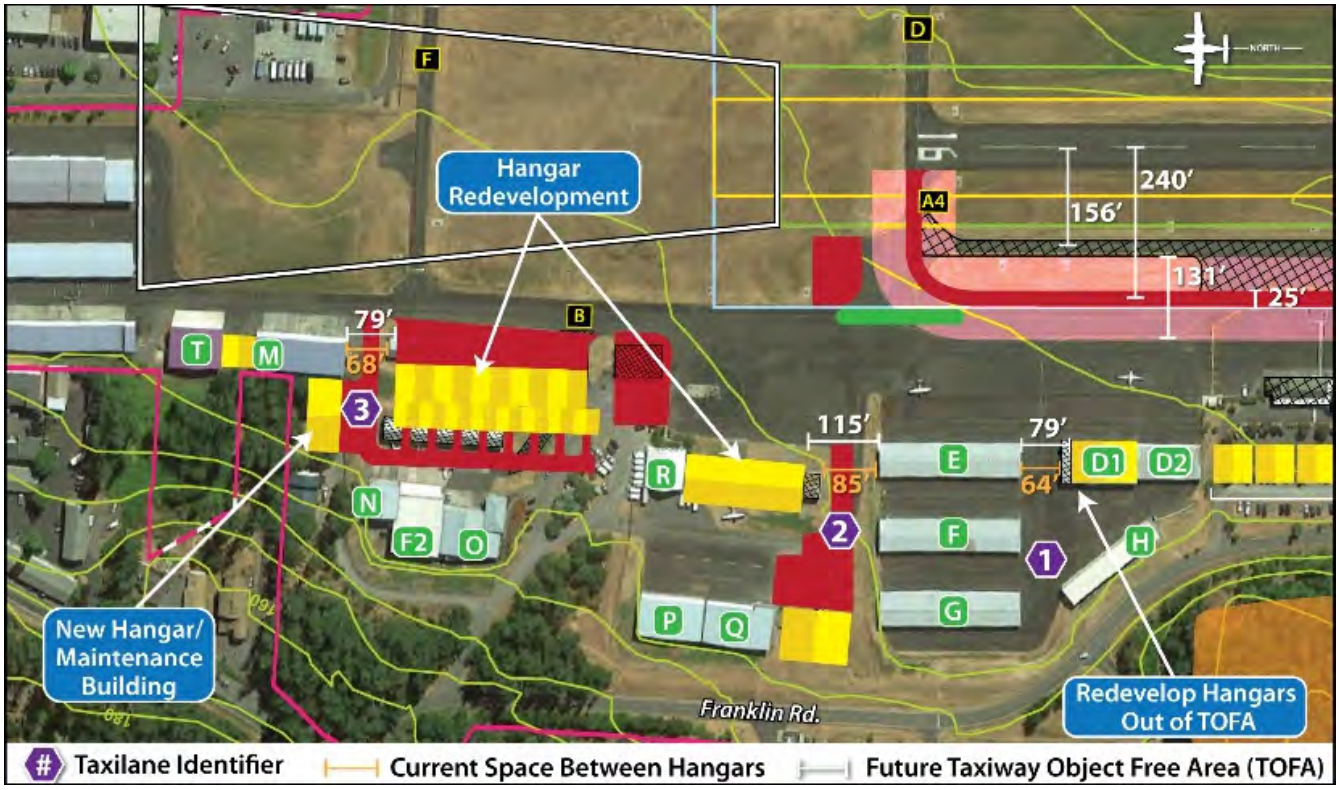

Figure 1: Taxilane Detail

The existing north taxilane provides access to hangars that house aircraft in ADG I. The taxilane OFA should be at least 79 feet wide. It is currently 79 feet wide, which meets standard. The recommended concept considers closing this taxilane and constructing a new taxilane between hangars A and M (#3 in Figure 1). This taxilane is planned with a 79-foot taxilane OFA.

DIRECT ACCESS FROM APRON TO RUNWAY

As discussed in Chapter Three – Facility Requirements, airfield layouts should not allow aircraft to inadvertently taxi directly from an apron area, across a parallel taxiway, and into the runway environment. A no-movement taxi-island is planned at the end of connecting Taxiways A3 and A4 so that pilots are forced to make a turn onto parallel Taxiway A before turning toward the runway.

FUEL ISLAND APRON

Currently, there is one fuel island at the airport located on the northwest apron, adjacent to Taxiway B. The B-II TOFA applied to Taxiway B will require the relocation of at least three aircraft tie-down positions

near the fuel island. These are tie-down positions that are highly utilized and are needed to meet demand at the airport.

The recommended concept considers ultimately relocating the fuel island to the planned new terminal area. The existing fuel island area would be reconfigured to accommodate replacement tie-down positions. In addition, the existing restaurant, north of the fuel island, would relocate to the replacement terminal building. The site of the current restaurant is planned to be converted to aircraft apron and marked with replacement tie-downs.

INSTRUMENT APPROACHES

Instrument approach procedures provide pilots with a predetermined set of maneuvers when landing to a runway. The procedures prescribe the lowest visibility and cloud ceiling height minimums that must be available in order to complete the landing. At Friday Harbor Airport, there are two instrument approaches to Runway 34 with the lowest visibility minimum being one mile. The Runway 16 end does not have an instrument approach and is a visual runway, which means the visibility minimum is three miles.

An instrument approach to Runway 16 is planned with not lower than one mile visibility minimums. Historically, an approach to this end has been challenging because of existing trees and terrain. This recommendation assumes that these obstacles can be removed or resolved. NextGen improvements could also help facilitate an instrument approach to Runway 16.

The RPZs serving the runway ends at FHR are the same size for any approach of not lower than one mile, including visual approaches. So that new incompatible land uses are not introduced to the existing RPZs, the lowest visibility minimums recommended are one mile.

AIRSIDE CONCLUSION

The recommended concept, depicted on **Exhibit 5A**, shows the planned improvements to the airfield. The runway is planned to remain in its current location on its current footprint. It will be limited to its current length of 3,402 feet for the duration of this master plan.

Parallel Taxiway A is currently situated 156 feet from the runway centerline when the design standard is 240 feet. The recommended concept includes reconstructing Taxiway A at 240 feet to meet standard. Relocating Taxiway A to 240 feet impacts existing Taxiway B and the terminal apron; therefore, a new terminal area is planned in the southwest quadrant of the airport with two new access taxilanes.

The hangar development areas are planned to ultimately accommodate the appropriate taxilane OFAs. Currently, the TOFA for existing hangar areas does not meet standard. When various hangars are redeveloped, the replacement hangars should be slightly less wide to accommodate the proper TOFA.

The instrument approach capability for the airport is planned to have visibility minimums of not lower than one mile. This will maintain the current size of the RPZs associated with the runway, which is important because any incompatible land uses currently within the RPZ do not have to be approved by FAA headquarters.

LANDSIDE CONCEPT

The primary goal of landside facility planning is to provide adequate aircraft storage space to meet forecast needs, while also maximizing operational efficiencies. The development scheme presented segregates aircraft activity levels, while placing the airport in a position to maximize revenue potential. The landside facility plan is depicted on **Exhibit 5A**.

There are an unlimited number of potential facility layout concepts that could be considered. The plan shown is only one possible layout for future hangars, which may change based on developer needs. Nonetheless, the layout presented is a starting point for future development needs. What should be strongly adhered to is utilization of aviation reserve land for aviation facilities.

TERMINAL BUILDING AND APRON

Issue: With the planned relocation of Taxiway A to 240 feet from the runway, the commercial terminal apron becomes severely constrained and potentially unusable. The existing terminal building is undersized and nearing the end of its useful life.

Alternatives: Two alternatives were considered for the terminal building and apron.

1. Maintain the existing terminal building but expand it to the north to provide commercial aircraft apron space.
2. Construct a new terminal building in the undeveloped southwest quadrant of the airport.

Recommendation: The first alternative considered expanding the terminal building to the north, which would require removal of Hangars D1 and D2. This location does not have available the area needed for the commercial apron. The second alternative considered constructing a replacement terminal building and aircraft apron in the undeveloped southwest quadrant. This alternative is reflected in the recommended concept.

The planned terminal building footprint is approximately 10,000 square feet. The planned terminal apron is approximately 11,000 square yards of pavement.

HANGARS

In the Facility Requirements chapter, it was determined, based on forecast growth and hangar occupancy arrangements, that the airport needs 155,400 square feet of additional hangar space over the next 20 years. A mix of T-hangars, conventional, and box hangars is assumed to fill this need. Individual owner and/or developer needs for hangar type may deviate from this assumption based on their operational needs.

To meet the aircraft storage needs, a new hangar development area, located in the undeveloped southwest quadrant is planned. This development includes a mix of the three hangar types. Two larger conventional hangars are planned to front an aircraft apron. Set back behind the conventional hangars is a mix of box hangars and T-hangars. In total, this area provides for 98,000 square feet of hangar space. Additional development along Taxiway B provides 22,500 square feet of hangar space. Redevelopment of the current terminal building area provides 34,500 square feet of space. In-fill north of the existing terminal area provides 16,000 square feet of space. In total, the recommended concept shows the addition of 171,000 square feet of hangar space.

Some areas, where there are existing hangars, are planned to be redeveloped with replacement hangars. Hangar buildings A, B, and C are planned to be replaced with new structures. These three combined currently provide 21,400 square feet of space. When redeveloped, the total square footage is approximately 40,000, for a net increase of 18,600 square feet. A 2,000 square-foot infill hangar is planned between Hangars M and T. A 4,000 square-foot hangar is planned to the immediate west of Hangar M. In total, 195,600 square feet of new hangar space is planned for the airport.

VEHICULAR ACCESS AND PARKING

A planning consideration for any airport master plan is the segregation of vehicles and aircraft operational areas. This is both a safety and security consideration for an airport. Aircraft safety is reduced and accident potential increased when vehicles and aircraft share the same pavement surfaces. Vehicles contribute to the accumulation of debris on aircraft operational surfaces, which increases the potential for FOD (foreign object debris), which can be especially detrimental for turbine-powered aircraft. The potential for runway incursions is also increased, as vehicles may inadvertently access an active runway or taxiway area if they become disoriented when on the aircraft operational area (AOA). Airfield security may be compromised as there is loss of control over the vehicles as they enter the secure AOA. The greatest concern is for public vehicles, such as delivery vehicles and visitors, which may not fully understand the operational characteristics of aircraft and the markings in place to control vehicle access. One solution is to provide dedicated vehicle access roads to each landside facility that is separated from the aircraft operational areas with security fencing.

The segregation of vehicle and aircraft operational areas is supported by FAA guidance established in June 2002. FAA AC 150/5210-20, *Ground Vehicle Operations on Airports* states, “The control of vehicular activity on the airside of an airport is of the highest importance.” The AC further states, “An airport

operator should limit vehicle operations on the movement areas of the airport to only those vehicles necessary to support the operational activity of the airport."

The landside alternative for FHR has been developed to reduce the need for vehicles to cross aprons or taxiways. Dedicated vehicle parking areas, which would be outside the planned airport perimeter fence, are considered in association with new hangars.

A public road will be needed to access the planned new southwest terminal area development. Storemore Way currently provides access to the self-storage units south of the airport. This existing road is planned to be extended to the new terminal area for primary access. Ultimately, Weber Way, which currently provides access to the college, would be extended to the new terminal area also.

LAND USE – ON AIRPORT

The recommended concept largely reflects the initial land use designations shown previously on Exhibit 4B. The following summarizes the on-airport land use designations.

AIRFIELD OPERATIONS

Airfield operations consists of that portion of airport property encompassing the major airside elements, such as the runways, taxiways, runway safety area, runway object free area, runway obstacle free zone, runway protection zone (on airport property), taxiway safety area, taxiway object free area, and any navigational aid critical areas. Airfield operations are intended for the safe and efficient movement of aircraft to and from the airfield. This land use designation includes the various object clearing areas and only elements necessary for aircraft navigation can be located here.

AVIATION DEVELOPMENT

The Aviation Development land use category includes those areas that should be reserved for development that require access to the airfield operations area. This might include aircraft hangars and transportation terminals. Any aviation business needing access to the runway and taxiway system should be located in these areas. Generally, any land adjacent to the runway/taxiway system should be reserved for current and future aviation purposes.

NON-AVIATION REVENUE SUPPORT

This land use classification includes development that is compatible with aviation activities but is unlikely to require access to the runway and taxiway system. Typically, it is preferable that activities in these areas complement airport activities to some degree, but that is not required. Examples of potential uses include research facilities, laboratories, manufacturing and processing facilities, warehouses, and other facilities compatible with an airport environment.

Development of airport property with non-aviation uses is only permitted by the FAA if it can be shown that the land will not be needed for aviation uses in the future. When non-aviation uses are introduced, the airport must receive a fair-market lease from the tenant, either through a land lease or facility lease. There are several areas on the airport that are identified as potential non-aviation parcels which are identified on **Exhibit 5B** and described as follows:

A. This area of airport property has two existing non-aviation commercial buildings and there is no existing taxiway access to the site. To gain access, the hangar taxilane serving hangar buildings L1 and L2 would have to be extended to the site. There are also grading issues, which would require excavation to make the site suitable for aircraft. This parcel is planned to remain in a revenue-producing non-aviation capacity.

B. This site is home to a fire station that serves the community, including the airport, and it is disconnected from the airport by Mullis Street. This portion of the parcel is planned to remain in a non-aviation revenue-producing capacity. The Mullis detention pond is adjacent to the fire station, serving an aviation purpose of detaining stormwater runoff.

C. This site is defined by the steep terrain and is home to Skagit Valley College. Because of the terrain, it is not feasible to utilize it for aviation purposes. This parcel is planned to remain in its current non-aviation revenue-producing role.

D. This parcel is physically situated on a hillside and would not be accessible to aircraft. The planned terminal access road defines the eastern edge of the future non-aviation revenue support development.

E. This small parcel is located outside the perimeter fence adjacent to the welcome center. This parcel is currently used in a non-aviation revenue support capacity for vehicle parking. It is planned to remain in a non-aviation revenue-producing capacity as it is not needed for aviation purposes.

F. This parcel is located on steep terrain and is not capable of being developed for aviation uses. Non-aviation revenue support uses are likely limited as well.

G. This parcel is on hilly terrain and is located some distance from the runway and taxiway system. This parcel lies below the approach surface to Runway 34; therefore, any development would be required to be below the approach surface.

The airport land use map is a concept drawing that will be included as one of the official drawings in the airport layout plan set. Identifying potential non-aviation land in the ALP set is only the first step toward allowing non-aviation uses. The airport must follow a prescribed FAA process to release the land from airport obligations. The airport must also receive fair-market value from any developer or tenant. All revenue generated from the lease must remain with the airport and cannot be diverted for other needs that are unrelated to the airport.

ENVIRONMENTAL OVERVIEW

An analysis of potential environmental impact associated with proposed airport projects is an essential consideration in the Airport Master Plan (AMP) process. The primary purpose of this discussion is to review the proposed Capital Improvement Program at the airport to determine whether the projects identified in the master plan could, individually or collectively, significantly impact existing environmental resources. The information contained in this section was obtained from previous studies, official internet websites, and analysis by the consultant.

Construction of any and all improvements depicted on the Airport Layout Plan (ALP) will require compliance with the *National Environmental Policy Act* (NEPA) *of 1969*, as amended. This includes privately funded projects, such as hangars, and those projects receiving federal funding. For projects not categorically excluded under FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*, compliance with NEPA is generally satisfied through the preparation of an Environmental Assessment (EA). In instances where significant environmental impacts are expected, as determined by the Federal Aviation Administration (FAA), an Environmental Impact Statement (EIS) may be required. While this portion of the AMP is not designed to satisfy the NEPA requirements, it provides a preliminary review of environmental issues that may need to be considered in more detail within the environmental review processes. It is important to note that the FAA is ultimately responsible for determining the level of environmental documentation required for airport actions.

The environmental inventory included in Chapter One provides baseline information about the airport environs. This appendix provides an overview of the potential impacts to the existing resources that could result from implementation of the planned improvements outlined in the master plan. While this portion of the master plan is not designed to satisfy NEPA requirements for a Documented Categorical Exclusion (CatEx), EA, or EIS, it is intended to supply a preliminary review of environmental issues that might affect implementation of the AMP.

POTENTIAL ENVIRONMENTAL CONCERNS

Table 5B summarizes potential environmental concerns associated with implementation of the recommended AMP development concept. Analysis under NEPA includes direct, indirect, and cumulative impacts.

TABLE 5B
Summary of Potential Environmental Concerns
Friday Harbor Airport

Environmental Impact Category	FAA Order 1050.1F Significance Threshold/ Factors to Consider	Potential Concern
Air Quality	**Threshold: The action would cause pollutant concentrations to exceed one or more**	Although the projected increase in operations over the 20-year planning horizon of the AMP would result in additional emissions, San Juan

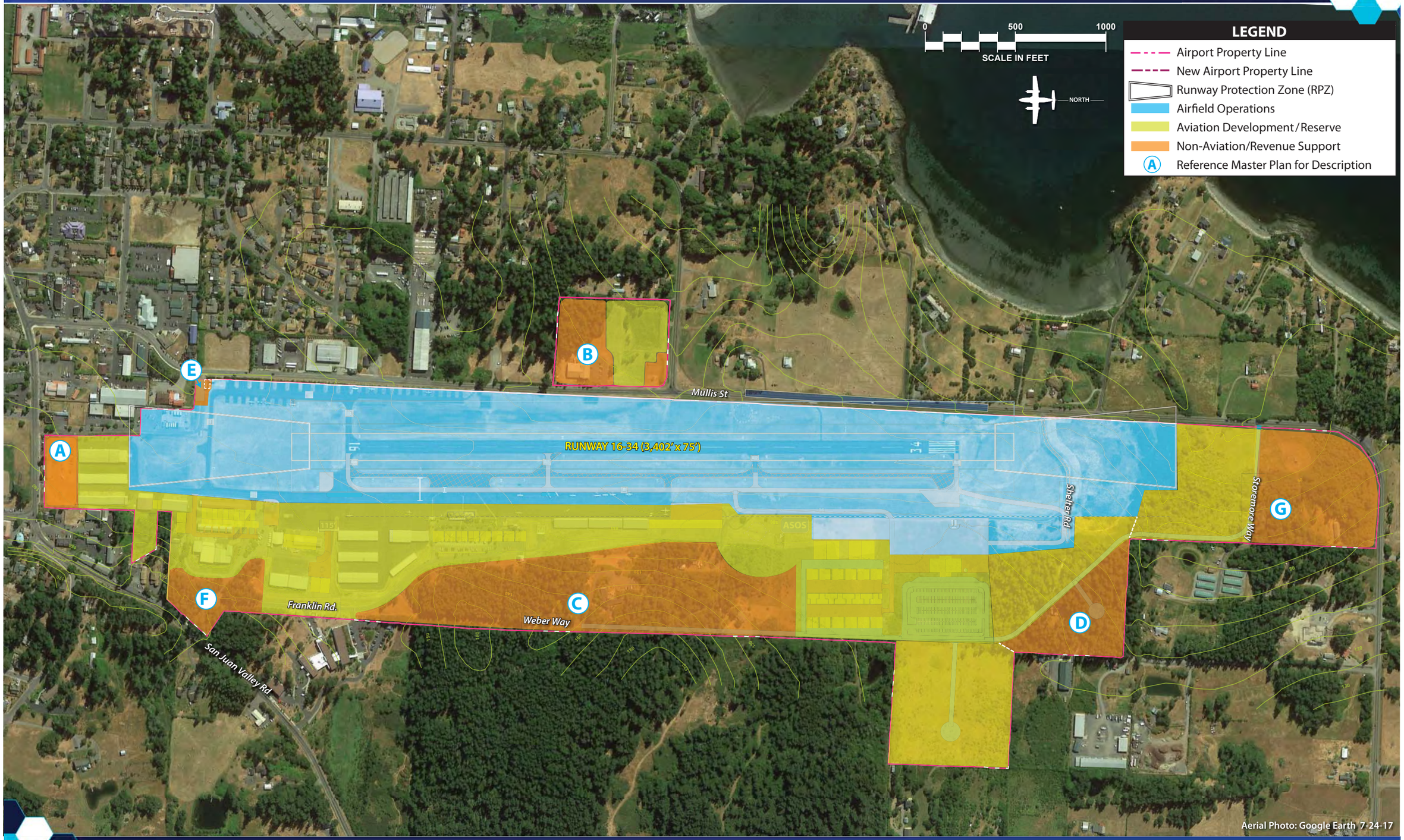
0
500
1000
SCALE IN FEET
NORTH
LEGEND
Airport Property Line
New Airport Property Line
Runway Protection Zone (RPZ)
Airfield Operations
Aviation Development/Reserve
Non-Aviation/Revenue Support
A Reference Master Plan for Description
A
B
C
D
E
F
G
RUNWAY 16-34 (3,402' x 75')
16
34
Mullis St
Shelter Rd
Storemore Way
Franklin Rd.
Weber Way
San Juan Valley Rd
ASOS
Aerial Photo: Google Earth 7-24-17

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TABLE 5B
Summary of Potential Environmental Concerns
Friday Harbor Airport

Environmental Impact Category	FAA Order 1050.1F Significance Threshold/ Factors to Consider	Potential Concern
	of the National Ambient Air Quality Standards (NAAQS), as established by the United States (U.S.) Environmental Protection Agency (EPA) under the *Clean Air Act*, for any of the time periods analyzed, or to increase the frequency or severity of any such existing violations.	County currently meets federal NAAQS standards. Therefore, general conformity review per the *Clean Air Act* is not required. According to the most recent FAA *Aviation Emissions and Air Quality Handbook* (2015), an emissions inventory under NEPA may be necessary for any proposed action that would result in a reasonably foreseeable increase in emissions due to plan implementation. For construction emissions, a qualitative or quantitative emissions inventory under NEPA may be required, depending on the type of environmental review needed for development projects outlined in the AMP.
Biological Resources	**Threshold: The U.S. Fish and Wildlife Service (FWS) or the National Marine Fisheries Service (NMFS) determines that the action would be likely to jeopardize the continued existence of a federally listed threatened or endangered species or would result in the destruction or adverse modification of federally designated critical habitat.** FAA has not established a significance threshold for non-listed species. However, factors to consider are if an action would have the potential for: • Long term or permanent loss of unlisted plant or wildlife species; • Adverse impacts to special status species or their habitats; • Substantial loss, reduction, degradation, disturbance, or fragmentation of native species' habitats or their populations; or Adverse impacts on a species' reproductive rates, non-natural mortality, or ability to sustain the minimum population levels required for population maintenance.	**For federally listed species:** Potential habitat for the marbled murrelet has been identified on airport property, as noted in Exhibit 1J. Since anticipated development is proposed within the marbled murrelet's habitat areas on airport property, impact must be assessed prior to action in this area and may require consultation with the USFWS. **For designated critical habitat:** Critical habitat for both the Chinook salmon and killer whale have been identified within the vicinity of airport property. Although these are aquatic species, the designated critical habitat area encompasses land areas. Runoff from the airport, either through general use or construction activities, can impact this critical habitat through surface water runoff. The FAA and USFWS are responsible for determining potential impact to critical habitat from airport activities. A Biological Assessment for the airport was conducted in July 2016 for anticipated airport improvements, and it was determined those activities would not impact critical habitat. However, additional projects are proposed in the AMP than originally summarized in the 2016 report. Therefore, Biological Assessments may be required as part of future formal Section 7 consultation, if determined necessary

TABLE 5B
Summary of Potential Environmental Concerns
Friday Harbor Airport

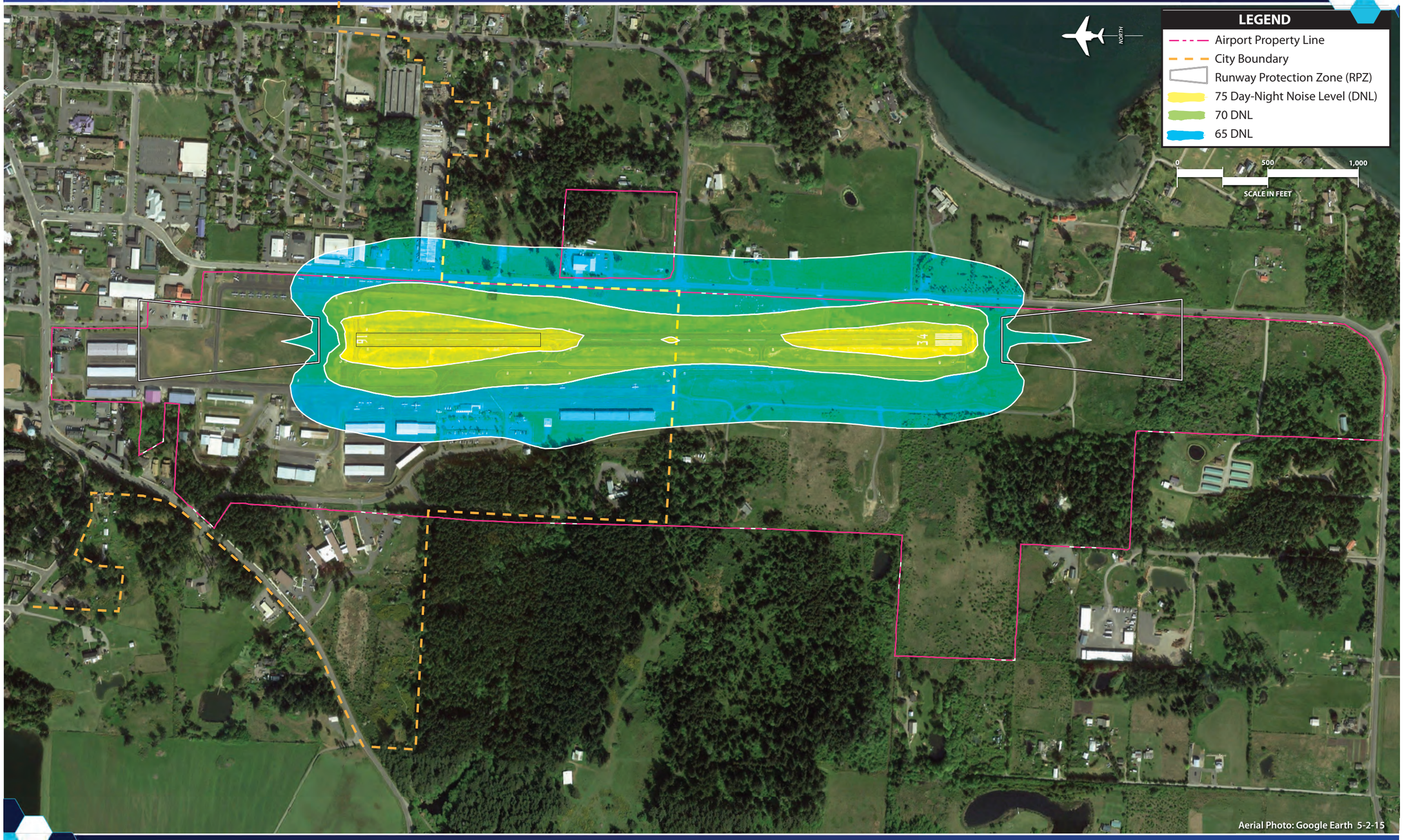
Environmental Impact Category	FAA Order 1050.1F Significance Threshold/ Factors to Consider	Potential Concern
		by the FAA. **For non-listed species:** Non-listed species of concern include those protected by the *Migratory Bird Treaty Act*. The potential for impacts to migratory birds should be evaluated on a project-specific basis. This may include pre-construction surveys or scheduling construction outside of nesting seasons.
Climate	**Threshold: The State of Washington has a mandatory Greenhouse Gas Reporting Program requiring large facilities and transportation fuel suppliers to report GHG emissions to the Washington Department of Ecology.** • **Facilities that emit at least 10,000 metric tons of carbon dioxide equivalent (CO_2e) per year in Washington.** • **Suppliers of liquid motor vehicle fuel, special fuel, or aircraft fuel that provide products equivalent to at least 10,000 metric tons of carbon dioxide per year in Washington.** FAA has not established a significance threshold for Climate; refer to FAA Order 1050.1F's, *Desk Reference*, for the most up-to-date methodology for examining impacts associated with climate change.	An increase in greenhouse gas (GHG) emissions could occur over the 20-year planning horizon of the AMP. Project-specific analysis may be required per the FAA Order 1050.1F, *Desk Reference*, based on the parameters of the individual projects. Also note that it may be necessary to report to the State Greenhouse Gas program through the Washington Department of Ecology if anticipated operations or projects at the airport expand.
Coastal Resources	FAA has not established a significant threshold for Coastal Resources. Factors to consider are if an action would have the potential to: • Be inconsistent with the relevant state coastal zone management plan(s); • Impact a coastal barrier resources system unit; • Pose an impact to coral reef ecosystems; • Cause an unacceptable risk to human safety or property; or Cause adverse impacts to the coastal environment that cannot be satisfactorily mitigated.	None. The Airport is not located within a designated Coastal Zone, per the State's Shoreline Management Act and San Juan County's Shoreline Master Program. As discussed in Chapter One, the Coastal Zone extends seaward is defined as all lands and waters from the coastline seaward for three nautical miles (approximately 3.45 miles).

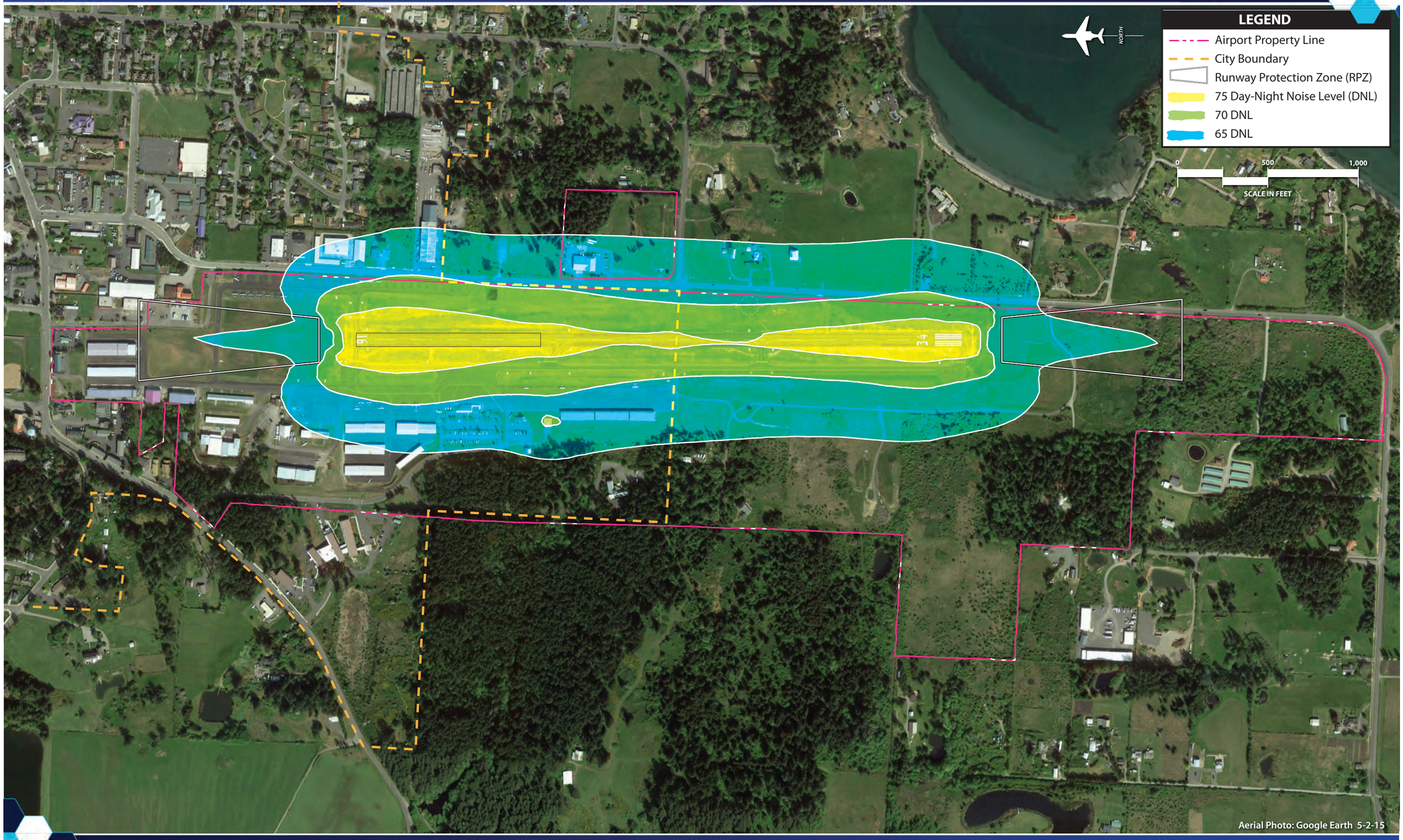
TABLE 5B
Summary of Potential Environmental Concerns
Friday Harbor Airport

Environmental Impact Category	FAA Order 1050.1F Significance Threshold/ Factors to Consider	Potential Concern
***Department of Transportation* (DOT) *Act*: Section 4(f)**	**Threshold: The action involves more than a minimal physical use of a Section 4(f) resource or constitutes a "constructive use" based on an FAA determination that the aviation project would substantially impair the Section 4(f) resource. Resources that are protected by Section 4(f) are publicly owned land from a public park, recreation area, or wildlife and waterfowl refuge of national, state, or local significance; and publicly or privately owned land from an historic site of national, state, or local significance. Substantial impairment occurs when the activities, features, or attributes of the resource that contribute to its significance or enjoyment are substantially diminished.**	The Clark McAlpine Trail, a recreational two-mile trail loop located on airport property, which connects to a larger regional trail system, is considered a Section 4(f) resource. Future physical and/or constructive use of this feature should be analyzed for AMP projects, as necessary. If necessary, the Section 4(f) compliance process can involve the preparation of a Section 4(f) statement, which evaluates other feasible alternatives.
Farmlands	**Threshold: The total combined score on Form AD-1006, *Farmland Conversion Impact Rating*," ranges between 200 and 260.** (Form AD-1006 is used by the U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS) to assess impacts under the *Farmland Protection Policy Act* (FPPA).) Factors to consider are if an action would have the potential to convert important farmlands to non-agricultural uses. Important farmlands include pastureland, cropland, and forest considered to be prime, unique, or statewide or locally important land.	A significant portion of airport property is classified as prime farmland by the NRCS. Many of the proposed projects in the AMP are on land identified as prime farmland; however, that land is not used for agricultural purposes. Therefore, projects would likely be exempt from FPPA requirements.
Hazardous Materials, Solid Waste, and Pollution Prevention	FAA has not established a significance threshold for Hazardous Materials, Solid Waste, and Pollution Prevention. However, factors to consider are if an action would have the potential to: • Violate applicable federal, state, tribal, or local laws or regulations regarding hazardous materials and/or solid waste management; • Involve a contaminated site;	The airport has a fuel farm and provides opportunity for aircraft maintenance activities that could involve fossil fuels or other types of hazardous materials or wastes; these operations are regulated and monitored by the appropriate regulatory agencies, such as the U.S. EPA, the Washington Department of Ecology, and San Juan County. The recommended AMP development concept

TABLE 5B
Summary of Potential Environmental Concerns
Friday Harbor Airport

Environmental Impact Category	FAA Order 1050.1F Significance Threshold/ Factors to Consider	Potential Concern
	• Produce an appreciably different quantity or type of hazardous waste; • Generate an appreciably different quantity or type of solid waste or use a different method of collection or disposal and/or would exceed local capacity; or Adversely affect human health and the environment.	does not anticipate land uses that would produce an appreciably different quantity or type of hazardous waste. However, should this type of land use be proposed, further NEPA review and/or permitting would be required. There are no known hazardous materials or waste contamination sites currently on airport property. Since land release is proposed on the concept plan, an Environmental Due Diligence Audit (EDDA) is required as part of the land release process.
Historical, Architectural, Archaeological, and Cultural Resources	FAA has not established a significance threshold for Historical, Architectural, Archaeological, and Cultural Resources. Factors to consider are if an action would result in a finding of "adverse effect" through the Section 106 process. However, an adverse effect finding does not automatically trigger preparation of an EIS (i.e., a significant impact).	Airport property is located on Samish Indian Nation tribal land and coordination with the tribal government for airport improvements may be necessary. Per E.O. 13175, *Consultation and Coordination with Indian Tribal Governments*, this coordination is undertaken by FAA as part of government-to-government consultation with federally recognized tribes.
Land Use	FAA has not established a significance threshold for Land Use. There are also no specific independent factors to consider. The determination that significant impacts exist is normally dependent on the significance of other impacts.	None. The proposed development concept plan includes avigation easements over the airport runway protection zones to prevent land use compatibility impacts with the airport. Avigation easements will also be required for the land identified for release.
Noise and Noise-Compatible Land Use	**Threshold: The action would increase noise by Day-Night Average Sound Level (DNL) 1.5 decibel (dB) or more for a noise-sensitive area that is exposed to noise at or above the DNL 65 dB noise exposure level, or that will be exposed at or above the DNL 65 dB level due to a DNL 1.5 dB or greater increase, when compared to the no action alternative for the same timeframe.** Another factor to consider is that special consideration needs to be given to the evaluation of the significance of noise impacts on noise-sensitive areas within Section 4(f) properties where the land use compatibility	**Exhibit 5C** shows existing and anticipated noise contours for the Friday Harbor Airport. As shown on the exhibit, the DNL 65 dB noise exposure level is beyond the eastern boundary of the airport and it extends over Mullis Street onto a portion of residential property, a noise-sensitive use east of the airport but not over the structure. In the 2037 condition, the DNL 65 dB noise exposure contours expand around the airport, encircling the residential structure. It is important to note that operational growth, unless tied to a specific project, will not result in noise impacts under FAA Order 1050.1F. Impacts to noise-sensitive land uses are only identified through NEPA documentation for


LEGEND
Airport Property Line
City Boundary
Runway Protection Zone (RPZ)
75 Day-Night Noise Level (DNL)
70 DNL
65 DNL
NORTH
0
500
1,000
SCALE IN FEET
16
34
Aerial Photo: Google Earth 5-2-15


LEGEND
Airport Property Line
City Boundary
Runway Protection Zone (RPZ)
75 Day-Night Noise Level (DNL)
70 DNL
65 DNL
NORTH
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SCALE IN FEET
16
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Aerial Photo: Google Earth 5-2-15

TABLE 5B
Summary of Potential Environmental Concerns
Friday Harbor Airport

Environmental Impact Category	FAA Order 1050.1F Significance Threshold/ Factors to Consider	Potential Concern
	guidelines in Title 14 Code of Federal Regulations (CFR) part 150 are not relevant to the value, significance, and enjoyment of the area in question.	specific projects or through the voluntary Part 150 process.
Socioeconomic Impacts, Environmental Justice, and Children's Environmental Health and Safety Risks		
Socioeconomics	FAA has not established a significance threshold for Socioeconomics. However, factors to consider are if an action would have the potential to: • Induce substantial economic growth in an area, either directly or indirectly (e.g., through establishing projects in an undeveloped area); • Disrupt or divide the physical arrangement of an established community; • Cause extensive relocation when sufficient replacement housing is unavailable; • Cause extensive relocation of community businesses that would cause severe economic hardship for affected communities; • Disrupt local traffic patterns and substantially reduce the levels of service of roads serving the airport and its surrounding communities; or Produce a substantial change in the community tax base.	The proposed development on airport property could potentially encourage economic growth for the Town of Friday Harbor and San Juan County. Results include new construction jobs, new jobs for the airport and other commercial uses, new housing, and increase the local tax base. The AMP does not include any recommendations to acquire residences or relocate businesses. New commercial development could change the level of service to roads leading to and within the airport, such as along Weber Way and Mullis Street. The long-term changes to the level of service are determined by the type of use proposed, and it may be necessary to perform a traffic study to ensure service is either not substantially impacted or mitigation measures are addressed. In the short-term during construction, there would be temporary disruptions to surface traffic patterns.
Environmental Justice	FAA has not established a significance threshold for Environmental Justice. However, factors to consider are if an action would have the potential to lead to a disproportionately high and adverse impact to an environmental justice population (i.e., a low-income or minority population), due to: • Significant impacts in other environmental impact categories; or Impacts on the physical or natural environment that affect an environmental justice population in a way that FAA determines is unique to the environmental justice population and significant to that population.	E.O. 12898, *Federal Action to Address Environmental Justice in Minority Populations and Low-Income Populations*, and the accompanying Presidential Memorandum, and Order DOT 5610.2, *Environmental Justice*, require the FAA to provide for meaningful public involvement by minority and low-income populations, as well as analysis that identifies and addresses potential impact on these populations that may be disproportionately high and adverse. If disproportionately high or adverse impacts are noted, mitigation and enhancement measures and offsetting benefits can be taken into consideration. Both low-income and minority populations have been identified in the vicinity of the airport.

TABLE 5B
Summary of Potential Environmental Concerns
Friday Harbor Airport

Environmental Impact Category	FAA Order 1050.1F Significance Threshold/ Factors to Consider	Potential Concern
Children's Environmental Health and Safety Risks	FAA has not established a significance threshold for Children's Environmental Health and Safety Risks. However, factors to consider are if an action would have the potential to lead to a disproportionate health or safety risk to children.	Per E.O. 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, federal agencies are directed to identify and assess environmental health and safety risks that may disproportionately affect children. These risks include those that are attributable to products or substances that a child is likely to come in contact with or ingest, such as air, food, drinking water, recreational waters, soil, or products to which they may be exposed. Within a close vicinity of the airport, seven schools have been identified (the location of these schools are labeled on Exhibit 1K in the Environmental Inventory). Best management practices should be implemented to decrease environmental health risks to children. During construction of the projects outlined in the AMP, appropriate measures should be taken to prevent access by unauthorized persons to construction project areas.
Visual		
Visual Effects	FAA has not established a significance threshold for Visual Resources/Visual Character. However, a factor to consider is the extent an action would have on the potential to: • Affect the nature of the visual character of the area, including the importance, uniqueness, and aesthetic value of the affected visual resources; • Contrast with the visual resources and/ or visual character in the study area; and Block or obstruct the views of the visual resources, including whether these resources would still be viewable from other locations.	Development planned in the Master Plan Concept could change the overall visual character of the airport with additional roads and structures planned on-site. New development could change the visual rural character of the area, contrast with the visual character from the coast, and potentially block views from surrounding property. Potential effects could be minimized by preserving as much natural vegetation as possible and integrating development into existing forest.
Water Resources (including Wetlands, Floodplains, Surface Waters, Groundwater, and Wild and Scenic Rivers)		
Wetlands	**Threshold: The action would:** **1. Adversely affect a wetland's function to protect the quality or quantity of municipal water supplies, including surface waters and sole source and other aquifers;**	Both emergent wetlands and freshwater forested/shrub wetlands have been identified on airport property, although this information is based on aerial photography interpretation dated August 1981. Field surveys and wetland delineations may be required to determine the

TABLE 5B
Summary of Potential Environmental Concerns
Friday Harbor Airport

Environmental Impact Category	FAA Order 1050.1F Significance Threshold/ Factors to Consider	Potential Concern
	2. Substantially alter the hydrology needed to sustain the affected wetland system's values and functions or those of a wetland to which it is connected; **3. Substantially reduce the affected wetland's ability to retain floodwaters or storm runoff, thereby threatening public health, safety or welfare (the term welfare includes cultural, recreational, and scientific resources or property important to the public);** **4. Adversely affect the maintenance of natural systems supporting wildlife and fish habitat or economically important timber, food, or fiber resources of the affected or surrounding wetlands.** **5. Promote development of secondary activities or services that would cause the circumstances listed above to occur; or** **Be inconsistent with applicable state wetland strategies.**	presence or absence of wetlands in project areas. Project areas which could be impacted include the relocation of the taxiway, new hangars, the possible land release for sale, and development south of the RPZ of Runway 16/34. Removal or relocation of wetlands may require a Section 404 permit under the *Clean Water Act*, which regulates the discharge of dredged or fill material into waters of the United States, including wetlands.
Floodplains	**Threshold: The action would cause notable adverse impacts on natural and beneficial floodplain values. Natural and beneficial floodplain values are defined in Paragraph 4.k of DOT Order 5650.2, *Floodplain Management and Protection.***	None. There are no 100-year floodplains located on the airport, and no projects are proposed in the coastal floodplain.
Surface Waters	**Threshold: The action would:** **1. Exceed water quality standards established by federal, state, local, and tribal regulatory agencies; or** **2. Contaminate public drinking water supply such that public health may be adversely affected.**	The airport is located within the San Juan Islands subwatershed and located within the coastal region of the watershed. Most likely, runoff from the airport will flow in an east-southeast pattern towards North Bay through two stormwater basins east of the airport (identified in Exhibit 1K in the Environmental Inventory portion of the report). Stormwater pollutants are a source of potential adverse effect to endangered species living in North Bay. The Port of Friday Harbor manages airport stormwater discharges with a National Pollutant Discharge Elimination System (NDPES) Industrial Stormwater General Permit issued and regulated by the Washington State Department of Ecology. Improvements to the airport

TABLE 5B
Summary of Potential Environmental Concerns
Friday Harbor Airport

Environmental Impact Category	FAA Order 1050.1F Significance Threshold/ Factors to Consider	Potential Concern
		will require a revised permit to be issued addressing operational and structural source controls, treatment best management practices (BMPs), and sediment and erosion control. FAA's Advisory Circular (AC) 150/5370-10G, *Standards for Specifying Construction of Airports, Item P-156, Temporary Air and Water Pollution, Soil Erosion and Siltation Control* should also be implemented during construction projects at the Airport.
Groundwater	**Threshold: The action would:** **1. Exceed groundwater quality standards established by federal, state, local, and tribal regulatory agencies: or** **2. Contaminate an aquifer used for public water supply such that public health may be adversely affected.** Factors to consider are when a project would have the potential to: • Adversely affect natural and beneficial groundwater values to a degree that substantially diminishes or destroys such values; • Adversely affect groundwater quantities such that the beneficial uses and values of such groundwater are appreciably diminished or can no longer be maintained and such impairment cannot be avoided or satisfactorily mitigated; or Present difficulties based on water quality impacts when obtaining a permit or authorization.	None. Proposed projects would not substantially change the amount of water used by the airport. Additionally, the airport property does not serve as a significant source of groundwater recharge and is not located near a sole source aquifer.
Wild and Scenic Rivers	FAA has not established a significance threshold for Wild and Scenic Rivers. Factors to consider are when an action would have an adverse impact on the values for which a river was designated (or considered for designation) through: • Destroying or altering a river's free-flowing nature; • A direct and adverse effect on the values for which a river was designated (or under study for designation);	None. The nearest designated Wild and Scenic river, Dungeness River, is over 30 miles from the airport. This river is also listed on the NRI. The recommended airport projects would not have adverse effects on the river's outstanding remarkable values (i.e., scenery, recreation, geology, fish, wildlife, and history).

TABLE 5B
Summary of Potential Environmental Concerns
Friday Harbor Airport

Environmental Impact Category	FAA Order 1050.1F Significance Threshold/ Factors to Consider	Potential Concern
	• Introducing a visual, audible, or other type of intrusion that is out of character with the river or would alter outstanding features of the river's setting; • Causing the river's water quality to deteriorate; • Allowing the transfer or sale of property interests without restrictions needed to protect the river or the river corridor; or Any of the above impacts preventing a river on the Nationwide Rivers Inventory (NRI) or a Section 5(d) river that is not included in the NRI from being included in the Wild and Scenic River System or causing a downgrade in its classification (e.g., from wild to recreational).	

Source: Coffman Associates analysis

LAND USE COMPATIBILITY

Land use planning in the area surrounding Friday Harbor Airport occurs through regulatory and non-regulatory means. The primary regulatory tool for directing land use is the zoning ordinance, which limits the types, size, and density of land uses in various locations. Examples of land use types include residential, commercial, industrial, and agricultural. Non-regulatory means of land use control include land use plans. These can be adopted for the greater municipality or for specific areas. Within the vicinity of Friday Harbor Airport, there are areas under the land use planning jurisdiction of the Town of Friday Harbor and San Juan County.

It is important to note the distinction between the primary land use concepts used in evaluating development within the airport environs and existing land use, zoning, and comprehensive plan land use. Existing land use refers to property improvements as they *exist today* according to county records. Zoning identifies the type of land use *permitted on* a given piece of property according to the county and city zoning ordinances and maps. Local governments are required to regulate the subdivision of all lands within their corporate limits.

The comprehensive plan land use map identifies the *projected or future* land use according to the locally adopted comprehensive plans. This document guides future development within the community planning area and provides the basis for zoning designations. Zoning ordinances should be consistent with

the general plan, where one has been prepared. In some cases, the land use allowed in the zoning ordinance or depicted in the general plan may differ from the existing land use.

The following sections describe the applicable land use policies for the areas within the vicinity of Friday Harbor Airport. Specifically, these sections pertain to the lands within the 65 DNL noise contours and the Part 77 Approach Surface out to one mile from the end of the runways. These geographic extents are discussed in more detail below.

EXISTING LAND USE

Existing land uses surrounding the airport include light industrial, commercial, and residential development to the east along Mullis Street. South of the airport, much of the area is developed in a low-density residential pattern with some light industrial and commercial properties. Much of the area west of the airport is undeveloped and wooded, but also includes the San Juan Center of Skagit Valley College, commercial development, a medical center, and low-density residential development. North of the airport, much of the land is developed with residences, commercial development, and a park.

TOWN OF FRIDAY HARBOR ZONING

Title 17 of the Town of Friday Harbor Municipal Code outlines the zones used to regulate the general growth within the town.

The purpose and allowable uses for each of these zones, as outlined in Title 17, Land Use, is discussed below.

Single-Family Residential: The purpose of the single-family residential zone is to provide for single-family residential uses and such other uses as may be compatible.

Permitted uses:

- Single-family dwellings; “transient accommodations,” as that term is defined in this title, are not permitted uses;
- Accessory uses and buildings normally incidental to the above permitted residential uses; a detached guesthouse is not a permitted accessory structure; “transient accommodations,” as that term is defined in this title, are not permitted uses; and
- Home occupations.

Multi-Family Residential: The purpose of the multi-family residential zone is to provide for multi-family residential development, allowing a maximum density of 14 units per acre and such other uses as may be compatible.

Permitted uses:

- Single-family dwellings; "transient accommodations," as that term is defined in this title, are not permitted uses;
- Accessory uses and buildings normally incidental to the above permitted residential uses; "transient accommodations," as that term is defined in this title, are not permitted uses;
- Multi-family dwellings; "transient accommodations," as that term is defined in this title, are not permitted uses;
- Home occupations;
- Community or public park and recreation facilities;
- Cultural and religious facilities; and
- Planned residential development.

Commercial: The purpose of the commercial zone is to provide retail and professional services and such other uses as may be compatible.

Permitted uses:

- Retail sales not requiring outdoor storage;
- Professional services;
- Indoor entertainment and amusement;
- Transient accommodations;
- Technical services;
- Governmental services;
- Churches;
- Marinas;
- Commercial parking lots;
- Community or public park and recreational facilities; and
- Ancillary residential uses on other than ground floor street front areas shall be less than 50 percent of the total habitable square footage.

Light Industrial: The purpose of the light industrial zone is to provide areas for the development of commercial and industrial facilities, and such other uses as may be compatible to protect the uses of adjoining zones, and to protect the natural environment from potential air, water, noise, visual, or other forms of pollution.

Permitted uses:

- Ancillary single-family uses;
- Wholesale and retail commercial uses to include outdoor storage;
- Light manufacturing uses;
- Automobile sales, service, and repair;
- Commercial parking lots;
- Community or public park and recreational facilities;
- Indoor entertainment and amusement facilities;
- Outdoor storage;
- Self-storage rental units;
- Professional services; and
- Cultural, religious, and health care facilities.

Light Manufacturing: The purpose of the light manufacturing zone is to provide for research and development, light manufacturing, and related commercial activities.

Permitted uses:

- Ancillary single-family residential uses;
- Retail and wholesale sales of products not requiring outdoor storage;
- Light manufacturing conducted indoors;
- Professional services;
- Technical services;
- Governmental services;
- Assembly, warehousing, and distribution operations not requiring outdoor storage;
- General repair services conducted indoors;
- Administrative and research and development facilities for high technology and science related activities; and
- Self-storage rental units.

Public Service: The purpose of the public service zone is to provide for siting of existing and future public schools and to protect existing publicly owned general aviation airports.

Permitted uses:

- Public schools;
- Playgrounds associated with public schools, to include lighting structures over 27 feet, provided they meet the requirements of Friday Harbor Municipal Code (FHMC)17.68.060(A)(12);
- Parking lots associated with public schools;
- Existing public general aviation airports;

- Aviation-related uses directly connected with existing public general aviation airports; and
- Parking lots associated with publicly owned general aviation airports.

Utility: The purpose of the utility zone is to provide areas for development and for regulations of both land located within the corporate limits and noncontiguous land annexed into the town that are used for municipal utility purposes. Such uses shall be compatible with the uses of adjoining zones and shall protect the natural environment from potential air, water, noise, visual, or other forms of pollution.

Permitted uses:

- Watersheds and reservoirs to supply potable water;
- Water treatment facilities;
- Water storage tanks;
- Wastewater treatment and solids handling facilities;
- Town public works yards and offices;
- Solid waste transfer facilities;
- Town maintenance facilities, including repairs performed outdoors and outdoor storage; and
- Accessory buildings associated with the above uses.

SAN JUAN COUNTY UNIFIED DEVELOPMENT CODE

The San Juan County Unified Development Code includes ordinances related to airport land use compatibility and the operation of airports. Chapter 18.35.150 is the airport overlay district, which is intended to promote land use compatibility between airport uses and land uses and activities in the vicinity of airports. The airport overlay district specifies the use of aircraft accident safety zones and Part 77 imaginary surfaces to promote land use compatibility. The accident safety zones are to be based on guidance provided in the *Airports and Compatible Land Use Guidebook* produced by the Washington State Department of Transportation. At this time, the overlay zone does not include the aforementioned safety zones for Friday Harbor Airport. The complete text of Chapter 18.35.150 can be found in **Appendix D.**
Additionally, Chapter 18.40.030 outlines provisions to restrict the height of structures in relation to an airport's Part 77 surfaces and hazards for airports. The height restrictions state that within the approach, transitional, horizontal, and conical zones structures are allowed unless the height would penetrate the applicable surface. This chapter also includes restrictions for rights-of-way within an airport's primary surface, lights or generation of smoke or haze that may interfere with air navigation, and land uses that may increase bird strike hazards. The complete text of Chapter 18.40.030 can be found in **Appendix D**.

TOWN OF FRIDAY HARBOR COMPREHENSIVE PLAN

The *Town of Friday Harbor Comprehensive Plan*, adopted in 2018, outlines the community's vision for future development. The following discussion, policies, and goals included in the Comprehensive Plan pertain to Friday Harbor Airport:

> Public Service Development Discussion: "The Comprehensive Plan must identify sufficient land to provide for the public school and public airport needs of the Friday Harbor community… The amount of land being used by public airports is not expected to expand during the planning period."
>
> Public Service Development Goals and Policies:
>
> - PS-3: Ensure that the quality of life of neighboring areas is not diminished by the siting of public schools or public airports. Including access to facilities that are constructed and designed for safe ingress and egress, per Town's specifications, and that do not disrupt established neighborhoods.
> - PS-5: Protect public airports from encroachment by incompatible development or uses.
> - PS-6: Friday Harbor should allow the establishment of a Public Service designation.
> - PS-7: Uses in the Public Service designation should include, but are not limited to, public schools, playgrounds, and parking lots related to public schools, the existing public airport, and aviation-related uses directly connected to the existing public airport.
>
> Transportation Policy: TE-36: Friday Harbor should coordinate with the Port of Friday Harbor to ensure that long-term operation of the Friday Harbor Airport is compatible with surrounding land uses and consistent with the Comprehensive Plan by:
>
> - Identifying land use types and intensities that are compatible with the airport.

SAN JUAN COUNTY COMPREHENSIVE PLAN

The *San Juan County Comprehensive Plan* includes the following goals and policies related to airports:

> Transportation Goal 6.3.A(1): To recognize the importance of public air transportation facilities to island commerce as well as to mobility of island residents.
>
> Transportation Goal 6.3.A(2): To promote optimum compatibility between air transportation facilities and services and other land uses in a manner that minimizes the impacts of airstrip, airfield, and airport use, while maintaining adequate, safe, efficient, and convenient service.
> Transportation Policies 6.3.A(1-3,5):

1. Coordinate with the WSDOT Aviation Division, FAA and port districts to provide and maintain air transportation facilities and services which:
   a. Serve the needs of island residents and visitors**;**
   b. Are planned consistent with the County's adopted land use goals and policies and that are developed through cooperation, consultation and participation with port districts, and airport operators, owners, users and the public; and
   c. Are consistent with state, regional and international air transportation plans.

2. Foster recognition by pilots and other airport users of their roles in minimizing air traffic safety hazards, noise, and other immediate impacts of airport activities on surrounding land uses. Cooperate with the port districts and solicit participation from airport operators, owners, and users, and the public, in anticipating and responding to land use, safety and noise concerns.

3. Moderate impacts of facilities for aircraft uses and facility expansion by:
   a. Applying adopted policies and regulations and the permit systems established in land use plans to private airstrips and airfields as well as to public airports;
   b. Coordinating with the FAA, WSDOT Aviation Division, port districts and airport operators to consider airport overlay districts and airport master plans and layout plans for public airports;
   c. Encouraging consideration of the effects of noise, light, vibration, fumes and the perception of low flying aircraft; and
   d. Ensuring that location-specific standards for airports will identify and prohibit the siting of incompatible uses adjacent to them.

5. Work to ensure that all existing public use airports, including land and sea bases, are identified as essential public facilities.

Land Use Policy 2. Regulations and policies may not preclude the siting and construction of Essential Public Facilities (EPFs). When possible, EPFs shall comply with existing regulations and policies. When this is not possible, or when existing, nonconforming facilities need to be expanded, special siting, design, and approval procedures should be developed that:

e. Prevent the siting of incompatible uses adjacent to general aviation airports.

Land Use Section 2.5.D, Airport Overlay District

Goal: To protect the public health, safety, and welfare, to recognize those areas devoted to aviation uses and provide areas for those activities supporting or dependent upon aircraft or air transportation, when such activities benefit from a location within or immediately adjacent to a public airport, and to promote compatibility between airport uses and land uses and activities in the airport vicinity and environs.

Policies (2.5.D.1–4):

1. The Airport Overlay District designation may be applied to publicly owned airports, and accessory uses. The boundaries of an airport overlay district may not necessarily coincide with those of a port district.
2. Designate FAA Airspace Zones within the Airport Overlay Districts and establish development standards and regulations for the lands underlying FAA imaginary surfaces, including but not limited to, standards for location, design, operations, clearances, marking and lighting, buffering, landscaping, and noise abatement. Such standards should be based on Federal Aviation Administration advisory circulars regarding "Model Airport Hazard Zoning" and FAA regulations regarding "Objects Affecting Navigable Airspace" as they may be amended.
3. Designate Aircraft Accident Safety Zones within the Airport Overlay Districts and establish development standards and regulations for allowable uses, residential densities, open space, and noise to address safety issues and avoid the location of potentially incompatible uses in the airport environs.
4. If there is any conflict between regulations of an Airport Overlay District and regulations of an underlying designation, the more restrictive regulations should apply.

The *San Juan County Comprehensive Plan* also outlines the following land use designations, which are present within the vicinity of Friday Harbor Airport.

Rural Residential
Goal: To protect the predominantly residential character of some rural areas and provide for a variety of residential living opportunities at *rural densities*.

Policies:

(1) Areas which are characterized by the following criteria may be designated as Rural Residential on the *Comprehensive Plan* Official Maps:

i. There are existing small acreage platted areas generally with private covenants and restrictions, and some exclusively residential developments are expected to continue to occur; and

ii. Parcels are generally two to five acres in size, and may also include areas with lots less than two acres in size.

(2) Guide the site design of new residential land divisions to retain rural character and minimize the demand for and cost of public facilities and services.

(3) Prohibit cottage enterprises and commercial and industrial uses, other than home occupations and uses of comparable impact on residential use.

(4) Community facilities, such as fire stations, club houses, and associated recreational amenities, should be allowed in Rural Residential areas to serve these residential communities.

Rural General Use

Goal: To provide flexibility for a variety of *small-scale*, low-impact uses to locate on rural lands.

Policies:

(1) Areas which are characterized by the following criteria may be designated as Rural General Use on the *Comprehensive Plan* Official Maps:

i. There is an existing mix of residential development, scattered single family residences, small farms, forestry activities, resource-based commercial and industrial uses, cottage enterprises, rural commercial, and rural industrial uses;

ii. Parcels are generally five to twenty acres in size; and

iii. Soils are marginal or unsuitable for intensive commercial agriculture or forestry uses.

(2) Allow resource-based industrial and commercial activities, rural commercial, rural industrial, and cottage enterprise uses.

(3) Establish performance standards for the uses contained in Policy (2), *above*, to minimize adverse environmental and visual impacts. Standards should address access, circulation, building height and bulk, lighting, screening, signage, noise, odor, vibration, spray, smoke, waste disposal, and storm drainage control.

(4) Allowable uses should 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.

Rural Farm-Forest

Goal: To provide for rural living opportunities which are compatible with small-scale farming and forestry activities.

Policies:

(1) Areas which are characterized by the following criteria may be designated as Rural Farm-Forest lands on the *Comprehensive Plan* Official Maps:

i. The predominant land use is farming and forestry mixed with residential development;

ii. Parcels are generally five or more acres in size; and

iii. Soils are suitable for small-scale agricultural or forestry uses.

(2) Adopt site development standards for permissible uses that will maintain a predominant portion of the farm and forested areas for farming and forest uses.

(3) Allow cottage enterprise uses and agriculture- and forestry-related commercial and industrial uses, such as processing and limited retailing facilities for farm and forest products, to be located on Rural Farm-Forest lands.

(4) Establish development standards that allow for farm stay accommodations for agritourism enterprises.

(5) Allow the development of farm worker accommodations on Rural Farm-Forest lands

subject to standards that ensure the occupancy is seasonal and limited to persons employed by the proprietor in farm labor for a farm production season only, and that ensure compliance with applicable public health and safety requirements.
(6) Establish performance standards for the uses listed in Policies (3), (4) and (5), *above*, to minimize adverse environmental and visual impacts. Standards should address access, circulation, building height and bulk, lighting, screening, signage, noise, odor, vibration, spray, smoke, waste disposal, and storm drainage.

Urban Growth Boundary

The Town of Friday Harbor and San Juan County have entered into an Urban Growth Area Management Agreement to cooperatively plan and provide public services in unincorporated areas of San Juan County that are adjacent to the Town. The Agreement outlines the process that these entities will use to promote development within the Town of Friday Harbor and in areas where public utility infrastructure is available rather than within unincorporated portions of the county. No Urban Growth Areas are within the future 65 DNL noise contours or the Part 77 Approach Surface.

Airport-Related Overlays

As previously discussed, San Juan County has adopted an airport overlay district; however, there are no zones established for Friday Harbor Airport. The Town of Friday Harbor has not adopted an airport-related overlay zone.

Subdivision Regulations

Subdivision regulations apply in cases where a parcel of land is proposed to be divided into lots or tracts. They are established to ensure the proper arrangements of streets, adequate and convenient public spaces, efficient movement of traffic, adequate and properly located facilities, and orderly and efficient layout and use of land.

Subdivision regulations can be used to specify requirements for airport-compatible land development by requiring developers to plat and develop land to minimize noise impacts or reduce the noise exposure to new development. The regulations can also be used to protect the airport proprietor from litigation for noise impacts at a later date.

The most common requirement is the dedication of a noise or avigation easement to the airport sponsor by the land developer as a condition of the development approval. Easements typically authorize overflights of property, with noise levels attendant to such operations. They can also require developers to incorporate noise insulation during construction.

The Town of Friday Harbor adopted subdivision regulations, which may be found in Table 16 of the municipal code. According to the regulations, there are not specific procedures related to airport land use compatibility in the Town's subdivision process.

Land division and subdivision procedures for San Juan County are codified in Chapter 18.70, Land Divisions of the San Juan County Code. According to this chapter, there are not specific procedures related to airport land use compatibility in the county's subdivision process.

Building Code

Building codes regulate the construction of buildings and ensure that they are constructed in a safe manner. Building codes may be used to require sound insulation in new residential, office, and institutional buildings when warranted by existing or potential high aircraft noise levels. According to the Friday Harbor Municipal Code and the San Juan County Code, each jurisdiction has adopted the International Existing Building Code with State of Washington amendments, which do not include specific provisions for aircraft noise attenuation.

NON-COMPATIBLE DEVELOPMENT ANALYSIS

Areas with the potential for non-compatible development, when compared to the noise exposure contours and Part 77 approach surfaces, are evaluated below. This was accomplished by evaluating the locally adopted future land use plan and zoning designations for those parcels encompassed by the noise contours to determine if noise-sensitive land uses could be developed on these areas. Additionally, for those areas within the Part 77 approach surface, an evaluation of the height of structures was performed to determine if structures within these areas penetrate this surface.

Noise Exposure Contours

The standard methodology for analyzing noise conditions at airports involves the use of a computer simulation model. The FAA has approved the Airport Environmental Design Tool (AEDT) for use in environmental analyses. The purpose of the noise model is to produce noise exposure contours that are overlain on a map of the airport and vicinity to graphically represent aircraft noise conditions. When compared to land use, zoning, and general plan maps, the noise exposure contours may be used to identify areas that are currently or have the potential to be exposed to aircraft noise.

To achieve an accurate representation of an airport's noise conditions, the AEDT uses a combination of industry standard information and user-supplied inputs specific to the airport. The software provides noise characteristics, standard flight profiles, and manufacturer-supplied flight procedures for aircraft which commonly operate at Friday Harbor Airport. As each aircraft has different design and operating characteristics (number and type of engines, weight, and thrust levels), each aircraft emits different

noise levels. The most common way to spatially represent the noise levels emitted by an aircraft is a noise exposure contour.

Airport specific information, including runway configuration, flight paths, aircraft fleet mix, runway use distribution, local terrain and elevation, average temperature, and numbers of daytime and nighttime operations, are also used as modeling inputs.

Based on the assumptions provided by the user, the AEDT calculates average 24-hour aircraft sound exposure within a grid covering the airport and surrounding areas. The grid values, represented with the day-night noise level metric or DNL, at each intersection point on the grid represent a noise level for that geographic location. To create the noise contours, an isoline, similar to those on a topographic map, is drawn which connects points of the same DNL noise value. In the same way that a topographic contour represents the same elevation, the noise contour identifies areas of equal noise exposure.

DNL is the metric currently accepted by the FAA, EPA, and Department of Housing and Urban Development (HUD) as an appropriate measure of cumulative noise exposure. These three agencies have each identified the 65 DNL noise contour as the threshold of incompatibility.

The FAA guidelines summarized in **Exhibit 5D** indicate that all land uses are acceptable in areas below 65 DNL. At or above the 65 DNL threshold, residential land uses without acoustic treatment, mobile homes, and transient lodging are all incompatible. The exhibit notes that homes of standard construction and transient lodging may be considered compatible where local communities have determined these uses are permissible; however, acoustic treatment of these structures is recommended to meet noise level reduction thresholds when comparing the outdoor noise level to the indoor noise level. Schools and other public use facilities are also generally considered to be incompatible with noise exposure above 65 DNL. As with residential development, communities can make a policy decision that these uses are acceptable with appropriate sound attenuation measures. Hospitals and nursing homes, places of worship, auditoriums, and concert halls are structures which are generally compatible if measures to achieve noise level reduction are incorporated into design and construction of structures. Outdoor music shells and amphitheaters are not compatible and should be prohibited within the 65 DNL noise contour. Additionally, agricultural uses and livestock farming are generally considered compatible with the exception of related residential components of these uses, which should incorporate sound attenuation measures.

Noise exposure contours were prepared for Friday Harbor Airport for a baseline condition (2017) and a long-range condition (2037) based on the operational forecasts presented in Chapter Two. The resulting contours are shown on **Exhibit 5C**.

Part 77 Approach Surface

Using a similar process to the non-compatible development analysis for the noise contours, the zoning

LAND USE	Yearly Day-Night Average Sound 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
Government services	Y	Y	25	30	N	N
Transportation	Y	Y	Y[2]	Y[3]	Y[4]	Y[4]
Parking	Y	Y	Y[2]	Y[3]	Y[4]	N
Commercial Use						
Offices, business and professional	Y	Y	25	30	N	N
Wholesale and retail-building materials, hardware and farm equipment	Y	Y	Y[2]	Y[3]	Y[4]	N
Retail trade-general	Y	Y	25	30	N	N
Utilities	Y	Y	Y[2]	Y[3]	Y[4]	N
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

The designations contained in this table do not constitute a federal determination that any use of land covered by the program is acceptable 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 erally-determined land uses for those determined to be appropriate by local authorities in response to locally-determined needs and values in ving noise compatible land uses.

See other side for notes and key to table.

KEY

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, 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 and 30 dB, respectively, should be incorporated into building codes and be considered in individual approvals. Normal residential construction can be expected to provide an 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 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.

Source: ***14 CFR Part 150***, Appendix A, Table 1.

for parcels within the Part 77 approach surfaces out to one mile from the end of the runways were evaluated. The dimensions of the Part 77 approach surfaces are defined in Code of Federal Regulations (CFR) Part 77, *Objects Affecting Navigable Airspace,* and are intended to be used to specify heights at which structures would be considered an obstruction and, therefore, result in a potentially adverse impact to the safe and efficient use of navigable airspace. The Part 77 Approach Surfaces out to one mile from the runway end are shown on **Exhibit 5E**.

Future Land Use Summary

For the purposes of this analysis, local land use information was collected for the areas within the 65 DNL noise contours and the Part 77 Approach Surfaces out to one mile from the runway end. Land use information includes zoning and comprehensive plan mapping for the Town of Friday and from the San Juan County Unified Development Code.

Noise Contours

As previously discussed, for existing and future conditions, the 65 DNL noise contour extends beyond the eastern boundary of the airport over Mullis Street. Within the Town of Friday Harbor, the land within the noise contour is zoned Light Industrial. Based on a review of aerial photography, these areas are currently developed with commercial land uses, which are considered compatible at 65 DNL. It is important to note that although these areas are developed, redevelopment may occur and that non-compatible land uses, such as residences, are permitted uses in accordance with the zoning ordinance.

The *Town of Friday Harbor Comprehensive Land Use Plan* map indicates that the land within the future 65 DNL is planned for non-residential development. As discussed in the Comprehensive Plan, the Town of Friday Harbor has adopted nonresidential commercial and professional service zones to meet the needs of business and the public in a convenient setting. These areas are to be designed to promote easy access for nearby residents, while also maintaining significant view and public view corridors.

The portions of San Juan County within the 65 DNL noise contour are developed with a fire station and multiple large-lot or rural residences. There is also undeveloped land within the noise exposure contours. Areas within the noise contours are identified as Rural Residential, Rural General Use, and Rural Farm-Forest as indicated on **Exhibit 5F**. These designations would promote development similar to what exists presently. In cases where a property may be developed with residences, the structures should be located outside of the future 65 DNL noise exposure contours.

Part 77 Approach Surfaces

As indicated on **Exhibit 5E**, Town of Friday Harbor zoning designations for land within the Part 77 Approach Surface include: Single-Family Residential, Multi-Family Residential, Commercial, Light Industrial, Light Manufacturing, Public Use, and Utility. Based on a review of the Town of Friday Harbor Municipal Code, the maximum height for structures in the Town is 27 feet. Based on the point closest to the runway end at which the Part 77 Approach Surface crosses the airport boundary to the north the height of the Approach Surface is 43 feet above the ground. Depending on the local topography, which generally rises north of the airport until the area just south of Boling Alley, construction of a building 27 feet tall may create an obstruction to the Part 77 Approach Surface.

As previously discussed, Chapter 18.40.030 of the San Juan County Code states that structures may be allowed within the Approach Zone without penetrating the Approach Surface.

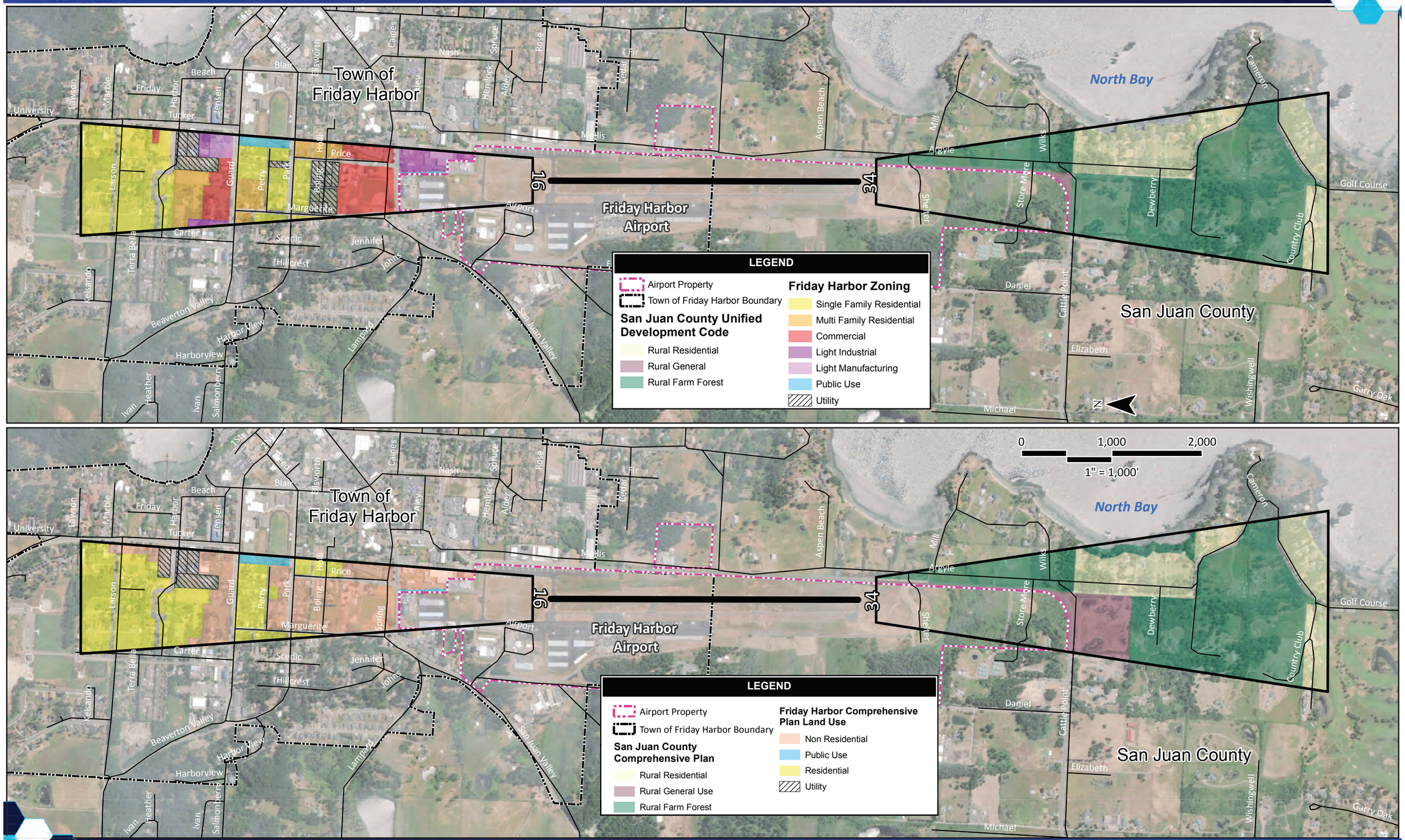
RECOMMENDATIONS

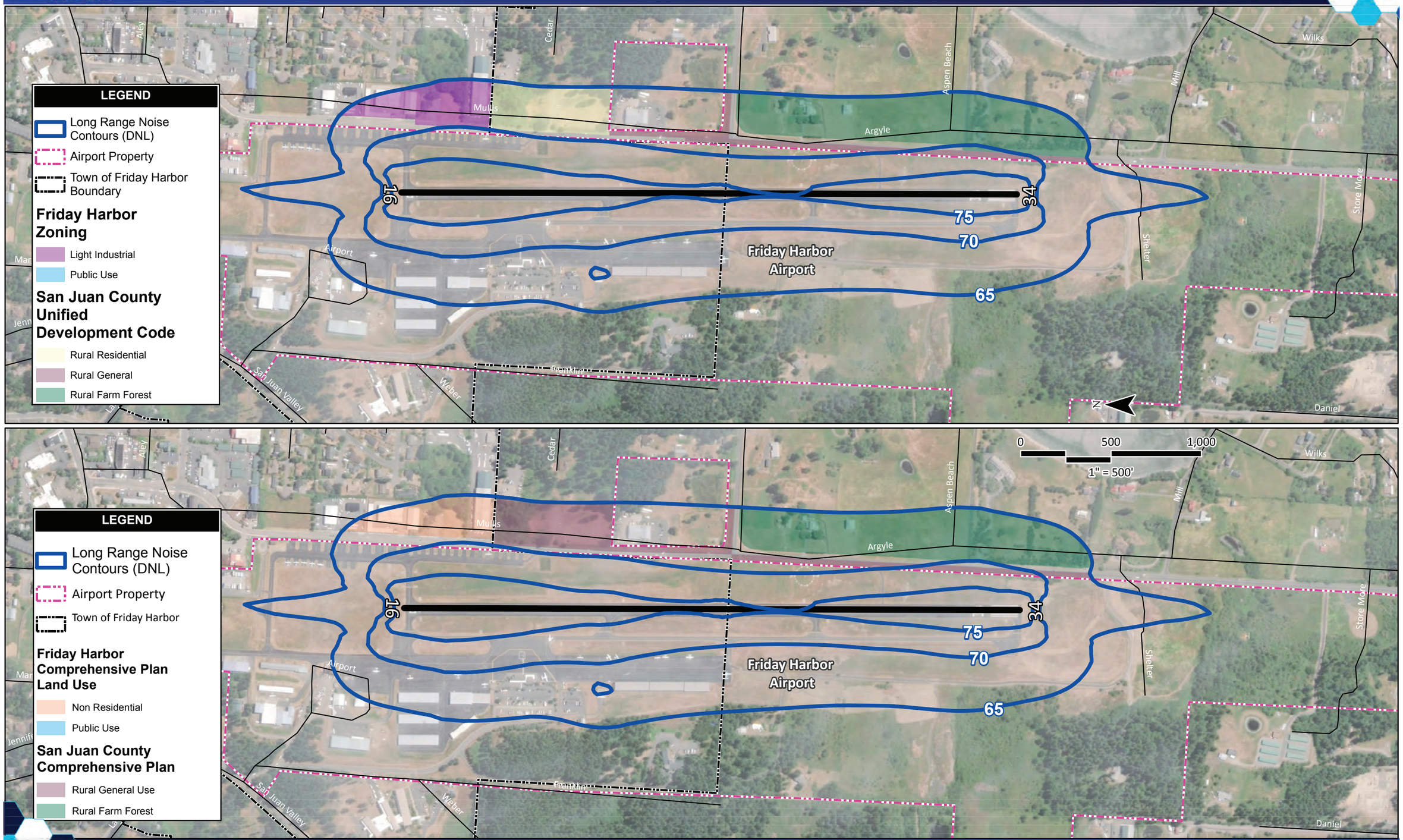
Based on the information presented above and the non-compatible development analysis, the following recommendations are provided to maintain airport land use compatibility in the vicinity of Friday Harbor Airport.

Establish Airport Overlay Zones for San Juan County. As previously discussed, San Juan County has established the regulatory framework for an Airport Overlay Zone within the county. The overlay zone text includes provisions for safety zones and height limitations based on guidance provided by the Washington State Department of Transportation's *Airports and Compatible Land Use Guidebook*. Although the text for such an overlay zone exists, zones have not been established for Friday Harbor Airport. Therefore, it is recommended that zones be established for the airport in accordance with the guidance mentioned above.

Consider Adopting an Airport Overlay Zone for the Town of Friday Harbor. To provide a uniform approach to protecting Friday Harbor Airport, the Port of Friday Harbor should encourage the Town of Friday Harbor to adopt an airport overlay zone similar to what has been adopted for San Juan County. The overlay safety zones discussed above are also recommended for the Town of Friday Harbor.

Adopt Fair Disclosure Requirements for Real Estate Transactions Within the Vicinity of the Airport. Fair disclosure regulations are intended to ensure that prospective buyers of property are informed that the property is or will be exposed to potentially disruptive aircraft noise or overflights. It is not uncommon, around even the busiest airports, for newcomers to report having bought property without having been informed about airport noise levels. At the most formal level, fair disclosure can be implemented through a local ordinance requiring a deed notice for property within the vicinity based on an existing boundary, such as the Part 77 Horizontal Surface. The following is an example of deed notice language that would notify the property owner of the proximity of an airport and expectations for living in the vicinity of an airport:


Town of Friday Harbor
Friday Harbor Airport
North Bay
San Juan County
16
34
N
0
1,000
2,000
1" = 1,000'
LEGEND
Airport Property
Town of Friday Harbor Boundary
San Juan County Unified Development Code
Rural Residential
Rural General
Rural Farm Forest
Friday Harbor Zoning
Single Family Residential
Multi Family Residential
Commercial
Light Industrial
Light Manufacturing
Public Use
Utility
LEGEND
Airport Property
Town of Friday Harbor Boundary
San Juan County Comprehensive Plan
Rural Residential
Rural General Use
Rural Farm Forest
Friday Harbor Comprehensive Plan Land Use
Non Residential
Public Use
Residential
Utility


LEGEND
Long Range Noise Contours (DNL)
Airport Property
Town of Friday Harbor Boundary
Friday Harbor Zoning
Light Industrial
Public Use
San Juan County Unified Development Code
Rural Residential
Rural General
Rural Farm Forest
LEGEND
Long Range Noise Contours (DNL)
Airport Property
Town of Friday Harbor
Friday Harbor Comprehensive Plan Land Use
Non Residential
Public Use
San Juan County Comprehensive Plan
Rural General Use
Rural Farm Forest
16
34
75
70
65
Friday Harbor Airport
Argyle
Mullis
Cedar
Aspen Beach
Wilks
Mill
Store Moore
Shelter
Airport
San Juan Valley
Weber
Daniel
0
500
1,000
1" = 500'
N

The subject property is within the vicinity of Friday Harbor Airport, located at 800 Franklin Road, Friday Harbor, WA 98250. Properties within this area are routinely subject to overflights by aircraft using this public-use airport and, as a result, residents may experience inconvenience, annoyance, or discomfort arising from the noise of such operations. Residents of property near such airports should, therefore, be prepared to accept the inconvenience, annoyance, or discomfort from normal aircraft operations. Residents also should be aware that the current volume of aircraft activity may increase in the future in response to local population and economic growth. Any subsequent deed conveying this parcel or subdivisions thereof shall contain a statement substantially this form.

Incorporate Airport Land Use Compatibility Goals and Policies into Comprehensive Plans. Appendix J of the previously mentioned *Airports and Compatible Land Use Guidebook* provides a series of goals and policies that support airport land use compatibility planning within the areas surrounding airports. A complete list of suggested goals and policies is included in **Appendix D** of this document, some of which have been adopted by San Juan County. Examples include:

- Protect the viability of the airport as a significant economic resource to the community by encouraging compatible land uses, densities, and reducing hazards that may endanger the lives and property of the public and aviation users.

- Promote the safe operation (Name of aviation facilities) by encouraging compatible land uses and activities, and discouraging uses or activities that will impede safe flight operations or endanger the lives of people on the ground.

SUMMARY

Friday Harbor Airport has transitioned from a B-I(s) facility to a B-II(s) facility. As a result, the applicable design standards for the airport have changed and are more restrictive. The recommended concept presents a plan to meet the new design standards, to the greatest degree feasible, while maintaining the current operational capability of the airport.

On the airside, the plan recommends maintaining the current footprint of the runway. At 3,402 feet in length, the runway is approximately 100 feet short of the ideal length; however, this difference would have minimal impact on aircraft operating at the airport. By maintaining the existing runway, no future extension of the runway is considered.

Parallel Taxiway A, which is currently only 156 feet from the runway, is planned to be reconstructed at the standard distance of 240 feet. This project would have a negative impact on commercial operations

in the terminal area by reducing the size of the commercial apron, which is already undersized. Therefore, as a safety and capacity project, a replacement terminal building is planned to be constructed in the undeveloped southwest quadrant of the airport.

To meet the new B-II(s) design standards the following actions are planned:

1. RSA – Grade to standard.
2. ROFA – Depress Mullis Street, the perimeter fence, and relocate the windcone.
3. RPZ – Maintain existing condition, while seeking opportunities to remove incompatible land uses.

On the landside, the plan identifies a need for an additional 155,400 square feet of aircraft hangar space. The recommended plan shows the potential for a total of 195,600 square feet of space. This includes utilizing a portion of the undeveloped southwest quadrant for hangar development.

A replacement terminal building is planned in the southwest quadrant of the airport. This building would be approximately 10,000 square feet to meet the long-term needs of the airport. Replacement of the terminal building is necessary to accommodate the relocation of the Taxiway A to the standard separation distance of 240 feet.

The next chapter of this master plan will present the 20-year capital improvement program, a reasonable schedule for undertaking the projects, and strategies for funding the recommended improvements over the course of the next 20 years.

FRIDAY HARBOR AIRPORT



CHAPTER SIX

Capital Improvement Program

AIRPORT MASTER PLAN



Chapter Six

CAPITAL IMPROVEMENT PROGRAM

The analyses completed in previous chapters evaluated development needs at the Airport over the next 20 years, based on forecast activity, operational efficiency, and meeting Federal Aviation Administration (FAA) design standards. Next, basic economic, financial, and management rationale is applied to each development item so the feasibility of each item contained in the plan can be assessed.

The presentation of the capital improvement program (CIP) has been organized into three sections. First, the airport development schedules and CIP cost estimates are presented in narrative and graphic form. Second, capital improvement funding sources on the federal, state, and local levels are identified and discussed. Third, a funding plan is presented which identifies the range of potential capital expenses for the Airport based on various funding assumptions.

Table 6A summarizes the aviation demand forecasts and key planning horizon milestones for the master plan.

TABLE 6A
Planning Horizon Summary
Friday Harbor Airport

	Base Year 2017	Short Term	Intermediate Term	Long Term
BASED AIRCRAFT	152	164	173	192
ENPLANEMENTS				
Scheduled Carriers	9,972	11,084	12,478	15,800
Charters	3,028	3,416	3,822	3,600
TOTAL ENPLANEMENTS	13,000	14,500	16,300	19,400
ANNUAL OPERATIONS				
Commercial Operations				
Air Taxi - Commuter	8,990	8,796	9,404	10,228
Air Taxi - Cargo, Air Ambulance	1,020	1,040	1,060	1,100
Air Taxi Other - Fractionals, Charters	100	164	236	272
Subtotal Commercial Operations	10,110	10,000	10,700	11,600
General Aviation				
Itinerant	12,533	13,701	14,608	17,048
Local	24,534	26,414	28,020	31,421
Subtotal General Aviation Operations	37,067	40,115	42,628	48,469
TOTAL OPERATIONS	**47,177**	**50,115**	**53,328**	**60,069**

Notes: FAA approved forecast dated 11.19.2018
Source: Coffman Associates analysis

AIRPORT DEVELOPMENT SCHEDULES AND COST SUMMARIES

Now that the recommended development concept has been presented and specific needs and improvements for the Airport have been established, the next step is to determine a realistic schedule (implementation timeline) and associated cost estimates for the plan. The recommended improvements are grouped by planning horizon: short-term, intermediate-term, and long-term. The short-term planning horizon is further subdivided into yearly increments.

As a master plan is a conceptual document, implementation of the capital projects should only be undertaken after further refinement of their design and costs through architectural and engineering analyses. Moreover, some projects may require additional infrastructure improvements (i.e., drainage improvements, extension of utilities, etc.) that may take more than one year to complete.

At this juncture, it is difficult to know, precisely, what the cost of individual projects will be; however, preparing order-of-magnitude cost estimates is an effective way to get a feel for the current costs. Many federal agencies utilize a system of five classes of estimates, as presented in **Table 6B**.

TABLE 6B
Cost Estimate Classification

Estimate Class	Name	Purpose	Project Definition Level
Class 5	Order of Magnitude	Screening or Feasibility	0% to 2%
Class 4	Intermediate	Concept Study or Feasibility	1% to 15%
Class 3	Preliminary	Budget, Authorization, or Control	10% to 40%
Class 2	Substantive	Control or Bid/Tender	30% to 70%
Class 1	Definitive	Check Estimate or Bid/Tender	50% to 100%

Source: U.S. Department of Energy

Once the list of necessary projects was identified and refined, project-specific cost estimates were developed. The cost estimates include environmental documentation, design, engineering, construction administration, and contingencies that may arise on the project. Capital costs presented here should be viewed only as estimates subject to further refinement during design. Nevertheless, these estimates are considered sufficient for planning purposes. Cost estimates were developed based on recent airport construction costs in the region. Cost estimates for each of the development projects in the CIP are in current (2019) dollars. **Exhibit 6A** presents the proposed CIP for Friday Harbor Airport.

FAA utilizes a priority ranking system to help objectively evaluate potential airport projects. Projects are weighted toward safety, infrastructure preservation, standards, and capacity enhancement. FAA will participate in the highest priority projects before considering lower priority projects, even if a lower priority project is considered a more urgent need by the local sponsor. Nonetheless, the project should remain a priority for the airport, and funding support should continue to be requested in subsequent years.

The most important feature of the CIP is that future projects for which the Airport may request FAA funding are included on the list. On an annual basis, the CIP is updated and reviewed with FAA. Projects on the CIP will be moved up and down, depending on priority and funding availability. Periodically, new projects will arise that can then be added to the annual CIP presented to the FAA.

Hangar construction is assumed to be undertaken by the private sector and is therefore not reflected in the CIP. The Airport is free to undertake hangar construction should they choose.

Routine pavement maintenance is a responsibility of the local airport sponsor and is required to meet FAA grant assurances. On average, the Airport invests approximately $20,000 into routine pavement maintenance. Routine pavement maintenance is not specifically called out in the CIP, but the Airport should be aware of this expense.

	PROJECT DESCRIPTION	PROJECT COST	FAA ELIGIBLE	WSDOT ELIGIBLE	LOCAL FUNDING
SHORT TERM PROGRAM					
2021					
1	NEPA Documentation for Master Plan Projects	$833,333	$750,000	$41,667	$41,667
2022					
2	Snow Removal Equipment (SRE) Building	$1,500,000	$1,350,000	$75,000	$75,000
2023					
3	RSA Grading (Design)	$175,000	$157,500	$8,750	$8,750
4	Runway Drainage Improvements (Design)	$135,000	$121,500	$6,750	$6,750
5	SW Development Area Phase 1 (Design)	$800,000	$720,000	$40,000	$40,000
2023 Subtotal		***$1,110,000***	***$999,000***	***$55,500***	***$55,500***
2024					
6	RSA Grading (Construction)	$550,000	$495,000	$27,500	$27,500
7	Runway Drainage Improvements (Construction)	$500,000	$450,000	$25,000	$25,000
2024 Subtotal		***$1,050,000***	***$945,000***	***$52,500***	***$52,500***
2025					
8	SW Development Area Phase 2 (Construction)	$2,500,000	$2,250,000	$125,000	$125,000
2026					
9	SW Development Area Phase 3 (Construction)	$1,800,000	$1,620,000	$90,000	$90,000
2027					
10	SW Development Area Phase 4 (Construction)	$1,700,000	$1,530,000	$85,000	$85,000
2028					
11	SW Development Area Phase 5 (Construction)	$1,700,000	$1,530,000	$85,000	$85,000
TOTAL SHORT TERM PROGRAM		**$12,193,333**	**$10,974,000**	**$609,667**	**$609,667**
INTERMEDIATE TERM PROGRAM					
1	Terminal Building/Side Aprons	$6,500,000	$5,850,000	$325,000	$325,000
2	Terminal Parking Lot and Loop Road	$1,150,000	$1,035,000	$57,500	$57,500
3	Obstruction Removal (North and South)	$250,000	$225,000	$12,500	$12,500
4	New Terminal Area Commercial Business Apron	$890,000	$516,200	$25,800	$348,000
5	New Terminal Area Taxilane - Phase 1	$450,000	$148,500	$7,400	$294,100
6	New Terminal Area Taxilane - Phase 2	$450,000	$148,500	$7,400	$294,100
7	Roads/Parking for New Terminal Area T-Hangars	$400,000	$360,000	$20,000	$20,000
8	Stormwater Detention Pond Construction/Expansion	$350,000	$315,000	$17,500	$17,500
9	Extend Apron South of Taxiway B/Site Prep	$780,000	$702,000	$39,000	$39,000
10	Remove Old Terminal Building/Site Prep	$870,000	$783,000	$43,500	$43,500
11	New North Taxilane	$390,000	$351,000	$19,500	$19,500
12	Tie-down Apron Expansion (Relocate Fuel Island)	$1,690,000	$1,521,000	$84,500	$84,500
13	Middle Taxilane Construction	$240,000	$216,000	$12,000	$12,000
14	Relocate Taxiway A to 240' (South End - Phase 1)	$1,840,000	$1,656,000	$92,000	$92,000
15	West Side Pavement Rehabilitation (Aprons/Taxilanes)	$250,000	$225,000	$12,500	$12,500
TOTAL INTERMEDIATE TERM PROGRAM		**$16,500,000**	**$14,052,200**	**$776,100**	**$1,671,700**
LONG TERM PROGRAM					
1	Taxiway D Grade Improvement/Elevate East Transient Apron	$3,500,000	$3,150,000	$175,000	$175,000
2	Depress Mullis Street for ROFA Clearance	$2,750,000	$2,475,000	$137,500	$137,500
3	Relocate Taxiway A to 240' (North End - Phase 2)	$3,000,000	$2,700,000	$150,000	$150,000
4	Taxilane to New Terminal Area - Second Access	$920,000	$828,000	$46,000	$46,000
5	Relocate Segmented Circle and Windcone	$20,000	$18,000	$1,000	$1,000
6	Runway Rehabilitation	$2,000,000	$1,800,000	$100,000	$100,000
7	Pavement Maintenance	$480,000	$432,000	$24,000	$24,000
TOTAL LONG TERM PROGRAM		**$12,670,000**	**$11,403,000**	**$633,500**	**$633,500**
TOTAL PROGRAM COSTS (Rounded to nearest $1,000)		**$41,363,000**	**$36,429,000**	**$2,019,000**	**$2,915,000**

Note: Totals may not equal due to rounding

The following sections will describe in greater detail the projects identified for the Airport over the next 20 years. The short-term projects are presented in yearly increments. The intermediate and long-term are grouped by local priority. **Exhibit 6B** presents the CIP phasing plan.

SHORT-TERM IMPROVEMENTS

The projects identified for the short-term planning period have been prioritized based on Airport need and potential to be funded. If any of these projects cannot be funded in the timeframe indicated, the airport sponsor should consider the project for the following year.

2021 Projects

Project #1: NEPA Documentation for Master Plan Projects
Description: Environmental documentation is required for all federally funded projects. The FAA Northwest Mountain Region prefers to examine the NEPA impacts for all short-term projects at one time. It is assumed that an Environmental Assessment (EA) will meet the environmental documentation requirement.
Cost Estimate: $833,333
Funding Eligibility: This project is eligible for 90 percent FAA and five percent WSDOT-Aviation funding.

2022 Projects

Project #2: Snow Removal Equipment (SRE)/Maintenance Building
Description: Construction of an SRE storage facility is eligible for FAA grant funding. The Airport currently uses several non-aviation structures for this purpose. The new SRE facility is planned to include non-eligible space for additional equipment storage needs.
Cost Estimate: $1,500,000
Funding Eligibility: This projected is estimated to be 75 percent eligible for FAA funding.

2023 Projects

Project #3: Runway Safety Area (RSA) Grading (Design)
Description: The RSA beyond (to the north of) the Runway 16 threshold is graded to standard. This will require excavation. The excavated material will be used to grade the RSA to the east side of the runway.
Cost Estimate: $175,000
Funding Eligibility: This project is eligible for 90 percent FAA and five percent WSDOT-Aviation funding.

Project #4: Runway Drainage Improvements (Design)
Description: The design element of various runway drainage improvements.
Cost Estimate: $135,000
Funding Eligibility: This project is eligible for 90 percent FAA and five percent WSDOT-Aviation funding.

Project #5: Southwest Development Area Phase 1 (Design)
Description: This is the design element of the first features of the planned southwest development area. The project includes design of a taxiway, access road utilizing the Storemore Way alignment, initial vehicle parking lot with 70 spaces, and the aircraft apron.
Cost Estimate: $800,000
Funding Eligibility: This project is eligible for 90 percent FAA and five percent WSDOT-Aviation funding.

2024 Projects

Project #6: Runway Safety Area (RSA) Grading (Construction)
Description: The RSA beyond (to the north of) the Runway 16 threshold is graded to standard. This will require excavation. The excavated material will be used to grade the RSA to the east side of the runway. This is the construction element of this project.
Cost Estimate: $550,000
Funding Eligibility: This project is eligible for 90 percent FAA and five percent WSDOT-Aviation funding.

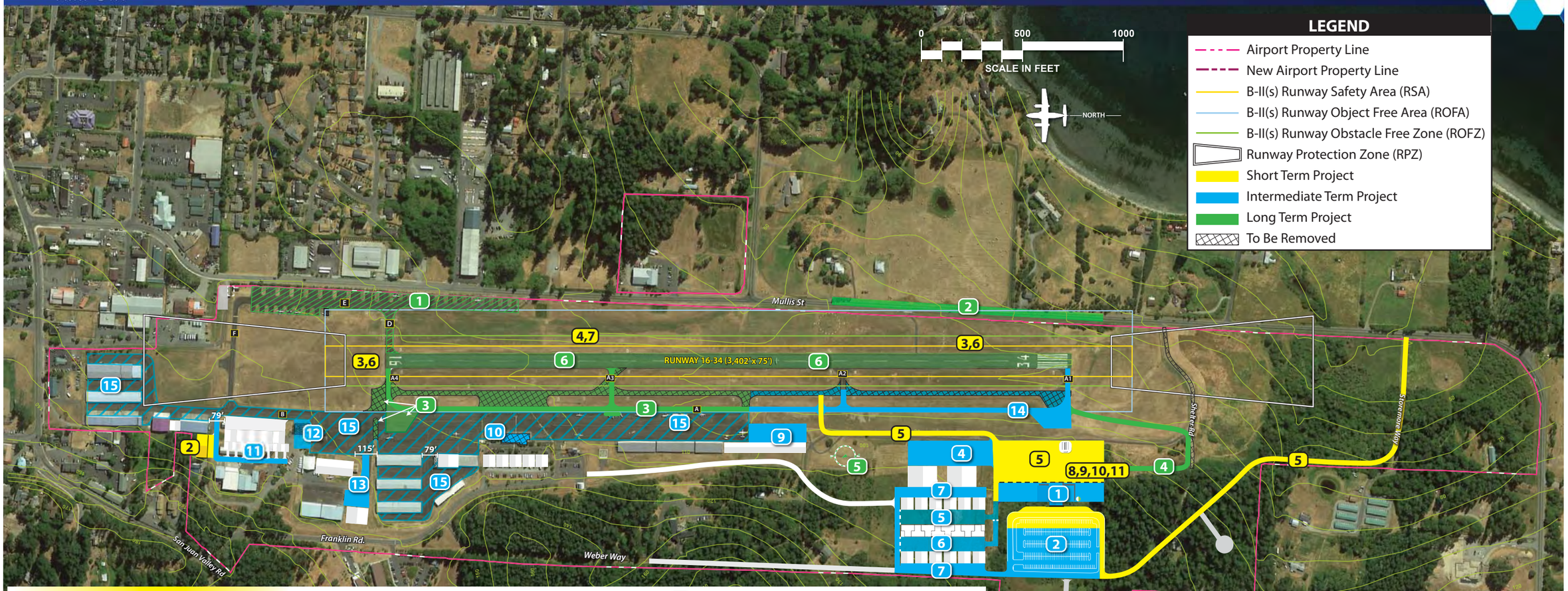
Project #7: Runway Drainage Improvements (Construction)
Description: The construction element of various runway drainage improvements.
Cost Estimate: $500,000
Funding Eligibility: This project is eligible for 90 percent FAA and five percent WSDOT-Aviation funding.

2025 Projects

Project #8: Southwest Development Area Phase 2 (Construction)
Description: This is the construction phase to access the southwest quadrant from both the airside and landside. Due to the grade change from Taxiway A to the terminal area (approximately 20 feet in elevation change over a distance of 200 feet), an extended taxiway is required to maintain grade standards. An initial aircraft apron is included. Storemore Way is improved to a 24-foot wide two-lane road leading to the terminal area. Shelter Road would be closed during this project, removing it from the runway protection zone (RPZ). An initial parking lot with up to 70 parking spaces is included.
Cost Estimate: $2,500,000
Funding Eligibility: This project is eligible for 90 percent FAA and five percent WSDOT-Aviation funding.

2026 Projects

Project #9: Southwest Development Area Phase 3 (Construction)
Description: Continued construction of the southwest development area. Project will require multiple construction phases so that the airport sponsor is able to provide the required matching share.
Cost Estimate: $1,800,000
Funding Eligibility: This project is eligible for 90 percent FAA and five percent WSDOT-Aviation funding.



SHORT TERM PROGRAM

2021

1. NEPA Documentation for Master Plan Projects-***NP***

2022

2. Snow Removal Equipment (SRE) Building

2023

3. RSA Grading (Design)
4. Runway Drainage Improvements (Design)-***NP***
5. SW Development Area Phase 1 (Design)

2024

6. RSA Grading (Construction)
7. Runway Drainage Improvements (Construction)

2025

8. SW Development Area Phase 2 (Construction)

2026

9. SW Development Area Phase 3 (Construction)

2027

10. SW Development Area Phase 4 (Construction)

2028

11. SW Development Area Phase 5 (Construction)

INTERMEDIATE TERM PROGRAM

1. Terminal Building/Side Aprons
2. Terminal Parking Lot and Loop Road
3. Obstruction Removal (North and South) - *NP*
4. New Terminal Area Commercial Business Apron
5. New Terminal Area Taxilane - Phase 1
6. New Terminal Area Taxilane - Phase 2
7. Roads/Parking for New Terminal Area T-Hangars
8. Stormwater Detention Pond Construction/ Expansion - *NP*
9. Extend Apron South of Taxiway B/Site Prep
10. Remove Old Terminal Building/Site Prep
11. New North Taxilane
12. Tie-down Apron Expansion (Relocate Fuel Island)
13. Middle Taxilane Construction
14. Relocate Taxiway A to 240' (South End - Phase 1)
15. West Side Pavement Rehabilitation (Aprons/Taxilanes)

LONG TERM PROGRAM

1. Taxiway D Grade Improvement/Elevate East Transient Apron
2. Depress Mullis Street for ROFA Clearance
3. Relocate Taxiway A to 240' (North End - Phase 2)
4. Taxilane to New Terminal Area - Second Access
5. Relocate Segmented Circle and Windcone
6. Runway Rehabilitation
7. Pavement Maintenance - *NP*

NP - Not Pictured White - Private development or beyond planning period.

Aerial Photo: Google Earth 7-24-17

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2027 Projects

Project #10: Southwest Development Area Phase 3 (Construction)
Description: Continued construction of the southwest development area. Project will require multiple construction phases so that the airport sponsor is able to provide the required matching share.
Cost Estimate: $1,700,000
Funding Eligibility: This project is eligible for 90 percent FAA and five percent WSDOT-Aviation funding.

2028 Projects

Project #11: Southwest Development Area Phase 3 (Construction)
Description: Continued construction of the southwest development area. Project will require multiple construction phases so that the airport sponsor is able to provide the required matching share.
Cost Estimate: $1,700,000
Funding Eligibility: This project is eligible for 90 percent FAA and five percent WSDOT-Aviation funding.

Short-Term Summary

The short-term focuses on the projects that will enable the relocation of Taxiway A to the standard distance from the runway. Prior to undertaking these projects, appropriate environmental documentation, assumed to be an EA, will need to be completed. Following completion of the EA, projects associated with relocating the terminal area to the currently undeveloped southwest quadrant are considered. This includes extending a new taxiway and vehicle access road to the area. The terminal building and aircraft apron projects are included in the short-term.

The short-term projects total approximately $12.2 million. The share eligible for FAA funding is estimated at $11.0 million. The portion eligible for WSDOT funding is estimated at $610,000, and the remaining local share is $610,000.

INTERMEDIATE-TERM IMPROVEMENTS

To provide maximum flexibility for management when programming capital improvement projects, the intermediate-term projects have been grouped and generally include those projects that may be needed in years six through ten. Airport management should regularly assess the need and timing for these projects based on actual demand and growth at the Airport.

Project #1: Terminal Building/Side Aprons - Design and Construction
Description: A new terminal building is planned in the undeveloped southwest quadrant of the Airport. This facility replaces the existing facility which is nearing the end of its useful like. The planned relocation

of Taxiway A to meet runway to taxiway design standards would reduce the already constrained commercial apron, making the relocation of the terminal building a capacity and safety enhancement project.
Cost Estimate: $6,500,000
Funding Eligibility: This project is eligible for 90 percent FAA and five percent WSDOT-Aviation funding.

Project #2: Terminal Parking Lot and Loop Road
Description: The planned terminal parking lot has capacity for 292 parking positions, 70 of which will have been completed in association with the terminal building project. Completion of the terminal loop road is planned as part of the project.
Cost Estimate: $1,150,000
Funding Eligibility: This project is eligible for 90 percent FAA and five percent WSDOT-Aviation funding.

Project #3: Obstruction Removal (North and South)
Description: The hillsides to the north and south of the Airport are heavily treed. This project is a placeholder for anticipated removal/topping of trees that may become obstructions.
Cost Estimate: $250,000
Funding Eligibility: This project is eligible for 90 percent FAA and five percent WSDOT-Aviation funding.

Project #4: New Terminal Area Commercial Business Apron
Description: An aircraft apron fronting two conventional hangars is planned. The first 50 feet of the apron closest to the hangars is not considered eligible for FAA funding. The remaining apron area is considered public-use and is eligible.
Cost Estimate: $890,000
Funding Eligibility: This project is eligible for approximately 60 percent FAA funding. It is assumed that builders of the planned hangars are responsible for an apron depth of 50 feet from the hangars.

Project #5: New Terminal Area Taxilane for Hangar Access (Phase 1)
Description: Public-use taxilane providing access to row of box hangars. Typically, only the width of the taxilane (25 feet) is eligible for FAA funding. The project cost assumes the whole area will be paved between the hangars.
Cost Estimate: $450,000
Funding Eligibility: This project is eligible for 33 percent FAA funding.

Project #6: New Terminal Area Taxilane for Hangar Access (Phase 2)
Description: Public-use taxilane providing access to row of box hangars. Typically, only the width of the taxilane (25 feet) is eligible for FAA funding. The project cost assumes the whole area will be paved between the hangars.
Cost Estimate: $450,000
Funding Eligibility: This project is eligible for 33 percent FAA funding.

Project #7: Roads/Parking for Terminal T-Hangars
Description: Construction of an access road and parking for planned hangars in the southwest quadrant.

Cost Estimate: $400,000
Funding Eligibility: This project is eligible for 90 percent FAA and five percent WSDOT-Aviation funding.

Project #8: Stormwater Detention Pond - Construction/Expansion
Description: Development of impervious surfaces will require additional stormwater runoff detainment. This project considers expansion of Mullis Pond or construction of a new detention pond located in the south portion of Airport property.
Cost Estimate: $350,000
Funding Eligibility: This project is eligible for 90 percent FAA and five percent WSDOT-Aviation funding.

Project #9: Extend Apron South of Taxiway B/Site Prep
Description: Additional aircraft apron which will also serve additional hangar construction. The site prep of the land where hangars would be constructed is also included.
Cost Estimate: $780,000
Funding Eligibility: This project is eligible for 90 percent FAA and five percent WSDOT-Aviation funding.

Project #10: Remove Old Terminal Building/Site Prep
Description: Demolition of the old terminal building and grading in preparation of new hangar construction.
Cost Estimate: $390,000
Funding Eligibility: This project is eligible for 90 percent FAA and five percent WSDOT-Aviation funding.

Project #11: New North Taxilane
Description: New taxilane providing access to existing hangar development area. Includes grading for new hangar construction.
Cost Estimate: $390,000
Funding Eligibility: This project is eligible for 90 percent FAA and five percent WSDOT-Aviation funding.

Project #12: Tie-Down Apron Expansion (Relocate Fuel Island)
Description: The north tie-down apron is planned to be expanded to the north on the site of the current airport restaurant to gain additional tie-down positions. Part of the project includes removal of the existing fuel island (to be replaced in the new terminal area). This project also includes removal of current airport restaurant and grading of the site.
Cost Estimate: $1,690,000
Funding Eligibility: This project is eligible for 90 percent FAA and five percent WSDOT-Aviation funding.

Project #13: Middle Taxilane Construction
Description: Reconstruction of the taxilane leading to the middle hangar development area. The taxilane is planned to be shifted approximately 10 feet to the north to meet taxiway object free area (TOFA) standard. Project does not include apron fronting planned new hangar.
Cost Estimate: $240,000
Funding Eligibility: This project is eligible for 90 percent FAA and five percent WSDOT-Aviation funding.

Project #14: Relocate Taxiway A to 240' Standard Separation Distance (South End - Phase 1)
Description: The relocation of Taxiway A is planned as a two-phase project with the south portion being relocated first.
Cost Estimate: $1,840,000
Funding Eligibility: This project is eligible for 90 percent FAA and five percent WSDOT-Aviation funding.

Project #15: West Side Pavement Rehabilitation (Aprons/Taxilanes)
Description: A placeholder for various pavement rehabilitation needed on the west side of the Airport.
Cost Estimate: $250,000
Funding Eligibility: This project is eligible for 90 percent FAA and five percent WSDOT-Aviation funding.

Intermediate-Term Summary

The intermediate-term projects include the first phase of relocating Taxiway A to the standard separation distance of 240 feet. Several taxilanes are proposed that will provide access to planned hangars.

The intermediate-term projects total approximately $16.5.0 million. The share eligible for FAA funding is estimated at $14.1 million. The portion eligible for WSDOT funding is estimated at $776,000, and the local share is estimated at $1.7 million.

LONG-TERM IMPROVEMENTS

Long-term projects are those planned for years 11-20. These projects are grouped as demand could shift over time. The need for these projects could be accelerated if exceptional growth occurs at the Airport. All relevant cost elements, including environmental documentation, design, and construction, are included for each project.

Project #1: Taxiway D Grade Improvement/Elevate East Transient Apron
Description: Project to elevate Taxiway D to meet grading standard. Will require a retaining wall along Mullis Street. Reconstruction of the transient apron will include providing at least 79 feet on either side of the apron, which corresponds the taxilane width.
Cost Estimate: $3,500,000
Funding Eligibility: This project is eligible for 90 percent FAA and five percent WSDOT-Aviation funding.

Project #2: Depress Mullis Street for TOFA Clearance
Description: This project considers depressing a portion of Mullis Street so the TOFA is not penetrated by the perimeter fence and passing vehicles on the road.
Cost Estimate: $2,750,000
Funding Eligibility: This project is eligible for 90 percent FAA and five percent WSDOT-Aviation funding.

Project #3: Relocate Taxiway A to 240' Standard Separation Distance (North End - Phase 2)
Description: With the completion of the new terminal area, this project would relocate the remaining portion of Taxiway A to 240 feet to meet standard.
Cost Estimate: $3,000,000
Funding Eligibility: This project is eligible for 90 percent FAA and five percent WSDOT-Aviation funding.

Project #4: Taxilane to New Terminal Area – Second Access
Description: A second access taxilane to the new terminal area is planned. This taxilane extends beyond the runway end, outside of the RPZ and the approach surface, and then turns back toward the terminal apron in order to maintain minimum grading standards. Retaining walls are not anticipated to be needed as part of this project.
Cost Estimate: $920,000
Funding Eligibility: This project is eligible for 90 percent FAA and five percent WSDOT-Aviation funding.

Project #5: Relocate Segmented Circle and Windcone
Description: The segmented circle and primary windcone are planned to be relocated to the west side of the airport to remove them from the runway object free area (ROFA).
Cost Estimate: $20,000
Funding Eligibility: This project is eligible for 90 percent FAA and five percent WSDOT-Aviation funding.

Project #6: Runway Rehabilitation
Description: By the end of the long-term timeframe, it is anticipated the runway will need a mill and overlay.
Cost Estimate: $2,000,000
Funding Eligibility: This project is eligible for 90 percent FAA and five percent WSDOT-Aviation funding.

Project #7: Pavement Maintenance
Description: This is a placeholder for anticipated pavement preservation projects.
Cost Estimate: $480,000
Funding Eligibility: This project is eligible for 90 percent FAA and five percent WSDOT-Aviation funding.

Long-Term Summary

Several of the long-term projects will bring certain areas up to standard. Taxiway D and the east transient apron are planned to be elevated to meet grading standards. Mullis Street is planned to be depressed by approximately 10 feet to meet ROFA standards. The remaining portion of Taxiway A will be relocated to the standard 240 feet from the runway. On-going pavement preservation is also included in the long-term planning period.

The long-term projects total approximately $12.7 million. The share eligible for FAA funding is estimated at $11.4 million. The portion eligible for WSDOT funding is estimated at approximately $600,000, and the local share is estimated at $600,000.

CAPITAL IMPROVEMENT SUMMARY

The CIP is intended as a road map of airport improvements to help guide the airport sponsor, FAA, and state aviation officials on needed projects. The plan as presented will meet the forecast demand over the next 20 years and, in many respects, beyond. The first five years of the CIP are separated into yearly installments, and the intermediate- and long-term projects are grouped together. The sequence of projects will likely change due to availability of funds or changing priorities in the years to come. Nonetheless, this is a comprehensive list of capital improvement projects the Airport should consider in the next 20 years.

The total CIP is estimated at approximately $41.4 million. The share eligible for FAA funding is estimated at $36.4 million. The portion eligible for WSDOT funding is estimated at $2.0 million, and the local share is estimated at $2.9 million.

CAPITAL IMPROVEMENT FUNDING SOURCES

There are generally four sources of funds used to finance airport development which include:

- Airport cash flow
- Revenue and general obligation bonds
- Federal/state/local grants
- Passenger facility charges (PFCs), which are reserved for commercial service airports

Access to these sources of financing varies widely among airports, with some large airports maintaining substantial cash reserves and the smaller commercial service and general aviation airports often requiring subsidies from local governments to fund operating expenses and to finance modest improvements.

Financing capital improvements at the Airport will not rely solely on the financial resources of the Port. Capital improvement funding is available through various grant-in-aid programs on both the federal and state levels. Historically, the Airport has received federal and state grants. While some years more funds could be available, the CIP was developed with project phasing in order to remain realistic and within the range of anticipated grant assistance. The following discussion outlines key sources of funding potentially available for capital improvements at the Airport.

FEDERAL GRANTS[1]

Through federal legislation over the years, various grant-in-aid programs have been established to develop and maintain a system of public-use airports across the United States. The purpose of this system and its federally based funding is to maintain national defense and to promote interstate commerce. The most recent legislation affecting federal airport funding is the *FAA Reauthorization Act of 2018*.

The current law authorizes the FAA's Airport Improvement Program (AIP) at $3.35 billion for fiscal years 2019 through 2023. The AIP is funded through the collection of user fees, such as those imposed on airline tickets, aircraft parts, and aviation fuel. Eligible airports are those included in the *National Plan of Integrated Airport Systems* (NPIAS), such as Friday Harbor Airport. **Table 6C** presents the approximate distribution of AIP funds and those categories for which the Airport may be eligible. The FAA determines which source grant funding would come from.

TABLE 6C
Federal AIP Funding Distribution

Funding Category	Percent of Total (2013)	Approximate Funds Available	Available to FHR
Passenger Entitlements	26.6%	$891,100,000	Yes
Cargo Entitlements	3.5%	$117,250,000	Yes
Nonprimary Entitlements	12.5%	$418,750,000	No
State Apportionment	7.4%	$247,900,000	Yes
Alaska Supplemental	0.7%	$23,450,000	No
Small Airport Fund	15.2%	$509,200,000	Yes
Discretionary Set Aside Funds			
Noise and Environmental Set Aside	4.2%	$140,700,000	Yes
Military Airports Program Set Aside	0.5%	$16,750,000	No
Reliever Set Aside	0.1%	$3,350,000	No
Discretionary Remaining after Set Asides			
Capacity/Safety/Security/Noise (C/S/S/N)	5.4%	$180,900,000	Yes
Pure Discretionary	1.8%	$60,300,000	Yes
Discretionary from Converted Entitlements/Apportionment	22.0%	$737,335,000	Yes
Totals	99.9%	$3,350,000,000	

AIP: Airport Improvement Program
Source: FAA Order 5100.38D, Airport Improvement Program Handbook

Funding for AIP-eligible projects is undertaken through a cost-sharing arrangement in which FAA provides up to 90 percent of the cost and the airport sponsor provides a 10 percent match. In exchange for this level of funding, the airport sponsor is required to meet various Grant Assurances, including maintaining the improvement. The following discussion of each of the funding categories is contingent upon

[1] Guidance on the eligibility of a project for federal AIP grant funding can be found in FAA Order 5100.38D, *Airport Improvement Program Handbook*, which can be accessed at:
http://www.faa.gov/airports/aip/aip_handbook/media/AIP-Handbook-Order-5100-38D

Congressional authorization (i.e., *FAA Reauthorization Act of 2018*) and an annual appropriation of at least $3.2 billion for AIP.

Passenger Entitlements: AIP provides funding for eligible projects at airports through an entitlement program. Primary commercial service airports receive a guaranteed minimum level of federal assistance each year based on their enplaned passenger levels and Congressional appropriation levels. A primary airport is defined as any commercial service airport enplaning at least 10,000 passengers annually, such as Friday Harbor Airport.

An airport enplaning 10,000 or more passengers annually will receive the higher of $1.0 million or an amount based upon the entitlement formula. The entitlement formula is $15.60 per enplaned passenger for the first 50,000 enplanements, and $10.40 per enplanement for the next 50,000 enplanements. The next 400,000 enplanements provide $5.20 each, and $1.30 for the next 500,000 enplanements. For each annual enplanement above one million, the airport receives $1.00. The FAA utilizes the official enplanement totals from the Air Carrier Activity Information System (ACAIS) database, which is two years behind the current date for determination of entitlement funds.

Cargo Entitlements: An airport may receive cargo entitlements if they reach a minimum landed cargo weight of 1.0 million pounds. Friday Harbor Airport has not reached 1.0 million pounds of landed cargo weight in the past.

Non-Primary Entitlements (NPE): Non-primary entitlements are the lesser of $150,000 annually or 1/5th of an airport's five-year development costs listed in the NPIAS. Since Friday Harbor Airport is a primary commercial service airport, it is not currently eligible for NPE funds and is instead eligible for the $1.0 million passenger entitlement. If the Airport were to drop below 10,000 annual enplanements, then it would only be eligible for NPE funds.

State Apportionment: Based on an area/population formula, AIP funds are available for distribution to airports within each state. FHR is eligible for AIP grant funding from this source.

Alaska Supplemental: This set-aside is reserved for Alaska airports. FHR is not eligible for AIP funding from this source.

Small Airport Fund: If a large- or medium-hub commercial service airport chooses to institute a passenger facility charge (PFC), which is a fee of up to $4.50 on each airline ticket, for funding of capital improvement projects, then their entitlement is reduced. Part of the reduced entitlement goes to the small airport fund. The small airport fund is reserved for small-hub primary commercial service airports, non-hub commercial service airports, and general aviation airports. FHR is eligible for funds from this source.

Discretionary Set-Aside Funds: Portions of AIP funds are set-asides designed to achieve specific funding minimums for noise compatibility planning and implementation, select former military airfields (Military Airport Program [MAP]), and select reliever airports. FHR may be eligible for noise compatibility planning

and implementation funds if it meets certain criteria. FHR does not qualify for MAP or reliever airport set-aside funds.

Remaining Discretionary Funds: The remaining AIP funds are distributed by FAA based on the priority of the project for which they have requested federal assistance through discretionary apportionments. A national priority ranking system is used to evaluate and rank each airport project. Those projects with the highest priority from airports across the country are given preference in funding. High priority projects include those related to meeting design standards, capacity improvements, and other safety enhancements.

Under the AIP program, examples of eligible development projects include the airfield, public aprons, and access roads. Additional buildings and structures may be eligible if the function of the structure is to serve airport operations in a non-revenue-generating capacity, such as maintenance facilities. Some revenue-enhancing structures, such as T-hangars, may be eligible if all airfield improvements have been made; however, the priority ranking of these facilities is very low.

Whereas entitlement monies are guaranteed on an annual basis when certain thresholds are achieved, discretionary funds are not assured. FHR is eligible for discretionary funds.

Passenger Facility Charges (PFC)

A PFC is a fee that airport operators can assess on airline tickets that originate from their airport. The fee goes toward the maintenance and upkeep of the airport. Federal law allows commercial airports to charge up to $4.50 for every enplaned passenger. The airports must use the money from the fees to pay for FAA-approved projects that enhance safety, security, and capacity, reduce noise, or increase air carrier competition.

FHR currently charges a $4.50 PFC, which equated to approximately $36,000 in 2018. The current PFC collection provides funding for the projects listed in **Table 6D**.

TABLE 6D
Approved PFC Projects
Friday Harbor Airport

Project Description	PFC Total
Electrical Vault Upgrade	$67,275
Westside Tie-Down relocation	$6,877
Runway 34 ROFA Grading and Drainage Improvements	$9,903
AGIS Survey	$9,540
Environmental Assessment for Obstruction Removal	$10,750
Total	**$104,345**

PFC: Passenger Facility Charge
Source: Airport records.

Terminal Building Eligibility

A replacement terminal building is planned in the undeveloped southwest quadrant of the airport. Only those public-use portions of the terminal building that are directly related to the movement of passengers and baggage is eligible for FAA funding. For non-hub primary commercial service airports, such as FHR, a maximum of $20.0 million is eligible for terminal development. Terminal development includes the public-use portions of the building, access roads servicing airport traffic to or from the terminal building exclusively, and walkways leading directly to or from the terminal building.

STATE AID TO AIRPORTS

The State of Washington recognizes the valuable contribution that airports make to the state's transportation economy. WSDOT administers several programs to help maintain airports in the state.

Pavement Management System

Approximately every five years, WSDOT conducts a system-wide (100 airports) study of pavement to assess the relative condition of pavements for selected Washington airports. The program serves as a tool to identify system pavement needs, shape programming decisions for federal and state grant aid, provide information for legislative decision-making, and assist airport sponsors in making informed planning decisions. The program also develops accurate pavement inventories and identifies necessary maintenance, repair, rehabilitation, and reconstruction projects.

Friday Harbor Airport is included in the state's pavement management system. The pavement condition maps for the Airport were utilized in the development of the CIP included in this Master Plan. There is no cost to the airports for the pavement assessment.

This is an extremely beneficial program to the airports in the state. It helps airports in the state meet federal grant assurances which require airports to monitor and maintain their pavement infrastructure. This program also helps WSDOT and the airport sponsors when making capital improvement decisions.

Airport Aid Program

The Airport Aid Program has two categories of funding. The first provides half of the local match, or five percent, for FAA-funded projects. The second category allows for WSDOT to fund airport projects directly. Direct funding is only available for those projects that the FAA is unable to fund in the current cycle. The maximum amount WSDOT can award to an individual airport sponsor is $750,000, which requires a local match of five percent.

WSDOT provides grants for capital improvements to many of the state's 134 public airports. The program is funded through an 11-cents-per gallon fee on aviation fuel, along with aircraft registration fees. Historically, $1.3 million per year is invested in the state's aviation system through the Airport Aid Program.

WSDOT Aviation Airport Aid grant funds may be used for the planning, acquisition, construction, improvement, and maintenance of airports. All project work must be available for public-use airports and be shown on the approved Airport Layout Plan (ALP). All projects must also be included in WSDOT's five-year Statewide Capital Improvement Program (SCIP).

For airports that are included in the federal NPIAS, the airport must demonstrate that it has pursued federal funding through FAA before WSDOT will consider issuing a grant for the project (other than matching funds to AIP grants).

Some of the commonly eligible items for WSDOT funded projects are:

- Approach aids (e.g., AWOS, REILS, VASI, etc.).
- Obstruction surveys for new or improved instrument approach procedures – must be accomplished in accordance with FAA Advisory Circular (AC) 150/5300-18B.
- New construction to include the extension, strengthening, or widening of a runway, taxiway, or aircraft parking apron.
- Reconstruction, resurfacing, application of seal coats and sealing pavement joints and cracks of runways, taxiways, and aircraft parking aprons.
- Runway and taxiway pavement markings.
- Runway safety areas.
- Lighting of a runway, taxiway, or apron.
- Marking of a runway, taxiway, or apron.
- Installation of rotating beacon and lighted wind cone and segmented circle.
- Obstruction removal (one-time removal, airport sponsor must maintain) including power line removal, relocation or burial, obstruction lighting and marking.
- New access and service roads.
- Fencing.
- Construction supervision and materials testing.
- Utilities removal, relocation and/or replacement if required to accomplish a development project.
- Engineering design costs if accomplished subsequent to the execution date of the grant agreement.
- Airport Master Planning and Airport Layout Plans (ALPs).

Some of the commonly ineligible items for WSDOT funded projects are:

- Airport or heliport facilities under exclusive lease or monopoly control of private individuals or corporations or otherwise unavailable for public use.
- Spare parts beyond those needed for testing equipment purchased under a grant.
- Landscaping that is not affected by the funded project.
- Landscaping beyond what is needed for erosion control.
- Projects that could be considered "maintenance" in nature. (For example, cleaning culverts and manholes, repair of culverts and manholes, patching potholes, repairing fence, cleaning sediment/debris from ditches, refreshing existing painted markings).
- Off-airport work that is not specifically called out in the project component.
- Funding for pavement rehabilitation that has not been adequately maintained by the airport.
- Updates to any project plans, documents, or studies due to lack of progress.
- Funding for a taxiway which serves a private facility.
- Improvements to accommodate private development.
- Aircraft Rescue and Fire Fighting (ARFF) equipment and facilities.
- Construction of or purchase from a private entity, facilities capable of producing revenue that can amortize the construction cost such as but not limited to:
    - Hangars (all types).
    - Terminal buildings and associated security systems.
    - Fuel facilities.
- Routine and low-cost maintenance work (e.g., weed spraying, mowing, sweeping, snow plowing, etc.).

WSDOT will not accept grant requests for construction projects starting prior to the date authorized in the solicitation for grant applications. Also, WSDOT will not reimburse an airport sponsor for work completed prior to the authorized date.

Applications for emergency projects will be considered by WSDOT should an emergent situation warrant immediate intervention, particularly events impacting airport safety. Emergency projects may be defined as the result of an unanticipated act of nature, vandalism, or an unintentional accident that has caused either damage to or destruction of an airport facility. Further, the impact of the event interferes with the safe operation of the airport. The airport owner must further demonstrate a valid need to take immediate action to repair or restore an airport facility damaged or destroyed by an act of nature, vandalism, or accident. Airport facilities that have been allowed to deteriorate over time due to normal wear, use, or inadequate maintenance shall not constitute an emergency. Approval for grant funds for emergent projects will be contingent on documentation of need, WSDOT concurrence, and availability of funds.

Additional guidance on the WSDOT grant programs can be found in the *WSDOT Airport Aid Grant Procedures Manual* accessible at: http://www.wsdot.wa.gov/aviation/.

Other Washington Funding Sources

In 2005, the Washington Legislature directed the Joint Legislative Audit & Review Committee (JLARC) to assemble an inventory of state grant and loan programs that assist local governments and others in developing their infrastructure. The inventory includes 75 separate programs. These programs provided more than $1 billion in grants and loans for infrastructure projects in 2005. The inventory is organized into three volumes. Potential sources for transportation infrastructure grants and loans are identified in volume two. More information on these programs can be found at:
http://leg.wa.gov/jlarc/AuditAndStudyReports/Documents/06-11a.pdf

The Washington Department of Commerce also provides guidance and grant assistance in several areas that could be beneficial to airports. This includes land use planning, infrastructure planning, and assistance with public financing of public projects. Further information can be obtained at:
https://www.commerce.wa.gov/

LOCAL FUNDING

The balance of project costs, after consideration has been given to grants, must be funded through local resources. The goal of the Airport is to generate enough revenue to cover all operating and capital expenditures. As with many small commercial service and general aviation airports, this is not always possible and other financing methods will be needed.

There are several alternatives for local financing options for future development at the Airport, including airport revenues, direct funding (subsidizing) from the Port, issuing bonds, and leasehold financing. These strategies could be used to fund the local matching share or complete the project if grant funding cannot be arranged.

Airport Revenue

Table 6E presents the operating revenue and expenses for Friday Harbor Airport for calendar years

TABLE 6E
Historical Operating Revenue and Expenses
Friday Harbor Airport

CATEGORY	2017	2018*
OPERATING REVENUE ($)		
Land Leases	206,797	219,859
Hangar Leases	170,018	173,878
Tie-Down Leases	15,632	14,288
Terminal Leases	19,957	27,982
Other Leases	4,020	7,550
Other Property Revenue	13,072	13,434
Commercial Landing Fees	13,823	16,274
Transient Landings	5,791	7,482
Auto Parking	30,747	32,891
Transient Tiedown Fees	13,465	11,877
Fuel Flowage	4,102	4,574
Misc. Revenue	10,222	25,762
Total Operating Revenue	***$507,646***	***$555,851***
OPERATING EXPENSES ($)		
Personnel	575,354	603,973
Insurance	19,495	17,494
Utilities	45,486	66,420
Professional Services	19,845	17,884
Supplies	14,000	20,786
Banking/B & O Taxes	13,507	13,966
Maintenance Expenses	28,376	33,955
Leased Property Expenses	28,615	23,179
Total Operating Expenses	***$744,678***	***$797,657***
NET OPERATING INCOME	**($237,032)**	**($241,806)**

*Unaudited
Source: Airport records.

2017 and 2018. As can be seen, Airport expenses exceeded revenues in each year by approximately $240,000. As a result, additional resources are necessary to implement the master plan capital improvement program.

Port of Friday Harbor General Fund

The Port of Friday Harbor has assets other than the Airport, most notably the marina. These assets are used to maintain an airport reserve fund. The reserve fund is intended to be used to match FAA AIP grants. Currently, the reserve fund has approximately $100,000. If the matching amount exceeds what is available in the reserve fund, then additional sources of financing may be required or project implementation may be delayed.

Bond Issuance

The Port of Friday Harbor is a special purpose district under Washington State law (Chapter 53 RCW), created by a community vote in 1950 for the purpose of operating a marina and supporting economic development. The Port purchased the Airport in 1982 with the assistance of federal funds. As owner and operator of the Airport, the Port of Friday Harbor has relative independence from state and local governments, but also has the responsibility to manage its own budget. The Port of Friday Harbor has taxing authority which includes a property tax mill levy on the residents of the district. The Port is also permitted by law to issue bonds for capital improvements.

Leasehold Financing

Leasehold financing refers to a developer or tenant financing improvements under a long-term ground lease. The advantage of such an arrangement is that it relieves the Port of Friday Harbor of the responsibility for raising the capital funds for improvements. However, the private development of facilities on a ground lease, particularly on property owned by a quasi-governmental agency, produces a unique set of concerns.

For example, it may be more difficult to obtain private financing as only the improvements and the right to continue the lease can be claimed in the event of a default. Ground leases normally provide for the reversion of improvements to the airport at the end of the lease term, which reduces their potential value to a lender taking possession. Also, companies that want to own their property as a matter of financial policy may not locate where land is only available for lease.

Financial Audit Compliance

The operations of Friday Harbor Airport generate revenues which are secured by federal grant assurances to be utilized at the Airport. All receipts, excluding bond proceeds or related grants and interest, are irrevocably pledged to the punctual payment of operating and maintenance expenses, payment of debt service for as long as bonds remain outstanding, or for additions or improvements to Airport facilities.

The Port of Friday Harbor maintains a separate Airport fund from the overall Port account. With this accounting method, the Port can determine the financial condition of the Airport as a stand-alone entity within the Port's assets. This accounting method meets FAA requirements as outlined in the following grant assurances.

Grant Assurance #24 – Fee and Rental Structure: Requires the airport sponsor to set fees, lease rates, and other charges that are directed at making the airport as self-sustaining as possible. Airport sponsors must impose fair market value charges for noncommercial uses of airport property, but aeronautical user charges may be less than fair market value. As demonstrated, the fee and rental structure for airport property and facilities is fair and equitable.

Grant Assurance #25 – Airport Revenues: Restricts the use of airport revenues generated by the airport and local taxes on aviation fuel to be expended for the capital or operating costs of the airport, the local airport system, or other facilities owned or operated by the airport sponsor, which directly and substantially relate to the actual air transportation of passengers or property or noise mitigation efforts. Under the *Single Audit Act of 1984*, the airport must conduct an annual audit and assure the government that airport funds have been properly used. In general, revenue generated by the airport may not be diverted to functions unrelated to the operation and maintenance of the airport. Examples of revenue diversion include:

a) General economic development;
b) Marketing and promotional activities unrelated to the airport;
c) Payments in lieu of taxes or other assessments that exceed the value of services;
d) Payments to compensate sponsoring governmental bodies for lost tax revenues exceeding stated tax rates; and
e) Direct or indirect payments of airport revenues beyond that which is required to pay for services and facilities provided to the airport.

FUNDING PLAN

The underlying strategy of the funding plan is to present the range of costs the Airport may be responsible for if the entire CIP were to be undertaken in the timeframe suggested. Total project costs in the

short-, intermediate-, and long-term have been identified. The remaining amount is what is eligible for FAA AIP grant funding. This amount is reduced by 10 percent, which is the Airport matching share (including five percent eligible for WSDOT funding). It is further reduced by the maximum entitlement funding (passenger entitlement). The remaining amount is what is eligible for FAA AIP discretionary funding.

Table 6F outlines the maximum potential funds from AIP entitlements and FAA discretionary sources that could be attained during each planning horizon. This analysis assumes that the short-term horizon would be attained in five years, the intermediate horizon would be achieved in the next five years, and the long-term horizon would be achieved in an additional 10 years. Each horizon includes the aggregate total costs and funds available for the given planning horizon.

TABLE 6F
CIP Financial Assumptions (2018$)
Friday Harbor Airport

	Short Term	Intermediate Term	Long Term	Total
Total Grant Eligible Project Costs	$12,193,333	$16,500,000	$12,670,000	$41,363,333
Project Grant Match (5%)	$609,667	$825,000	$633,500	$2,068,167
WSDOT Grant Match (5%)	$609,667	$825,000	$633,500	$2,068,167
Remaining Costs Less Matching Funds	$10,974,000	$14,850,000	$11,403,000	$37,227,000
AIP Entitlement Funds	$5,000,000	$5,000,000	$10,000,000	$20,000,000
Remaining Costs Eligible for FAA Discretionary Funding	$5,974,000	$9,850,000	$1,403,000	$17,227,000
Airport CIP Costs High End[1]	$6,583,666	$10,675,000	$2,036,500	$19,295,166
Airport CIP Costs Low End[2]	$609,667	$825,000	$633,500	$2,068,167

[1]Assumes no discretionary FAA funding.
[2]Assumes eligible costs receive full discretionary FAA funding.
AIP - Airport Improvement Program

In the short-term, if the Airport were to receive full FAA discretionary funding for eligible projects, the minimum local investment would be $610,000. If no discretionary funding is available, then the high-end for local funding would be $6.9 million.

In the intermediate-term, the low-end local cost would be $825,000, which assumes full discretionary FAA funding. The high-end local cost would be $10.7 million.

In the long-term, the minimum investment required from local sources is $633,500. The high-end local cost would be $2.0 million.

The funding plan makes no assumption about the potential for other grant sources or the method for financing the local responsibility. Instead, a range is provided for the likely level of required local financial participation if the entire CIP were to be implemented. If the full level of FAA and WSDOT funding can be obtained, then the Airport would be responsible for approximately $610,000 in the short-term, $825,000 in the intermediate term, and $633,500 in the long-term.

FUNDING AIRPORT OPERATIONS

The Airport is operated by the Port of Friday Harbor through the collection of various rates and charges from general aviation revenue sources. These revenues are generated specifically by Airport operations. There are, however, restrictions on the use of revenues collected by the Airport. All receipts, excluding bond proceeds or related grants and interest, are irrevocably pledged to the punctual payment of operating and maintenance expenses, payment of debt service for as long as bonds remain outstanding, or to additions or improvements to Airport facilities.

The operation of the Airport generates revenues, which are secured by federal grant assurances, to be utilized only on the Airport. While these revenues generated are significant, they are oftentimes not enough to fund both Airport operating expenditures and capital improvement requirements. Most general aviation and small commercial service airports in this country do not generate enough revenue to cover operating expenses. According to airport records, the Airport operating expenses exceed operating revenues. All potential revenue sources should be considered to support future capital expenditures, if necessary.

To ensure the Airport maximizes revenue potential in the future, FHR should periodically review aviation services rates and charges (i.e., ground lease rates, rental rates, etc.) at other airports to be certain that FHR's rates and charges are competitive. Additionally, all new leases at the Airport should have inflation clauses allowing for periodic rate increases in line with inflationary factors.

AIRPORT RATES AND CHARGES

All airports should establish standard basis rates for various leases. All lease rates should be set to adjust to a standard index, such as the Consumer Price Index, to assure that fair and equitable rates continue to be charged into the future. The condition and location of hangar space should also be considered when establishing the lease rates. Standard basis rates should be established for Port-owned hangars, terminal building office space, and ground leases. Fuel flowage fees and aircraft tie-down fees should also be uniform.

The FAA places several stipulations on rates and charges establishment and collection; however, two primary considerations need to be addressed. First, the rates and charges must be fair, equally applied, and resemble fair market value. Second, the rates and charges collected must be returned to and used

only by and/or for the airport. In other words, the revenues generated by Airport operations cannot be diverted to the general use of the Port of Friday Harbor. The FAA requires funds to be used at airports, as these funds are many times needed to either support the day-to-day operational costs or offset capital improvement costs.

Aircraft Parking/Tiedowns

Aircraft parking fees, also referred to as tie-down fees, are typically assessed to those aircraft utilizing a portion of an aircraft parking area that is owned by the airport. These fees are most generally assessed on a daily or monthly basis, depending upon the specific activity of a particular aircraft.

Aircraft parking fees can be established in several different ways. Typically, airports assess aircraft parking fees in accordance with an established schedule in which an aircraft within a designated weight and/or size pays a similar fee (i.e., small aircraft, single engine aircraft). Aircraft parking fees may also be charged according to a "cents per 1,000 pounds" basis in which larger aircraft with increased weights would pay more for utilizing the aircraft parking apron. There are also instances in which aircraft parking fees are not assessed on an airport.

In a lease agreement with an aviation-related commercial operator at the airport, an airport sponsor may also include the collection of aircraft parking fees on portions of an aircraft parking apron in which the airport does not own or is leasing to a commercial operator. As a result, the airport could directly collect parking fees from an aircraft utilizing this space or allow the commercial operator to collect the parking fee, in which the agreement may allow the commercial operator to retain a portion of the parking fee as an administrative or service fee.

As previously discussed, aircraft parking fees can be assessed on a daily or monthly basis. Daily aircraft parking fees are typically assessed to transient aircraft utilizing the airport on a short-term basis, while monthly fees are charged to aircraft that utilize a particular parking area for the permanent storage of their aircraft. Monthly aircraft parking fees are often assessed at airports that have a waiting list for aircraft hangar storage space. It is also common practice at many airports to waive a daily aircraft parking fee in the event the aircraft purchases fuel prior to departure.

Table 6G
Aircraft Parking Fees (2019)
Friday Harbor Airport

Category	Term	Fee
Wingspan up to 38'	Monthly	$77
Wingspan 39' to 48'	Monthly	$109
Wingspan over 48'	Monthly	$142
Transient	Monthly	$81
Transient Piston	Daily	$15
Transient Turboprop	Daily	$30
Transient Jet	Daily	$60

Source: Airport records.

At FHR, the daily transient parking fee is $5.00 for a stay of more than five hours. Overnight and monthly aircraft parking rates are shown in **Table 6G**.

Aircraft Storage Hangars

There are several types of aircraft storage hangars that can accommodate aircraft on an airport. In order to establish hangar fees, an airport typically factors in such qualities as hangar size, location, and utilities. Aircraft hangar fees are most often charged on a monthly basis.

Common aircraft storage hangars are typically categorized as T-hangars, box hangars, and conventional hangars. T-hangars provide for separate, single-aircraft storage areas. Box hangars are smaller clear-span hangars for individual aircraft. Conventional hangars provide a larger enclosed space that can accommodate larger multi-engine piston or turbine aircraft and/or multiple aircraft storage. Conventional hangars can also be utilized by aviation-related commercial operators for their business activities on an airport.

Location can also play a role in determining hangar rates. Aircraft storage hangars with direct access to improved taxiways/taxilanes and adjacent to aviation services being offered at an airport can oftentimes be more expensive to rent. In addition, the type of utility infrastructure available can also help determine storage fees. Smaller aircraft storage hangars, such as a T-hangar or small box hangar, can either be granted access through a manual sliding door or electric door. It is common for hangars that provide electric doors to have higher rental fees, as construction costs for these hangars is higher.

At some airports, hangar facilities are constructed by the airport sponsor, while at other airports, hangars are built by private entities. In some cases, airports have both public and private hangar facilities available. Hangars can be expensive to construct and offer minimal return on investment in the short term. In order to amortize the cost of constructing hangars, lease rates should be developed to recover development and finance costs.

The Port of Friday Harbor has multiple hangars at the airport. The fee structure is based on many factors including type of hangar, condition, location, and if the hangar door is electric or not. The rates vary from $204-$567 per month for 2019.

Land Lease

Land leases can be applied to aviation and non-aviation development on an airport. A land lease can be structured to meet the particular needs of an airport operator in terms of location, terrain features, amount of land needed, and type of facility infrastructure included.

One of the single most valuable assets available to an airport is the leasable land with access to the runway/taxiway system. For aviation-related businesses, it is critical that they be located on an airport. Airport property is available for long-term lease but, in most cases, it cannot be sold. At the expiration of the lease and any extensions, the improvements on the leased land revert back to the airport sponsor. In order for this arrangement to make financial sense, most ground leases are at least 20 years in length

and include extension opportunities. Those who lease land on an airport are typically interested in constructing a hangar for their own private use, for sub-lease, or for operation of an airport business. Therefore, the long-term lease arrangement is important in order to obtain capital funding for the construction of a hangar or other type of facility. It should also be noted that ground leases should include the opportunity to periodically review the lease and adjust the rate according to the consumer price index (CPI). FAA guidance allows for lease terms of up to 50 years.

Land leases are typically established on a yearly fee schedule based upon the amount of square feet leased. The amount charged can vary greatly depending on the level of improvements to the land. For example, undeveloped land with readily accessible utilities and taxiway access can generate more revenue than unimproved property.

Some airports will have other leasable space available. For example, airports with a terminal building may have office or counter space available for aviation and non-aviation related businesses.

As previously mentioned, under certain circumstances, an airport sponsor may utilize portions of the airport for non-aeronautical purposes, such as commercial and/or industrial development if certain areas are not needed to satisfy aviation demand or are not accessible to aviation activity. Prior to an airport pursuing a ground lease with a commercial operator for non-aeronautical purposes, the sponsor must formally request that the FAA release the land in question from its federal obligations.

FHR offers land leases for airport operators:

- Airside/Commercial land is $0.88/sf/year
- Airside/Non-Commercial land is $0.64/sf/year
- Non-Airside/Commercial is $0.76/sf/year
- Non-Airside/Non-Commercial variable rates

Fuel Sales and Flowage

Friday Harbor Airport owns the underground fuel farm. The fixed base operator (FBO) is contracted to maintain the equipment. The fuel flowage fee is 3.5 percent of the wholesale price of fuel.

Landing Fees

Landing fees are assessed at some airports as a revenue source to fund airport operations and maintenance. Landing fees are common at commercial service airports and are less common at general aviation airports. For smaller airports, landing fees can be difficult to collect and can discourage aircraft operators, who may elect to utilize a nearby airport that does not collect a landing fee.

When landing fees are assessed, they are commonly based upon aircraft weight and a "cents per 1,000 pounds" approach. In addition, some airport sponsors may use a flat fee approach wherein aircraft within a specified weight range are charged the same fee.

Landing fees may be collected directly by the airport sponsor, or an airport may have an agreement with a commercial operator to collect landing fees. Similar to what was discussed with aircraft parking fees, under this scenario, the agreement may allow the commercial operator, such as an FBO, to retain a portion of the landing fee as an administrative or service fee.

Friday Harbor Airport has the following landing fee schedule based on aircraft weight:

- 0 lbs. - 7,499 lbs./$0 per landing
- 7,500 lbs. – 12,499 lbs./$20 per landing
- 12,500 lbs. – 15,000 lbs./ $100 per landing
- Over 15,000 lbs./$150 per landing

Auto Parking

The airport also has a fee schedule for auto parking. The lower tier of the terminal parking lot is free for short-term parking (less than 24 hours). The upper tier (west side) of the terminal parking lot is available for longer term vehicle parking. The parking rates are as follows:

- Daily - $10
- Weekly - $26
- Monthly - $52
- Yearly - $430

There is an Airport-owned parking lot in the northeast corner of the Airport that is available for vehicle parking. The rates for this lot are $397 per year or $19 per week for one parking space. Space for an RV is $3.00 per square foot per month.

MASTER PLAN IMPLEMENTATION

To implement the master plan recommendations, it is key to recognize that planning is a continuous process and does not end with approval of this document. The Airport should implement measures that allow them to track various demand indicators, such as based aircraft, hangar demand, and operations. The issues that this master plan is based on will remain valid for a number of years. The primary goal is for the Airport to best serve the air transportation needs of the region, while striving to be economically self-sufficient.

The actual need for facilities is best established by airport activity levels rather than a specified date. For example, projections have been made as to when additional hangars may be needed at the Airport. In reality, the timeframe in which the development is needed may be substantially different. Actual demand may be slower to develop than expected. On the other hand, high levels of demand may establish the need to accelerate development. Although every effort has been made in this master planning process to conservatively estimate when facility development may be needed, aviation demand will dictate timing of facility improvements.

The value of a master plan is keeping the issues and objectives at the forefront of the minds of managers and decision-makers. In addition to adjustments in aviation demand, when to undertake the improvements recommended in this master plan will impact how long the plan remains valid. The format of this plan reduces the need for formal and costly updates by simply adjusting the timing of project implementation. Updating can be done by the airport manager, thereby improving the plan's effectiveness.

In summary, the planning process requires the Port of Friday Harbor to consistently monitor the progress of the Airport in terms of aircraft operations and based aircraft. Analysis of aviation demand is critical to the timing and need for new Airport facilities.

FRIDAY HARBOR AIRPORT









APPENDIX A

Glossary of Terms

AIRPORT MASTER PLAN

Glossary of Terms

A

ABOVE GROUND LEVEL: The elevation of a point or surface above the ground.

ACCELERATE-STOP DISTANCE AVAILABLE (ASDA): See declared distances.

ADVISORY CIRCULAR: External publications issued by the FAA consisting of nonregulatory material providing for the recommendations relative to a policy, guidance and information relative to a specific aviation subject.

AIR CARRIER: An operator which: (1) performs at least five round trips per week between two or more points and publishes flight schedules which specify the times, days of the week, and places between which such flights are performed; or (2) transports mail by air pursuant to a current contract with the U.S. Postal Service. Certified in accordance with Federal Aviation Regulation (FAR) Parts 121 and 127.

AIRCRAFT: A transportation vehicle that is used or intended for use for flight.

AIRCRAFT APPROACH CATEGORY: A grouping of aircraft based on 1.3 times the stall speed in their landing configuration at their maximum certificated landing weight. The categories are as follows:

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

AIRCRAFT OPERATION: The landing, takeoff, or touch-and-go procedure by an aircraft on a runway at an airport.

AIRCRAFT OPERATIONS AREA (AOA): A restricted and secure area on the airport property designed to protect all aspects related to aircraft operations.

AIRCRAFT OWNERS AND PILOTS ASSOCIATION: A private organization serving the interests and needs of general aviation pilots and aircraft owners.

AIRCRAFT RESCUE AND FIRE FIGHTING: A facility located at an airport that provides emergency vehicles, extinguishing agents, and personnel responsible for minimizing the impacts of an aircraft accident or incident.

AIRFIELD: The portion of an airport which contains the facilities necessary for the operation of aircraft.

AIRLINE HUB: An airport at which an airline concentrates a significant portion of its activity and which often has a significant amount of connecting traffic.

AIRPLANE DESIGN GROUP (ADG): A grouping of aircraft based upon wingspan. The groups are as follows:

- Group I: Up to but not including 49 feet.
- Group II: 49 feet up to but not including 79 feet.
- Group III: 79 feet up to but not including 118 feet.
- Group IV: 118 feet up to but not including 171 feet.
- Group V: 171 feet up to but not including 214 feet.
- Group VI: 214 feet or greater.

AIRPORT AUTHORITY: A quasi-governmental public organization responsible for setting the policies governing the management and operation of an airport or system of airports under its jurisdiction.

AIRPORT BEACON: A navigational aid located at an airport which displays a rotating light beam to identify whether an airport is lighted.

AIRPORT CAPITAL IMPROVEMENT PLAN: The planning program used by the Federal Aviation Administration to identify, prioritize, and distribute funds for airport development and the needs of the National Airspace System to meet specified national goals and objectives.

AIRPORT ELEVATION: The highest point on the runway system at an airport expressed in feet above mean sea level (MSL).

AIRPORT IMPROVEMENT PROGRAM: A program authorized by the Airport and Airway Improvement Act of 1982 that provides funding for airport planning and development.

AIRPORT LAYOUT DRAWING (ALD): The drawing of the airport showing the layout of existing and proposed airport facilities.

AIRPORT LAYOUT PLAN (ALP): A scaled drawing of the existing and planned land and facilities necessary for the operation and development of the airport.

AIRPORT LAYOUT PLAN DRAWING SET: A set of technical drawings depicting the current and future airport conditions. The individual sheets comprising the set can vary with the complexities of the airport, but the FAA-required drawings include the Airport Layout Plan (sometimes referred to as the Airport Layout Drawing (ALD), the Airport Airspace Drawing, and the Inner Portion of the Approach Surface Drawing, On-Airport Land Use Drawing, and Property Map.

AIRPORT MASTER PLAN: The planner's concept of the long-term development of an airport.

AIRPORT MOVEMENT AREA SAFETY SYSTEM: A system that provides automated alerts and warnings of potential runway incursions or other hazardous aircraft movement events.

AIRPORT OBSTRUCTION CHART: A scaled drawing depicting the Federal Aviation Regulation (FAR) Part 77 surfaces, a representation of objects that penetrate these surfaces, runway, taxiway, and ramp areas, navigational aids, buildings, roads and other detail in the vicinity of an airport.

AIRPORT REFERENCE CODE (ARC): A coding system used to relate airport design criteria to the operational (Aircraft Approach Category) to the physical characteristics (Airplane Design Group) of the airplanes intended to operate at the airport.

AIRPORT REFERENCE POINT (ARP): The latitude and longitude of the approximate center of the airport.

AIRPORT SPONSOR: The entity that is legally responsible for the management and operation of an airport, including the fulfillment of the requirements of laws and regulations related thereto.

AIRPORT SURFACE DETECTION EQUIPMENT: A radar system that provides air traffic controllers with a visual representation of the movement of aircraft and other vehicles on the ground on the airfield at an airport.

AIRPORT SURVEILLANCE RADAR: The primary radar located at an airport or in an air traffic control terminal area that receives a signal at an antenna and transmits the signal to air traffic control display equipment defining the location of aircraft in the air. The signal provides only the azimuth and range of aircraft from the location of the antenna.

AIRPORT TRAFFIC CONTROL TOWER (ATCT): A central operations facility in the terminal air traffic control system, consisting of a tower, including an associated instrument flight rule (IFR) room if radar equipped, using air/ground communications and/or radar, visual signaling and other devices to provide safe and expeditious movement of terminal air traffic.

AIR ROUTE TRAFFIC CONTROL CENTER: A facility which provides en route air traffic control service to aircraft operating on an IFR flight plan within controlled airspace over a large, multi-state region.

AIRSIDE: The portion of an airport that contains the facilities necessary for the operation of aircraft.

AIRSPACE: The volume of space above the surface of the ground that is provided for the operation of aircraft.

AIR TAXI: An air carrier certificated in accordance with FAR Part 121 and FAR Part 135 and authorized to provide, on demand, public transportation of persons and property by aircraft. Generally operates small aircraft "for hire" for specific trips.

AIR TRAFFIC CONTROL: A service operated by an appropriate organization for the purpose of providing for the safe, orderly, and expeditious flow of air traffic.

AIR ROUTE TRAFFIC CONTROL CENTER (ARTCC): A facility established to provide air traffic control service to aircraft operating on an IFR flight plan within controlled airspace and principally during the en route phase of flight.

AIR TRAFFIC CONTROL SYSTEM COMMAND CENTER: A facility operated by the FAA which is responsible for the central flow control, the central altitude reservation system, the airport reservation position system, and the air traffic service contingency command for the air traffic control system.

AIR TRAFFIC HUB: A categorization of commercial service airports or group of commercial service airports in a metropolitan or urban area based upon the proportion of annual national enplanements existing at the airport or airports. The categories are large hub, medium hub, small hub, or non-hub. It forms the basis for the apportionment of entitlement funds.

AIR TRANSPORT ASSOCIATION OF AMERICA: An organization consisting of the principal U.S. airlines that represents the interests of the airline industry on major aviation issues before federal, state, and local government bodies. It promotes air transportation safety by coordinating industry and governmental safety programs and it serves as a focal point for industry efforts to standardize practices and enhance the efficiency of the air transportation system.

ALERT AREA: See special-use airspace.

ALTITUDE: The vertical distance measured in feet above mean sea level.

ANNUAL INSTRUMENT APPROACH (AIA): An approach to an airport with the intent to land by an aircraft in accordance with an IFR flight plan when visibility is less than three miles and/or when the ceiling is at or below the minimum initial approach altitude.

APPROACH LIGHTING SYSTEM (ALS): An airport lighting facility which provides visual guidance to landing aircraft by radiating light beams by which the pilot aligns the aircraft with the extended centerline of the runway on final approach and landing.

APPROACH MINIMUMS: The altitude below which an aircraft may not descend while on an IFR approach unless the pilot has the runway in sight.

APPROACH SURFACE: An imaginary obstruction limiting surface defined in FAR Part 77 which is longitudinally centered on an extended runway centerline and extends outward and upward from the primary surface at each end of a runway at a designated slope and distance based upon the type of available or planned approach by aircraft to a runway.

APRON: A specified portion of the airfield used for passenger, cargo or freight loading and unloading, aircraft parking, and the refueling, maintenance and servicing of aircraft.

AREA NAVIGATION: The air navigation procedure that provides the capability to establish and maintain a flight path on an arbitrary course that remains within the coverage area of navigational sources being used.

AUTOMATED TERMINAL INFORMATION SERVICE (ATIS): The continuous broadcast of recorded non-control information at towered airports. Information typically includes wind speed, direction, and runway in use.

AUTOMATED SURFACE OBSERVATION SYSTEM (ASOS): A reporting system that provides frequent airport ground surface weather observation data through digitized voice broadcasts and printed reports.

AUTOMATIC WEATHER OBSERVATION STATION (AWOS): Equipment used to automatically record weather conditions (i.e. cloud height, visibility, wind speed and direction, temperature, dew point, etc.)

AUTOMATIC DIRECTION FINDER (ADF): An aircraft radio navigation system which senses and indicates the direction to a non-directional radio beacon (NDB) ground transmitter.

AVIGATION EASEMENT: A contractual right or a property interest in land over which a right of unobstructed flight in the airspace is established.

AZIMUTH: Horizontal direction expressed as the angular distance between true north and the direction of a fixed point (as the observer's heading).

B

BASE LEG: A flight path at right angles to the landing runway off its approach end. The base leg normally extends from the downwind leg to the intersection of the extended runway centerline. See "traffic pattern."

BASED AIRCRAFT: The general aviation aircraft that use a specific airport as a home base.

BEARING: The horizontal direction to or from any point, usually measured clockwise from true north or magnetic north.

BLAST FENCE: A barrier used to divert or dissipate jet blast or propeller wash.

BLAST PAD: A prepared surface adjacent to the end of a runway for the purpose of eliminating the erosion of the ground surface by the wind forces produced by airplanes at the initiation of takeoff operations.

BUILDING RESTRICTION LINE (BRL): A line which identifies suitable building area locations on the airport.

C

CAPITAL IMPROVEMENT PLAN: The planning program used by the Federal Aviation Administration to identify, prioritize, and distribute Airport Improvement Program funds for airport development and the needs of the National Airspace System to meet specified national goals and objectives.

CARGO SERVICE AIRPORT: An airport served by aircraft providing air transportation of property only, including mail, with an annual aggregate landed weight of at least 100,000,000 pounds.

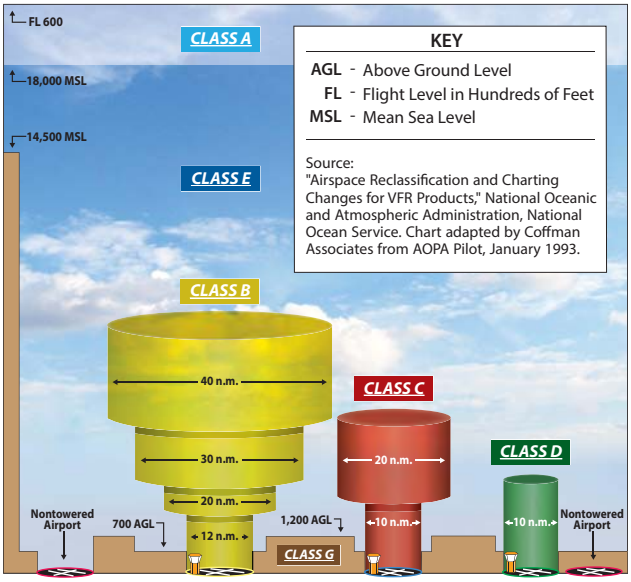
CATEGORY I: An Instrument Landing System (ILS) that provides acceptable guidance information to an aircraft from the coverage limits of the ILS to the point at which the localizer course line intersects the glide path at a decision height of 200 feet above the horizontal plane containing the runway threshold.

CATEGORY II: An ILS that provides acceptable guidance information to an aircraft from the coverage limits of the ILS to the point at which the localizer course line intersects the glide path at a decision height of 100 feet above the horizontal plane containing the runway threshold.

CATEGORY III: An ILS that provides acceptable guidance information to a pilot from the coverage limits of the ILS with no decision height specified above the horizontal plane containing the runway threshold.

CEILING: The height above the ground surface to the location of the lowest layer of clouds which is reported as either broken or overcast.

CIRCLING APPROACH: A maneuver initiated by the pilot to align the aircraft with the runway for landing when flying a predetermined circling instrument approach under IFR.



CLASS A AIRSPACE: See Controlled Airspace.

CLASS B AIRSPACE: See Controlled Airspace.

CLASS C AIRSPACE: See Controlled Airspace.

CLASS D AIRSPACE: See Controlled Airspace.

CLASS E AIRSPACE: See Controlled Airspace.

CLASS G AIRSPACE: See Controlled Airspace.

CLEAR ZONE: See Runway Protection Zone.

COMMERCIAL SERVICE AIRPORT: A public airport providing scheduled passenger service that enplanes at least 2,500 annual passengers.

COMMON TRAFFIC ADVISORY FREQUENCY: A radio frequency identified in the appropriate aeronautical chart which is designated for the purpose of transmitting airport advisory information and procedures while operating to or from an uncontrolled airport.

COMPASS LOCATOR (LOM): A low power, low/medium frequency radio-beacon installed in conjunction with the instrument landing system at one or two of the marker sites.

CONICAL SURFACE: An imaginary obstruction-limiting surface defined in FAR Part 77 that extends

from the edge of the horizontal surface outward and upward at a slope of 20 to 1 for a horizontal distance of 4,000 feet.

CONTROLLED AIRPORT: An airport that has an operating airport traffic control tower.

CONTROLLED AIRSPACE: Airspace of defined dimensions within which air traffic control services are provided to instrument flight rules (IFR) and visual flight rules (VFR) flights in accordance with the airspace classification. Controlled airspace in the United States is designated as follows:

- **CLASS A**: Generally, the airspace from 18,000 feet mean sea level (MSL) up to but not including flight level FL600. All persons must operate their aircraft under IFR.
- **CLASS B**: Generally, the airspace from the surface to 10,000 feet MSL surrounding the nation's busiest airports. The configuration of Class B airspace is unique to each airport, but typically consists of two or more layers of air space and is designed to contain all published instrument approach procedures to the airport. An air traffic control clearance is required for all aircraft to operate in the area.
- **CLASS C**: Generally, the airspace from the surface to 4,000 feet above the airport elevation (charted as MSL) surrounding those airports that have an operational control tower and radar approach control and are served by a qualifying number of IFR operations or passenger enplanements. Although individually tailored for each airport, Class C airspace typically consists of a surface area with a five nautical mile (nm) radius and an outer area with a 10 nautical mile radius that extends from 1,200 feet to 4,000 feet above the airport elevation. Two-way radio communication is required for all aircraft.
- **CLASS D**: Generally, that airspace from the surface to 2,500 feet above the air port elevation (charted as MSL) surrounding those airports that have an operational control tower. Class D airspace is individually tailored and configured to encompass published instrument approach procedure. Unless otherwise authorized, all persons must establish two-way radio communication.
- **CLASS E**: Generally, controlled airspace that is not classified as Class A, B, C, or D. Class E airspace extends upward from either the surface or a designated altitude to the overlying or adjacent controlled airspace. When designated as a surface area, the airspace will be configured to contain all instrument procedures. Class E airspace encompasses all Victor Airways. Only aircraft following instrument flight rules are required to establish two-way radio communication with air traffic control.
- **CLASS G**: Generally, that airspace not classified as Class A, B, C, D, or E. Class G airspace is uncontrolled for all aircraft. Class G airspace extends from the surface to the overlying Class E airspace.

CONTROLLED FIRING AREA: See special-use airspace.

CROSSWIND: A wind that is not parallel to a runway centerline or to the intended flight path of an aircraft.

CROSSWIND COMPONENT: The component of wind that is at a right angle to the runway centerline or the intended flight path of an aircraft.

CROSSWIND LEG: A flight path at right angles to the landing runway off its upwind end. See "traffic pattern."

D

DECIBEL: A unit of noise representing a level relative to a reference of a sound pressure 20 micro newtons per square meter.

DECISION HEIGHT/ DECISION ALTITUDE: The height above the end of the runway surface at which a decision must be made by a pilot during the ILS or Precision Approach Radar approach to either continue the approach or to execute a missed approach.

DECLARED DISTANCES: The distances declared available for the airplane's takeoff runway, takeoff distance, accelerate-stop distance, and landing distance requirements. The distances are:

- **TAKEOFF RUNWAY AVAILABLE (TORA):** The runway length declared available and suitable for the ground run of an airplane taking off.

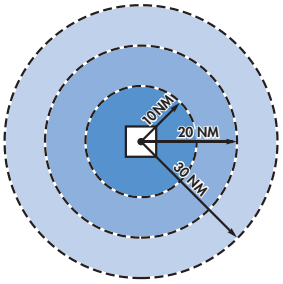
- **TAKEOFF DISTANCE AVAILABLE (TODA):** The TORA plus the length of any remaining runway and/or clear way beyond the far end of the TORA.
- **ACCELERATE-STOP DISTANCE AVAILABLE (ASDA):** The runway plus stopway length declared available for the acceleration and deceleration of an aircraft aborting a takeoff.
- **LANDING DISTANCE AVAILABLE (LDA):** The runway length declared available and suitable for landing.

DEPARTMENT OF TRANSPORTATION: The cabinet level federal government organization consisting of modal operating agencies, such as the Federal Aviation Administration, which was established to promote the coordination of federal transportation programs and to act as a focal point for research and development efforts in transportation.

DISCRETIONARY FUNDS: Federal grant funds that may be appropriated to an airport based upon designation by the Secretary of Transportation or Congress to meet a specified national priority such as enhancing capacity, safety, and security, or mitigating noise.

DISPLACED THRESHOLD: A threshold that is located at a point on the runway other than the designated beginning of the runway.

DISTANCE MEASURING EQUIPMENT (DME): Equipment (airborne and ground) used to measure, in nautical miles, the slant range distance of an aircraft from the DME navigational aid.



DNL: The 24-hour average sound level, in decibels, obtained after the addition of ten decibels to sound levels for the periods between 10 p.m. and 7 a.m. as averaged over a span of one year. It is the FAA standard metric for determining the cumulative exposure of individuals to noise.

DOWNWIND LEG: A flight path parallel to the landing runway in the direction opposite to landing. The downwind leg normally extends between the crosswind leg and the base leg. Also see "traffic pattern."

E

EASEMENT: The legal right of one party to use a portion of the total rights in real estate owned by another party. This may include the right of passage over, on, or below the property; certain air rights above the property, including view rights; and the rights to any specified form of development or activity, as well as any other legal rights in the property that may be specified in the easement document.

ELEVATION: The vertical distance measured in feet above mean sea level.

ENPLANED PASSENGERS: The total number of revenue passengers boarding aircraft, including originating, stop-over, and transfer passengers, in scheduled and nonscheduled services.

ENPLANEMENT: The boarding of a passenger, cargo, freight, or mail on an aircraft at an airport.

ENTITLEMENT: Federal funds for which a commercial service airport may be eligible based upon its annual passenger enplanements.

ENVIRONMENTAL ASSESSMENT (EA): An environmental analysis performed pursuant to the National Environmental Policy Act to determine whether an action would significantly affect the environment and thus require a more detailed environmental impact statement.

ENVIRONMENTAL AUDIT: An assessment of the current status of a party's compliance with applicable environmental requirements of a party's environmental compliance policies, practices, and controls.

ENVIRONMENTAL IMPACT STATEMENT (EIS): A document required of federal agencies by the National Environmental Policy Act for major projects are legislative proposals affecting the environment. It is a tool for decision-making describing the positive and negative effects of a proposed action and citing alternative actions.

ESSENTIAL AIR SERVICE: A federal program which guarantees air carrier service to selected small cities by providing subsidies as needed to prevent these cities from such service.

F

FEDERAL AVIATION REGULATIONS: The general and permanent rules established by the executive departments and agencies of the Federal Government for aviation, which are published in the Federal Register. These are the aviation subset of the Code of Federal Regulations.

FEDERAL INSPECTION SERVICES: The provision of customs and immigration services including passport inspection, inspection of baggage, the collection of duties on certain imported items, and the inspections for agricultural products, illegal drugs, or other restricted items.

FINAL APPROACH: A flight path in the direction of landing along the extended runway centerline. The final approach normally extends from the base leg to the runway. See "traffic pattern."

FINAL APPROACH AND TAKEOFF AREA (FATO). A defined area over which the final phase of the helicopter approach to a hover, or a landing is completed and from which the takeoff is initiated.

FINAL APPROACH FIX: The designated point at which the final approach segment for an aircraft landing on a runway begins for a non-precision approach.

FINDING OF NO SIGNIFICANT IMPACT (FONSI): A public document prepared by a Federal agency that presents the rationale why a proposed action will not have a significant effect on the environment and for which an environmental impact statement will not be prepared.

FIXED BASE OPERATOR (FBO): A provider of services to users of an airport. Such services include, but are not limited to, hangaring, fueling, flight training, repair, and maintenance.

FLIGHT LEVEL: A measure of altitude used by aircraft flying above 18,000 feet. Flight levels are indicated by three digits representing the pressure altitude in hundreds of feet. An airplane flying at flight level 360 is flying at a pressure altitude of 36,000 feet. This is expressed as FL 360.

FLIGHT SERVICE STATION: An operations facility in the national flight advisory system which utilizes data interchange facilities for the collection and dissemination of Notices to Airmen, weather, and administrative data and which provides pre-flight and in-flight advisory services to pilots through air and ground based communication facilities.

FRANGIBLE NAVAID: A navigational aid which retains its structural integrity and stiffness up to a designated maximum load, but on impact from a greater load, breaks, distorts, or yields in such a manner as to present the minimum hazard to aircraft.

G

GENERAL AVIATION: That portion of civil aviation which encompasses all facets of aviation except air carriers holding a certificate of convenience and necessity, and large aircraft commercial operators.

GENERAL AVIATION AIRPORT: An airport that provides air service to only general aviation.

GLIDESLOPE (GS): Provides vertical guidance for aircraft during approach and landing. The glideslope consists of the following:

1. Electronic components emitting signals which provide vertical guidance by reference to airborne instruments during instrument approaches such as ILS; or

2. Visual ground aids, such as VASI, which provide vertical guidance for VFR approach or for the visual portion of an instrument approach and landing.

GLOBAL POSITIONING SYSTEM (GPS): A system of 48 satellites used as reference points to enable navigators equipped with GPS receivers to determine their latitude, longitude, and altitude.

GROUND ACCESS: The transportation system on and around the airport that provides access to and from the airport by ground transportation vehicles for passengers, employees, cargo, freight, and airport services.

H

HELIPAD: A designated area for the takeoff, landing, and parking of helicopters.

HIGH INTENSITY RUNWAY LIGHTS: The highest classification in terms of intensity or brightness for lights designated for use in delineating the sides of a runway.

HIGH-SPEED EXIT TAXIWAY: A long radius taxiway designed to expedite aircraft turning off the runway after landing (at speeds to 60 knots), thus reducing runway occupancy time.

HORIZONTAL SURFACE: An imaginary obstruction-limiting surface defined in FAR Part 77 that is specified as a portion of a horizontal plane surrounding a runway located 150 feet above the established airport elevation. The specific horizontal dimensions of this surface are a function of the types of approaches existing or planned for the runway.

I

INITIAL APPROACH FIX: The designated point at which the initial approach segment begins for an instrument approach to a runway.

INSTRUMENT APPROACH PROCEDURE: A series of predetermined maneuvers for the orderly transfer of an aircraft under instrument flight conditions from the beginning of the initial approach to a landing, or to a point from which a landing may be made visually.

INSTRUMENT FLIGHT RULES (IFR): Procedures for the conduct of flight in weather conditions below Visual Flight Rules weather minimums. The term IFR is often also used to define weather conditions and the type of flight plan under which an aircraft is operating.

INSTRUMENT LANDING SYSTEM (ILS): A precision instrument approach system which normally consists of the following electronic components and visual aids:

1. Localizer.
2. Glide Slope.
3. Outer Marker.
4. Middle Marker.
5. Approach Lights.

INSTRUMENT METEOROLOGICAL CONDITIONS: Meteorological conditions expressed in terms of specific visibility and ceiling conditions that are less than the minimums specified for visual meteorological conditions.

ITINERANT OPERATIONS: Operations by aircraft that are not based at a specified airport.

K

KNOTS: A unit of speed length used in navigation that is equivalent to the number of nautical miles traveled in one hour.

L

LOCAL-AREA AUGMENTATION SYSTEM: (LAAS) is an all-weather aircraft landing system based on real-time differential correction of the GPS signal.

LANDSIDE: The portion of an airport that provides the facilities necessary for the processing of passengers, cargo, freight, and ground transportation vehicles.

LANDING DISTANCE AVAILABLE (LDA): See declared distances.

LARGE AIRPLANE: An airplane that has a maximum certified takeoff weight in excess of 12,500 pounds.

LOCAL AREA AUGMENTATION SYSTEM: A differential GPS system that provides localized measurement correction signals to the basic GPS signals to improve navigational accuracy integrity, continuity, and availability.

LOCAL OPERATIONS: Aircraft operations performed by aircraft that are based at the airport and that operate in the local traffic pattern or within sight of the airport, that are known to be departing for or arriving from flights in local practice areas within a prescribed distance from the airport, or that execute simulated instrument approaches at the airport.

LOCAL TRAFFIC: Aircraft operating in the traffic pattern or within sight of the tower, or aircraft known to be departing or arriving from the local practice areas, or aircraft executing practice instrument approach procedures. Typically, this includes touch and-go training operations.

LOCALIZER: The component of an ILS which provides course guidance to the runway.

LOCALIZER TYPE DIRECTIONAL AID (LDA): A facility of comparable utility and accuracy to a localizer, but is not part of a complete ILS and is not aligned with the runway.

LONG RANGE NAVIGATION SYSTEM (LORAN): Long range navigation is an electronic navigational aid

which determines aircraft position and speed by measuring the difference in the time of reception of synchronized pulse signals from two fixed transmitters. Loran is used for en route navigation.

LOW INTENSITY RUNWAY LIGHTS: The lowest classification in terms of intensity or brightness for lights designated for use in delineating the sides of a runway.

M

MEDIUM INTENSITY RUNWAY LIGHTS: The middle classification in terms of intensity or brightness for lights designated for use in delineating the sides of a runway.

MICROWAVE LANDING SYSTEM (MLS): An instrument approach and landing system that provides precision guidance in azimuth, elevation, and distance measurement.

MILITARY OPERATIONS: Aircraft operations that are performed in military aircraft.

MILITARY OPERATIONS AREA (MOA): See special-use airspace

MILITARY TRAINING ROUTE: An air route depicted on aeronautical charts for the conduct of military flight training at speeds above 250 knots.

MISSED APPROACH COURSE (MAC): The flight route to be followed if, after an instrument approach, a landing is not affected, and occurring normally:

1. When the aircraft has descended to the decision height and has not established visual contact; or
2. When directed by air traffic control to pull up or to go around again.

MOVEMENT AREA: The runways, taxiways, and other areas of an airport which are utilized for taxiing/hover taxiing, air taxiing, takeoff, and landing of aircraft, exclusive of loading ramps and parking areas. At those airports with a tower, air traffic control clearance is required for entry onto the movement area.

N

NATIONAL AIRSPACE SYSTEM: The network of air traffic control facilities, air traffic control areas, and navigational facilities through the U.S.

NATIONAL PLAN OF INTEGRATED AIRPORT SYSTEMS: The national airport system plan developed by the Secretary of Transportation on a biannual basis for the development of public use airports to meet national air transportation needs.

NATIONAL TRANSPORTATION SAFETY BOARD: A federal government organization established to investigate and determine the probable cause of transportation accidents, to recommend equipment and procedures to enhance transportation safety, and to review on appeal the suspension or revocation of any certificates or licenses issued by the Secretary of Transportation.

NAUTICAL MILE: A unit of length used in navigation which is equivalent to the distance spanned by one minute of arc in latitude, that is, 1,852 meters or 6,076 feet. It is equivalent to approximately 1.15 statute mile.

NAVAID: A term used to describe any electrical or visual air navigational aids, lights, signs, and associated supporting equipment (i.e. PAPI, VASI, ILS, etc.)

NAVIGATIONAL AID: A facility used as, available for use as, or designed for use as an aid to air navigation.

NOISE CONTOUR: A continuous line on a map of the airport vicinity connecting all points of the same noise exposure level.

NON-DIRECTIONAL BEACON (NDB): A beacon transmitting nondirectional signals whereby the pilot of an aircraft equipped with direction finding equipment can determine their bearing to and from the radio beacon and home on, or track to, the station. When the radio beacon is installed in conjunction with the Instrument Landing System marker, it is normally called a Compass Locator.

NON-PRECISION APPROACH PROCEDURE: A standard instrument approach procedure in which no electronic glide slope is provided, such as VOR, TACAN, NDB, or LOC.

NOTICE TO AIRMEN: A notice containing information concerning the establishment, condition, or change in any component of or hazard in the National Airspace System, the timely knowledge of which is considered essential to personnel concerned with flight operations.

O

OBJECT FREE AREA (OFA): An area on the ground centered on a runway, taxiway, or taxilane centerline provided to enhance the safety of aircraft operations by having the area free of objects, except for objects that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes.

OBSTACLE FREE ZONE (OFZ): The airspace below 150 feet above the established airport elevation and along the runway and extended runway centerline that is required to be kept clear of all objects, except for frangible visual NAVAIDs that need to be located in the OFZ because of their function, in order to provide clearance for aircraft landing or taking off from the runway, and for missed approaches.

ONE-ENGINE INOPERABLE SURFACE: A surface emanating from the runway end at a slope ratio of 62.5:1. Air carrier airports are required to maintain a technical drawing of this surface depicting any object penetrations by January 1, 2010.

OPERATION: The take-off, landing, or touch-and-go procedure by an aircraft on a runway at an airport.

OUTER MARKER (OM): An ILS navigation facility in the terminal area navigation system located four to seven miles from the runway edge on the extended centerline, indicating to the pilot that he/she is passing over the facility and can begin final approach.

P

PILOT CONTROLLED LIGHTING: Runway lighting systems at an airport that are controlled by activating the microphone of a pilot on a specified radio frequency.

PRECISION APPROACH: A standard instrument approach procedure which provides runway alignment and glide slope (descent) information. It is categorized as follows:

- **CATEGORY I (CAT I)**: A precision approach which provides for approaches with a decision height of not less than 200 feet and visibility not less than 1/2 mile or Runway Visual Range (RVR) 2400 (RVR 1800) with operative touchdown zone and runway centerline lights.
- **CATEGORY II (CAT II)**: A precision approach which provides for approaches with a decision height of not less than 100 feet and visibility not less than 1200 feet RVR.
- **CATEGORY III (CAT III)**: A precision approach which provides for approaches with minima less than Category II.

PRECISION APPROACH PATH INDICATOR (PAPI): A lighting system providing visual approach slope guidance to aircraft during a landing approach. It is similar to a VASI but provides a sharper transition between the colored indicator lights.

PRECISION APPROACH RADAR: A radar facility in the terminal air traffic control system used to detect and display with a high degree of accuracy the direction, range, and elevation of an aircraft on the final approach to a runway.

PRECISION OBJECT FREE AREA (POFA): An area centered on the extended runway centerline, beginning at the runway threshold and extending behind the runway threshold that is 200 feet long by 800 feet wide. The POFA is a clearing standard which requires the POFA to be kept clear of above ground objects protruding above the runway safety area edge elevation (except for frangible NAVAIDS). The POFA applies to all new authorized instrument approach procedures with less than 3/4 mile visibility.

PRIMARY AIRPORT: A commercial service airport that enplanes at least 10,000 annual passengers.

PRIMARY SURFACE: An imaginary obstruction limiting surface defined in FAR Part 77 that is specified as a rectangular surface longitudinally centered about a runway. The specific dimensions of this surface are a function of the types of approaches existing or planned for the runway.

PROHIBITED AREA: See special-use airspace.

PVC: Poor visibility and ceiling. Used in determining Annual Service Volume. PVC conditions exist when the cloud ceiling is less than 500 feet and visibility is less than one mile.

R

RADIAL: A navigational signal generated by a Very High Frequency Omni-directional Range or VORTAC station that is measured as an azimuth from the station.

REGRESSION ANALYSIS: A statistical technique that seeks to identify and quantify the relationships between factors associated with a forecast.

REMOTE COMMUNICATIONS OUTLET (RCO): An unstaffed transmitter receiver/facility remotely controlled by air traffic personnel. RCOs serve flight service stations (FSSs). RCOs were established to provide ground-to-ground communications between air traffic control specialists and pilots at satellite airports for delivering en route clearances, issuing departure authorizations, and acknowledging instrument flight rules cancellations or departure/ landing times.

REMOTE TRANSMITTER/RECEIVER (RTR): See remote communications outlet. RTRs serve ARTCCs.

RELIEVER AIRPORT: An airport to serve general aviation aircraft which might otherwise use a congested air-carrier served airport.

RESTRICTED AREA: See special-use airspace.

RNAV: Area navigation - airborne equipment which permits flights over determined tracks within prescribed accuracy tolerances without the need to overfly ground-based navigation facilities. Used en route and for approaches to an airport.

RUNWAY: A defined rectangular area on an airport prepared for aircraft landing and takeoff. Runways are normally numbered in relation to their magnetic direction, rounded off to the nearest 10 degrees. For example, a runway with a magnetic heading of 180 would be designated Runway 18. The runway heading on the opposite end of the runway is 180 degrees from that runway end. For example, the opposite runway heading for Runway 18 would be Runway 36 (magnetic heading of 360). Aircraft can takeoff or land from either end of a runway, depending upon wind direction.

RUNWAY ALIGNMENT INDICATOR LIGHT: A series of high intensity sequentially flashing lights installed on the extended centerline of the runway usually in conjunction with an approach lighting system.

RUNWAY DESIGN CODE: A code signifiying the design standards to which the runway is to be built.

RUNWAY END IDENTIFICATION LIGHTING (REIL): Two synchronized flashing lights, one on each side of the runway threshold, which provide rapid and positive identification of the approach end of a particular runway.

RUNWAY GRADIENT: The average slope, measured in percent, between the two ends of a runway.

RUNWAY PROTECTION ZONE (RPZ): An area off the runway end to enhance the protection of people and property on the ground. The RPZ is trapezoidal in shape. Its dimensions are determined by the aircraft approach speed and runway approach type and minima.

RUNWAY REFERENCE CODE: A code signifying the current operational capabilities of a runway and associated taxiway.

RUNWAY SAFETY AREA (RSA): A defined surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway.

RUNWAY VISIBILITY ZONE (RVZ): An area on the airport to be kept clear of permanent objects so that there is an unobstructed line of- site from any point five feet above the runway centerline to any point five feet above an intersecting runway centerline.

RUNWAY VISUAL RANGE (RVR): An instrumentally derived value, in feet, representing the horizontal distance a pilot can see down the runway from the runway end.

S

SCOPE: The document that identifies and defines the tasks, emphasis, and level of effort associated with a project or study.

SEGMENTED CIRCLE: A system of visual indicators designed to provide traffic pattern information at airports without operating control towers.

SHOULDER: An area adjacent to the edge of paved runways, taxiways, or aprons providing a transition between the pavement and the adjacent surface; support for aircraft running off the pavement; enhanced drainage; and blast protection. The shoulder does not necessarily need to be paved.

SLANT-RANGE DISTANCE: The straight line distance between an aircraft and a point on the ground.

SMALL AIRCRAFT: An aircraft that has a maximum certified takeoff weight of up to 12,500 pounds.

SPECIAL-USE AIRSPACE: Airspace of defined dimensions identified by a surface area wherein activities must be confined because of their nature and/or wherein limitations may be imposed upon aircraft operations that are not a part of those activities. Special-use airspace classifications include:

- **ALERT AREA**: Airspace which may contain a high volume of pilot training activities or an unusual type of aerial activity, neither of which is hazardous to aircraft.
- **CONTROLLED FIRING AREA**: Airspace wherein activities are conducted under conditions so controlled as to eliminate hazards to nonparticipating aircraft and to ensure the safety of persons or property on the ground.
- **MILITARY OPERATIONS AREA (MOA)**: Designated airspace with defined vertical and lateral dimensions established outside Class A airspace to separate/segregate certain military activities from instrument flight rule (IFR) traffic and to identify for visual flight rule (VFR) traffic where these activities are conducted.
- **PROHIBITED AREA**: Designated airspace within which the flight of aircraft is prohibited.
- **RESTRICTED AREA**: Airspace designated under Federal Aviation Regulation (FAR) 73, within which the flight of aircraft, while not wholly prohibited, is subject to restriction. Most restricted areas are designated joint use. When not in use by the using agency, IFR/VFR operations can be authorized by the controlling air traffic control facility.
- **WARNING AREA:** Airspace which may contain hazards to nonparticipating aircraft.

STANDARD INSTRUMENT DEPARTURE (SID): A preplanned coded air traffic control IFR departure routing, preprinted for pilot use in graphic and textual form only.

STANDARD INSTRUMENT DEPARTURE PROCEDURES: A published standard flight procedure to be utilized following takeoff to provide a transition between the airport and the terminal area or en route airspace.

STANDARD TERMINAL ARRIVAL ROUTE (STAR): A preplanned coded air traffic control IFR arrival routing, preprinted for pilot use in graphic and textual or textual form only.

STOP-AND-GO: A procedure wherein an aircraft will land, make a complete stop on the runway, and then commence a takeoff from that point. A stop-and-go is recorded as two operations: one operation for the landing and one operation for the takeoff.

STOPWAY: An area beyond the end of a takeoff runway that is designed to support an aircraft during an aborted takeoff without causing structural damage to the aircraft. It is not to be used for takeoff, landing, or taxiing by aircraft.

STRAIGHT-IN LANDING/APPROACH: A landing made on a runway aligned within 30 degrees of the final approach course following completion of an instrument approach.

T

TACTICAL AIR NAVIGATION (TACAN): An ultrahigh frequency electronic air navigation system which provides suitably-equipped aircraft a continuous indication of bearing and distance to the TACAN station.

TAKEOFF RUNWAY AVAILABLE (TORA):
See declared distances.

TAKEOFF DISTANCE AVAILABLE (TODA):
See declared distances.

TAXILANE: The portion of the aircraft parking area used for access between taxiways and aircraft parking positions.

TAXIWAY: A defined path established for the taxiing of aircraft from one part of an airport to another.

TAXIWAY DESIGN GROUP: A classification of airplanes based on outer to outer Main Gear Width (MGW) and Cockpit to Main Gear (CMG) distance.

TAXIWAY SAFETY AREA (TSA): A defined surface alongside the taxiway prepared or suitable for reducing the risk of damage to an airplane unintentionally departing the taxiway.

TERMINAL INSTRUMENT PROCEDURES: Published flight procedures for conducting instrument approaches to runways under instrument meteorological conditions.

TERMINAL RADAR APPROACH CONTROL: An element of the air traffic control system responsible for monitoring the en-route and terminal segment of air traffic in the airspace surrounding airports with moderate to high levels of air traffic.

TETRAHEDRON: A device used as a landing direction indicator. The small end of the tetrahedron points in the direction of landing.

THRESHOLD: The beginning of that portion of the runway available for landing. In some instances the landing threshold may be displaced.

TOUCH-AND-GO: An operation by an aircraft that lands and departs on a runway without stopping or exiting the runway. A touch-and go is recorded as two operations: one operation for the landing and one operation for the takeoff.

TOUCHDOWN: The point at which a landing aircraft makes contact with the runway surface.

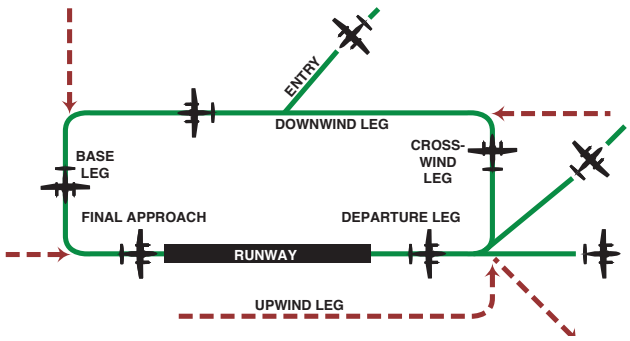
TOUCHDOWN AND LIFT-OFF AREA (TLOF): A load bearing, generally paved area, normally centered in the FATO, on which the helicopter lands or takes off.

TOUCHDOWN ZONE (TDZ): The first 3,000 feet of the runway beginning at the threshold.

TOUCHDOWN ZONE ELEVATION (TDZE): The highest elevation in the touchdown zone.

TOUCHDOWN ZONE (TDZ) LIGHTING: Two rows of transverse light bars located symmetrically about the runway centerline normally at 100- foot intervals. The basic system extends 3,000 feet along the runway.

TRAFFIC PATTERN: The traffic flow that is prescribed for aircraft landing at or taking off from an airport. The components of a typical traffic pattern are the upwind leg, crosswind leg, downwind leg, base leg, and final approach.



U

UNCONTROLLED AIRPORT: An airport without an air traffic control tower at which the control of Visual Flight Rules traffic is not exercised.

UNCONTROLLED AIRSPACE: Airspace within which aircraft are not subject to air traffic control.

UNIVERSAL COMMUNICATION (UNICOM):
A nongovernment communication facility which may provide airport information at certain airports. Locations and frequencies of UNICOM's are shown on aeronautical charts and publications.

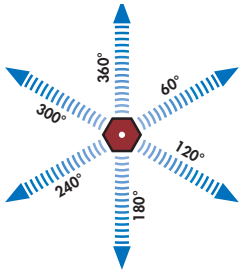
UPWIND LEG: A flight path parallel to the landing runway in the direction of landing. See "traffic pattern."

V

VECTOR: A heading issued to an aircraft to provide navigational guidance by radar.

VERY HIGH FREQUENCY/ OMNIDIRECTIONAL RANGE (VOR): A ground-based electronic navigation aid transmitting very high frequency navigation signals, 360 degrees in azimuth, oriented from magnetic north. Used as the basis for navigation in the national airspace system. The VOR periodically identifies itself by Morse Code and may have an additional voice identification feature.

VERY HIGH FREQUENCY OMNI-DIRECTIONAL RANGE/ TACTICAL AIR NAVIGATION (VORTAC): A navigation aid providing VOR azimuth, TACAN azimuth, and TACAN distance-measuring equipment (DME) at one site.



VICTOR AIRWAY: A control area or portion thereof established in the form of a corridor, the centerline of which is defined by radio navigational aids.

VISUAL APPROACH: An approach wherein an aircraft on an IFR flight plan, operating in VFR conditions under the control of an air traffic control facility and having an air traffic control authorization, may proceed to the airport of destination in VFR conditions.

VISUAL APPROACH SLOPE INDICATOR (VASI): An airport lighting facility providing vertical visual approach slope guidance to aircraft during approach to landing by radiating a directional pattern of high intensity red and white focused light beams which indicate to the pilot that he is on path if he sees red/ white, above path if white/white, and below path if red/red. Some airports serving large aircraft have three-bar VASI's which provide two visual guide paths to the same runway.

VISUAL FLIGHT RULES (VFR): Rules that govern the procedures for conducting flight under visual conditions. The term VFR is also used in the United States to indicate weather conditions that are equal to or greater than minimum VFR requirements. In addition, it is used by pilots and controllers to indicate type of flight plan.

VISUAL METEOROLOGICAL CONDITIONS: Meteorological conditions expressed in terms of specific visibility and ceiling conditions which are equal to or greater than the threshold values for instrument meteorological conditions.

VOR: See "Very High Frequency Omnidirectional Range Station."

VORTAC: See "Very High Frequency Omnidirectional Range Station/Tactical Air Navigation."

W

WARNING AREA: See special-use airspace.

WIDE AREA AUGMENTATION SYSTEM: An enhancement of the Global Positioning System that includes integrity broadcasts, differential corrections, and additional ranging signals for the purpose of providing the accuracy, integrity, availability, and continuity required to support all phases of flight.

Abbreviations

AC: advisory circular

ACIP: airport capital improvement program

ADF: automatic direction finder

ADG: airplane design group

AFSS: automated flight service station

AGL: above ground level

AIA: annual instrument approach

AIP: Airport Improvement Program

AIR-21: Wendell H. Ford Aviation Investment and Reform Act for the 21st Century

ALS: approach lighting system

ALSF-1: standard 2,400-foot high intensity approach lighting system with sequenced flashers (CAT I configuration)

ALSF-2: standard 2,400-foot high intensity approach lighting system with sequenced flashers (CAT II configuration)

AOA: Aircraft Operation Area

APV: instrument approach procedure with vertical guidance

ARC: airport reference code

ARFF: aircraft rescue and fire fighting

ARP: airport reference point

ARTCC: air route traffic control center

ASDA: accelerate-stop distance available

ASR: airport surveillance radar

ASOS: automated surface observation station

ATC(T): airport traffic control tower

ATIS: automated terminal information service

AVGAS: aviation gasoline - typically 100 low lead (100LL)

AWOS: automatic weather observation station

BRL: building restriction line

CFR: Code of Federal Regulation

CIP: capital improvement program

DME: distance measuring equipment

DNL: day-night noise level

DWL: runway weight bearing capacity of aircraft with dual-wheel type landing gear

DTWL: runway weight bearing capacity of aircraft with dual-tandem type landing gear

FAA: Federal Aviation Administration

FAR: Federal Aviation Regulation

FBO: fixed base operator

FY: fiscal year

GA: general aviation

GPS: global positioning system

GS: glide slope

HIRL: high intensity runway edge lighting

IFR: instrument flight rules (FAR Part 91)

ILS: instrument landing system

IM: inner marker

LAAS: local area augmented system

LDA: localizer type directional aid

LDA: landing distance available

LIRL: low intensity runway edge lighting

LMM: compass locator at middle marker

LOM: compass locator at outer marker

LORAN: long range navigation

MALS: medium intensity approach lighting system with indicator lights

MIRL: medium intensity runway edge lighting

MITL: medium intensity taxiway edge lighting

MLS: microwave landing system

MM: middle marker

MOA: military operations area

MSL: mean sea level

NAVAID: navigational aid

NDB: nondirectional radio beacon

NM: nautical mile (6,076.1 feet)

NPDES: National Pollutant Discharge Elimination System

NPIAS: National Plan of Integrated Airport Systems

NPRM: notice of proposed rule making

ODALS: omnidirectional approach lighting system

OFA: object free area

OFZ: obstacle free zone

OM: outer marker

PAC: planning advisory committee

PAPI: precision approach path indicator

PFC: porous friction course

PFC: passenger facility charge

PCL: pilot-controlled lighting

PIW public information workshop

PLASI: pulsating visual approach slope indicator

POFA: precision object free area

PVASI: pulsating/steady visual approach slope indicator

PVC: poor visibility and ceiling

RCO: remote communications outlet

RRC: Runway Reference Code

RDC: Runway Design Code

REIL: runway end identification lighting

RNAV: area navigation

RPZ: runway protection zone

RSA: runway safety area

RTR: remote transmitter/receiver

RVR: runway visibility range

RVZ: runway visibility zone

SALS: short approach lighting system

SASP: state aviation system plan

SEL: sound exposure level

SID: standard instrument departure

SM: statute mile (5,280 feet)

SRE: snow removal equipment

SSALF: simplified short approach lighting system with runway alignment indicator lights

STAR: standard terminal arrival route

SWL: runway weight bearing capacity for aircraft with single-wheel tandem type landing gear

TACAN: tactical air navigational aid

TAF: Federal Aviation Administration (FAA) Terminal Area Forecast

TDG: Taxiway Design Group

TLOF: Touchdown and lift-off

TDZ: touchdown zone

TDZE: touchdown zone elevation

TODA: takeoff distance available

TORA: takeoff runway available

TRACON: terminal radar approach control

VASI: visual approach slope indicator

VFR: visual flight rules (FAR Part 91)

VHF: very high frequency

VOR: very high frequency omni-directional range

VORTAC: VOR and TACAN collocated

WAAS: wide area augmentation system

FRIDAY HARBOR AIRPORT



APPENDIX B

Grant Assurances

FAA
Airports

ASSURANCES

Airport Sponsors

A. General.

1. These assurances shall be complied with in the performance of grant agreements for airport development, airport planning, and noise compatibility program grants for airport sponsors.
2. These assurances are required to be submitted as part of the project application by sponsors requesting funds under the provisions of Title 49, U.S.C., subtitle VII, as amended. As used herein, the term "public agency sponsor" means a public agency with control of a public-use airport; the term "private sponsor" means a private owner of a public-use airport; and the term "sponsor" includes both public agency sponsors and private sponsors.
3. Upon acceptance of this grant offer by the sponsor, these assurances are incorporated in and become part of this grant agreement.

B. Duration and Applicability.

1. **Airport development or Noise Compatibility Program Projects Undertaken by a Public Agency Sponsor.**

   The terms, conditions and assurances of this grant agreement shall remain in full force and effect throughout the useful life of the facilities developed or equipment acquired for an airport development or noise compatibility program project, or throughout the useful life of the project items installed within a facility under a noise compatibility program project, but in any event not to exceed twenty (20) years from the date of acceptance of a grant offer of Federal funds for the project. However, there shall be no limit on the duration of the assurances regarding Exclusive Rights and Airport Revenue so long as the airport is used as an airport. There shall be no limit on the duration of the terms, conditions, and assurances with respect to real property acquired with federal funds. Furthermore, the duration of the Civil Rights assurance shall be specified in the assurances.

2. **Airport Development or Noise Compatibility Projects Undertaken by a Private Sponsor.**

   The preceding paragraph 1 also applies to a private sponsor except that the useful life of project items installed within a facility or the useful life of the facilities developed or equipment acquired under an airport development or noise compatibility program project shall be no less than ten (10) years from the date of acceptance of Federal aid for the project.

3. **Airport Planning Undertaken by a Sponsor.**

Unless otherwise specified in this grant agreement, only Assurances 1, 2, 3, 5, 6, 13, 18, 25, 30, 32, 33, and 34 in Section C apply to planning projects. The terms, conditions, and assurances of this grant agreement shall remain in full force and effect during the life of the project; there shall be no limit on the duration of the assurances regarding Airport Revenue so long as the airport is used as an airport.

C. Sponsor Certification.

The sponsor hereby assures and certifies, with respect to this grant that:

1. **General Federal Requirements.**

It will comply with all applicable Federal laws, regulations, executive orders, policies, guidelines, and requirements as they relate to the application, acceptance and use of Federal funds for this project including but not limited to the following:

Federal Legislation

a. Title 49, U.S.C., subtitle VII, as amended.
b. Davis-Bacon Act - 40 U.S.C. 276(a), et seq.[1]
c. Federal Fair Labor Standards Act - 29 U.S.C. 201, et seq.
d. Hatch Act – 5 U.S.C. 1501, et seq.[2]
e. Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 Title 42 U.S.C. 4601, et seq.[1 2]
f. National Historic Preservation Act of 1966 - Section 106 - 16 U.S.C. 470(f).[1]
g. Archeological and Historic Preservation Act of 1974 - 16 U.S.C. 469 through 469c.[1]
h. Native Americans Grave Repatriation Act - 25 U.S.C. Section 3001, et seq.
i. Clean Air Act, P.L. 90-148, as amended.
j. Coastal Zone Management Act, P.L. 93-205, as amended.
k. Flood Disaster Protection Act of 1973 - Section 102(a) - 42 U.S.C. 4012a.[1]
l. Title 49, U.S.C., Section 303, (formerly known as Section 4(f))
m. Rehabilitation Act of 1973 - 29 U.S.C. 794.
n. Title VI of the Civil Rights Act of 1964 (42 U.S.C. § 2000d et seq., 78 stat. 252) (prohibits discrimination on the basis of race, color, national origin);
o. Americans with Disabilities Act of 1990, as amended, (42 U.S.C. § 12101 et seq.), prohibits discrimination on the basis of disability).
p. Age Discrimination Act of 1975 - 42 U.S.C. 6101, et seq.
q. American Indian Religious Freedom Act, P.L. 95-341, as amended.
r. Architectural Barriers Act of 1968 -42 U.S.C. 4151, et seq.[1]
s. Power plant and Industrial Fuel Use Act of 1978 - Section 403- 2 U.S.C. 8373.[1]
t. Contract Work Hours and Safety Standards Act - 40 U.S.C. 327, et seq.[1]
u. Copeland Anti-kickback Act - 18 U.S.C. 874.1
v. National Environmental Policy Act of 1969 - 42 U.S.C. 4321, et seq.[1]
w. Wild and Scenic Rivers Act, P.L. 90-542, as amended.
x. Single Audit Act of 1984 - 31 U.S.C. 7501, et seq.[2]
y. Drug-Free Workplace Act of 1988 - 41 U.S.C. 702 through 706.

z. The Federal Funding Accountability and Transparency Act of 2006, as amended (Pub. L. 109-282, as amended by section 6202 of Pub. L. 110-252).

Executive Orders

a. Executive Order 11246 - Equal Employment Opportunity[1]
b. Executive Order 11990 - Protection of Wetlands
c. Executive Order 11998 – Flood Plain Management
d. Executive Order 12372 - Intergovernmental Review of Federal Programs
e. Executive Order 12699 - Seismic Safety of Federal and Federally Assisted New Building Construction[1]
f. Executive Order 12898 - Environmental Justice

Federal Regulations

a. 2 CFR Part 180 - OMB Guidelines to Agencies on Governmentwide Debarment and Suspension (Nonprocurement).
b. 2 CFR Part 200, Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards. [OMB Circular A-87 Cost Principles Applicable to Grants and Contracts with State and Local Governments, and OMB Circular A-133 - Audits of States, Local Governments, and Non-Profit Organizations].[4, 5, 6]
c. 2 CFR Part 1200 – Nonprocurement Suspension and Debarment
d. 14 CFR Part 13 - Investigative and Enforcement Procedures14 CFR Part 16 - Rules of Practice For Federally Assisted Airport Enforcement Proceedings.
e. 14 CFR Part 150 - Airport noise compatibility planning.
f. 28 CFR Part 35- Discrimination on the Basis of Disability in State and Local Government Services.
g. 28 CFR § 50.3 - U.S. Department of Justice Guidelines for Enforcement of Title VI of the Civil Rights Act of 1964.
h. 29 CFR Part 1 - Procedures for predetermination of wage rates.[1]
i. 29 CFR Part 3 - Contractors and subcontractors on public building or public work financed in whole or part by loans or grants from the United States.[1]
j. 29 CFR Part 5 - Labor standards provisions applicable to contracts covering federally financed and assisted construction (also labor standards provisions applicable to non-construction contracts subject to the Contract Work Hours and Safety Standards Act).[1]
k. 41 CFR Part 60 - Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor (Federal and federally assisted contracting requirements).[1]
l. 49 CFR Part 18 - Uniform administrative requirements for grants and cooperative agreements to state and local governments.[3]
m. 49 CFR Part 20 - New restrictions on lobbying.
n. 49 CFR Part 21 – Nondiscrimination in federally-assisted programs of the Department of Transportation - effectuation of Title VI of the Civil Rights Act of 1964.
o. 49 CFR Part 23 - Participation by Disadvantage Business Enterprise in Airport Concessions.

p. 49 CFR Part 24 – Uniform Relocation Assistance and Real Property Acquisition for Federal and Federally Assisted Programs.[1] [2]
q. 49 CFR Part 26 – Participation by Disadvantaged Business Enterprises in Department of Transportation Programs.
r. 49 CFR Part 27 – Nondiscrimination on the Basis of Handicap in Programs and Activities Receiving or Benefiting from Federal Financial Assistance.[1]
s. 49 CFR Part 28 – Enforcement of Nondiscrimination on the Basis of Handicap in Programs or Activities conducted by the Department of Transportation.
t. 49 CFR Part 30 - Denial of public works contracts to suppliers of goods and services of countries that deny procurement market access to U.S. contractors.
u. 49 CFR Part 32 – Governmentwide Requirements for Drug-Free Workplace (Financial Assistance)
v. 49 CFR Part 37 – Transportation Services for Individuals with Disabilities (ADA).
w. 49 CFR Part 41 - Seismic safety of Federal and federally assisted or regulated new building construction.

Specific Assurances

Specific assurances required to be included in grant agreements by any of the above laws, regulations or circulars are incorporated by reference in this grant agreement.

Footnotes to Assurance C.1.

[1] These laws do not apply to airport planning sponsors.

[2] These laws do not apply to private sponsors.

[3] 49 CFR Part 18 and 2 CFR Part 200 contain requirements for State and Local Governments receiving Federal assistance. Any requirement levied upon State and Local Governments by this regulation and circular shall also be applicable to private sponsors receiving Federal assistance under Title 49, United States Code.

[4] On December 26, 2013 at 78 FR 78590, the Office of Management and Budget (OMB) issued the Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards in 2 CFR Part 200. 2 CFR Part 200 replaces and combines the former Uniform Administrative Requirements for Grants (OMB Circular A-102 and Circular A-110 or 2 CFR Part 215 or Circular) as well as the Cost Principles (Circulars A-21 or 2 CFR part 220; Circular A-87 or 2 CFR part 225; and A-122, 2 CFR part 230). Additionally it replaces Circular A-133 guidance on the Single Annual Audit. In accordance with 2 CFR section 200.110, the standards set forth in Part 200 which affect administration of Federal awards issued by Federal agencies become effective once implemented by Federal agencies or when any future amendment to this Part becomes final. Federal agencies, including the Department of Transportation, must implement the policies and procedures applicable to Federal awards by promulgating a regulation to be effective by December 26, 2014 unless different provisions are required by statute or approved by OMB.

[5] Cost principles established in 2 CFR part 200 subpart E must be used as guidelines for determining the eligibility of specific types of expenses.

[6] Audit requirements established in 2 CFR part 200 subpart F are the guidelines for audits.

2. **Responsibility and Authority of the Sponsor.**

   a. Public Agency Sponsor:

   It has legal authority to apply for this grant, and to finance and carry out the proposed project; that a resolution, motion or similar action has been duly adopted or passed as an official act of the applicant's governing body authorizing the filing of the application, including all understandings and assurances contained therein, and directing and authorizing the person identified as the official representative of the applicant to act in connection with the application and to provide such additional information as may be required.

   b. Private Sponsor:

   It has legal authority to apply for this grant and to finance and carry out the proposed project and comply with all terms, conditions, and assurances of this grant agreement. It shall designate an official representative and shall in writing direct and authorize that person to file this application, including all understandings and assurances contained therein; to act in connection with this application; and to provide such additional information as may be required.

3. **Sponsor Fund Availability.**

   It has sufficient funds available for that portion of the project costs which are not to be paid by the United States. It has sufficient funds available to assure operation and maintenance of items funded under this grant agreement which it will own or control.

4. **Good Title.**

   a. It, a public agency or the Federal government, holds good title, satisfactory to the Secretary, to the landing area of the airport or site thereof, or will give assurance satisfactory to the Secretary that good title will be acquired.

   b. For noise compatibility program projects to be carried out on the property of the sponsor, it holds good title satisfactory to the Secretary to that portion of the property upon which Federal funds will be expended or will give assurance to the Secretary that good title will be obtained.

5. **Preserving Rights and Powers.**

   a. It will not take or permit any action which would operate to deprive it of any of the rights and powers necessary to perform any or all of the terms, conditions, and assurances in this grant agreement without the written approval of the Secretary, and will act promptly to acquire, extinguish or modify any outstanding rights or claims of right of others which would interfere with such performance by the sponsor. This shall be done in a manner acceptable to the Secretary.

b. It will not sell, lease, encumber, or otherwise transfer or dispose of any part of its title or other interests in the property shown on Exhibit A to this application or, for a noise compatibility program project, that portion of the property upon which Federal funds have been expended, for the duration of the terms, conditions, and assurances in this grant agreement without approval by the Secretary. If the transferee is found by the Secretary to be eligible under Title 49, United States Code, to assume the obligations of this grant agreement and to have the power, authority, and financial resources to carry out all such obligations, the sponsor shall insert in the contract or document transferring or disposing of the sponsor's interest, and make binding upon the transferee all of the terms, conditions, and assurances contained in this grant agreement.

c. For all noise compatibility program projects which are to be carried out by another unit of local government or are on property owned by a unit of local government other than the sponsor, it will enter into an agreement with that government. Except as otherwise specified by the Secretary, that agreement shall obligate that government to the same terms, conditions, and assurances that would be applicable to it if it applied directly to the FAA for a grant to undertake the noise compatibility program project. That agreement and changes thereto must be satisfactory to the Secretary. It will take steps to enforce this agreement against the local government if there is substantial non-compliance with the terms of the agreement.

d. For noise compatibility program projects to be carried out on privately owned property, it will enter into an agreement with the owner of that property which includes provisions specified by the Secretary. It will take steps to enforce this agreement against the property owner whenever there is substantial non-compliance with the terms of the agreement.

e. If the sponsor is a private sponsor, it will take steps satisfactory to the Secretary to ensure that the airport will continue to function as a public-use airport in accordance with these assurances for the duration of these assurances.

f. If an arrangement is made for management and operation of the airport by any agency or person other than the sponsor or an employee of the sponsor, the sponsor will reserve sufficient rights and authority to insure that the airport will be operated and maintained in accordance Title 49, United States Code, the regulations and the terms, conditions and assurances in this grant agreement and shall insure that such arrangement also requires compliance therewith.

g. Sponsors of commercial service airports will not permit or enter into any arrangement that results in permission for the owner or tenant of a property used as a residence, or zoned for residential use, to taxi an aircraft between that property and any location on airport. Sponsors of general aviation airports entering into any arrangement that results in permission for the owner of residential real property adjacent to or near the airport must comply with the requirements of Sec. 136 of Public Law 112-95 and the sponsor assurances.

6. **Consistency with Local Plans.**

   The project is reasonably consistent with plans (existing at the time of submission of this application) of public agencies that are authorized by the State in which the project is located to plan for the development of the area surrounding the airport.

7. **Consideration of Local Interest.**

   It has given fair consideration to the interest of communities in or near where the project may be located.

8. **Consultation with Users.**

   In making a decision to undertake any airport development project under Title 49, United States Code, it has undertaken reasonable consultations with affected parties using the airport at which project is proposed.

9. **Public Hearings.**

   In projects involving the location of an airport, an airport runway, or a major runway extension, it has afforded the opportunity for public hearings for the purpose of considering the economic, social, and environmental effects of the airport or runway location and its consistency with goals and objectives of such planning as has been carried out by the community and it shall, when requested by the Secretary, submit a copy of the transcript of such hearings to the Secretary. Further, for such projects, it has on its management board either voting representation from the communities where the project is located or has advised the communities that they have the right to petition the Secretary concerning a proposed project.

10. **Metropolitan Planning Organization.**

    In projects involving the location of an airport, an airport runway, or a major runway extension at a medium or large hub airport, the sponsor has made available to and has provided upon request to the metropolitan planning organization in the area in which the airport is located, if any, a copy of the proposed amendment to the airport layout plan to depict the project and a copy of any airport master plan in which the project is described or depicted.

11. **Pavement Preventive Maintenance.**

    With respect to a project approved after January 1, 1995, for the replacement or reconstruction of pavement at the airport, it assures or certifies that it has implemented an effective airport pavement maintenance-management program and it assures that it will use such program for the useful life of any pavement constructed, reconstructed or repaired with Federal financial assistance at the airport. It will provide such reports on pavement condition and pavement management programs as the Secretary determines may be useful.

12. **Terminal Development Prerequisites.**

    For projects which include terminal development at a public use airport, as defined in Title 49, it has, on the date of submittal of the project grant application, all the safety equipment required for certification of such airport under section 44706 of Title 49, United States Code, and all the security equipment required by rule or regulation, and

has provided for access to the passenger enplaning and deplaning area of such airport to passengers enplaning and deplaning from aircraft other than air carrier aircraft.

13. **Accounting System, Audit, and Record Keeping Requirements.**

    a. It shall keep all project accounts and records which fully disclose the amount and disposition by the recipient of the proceeds of this grant, the total cost of the project in connection with which this grant is given or used, and the amount or nature of that portion of the cost of the project supplied by other sources, and such other financial records pertinent to the project. The accounts and records shall be kept in accordance with an accounting system that will facilitate an effective audit in accordance with the Single Audit Act of 1984.

    b. It shall make available to the Secretary and the Comptroller General of the United States, or any of their duly authorized representatives, for the purpose of audit and examination, any books, documents, papers, and records of the recipient that are pertinent to this grant. The Secretary may require that an appropriate audit be conducted by a recipient. In any case in which an independent audit is made of the accounts of a sponsor relating to the disposition of the proceeds of a grant or relating to the project in connection with which this grant was given or used, it shall file a certified copy of such audit with the Comptroller General of the United States not later than six (6) months following the close of the fiscal year for which the audit was made.

14. **Minimum Wage Rates.**

    It shall include, in all contracts in excess of $2,000 for work on any projects funded under this grant agreement which involve labor, provisions establishing minimum rates of wages, to be predetermined by the Secretary of Labor, in accordance with the Davis-Bacon Act, as amended (40 U.S.C. 276a-276a-5), which contractors shall pay to skilled and unskilled labor, and such minimum rates shall be stated in the invitation for bids and shall be included in proposals or bids for the work.

15. **Veteran's Preference.**

    It shall include in all contracts for work on any project funded under this grant agreement which involve labor, such provisions as are necessary to insure that, in the employment of labor (except in executive, administrative, and supervisory positions), preference shall be given to Vietnam era veterans, Persian Gulf veterans, Afghanistan-Iraq war veterans, disabled veterans, and small business concerns owned and controlled by disabled veterans as defined in Section 47112 of Title 49, United States Code. However, this preference shall apply only where the individuals are available and qualified to perform the work to which the employment relates.

16. **Conformity to Plans and Specifications.**

    It will execute the project subject to plans, specifications, and schedules approved by the Secretary. Such plans, specifications, and schedules shall be submitted to the Secretary prior to commencement of site preparation, construction, or other performance under this grant agreement, and, upon approval of the Secretary, shall be incorporated into this grant agreement. Any modification to the approved plans,

specifications, and schedules shall also be subject to approval of the Secretary, and incorporated into this grant agreement.

17. **Construction Inspection and Approval.**

    It will provide and maintain competent technical supervision at the construction site throughout the project to assure that the work conforms to the plans, specifications, and schedules approved by the Secretary for the project. It shall subject the construction work on any project contained in an approved project application to inspection and approval by the Secretary and such work shall be in accordance with regulations and procedures prescribed by the Secretary. Such regulations and procedures shall require such cost and progress reporting by the sponsor or sponsors of such project as the Secretary shall deem necessary.

18. **Planning Projects.**

    In carrying out planning projects:

    a. It will execute the project in accordance with the approved program narrative contained in the project application or with the modifications similarly approved.

    b. It will furnish the Secretary with such periodic reports as required pertaining to the planning project and planning work activities.

    c. It will include in all published material prepared in connection with the planning project a notice that the material was prepared under a grant provided by the United States.

    d. It will make such material available for examination by the public, and agrees that no material prepared with funds under this project shall be subject to copyright in the United States or any other country.

    e. It will give the Secretary unrestricted authority to publish, disclose, distribute, and otherwise use any of the material prepared in connection with this grant.

    f. It will grant the Secretary the right to disapprove the sponsor's employment of specific consultants and their subcontractors to do all or any part of this project as well as the right to disapprove the proposed scope and cost of professional services.

    g. It will grant the Secretary the right to disapprove the use of the sponsor's employees to do all or any part of the project.

    h. It understands and agrees that the Secretary's approval of this project grant or the Secretary's approval of any planning material developed as part of this grant does not constitute or imply any assurance or commitment on the part of the Secretary to approve any pending or future application for a Federal airport grant.

19. **Operation and Maintenance.**

    a. The airport and all facilities which are necessary to serve the aeronautical users of the airport, other than facilities owned or controlled by the United States, shall be operated at all times in a safe and serviceable condition and in accordance with the minimum standards as may be required or prescribed by applicable Federal,

state and local agencies for maintenance and operation. It will not cause or permit any activity or action thereon which would interfere with its use for airport purposes. It will suitably operate and maintain the airport and all facilities thereon or connected therewith, with due regard to climatic and flood conditions. Any proposal to temporarily close the airport for non-aeronautical purposes must first be approved by the Secretary. In furtherance of this assurance, the sponsor will have in effect arrangements for-

1) Operating the airport's aeronautical facilities whenever required;
2) Promptly marking and lighting hazards resulting from airport conditions, including temporary conditions; and
3) Promptly notifying airmen of any condition affecting aeronautical use of the airport. Nothing contained herein shall be construed to require that the airport be operated for aeronautical use during temporary periods when snow, flood or other climatic conditions interfere with such operation and maintenance. Further, nothing herein shall be construed as requiring the maintenance, repair, restoration, or replacement of any structure or facility which is substantially damaged or destroyed due to an act of God or other condition or circumstance beyond the control of the sponsor.

b. It will suitably operate and maintain noise compatibility program items that it owns or controls upon which Federal funds have been expended.

20. **Hazard Removal and Mitigation.**

It will take appropriate action to assure that such terminal airspace as is required to protect instrument and visual operations to the airport (including established minimum flight altitudes) will be adequately cleared and protected by removing, lowering, relocating, marking, or lighting or otherwise mitigating existing airport hazards and by preventing the establishment or creation of future airport hazards.

21. **Compatible Land Use.**

It 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. In addition, if the project is for noise compatibility program implementation, it will not cause or permit any change in land use, within its jurisdiction, that will reduce its compatibility, with respect to the airport, of the noise compatibility program measures upon which Federal funds have been expended.

22. **Economic Nondiscrimination.**

a. It will make the airport available as an airport for public use on reasonable terms and without unjust discrimination to all types, kinds and classes of aeronautical activities, including commercial aeronautical activities offering services to the public at the airport.

b. In any agreement, contract, lease, or other arrangement under which a right or privilege at the airport is granted to any person, firm, or corporation to conduct or

to engage in any aeronautical activity for furnishing services to the public at the airport, the sponsor will insert and enforce provisions requiring the contractor to-

1) furnish said services on a reasonable, and not unjustly discriminatory, basis to all users thereof, and

2) charge reasonable, and not unjustly discriminatory, prices for each unit or service, provided that the contractor may be allowed to make reasonable and nondiscriminatory discounts, rebates, or other similar types of price reductions to volume purchasers.

c. Each fixed-based operator at the airport shall be subject to the same rates, fees, rentals, and other charges as are uniformly applicable to all other fixed-based operators making the same or similar uses of such airport and utilizing the same or similar facilities.

d. Each air carrier using such airport shall have the right to service itself or to use any fixed-based operator that is authorized or permitted by the airport to serve any air carrier at such airport.

e. Each air carrier using such airport (whether as a tenant, non-tenant, or subtenant of another air carrier tenant) shall be subject to such nondiscriminatory and substantially comparable rules, regulations, conditions, rates, fees, rentals, and other charges with respect to facilities directly and substantially related to providing air transportation as are applicable to all such air carriers which make similar use of such airport and utilize similar facilities, subject to reasonable classifications such as tenants or non-tenants and signatory carriers and non-signatory carriers. Classification or status as tenant or signatory shall not be unreasonably withheld by any airport provided an air carrier assumes obligations substantially similar to those already imposed on air carriers in such classification or status.

f. It will not exercise or grant any right or privilege which operates to prevent any person, firm, or corporation operating aircraft on the airport from performing any services on its own aircraft with its own employees [including, but not limited to maintenance, repair, and fueling] that it may choose to perform.

g. In the event the sponsor itself exercises any of the rights and privileges referred to in this assurance, the services involved will be provided on the same conditions as would apply to the furnishing of such services by commercial aeronautical service providers authorized by the sponsor under these provisions.

h. The sponsor may establish such reasonable, and not unjustly discriminatory, conditions to be met by all users of the airport as may be necessary for the safe and efficient operation of the airport.

i. The sponsor may prohibit or limit any given type, kind or class of aeronautical use of the airport if such action is necessary for the safe operation of the airport or necessary to serve the civil aviation needs of the public.

23. **Exclusive Rights.**

It will permit no exclusive right for the use of the airport by any person providing, or intending to provide, aeronautical services to the public. For purposes of this paragraph, the providing of the services at an airport by a single fixed-based operator shall not be construed as an exclusive right if both of the following apply:

a. It would be unreasonably costly, burdensome, or impractical for more than one fixed-based operator to provide such services, and

b. If allowing more than one fixed-based operator to provide such services would require the reduction of space leased pursuant to an existing agreement between such single fixed-based operator and such airport. It further agrees that it will not, either directly or indirectly, grant or permit any person, firm, or corporation, the exclusive right at the airport to conduct any aeronautical activities, including, but not limited to charter flights, pilot training, aircraft rental and sightseeing, aerial photography, crop dusting, aerial advertising and surveying, air carrier operations, aircraft sales and services, sale of aviation petroleum products whether or not conducted in conjunction with other aeronautical activity, repair and maintenance of aircraft, sale of aircraft parts, and any other activities which because of their direct relationship to the operation of aircraft can be regarded as an aeronautical activity, and that it will terminate any exclusive right to conduct an aeronautical activity now existing at such an airport before the grant of any assistance under Title 49, United States Code.

24. **Fee and Rental Structure.**

It will maintain a fee and rental structure for the facilities and services at the airport which will make the airport as self-sustaining as possible under the circumstances existing at the particular airport, taking into account such factors as the volume of traffic and economy of collection. No part of the Federal share of an airport development, airport planning or noise compatibility project for which a grant is made under Title 49, United States Code, the Airport and Airway Improvement Act of 1982, the Federal Airport Act or the Airport and Airway Development Act of 1970 shall be included in the rate basis in establishing fees, rates, and charges for users of that airport.

25. **Airport Revenues.**

a. All revenues generated by the airport and any local taxes on aviation fuel established after December 30, 1987, will be expended by it for the capital or operating costs of the airport; the local airport system; or other local facilities which are owned or operated by the owner or operator of the airport and which are directly and substantially related to the actual air transportation of passengers or property; or for noise mitigation purposes on or off the airport. The following exceptions apply to this paragraph:

1) If covenants or assurances in debt obligations issued before September 3, 1982, by the owner or operator of the airport, or provisions enacted before September 3, 1982, in governing statutes controlling the owner or operator's financing, provide for the use of the revenues from any of the airport owner or

operator's facilities, including the airport, to support not only the airport but also the airport owner or operator's general debt obligations or other facilities, then this limitation on the use of all revenues generated by the airport (and, in the case of a public airport, local taxes on aviation fuel) shall not apply.

2) If the Secretary approves the sale of a privately owned airport to a public sponsor and provides funding for any portion of the public sponsor's acquisition of land, this limitation on the use of all revenues generated by the sale shall not apply to certain proceeds from the sale. This is conditioned on repayment to the Secretary by the private owner of an amount equal to the remaining unamortized portion (amortized over a 20-year period) of any airport improvement grant made to the private owner for any purpose other than land acquisition on or after October 1, 1996, plus an amount equal to the federal share of the current fair market value of any land acquired with an airport improvement grant made to that airport on or after October 1, 1996.

3) Certain revenue derived from or generated by mineral extraction, production, lease, or other means at a general aviation airport (as defined at Section 47102 of title 49 United States Code), if the FAA determines the airport sponsor meets the requirements set forth in Sec. 813 of Public Law 112-95.

b. As part of the annual audit required under the Single Audit Act of 1984, the sponsor will direct that the audit will review, and the resulting audit report will provide an opinion concerning, the use of airport revenue and taxes in paragraph (a), and indicating whether funds paid or transferred to the owner or operator are paid or transferred in a manner consistent with Title 49, United States Code and any other applicable provision of law, including any regulation promulgated by the Secretary or Administrator.

c. Any civil penalties or other sanctions will be imposed for violation of this assurance in accordance with the provisions of Section 47107 of Title 49, United States Code.

26. **Reports and Inspections.**

It will:

a. submit to the Secretary such annual or special financial and operations reports as the Secretary may reasonably request and make such reports available to the public; make available to the public at reasonable times and places a report of the airport budget in a format prescribed by the Secretary;

b. for airport development projects, make the airport and all airport records and documents affecting the airport, including deeds, leases, operation and use agreements, regulations and other instruments, available for inspection by any duly authorized agent of the Secretary upon reasonable request;

c. for noise compatibility program projects, make records and documents relating to the project and continued compliance with the terms, conditions, and assurances of this grant agreement including deeds, leases, agreements, regulations, and other instruments, available for inspection by any duly authorized agent of the Secretary upon reasonable request; and

d. in a format and time prescribed by the Secretary, provide to the Secretary and make available to the public following each of its fiscal years, an annual report listing in detail:

1) all amounts paid by the airport to any other unit of government and the purposes for which each such payment was made; and

2) all services and property provided by the airport to other units of government and the amount of compensation received for provision of each such service and property.

27. **Use by Government Aircraft.**

It will make available all of the facilities of the airport developed with Federal financial assistance and all those usable for landing and takeoff of aircraft to the United States for use by Government aircraft in common with other aircraft at all times without charge, except, if the use by Government aircraft is substantial, charge may be made for a reasonable share, proportional to such use, for the cost of operating and maintaining the facilities used. Unless otherwise determined by the Secretary, or otherwise agreed to by the sponsor and the using agency, substantial use of an airport by Government aircraft will be considered to exist when operations of such aircraft are in excess of those which, in the opinion of the Secretary, would unduly interfere with use of the landing areas by other authorized aircraft, or during any calendar month that –

a. Five (5) or more Government aircraft are regularly based at the airport or on land adjacent thereto; or

b. The total number of movements (counting each landing as a movement) of Government aircraft is 300 or more, or the gross accumulative weight of Government aircraft using the airport (the total movement of Government aircraft multiplied by gross weights of such aircraft) is in excess of five million pounds.

28. **Land for Federal Facilities.**

It will furnish without cost to the Federal Government for use in connection with any air traffic control or air navigation activities, or weather-reporting and communication activities related to air traffic control, any areas of land or water, or estate therein, or rights in buildings of the sponsor as the Secretary considers necessary or desirable for construction, operation, and maintenance at Federal expense of space or facilities for such purposes. Such areas or any portion thereof will be made available as provided herein within four months after receipt of a written request from the Secretary.

29. **Airport Layout Plan.**

a. It will keep up to date at all times an airport layout plan of the airport showing

1) boundaries of the airport and all proposed additions thereto, together with the boundaries of all offsite areas owned or controlled by the sponsor for airport purposes and proposed additions thereto;

2) the location and nature of all existing and proposed airport facilities and structures (such as runways, taxiways, aprons, terminal buildings, hangars and

roads), including all proposed extensions and reductions of existing airport facilities;

3) the location of all existing and proposed nonaviation areas and of all existing improvements thereon; and

4) all proposed and existing access points used to taxi aircraft across the airport's property boundary. Such airport layout plans and each amendment, revision, or modification thereof, shall be subject to the approval of the Secretary which approval shall be evidenced by the signature of a duly authorized representative of the Secretary on the face of the airport layout plan. The sponsor will not make or permit any changes or alterations in the airport or any of its facilities which are not in conformity with the airport layout plan as approved by the Secretary and which might, in the opinion of the Secretary, adversely affect the safety, utility or efficiency of the airport.

b. If a change or alteration in the airport or the facilities is made which the Secretary determines adversely affects the safety, utility, or efficiency of any federally owned, leased, or funded property on or off the airport and which is not in conformity with the airport layout plan as approved by the Secretary, the owner or operator will, if requested, by the Secretary (1) eliminate such adverse effect in a manner approved by the Secretary; or (2) bear all costs of relocating such property (or replacement thereof) to a site acceptable to the Secretary and all costs of restoring such property (or replacement thereof) to the level of safety, utility, efficiency, and cost of operation existing before the unapproved change in the airport or its facilities except in the case of a relocation or replacement of an existing airport facility due to a change in the Secretary's design standards beyond the control of the airport sponsor.

30. **Civil Rights.**

It will promptly take any measures necessary to ensure that no person in the United States shall, on the grounds of race, creed, color, national origin, sex, age, or disability be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination in any activity conducted with, or benefiting from, funds received from this grant.

a. Using the definitions of activity, facility and program as found and defined in §§ 21.23 (b) and 21.23 (e) of 49 CFR § 21, the sponsor will facilitate all programs, operate all facilities, or conduct all programs in compliance with all non-discrimination requirements imposed by, or pursuant to these assurances.

b. Applicability

1) Programs and Activities. If the sponsor has received a grant (or other federal assistance) for any of the sponsor's program or activities, these requirements extend to all of the sponsor's programs and activities.

2) Facilities. Where it receives a grant or other federal financial assistance to construct, expand, renovate, remodel, alter or acquire a facility, or part of a facility, the assurance extends to the entire facility and facilities operated in connection therewith.

3) Real Property. Where the sponsor receives a grant or other Federal financial assistance in the form of, or for the acquisition of real property or an interest in real property, the assurance will extend to rights to space on, over, or under such property.

c. Duration.

The sponsor agrees that it is obligated to this assurance for the period during which Federal financial assistance is extended to the program, except where the Federal financial assistance is to provide, or is in the form of, personal property, or real property, or interest therein, or structures or improvements thereon, in which case the assurance obligates the sponsor, or any transferee for the longer of the following periods:

1) So long as the airport is used as an airport, or for another purpose involving the provision of similar services or benefits; or

2) So long as the sponsor retains ownership or possession of the property.

d. Required Solicitation Language. It will include the following notification in all solicitations for bids, Requests For Proposals for work, or material under this grant agreement and in all proposals for agreements, including airport concessions, regardless of funding source:

"The **(Name of Sponsor)**, in accordance with the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252, 42 U.S.C. §§ 2000d to 2000d-4) and the Regulations, hereby notifies all bidders that it will affirmatively ensure that any contract entered into pursuant to this advertisement, disadvantaged business enterprises and airport concession disadvantaged business enterprises will be afforded full and fair opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, or national origin in consideration for an award."

e. Required Contract Provisions.

1) It will insert the non-discrimination contract clauses requiring compliance with the acts and regulations relative to non-discrimination in Federally-assisted programs of the DOT, and incorporating the acts and regulations into the contracts by reference in every contract or agreement subject to the non-discrimination in Federally-assisted programs of the DOT acts and regulations.

2) It will include a list of the pertinent non-discrimination authorities in every contract that is subject to the non-discrimination acts and regulations.

3) It will insert non-discrimination contract clauses as a covenant running with the land, in any deed from the United States effecting or recording a transfer of real property, structures, use, or improvements thereon or interest therein to a sponsor.

4) It will insert non-discrimination contract clauses prohibiting discrimination on the basis of race, color, national origin, creed, sex, age, or handicap as a

covenant running with the land, in any future deeds, leases, license, permits, or similar instruments entered into by the sponsor with other parties:

a) For the subsequent transfer of real property acquired or improved under the applicable activity, project, or program; and

b) For the construction or use of, or access to, space on, over, or under real property acquired or improved under the applicable activity, project, or program.

f. It will provide for such methods of administration for the program as are found by the Secretary to give reasonable guarantee that it, other recipients, sub-recipients, sub-grantees, contractors, subcontractors, consultants, transferees, successors in interest, and other participants of Federal financial assistance under such program will comply with all requirements imposed or pursuant to the acts, the regulations, and this assurance.

g. It agrees that the United States has a right to seek judicial enforcement with regard to any matter arising under the acts, the regulations, and this assurance.

31. **Disposal of Land.**

a. For land purchased under a grant for airport noise compatibility purposes, including land serving as a noise buffer, it will dispose of the land, when the land is no longer needed for such purposes, at fair market value, at the earliest practicable time. That portion of the proceeds of such disposition which is proportionate to the United States' share of acquisition of such land will be, at the discretion of the Secretary, (1) reinvested in another project at the airport, or (2) transferred to another eligible airport as prescribed by the Secretary. The Secretary shall give preference to the following, in descending order, (1) reinvestment in an approved noise compatibility project, (2) reinvestment in an approved project that is eligible for grant funding under Section 47117(e) of title 49 United States Code, (3) reinvestment in an approved airport development project that is eligible for grant funding under Sections 47114, 47115, or 47117 of title 49 United States Code, (4) transferred to an eligible sponsor of another public airport to be reinvested in an approved noise compatibility project at that airport, and (5) paid to the Secretary for deposit in the Airport and Airway Trust Fund. If land acquired under a grant for noise compatibility purposes is leased at fair market value and consistent with noise buffering purposes, the lease will not be considered a disposal of the land. Revenues derived from such a lease may be used for an approved airport development project that would otherwise be eligible for grant funding or any permitted use of airport revenue.

b. For land purchased under a grant for airport development purposes (other than noise compatibility), it will, when the land is no longer needed for airport purposes, dispose of such land at fair market value or make available to the Secretary an amount equal to the United States' proportionate share of the fair market value of the land. That portion of the proceeds of such disposition which is proportionate to the United States' share of the cost of acquisition of such land will, (1) upon application to the Secretary, be reinvested or transferred to another

eligible airport as prescribed by the Secretary. The Secretary shall give preference to the following, in descending order: (1) reinvestment in an approved noise compatibility project, (2) reinvestment in an approved project that is eligible for grant funding under Section 47117(e) of title 49 United States Code, (3) reinvestment in an approved airport development project that is eligible for grant funding under Sections 47114, 47115, or 47117 of title 49 United States Code, (4) transferred to an eligible sponsor of another public airport to be reinvested in an approved noise compatibility project at that airport, and (5) paid to the Secretary for deposit in the Airport and Airway Trust Fund.

c. Land shall be considered to be needed for airport purposes under this assurance if (1) it may be needed for aeronautical purposes (including runway protection zones) or serve as noise buffer land, and (2) the revenue from interim uses of such land contributes to the financial self-sufficiency of the airport. Further, land purchased with a grant received by an airport operator or owner before December 31, 1987, will be considered to be needed for airport purposes if the Secretary or Federal agency making such grant before December 31, 1987, was notified by the operator or owner of the uses of such land, did not object to such use, and the land continues to be used for that purpose, such use having commenced no later than December 15, 1989.

d. Disposition of such land under (a) (b) or (c) will be subject to the retention or reservation of any interest or right therein necessary to ensure that such land will only be used for purposes which are compatible with noise levels associated with operation of the airport.

32. **Engineering and Design Services.**

It will award each contract, or sub-contract for program management, construction management, planning studies, feasibility studies, architectural services, preliminary engineering, design, engineering, surveying, mapping or related services with respect to the project in the same manner as a contract for architectural and engineering services is negotiated under Title IX of the Federal Property and Administrative Services Act of 1949 or an equivalent qualifications-based requirement prescribed for or by the sponsor of the airport.

33. **Foreign Market Restrictions.**

It will not allow funds provided under this grant to be used to fund any project which uses any product or service of a foreign country during the period in which such foreign country is listed by the United States Trade Representative as denying fair and equitable market opportunities for products and suppliers of the United States in procurement and construction.

34. **Policies, Standards, and Specifications.**

It will carry out the project in accordance with policies, standards, and specifications approved by the Secretary including but not limited to the advisory circulars listed in the Current FAA Advisory Circulars for AIP projects, dated _____ (the latest approved version as of this grant offer) and included in this grant, and in accordance

with applicable state policies, standards, and specifications approved by the Secretary.

35. **Relocation and Real Property Acquisition.**

    a. It will be guided in acquiring real property, to the greatest extent practicable under State law, by the land acquisition policies in Subpart B of 49 CFR Part 24 and will pay or reimburse property owners for necessary expenses as specified in Subpart B.
    b. It will provide a relocation assistance program offering the services described in Subpart C and fair and reasonable relocation payments and assistance to displaced persons as required in Subpart D and E of 49 CFR Part 24.
    c. It will make available within a reasonable period of time prior to displacement, comparable replacement dwellings to displaced persons in accordance with Subpart E of 49 CFR Part 24.

36. **Access By Intercity Buses.**

    The airport owner or operator will permit, to the maximum extent practicable, intercity buses or other modes of transportation to have access to the airport; however, it has no obligation to fund special facilities for intercity buses or for other modes of transportation.

37. **Disadvantaged Business Enterprises.**

    The sponsor shall not discriminate on the basis of race, color, national origin or sex in the award and performance of any DOT-assisted contract covered by 49 CFR Part 26, or in the award and performance of any concession activity contract covered by 49 CFR Part 23. In addition, the sponsor shall not discriminate on the basis of race, color, national origin or sex in the administration of its DBE and ACDBE programs or the requirements of 49 CFR Parts 23 and 26. The sponsor shall take all necessary and reasonable steps under 49 CFR Parts 23 and 26 to ensure nondiscrimination in the award and administration of DOT-assisted contracts, and/or concession contracts. The sponsor's DBE and ACDBE programs, as required by 49 CFR Parts 26 and 23, and as approved by DOT, are incorporated by reference in this agreement. Implementation of these programs is a legal obligation and failure to carry out its terms shall be treated as a violation of this agreement. Upon notification to the sponsor of its failure to carry out its approved program, the Department may impose sanctions as provided for under Parts 26 and 23 and may, in appropriate cases, refer the matter for enforcement under 18 U.S.C. 1001 and/or the Program Fraud Civil Remedies Act of 1936 (31 U.S.C. 3801).

38. **Hangar Construction.**

    If the airport owner or operator and a person who owns an aircraft agree that a hangar is to be constructed at the airport for the aircraft at the aircraft owner's expense, the airport owner or operator will grant to the aircraft owner for the hangar a long term lease that is subject to such terms and conditions on the hangar as the airport owner or operator may impose.

39. **Competitive Access.**

a. If the airport owner or operator of a medium or large hub airport (as defined in section 47102 of title 49, U.S.C.) has been unable to accommodate one or more requests by an air carrier for access to gates or other facilities at that airport in order to allow the air carrier to provide service to the airport or to expand service at the airport, the airport owner or operator shall transmit a report to the Secretary that-

   1) Describes the requests;

   2) Provides an explanation as to why the requests could not be accommodated; and

   3) Provides a time frame within which, if any, the airport will be able to accommodate the requests.

b. Such report shall be due on either February 1 or August 1 of each year if the airport has been unable to accommodate the request(s) in the six month period prior to the applicable due date.

FRIDAY HARBOR AIRPORT









APPENDIX C

Forecast Approval Letter

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

Northwest Mountain Region
Seattle Airports District Office
2200 S. 216th Street
Des Moines, WA 98198

November 19, 2018

Mr. Todd S. Nicholson
Executive Director
Port of Friday Harbor
P.O. Box 889
Friday Harbor, WA 98250

Friday Harbor Airport (FHR)
Aviation Forecast Approval

Dear Todd:

The Federal Aviation Administration (FAA), Seattle Airports District Office has reviewed the aviation forecast for the Friday Harbor Airport (FHR) Master Plan Update, submitted November 19, 2018. The FAA approves these forecasts for airport planning purposes, including for Airport Layout Plan (ALP) development. The FAA approval is based on the following:

1. The difference between the FAA Terminal Area Forecast (TAF) and Friday Harbor's forecast for passenger enplanements, commercial operations, total operations, and based aircraft is within the 10 percent and 15 percent allowance for the 5-year and 10-year planning horizons.
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 existing and future critical aircraft typified by the Cessna Grand Caravan 208B (RDC B-II).

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.

If you have any questions about this forecast approval, please call me at (206) 231-4135.

Sincerely,

Jennifer I. Kandel
Planner, FAA Seattle Airports District Office

FRIDAY HARBOR AIRPORT







APPENDIX D

Land Use Supplemental Materials

AIRPORT MASTER PLAN

Appendix D
Land Use Supplemental Materials

This appendix includes the following supplemental materials to support the airport master plan land use analysis.

- Excerpts from the San Juan County Unified Development Code that pertain to airports.
- *WSDOT Airports and Compatible Land Use Guidebook* Appendix J – Comprehensive Plan Goals and Policies

San Juan County Unified Development Code Excerpts

18.35.150 Airport overlay district.

A. Purpose. To implement the policies of the Comprehensive Plan for airport overlay districts and the directives of Revised Code of Washington(RCW) 36.70.547 and 36.70A.510. The airport overlay district is intended to protect the public health, safety and welfare, to recognize and protect those areas devoted to public-use aviation and associated activities from airspace obstructions or hazards, and to promote compatibility between airport uses and land uses and activities in the airport vicinity and environs.

B. Applicability.

1. The airport overlay district shall include the areas that are within aircraft accident safety zones, and FAA airspace zones, if applicable, as depicted on the official maps, and any additional administrative area that is included in a district.

2. All project and development permits, subdivisions, binding site plans, and planned unit developments within the designated limits of an airport overlay district as shown on the official maps shall be subject to the regulations of this section and to the applicable performance standards in San Juan County Code (SJCC) 18.40.030 et seq.

3. If there is any conflict between regulations of an airport overlay district and regulations of the underlying land use designation, the more restrictive regulations shall apply.

C. Aircraft Accident Safety Zones. These zones include the lands within the runway protection zone (zone 1), inner safety zone (zone 2), inner turning zone (zone 3), outer safety zone (zone 4), sideline safety zone/airport development zone (zone 5), and traffic pattern zone (zone 6), which are defined in Chapter 18.20 SJCC.

D. Allowable Uses. The performance standards of SJCC 18.40.030 et seq. for airports and airport districts further limit and regulate the allowable and prohibited uses that are listed in Chapter 16.55 SJCC, the Eastsound Subarea Plan, and in Tables 18.30.030 and 18.30.040 for the underlying land use districts. Airport district ordinances may supplement these provisions for allowable uses. (Ord. 25-2012 § 16; Ord. 5-2002 § 3; Ord. 14-2000 § 7(DDD); Ord. 2-1998 Exh. B § 3.6.11. Formerly 18.30.180)

18.40.030 Airports.

A. Height Limitation. No structure, vegetation, or obstruction of any kind shall be built, placed, hung, or allowed to grow so that any part exceeds the height as provided in the zone areas and surfaces established in this subsection, unless otherwise specified on an adopted airport district overlay designation. Where an area is subject to more than one height limitation, the lower limitation shall apply. The height restriction for each zone is as follows:

1. Approach Zone. As may be allowed without penetrating the imaginary surface described in the definition of approach surface in Chapter 18.20 SJCC.

2. Transitional Zone. As may be allowed without penetrating the imaginary surface described in the definition of transitional surface in Chapter 18.20 SJCC.

3. Horizontal Zone. As may be allowed without penetrating the imaginary surface described in the definition of horizontal surface in Chapter 18.20 SJCC.

4. Conical Zone. As may be allowed without penetrating the imaginary surface described in the definition of conical surface in Chapter 18.20 SJCC.

B. Hazards for Airports. The following standards apply to airports in addition to the standards in subsection (A) of this section.

1. Distances of Rights-of-Way from Primary Surface. All private and public road rights-of-way must either (a) be set back a minimum of 200 feet from the end of the primary surface as measured parallel to the extended runway centerline or (b) must allow a minimum of 10 feet clearance between the road rights-of-way and approach surface. In addition, road rights-of-way must be set back a minimum of 200 feet from the extended runway centerline, as measured perpendicular thereto.

2. Lights. No searchlight, beacon light, or other glaring light shall be used, maintained, or operated within the approach, transitional, or horizontal zones in such a way as to cause a visual hazard to normal aircraft operations.

3. Smoke or Haze. Any land use or activity that produces smoke or haze to a degree that would interfere with normal aircraft operations is prohibited.

4. Bird Hazard. Any land use or activity that produces a bird-strike hazard for normal aircraft operations is prohibited.

5. Public Assemblies. Any land use that causes or encourages people to assemble in large numbers, including medium- and high-density residential uses (greater than one dwelling unit per two acres), commercial uses requiring more than 10 parking spaces or an equivalent degree of traffic generation, and campgrounds (having more than three campsites per acre), is prohibited in the approach and transitional zones designated by an airport district overlay.

6. Noise. Any land use that requires a low background noise level and which would be adversely affected by a noise impact greater than the noise exposure forecast level projected for the airport vicinity for the year of application, including auditoriums, schools, churches, hospitals, and concert halls, is prohibited in the approach and transitional zones designated by an airport district overlay.

7. Marking and Lighting. Notwithstanding this subsection, the owner of any existing nonconforming structure or tree is required to permit the installation, operation, and maintenance thereon of such markers and lights as shall be deemed necessary by the Federal Aviation Administration (FAA) to indicate the presence of such airport hazards. Such markers and lights shall be installed, operated, and maintained at the expense of the airport served.

8. FAA Restrictions.

a. All development must comply with the Federal Aviation Regulations (FAR) Part 77, relating to heights of land uses proximate to airports and protection of airspaces critical to airport operations.

b. All development must comply with the FAA Advisory Circular 150/5370-10, *Standards for Specifying Construction on Airports*.

C. Permit Restrictions.

1. No permit shall be granted that would:

a. Allow the establishment or creation of an airport hazard;

b. Authorize any use or activity that would result in the siting of an incompatible use adjacent to an airport (Chapter 36.70 RCW); or

c. Permit a nonconforming structure or use to be made larger or to become higher or become a greater hazard to air navigation than it was when this code was adopted.

2. Additional or new commercial aircraft operations at an airport constitute an expansion of use subject to conditional use permit requirements of this code. (Ord. 2-1998 Exh. B § 4.3)

18.40.031 General standards for airport overlay districts.

A. Incompatible Uses. Any land use or activity or density that is prohibited by or cannot meet the performance standards in SJCC 18.40.030 and the standards in SJCC 18.40.032 et seq., for the appropriate district is an incompatible use adjacent to an airport and is prohibited.

B. Permit Restrictions.

1. All development, land divisions, and binding site plans within an adopted airport overlay district must comply with the requirements of SJCC 18.35.150 and with the performance standards in SJCC

18.40.030 et seq. for the appropriate district. The administrator shall condition or deny an application that does not so comply.

2. Applications for development and subdivision in an airport overlay district shall clearly indicate the applicable aircraft accident safety zone, and height overlay district zone, if applicable, in which the parcel or project is located. (Ord. 5-2002 § 4)

18.40.040 Airfields and airstrips.

A. Standards.

1. No aircraft except those of the airfield or airstrip owners shall be stored at any airfield or airstrip. If hangars are proposed for aircraft storage, they shall be only for the noncommercial use of the aircraft owner(s).

2. No commercial activity shall be allowed. The owner of an airfield or airstrip may allow commercial carriers to land on a regular basis for the purpose of delivering mail or freight to an island and may allow nonscheduled charter flights to land, but no freight distribution facilities or other commercial service shall be conducted.

3. In any application for a new or expanded airfield or airstrip, the applicant is required to demonstrate that:

a. The proposed use cannot be accommodated by existing facilities or planned expansions to existing facilities;

b. The safety of persons and property on the ground will be assured;

c. The traffic pattern is approved by the FAA prior to permit application and, if required by the County, marked on the ground prior to operation in accordance with FAA standards for segmented circle marker systems;

d. Traffic patterns shall minimize noise impacts on nearby properties; and

e. Drainage will be controlled so that pollutants and sediments will not be carried into waterbodies or onto adjacent properties. (See SJCC 18.60.060 and 18.60.070.)

4. Signs may be required in order to post noise control requirements for departures.

5. Aircraft operations that have not been established prior to the effective date of this code shall be allowed only between 7:00 a.m. and dusk.

B. Standards for Nonconforming Airfields and Airstrips. The following standards apply to all airfields and airstrips made nonconforming by adoption of this code:

1. Nonconforming airfields and airstrips are deemed abandoned if aircraft operations cease for any period of 24 consecutive months.

2. Aircraft operations are only allowed between the hours of 7:00 a.m. and dusk.

C. Standards for the Alteration or Expansion of Airfields and Airstrips. Additional or new commercial aircraft operations at airfields and airstrips constitute an expansion of use. An increase in the number of owners or legal beneficiaries of rights to the use of an airfield or airstrip constitutes an expansion subject to the use regulations for the applicable land use district (Tables 18.30.030 and 18.30.040).

1. An alteration or expansion that would result in increased aircraft activity, conflict with the purpose of the applicable land use district, or cause increased adverse impacts to surrounding areas is prohibited.

2. For other minor, low-impact changes (see Table 8.2, SJCC 18.80.090) the administrator may apply conditions appropriate to ensure that such uses have minimal adverse impacts. (Ord. 2-1998 Exh. B § 4.4)

Appendix J Comprehensive Plan Goals and Policies

The following example goals/policies are offered to assist local communities in the development or amendment of comprehensive plans. The sample language may be used in whole or in-part as needed to reach community objectives and promote aviation as a significant resource within Washington State. We recommend that local jurisdictions insert policy language into several sections of their comprehensive plan including sections for general land use, capital facilities, economic development, essential public facilities and the transportation element.

- Protect the viability of the airport as a significant economic resource to the community by encouraging compatible land uses, densities, and reducing hazards that may endanger the lives and property of the public and aviation users.
- Encourage the protection of the (Name) Airport from adjacent incompatible land uses and/or activities that could impact the present and/or future use of the airport as an Essential Public Facility (EPF), endanger the lives of people on the ground and/or promote inadvertent growth of incompatible land uses. Incompatible land uses may include residential, multi-family, height hazards, uses that attract large concentrations of people, wildlife hazards, and special uses such as schools, hospitals and nursing homes, and explosive/hazardous materials.
- Coordinate the protection of the (name) Airport with (adjacent county or city) by developing consistent development regulations that utilize WSDOT Aviation Airport and Land Use Compatibility guidelines and other best management practices for encouraging compatible land uses adjacent to (name) airport(s).
- Promote the safe operation (Name of aviation facilities) by encouraging compatible land uses and activities, and discouraging uses or activities that will impede safe flight operations or endanger the lives of people on the ground.
- Encourage open space/clear areas and utilize zoning criteria within key safety areas adjacent to the airport to facilitate protection of the airport as an essential public facility, and reduce safety risk exposure to people on the ground and in the air. Applicable criteria may include promoting cluster development to promote open space/clear areas, locating structures away from the extended centerline of the runway, discouraging public assembly, transfer of development rights and other applicable strategies. When possible promote contiguous open space parcels, especially in areas with smaller parcel size configurations.
- Within the Airport Influence area a notice to title/disclosure statement should be required for new or substantial redevelopment of lots, buildings, structures, and activities. The notice should indicate that the property is located adjacent to the (name) airport and may experience low overhead flights, odor, vibrations, noise and other similar aviation impacts.
- Discourage the siting of uses adjacent to airports that attract birds, create visual hazards, discharge any particulate matter in the air that could alter atmospheric conditions, emit transmissions that would interfere with aviation communications and/or instrument landing systems, or otherwise obstruct or conflict with aircraft patterns, or result in potential hazards to aviation.

- Encourage the adoption of development regulations that protect the airport from height hazards by developing a Height Overlay District that will prohibit buildings or structures from penetrating the Federal Aviation Regulations (FAR) Part 77 "Imaginary Surfaces".
- Ensure that the (name) Airport is protected from incompatible uses consistent with WSDOT Aviation Airport and Land Use Compatibility guidelines and best management practices.
- Recognize (name of airport) as an essential public facility and discourage land uses that may promote incompatible development adjacent to the (name) airport.
- Develop criteria, standards and compatible land use designations that will protect the airport and aviation uses from incompatible development by adopting a combination of zoning techniques including compatible zoning districts, overlay districts, and development siting criteria for evaluating uses or activities in key areas adjacent to the airport.
- Identify, preserve, and enhance, through interjurisdictional planning, goals, policies and development regulations that promote significant regional transportation linkages and multimodal connections to and from aviation facilities and employment centers.
- Encourage economic development opportunities and aviation related uses adjacent to airports and promote the efficient mobility of goods and services region-wide consistent with the economic development element and the regional transportation strategy.
- Evaluate all proposed amendments to the comprehensive plan, capital facilities plan and/or urban growth area (UGA) that will increase incompatible land uses or potential of incompatible development adjacent to the airport through inappropriate land use or zoning designations and/or inadvertent land use policies.

FRIDAY HARBOR AIRPORT









APPENDIX E

Airport Recycling, Reuse, and Waste Reduction

AIRPORT MASTER PLAN

Appendix E
Airport Recycling, Reuse, and Waste Reduction

The *FAA Modernization and Reform Act of 2012* (FMRA), which amended Title 49, United States Code (USC), included several changes to the Airport Improvement Program (AIP). Two of these changes are related to recycling, reuse, and waste reduction at airports.

- Section 132(b) of the FMRA expanded the definition of airport planning to include "developing a plan for recycling and minimizing the generation of airport solid waste, consistent with applicable State and local recycling laws, including the cost of a waste audit."

- Section 133 of the FMRA added a provision requiring airports that have or plan to prepare a master plan, and that receive AIP funding for an eligible project, to ensure that the new or updated master plan addresses issues relating to solid waste recycling at the airport, including:

    - The feasibility of solid waste recycling at the airport;
    - Minimizing the generation of solid waste at the airport;
    - Operation and maintenance requirements;
    - A review of waste management contracts; and,
    - The potential for cost savings or the generation of revenue.

Typically, airport sponsors have purview over waste handling services in facilities it owns and operates such as the passenger terminal building, ARFF station, and maintenance facilities. Tenants of airport-owned buildings/hangars or tenants that own their own facilities are typically responsible for coordinating their own waste handling services. While the focus of this plan is on airport-operated facilities, the airport should work to incorporate facility-wide strategies that create consistency in waste disposal mechanisms. This would ultimately result in the reduction of materials sent to the landfill.

Understanding the airport's waste stream requires an understanding of the types of waste typically generated at airports. Generally, waste from airports can be divided into eight categories, with additional types of municipal solid waste (MSW).[1]

- **Municipal Solid Waste** – more commonly known as trash or garbage – consists of everyday items that are used and then discarded, like product packaging. The following subcategories are either combined with MSW or sorted separately depending on an airport's solid waste practices.

  *Approximately **25-35** percent of deplaned waste, by weight, consists of recyclables.*

  - **Construction and Demolition Waste** (C&D) is considered non-hazardous trash resulting from land clearing, excavation, demolition, renovation or repair of structures, roads and utilities, including concrete, wood, metals, drywall, carpet, plastic, pipe, cardboard, and salvaged building components.
  - **Green Waste** is yard waste consisting of tree, shrub and grass clippings, leaves, weeds, small branches, seeds, and pods.
  - **Food Waste** includes unconsumed food products or waste generated and discarded during food preparation.
  - **Deplaned Waste** is waste removed from passenger aircrafts. Deplaned waste includes bottles, cans, newspaper, mixed paper (newspaper, napkins, paper towels), plastic cups, service ware, food waste, and food soiled paper/packaging.

- **Lavatory Waste** is a special waste that is emptied through a hose and pumped into a lavatory service vehicle. The waste is then transported to a triturator[2] facility for pretreatment prior to discharge in the sanitary sewage system. Due to the chemical in lavatory waste, it can present environmental and human health risks if mishandled. Caution must be taken to ensure lavatory waste is not released to the public sanitary sewerage system prior to pretreatment.

- **Spill Clean and Remediation Wastes** are also special wastes and are generated during cleanup of spills and/or the remediation of contamination from several types of sites on an airport.

- **Hazardous Wastes** are governed by the *Resource Conservation and Recovery Act* (RCRA), as well as the regulations in 40 Code of Federal Regulations (CFR) Subtitle C, Parts 260 to 270. The Environmental Protection Agency (EPA) developed less stringent regulations for certain hazardous waste, known as universal waste, described in 40 CFR Part 237 – The Universal Waste Rule.

The FAA's Airport Cooperative Research Program (ACRP) identified five key best practices in its report, *Recycling Best Practices – A Guidebook for Advancing Recycling from Aircraft Cabins* (2014), that are most effective at advancing aviation recycling.

1. Secure top-down and bottom-up commitment within the airport for recycling efforts
2. Develop consistent recycling procedures and infrastructure
3. Increase the efficiency of existing systems
4. Track, evaluate, and share data on program performance
5. Make recycling a part of everyday business

[1] Recycling, Reuse and Waste Reduction at Airports, FAA (April 24, 2013)

[2] A triturator facility turns lavatory waste into fine particulates for further processing.

As seen on **Exhibit E1**, there are seven potential areas of an airport contributing to the waste stream, including terminals, airfields, aircraft maintenance hangars, cargo hangars, flight kitchens, offices, and airport construction projects. To create a comprehensive waste reduction and recycling plan for FHR, all potential inputs must be considered.

There are often few key staff members that are directly involved in the waste management system, making their support and participation critical. It is also crucial to gain the participation of tenants to ensure buy-in of the airport's recycling efforts. FHR must establish consistent internal procedures to ensure there are no unacceptable items contaminating recycling containers, or recyclables thrown in the trash. Clearly marked signage of what is and is not accepted placed near the solid waste and recycling containers is another significant part of a consistent, effective recycling system.

FHR should ensure that the waste and recycling containers are right-sized to the existing operation, as well as on a collection schedule that picks up only when the containers are full. If recycling services are offered, FHR could track recycling rates and waste quantities to identify cost saving measures that are currently unidentified simply based on the lack of quantitative data. Lastly, FHR should make recycling a part of everyday business. Airport administration can provide training, education, and support to personnel, tenants, and others who conduct business at the airport. In-person meetings with airport tenants should be held to create mutual understanding of the airport's solid waste and recycling goals and how tenants play a vital role in the airport's overall success.

The implementation of an effective program requires accurate data of current waste and recycling rates. There are several ways an airport can gain insight into their waste stream. The waste audit is the most comprehensive and intensive way to assess waste stream composition, opportunities for waste reduction, and capture of recyclables.

Examination of Records

- Waste hauling and disposal records and contracts
- Supply and equipment invoices
- Other waste management costs (commodity rebates, container costs, etc.)

Facility Walk-Through

- Qualitative waste information
- Understanding waste pickup and hauling practices

Waste Audit

- Collection and analysis of the types of waste produced

EXISTING SERVICES

Solid waste services at the airport are provided by San Juan Sanitation. The airport has one solid waste dumpster and one recycling dumpster, depicted in **Figure A**, which are located landside adjacent to the terminal. The airport also has several interior recycling bins in the terminal and other locations at the airport. No information was available regarding the weight of MSW or recycling materials hauled or the cost of service. MSW bins at the airport are emptied twice monthly.



Figure A: Existing waste and recycling dumpster at FHR

Figure B outlines items San Juan Sanitation allows to be recycled and those items that are not permitted. It is recommended the airport occasionally refer to the company's website to confirm allowable recyclables.



Figure B – San Juan Sanitation Recyclables
Source: https://www.sanjuansani.com/recycling (January 2019)

Waste management services at FHR are currently managed independently by various tenants and entities in what is known as a *decentralized* waste management system. To maximize recycling efforts, the airport should actively engage tenants by transitioning to a *centralized* waste management system. **Exhibit E2** summarizes the differences between these two styles.



Recycling Bin Restrictive Lids



Centralized waste management systems provide greater opportunity for participation from airport tenants who may not be incentivized to recycle on their own. The centralized system is advantageous in that is has less players involved in the overall management of the solid waste and recycling efforts. This management style allows greater control by the airport over the type, placement, and maintenance of compactors and dumpsters, saving space and eliminating the need for each

tenant to have their own containers. A centralized strategy can be inefficient for some airports as it requires more effort and oversight on the part of airport management. Ultimately, a centralized waste management system will streamline waste and recycling collection, maximizing the opportunity to reduce waste generation and increase diversion of recyclables.

SOLID WASTE AND RECYCLING GOALS

While the airport may or may not expand the existing waste management system with additional landside recycle dumpsters in other locations at the airport, there are other opportunities for improvement. **Table E1** outlines objectives that could help reduce waste generation and increase recycling efforts at FHR. To increase the effectiveness of tracking progress at the airport, a baseline state of all suggested metrics should be established to provide a comparison over time.

TABLE E1
Waste Management and Recycling Goals
Friday Harbor Airport

Goals	Objectives
Reduce amount of solid waste generated	Switch to online bill pay to eliminate monthly paper bills
	Conduct a waste audit to identify most common types of waste
	Eliminate purchase of items that are not recyclable (i.e. Styrofoam, plastic bags)
Increase amount of material recycled	Promote the expansion of recycling services to all areas of the airport
	Improve waste and recycling tracking and data management
	Incorporate recycling requirements and/or recommendations into tenant lease agreements
	Expand recycling marketing & promotion efforts throughout public areas
	Require contractors to implement strategies to reduce, reuse & recycle construction & demolition waste

Source: Coffman Associates, Inc.

FRIDAY HARBOR AIRPORT









APPENDIX F

Airport Plans

AIRPORT MASTER PLAN

Appendix F
Airport Plans

As part of this master plan, the Federal Aviation Administration (FAA) requires the development of several technical drawings detailing specific parts of the airport and its environs. These drawings were created on a computer-aided drafting system (CAD) and serve as the official depiction of the current and planned condition of the airport. These drawings will be delivered to the FAA for their review and inspection. The FAA will critique the drawings from a technical perspective to be sure all applicable federal regulations are met. The FAA will use the CAD drawings as the basis and justification for funding decisions.

It should be noted that the FAA requires that any planned changes to the airfield (i.e., runway and taxiway system, etc.) be represented on the drawings. The landside configuration developed during this master planning process is also depicted on the drawings, but the FAA recognized that landside development is much more fluid and dependent upon developer needs. Thus, an updated drawing set is not typically necessary for minor landside alterations.

The following is a description of the CAD drawings included with this master plan. The set of technical drawings has been developed following guidance from FAA *Standard Operating Procedures 2.0 – Standard Procedures for FAA Review and Approval of Airport Layout Plans (ALPs).*

AIRPORT LAYOUT PLAN

The ALP is a scaled, graphical presentation of the existing and future airport facilities, their location on the airport campus, and pertinent clearance and dimensional information. The ALP is a major product

of the Master Plan Update, which contains information used by the FAA to program future funding assistance and to monitor the airport's compliance with design standards and grant assurances. It also allows the FAA to anticipate budgetary and procedural needs, and to protect the airspace required for facility or aircraft approach procedure improvements. An up-to-date FAA-approved ALP that ensures the safety, utility, and efficiency of the airport is required for the airport to receive financial assistance.

An ALP, which is a public document that serves as a record of present and future aeronautical requirements, is a blueprint for airport development by which the airport sponsor – in this case, the sponsor is the Port of Friday Harbor – can ensure that development remains consistent with airport design standards and safety requirements, as well as airport and community land use plans.

AIRPORT AIRSPACE DRAWING

Federal Aviation Regulation (FAR) Part 77, *Objects Affecting Navigable Airspace*, was established by FAA for use by local authorities to define recommended airspace protection surfaces near airports. The airport airspace drawing included in this master plan is a graphic depiction of these protection surfaces. The airport airspace drawing is a tool to aid local authorities in determining if proposed development could present a hazard to aircraft using the airport. The airport airspace drawing can be a critical tool for the airport sponsor's use in reviewing proposed development in the vicinity of the airport.

The airport sponsor should do all in his/her power to ensure development stays below the FAR Part 77 surfaces to protect the role of the airport. The following discussion will describe those surfaces that make up the recommended FAR Part 77 surfaces at Friday Harbor Airport.

The airport airspace drawing assigns three-dimensional imaginary surfaces associated with the airport. These imaginary surfaces emanate from the runway centerline(s) and are dimensioned according to the visibility minimums associated with the instrument approach to the runway end and size of aircraft to operate on the runway. The FAR Part 77 imaginary surfaces include the primary surface, approach surface, transitional surface, horizontal surface, and conical surface. Each surface is described as follows. The imaginary surfaces are established based on the planned future runway design code (i.e., B-II(s)-5000).

Primary Surface

The primary surface is an imaginary surface longitudinally centered on the runway. The primary surface extends 200 feet beyond each runway end. The elevation of any point on the primary surface is the same as the elevation along the nearest associated point on the runway centerline. Under FAR Part 77 regulations, the primary surface for the runway at Friday Harbor Airport is 500 feet wide.

Approach Surface

The approach surface is longitudinally centered on the extended runway centerline and extends outward and upward from each end of the primary surface. The dimensions of the approach surface leading to each runway end is based upon the type of approach (instrument or visual) planned and the type of runway (utility or other-than-utility). Utility runways have a pavement strength of 12,500 pounds or less and primarily serve smaller aircraft.

To protect the airport from future adjacent incompatible land uses, approach surfaces with instrument approach procedures are planned to each runway end. The approach slope dimensions are based on both runway ends having a non-precision instrument approach with 1-mile visibility minimums. The approach surface extends from the primary surface (500 feet wide) at a 20:1 slope for 5,000 feet and to a width of 2,000 feet.

Transitional Surface

The transitional surface begins at the outside edge of the primary surface at the same elevation as the runway. The transitional surface also connects with the approach surface. The transitional surface rises at a slope of 7:1, up to a height 150 feet above the highest runway elevation. At that point, the transitional surface is replaced by the horizontal surface.

Horizontal Surface

The horizontal surface is a plane 150 feet above the established airport elevation. Having no slope, the horizontal surface connects the transitional and approach surfaces to the conical surface 5,000 feet from the end of the primary surface.

Conical Surface

The conical surface begins at the outer edge of the horizontal surface, rising at a 20:1 slope to 4,000 feet. At 4,000 feet from the horizontal surface, the elevation of the conical surface is 350 feet above the airport elevation.

APPROACH SURFACE PROFILE DRAWINGS

The runway profile drawing presents the entirety of the FAR Part 77 approach surface to the runway ends. It also depicts the runway centerline profile with elevations. This drawing provides profile detail that the airport airspace drawing does not. The profile drawings also depict the existing and future threshold siting surface (obstacle clearance surface).

INNER APPROACH SURFACE DRAWINGS

The inner portion of the approach surface drawing contains the plan and profile view of the inner portion of the approach surface to the runway and a tabular listing of all surface penetrations. The drawing also contains the threshold siting surface (obstacle clearance surface). Detailed obstruction and facility data are provided to identify planned improvements and the disposition of obstructions. A drawing of each runway end is provided.

DEPARTURE SURFACE DRAWING

For runways supporting instrument operations, a separate drawing depicting the departure surface is required. The departure service, also called the one engine inoperable (OEI) obstacle identification surface (OIS), is a surface emanating from the departure end of the runway to 10,200 feet. The inner width is 1,000 feet and the outer width is 6,466 feet. On January 1, 2009, the FAA required that the airport have this drawing completed. The departure surface information should be made available to any commercial operator at the airport.

There are three recommended methods to mitigate penetrations to this surface:

1. The object is removed or lowered.
2. The Takeoff Distance Available (TODA) is decreased (i.e., pilots are instructed to lift off prior to the runway end in order to avoid the obstruction.
3. Instrument departure minimums are raised.

Existing obstacles of 35 feet or less would not require mitigation; instead, new departure procedures may be introduced, or existing departure procedures may be altered, or no action may be taken.

TERMINAL AREA DRAWING

The terminal area drawing is a larger scale plan view drawing of existing and planned aprons, buildings, hangars, parking lots, and other landside facilities. It is prepared in accordance with FAA AC 150/5300-13, *Airport Design*.

AIRPORT LAND USE DRAWING

The objective of the airport land use drawing is to coordinate uses of the airport property in a manner compatible with the functional design of the airport facility. Airport land use planning is important for orderly development and efficient use of available space. There are two primary considerations for airport land use planning: 1) To secure those areas essential to the safe and efficient operation of the airport; and 2) To determine compatible land uses for the balance of the property which would be most advantageous to the airport and community.

In the development of an airport land use plan for Friday Harbor Airport, the airport property was broken into several large general tracts. Each tract was analyzed for specific site characteristics, such as tract size and shape, land characteristics, and existing land uses. The availability of utilities and the accessibility to various transportation modes were also considered. Limitations and constraints to development, such as height and noise restrictions, runway visibility zones, and contiguous land uses were analyzed next. Finally, the compatibility of various land uses in each tract was analyzed.

The depiction of on-airport land uses on this drawing is a recommendation based on the analysis of the highest and best use of airport property. Any airport land considered for non-aviation purposes will require FAA review and approval prior to implementation.

EXHIBIT A - AIRPORT PROPERTY MAP

The Exhibit A - Airport Property Map provides information on property under airport control and is, therefore, subject to FAA grant assurances. The various recorded deeds that make up the airport property are listed in tabular format. The primary purpose of the drawing is to provide information for analyzing the current and future aeronautical use of land acquired with federal funds. This drawing was developed following FAA *Standard Operating Procedures 3.0 – Standard Procedures for FAA Review of Exhibit 'A' Airport Property Inventory Maps*.

LAND RELEASE MAP

The land release map provides additional detail related to the portions of airport property that are considered for use as compatible non-aviation revenue support. These areas are also depicted on the airport land use drawing. On August 5, 2019, the airport submitted a request to the FAA to release these parcels from airport obligation. All identified parcels will remain under the ownership of the airport.

DRAFT ALP DISCLAIMER

The ALP set has been developed in accordance with accepted FAA standards. The ALP set has not yet been approved by the FAA and is subject to FAA airspace review. Land use and other changes may result.

AIRPORT LAYOUT PLAN

Prepared for

PORT OF FRIDAY HARBOR

FRIDAY HARBOR AIRPORT

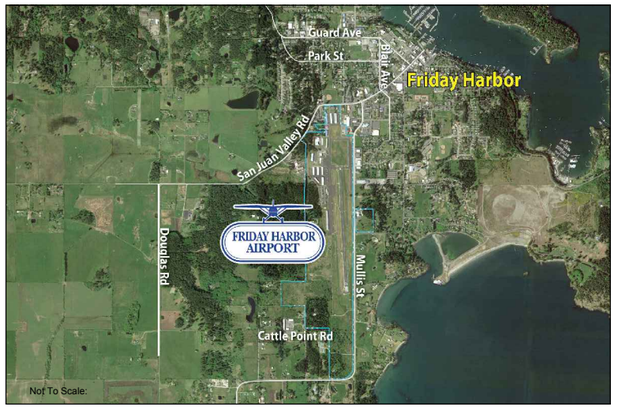
FRIDAY HARBOR, WA

April 7, 2020

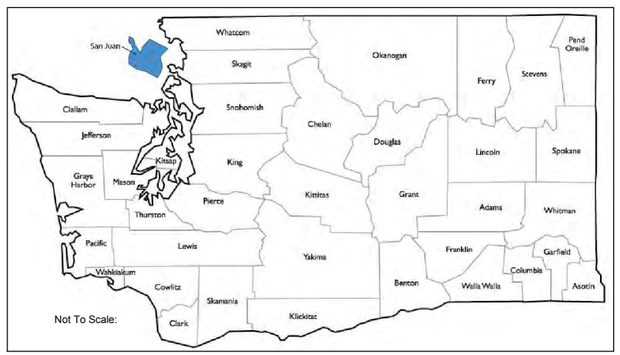
Grant # 3-53-0152-034-2017

INDEX OF DRAWINGS

		Revision Date:
1.	TITLE SHEET	April 7, 2020
2.	AIRPORT DATA SHEET	April 7, 2020
3.	AIRPORT LAYOUT PLAN DRAWING	April 7, 2020
4.	AIRPORT AIRSPACE DRAWING	April 7, 2020
5.	APPROACH SURFACE PROFILES	April 7, 2020
6.	INNER PORTION OF RUNWAY 16 APPROACH SURFACE DRAWING	April 7, 2020
7.	INNER PORTION OF RUNWAY 34 APPROACH SURFACE DRAWING	April 7, 2020
8.	DEPARTURE SURFACE DRAWING	April 7, 2020
9.	TERMINAL AREA DRAWING I	April 7, 2020
10.	TERMINAL AREA DRAWING II	April 7, 2020
11.	AIRPORT LAND USE DRAWING	April 7, 2020
12.	EXHIBIT A AIRPORT PROPERTY MAP	April 7, 2020
13.	LAND RELEASE MAP	April 7, 2020







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Airport Manager: DATE:

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1	-	-	-	—

"THE PREPARATION OF THESE DOCUMENTS WAS FINANCED IN PART THROUGH A GRANT FROM THE FEDERAL AVIATION ADMINISTRATION AS PROVIDED UNDER SECTION 505 OF THE AIRPORT AND AIRWAY IMPROVEMENT ACT OF 1982, AS AMENDED. THE CONTENTS DO NOT NECESSARILY REFLECT THE OFFICIAL VIEWS OR POLICY OF THE FAA. ACCEPTANCE OF THESE DOCUMENTS BY THE FAA DOES NOT IN ANY WAY CONSTITUTE A COMMITMENT ON THE PART OF THE UNITED STATES TO PARTICIPATE IN ANY DEVELOPMENT DEPICTED HEREIN NOR DOES IT INDICATE THAT THE PROPOSED DEVELOPMENT IS ENVIRONMENTALLY ACCEPTABLE IN ACCORDANCE WITH APPROPRIATE PUBLIC LAWS."

FRIDAY HARBOR AIRPORT

TITLE SHEET

Friday Harbor, Washington

PLANNED BY: Patrick C. Taylor

DETAILED BY: Larry D. Johnson

APPROVED BY: Mike W. Dmyterko

MAY 5, 2020 SHEET 1 OF 13

Coffman Associates
Airport Consultants
www.coffmanassociates.com

RUNWAY DECLARED DISTANCE	EXISTING		ULTIMATE	
	16	34	16	34
TAKE OFF RUN AVAILABLE (TORA)	3,402'	3,402'	3,402'	3,402'
TAKEOFF DISTANCE AVAILABLE (TODA)	3,402'	3,402'	3,402'	3,402'
ACCELERATE-STOP DISTANCE AVAILABLE (ASDA)	3,402'	3,402'	3,402'	3,402'
LANDING DISTANCE AVAILABLE (LDA)	3,402'	3,402'	3,402'	3,402'

AIRPORT NAVAID (Owned by FAA)
None

GENERAL NOTES:

1. Depiction of close in features and objects, including related elevations and clearances, within the 14 CFR Part 77 Approach Surface are depicted on the INNER PORTION OF THE APPROACH SURFACE DRAWINGS.
2. Details concerning terminal improvements are depicted on the TERMINAL AREA DRAWING.
3. Vertical Datum NAVD 88 and Horizontal Datum NAD 83.

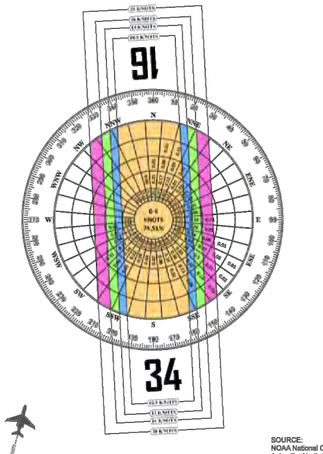
AIRPORT DATA		
OWNER: Port of Friday Harbor, Washington	CITY: Friday Harbor, Washington	COUNTY: San Juan, Washington
Friday Harbor Airport (FHR)	EXISTING	ULTIMATE
AIRPORT REFERENCE CODE (ARC)	B-II (Small Aircraft)	B-II (Small Aircraft)
MEAN MAXIMUM TEMPERATURE OF HOTTEST MONTH	71.7° F (July)	71.7° F (July)
AIRPORT ELEVATION (NAVD 88)	112.7' MSL	112.7' MSL
AIRPORT NAVIGATIONAL AIDS	RNAV GPS, NDB	RNAV GPS, NDB
	MIRL, REIL, PAPI	MIRL, REIL, PAPI
	Rotating Beacon	Rotating Beacon
AIRPORT REFERENCE POINT (ARP) COORDINATES (NAD 83)	Latitude 48° 31' 19.100" N	Latitude 48° 31' 19.100" N
	Longitude 123° 01' 27.700" W	Longitude 123° 01' 27.700" W
MISCELLANEOUS FACILITIES	MITL	MITL
	ASOS	ASOS
	Lighted Windcone	Lighted Windcone
DESIGN CRITICAL AIRCRAFT	B-II (S) -1A	B-II (S) -1A
DESIGN CRITICAL AIRCRAFT TYPE	Cessna Caravan 208B	Cessna Caravan 208B
WINGSPAN OF DESIGN AIRCRAFT (FEET)	52.08'	52.08'
APPROACH SPEED OF DESIGN AIRCRAFT (KNOTS)	79 Knots	79 Knots
UNDERCARRIAGE WIDTH OF DESIGN AIRCRAFT (FEET)	11.7' MGW	11.7' MGW
MAGNETIC DECLINATION	15.93° E (2018-11-15)	15.93° E (2018-11-15)
SOURCE: https://www.ngdc.noaa.gov/geomag-web/	Annual rate of changing 0.15° W	Annual rate of changing 0.15° W
NPIAS CODE	Commercial Service (CS)	Commercial Service (CS)
STATE SYSTEM PLAN ROLE	Regional Airport	Regional Airport

MODIFICATIONS TO STANDARDS APPROVAL TABLE			
APPROVAL DATE	AIRSPACE CASE NUMBER	STANDARD MODIFIED	DESCRIPTION
9/12/2011	N/A	Rwy to Twy 240' (standard)	Rwy to Twy A Separation 156'
Relocate Taxiway A to 156' (Completed). FD/NOTAM for greater than 55' wingspans (Completed).			

RUNWAY DATA TABLE		RUNWAY 16-34			
		EXISTING		ULTIMATE	
RUNWAY IDENTIFICATION (Utility Runway)		16	34	16	34
RUNWAY DESIGN CODE (RDC)		B/II (S) /5000		B/II (S) /5000	
APPROACH REFERENCE CODE (APRC)		B/I (S) /VIS, B/I (S) /5000		B/II (S) /VIS, B/II (S) /5000	
DEPARTURE REFERENCE CODE (DPRC)		B/I (S)		B/II	
RUNWAY SURFACE MATERIAL		Asphalt		Asphalt	
RUNWAY PAVEMENT STRENGTH WHEEL (IN THOUSAND LBS. #1)		12.5 (S)		12.5 (S)	
RUNWAY PAVEMENT STRENGTH PCN		N/A		N/A	
RUNWAY PAVEMENT SURFACE TREATMENT		Grooved		Grooved	
RUNWAY EFFECTIVE GRADIENT		0.80%		0.80%	
RUNWAY WIND COVERAGE (13 KNOTS/15 MPH)		97.95%		97.95%	
RUNWAY DIMENSIONS (L X W)		3,402' x 75'		3,402' x 75'	
RUNWAY DISPLACED THRESHOLD		None	None	None	None
RUNWAY SAFETY AREA (Standard Beyond Runway End)		300' x 150'	300' x 150'	300' x 150'	300' x 150'
RUNWAY SAFETY AREA (Actual L x W)		4,002' x 150'		4,002' x 150'	
RUNWAY END COORDINATES (NAD83)	LAT	48° 31' 35.8395" N	48° 31' 02.3160" N	48° 31' 35.8395" N	48° 31' 02.3160" N
	LONG	123° 01' 29.0329" W	123° 01' 26.4319" W	123° 01' 29.0329" W	123° 01' 26.4319" W
RUNWAY LIGHTING		MIRL		MIRL	
RUNWAY PROTECTION ZONE DIMENSIONS		250' x 1000' x 450'	250' x 1000' x 450'	250' x 1000' x 450'	250' x 1000' x 450'
RUNWAY MARKING		Basic	Nonprecision	Nonprecision	Nonprecision
14 CFR PART 77 APPROACH CATEGORY		AV (20:1)	ANP (20:1)	ANP (20:1)	ANP (20:1)
VISIBILITY MINIMUMS		Visual	1 mile	1 mile	1 mile
TYPE OF AERONAUTICAL SURVEY REQUIRED FOR APPROACH		NVG	VG	VG	VG
DEPARTURE SURFACE (YES/NO)		Yes	Yes	Yes	Yes
OBJECT FREE AREA (Standard Beyond Runway End)		300' x 500'	300' x 500'	300' x 500'	300' x 500'
OBJECT FREE AREA (Actual L x W)		4,002' x 500'		4,002' x 500'	
OBSTACLE FREE ZONE (Standard Beyond Runway End)		200' x 250'	200' x 250'	200' x 250'	200' x 250'
OBSTACLE FREE ZONE (Actual L x W)		3,802' x 250'		3,802' x 250'	
OBSTACLE CLEARANCE SURFACE (EB 99, updated 2018)		Rw Type 2	Rw Type 4	Rw Type 4	Rw Type 4
INSTRUMENT APPROACH PROCEDURES		None	RNAV GPS	RNAV GPS	RNAV GPS
			NDB		NDB
RUNWAY VISUAL NAVIGATIONAL AIDS		PAPI-2	PAPI-4	PAPI-4	PAPI-4
		REIL	REIL	REIL	REIL
TOUCHDOWN ZONE ELEVATION (TDZE)		112.7' MSL	107.7' MSL	112.7' MSL	107.7' MSL
TAXIWAY and TAXILANE WIDTH		Varies (25'-35')	25'	Varies (25'-35')	25'
TAXIWAY and TAXILANE SAFETY AREA DIMENSIONS		79'		79'	
TAXIWAY and TAXILANE OBJECT FREE AREA WIDTH		131' / 115'		131' / 115'	
TAXIWAY/TAXILANE CENTERLINE TO FIXED OR MOVABLE OBJECT		65.5' / 57.5'		65.5' / 57.5'	
TAXIWAY/TAXILANE LIGHTING		MITL		MITL	
VERTICAL DATUM		NAVD 88		NAVD 88	
HORIZONTAL DATUM		NAD 83		NAD 83	
TAXIWAY EDGE SAFETY MARGIN		5'		5'	
TAXIWAY HOLDING MARKING/HOLD SIGN		125'		125'	
1 PAVEMENT STRENGTHS ARE EXPRESSED IN SINGLE (S), DUAL (D), DUAL TANDEM (2D) WHEEL LOAD CAPACITIES					

ALL WEATHER WIND COVERAGE

Runways	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 16-34	85.86%	97.95%	99.35%	99.87%



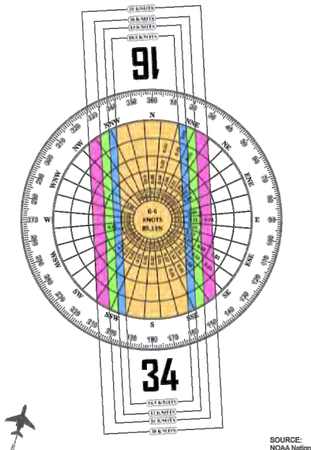
Magnetic Declination
16° 05' 00" East (August 2017)
Annual Rate of Change
00° 05' 00" West (August 2017)

SOURCE:
NOAA National Climatic Center
Asheville, North Carolina
Friday Harbor Airport
Friday Harbor, Washington

OBSERVATIONS:
108,657 All Weather Observations
Jan. 1, 2007 - Dec, 31 2016

IFR WIND COVERAGE

Runways	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 16-34	95.84%	98.47%	99.91%	99.98%



Magnetic Declination
16° 05' 00" East (August 2017)
Annual Rate of Change
00° 05' 00" West (August 2017)

SOURCE:
NOAA National Climatic Center
Asheville, North Carolina
Friday Harbor Airport
Friday Harbor, WA

OBSERVATIONS:
15,629 IFR Observations
Jan. 1, 2007 - Dec, 31 2016

FAA APPROVAL STAMP

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FRIDAY HARBOR AIRPORT

AIRPORT DATA SHEET

Friday Harbor, Washington

PLANNED BY: Patrick C. Taylor
DETAILED BY: Larry D. Johnson
APPROVED BY: Mike W. Dmyterko

MAY 5, 2020 SHEET 2 OF 13

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Coffman Associates C:\Users\Johnson\Coffman Associates Inc\Coffman - do_CAD\CAD\Johnson\MP\FHR-Friday\dgset\FHR_UHDZ_DATA.dwg Printed Date: 5-06-20 09:23:40 AM Johnson

Existing
Part 77 Surface
500' x 5,000' x 1,250'
20:1 Visual Approach

Existing & Ultimate RPZ
250' x 1000' x 450'
Ext. Visibility Minimums Visual
Partially Owned/Easement
Ult. Visibility Minimums 1-mile

Existing/Ultimate Runway 16
EL. 112.7 (TDZE/High Point)
48° 31' 35.8395" N
123° 01' 29.0329" W

Existing/Ultimate RPZ
250' x 1000' x 450'
Visibility Minimums 1 mile
Partially Owned/Easement

Existing/Ultimate Runway 34
EL. 83.9 (Low Point)
48° 31' 02.3160" N
123° 01' 26.4319" W

Ext/Ultimate Part 77 Surface
500' x 5,000' x 2,000'
20:1 Nonprecision Approach

Ext/Ult ARP
48° 31' 19.10" N
123° 01' 27.70" W

Ext/Ult 3402' x 75' Runway (True Bearing N 4° 19' 0.47" E)

Ultimate Part 77 Surface (ANP)
500' x 5,000' x 2,000'
20:1 Nonprecision Approach

Ext/Ultimate Part 77 Surface
500' x 5,000' x 2,000'
20:1 Nonprecision Approach

Existing/Ultimate RPZ
250' x 1000' x 450'
Visibility Minimums 1 mile
Partially Owned/Easement

INSET 'A'

SEE INSET "A"

Date of Survey: 4/7/2016

EXISTING BUILDINGS/FACILITIES

NO.	Facility Name	Elevation Top (MSL)	OL Lighted
1	MAIN TERMINAL BUILDING (TBR)	143	
2	ADMINISTRATION BUILDING/ATCT	144	
3	FUEL FACILITY (To Be Relocated)	134	
4	AIRPORT ROTATING BEACON (TBR)	157.3	OL
5	DEICING FACILITY/WASH RACK	116.8	
6	HELIPAD FOR EMS (To Be Relocated)	116	
7	AUTOMATED WEATHER STATION (ASOS)	145.9	OL
8	CAFE - TO BE RELOCATED	146	
9	CABINET SHOP	165	
10	BUILDING	160	
11	ANIMAL SHELTER	128	
12	SKAGIT VALLEY COLLEGE	186	
13	SAN JUAN COUNTY FIRE DEPARTMENT	120	
14	BUILDING	162	
15	FBO/MAINTENANCE/EXECUTIVE HANGAR	163.2	
16	BUILDING	154	
17	SEGMENTED CIRCLE/ WINDSOCK	108.7	OL
18	NON-DIRECTIONAL BEACON	91.1	
19	BUILDING	94	
20	ELECTRICAL VAULT	116.8	
21	BUILDING - WELCOME CENTER (V)	130	
25	T-SHADE (A)	149.1	
26	T-SHADE (B)	146.4	
27	T-HANGAR (C)	142.7	
28	T-HANGAR (D1)	134.5	
29	T-HANGAR (D2)	134.6	
30	T-HANGAR (E)	131.9	
31	T-HANGAR (F)	132.3	
32	T-HANGAR (G)	133.4	
33	BOX HANGAR (H)	136	
34	BOX HANGAR (J)	155.9	
35	T-HANGAR (K)	147.5	
36	T-HANGAR (L1)	157	
37	T-HANGAR (L2)	157	
38	CONVENTIONAL HANGAR (M)	157.3	OL
39	BOX HANGAR (N)	158.6	
40	CONVENTIONAL HANGAR (O)	157	
41	CONVENTIONAL HANGAR (P)	151	
42	CONVENTIONAL HANGAR (Q)	150.8	
43	BOX HANGAR (R)	156.8	
44	BOX HANGAR (T)	158	
45	CONVENTIONAL HANGAR (51)	119.5	
46	CONVENTIONAL HANGAR (52)	116.5	
47	CONVENTIONAL HANGAR (53)	115.1	
48	BOX HANGAR (W)	157	OL
49	STORAGE BARN (U)	151.4	

ULTIMATE BUILDINGS/FACILITIES

NO.	DESCRIPTION	ELEVATION AGL (MSL)
50	TERMINAL BUILDING (180' x 80')	50'
51	HANGAR (150' x 100')	35'
52	HANGAR (150' x 100')	35'
53	HANGAR (60' x 60')	25'
54	HANGAR (60' x 60')	25'
55	HANGAR (60' x 60')	25'
56	HANGAR (60' x 60')	25'
57	HANGAR (60' x 60')	25'
58	HANGAR (60' x 60')	25'
59	T-HANGAR (18 units)	23'
60	HANGAR (60' x 60')	25'
61	HANGAR (60' x 60')	25'
62	HANGAR (60' x 60')	25'
63	HANGAR (60' x 60')	25'
64	HANGAR (60' x 60')	25'
65	HANGAR (60' x 60')	25'
66	HANGAR (380' x 50')	35'
67	HANGAR (56' x 60')	25'
68	HANGAR (56' x 60')	25'
69	HANGAR (56' x 60')	25'
70	HANGAR (56' x 60')	25'
71	HANGAR (56' x 60')	25'
72	HANGAR (120' x 80')	35'
73	HANGAR (60' x 60')	25'
74	HANGAR (60' x 60')	25'
75	HANGAR (60' x 60')	25'
76	HANGAR (60' x 60')	25'
77	HANGAR (60' x 60')	25'
78	HANGAR (47' x 47')	25'
79	HANGAR (110' x 50')	35'
80	HANGAR (180' x 75')	35'
81	BOX HANGARS (8 units, 40' x 40')	25'
82	SEGMENTED CIRCLE/WINDCONE	27'
83	AIRPORT ROTATING BEACON	40'
84	FUEL ISLAND	N/A

LEGEND

EXISTING	ULTIMATE	DESCRIPTION
	SAME	ABANDONED PAVEMENT (To Be Removed)
		AIRPORT PROPERTY LINE/FENCE
	SAME	AIRPORT REFERENCE POINT (ARP)
		AIRPORT ROTATING BEACON
	SAME	BUILDING ABANDONMENT (To Be Removed)
N/A		BUILDING
		NO-TAXI ISLAND
		PAVEMENT
		FENCING
xPAPI	SAME	NAVIGATIONAL AID INSTALLATION (PAPI-4)
	SAME	RUNWAY THRESHOLD LIGHTS and REIL
25	SAME	SECTION CORNER
		WIND INDICATOR/WINDSOCK (WS)
10	SAME	TOPOGRAPHY (NAVD 88)
	SAME	HOLDING POSITION MARKING
	SAME	PARCELS
TSA	SAME	TAXIWAY SAFETY AREA (79')
TOFA	SAME	TAXIWAY OBJECT FREE AREA (131')
Extd OFA	SAME	EXTENDED OBJECT FREE AREA
OFZ	SAME	OBSTACLE FREE ZONE (OFZ)
RSA	SAME	RUNWAY SAFETY AREA (RSA)
OFA	SAME	RUNWAY OBJECT FREE AREA (OFA)
AS	uAS	PART 77 APPROACH SURFACE
	SAME	SURVEY MONUMENT (PACS/SACS)
	SAME	RUNWAY PROTECTION ZONE (RPZ)
BRL	SAME	BUILDING RESTRICTION LINE (BRL)
	SAME	ASOS
	SAME	EASEMENT
		TIE-DOWNS
		ROAD and PARKING

NORTH

Magnetic Declination
15.93° East (November 2018)
Annual Rate of Change 0.15° West

0 200 400 600
SCALE IN FEET

GENERAL NOTES:

1. Depiction of close in features and objects, including related elevations and clearances, within the 14 CFR Part 77 Approach Surface are depicted on the INNER PORTION OF THE APPROACH SURFACE DRAWINGS.
2. Details concerning terminal improvements are depicted on the TERMINAL AREA DRAWING.
3. Vertical Datum NAVD 88 and Horizontal Datum NAD 83.
4. Depress Mullis Road and Fence Below ROFA.

FAA APPROVAL STAMP

FOR APPROVAL BY

Airport Manager DATE:

NO.	REVISIONS	DATE	BY	APP'D.
3	-	—	—	—
2	-	-	-	—
1	-	—	—	—

"THE PREPARATION OF THESE DOCUMENTS WAS FINANCED IN PART THROUGH A GRANT FROM THE FEDERAL AVIATION ADMINISTRATION AS PROVIDED UNDER SECTION 505 OF THE AIRPORT AND AIRWAY IMPROVEMENT ACT OF 1982, AS AMENDED. THE CONTENTS DO NOT NECESSARILY REFLECT THE OFFICIAL VIEWS OR POLICY OF THE FAA. ACCEPTANCE OF THESE DOCUMENTS BY THE FAA DOES NOT IN ANY WAY CONSTITUTE A COMMITMENT ON THE PART OF THE UNITED STATES TO PARTICIPATE IN ANY DEVELOPMENT DEPICTED HEREIN NOR DOES IT INDICATE THAT THE PROPOSED DEVELOPMENT IS ENVIRONMENTALLY ACCEPTABLE IN ACCORDANCE WITH APPROPRIATE PUBLIC LAWS."

FRIDAY HARBOR AIRPORT

AIRPORT LAYOUT PLAN DRAWING

Friday Harbor, Washington

PLANNED BY: Patrick C. Taylor
DETAILED BY: Larry D. Johnson
APPROVED BY: Mike W. Dmyterko

MAY 5, 2020 SHEET 3 OF 13

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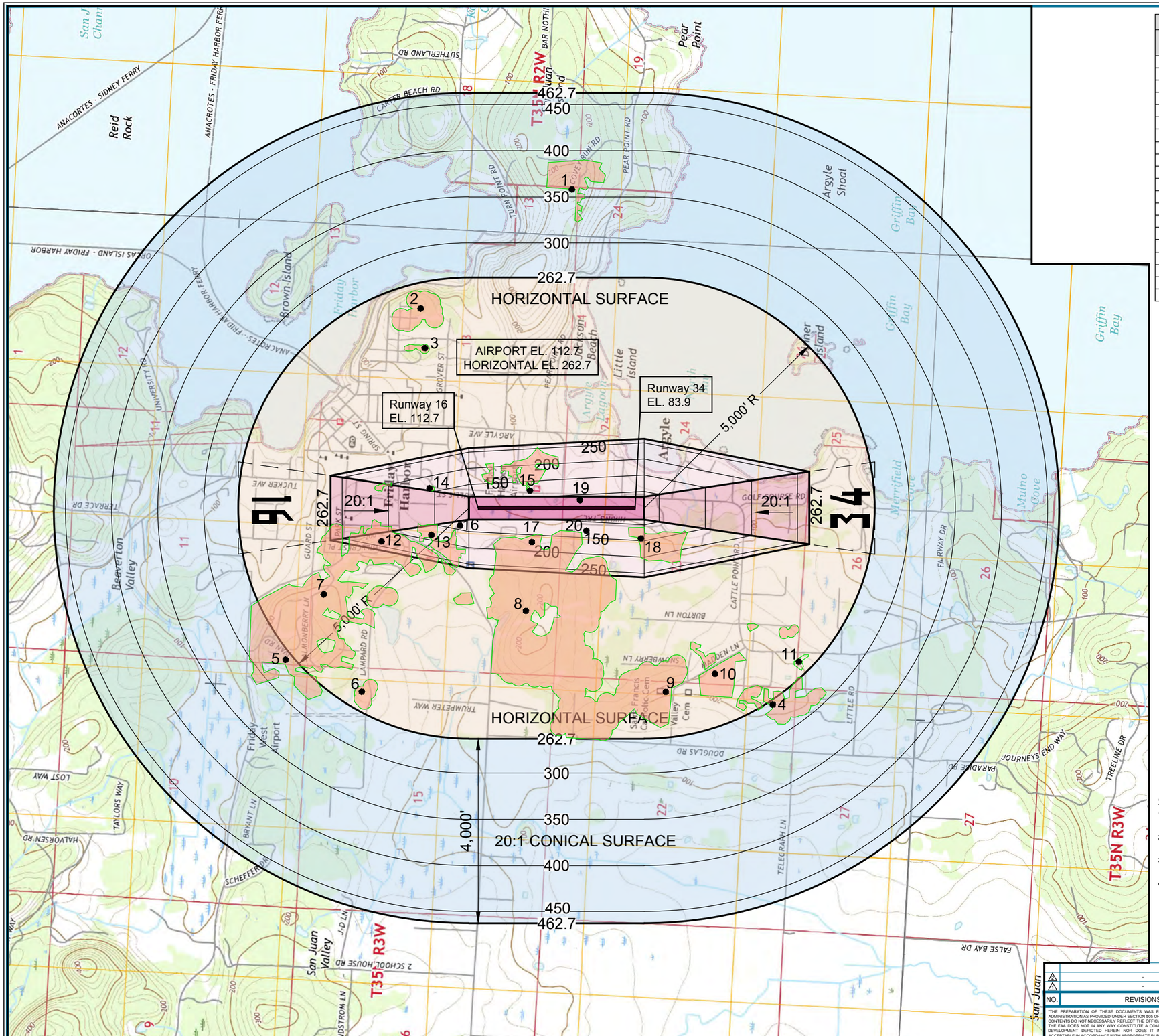
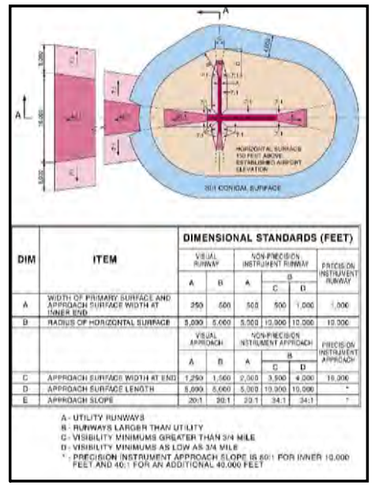


OBSTRUCTION TABLE

No.	Description	Elevation TOP MSL	Object AGL	Part 77 Surface	Object Penetration	Remediation
1	TREE	371.2	N/A	Conical	13.1	Remove Trees
2	TREE	282.9	N/A	Horizontal	20.2	Remove Trees
3	TREE	265.0	N/A	Horizontal	2.3	Remove Trees
4	TREE	331.4	N/A	Conical	64.3	Remove Trees
5	TREE	340.5	N/A	Conical	69.7	Remove Trees
6	TREE	294.8	N/A	Horizontal	32.1	Remove Trees
7	TREE	346.5	N/A	Horizontal	83.8	Remove Trees
8	TREE	320.0	N/A	Horizontal	57.3	Remove Trees
9	TREE	342.2	N/A	Horizontal	79.5	Remove Trees
10	TREE	339.4	N/A	Horizontal	76.7	Remove Trees
11	TREE	303.4	N/A	Horizontal	40.7	Remove Trees
12	TREE	353.4	N/A	Transitional	118.4	Remove Trees
13	TREE	255.4	N/A	Transitional	70.2	Remove Trees
14	TREE	180.8	N/A	Transitional	16.1	Remove Trees
15	TREE	178.3	N/A	Transitional	56.8	Remove Trees
16	BEACON	157.3	30.3	Transitional	7.4	No Action
17	TREE	252.4	N/A	Transitional	79.1	Remove Trees
18	TREE	210.6	N/A	Transitional	67.5	Remove Trees
19	WINDSOCK	108.7	21.7	Primary	14.5	Relocate WS
20	ASOS	145.9	34.9	Transitional	14	No Action



DIM	ITEM	DIMENSIONAL STANDARDS (FEET)					
		VISUAL RUNWAY		NON-PRECISION INSTRUMENT RUNWAY			PRECISION INSTRUMENT RUNWAY
		A	B	A	B C	B D	
A	WIDTH OF PRIMARY SURFACE AND APPROACH SURFACE WIDTH AT INNER END	250	500	500	500	1,000	1,000
B	RADIUS OF HORIZONTAL SURFACE	5,000	5,000	5,000	10,000	10,000	10,000
		VISUAL APPROACH		NON-PRECISION INSTRUMENT APPROACH			PRECISION INSTRUMENT APPROACH
		A	B	A	C	D	
C	APPROACH SURFACE WIDTH AT END	1,250	1,500	2,000	3,500	4,000	16,000
D	APPROACH SURFACE LENGTH	5,000	5,000	5,000	10,000	10,000	*
E	APPROACH SLOPE	20:1	20:1	20:1	34:1	34:1	*

A - UTILITY RUNWAYS
B - RUNWAYS LARGER THAN UTILITY
C - VISIBILITY MINIMUMS GREATER THAN 3/4 MILE
D - VISIBILITY MINIMUMS AS LOW AS 3/4 MILE
* - PRECISION INSTRUMENT APPROACH SLOPE IS 50:1 FOR INNER 10,000 FEET AND 40:1 FOR AN ADDITIONAL 40,000 FEET

OBSTRUCTION LEGEND

1 ● OBSTRUCTION

GROUP of TREES

Date of Survey: 4/7/2016

GENERAL NOTES:

1. Obstructions, clearances, and locations are calculated from ultimate runway end elevations and ultimate approach surfaces, unless otherwise noted.
2. Depiction of features and objects within the primary, transitional, horizontal, and conical surfaces, are illustrated on the AIRPORT AIRSPACE DRAWINGS.
3. Depiction of features and objects within the outer portion of the approach surfaces, are illustrated on the APPROACH SURFACE PROFILES.
4. Depiction of features and objects within the inner portion of the approach surfaces, are illustrated on the INNER PORTION OF RUNWAY APPROACH SURFACE DRAWINGS.

NORTH

Magnetic Declination
15.93° East (November 2018)
Annual Rate of Change 0.15° West

0 1000 2000 3000
SCALE IN FEET

NO.	REVISIONS	DATE	BY	APP'D.
2	-	-	-	-
1	-	-	-	-

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FRIDAY HARBOR AIRPORT

AIRPORT AIRSPACE DRAWING

Friday Harbor, Washington

PLANNED BY: Patrick C. Taylor
DETAILED BY: Larry D. Johnson
APPROVED BY: Mike W. Dmyterko

MAY 5, 2020 SHEET 4 OF 13

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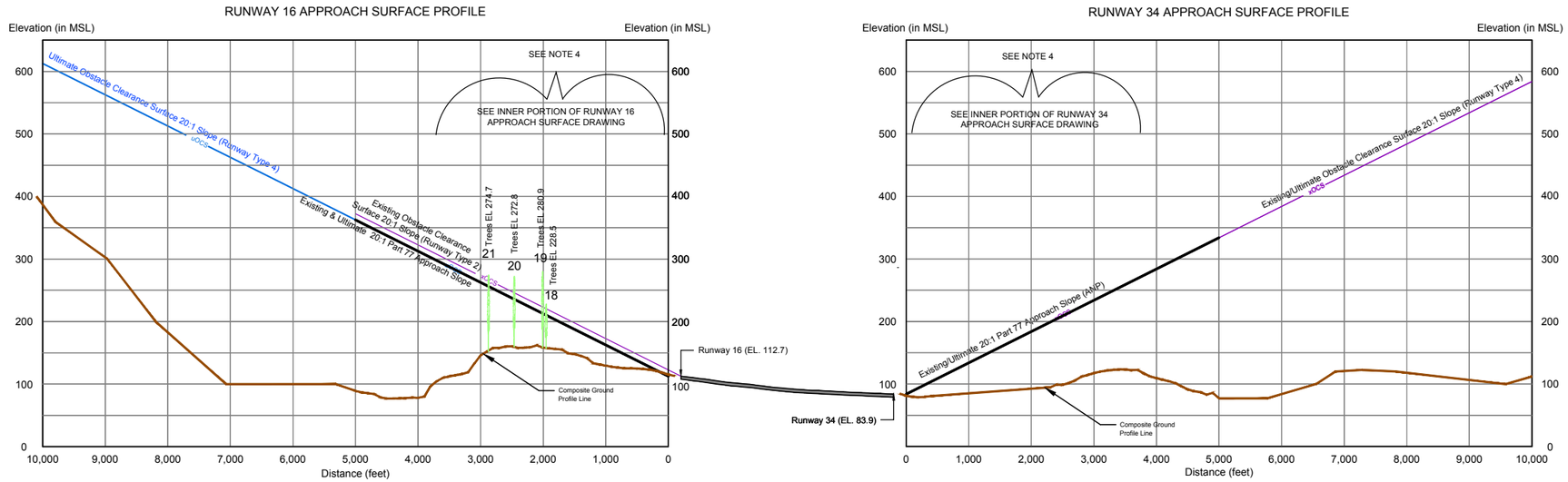
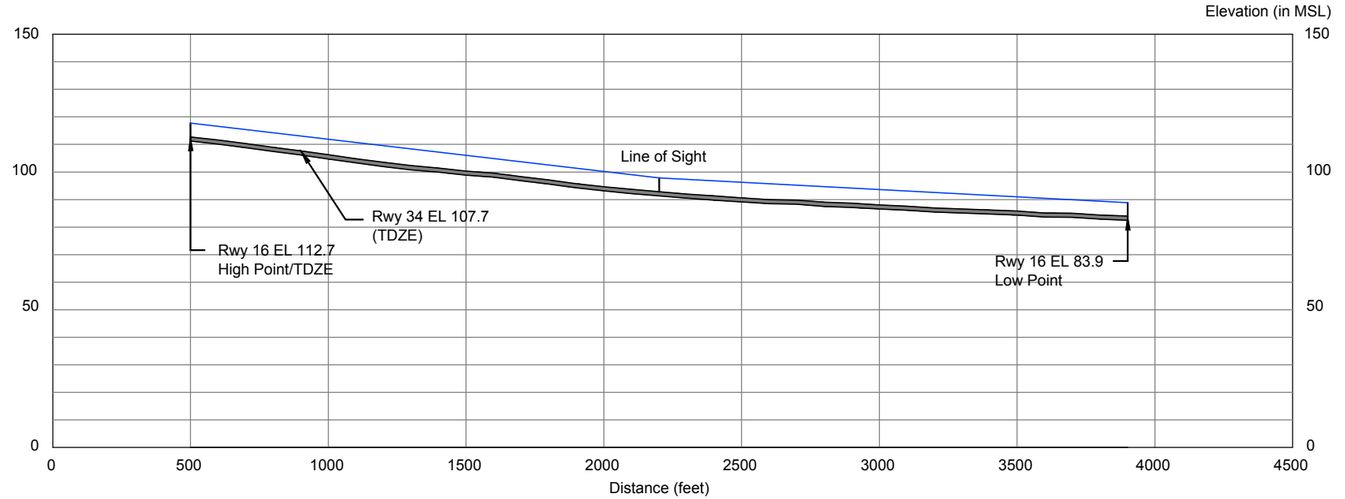




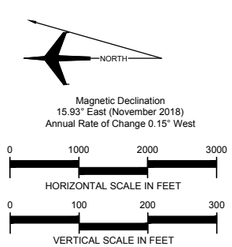
Date of Survey: 4/7/2016

OBSTRUCTION TABLE (Outer Portion) Runway 16							
No.	Object Name	Elevation TOP MSL	Existing 20:1 Approach	Existing 20:1 OCS	Ultimate 20:1 Approach	Ultimate 20:1 OCS	Remediation
18	Trees	228.5	19'	N/A	19'	19'	Remove Trees
19	Trees	280.9	N/A	N/A	67.7'	67.7'	Remove Trees
20	Trees	272.8	36.9'	N/A	36.9'	N/A	Remove Trees
21	Trees	274.7	18.2'	N/A	18.2'	18.2'	Remove Trees

OBSTRUCTION TABLE (Outer Portion) Runway 34							
No.	Object Name	Elevation TOP MSL	Existing 20:1 Approach	Existing 20:1 OCS	Ultimate 20:1 Approach	Ultimate 20:1 OCS	Remediation
-	None	-	-	-	-	-	-

GENERAL NOTES:

1. Obstructions, clearances, and locations are calculated from ultimate runway end elevations and ultimate approach surfaces, unless otherwise noted.
2. Depiction of features and objects within the primary, transitional, horizontal, and conical surfaces, are illustrated on the AIRPORT AIRSPACE DRAWINGS.
3. Depiction of features and objects within the outer portion of the approach surfaces, are illustrated on the APPROACH SURFACE PROFILES.
4. Depiction of features and objects within the inner portion of the approach surfaces, are illustrated on the INNER PORTION OF RUNWAY APPROACH SURFACE DRAWINGS.



NO.	REVISIONS	DATE	BY	APP'D.
2	-	—	—	—
1	-	-	-	—

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FRIDAY HARBOR AIRPORT

APPROACH SURFACE PROFILES

Friday Harbor, Washington

PLANNED BY: Patrick C. Taylor
DETAILED BY: Larry D. Johnson
APPROVED BY: Mike W. Dmyterko

MAY 5, 2020 SHEET 5 OF 13

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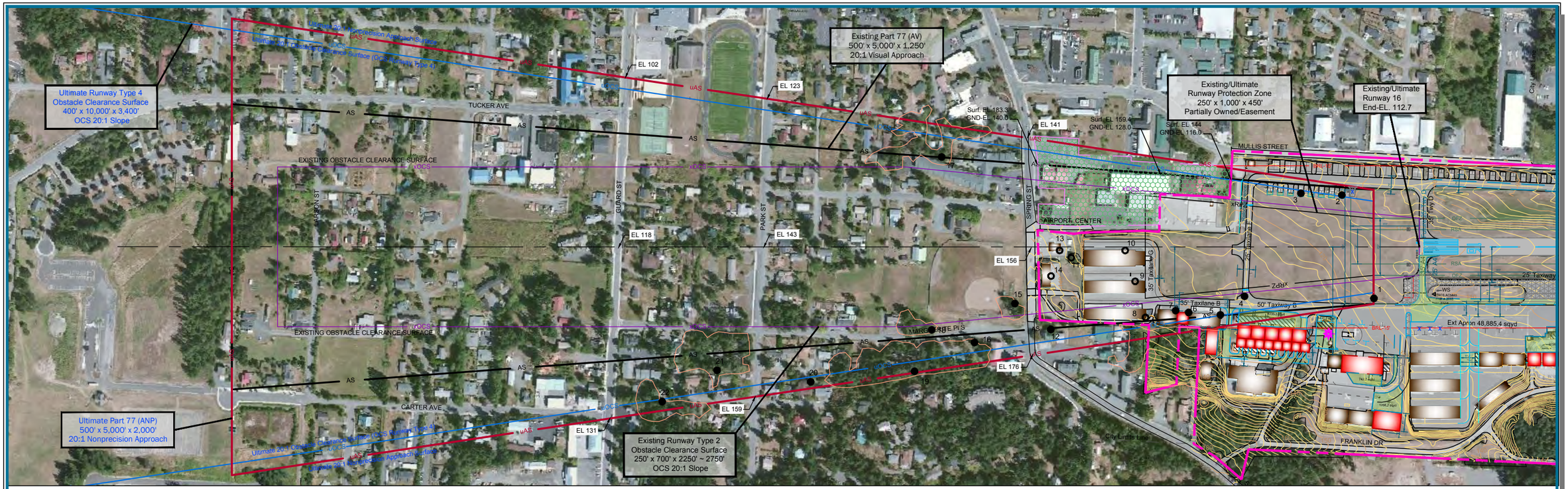


ELEVATION (MSL)

ELEVATION (MSL)

Date of Survey: 4/7/2016

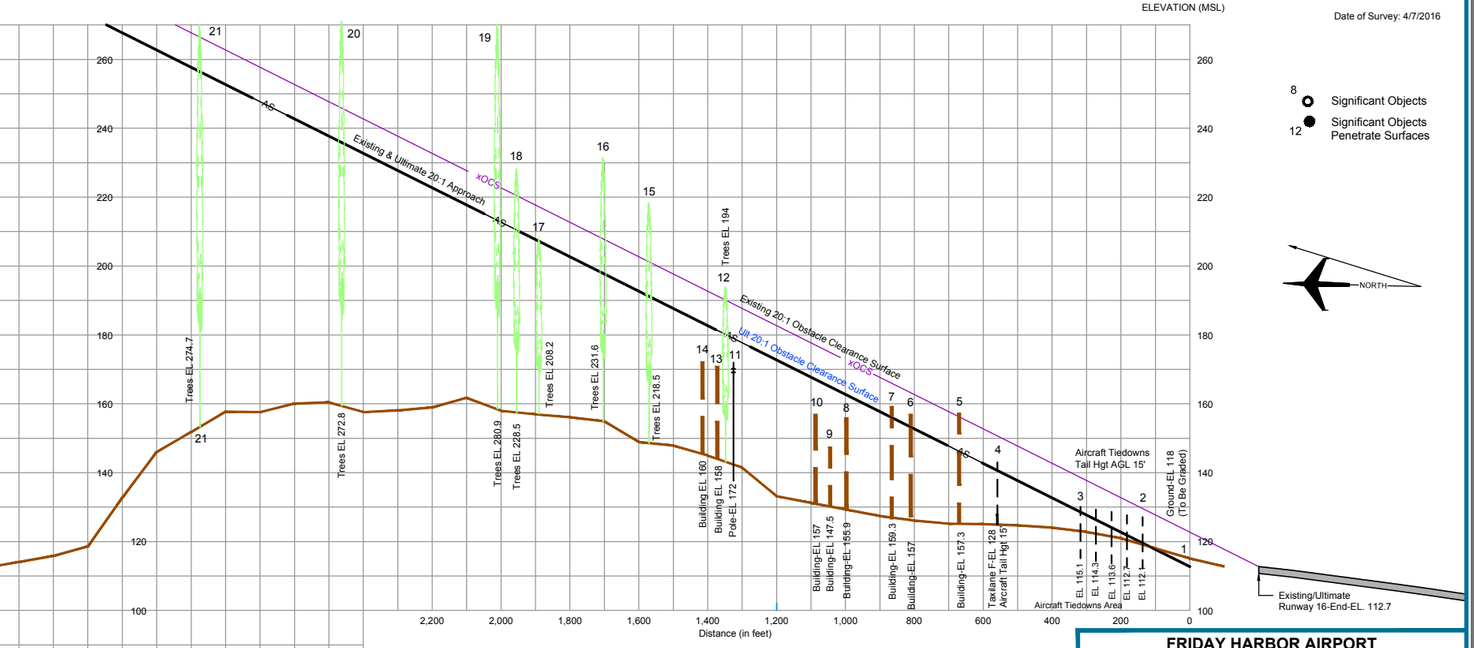
OBSTRUCTION TABLE

No.	Object Name	Elevation TOP MSL	Existing 20:1 Approach Penetration	Existing 20:1 OCS Penetration	Ultimate 20:1 Approach Penetration	Ultimate 20:1 OCS Penetration	Remediation
1	Ground	118	5.3'	0'	5.3'	5.3'	Ground To Be Graded
2	Tie Downs	127.1 (15' AGL)	8.7'	0'	8.7'	5.7'	To Be Relocated
3	Tie Downs	130.1 (15' AGL)	2.2'	0'	2.2'	2.2'	To Be Relocated
4	Taxilane F	143 (15' AGL)	2.2'	0'	2.2'	2.2'	Install Hold Lines
5	Building	157.3	11.1'	0'	11.1'	11.1'	Add Obstruction Light
6	Building	157	3.8'	0'	3.8'	3.8'	Add Obstruction Light
7	Building	159.3	3.3'	0'	3.3'	3.3'	Add Obstruction Light
12	Trees	194	14.1'	N/A	14.1'	14.1'	Remove Trees
15	Trees	222.9	31.9'	N/A	31.9'	31.9'	Remove Trees
16	Trees	231.6	33.8'	N/A	33.8'	33.8'	Remove Trees
17	Trees	208.2	1'	N/A	1'	1'	Remove Trees
18	Trees	228.5	19'	N/A	19'	19'	Remove Trees
19	Trees	280.9	N/A	N/A	67.7'	67.7'	Remove Trees
20	Trees	272.8	36.9'	N/A	36.9'	N/A	Remove Trees
21	Trees	274.7	18.2'	N/A	18.2'	18.2'	Remove Trees
-	-	-	-	-	-	-	-

GENERAL NOTES:

1. Obstructions, clearances, and locations are calculated from ultimate runway end elevations and ultimate approach surfaces, unless otherwise noted. Road obstructions reflect a safety clearance of 10' for dirt roads or private roads, 15' for noninterstate roads, 17' for interstate roads, and 23' for railroad.
2. Depiction of features and objects within the primary, transitional, and horizontal Part 77 surfaces, is illustrated on the AIRPORT AIRSPACE DRAWING.
3. Airport Design Advisory Circular No. 150/5300-13A Chg 1, dated 2/26/2014.

COMPOSITE TOPOGRAPHIC



8 Significant Objects
12 Significant Objects Penetrate Surfaces

NORTH

Magnetic Declination
15.93° East (November 2018)
Annual Rate of Change 0.15° West

0 200 400 600
HORIZONTAL SCALE IN FEET

0 20 40 60
VERTICAL SCALE IN FEET

NO.	REVISIONS	DATE	BY	APP'D.
1	-	—	—	—
2	-	-	-	—

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FRIDAY HARBOR AIRPORT

INNER PORTION OF RUNWAY 16 APPROACH SURFACE DRAWING

Friday Harbor, Washington

PLANNED BY: Patrick C. Taylor
DETAILED BY: Larry D. Johnson
APPROVED BY: Mike W. Dmyterko

MAY 5, 2020 SHEET 6 OF 13

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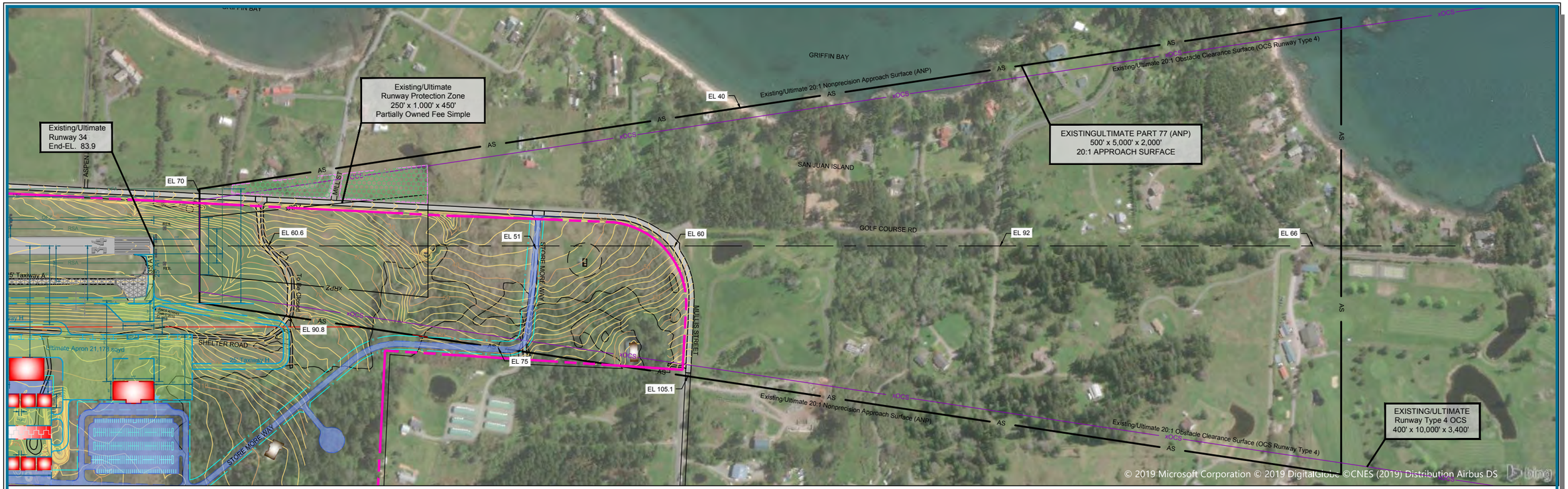

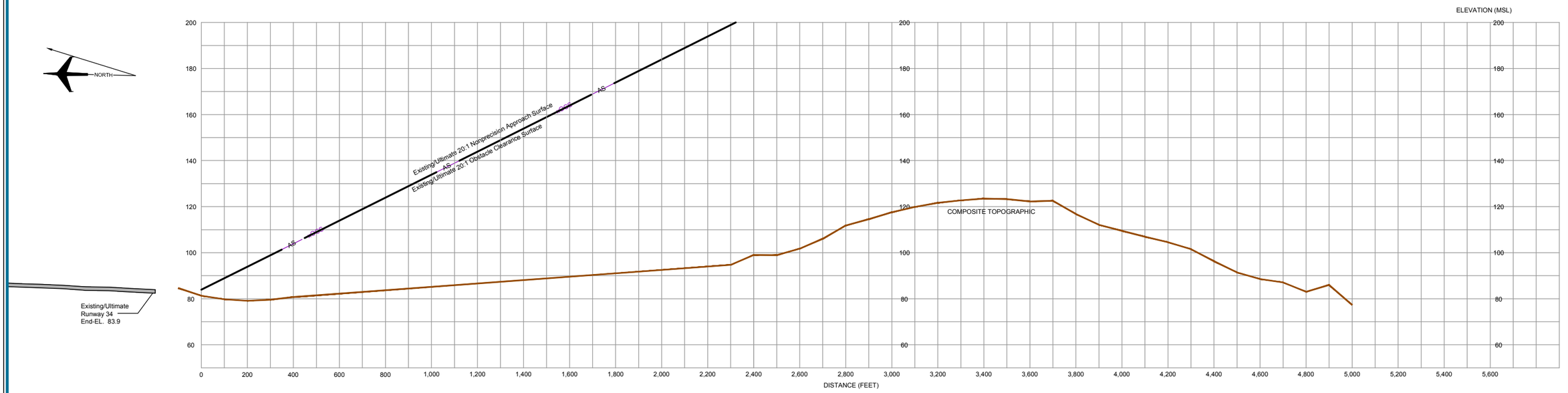

Date of Survey: 4/7/2016

OBSTRUCTION TABLE

No.	Object Name	Elevation TOP MSL	Existing 20:1 Approach Penetration	Existing 20:1 OCS Penetration	Ultimate 20:1 Approach Penetration	Ultimate 20:1 OCS Penetration	Remediation
	None						

GENERAL NOTES:

1. Obstructions, clearances, and locations are calculated from ultimate runway end elevations and ultimate approach surfaces, unless otherwise noted. Road obstructions reflect a safety clearance of 10' for dirt roads or private roads, 15' for noninterstate roads, 17' for interstate roads, and 23' for railroad.
2. Depiction of features and objects within the primary, transitional, and horizontal Part 77 surfaces, is illustrated on the AIRPORT AIRSPACE DRAWING.
3. Airport Design Advisory Circular No. 150/5300-13A Chg 1, dated 2/26/2014.

Magnetic Declination
15.93° East (November 2018)
Annual Rate of Change 0.15° West

HORIZONTAL SCALE IN FEET

VERTICAL SCALE IN FEET

NO.	REVISIONS	DATE	BY	APP'D.
1	-	—	—	—
2	-	-	-	—

"THE PREPARATION OF THESE DOCUMENTS WAS FINANCED IN PART THROUGH A GRANT FROM THE FEDERAL AVIATION ADMINISTRATION AS PROVIDED UNDER SECTION 505 OF THE AIRPORT AND AIRWAY IMPROVEMENT ACT OF 1982, AS AMENDED. THE CONTENTS DO NOT NECESSARILY REFLECT THE OFFICIAL VIEWS OR POLICY OF THE FAA. ACCEPTANCE OF THESE DOCUMENTS BY THE FAA DOES NOT IN ANY WAY CONSTITUTE A COMMITMENT ON THE PART OF THE UNITED STATES TO PARTICIPATE IN ANY DEVELOPMENT DEPICTED HEREIN NOR DOES IT INDICATE THAT THE PROPOSED DEVELOPMENT IS ENVIRONMENTALLY ACCEPTABLE IN ACCORDANCE WITH APPROPRIATE PUBLIC LAWS."

FRIDAY HARBOR AIRPORT

INNER PORTION OF RUNWAY 34 APPROACH SURFACE DRAWING

Friday Harbor, Washington

PLANNED BY: Patrick C. Taylor
DETAILED BY: Larry D. Johnson
APPROVED BY: Mike W. Dmyterko

MAY 5, 2020 | SHEET 7 OF 13

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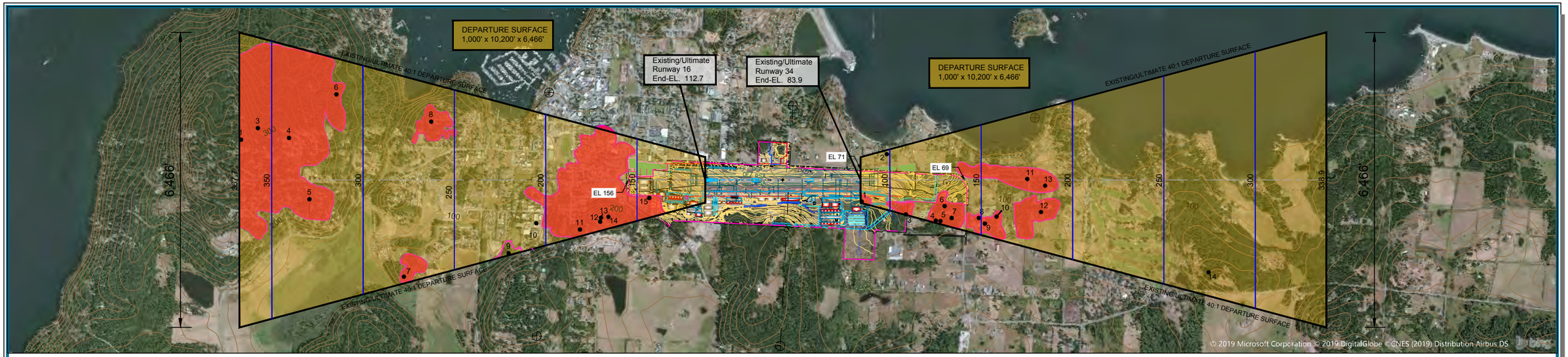

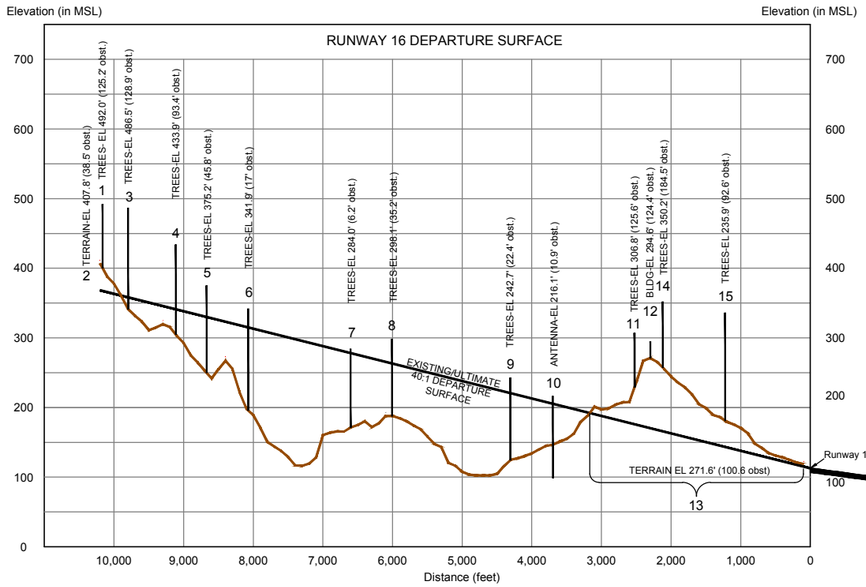

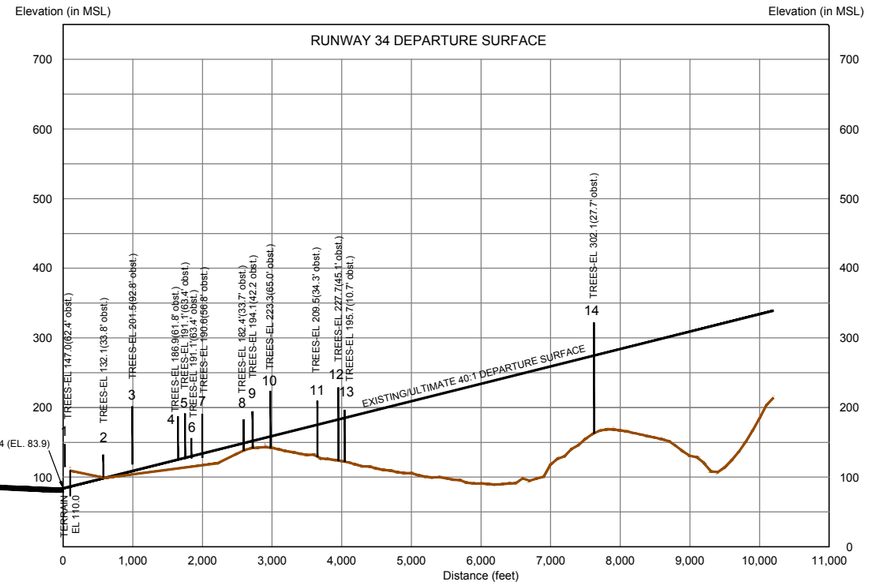

RWY 16 EXISTING/ULTIMATE DEPARTURE OBSTRUCTION TABLE

No.	Description	Top Elevation (msl)	Object Penetration	Proposed Disposition
1	TREES	492.0'	125.2'	TRIM OR REMOVE ALL TREES
2	TERRAIN	407.8'	38.5'	ASSESS DEPARTURE AREA; MAINTAIN/UPDATE OBSTACLE DEPARTURE PROCEDURE
3	TREES	486.5'	128.9'	TRIM OR REMOVE ALL TREES
4	TREES	433.9'	93.4'	TRIM OR REMOVE ALL TREES
5	TREES	375.2'	45.8'	TRIM OR REMOVE ALL TREES
6	TREES	341.9	17.0'	TRIM OR REMOVE ALL TREES
7	TREES	284.0	6.2'	TRIM OR REMOVE ALL TREES
8	TREES	298.1'	35.2'	TRIM OR REMOVE ALL TREES
9	TREES	242.7'	22.4'	TRIM OR REMOVE ALL TREES
10	ANTENNA	216.1'	10.9'	ADD OR MAINTAIN OBSTRUCTION LIGHT
11	TREES	306.8'	125.6'	TRIM OR REMOVE ALL TREES
12	BUILDING	294.6'	124.4'	ADD OR MAINTAIN OBSTRUCTION LIGHT
13	TERRAIN	271.6	100.8'	ASSESS DEPARTURE AREA; MAINTAIN/UPDATE OBSTACLE DEPARTURE PROCEDURE
14	TREES	350.2	184.5	TRIM OR REMOVE ALL TREES
15	TREES	235.9	92.6'	TRIM OR REMOVE ALL TREES

RWY 34 EXISTING/ULTIMATE DEPARTURE OBSTRUCTION TABLE

No.	Description	Top Elevation (msl)	Object Penetration	Proposed Disposition
1	TREES	147.0'	62.4'	TRIM OR REMOVE ALL TREES
2	TREES	132.1'	33.8'	TRIM OR REMOVE ALL TREES
3	TREES	201.5'	92.8'	TRIM OR REMOVE ALL TREES
4	TREES	186.9'	61.8'	TRIM OR REMOVE ALL TREES
5	TREES	191.1'	63.4'	TRIM OR REMOVE ALL TREES
6	TREES	155.8'	25.9'	TRIM OR REMOVE ALL TREES
7	TREES	190.6'	56.8'	TRIM OR REMOVE ALL TREES
8	TREES	182.4'	33.7'	TRIM OR REMOVE ALL TREES
9	TREES	194.1	42.2'	TRIM OR REMOVE ALL TREES
10	TREES	223.3'	65.0'	TRIM OR REMOVE ALL TREES
11	TREES	209.5'	34.3'	TRIM OR REMOVE ALL TREES
12	TREES	227.7'	45.1'	TRIM OR REMOVE ALL TREES
13	TREES	195.7'	10.7'	TRIM OR REMOVE ALL TREES
14	TREES	302.1	27.7'	TRIM OR REMOVE ALL TREES

Date of Survey: 4/7/2016

LEGEND

OBSTRUCTION AREA

NORTH

Magnetic Declination
15.93° East (November 2018)
Annual Rate of Change 0.15° West

HORIZONTAL SCALE IN FEET (0, 1000, 2000, 3000)

VERTICAL SCALE IN FEET (0, 100, 200, 300)

GENERAL NOTES:

1. Depiction of features and objects, including related elevations and clearances, within the runway protection zones are depicted on the INNER PORTION OF RUNWAY APPROACH SURFACE DRAWINGS.
2. NAD83 for all Horizontal Datum and NAVD88 Datum was used for all vertical Datum.
3. Shape file (Data Table) list objects regardless of whether or not they are obstructions, to enhance clarity the Obstruction Tables list obstructions.
4. Some objects with clearance over fifty feet AGL are not detailed.
5. Objects within groupings represent tallest obstruction in that area.

NO.	REVISIONS	DATE	BY	APP'D.
2	-	—	—	—
1	-	-	-	—

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FRIDAY HARBOR AIRPORT

RUNWAY 16-34
DEPARTURE SURFACE DRAWING

Friday Harbor, Washington

PLANNED BY: Patrick C. Taylor
DETAILED BY: Larry D. Johnson
APPROVED BY: Mike W. Dmyterko

MAY 5, 2020 | SHEET 8 OF 13

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Date of Survey: 4/7/2016

EXISTING BUILDINGS/FACILITIES

NO.	Facility Name	Elevation Top (MSL)	OL Lighted
1	MAIN TERMINAL BUILDING (TBR)	143	
2	ADMINISTRATION BUILDING/ATCT	144	
3	FUEL FACILITY (To Be Relocated)	134	
4	AIRPORT ROTATING BEACON (TBR)	157.3	OL
5	DEICING FACILITY/WASH RACK	116.8	
6	HELIPAD FOR EMS (To Be Relocated)	116	
8	CAFE (To Be Relocated)	146	
9	CABINET SHOP	165	
10	BUILDING	160	
12	SKAGIT VALLEY COLLEGE	186	
13	SAN JUAN COUNTY FIRE DEPARTMENT	120	
14	BUILDING	162	
21	BUILDING - WELCOME CENTER (V)	130	
25	T-SHADE (A) (To Be Removed)	149.1	
26	T-SHADE (B)	146.4	
27	T-HANGAR (C) (To Be Removed)	142.7	
28	T-HANGAR (D1) (Redevelop outside TOFA)	134.5	
29	T-HANGAR (D2)	134.6	
30	T-HANGAR (E)	131.9	
31	T-HANGAR (F)	132.3	
32	T-HANGAR (G)	133.4	
33	BOX HANGAR (H)	136	
34	BOX HANGAR (J)	155.9	
35	T-HANGAR (K)	147.5	
36	T-HANGAR (L1)	157	
37	T-HANGAR (L2)	157	
38	CONVENTIONAL HANGAR (M)	157.3	OL
39	BOX HANGAR (N)	158.6	
40	CONVENTIONAL HANGAR (O)	157	
41	CONVENTIONAL HANGAR (P)	151	
42	CONVENTIONAL HANGAR (Q)	150.8	
43	BOX HANGAR (R)	156.8	
44	BOX HANGAR (T)	158	
45	CONVENTIONAL HANGAR (S1)	119.5	
46	CONVENTIONAL HANGAR (S2)	116.5	
47	CONVENTIONAL HANGAR (S3)	115.1	
48	BOX HANGAR (W)	157	OL
49	STORAGE BARN (U)	151.4	

ULTIMATE BUILDINGS/FACILITIES

NO.	DESCRIPTION	Elevation AGL (MSL)
67	HANGAR (56' x 60')	25'
68	HANGAR (56' x 60')	25'
69	HANGAR (56' x 60')	25'
70	HANGAR (56' x 60')	25'
71	HANGAR (56' x 60')	25'
72	HANGAR (120' x 80')	35'
73	HANGAR (60' x 60')	25'
74	HANGAR (60' x 60')	25'
75	HANGAR (60' x 60')	25'
76	HANGAR (60' x 60')	25'
77	HANGAR (60' x 60')	25'
78	HANGAR (47' x 47')	25'
79	HANGAR (110' x 50')	35'
80	HANGAR (180' x 75')	35'
81	BOX HANGARS (8 units, 40' x 40')	25'

LEGEND

EXISTING	ULTIMATE	DESCRIPTION
	SAME	ABANDONED PAVEMENT (To Be Removed)
		AIRPORT PROPERTY LINE/FENCE
	SAME	AIRPORT REFERENCE POINT (ARP)
		AIRPORT ROTATING BEACON
	SAME	BUILDING ABANDONMENT (To Be Removed)
N/A		BUILDING
		NO-TAXI ISLAND
		PAVEMENT
	SAME	FENCING
xPAPI	SAME	NAVIGATIONAL AID INSTALLATION (PAPI-4)
	SAME	RUNWAY THRESHOLD LIGHTS and REIL
	SAME	SECTION CORNER
		WIND INDICATOR/WINDSOCK (WS)
112	SAME	TOPOGRAPHY (NAVD 88)
		HOLDING POSITION MARKING
	SAME	PARCELS
TSA	SAME	TAXIWAY SAFETY AREA (79')
TOFA	SAME	TAXIWAY OBJECT FREE AREA (131')
Extd OFA	SAME	EXTENDED OBJECT FREE AREA
OFZ	SAME	OBSTACLE FREE ZONE (OFZ)
RSA	SAME	RUNWAY SAFETY AREA (RSA)
OFA	SAME	RUNWAY OBJECT FREE AREA (OFA)
AS	uAS	PART 77 APPROACH SURFACE
	SAME	SURVEY MONUMENT (PACS/SACS)
	SAME	RUNWAY PROTECTION ZONE (RPZ)
BRL	SAME	BUILDING RESTRICTION LINE (BRL)
	SAME	ASOS
	SAME	EASEMENT
		TIE-DOWNS
		ROAD and PARKING

NORTH

Magnetic Declination
15.93° East (November 2018)
Annual Rate of Change 0.15° West

0 100 200
SCALE IN FEET

NO.	REVISIONS	DATE	BY	APP'D.
1	-	-	-	-
2	-	-	-	-

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FRIDAY HARBOR AIRPORT

TERMINAL AREA DRAWING I

Friday Harbor, Washington

PLANNED BY: Patrick C. Taylor
DETAILED BY: Larry D. Johnson
APPROVED BY: Mike W. Dmyterko

MAY 5, 2020 SHEET 9 OF 13

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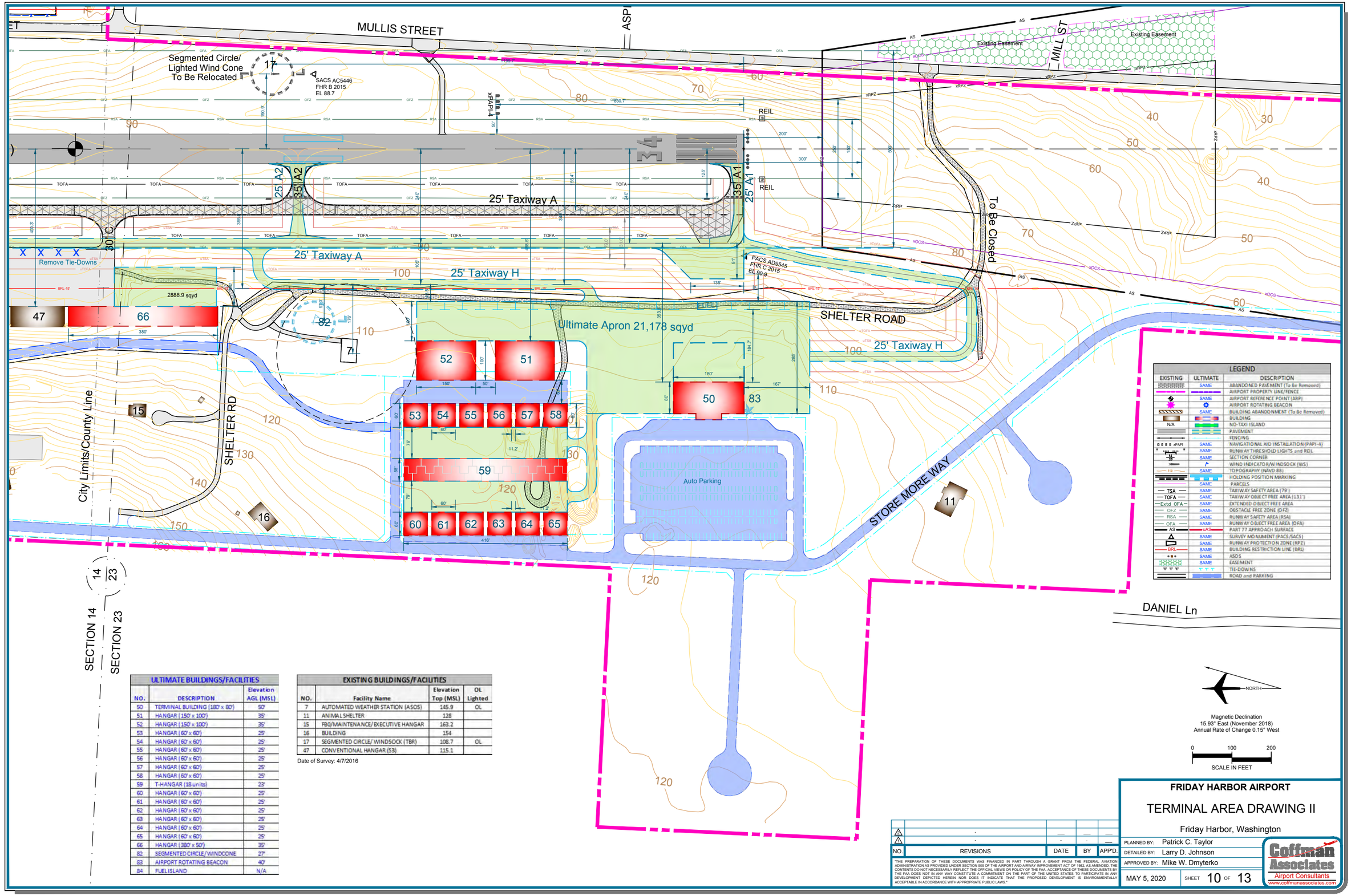

LEGEND		
EXISTING	ULTIMATE	DESCRIPTION
	SAME	ABANDONED PAVEMENT (To Be Removed)
		AIRPORT PROPERTY LINE/FENCE
	SAME	AIRPORT REFERENCE POINT (ARP)
		AIRPORT ROTATING BEACON
	SAME	BUILDING ABANDONMENT (To Be Removed)
		BUILDING
N/A		NO-TAXI ISLAND
		PAVEMENT
		FENCING
xPAPI	SAME	NAVIGATIONAL AID INSTALLATION (PAPI-4)
	SAME	RUNWAY THRESHOLD LIGHTS and REIL
	SAME	SECTION CORNER
		WIND INDICATOR/W/WINDSOCK (WS)
115	SAME	TOPOGRAPHY (NAVD 88)
		HOLDING POSITION MARKING
	SAME	PARCELS
TSA	SAME	TAXIWAY SAFETY AREA (79')
TOFA	SAME	TAXIWAY OBJECT FREE AREA (131')
Extd OFA	SAME	EXTENDED OBJECT FREE AREA
OFZ	SAME	OBSTACLE FREE ZONE (OFZ)
RSA	SAME	RUNWAY SAFETY AREA (RSA)
OFA	SAME	RUNWAY OBJECT FREE AREA (OFA)
AS	uAS	PART 77 APPROACH SURFACE
	SAME	SURVEY MONUMENT (PACS/SACS)
	SAME	RUNWAY PROTECTION ZONE (RPZ)
BRL	SAME	BUILDING RESTRICTION LINE (BRL)
	SAME	ASOS
	SAME	EASEMENT
T T T		TIE-DOWNS
		ROAD and PARKING

ULTIMATE BUILDINGS/FACILITIES

NO.	DESCRIPTION	Elevation AGL (MSL)
50	TERMINAL BUILDING (180' x 80')	50'
51	HANGAR (150' x 100')	35'
52	HANGAR (150' x 100')	35'
53	HANGAR (60' x 60')	25'
54	HANGAR (60' x 60')	25'
55	HANGAR (60' x 60')	25'
56	HANGAR (60' x 60')	25'
57	HANGAR (60' x 60')	25'
58	HANGAR (60' x 60')	25'
59	T-HANGAR (18 units)	23'
60	HANGAR (60' x 60')	25'
61	HANGAR (60' x 60')	25'
62	HANGAR (60' x 60')	25'
63	HANGAR (60' x 60')	25'
64	HANGAR (60' x 60')	25'
65	HANGAR (60' x 60')	25'
66	HANGAR (380' x 50')	35'
82	SEGMENTED CIRCLE/WINDCONE	27'
83	AIRPORT ROTATING BEACON	40'
84	FUEL ISLAND	N/A

EXISTING BUILDINGS/FACILITIES

NO.	Facility Name	Elevation Top (MSL)	OL Lighted
7	AUTOMATED WEATHER STATION (ASOS)	145.9	OL
11	ANIMAL SHELTER	128	
15	FBO/MAINTENANCE/EXECUTIVE HANGAR	163.2	
16	BUILDING	154	
17	SEGMENTED CIRCLE/ WINDSOCK (TBR)	108.7	OL
47	CONVENTIONAL HANGAR (53)	115.1	

Date of Survey: 4/7/2016

NO.	REVISIONS	DATE	BY	APP'D.
2	-	—	—	—
1	-	-	-	—

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FRIDAY HARBOR AIRPORT

TERMINAL AREA DRAWING II

Friday Harbor, Washington

PLANNED BY: Patrick C. Taylor
DETAILED BY: Larry D. Johnson
APPROVED BY: Mike W. Dmyterko

MAY 5, 2020 SHEET 10 OF 13

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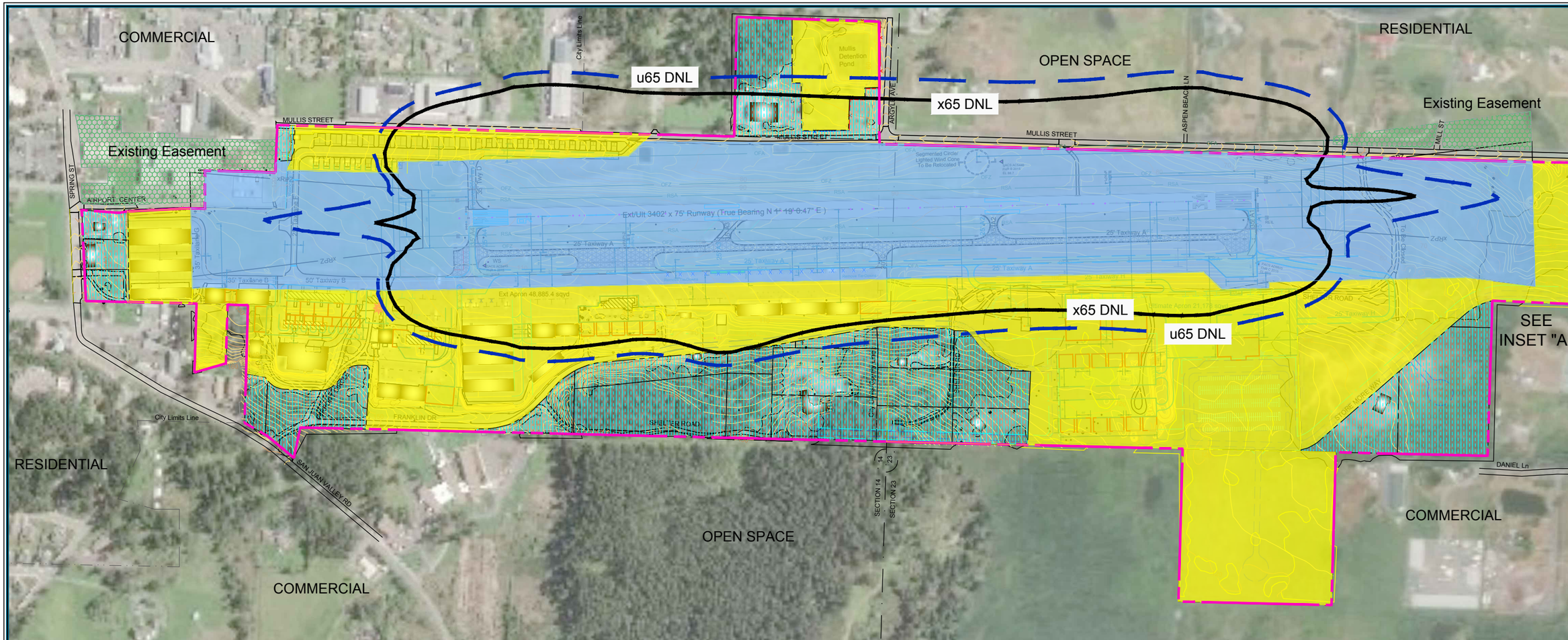

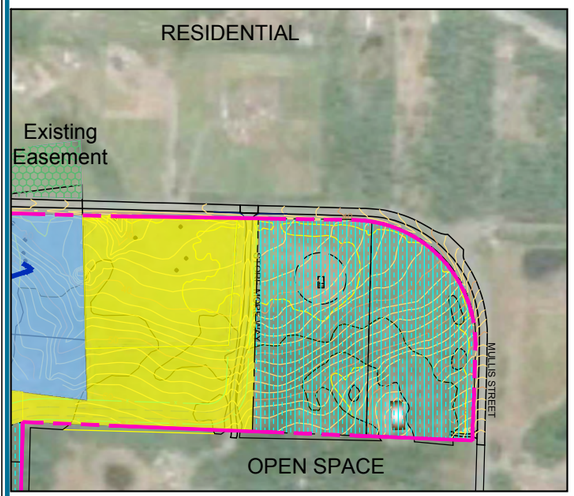

INSET 'A'

On-Airport Land Use Legend

- AIRPORT OPERATION (AO)
- GENERAL AVIATION (GA)
- REVENUE SUPPORT (RS) (Non-Aviation Related)
- EASEMENT

- EXISTING 2017 DNL-65
- ULTIMATE 2037 DNL-65

NORTH

Magnetic Declination
15.93° East (November 2018)
Annual Rate of Change 0.15° West

0 200 400 600
SCALE IN FEET

GENERAL NOTES:

1. Depiction of close in features and objects, including related elevations and clearances, within the 14 CFR Part 77 Approach Surface are depicted on the INNER PORTION OF THE APPROACH SURFACE DRAWINGS.
2. Details concerning terminal improvements are depicted on the TERMINAL AREA DRAWING.
3. Vertical Datum NAVD 88 and Horizontal Datum NAD 83.

NO.	REVISIONS	DATE	BY	APP'D.
2	-	—	—	—
1	-	-	-	—

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FRIDAY HARBOR AIRPORT

AIRPORT LAND USE DRAWING

Friday Harbor, Washington

PLANNED BY: Patrick C. Taylor
DETAILED BY: Larry D. Johnson
APPROVED BY: Mike W. Dmyterko

MAY 5, 2020 SHEET 11 OF 13

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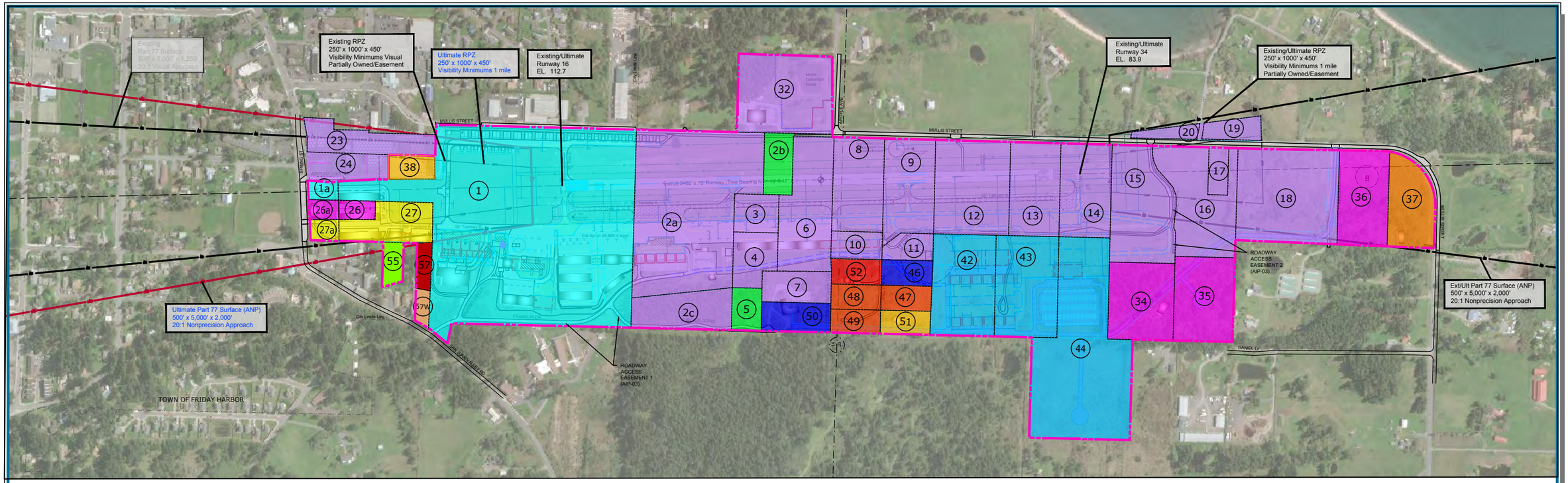

PROPERTY DATA

NO	Book/Page/Recording Info	Type	Grantor	Grantee	Acreage	AIP #	Date	Instrument
1	AF NO. 122668	FEE SIMPLE	Island Sky Ferries	Friday Harbor Airport	44.11	AIP-01	AUG 82	Warranty Deed
1a	AF NO. 122668	FEE SIMPLE	Island Sky Ferries	Friday Harbor Airport	0.05	AIP-01	AUG 82	Warranty Deed
2a	AF NO. 122668	FEE SIMPLE	Island Sky Ferries	Friday Harbor Airport	21.27	AIP-02 DONATION	DEC 82	Warranty Deed
2b	AF NO. 122668	FEE SIMPLE	Island Sky Ferries	Friday Harbor Airport	2.39	AIP-03 DONATION	DEC 82	Warranty Deed
2c	AF NO. 122668	FEE SIMPLE	Island Sky Ferries	Friday Harbor Airport	3.56	AIP-02 DONATION	DEC 82	Warranty Deed
3	V.2 of short plats, PG. 63	FEE SIMPLE	D. Corliss	Friday Harbor Airport	2.01	AIP-02	DEC 84	Warranty Deed
4	V.2 of short plats, PG. 63	FEE SIMPLE	D. Corliss	Friday Harbor Airport	2.04	AIP-02	DEC 84	Warranty Deed
5	V.2 of short plats, PG. 63	FEE SIMPLE	R. Corliss	Friday Harbor Airport	1.24	AIP-03	NOV 84	Warranty Deed
6	V.2 of short plats, PG. 63	FEE SIMPLE	Miner	Friday Harbor Airport	5.44	AIP-02	AUG 84	Warranty Deed
7	AF NO. 105190	FEE SIMPLE	Janovich	Friday Harbor Airport	2.51	AIP-02	DEC 84	Warranty Deed
8	AF NO. 82937	FEE SIMPLE	Addison	Friday Harbor Airport	4.85	AIP-02	SEP 84	Warranty Deed
9	AF NO. 94847	FEE SIMPLE	Brown	Friday Harbor Airport	1.25	AIP-02	NOV 84	Warranty Deed
10	AF NO. 109611	FEE SIMPLE	Malloy	Friday Harbor Airport	4.85	AIP-02	OCT 84	Warranty Deed
11	V.1 of a short plats, P.G. 78	FEE SIMPLE	Sollinger	Friday Harbor Airport	1.25	AIP-02	NOV 84	Warranty Deed
12	AF NO. 118289	FEE SIMPLE	Linge	Friday Harbor Airport	7.25	AIP-02	OCT 84	Warranty Deed
13	AF NO. 98775	FEE SIMPLE	Larson	Friday Harbor Airport	4.77	AIP-02	SEP 84	Warranty Deed
14	AF NO. 53559	FEE SIMPLE	Nash, G.	Friday Harbor Airport	4.85	AIP-02	SEP 84	Warranty Deed
15	V.4 of short plats, PG. 39	FEE SIMPLE	Nash, G.	Friday Harbor Airport	6.97	AIP-02	DEC 84	Warranty Deed
16	V.4 of short plats, PG. 39	FEE SIMPLE	Nash, G.	Friday Harbor Airport	7.06	AIP-02	DEC 84	Warranty Deed
17	AF NO. 109395	FEE SIMPLE	Figlewicz	Friday Harbor Airport	1	AIP-02	FEB 85	Warranty Deed
18	AF NO. 101004	FEE SIMPLE	Rouleau	Friday Harbor Airport	9.24	AIP-02	DEC 86	Warranty Deed
19	AF NO. 101001	AVIGATION EASEMENT	Rouleau	Friday Harbor Airport	1.79	AIP-02	DEC 86	Warranty Deed
20	AF NO. 113688	AVIGATION EASEMENT	Gubleman/Ryan	Friday Harbor Airport	3.55	AIP-02	OCT 85	Warranty Deed
23	AF NO. 100267	AVIGATION EASEMENT	Pope Lumber	Friday Harbor Airport	3.48	AIP-02	JUL 85	Warranty Deed
24	AF NO. 128051	AVIGATION EASEMENT	Mark & Pak/Howard	Friday Harbor Airport	2.49	AIP-02	JUL 85	Warranty Deed
26	AF NO. 156461	FEE SIMPLE	Charlton	Friday Harbor Airport	1	AIP-06	MAR 89	Warranty Deed
26a	AF NO. 156461	FEE SIMPLE	Charlton	Friday Harbor Airport	0.5	AIP-06	MAR 89	Warranty Deed
27	AF NO. 84443	FEE SIMPLE	Wotton	Friday Harbor Airport	3.76	AIP-04	DEC 86	Warranty Deed
27a	AF NO. 84443	FEE SIMPLE	Wotton	Friday Harbor Airport	0.5	AIP-04	DEC 86	Warranty Deed
32	AF NO. 133053	FEE SIMPLE	Workman	Friday Harbor Airport	7.58	AIP-02	NOV 84	Warranty Deed
34	V.4 of short plats, PG. 39	FEE SIMPLE	Nash	Friday Harbor Airport	5	AIP-06	AUG 89	Warranty Deed
35	V.4 of short plats, PG. 39	FEE SIMPLE	Nash	Friday Harbor Airport	5	AIP-06	AUG 89	Warranty Deed
36	AF NO. 0191483	FEE SIMPLE	Fanjul, K	Friday Harbor Airport	4.7	AIP-06	DEC 93	Warranty Deed
37	AF NO. 132329	FEE SIMPLE	Fanjul, J	Friday Harbor Airport	4.44	AIP-11	DEC 93	Warranty Deed
38	AF NO. 0111002	FEE SIMPLE	Mark & Pak/Howard	Friday Harbor Airport	1	AIP-18	DEC 01	Warranty Deed
42	AF NO. 115211	FEE SIMPLE	Stephens	Friday Harbor Airport	6.25	AIP-07	DEC 93	Warranty Deed
43	AF NO. 115212	FEE SIMPLE	Rimkeit	Friday Harbor Airport	6.25	AIP-07	DEC 94	Warranty Deed
44	AF NO. 126209	FEE SIMPLE	Mager	Friday Harbor Airport	15.05	AIP-07	DEC 93	Warranty Deed
46	AF NO. 0184660	FEE SIMPLE	Fines	Friday Harbor Airport	1.25	AIP-09	DEC 93	Warranty Deed
47	AF NO. 0430008	FEE SIMPLE	Brekke	Friday Harbor Airport	1.25	AIP-15	DEC 99	Warranty Deed
48	AF NO. 0128002	FEE SIMPLE	Silverman	Friday Harbor Airport	1.25	AIP-15	DEC 00	Warranty Deed
49	AF NO. 0422018	FEE SIMPLE	Finke	Friday Harbor Airport	1.25	AIP-15	DEC 99	Warranty Deed
50	AF NO. 0184660	FEE SIMPLE	Riley	Friday Harbor Airport	2.02	AIP-09	DEC 93	Warranty Deed
51	AF NO. 0111003	FEE SIMPLE	Lumkes	Friday Harbor Airport	1.25	AIP-18	DEC 01	Warranty Deed
52	AF NO. 0410019	FEE SIMPLE	Wutzl	Friday Harbor Airport	1.25	AIP-16	DEC 00	Warranty Deed
55	AF NO. 0126009	FEE SIMPLE	Bentzen	Friday Harbor Airport	0.6	AIP-21	2008	Boundary Adjustment
57	AF NO. 0612034	FEE SIMPLE	Boothman	Friday Harbor Airport	0.57	AIP-22	2008	Boundary Adjustment
57W	AF NO. 0430008	FEE SIMPLE	Boothman	Friday Harbor Airport	0.43	AIP-23	2009	Warranty Deed

GENERAL NOTES:

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3. Vertical Datum NAVD 88 and Horizontal Datum NAD 83.

NORTH

Magnetic Declination
15.93° East (November 2018)
Annual Rate of Change 0.15° West

0 300 600 900
SCALE IN FEET

FOR APPROVAL BY

Airport Manager DATE:

NO.	REVISIONS	DATE	BY	APP'D.
2	-	—	—	—
1	-	-	-	—

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FRIDAY HARBOR AIRPORT

EXHIBIT A
AIRPORT PROPERTY MAP

Friday Harbor, Washington

PLANNED BY: Patrick C. Taylor
DETAILED BY: Larry D. Johnson
APPROVED BY: Mike W. Dmyterko

MAY 5, 2020 SHEET 12 OF 13

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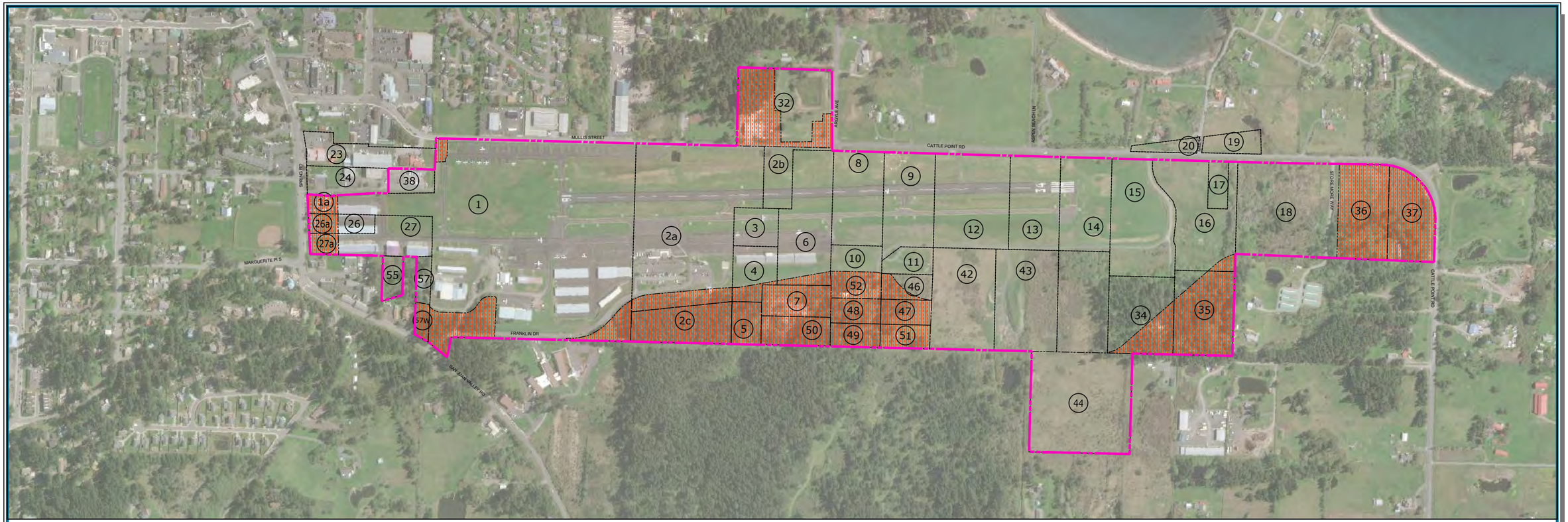

Current Exhibit A Parcel No.	Obligating Federal Agreement	Acres	Description	Current Use	How Acquired	Justification
1a	AIP-01	0.5	M&W Auto Sales/Rental	Leased	AIP Grant - Land Acquisition, not otherwise described.	Disconnected from the airfield and currently under non-aviation lease.
26a	AIP-06	0.5	Spring Street - 2 Lots	North lot - Vacant. South lot Leased to M&W Auto		
27a	AIP-04	0.5	Spring Street - 1 Lot	Vacant	AIP Grant - Land Acquisition for clear zone and approach protection.	
32	AIP-02	7.59 Total ± 3.86 For Release	Mullis Fire Station & Vacant Portions	Fire station lease. Remaining portion vacant.	AIP Grant - Land Acquisition for clear zone and approach protection.	Separated from air Operations Area (AOA) by Mullis Street. Fire Station provides services to airport.
1	AIP-01	44.11 Total ± 1.00 For Release	Franklin Drive	Vacant	AIP Grant - Land Acquisition, not otherwise described.	Grade issues prohibit aircraft access. Not feasible for aeronautical use. Existing and planned access roads separate AOA from these areas.
2a	AIP-02	21.27 Total ± 1.48 For Release	Franklin Drive	Vacant	AIP Grant - Land Acquisition for airport development and clear zones.	
2c	AIP-02	3.56	Weber Way	Vacant		
4	AIP-02	2.04 Total ± 0.52 For Release	Steep terrain	Vacant		
5	AIP-03	1.24	Weber Way	Vacant	AIP Grant - Land Acquisition for airport development.	
6	AIP-02	5.44 Total ± 0.49 For Release	Steep terrain	Vacant	AIP Grant - Land Acquisition for airport development and clear zones.	
7	AIP-02	2.51	Skagit Valley College	Leased		
50	AIP-09	2.02	Skagit Valley College	Leased	AIP Grant - Land Acquisition for airport development.	
46	AIP-09	1.25 Total ± 0.56 For Release	Shelter Road	Vacant		
47	AIP-15	1.25	Shelter Road	Vacant	AIP Grant - Land Acquisition, not otherwise described.	
48	AIP-15	1.25	Shelter Road	Vacant		
49	AIP-15	1.25	Shelter Road	Vacant		
51	AIP-18	1.25	Shelter Road	Vacant		
52	AIP-16	1.25	Shelter Road	Vacant (Old structure to be demolished)		
34	AIP-06	5.00 Total ± 1.16 For Release	Animal Shelter	Leased	AIP Grant - Land Acquisition, not otherwise described.	2019 Master Plan indicates this parcel will not be needed for aeronautical purposes. Planned new terminal area and access road will separate this parcel from AOA. Parcel use likely constrained by existing wetlands.
35	AIP-06	5.00 Total ± 4.49 For Release	Steep terrain	Vacant	AIP Grant - Land Acquisition for airport development and clear zones.	
16	AIP-02	5.00 Total ± 4.49 For Release	Storemore Way	Vacant		
1	AIP-01	5.00 Total ± 4.49 For Release	Vehicle Parking	Leased	AIP Grant - Land Acquisition, not otherwise described.	2019 Master Plan indicates this parcel will not be needed for aeronautical purposes. Area is separate from AOA by existing fence and is outside the TOFA.
57W	AIR-23	0.43	Boothman (West)	Vacant	AIP Grant - Trade for Parcel 56	Grade issues and high cost to remove existing rock prohibit aircraft access. AOA access constrained by existing hangars.
1	AIR-01	44.11 Total ± 2.24 For Release	Steep terrain	Vacant	AIP Grant - Land Acquisition, not otherwise described.	
36	AIP-06	4.7	Storemore Way	Vacant		Grade issues and distance to AOA prohibit aircraft access. Planned terminal area access road will separate area from AOA.
37	AIP-11	4.44	Storemore Way	Vacant (small airport storage building at site)		

GENERAL NOTES:
Purpose: To released certain airport parcels (or portions thereof) from aeronautical use obligation. Port to maintain control/ownership.
Reason: To generate revenue from airport land that cannot/will not be used for future aviation purposes.
Benefit: To allow the Port to have the financial means to support/match capital projects associated with meeting ARC B-II design standards.
Expected Use: Compatible non-aviation development such as retail, commercial, light industrial, and light manufacturing. All future leases at fair market value.

NORTH

Magnetic Declination
15.93° East (November 2018)
Annual Rate of Change 0.15° West

0 300 600 900
SCALE IN FEET

FOR APPROVAL BY

Airport Manager DATE:

NO.	REVISIONS	DATE	BY	APP'D.
2	-	—	—	—
1	-	-	-	—

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FRIDAY HARBOR AIRPORT

LAND RELEASE MAP

Friday Harbor, Washington

PLANNED BY: Patrick C. Taylor
DETAILED BY: Larry D. Johnson
APPROVED BY: Mike W. Dmyterko

MAY 5, 2020 SHEET 13 OF 13

Coffman Associates
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