FINAL ENVIRONMENTAL ASSESSMENT

Environmental Assessment to Comply with FAA Design Standards, Meet Runway Length Requirements, Improve All-Weather Reliability, and Terminal Improvements

Pullman-Moscow Regional Airport

APPENDIX VOLUME I

November 2014

Mead&Hunt

In Partnership with:

JUB Engineers, Inc.
TO Engineers, Inc.
Epic Land Solutions, Inc.
GeoEngineers, Inc.
Transect Archaeology

Appendix A
Phase II Airport Master Plan Report

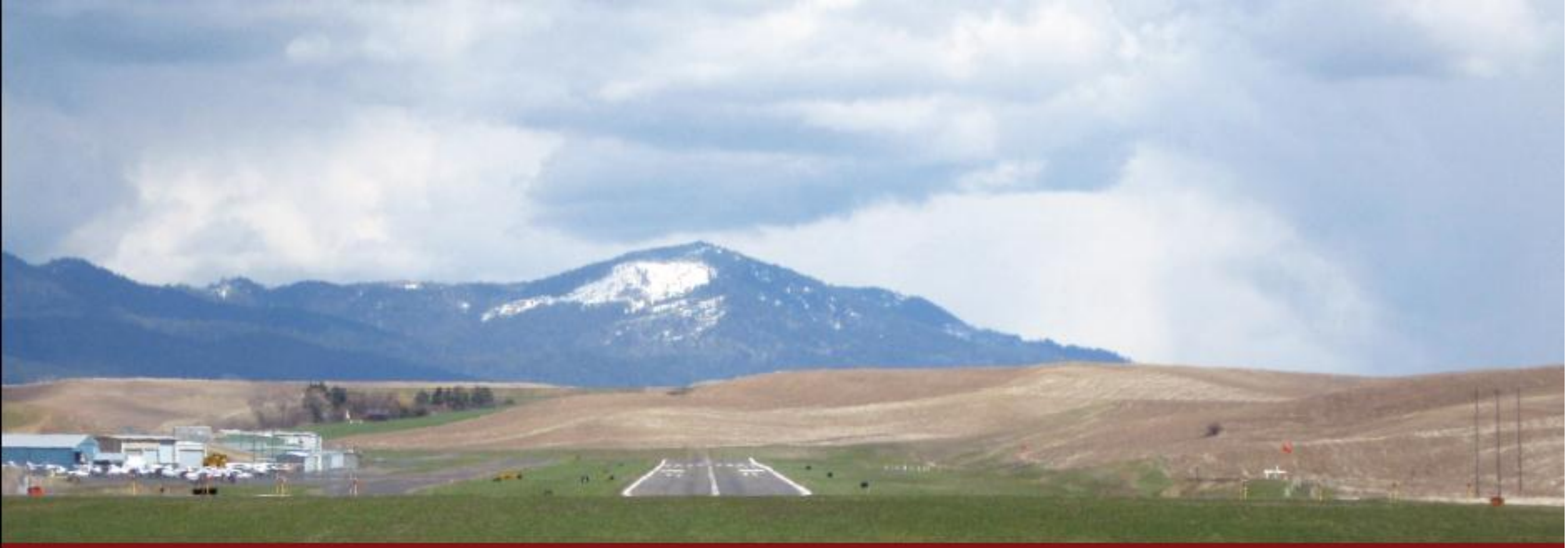
FINAL ENVIRONMENTAL ASSESSMENT

PULLMAN-MOSCOW REGIONAL AIRPORT

MASTER PLAN, PHASE II
VOLUME I: REPORT

Fly PUW

Mead&Hunt



Pullman-Moscow Regional Airport

Airport Master Plan – Phase II

Prepared for
Pullman – Moscow Regional Airport

Prepared by

Mead & Hunt

www.meadhunt.com

"The preparation of this document may have been supported, in part, through the Airport Improvement Program financial assistance from the Federal Aviation Administration (Project Number 3-41-0055-016 and 3-41-055-017) as provided under Title 49 U.S.C., Section 47104. The contents do not necessarily reflect the official views or policy of the FAA. Acceptance of this report by the FAA does not in any way constitute a commitment on the part of the United States to participate in any development depicted therein nor does it indicate that the proposed development is environmentally acceptable in accordance with appropriate public laws."

PULLMAN-MOSCOW REGIONAL AIRPORT

MASTER PLAN EXECUTIVE SUMMARY

Fly PUW

BACKGROUND

Pullman-Moscow Regional Airport (PUW) and the Federal Aviation Administration (FAA) have long-recognized the nonstandard conditions on the airfield, resulting from the introduction of larger commercial aircraft serving the Airport. To address the situation, a temporary “Modification to Design Standards” from the FAA was granted in 2006. This agreement permits commercial operations to continue, provided the Airport works toward a long-term solution to meet the required design standards.

This Master Plan is the second of a two-phased project and follows the completion of the Phase I Master Plan in 2007. Phase I evaluated more than 20 on-Airport airfield alternatives that would meet FAA design standards for C-III aircraft. The preferred alternative realigns the Airport’s only runway, requiring the construction of a new runway and parallel taxiway.

The Phase II Master Plan’s primary focus is to determine whether the project can be built, by identifying and providing solutions to mitigate the runway realignment’s challenges. The Phase II analysis revealed the preferred runway realignment has no fatal flaws that would prevent construction. This project is currently a high priority for the FAA Northwest Region and is scheduled for funding in 2015.

CHALLENGES

The Phase II Master Plan identified multiple design challenges associated with the realignment of the airport’s only runway. PUW is located in the rolling hills of the Palouse region where large areas of level land are rare, and the area around the airfield is no exception. The preferred alternative for the runway realignment will require the removal of more than 5 million cubic yards of earth, enough to fill Washington State University’s Martin Stadium 16 times or the University of Idaho’s Kibbie Dome 36 times. Other design challenges included:

- Property impacts to Washington State University’s agricultural research facilities
- Realignment of the future State Highway 276 corridor
- Relocation of power lines serving the community
- Relocation of Airport Creek
- Minimizing impacts to wetlands
- Construction phasing to reduce airport closures

PREFERRED DEVELOPMENT PROGRAM

The Phase I Master Plan, which established a preferred runway alignment at the existing Airport site, was completed in 2007. The goal of the planning exercise was to achieve both compliance with C-III design standards and lower approach procedure minimums to improve reliability during the winter season. The preferred runway alignment rotates the existing runway and taxiway system approximately 10 degrees counterclockwise and shifts the new runway south to allow for future landside development on Airport property.

PASSENGER ENPLANEMENTS

Since 2007, passenger enplanements at PUW have grown by a compounded annual growth rate of 14 percent. They exceeded the FAA Terminal Area Forecast by 4.8 percent in 2010.

All of the Phase II airside alternatives use the preferred runway alternative from Phase I. From this starting point, four airside alternatives were developed, each meeting FAA's airfield design standards to the maximum extent feasible.

The selected alternative provides for a 7,100 foot realigned runway, the required near-term runway length identified in the facility requirements analysis. This is the runway length approved for near-term construction by the FAA, based on the Airport's current activity and fleet mix.

Landside features considered included:

- Passenger terminal building
- Vehicle access, circulation, parking and rental car facilities
- Commercial aircraft parking apron
- Aircraft rescue and firefighting facilities
- General aviation and fixed based operator facilities
- Air cargo facilities
- Airport business park

PROJECT BENEFITS

The runway realignment is a crucial turning point for the Airport. It makes sense for many reasons, including the economic and transportation benefits it provides to the community. On the other hand, the "do nothing" scenario will permanently limit the services and facilities the Airport can provide.

ADVANTAGES OF A POSITIVE RESOLUTION:

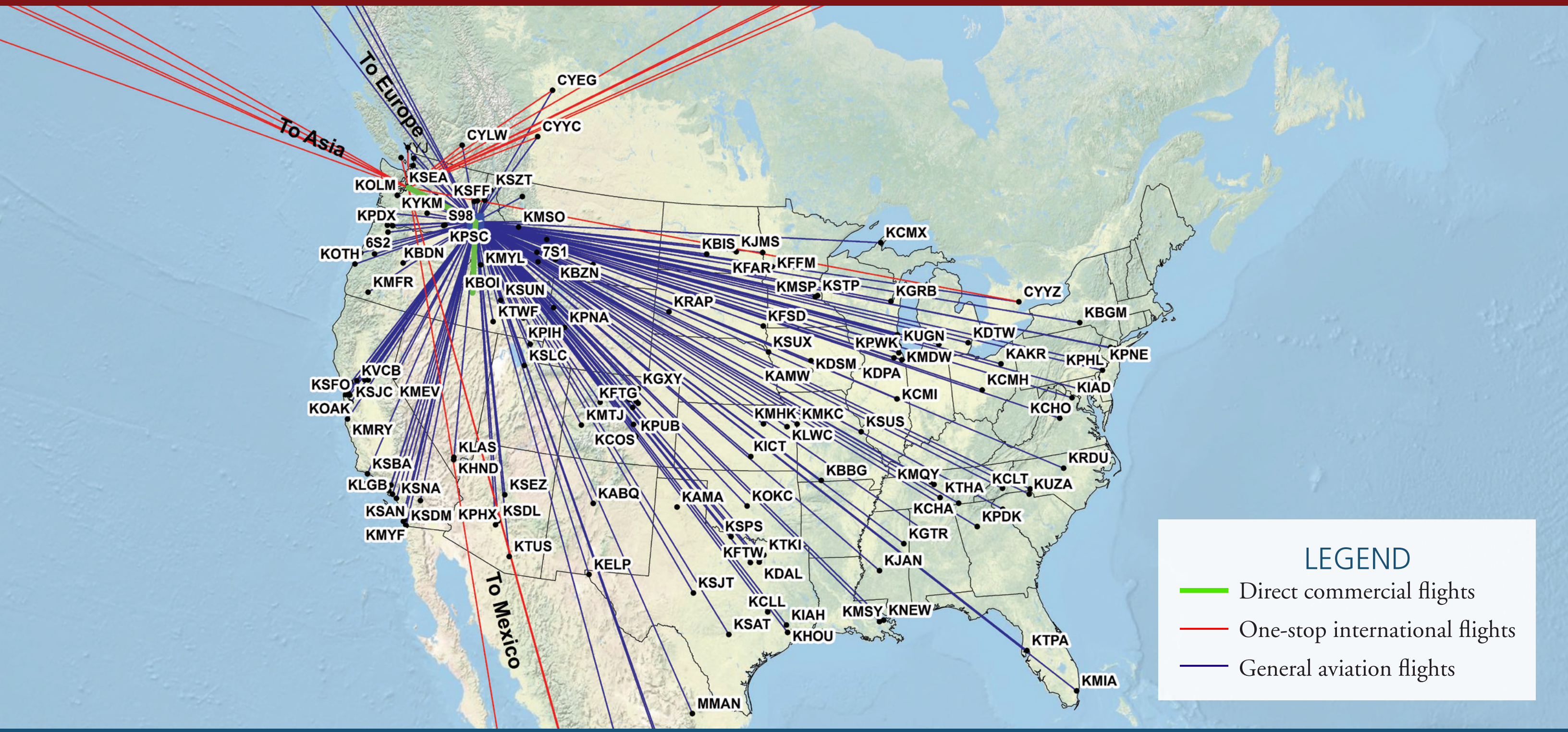
- Airfield meets FAA design standards for C-III aircraft
- Continued commercial air service
- Improved reliability of commercial air service
- Opportunity for future, expanded commercial air service
- Opportunity for additional charter flights
- Improved service, facilities and reliability to support the regional economy
- Additional land available for development at the Airport
- Opportunity for expanded general aviation facilities
- Opportunity for longer runway in the future
- Continuation of existing commercial air service

IMPACTS OF A "DO NOTHING" SCENARIO

- Loss of current commercial air service
- Permanent operating restrictions that restrict Airport operations
- No opportunity to extend runway length
- Limited improvements in all-weather reliability
- Limited landside development potential

TRANSPORTATION GATEWAY TO THE WORLD

PUW is a transportation gateway to the world. The lines on the map show actual flights that happened in 2010. The scheduled, commercial air service allows travelers to connect to national destinations. Commercial flights are shown with the green lines. From Seattle, there are international connections to Mexico, Europe and Asia. International connections are shown with the red lines. The blue lines represent flights made by private aircraft traveling to and from the Airport.



PROJECT FUNDING

The Airport will be responsible for 5% of all project costs. These funds are expected to come from Airport revenue and sponsor contributions. The FAA will provide funds for 95% of costs through several programs:

AIRPORT IMPROVEMENT PROGRAM (AIP): AIP provides money, called entitlement funds, to airports around the country based on the airport's size and the number of passenger enplanements.

DISCRETIONARY FUNDS: The FAA distributes discretionary funds for high-priority projects. PUW's runway project is scheduled to receive discretionary funding in 2015 for construction.

PASSENGER FACILITY CHARGES (PFC): The Airport receives funds from PFCs and landing fees. These funds can be used for the local match requirements.

ESTIMATED CONSTRUCTION COSTS

Cost estimates for the project were developed as part of the planning process and will be refined during the design phase.

ALTERNATIVE	TOTAL ESTIMATED COST
Alternative 1: 6,700 foot runway	$55,763,500
Alternative 2: 7,100 foot runway	$58,972,000
Alternative 3: 8,000 foot runway	$69,195,500
Alternative 4: 8,000 foot runway with displaced threshold	$66,550,500

FOR ADDITIONAL INFORMATION

Please visit http://www.pullman-wa.gov/airport and look for the Master Plan link.

Mead & Hunt
9600 NE Cascades Parkway, Suite 100
Portland, OR 97220
503-548-1494
meadhunt.com

Exhibits

Tables

CHAPTER 1: Airport Inventory

PULLMAN-MOSCOW REGIONAL AIRPORT

This chapter describes the existing conditions at Pullman-Moscow Regional Airport (PUW). The information provides an overview for a large target audience of stakeholders with varying backgrounds and informational needs. It is an introduction to the airport, its facilities and the region it serves as a public transportation asset and engine of commerce. Finally, this chapter is a starting point from which to compare future needs.

1.1 AIRPORT LOCATION

PUW is located in southeastern Washington in Whitman County, just a few miles from the Idaho boarder and approximately 75 miles south of Spokane. The airport is centrally located with respect to both the communities it serves and the regional transportation network. Pullman, Washington is three miles west of the airport and Moscow, Idaho is seven miles to the east. Roadway access is provided by Airport Road which forms the airport's northern boundary. The Pullman-Moscow Highway (Route 270) is just south of the airport, providing regional east-west access between the two cities and to the airport. PUW is also located between U.S. Routes 195 west of the airport and 95 to the east, which serve as the major north-south arteries for the region. **Exhibit 1-1, Location Map** graphically depicts the airport's location and regional roadway network. Geographically, the airport is located at 46° 44' 37.9" north latitude and 117° 6' 34.5" west longitude at an established airport elevation of 2,556 feet above mean sea level (MSL). See **Appendix A** for a "*Glossary of Terms and Acronyms*" commonly found in the aviation industry and in this report.

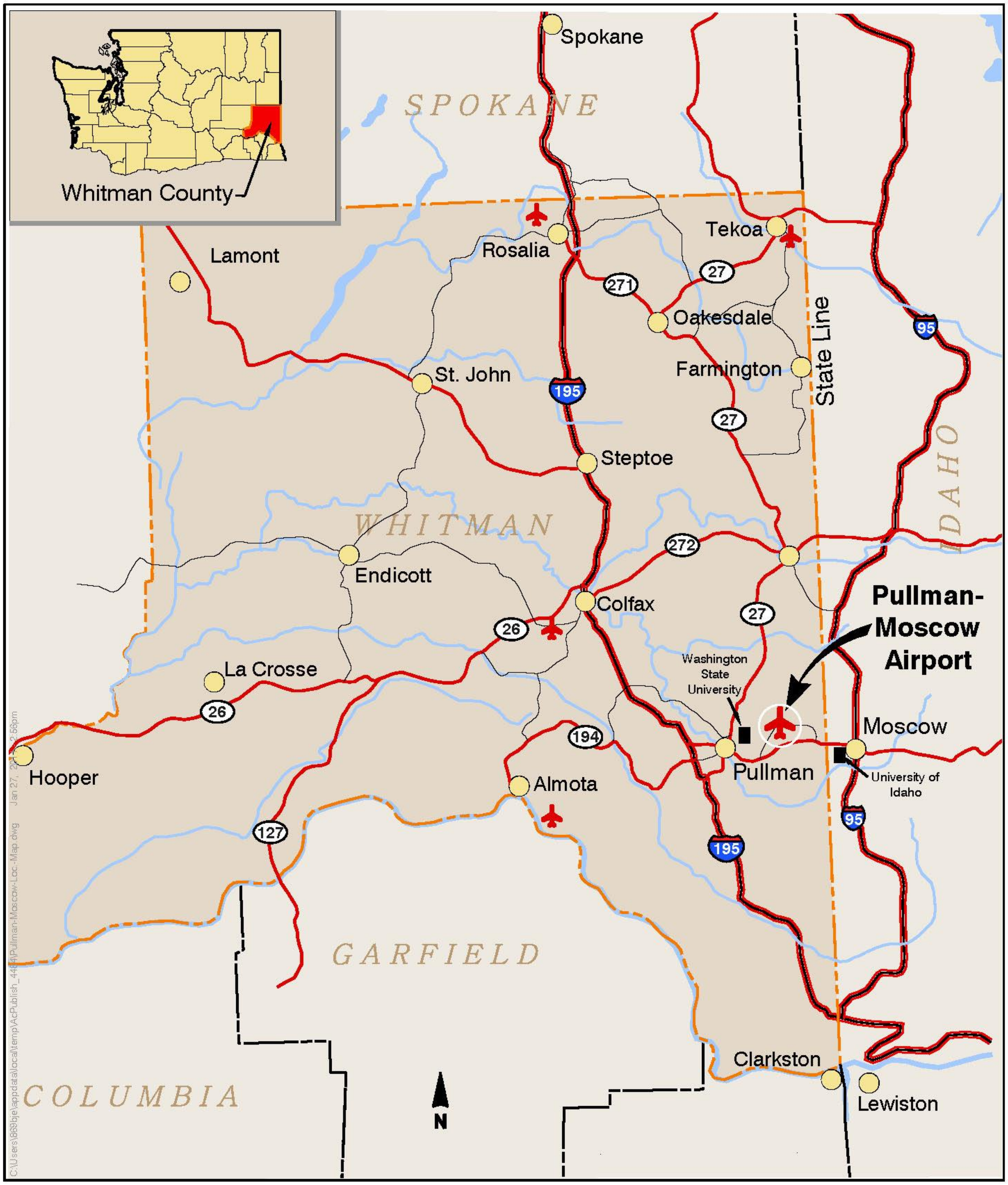


Exhibit 1-1

Location Map

PUW lies in the heart of the fertile Palouse Region located in the foothills of the Clearwater Mountains. The region includes parts of five Washington counties and two Idaho counties. The topography for this region characterized by rolling silt and sand, steep rock, and channeled scablands. Whitman county produces more wheat than any county in the United States. The easternmost portion of the Palouse is forested with steep-sloped mountains. The tallest mountain in the range is Moscow Mountain at 4,983 feet MSL. It is located about seven miles northeast of PUW in Latah County, Idaho. To the west are buttes with top elevations ranging from 2,500 feet to 4,000 feet MSL. Surrouding the buttes are rolling hills. PUW is entirely surrounded by 100 to 200-foot-tall hills. A significant portion of the vicinity and region is similarly comprised of hilly, rolling terrain with minimal flatland areas.

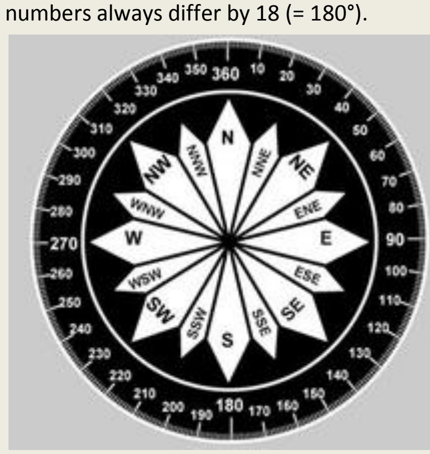
1.2 AIRPORT FACILITIES

PUW's facilities consist of a single east-west runway, parallel and connecting taxiways, and a narrow building area on the north side. The airport footprint comprises 468 acres entirely located at the bottom of a "bowl" surrounded by 100 to 200-foot tall hills. Airport Road provides the only direct access to the airport. The airport complex which includes the access road and building area is nestled between the northern rim of the bowl and the parallel taxiway. Airport Road runs approximately parallel to the runway along the northern trough, creating a wave-shaped development pattern between the roadway and building area. The airline terminal complex is located within the western-most building pocket. Other hangars and support facilities are located within development pockets east of the terminal.

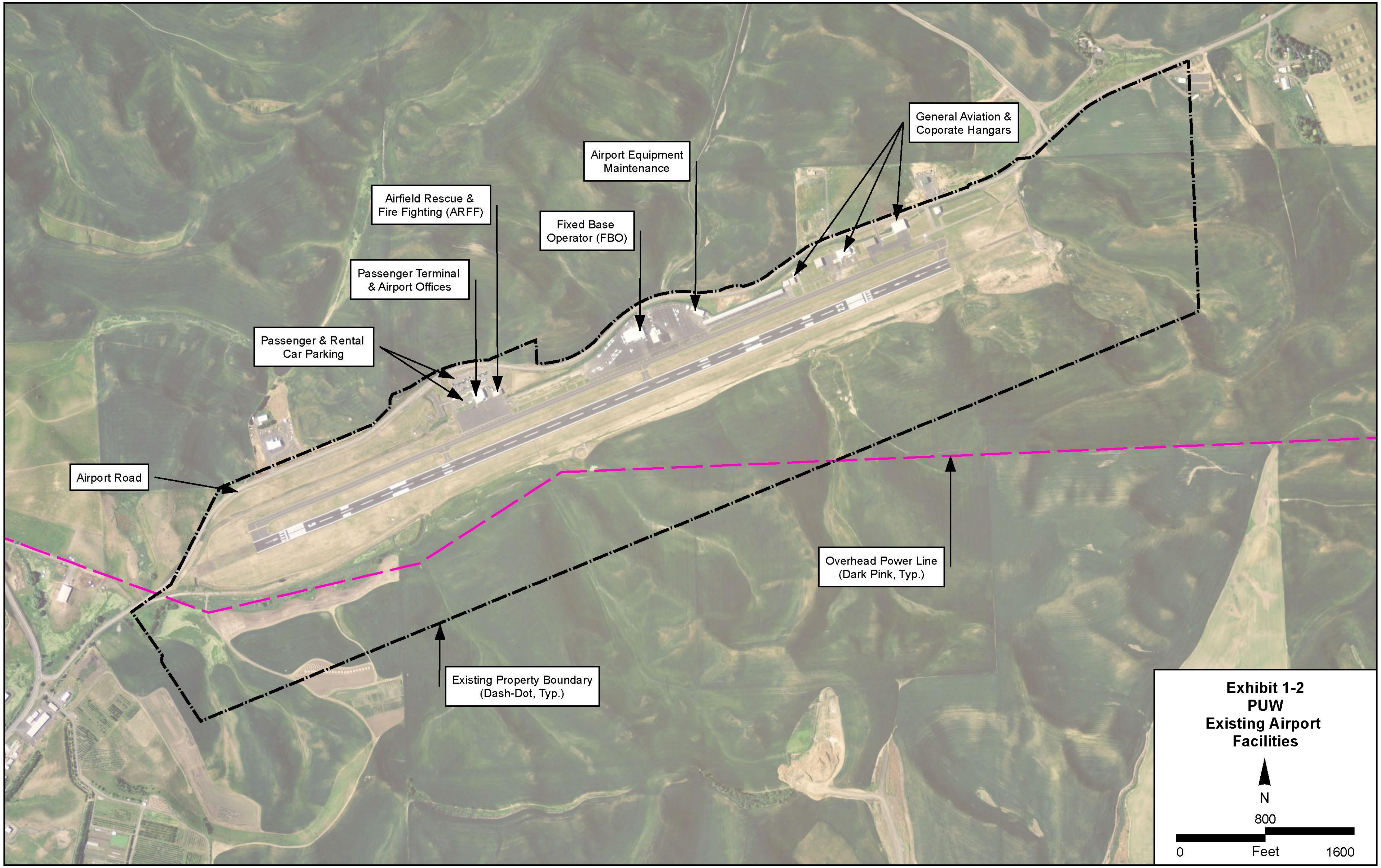
The airport property south of the runway is largely undeveloped hilly terrain. A portion of the south side hills is leased farmland. A power line also traverses the the low-lying portion of the airport's south-side property. Over the years, the airport has expanded its property holdings on the south side and preserved the undeveloped land for purposes of accommodating a future replacement runway. **Exhibit 1-2, Existing Airport Facilities** provides a graphic depiction of the airport's layout and major facilties. The remainder of this section provides a more detailed description of the airport's major facilities.

Runway Numbering. Runways are laid out according to the numbers of a compass and are given a number between 01 and 36. This indicates the runway's heading. A runway with the number 36 points to the north (360°), runway 09 points east (90°), runway 18 is south (180°), and runway 27 points west (270°). Thus, the runway number is one-tenth of the runway centerline's magnetic azimuth, measured clockwise from the magnetic declination.

A runway can be used in two directions, which means the runway has two names: "Runway 33" and "Runway 15". The two numbers always differ by 18 (= 180°).



This Page Intentionally Left Blank


General Aviation & Coporate Hangars
Airport Equipment Maintenance
Airfield Rescue & Fire Fighting (ARFF)
Fixed Base Operator (FBO)
Passenger Terminal & Airport Offices
Passenger & Rental Car Parking
Airport Road
Overhead Power Line (Dark Pink, Typ.)
Existing Property Boundary (Dash-Dot, Typ.)
Exhibit 1-2
PUW
Existing Airport Facilities
N
800
0
Feet
1600

Runway 5-23

> **Declared Distances** *def.,* the distances the airport owner declares available for the airplane's takeoff run, takeoff distance, accelerate-stop distance, and landing distance requirements.

Runway 5-23, PUW's only runway, is 6,730 feet long and 100 feet wide. The whole length of the runway pavement cannot be used for take-off and landing because of close-in obstructions and runway safety requirements. These limit the runway length that may be applied to operations in both directions. In particular, the landing thresholds are displaced from the physical runway ends to provide adequate vertical clearance to landing aircraft.

The resulting "declared" distances are shown in **Table 1-1**. Runway 5-23 is constructed of grooved asphalt that can accommodate aircraft weighing up to 135,000 pounds, depending on the airplane landing gear configuration. The runway slopes east to west with a noticeable dip near the Taxiway B intersection. As a result of the bowed mid- section, a positive (uphill) runway gradient of 0.4% applies to takeoffs in both directions. The pavement condition varies from fair to poor, but the surface is scheduled for overlay in July of 2012.

In addition to markings on the pavement, the runway is also augmented by a variety of visual aids. The runway is lighted with high intensity runway edge lights (HIRL), runway threshlold lights, and runway end identifier lights (REIL's). Landing operations are facilitated by precision approach path indicator (PAPI) lights located to the left of and adjacent to the desired touchdown point; Runway 5 has a two-light system while Runway 23 has a four-light system. Both runway directions are marked as precision-instrument.

Table 1-1: Declared Distances for Runway 5-23

	TORA[1]	TODA[2]	ASDA[3]	LDA[4]	Displaced Threshold
Runway 5	6,730 ft	6,730 ft	6,490 ft	6,200 ft	290 ft.
Runway 23	6,730 ft	6,730 ft	6,040 ft	5,240 ft	801 ft.

1. Takeoff run available
2. Takeoff distance available
3. Accelerate-stop distance available
4. Landing distance available

Source: FAA Airport Master Record (Form 5010) for PUW

Taxiways and Holding Aprons

Taxiway A is a full-length taxiway parallel to Runway 5-23 at a centerline-to-centerline distance of 200 feet. Taxiway A includes two right-angled entrance/exit connectors with one at each runway end. Both ends of Taxiway A have paved aprons where aircraft can perform engine-runups and systems checks prior to take-off. Taxiways B and C function as midfield exit taxiways connecting the runway with parallel Taxiway A. The taxiways have the same pavement strength as the runway, and have basic markings. Lighting is provided with Medium Intensity Taxiway Lights (MITL) along the taxiway edges. When large aircraft are operating, such as Horizon Air's Bombardier Q400, special airport operating procedures are in effect that require other aircraft to remain clear of the runway and taxiways. The procedure is in effect whenever an airplane having a wingspan greater than 78 feet is landing or departing the airport. A summary of taxiway facilities is presented in **Table 1-2**.

Table 1-2: Taxiway Summary

	Length	Width	Taxiway Type	Surface Type
Taxiway A	6,730 ft	60 ft	Parallel/Entrance/Hold	Asphalt
Taxiway B	200 ft	60 ft	Runway Exit	Asphalt
Taxiway C	200 ft	60 ft	Runway Exit	Asphalt

Source: Washington State DOT data base information for PUW current 2010, FAA 5010 Airport Master Record Form, Current Airport Layout Plan (ALP)

Airport Electronic and Visual Aids

PUW has a green and white rotating beacon to assist pilots in identifying the airport at night and as a public-use airport. The 55-foot tall beacon is operated by the airport and is located on the north side of the FBO building. An automated surface and observation system (ASOS) is located just to the west of the terminal building complex. It provides up-to-the-minute weather reports to airplanes through a VHF-voice message, telephone and Internet site. PUW is a non-towered airport meaning that there is neither an operating control tower nor staffed meteorologists on site. Traffic control is provided through a self-announce system using a common traffic advisory frequency (CTAF) for airplanes operating within or near the airport traffic pattern. Instrument flight departures and arrivals are coordinated with Seattle Center control. There are no ground-based navigation aids located at PUW.

Airline Terminal Facilities

PUW's terminal building serves several functions. This one-story building has a footprint of 10,000 square feet. The passenger staging area has two ground-level doors to the tarmac for passengers boarding. A third door, on the west side of the building, is used for arriving passengers. Aside from its primary purpose of processing passengers, the terminal also performs the following functions:

Secure/non-secure holdrooms

Non-secure terminal area

- office space for airport administration,
- counter space and offices for the two rental car companies,
- airline ticketing and check-in,
- baggage processing,
- baggage claim,
- a departure lobby,
- restrooms,
- snack machines,
- a Transportation Security Administration (TSA) security screening checkpoint,
- additional TSA room-space, and
- a lobby for the public.

A unique feature of the terminal building is its slanted roofline. That feature is due to the building's close proximity to the runway enabling it to clear the runway's imaginary clearance surfaces.
The combined airline terminal complex occupies approximately six acres within the westernmost building area pocket formed between parallel Taxiway A and an outward curve of Airport Road. Facilities within this area include:

- a 10,000 square-foot (SF) single-story terminal building,
- a 13,000 square-yard (SY) aircraft parking apron capable of accommodating two Bombardier Q400 airplanes,
- security features and fencing,
- a 34-space rental car and employee parking lot,

- a 173-space passenger lot which includes a limited number of free spaces for passenger drop-off/pickup, and
- a short semi-circular terminal frontage / curb drop-off road.

Included in the secure airline apron area is space for ground service equipment parking, baggage make-up area, and a baggage return area. Eleven additional parking spaces for airport staff are located north of the ARFF building.

Aircraft Rescue and Fire Fighting

The Aircraft Rescue and Fire Fighting (ARFF) building is located adjacent to and east of the terminal building, and is approximately 3,400 square feet in area with three vehicle bays. PUW is classified as a 14 CFR, Part 139 Index A airport. As such, it is required to have either a vehicle carrying 500 pounds of dry chemical or a vehicle carrying 450 pounds of dry chemical and 50 gallons of water for foam production. PUW exceeds the minimum requirements by having two vehicles: one ARFF Category A and one ARFF Category B. The airport added an additional Category B ARFF vehicle in 2011, and expects to add an additional 2,300 square-foot vehicle bay to accommodate the new vehicle. Additional emergency services are provided by the City of Pullman's firefighting Station 31 and Station 32. On-site ARFF staff consists of two full-time and three part-time airport staff person who also have other airport operational and maintenance responsibilities. The airport's certification manual requires the ARFF station to be staffed for a period beginning 15 minutes before and continuing 30 minutes after a scheduled airline operation.

A new addition to the fire suppression system was installed in 2010. A 420,000 gallon water tank connected to the fire hydrant supply line sits on top of a hill north of Airport Road across from the airline terminal. The line enters airport property near the ARFF building and extends to the east, terminating near the far end of the airfield. Multiple sub-surface fire hydrants are connected to the line.

Airport Maintenance / Support Facilities

The airport maintenance and snow removal equipment (SRE) buildings are located east of the Fixed Base Operator (FBO) within the second "pocket" formed between a northward curve in Airport Road and parallel Taxiway A. The two buildings have a combined floor space of 3,900 square feet. Maintenance staff performs a variety of functions to support airport operations including:

- maintenance of grass infield areas both on and off the airfield,
- removal of snow and ice during winter months,

- collection of parking lot fees, and
- regular inspections and maintenance of pavement and buildings.

Maintenance staff uses large lawn mowers for cutting the grass areas around the runways, taxiways and infield areas; snow removal and sand application equipment; and a pick-up truck for airfield and runway inspections.

Fixed Base Operator and Tenant Facilities

FBO's provide a range of services to support general aviation users. At PUW, these include:

- aircraft rental and charter
- aircraft maintenance and fueling
- flight training
- catering services for corporate and charter operators
- crew rest area
- hangar space

Fixed base operator (FBO) *def.* is a provider of services to aircraft and operators located at or adjacent to an airport. An FBO may be a private enterprise, municipality or city operated, or state-agency operated.

FBO businesses traditionally offer aircraft refueling, aircraft parking and tie-down, and access to basic comforts such as restrooms and telephones. Other services may include flight training and aircraft rental, aircraft maintenance service, hangar storage, air charter and air-taxi, aircraft sales, and ground handling of passengers, baggage and/or cargo.

PUW currently has one FBO at the airport located midfield. Other tenants include Schweitzer Engineering, which maintain their own hangars and fleet of aircraft, and various aircraft owners that lease hangar or tie-down space at the airport. Airport data reports a total of 51 aircraft tie-down spaces (31 leased and 20 transient), 4 individually leased large airplane hangars, two large FBO hangars, and 24 small airplane hangars, with a total of 16,000 square yards of aircraft parking apron. The FBO has 34 parking spaces available for staff and customers/visitors to the north and northeast of the building. The large hangars all have parking for those tenants.

Vehicle Access and Circulation

Road access to PUW is via Airport Road. It is a six mile loop beginning at the intersection of Airport Road and SR 270 fronting then forming the northern perimeter boundary of the airport and thereafter continuing south to rejoin SR 270 one mile from the Washington-Idaho border. PUW's terminal and administrative building is accessed by one of two driveways located at either end of the public parking area. There are additional driveways located along Airport Road that grant access to the FBO and corporate hangar facilities as well as badge-access gated driveways that are utilized by airport maintenance staff, emergency personnel, and airport tenants. **Table 1-3** presents a composite of airport services and features.

Table 1-3
Airport Profile

General Information

- *Airport Ownership:* Public, owned by the Pullman-Moscow Regional Airport Board
- *Year Opened*: February 1932
- *Property Size*
  - Fee simple (468 acres)
  - Avigation easement (22.5 acres)
- *Airport Classification:* Primary Non-Hub
- *Airport Elevation*: 2,556 ft. above MSL

Runway/Taxiway Design

Runway 5-23

- *Airport Reference Code:* B-II/C-III with special procedures
- *Critical Aircraft*: Bombardier Q-400
- *Dimensions:* 6,730 ft. long, 100 ft. wide
- *Pavement Strength (main landing gear configuration)*
  - 57,000 lbs. (single wheel)
  - 75,000 lbs. (dual wheel)
  - 135,000 lbs. (dual-tandem wheel)
- *Average Gradient:* 0.29% (rising to the east)
- *Runway Lighting*
  - High Intensity Runway Lights (HIRL)

Taxiways

- *Primary Taxiway:* Full-length parallel Taxiway A on north side
- *Dimensions:* 6,730 ft. long, 60 ft, wide
- *Pavement Strength (main landing gear configuration)*
  - 57,000 lbs. (single wheel)
  - 75,000 lbs. (dual wheel)
  - 135,000 lbs. (dual-tandem wheel)
- *Taxiway Lighting:* Medium Intensity Taxiway Lights (MITL)
- *Other Taxiways* Taxiway B and C connect Runway to Taxiway A
- *Dimensions:* 200 ft. long, 60 ft, wide for B and C

Building Area

- *Aircraft Parking Location:* North of airfield
- *Aircraft Parking Capacity*
  - Hangars:
    - – Large FBO common hangars: 2
    - – Large: 4
    - – Small: 24
  - Tie-downs:51:
- *Other Facilities*
  - ARFF Category A: 2 vehicles (near terminal)
  - Snow removal equipment/storage

Management And Services

Management

- Airport Board through inter-local agreement
- Management and maintenance by the Pullman-Moscow Airport Manager and limited airport staff

Fixed Based Operations (FBO) Services

- FBO offers a variety of aircraft and general aviation services
- Fuel service: 100LL, Jet A, Service provided by FBO via truck or self service fuel island
- Fuel service hours of operation: 8:00 am to 6:00 pm, 7 days a week. 24-hour Avgas and Mogas (self service). Fuel call-out fee after hours

Other Services

- Charter, flight instruction, aircraft rental and sales, avionics, cargo, and airfreight

Traffic Patterns and Approach Procedures

Airplane Traffic Patterns

- Runways 5-23: Left traffic
- Typical Pattern altitude (downwind leg)
  - Runway 5-23: Small aircraft 3,550 ft. MSL (1,000 ft. AGL)
  - Runway 5-23: Large aircraft 4,600 ft. MSL (2,100 ft. AGL)

Instrument Approach Procedures (lowest minimums)

- Runway 5 RNAV (GPS)
  - Straight-in: 1½ mi. visibility, 441 ft. ceiling
- Runway 5 VOR
  - Straight-in: 1 mi. visibility, 580 ft. ceiling
  - Circling: 1 mi. visibility, 631 ft. ceiling
- Runway 23 RNAV (GPS)
  - Straight-in: 1¾ mi. visibility, 624 ft. ceiling

Visual Approach Aids

- Airport: Rotating Beacon, PAPI at both runway ends, REIL at both runway ends

Operational Restrictions / Noise Abatement Procedures

- Special procedures in effect during operations of airplanes with wingspan greater than 78 ft.

1.3 AIRPORT MANAGEMENT AND OPERATION

PUW is operated by an Airport Board under an inter-local agreement with signatory entities in both Washington and Idaho. As such, PUW is included in both state's airport system plans. Executive oversight is provided by a 7-member board comprised of the following:

- Mayor, City of Pullman, Washington (current chair)
- Mayor, City of Moscow, Idaho
- City Council Representative, City of Pullman, Washington
- Appointed Representative, City of Moscow, Idaho
- Appointed Representative, Washington State University
- Appointed Representative, Latah County, Idaho
- At-large Representative, elected by Airport Board

Airport Board meetings are held monthly or more frequently as needed. Board meetings are open to the public. Representative entities comprising the Airport Board also contribute to the financial operation of the airport and the oversight of the airport's Enterprise Fund.

Enterprise Fund: *def.,* a fund established to account for operations that are financed and operated in a manner similar to private business enterprises. The intent is that the full costs of providing the goods or services be financed primarily through charges and fees, thus removing the expenses from the tax rate.

The airport is managed by a full-time manager appointed by the Airport Board. Besides the airport manager, the airport has a limited staff consisting of two full-time and three part-time employees. The airport is certificated and maintained in accordance with Code of Federal Regulations (CFR) Part 139, which establishes the standards for the operation and maintenance of an air carrier airport. The Part 139 regulations were recently overhauled to break air carrier airport certification requirements into sub-groups. The modifications generally imposed additional requirements on small air carrier airports like PUW. Some examples of the regulation changes are: new training requirements for ARFF staff, snow and ice removal operations, and clarifications to safety area definitions and pavement repair. A full listing of the new requirements can be found in Title 14, CFR Part 139.

1.4 AERONAUTICAL SETTING

PUW is situated within the city limits of Pullman, Washington, and is certified as a commercial service facility. It provides scheduled air carrier passenger service and general aviation access to the residents and visitors of Pullman, Moscow, and other nearby communities of Whitman and Latah Counties. The airport handles an average of 80 operations per day and has 71 based aircraft.

PUW is located between two airports with air service. Spokane International Airport is 75 miles to the north and Lewiston-Nez Perce County Airport is 35 miles to the south. This contributes to a high percentage of "leaked" passengers as well as competition between airports for based business jets, turbo-props and the charter flights supporting university sporting events. In this way, PUW's aviation profile is closely intertwined with Lewiston although they both have their unique airline service niches. Considering the combined service areas of both airports, PUW is located at the center of the area's population, business, and university travel interests, but has a more constrained airport facility. Airport operational and development constraints are major contributors to PUW's leaked services and future development opportunities, both on and off airport.

Air Service

Horizon Air began offering passenger service to and from PUW in 1982 just one year after it was founded in Seattle. Today Horizon Air is a fully-owned subsidiary of Alaska Airlines Group, the holding company that also owns Alaska Airlines. Horizon Air currently provides direct and one-stop service to Seattle-Tacoma International Airport, and Boise, Idaho. The one-stop service includes a stop at Lewiston.

Passenger capacity: 74	Length: 107 ft., 9 in.
Wingspan: 93 ft., 3 in.	Range: 1,567 miles
Cruise speed: 414 mph	Ceiling: 25,000 ft.

Bombardier Q400

Area Airports

PUW experiences market competition from airports that are located nearby. There are five airports offering air carrier service located within 120 road-miles of PUW and three public-use general aviation airports within 50 statute miles. **Table 1-4** identifies those airports and their facilities and services.

Table 1-4

Area Airports

Airport Name [1]	Owner	Location: Associated City (County)	Location: Distance/Direction [1,2]	Based Aircraft [3]	Facilities: Number of Runways	Facilities: Longest Runway (ft.)	Facilities: Surface [4]	Facilities: Lighting Intensity [5]	Facilities: Approach Visibility [6]	Services: Control Tower	Services: Airline Service	Services: AvGas	Services: Jet Fuel	Services: Maintenance	Services: Automobile Rentals	Services: Food
Pullman-Moscow Regional Airport	**Airport Board**	**Pullman (Whitman)**	**–**	**71**	**1**	**6,730**	**asph**	**H**	***1½***	***No***	***Yes***	✓	✓	✓	✓	✓
Area Airports with Passenger Service																
Lewiston-Nez Perce County Airport	City of Lewiston	Lewiston (Nez-Perce)	40rm S	145	2	6,511	asph	H	½	Yes	Yes	✓	✓	✓	✓	✓
Spokane International Airport	City/County of Spokane	Spokane (Spokane)	82rm NNW	78	2	9,001	asph	H	¼	Yes	Yes	✓	✓	✓	✓	✓
Walla Walla Regional Airport	Port of Walla Walla	Walla Walla (Walla Walla)	115rm SW	135	3	6,527	asph	H	½	Yes	Yes	✓	✓	✓	✓	✓
Tri-Cities Airport	Port of Pasco	Pasco (Franklin)	139rm WSW	119	3	7,711	asph	H	½	Yes	Yes	✓	✓	✓	✓	✓
Area Airports / General Aviation																
Port of Whitman Business Air Center	Port of Whitman	Colfax (Whitman)	13nm WNW	19	1	3,209	asph	–	VIS	No	No	✓	–	–	–	–
Willard Field	City of Tekoa	Tekoa (Whitman)	30nm N	9	1	2,260	asph	M	VIS	No	No	✓	–	✓	–	–
Rosalia Municipal Airport	Town of Rosalia	Rosalia (Whitman)	32nm NNW	9	1	2,800	asph	M	VIS	No	No	✓	–	–	–	–

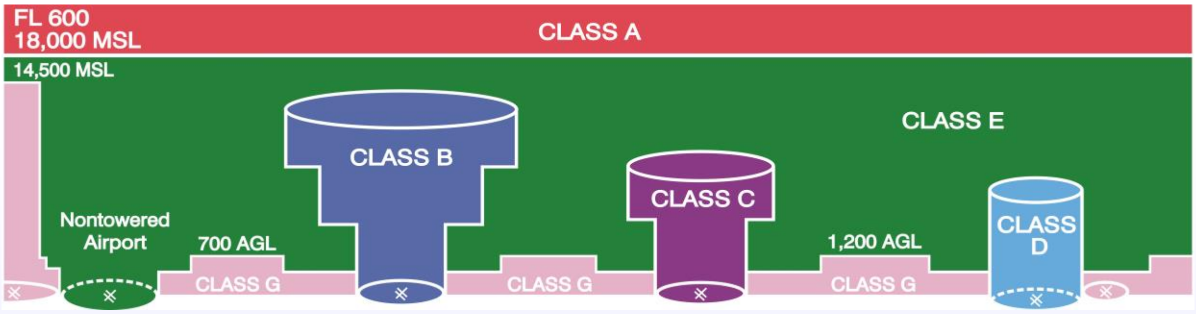
Notes:

[1] Airports within 150 road miles (rm) or 50 nautical miles (nm) of PUW
[2] Relative to PUW
[3] FAA APO Terminal Area Forecast data as of December 2009
[4] ASPH=asphalt; CONC=concrete
[5] L=low; M=medium; H=high
[6] Lowest visibility minimums for instrument approach procedures; distance in statute miles. VIS = No instrument approach – VFR only.

Source: FAA 5010 Reports, FAA Terminal Procedures Publications, and Airport Diagrams. Distance information from Travelmath.com

Area Airspace

Federal aviation regulations (FAR) define various categories of airspace with distinct operating requirements for each type. These airspace classifications are defined as Class A, B, C, D, E, and G (See graphic below).



AGL – above ground level, MSL – mean sea level, FL – flight level

Airspace Classes	Communications	Entry Requirements	Separation	Special VFR in Surface Area
A	Required	ATC clearance	All	N/A
B	Required	ATC clearance	All	Yes
C	Required	Two-way communications prior to entry	VFR/IFR	Yes
D	Required	Two-way communications prior to entry	Runway operations	Yes
E	Not required for VFR	None for VFR	None for VFR	Yes
G	Not required	None	None	N/A

Airspace Classes

PUW is within Class E airspace that begins at the Airport surface and extends up to but does not include 18,000 feet mean sea level (MSL). These boundaries extend out from the Airport to a 4 nautical mile (nm) radius with northeast-southwest extensions. They protect the instrument approach and missed-approach corridors associated with the Pullman radio-beacon. A fan-shaped Class-E transition area emanates outward from the Pullman VOR from the northwest to the northeast. The floor of Class E for this area begins at 700 feet above the surface and continues up to but does not include 18,000 feet MSL. This Class E transition area provides air traffic control flight separation service for IFR flights climbing and descending in this area. Below the floor of the Class E transition shelf, the airspace from the surface to 700 feet above the ground is Class-G. This uncontrolled airspace has no air traffic separation service. **Exhibit 1-3** illustrates the airspace around PUW.

Visual flight rules (VFR) *def.* are a set of aviation regulations under which a pilot may operate an aircraft, if weather conditions are sufficient to allow the pilot to visually control the aircraft's attitude, navigate, and maintain separation with obstacles such as terrain and other aircraft.

Instrument flight rules (IFR) *def.* are a set of regulations and procedures for flying aircraft without the assumption that pilots will be able to see and avoid obstacles, terrain, and other air traffic; it is an alternative to visual flight rules (VFR), where the pilot is primarily or exclusively

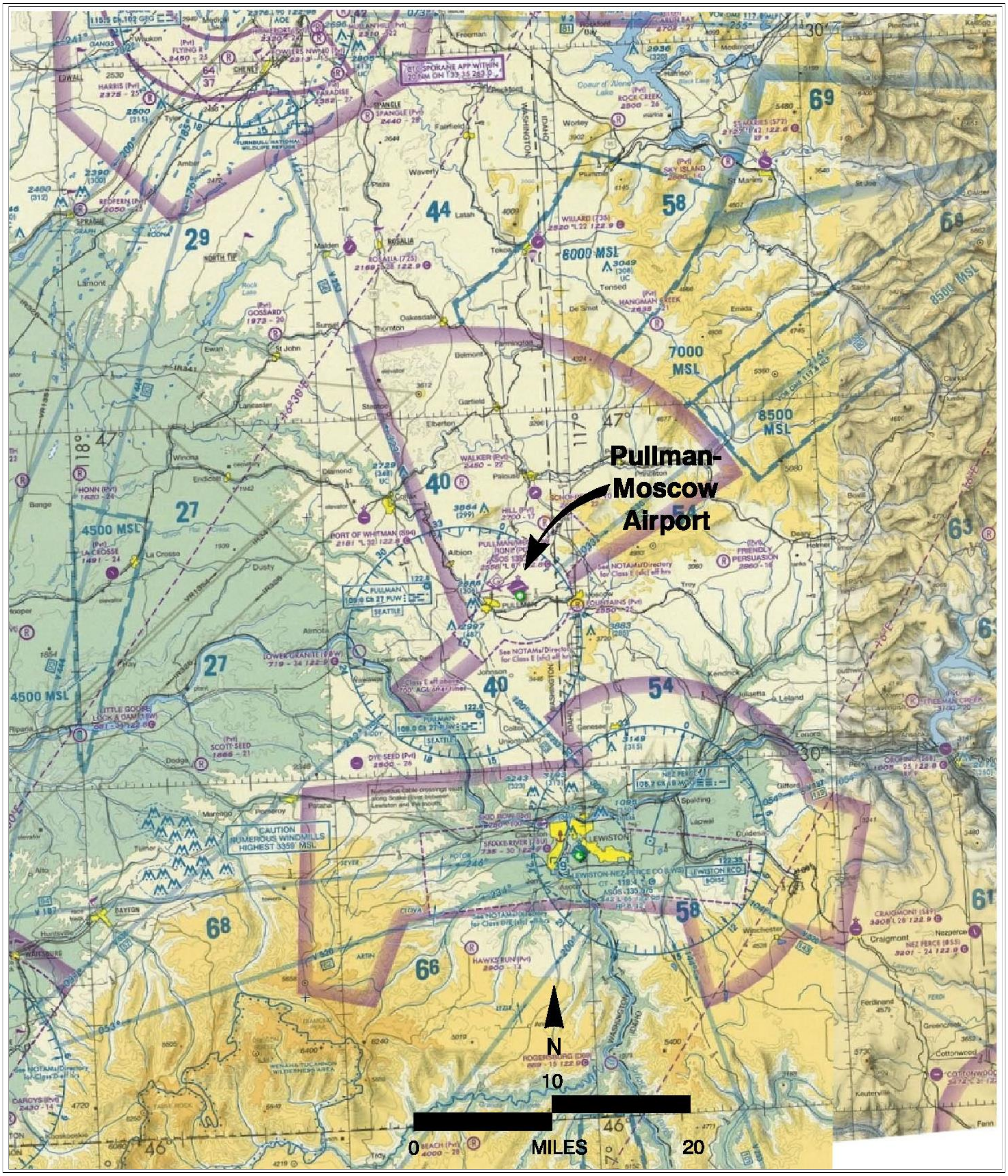


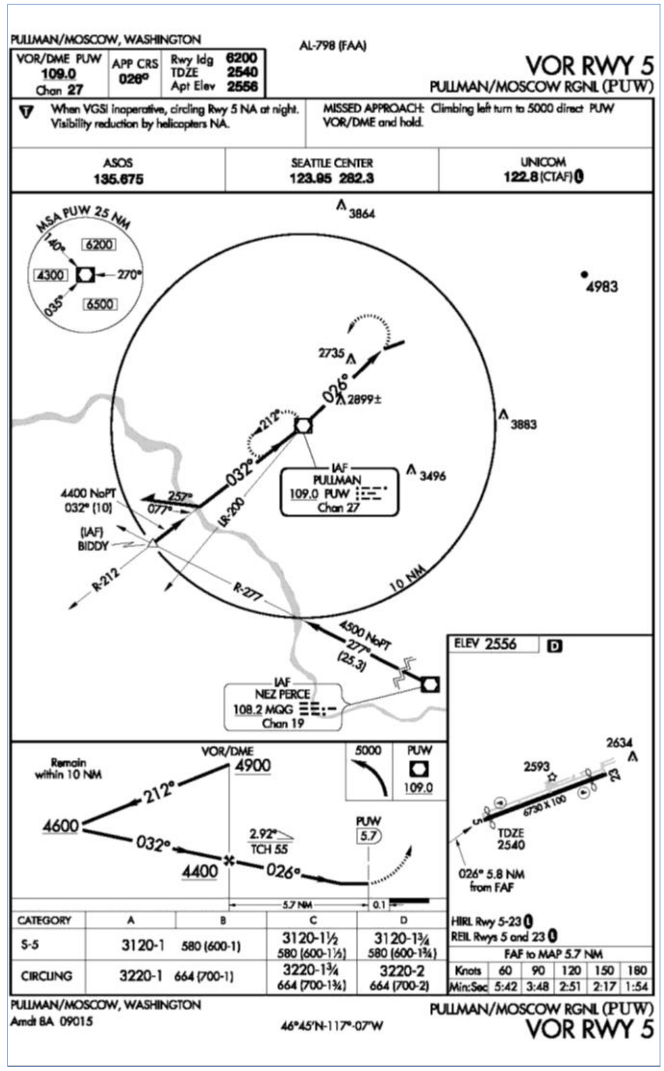
Exhibit 1-3

Area Airspace

PUW has three published instrument approach procedures:

RNAV (GPS) RWY 5—satelite-based approach to Runway 5; vertically-guided localizer-precision vertical (LPV) approach with approach minimums of 1½- mile visibility and 441-foot cloud ceiling. Higher approach minimums are also published for this procedure depending on the equipment in use on the airplane.

VOR RWY 5—surface radio-based approach to Runway 5 using very high frequency ominidirectional radio beacon (VOR). The Pullman VOR is located 7 miles southwest of the airport. The procedure is non-precision, meaning it provides horizontal guideance only with approach minimums of 1-mile visibility and 580-foot cloud ceiling. Airplanes may also circle-to-land on Runway 23 using this procedure and a 84-foot higher cloud ceiling of 664 feet.



RNAV (GPS) RWY 23—satelite-based non-precision approach to Runway 23 with approach visibility minimums of 1 mile visibility and 631-foot cloud ceiling. Airplanes may also circle-to-land on Runway 5 using this procedure and a 33-foot higher cloud ceiling of 664 feet.

> **Approach Minimums** *def.* Approach Minimums are published for different aircraft categories (based primarily on their approach speed) and consist of a minimum altitude (DA-Decision Altitude, DH-Decision Height, or MDA-Minimum Descent Altitude) and a required minimum visibility. These minimums are determined by applying the appropriate TERPS criteria to ensure adequate terrain clearance. The minimums reflect the type of electronic instrument landing system installed, as well as the availability of approach lighting systems and supporting approach-related equipment (e.g., runway visibility range indicators, runway surface markings, etc.).

The airport uses a standard box-shaped traffic pattern. Pilots self-announce their positing over the CTAF. The pattern altitude is 3,550 feet MSL for light aircraft with less than 6 passengers and 4,600 feet MSL for larger aircraft. The flight traffic pattern for Runway 5 and Runway 23 is left hand traffic, meaning turns are to the left. This places the box on the north side of the runway when Runway 5 is in use and on the south side when Runway 23 is in use.

Special Airport Operating Procedures

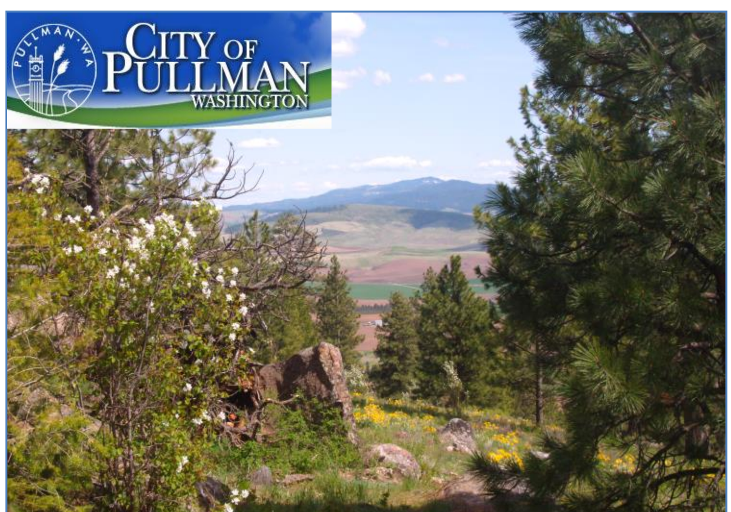
PUW currently has special operating procedures that become effective whenever a large airplane having a wingspan of 78 feet or more is operating (arriving, departing, and/or taxiing) at the airport. They are in place because of the close proximity between the runway and parallel taxiway. They provide a level of safety equal to that required by current FAA airport design standards for the classification of airplanes now operating at PUW. The special procedures are a part of a comprehensive approach aimed at maintaining safety levels until the airport is redeveloped to meet FAA standards. The airport has already implemented some physical improvements to improve safety such as terrain grading and obstacle removal near and to the sides of the runway. These improvements, combined with the special procedures, are collectively referred to as the “CIII Mitigation Actions”. These actions were approved by the FAA’s Flight Standards Division. They, in turn, granted a temporary compliance waiver that permits the current air carrier service to use the 74-seat Bombardier Q400 airplane. The temporary waiver of compliance allows the airport time to finalize and implement a compliant airport layout. The primary purpose of this master plan is to confirm that plan and define an implementation process. The mitigation plan is reproduced as **Appendix B**.

1.5 COMMUNITY PROFILE

This section contains a description of the nearby communities served by PUW and their attributes. The information contained in this section is summarized in **Table 1-5.**

Pullman, Washington

Pullman was originally settled around 1877 when it was known as "Three Forks”. It was so named because of the confluence of the Missouri Flat Creek, Dry Fork Creek and South Fork, three waterways associated with the Palouse River. The town was incorporated in 1888 at a time when major railroads were being built. It was renamed after George Pullman, inventor of the Pullman Sleeping Car.



Pullman, Washington region

The City of Pullman utilizes a Mayor-Council form of government consisting of an elected mayor and an elected seven-member council. The economy of the area consists of government entities, Washington State University, trade center activities, growing high-tech research and manufacturing segments, and agrticulture. The State Office of Financial Management estimates that the City of Pullman's 2009 population was 27,600. Based on population, it is the largest city in Whitman County, Washinton. The County has a population of about 42,000.

The City of Pullman is closely associated with Washington State University (WSU), a land-grant university. WSU was founded in 1890 for the purpose of providing education in the areas of agricultural, applied-arts, and industry research. WSU's academic curriculum has diversified into the fields of Business, Communication, Education, Veterinary Medicine, Engineering/Architecture, Medical, and Sciences. The main campus has an enrolled student population of 17,753. WSU is Pullman's largest employer with approximately 4,000 full-time and 2,000 part-time employees. As part of the Pacific Athletics Conference (PAC-10), the university supports a robust athletics department, collegiate sports teams, and major championship competitions. Home games attract many visitors to the area.

Washington State University at Pullman, WA

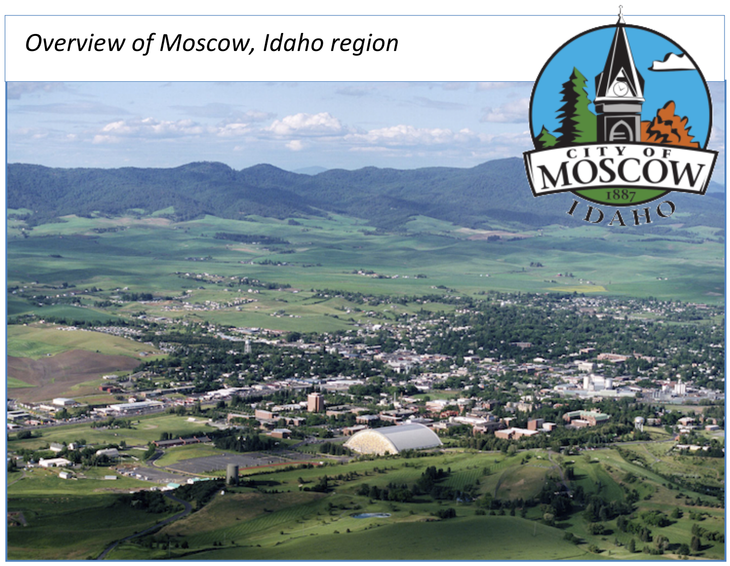
Pullman is also the worldwide headquarters for Schweitzer Engineering Laboratories, Inc. (SEL). They are the City's second largest employer at 1,080. This number also represents about half of the company's worldwide work force. The company was founded in 1982 by a WSU student working on a Ph.D. project. It evolved into the invention of the first all-digitial protective relay. SEL now produces and services a variety of electic power systems and components. Today, Schweiter's 130-acre campus includes ten buildings, an event center and 200,000 squarefeet of manufacturing space.

Pullman's emerging growth into the high tech and manufacturing industries is altering the employment dynamics. The growth of SEL is an example of how new business is spawned by the university. A 2005 survey ranked Pullman #2 in terms of best places for business in the State of Washington. The ranking was based on a combination of factors including employee education, cost of living, concentration of business, and quality of life. The City continues to grow and diversify. Recent efforts to accommodate future growth include new zoning regulations, expanded water and sewer capacity and new infrastructure for future industrial parks.

Moscow, Idaho

Permanent settlement of the area began around 1871 with an influx of miners and farmers following the Civil War. The original post office name for the town was "Paradise Valley" after the Paradise Creek which flows through town. The current name of Moscow arose in 1875 with the filing of paperwork for a new Post Office. Early growth was fueled by the construction of the Union Pacific Railroad. Today, Moscow serves as the county seat of Latah County and is also the county's largest city with a population of over 23,000. The City of Moscow has a Council-Mayor form of government consisting of six council members at-large and a Mayor. They are all elected separately over staggered four year terms. Moscow is the commercial and agricultural hub for Idaho's Palouse region and is also home to the University of Idaho (UI), the City's largest employer (2,400 employees).

Overview of Moscow, Idaho region



UI is the State's primary research facility and land grant institution. UI has an enrollment roster of nearly 9,000 undergraduate and 2,000 graduate students. The univseriity is currently organized into ten colleges including: Agricultural Science, Business and Economics, Education, Engineering, and Law. UI also supports a robust athletic department, sports teams and facilities. This draws spectators and teams to the community and requires travel for away games. Historically, UI was chartered one year before WSU and Idaho gained U.S. Statehood eight months after Washington. The close relationship between the two Cities of Moscow and Pullman continues today as they remain similar in size, population, and university enrollment.

University of Idaho (UI) administration building

Table 1-5

Community Profile

GEOGRAPHY

Location

- Pullman-Moscow Airport lies 75 miles south of Spokane and 290 miles east of Seattle,
  - City of Pullman, WA is 3 miles west of Airport
  - City of Moscow, ID is 7 miles east of Airport

Topography

- City of Pullman elevation: 2400 feet
- Immediate vicinity of airport level, ranging generally between 2,500 feet and 2,600 feet above Mean Sea Level (MSL).

SURFACE TRANSPORTATION

Major Highways

- US highways serving the Airport area:
  - 95 and 195 are major north/south
  - State Route 270 provides east-west linkage between Pullman and Moscow, passing south of the airport and connected by Airport Road.
- Nearest Interstate Highway:
  - Interstate 90 is 75 miles to the north

Railroads

- Washington and Idaho Railway Inc. is strictly a freight service that connects to the Palouse River and Coulee City Rail Road network

Public Transportation

- Bus Service:
  - Pullman Transit city wide service
  - Moscow-Region 2 Valley Transit city wide service
  - links Pullman, WA and Moscow, ID, makes stops at Pullman Airport for $5 charge

POPULATION AND ECONOMY

Current / Historical Population

	1995	2000	2005	2010
City of Pullman, WA	23,824	24,948	26,590	27,600
City of Moscow, ID	20,096	21,342	22,702	23,131

Source: Washington Office of Financial Management and U.S. Census Bureau

Projected Population

	2015	2020
City of Pullman, WA[1]	28,318	33,650
City of Moscow, ID [2]	27,573	31,348
Total	55,891	64,998

Sources: [1] City of Pullman, Comprehensive Plan (1999)
[2] City of Moscow Staff Estimate (7/15/2010)

Basis of Economy

- Economy historically based on agriculture
- Major employment by industry (2009)

	Pullman, WA[1]	Moscow, ID[2]
Government	51%	36%
Education, Health Services	19%	10%
Trade	11%	24%
Manufacturing	7%	9%
Agriculture	3%	1.5%
Transportation	2%	1.5%
Other	7%	18%

Sources: [1] Southeast WA Economic Development Association
[2] Growth in Moscow (A Study of Population Growth and Rising Economic Prosperity) (2006)

CLIMATE

Temperature

	Avg. High	Avg. Low
Hottest month (Jul. & Aug.)	83.0°F	52.0°F
Coldest month (January)	37.0°F	26.0°F

Precipitation and Fog

- Average annual rainfall in Pullman: 21.00 inches

Winds

- Prevailing winds from east and southwest

1.6 CLIMATE AND WEATHER

The Polouse region ecompassing both Pullman and Moscow enjoys four distinct seasons and a mild climate supportive of its historical agricultural base. Annual precipitation averages 21 inches. Average winter-season snowfall varies from 20 to 40 inches with a historic annual average of 28 inches. Snow can be expected in November and remains on the ground for periods ranging from a few days to two months. Summer sky conditions are the clearest. Outside of summer, cloudy skies are typical and precipitation occurs regularly. July and August are the warmest months with an average maximum temperature of 83 degrees farenheit. January is the coldest month with an average minimum temperature of 22.7 degrees fareheit. The maximum average precipitation occurs in November.

Table 1-6: Monthly Climate Averages and Records for Pullman, WA

Month	Average low	Average high	Average precipitation	Record low	Record high
January	26°	38°	2.65 in	-30° (1937)	57° (1971)
February	28°	43°	2.06 in	-24° (1996)	66° (1986)
March	33°	51°	2.2 in	-10° (1891)	73° (1960)
April	37°	58°	2.13 in	0° (2003)	88° (1987)
May	43°	66°	2.15 in	23° (1954)	95° (1897)
June	48°	74°	1.46 in	30° (2002)	100° (1924)
July	52°	83°	0.98 in	27° (1939)	105° (1928)
August	51°	83°	0.98 in	30° (1942)	110° (1961)
September	45°	74°	1.03 in	14° (1926)	100° (1988)
October	38°	60°	1.98 in	2° (1935)	90° (1992)
November	31°	45°	2.85 in	-14° (1896)	72° (1999)
December	26°	37°	2.81 in	-32° (1968)	62° (2002)

Source: www.weather.com/weather/wxclimatology

Table 1-7 highlights the effects of low visibility and cloud ceilings during the winter months which result in a comparatively high level of flight cancellations and delays.

Table 1-7: Low Visibility/Cloud Ceiling During Winter Months

	Annual	NOV	DEC	JAN	FEB
IMC[1]	5.5%	6.7%	16.2%	16.5%	8.9%
PVC[2]	1.6%	3.1%	5.6%	4.3%	2.6%

[1] Instrument Meteorological Condition = Ceiling < 1,000 feet and/or visibility < 3 statute miles.

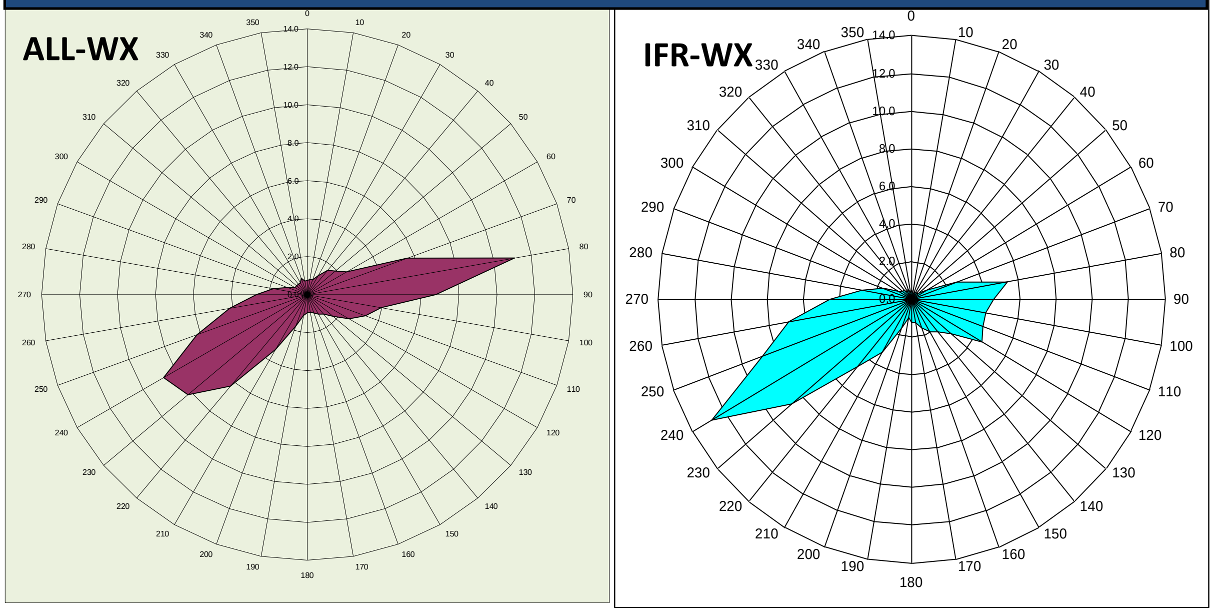
[2] Poor Visibility Conditions = Ceiling < 200 feet and/or ceiling < ½-mile

Source: Hourly weather observations, January 1, 1995 to December 31, 2004, 72,990 total observations, Pullman 2 NW AWOS Station

As shown in **Exhibit 1-4** below, surface winds at PUW are out of the east and southwest. During periods of inclement weather having lower cloud ceilings and visibilities, the southwest concentration increases.

Exhibit 1-4

All Weather and IFR Weather Wind Persistency



IFR Weather: Cloud Ceiling less than 1,000 feet and/or visibility less than 3 statute miles.
Source: Pullman 2 NW AWOS Station hourly weather observations, January 1, 1995 to December 31, 2004; 72,990 total observations.

1.7 RELEVANT PLANS AND STUDIES

Research and planning studies completed to date include the following:

Pullman Moscow Regional Airport Master Plan – Phase 1 (July 2007)

The primary objective of Phase 1 was to determine the optimized runway orientation based on airspace approach constraints, ability to meet FAA design standards, minimizing operational disruptions during construction, and meeting financial feasibility objectives. The report determined optimal alignments similar to those presented in prior studies.

Airport Site Investigation Report and Instrument Runway Designation Report (June 2004)

The original focus of this study effort was to update the Airport Layout Plan (ALP) to include expansion of the airport's general aviation facilities such as revenue producing hangars, aprons and support services. However, the emphasis of this study shifted to runway alignment following Horizon Air's introduction and subsequent cancellation of Q400 (C-III) service. This aircraft exceeded airfield design standards which sparked a compelling need to resolve the airport's non-standard conditions. The report's conclusions were drawn from an analysis of engineering feasibility. Limited consideration was given to instrument approach and departure constraints or improved all-weather reliability. The Q400 operates currently under special operating rules and an FAA waiver requiring airfield improvements.

Pullman Moscow Regional Airport Master Plan Update (1999)

This document provides the technical basis for the airport's current ALP adopted by the Airport Board. The stated goals of the current plan are to: 1) develop the airport in a manner consistent with federal, state, and local standards; 2) investigate strategies to eliminate the modifications to standards currently in place; and 3) investigate ways to improve operational efficiency during instrument meteorological conditions.

The plan evaluated two primary methods of achieving its airside goals: runway realignment and airport relocation. Airport relocation was ultimately rejected in favor of runway realignment given the presence of two nearby air carrier airports: Lewiston – Nez Perce County and Spokane International Airport. Airspace analysis was limited to an investigation of C.F.R. 14, Part 77, Civil Airport Imaginary Surfaces. It did not consider either terminal instrument procedures design or special operating procedures authorized to certain operators.

FAA approval of the recommended alternative was contingent upon the completion of an airport site selection study. As a result, the plan was tabled pending a subsequent study. In the meantime, the airport began making interim safety improvements that were supported by the FAA. Although it was not fully implemented, the 1999 master plan report contains valuable background information that is relevant to the current update. Likewise, the goals established by the 1999 plan are retained as the primary objectives to be accomplished in the future.

City of Pullman Comprehensive Plan (1999)

The plan states: *"In today's global economy, maintaining connections with the outside world is essential. Pullman is served by a regional airport which provides convenient access to major cities. It is extremely important to uphold the viability of this airport in order to maintain a strong economy in Pullman and the surrounding region…..The Pullman-Moscow Regional Airport is a critical component of the local economy. Maintaining the viability of this airport, through appropriate planning and financial support, is considered to be essential to the community."*

Relevant policies include:

Policy T3.1: Support expansion of commercial air service to the Pullman region. Avoid development of incompatible uses, roadways, or other facilities adjacent to the airport.

Policy T3.2: Cooperate with the Pullman-Moscow Airport Board to take action as necessary to maintain the viability of the Pullman-Moscow Regional Airport.

City of Moscow Comprehensive Plan (1999)

The City of Moscow's Comprehensive Plan language is similar to the City of Pullman in terms of offering supporting language for improved air transportation. However, it also suggests frustration with the lack of air services stating:

"Efficient transportation connections within Moscow, with surrounding areas, and ultimately with the rest of the world, is crucial for the vitality of our community. Long distance travel between Moscow and other points is hampered by the lack of transportation alternatives. With distances between Moscow and the southern part of the state and other major urban centers being considerable, transportation other than the motor vehicle is often sought."

"…the limited air transportation from the Pullman-Moscow Regional Airport often fails to provide a workable transport option and has serious economic implications. For example, it limits Moscow's potential as a conference center and limits access to the university from other parts of the state and nation. Businesses that frequently use air transportation for their employees are discouraged from locating in Moscow because of the lack of direct air access to their suppliers as well as to the major marketing areas in the nation."

The City of Moscow's adopted policy is: *"continue to work for improved air travel in and out of this area."*

Idaho Air Passenger Demand Study (2003)

This study accurately summarizes Pullman-Moscow Airport's passenger market constraints.

Geodetic Control for an Airport Obstruction Chart Survey at Pullman-Moscow Regional Airport (1999)

This technical report provided valuable information which will be used during Phase 1 to obtain new airport photogrammetry and for conducting field surveys and obstruction mapping.

Site Selection Report Category I Microwave Landing System (MLS) Runway 23 (1993)

This report identified alternative site locations for MLS equipment.

1.8 ENVIRONMENTAL INVENTORY

The purpose of this section is to document PUW's environmental setting and to identify the major environmental features present or near the surface that will be considered as the master plan progresses. The information contained in this chapter may also be used to quantify and compare impacts during the alternatives analysis portion of the master plan. Finally, the information may again be called upon for purposes of estimating environmental impacts, mitigation efforts, and permitting requirements that may be necessary prior to implementing the various projects recommended by this plan. The primary result of this effort is the production of an environmental features map that can be used as a planning tool for the airport. Ultimately, the projects identified by this master plan will be subject to environmental review pursuant to the requirements of the National Environmental Policy Act of 1969 (NEPA) before they can be implemented.

The following discussion is based on data obtained from previous studies, available environmental databases, and reconnaissance-level field investigations.

Environmental Setting

PUW lies within the Palouse region, which is composed of seven counties in the foothills of the Clearwater Mountains. The site topography is composed of depositional landscape characterized by rolling silt and sand, steep rock, and channeled scablands. Whitman County is composed of rolling hills of the Palouse and flat land with elevations ranging from 1,100 to 3,400 feet above sea level. PUW lies at an elevation of 2,556 feet above mean sea level in an area characterized by rolling hills with 5-40% slopes. It is the hilly terrain surrounding the airport that imposes the aeronautical constraints on the facility. Removing the aeronautical constraints or reconfiguring the airfield to reduce their impact on airport operations would undoubtedly require substantial earthmoving. Likewise, significant earthmoving is to be anticipated with any roadway realignment or other major construction in the general vicinity.

The airport is bounded by non-irrigated grain crops south of the airport, property owned by Washington State University to the west, and rolling terrain to the north and east. The University uses their property primarily for agricultural and animal research. The property includes a fruit orchard and several buildings. The City of Pullman zoning map identifies the Airport as "C3 – General Commercial District." The airport is adjacent to unincorporated areas of Whitman County to the north, south and east.

Study Area

The environmental study area applied to this master plan encompasses approximately 560 acres of airport property and adjacent property. The study area was derived using a range of potential runway alignments and associated noise levels generated during the Phase 1 *Airspace Feasibility* investigations. The outer limit of the study area was identified using a noise exposure threshold of 60 average day/night level (DNL) considering a future runway similar to the one included on the current ALP. The study area was selected because it includes and extends beyond the likely limits of potential disturbance associated with airfield reconfiguration.

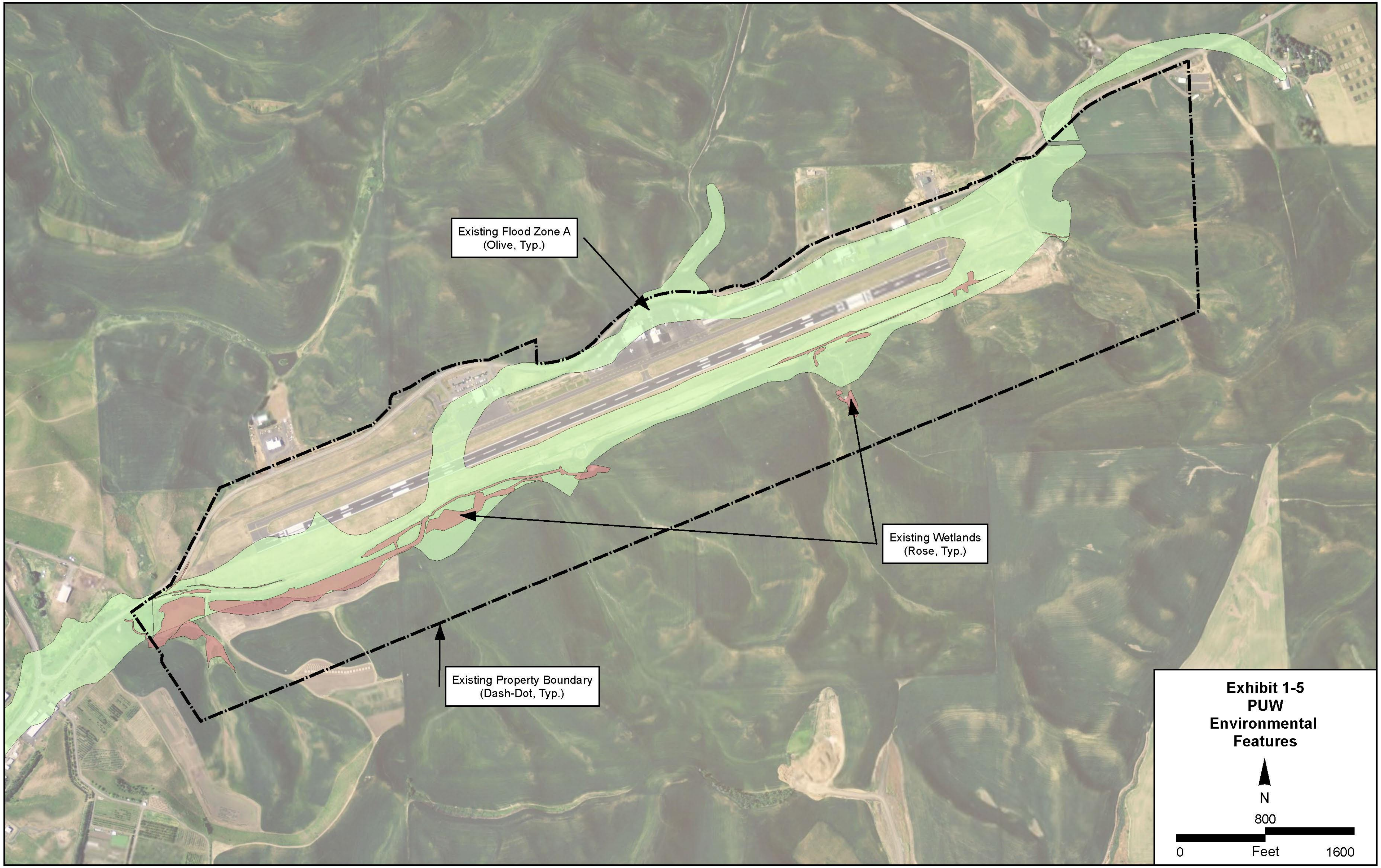
Environmental Features

The following discussion presents known physical resources existing at or near the ground surface within the Study Area. Subsequent assessments will be required for each of the environmental impact categories included in the National Environmental Policy Act (NEPA) as they relate to the specific project components associated with phased master plan implementation.

View to the south, including WSU orchard

Floodplains. Based upon the available Flood Insurance Rate Map for Whitman County, Washington, a portion of the airport and study area centering on the airfield environs is within the 100-year floodplain for Airport Creek (see **Exhibit 1-5**). This area would become inundated following a 100-year storm event. Hazard factors have not been determined.

The proposed project will require substantial earthmoving activities that have the potential to affect drainage patterns and alter the 100-year floodplain. In addition, the proposed project will increase the amount of impervious surface within the floodplain. Project designs will address the increased amount of storm water runoff associated with new impervious surface and other potential impacts to the 100-year floodplains. Coordination with the U.S. Army Corps of Engineers will be required to avoid and minimize impacts and to comply with the U.S. Clean Water Act.


Existing Flood Zone A
(Olive, Typ.)
Existing Wetlands
(Rose, Typ.)
Existing Property Boundary
(Dash-Dot, Typ.)
Exhibit 1-5
PUW
Environmental
Features
N
800
0
Feet
1600

Wetlands and Waters of the U.S. A wetland delineation encompassing a 350-acre area was completed in 2009 and verified by the U.S. Army Corps of Engineers in a letter received on January 13, 2010. The results of the wetland delineation indicate the presence of 14.7 acres of wetlands including riverine wetlands (8.4 acres), sloped wetlands (6.1 acres) and depressional wetlands (0.2 acre) as shown on **Exhibit 1-5**. The results of supplemental site reconnaissance surveys conducted in the remaining 210 acres of the environmental constraints study area in July 2010 indicate that additional wetlands are likely within the RPZs and within the project area south of the airport property boundary that have not been delineated.

Surface Water. Airport Creek flows along Airport Road and the northern boundary. It then routes under runway 5 and continues along the south side of the airport boundary. Several ephemeral streams and fringe wetlands contribute flow to Airport Creek. The Creek is considered Waters of the U.S. and alterations to the creek are regulated by the Army Corps of Engineers.

Biotic Communities/Threatened and Endangered Species. A Biological Scan was performed in July 2010 to identify federally-listed threatened or state-listed threatened species occurring within the 560-acre environmental constraints study area.

Spaldings Silene

Available data obtained from the U.S. Fish and Wildlife Service (USFWS) and the Washington Department of National Resources (WADNR) indicated that three listed species have the potential to be present within the study area:

- Spaldings Silene (*Silene spaldingii)*, a federally-listed and state-listed threatened plant species
- Palouse goldenweed *(Pyrrocoma liatriformis)*, a federal species of concern and state-listed endangered species; and
- Palouse milk vetch *(Astragalus arrectus),* a state-listed threatened species.

None of the listed species was documented as occurring within the study area, and none was observed during the site reconnaissance survey associated with the biological scan (Barthels, 2010b). Moreover, the appropriate habitat associated with each species was not present due to previous site disturbances associated with agricultural activity and airport and university development. The results of the site reconnaissance visit indicated that the 560-acre study area could be characterized “as having virtually no ecologically valuable native habitat due to the fact that the landscape is disturbed (by agricultural or horticultural land uses) or completely developed” (Barthels 2010b).

Cultural and Historic Resources. Section 106 of the National Historic Preservation Act (NHPA), as implemented through 36 CFR Part 800, defines a historic property as "any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in the National Register of Historic Places (NRHP) maintained by the Secretary of the Interior" (36 CFR Section 800.16(l)). Cultural resources, such as archaeological sites with traditional religious or cultural importance to Native American Tribes may qualify as historic resources under the NHPA.

A cultural resources survey was conducted for the 560-acre constraints analysis study area in June 2010 to identify potential archaeological resources and potential historic properties. The survey included a thorough review of records obtained from the Washington State Department of Archaeology and Historic Preservation (DAHP), Washington Information System for Architectural and Archaeological Record Data (WISAARD), National Register of Historic Places (NRHP), and the Washington Heritage Request (WHR) to identify previously identified cultural and historical resources within a 1-mile radius of the study area. A pedestrian survey was also conducted throughout the study area and shovel testing was conducted in areas considered most likely to contain cultural materials.

Cultural Resources

The predominant attraction for Native American and Euro-American populations on the Columbia Plateau was its extensive river systems. The South Fork of the Palouse River divides the City of Pullman approximately 2.2 miles south of the study area (Plateau 2010).

The region that includes the study area is associated with the Palouse and Nez Perce tribes. At contact, other native groups also traversed the area, but the Nez Perce were considered permanent inhabitants of this portion of the Columbia Plateau (Plateau, 2010). Noted places of importance to local tribes include the Palouse site of Palus. The village site is located at the mouth of the Palouse River, approximately 54 miles southwest of the airport.

The results of the records search and review of previous archaeological investigations did not identify any Traditional Cultural Properties (TCPs) within 1.0 mile of the study area. The results of the pedestrian survey did not indicate the presence of Native American cultural materials or features, and no isolated finds were identified (Plateau, 2010). The NHPA requires project sponsors to contact Tribal Historic Preservation Officers (THPOs) or other interested parties to identify potentially previously unknown TCPs. The FAA will initiate consultation with the Confederated Tribes and Bands of the Yakama Nation, the Confederated Tribes of the Colville Reservations, the Spokane Tribe, and the Nez Perce Tribe either as part of this master plan or as part of forthcoming environmental assessment processes.

Historical Resources

PUW was established in 1932 as a training location for the Civilian Pilot Training Programs for both the University of Idaho and the State College of Washington. Construction was undertaken by the Civilian Conservation Corps (CCC) until 1934 and overtaken by the Civil Works Administration (CWA). PUW was originally a turf runway and now encompasses a paved runway, terminal, and aviation-related businesses. Beginning in 1940, the airport served as a training and flight school for the Army Air Corps. Cultural deposits associated with the CCC appear to have been obliterated by the construction of subsequent facilities including parking areas and paved aviation surfaces.
A previous cultural survey indicated the presence of one historic airplane hangar that was constructed in approximately 1938. Although this structure was recorded, it was not considered eligible for the National Register of Historic Places and has been removed (Plateau 2010).

Several structures associated with Washington State University (WSU) are located southwest of the runway (*see adjacent photos*). The structures are of metal pole construction and appear to be less than 50 years in age. None of the buildings exhibited important design or construction features. Based on the photographic documentation, these buildings did not appear to individually meet the *National Register Criteria for Evaluation* because they appeared to be less than 50 years in age and did not appear to possess exceptional significance.

The results of the pedestrian survey identified the presence of one historic site and two historic-era isolates southeast of the current runway. No buried deposits were encountered.

One site, a historic scatter, was identified in a swale between hills southeast of the current runway. Based on a photograph located at the Inter-state Aviation office, the scatter appears to be associated with a homestead that was sold to support airport constructional though no record of the homestead appears on maps or other records.

The scatter consists of mostly domestic debris, such as bottle glass fragments of various colors. Approximately 25 glass shards were identified, as well as metal bolts that appear to be related to agricultural machinery. Because homesteading in the Pullman-Moscow area was established circa 1870, it is likely that the scatter dates to 1870 or afterward. All of the artifacts associated with the scatter were identified in the active plow zone, are widely dispersed, and no artifact concentration or midden was identified. The artifacts have been redistributed by tilling and harvesting and do not retain integrity. No architectural or structural materials were identified.

The two isolates identified during the field investigation are likely associated with the historic scatter, but were too distant from the scatter to be considered part of that site. One isolate is a heavily rusted, flattened metal muffler related to farming equipment and was present on the surface of a wheat field. No distinguishing characteristics were identified (serial number, company name, etc.). The second was a single fragment of an amethyst bottle glass. The isolate were identified in the plow zone and do not retain integrity.

Shovel probes were excavated in the southwest of the airport on WSU Property. This locate was selected because the terrain appeared to have little disturbance associated with agriculture or mechanical grading and appeared to be intact. No cultural materials were identified in the probe.

Chapter 2: Aviation Forecasts

Overview

This chapter contains aviation demand forecasts for the Pullman Moscow Regional Airport (PUW). Aviation demand forecasts use a sophisticated analytical process to anticipate what will happen at the airport in the future. Forecasts are an important step in the master planning process. Ultimately, they form the basis for future demand-driven improvements. They also provide data from which to estimate current and future "off-airport" impacts such as noise and over-flight traffic. Aviation demand forecasts provide value to the larger community, and are often incorporated by reference into other studies and policy decisions. This chapter presents aviation demand forecasts over the 20-year planning horizon from 2010 through 2030. It is organized as follows:

2.1 Airline Passenger Forecasts
2.2 Airline Operations
2.3 Based Aircraft Forecasts
2.4 Forecasts of Non-Scheduled Operations
2.5 Forecasts Summary and TAF Comparison

The FAA's ***National Plan of Integrated Airport Systems*** (NPIAS) categorizes Pullman Moscow Regional Airport as a "Primary Non-hub Airport." The NPIAS defines a Non-hub Primary as a commercial service airport that has more than 10,000 annual enplanements. The 2011-2015 NPIAS reported that there are 244 non-hub primary airports that together account for 3% of all enplanements nationwide. The NPIAS identifies existing and proposed airports that are significant to the national air transportation system. It contains estimates of costs of airport development projects eligible for federal aid that are needed to meet aviation demand over the next five years.

Passenger enplanements are passengers boarding commercial service aircraft departing from PUW. Enplanements do not include airline crew that do not produce revenue or incur aviation related fees such as Passenger Facility Charges (PFCs). The terms "boardings" and "enplanements" are used interchangeably in this chapter.

2.1 Airline Passenger Forecasts

The airline passenger forecast describes the expectations for future scheduled commercial passenger airline service at PUW. The airline passenger forecast is particularly important to this master plan because significant emphasis is placed on meeting FAA airport design standards required by the Bombardier Q400 airplane operated by Horizon Air. Additionally, there is a direct connection between commercial passenger service and federal funding. In 2010, the airport received $1 million per year through FAA annual entitlements as well as a per passenger facility charge currently set at $4.50 per enplaned passenger. This section considers historic trends, previous studies, and an indpendent analysis in formulating the airline passenger service forecast recommendations.

Historical Perspective

As shown in **Table 2-1** and **Exhibit 2-1**, PUW averaged just over 30,500 annual enplanements between 1990 and 2009. Passenger volume has remained consistent in the first 10 years, and then enplanements declined between 1999 and 2004. Since 2004, PUW has experienced a period of sustained recovery. Horizon Air was the sole provider of scheduled airline service at PUW between 1990 and 2009. Beginning in 2010, Horizon Air combines passengers at PUW with those of Lewiston for its flights to Seattle and Boise.

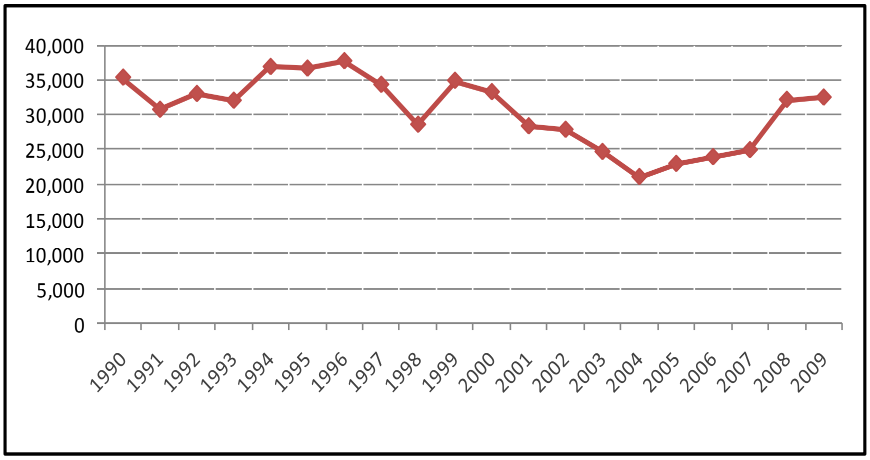
The increase in passenger boardings since 2007 runs counter to the national trend. Nationally, enplanement numbers have declined since the U.S. economy entered a recession in 2008. During this same period, many regional airports experienced a reduction or elimination of scheduled commercial passenger airline service as air carriers reduced their available seat capacity. Enplanement growth at PUW was aided when Horizon Air transitioned from the 37-seat Q-200 to the 76-seat Q-400 without reducing flight frequency.

Table 2-1: Travel Frequency

Year	Boardings
1990	35,320
1991	30,680
1992	32,960
1993	31,987
1994	36,851
1995	36,622
1996	37,687
1997	34,283
1998	28,524
1999	34,858
2000	33,221
2001	28,291
2002	27,794
2003	24,596
2004	20,980
2005	22,874
2006	23,838
2007	24,856
2008	32,108
2009	32,443

Source: 1990-1999: Prior master plans; 2000-2009 Air Carrier Activity Information System

Exhibit 2-1: PUW Annual Enplanements from 1990–2009



Previous Studies

Several previous studies have assessed passenger boardings at PUW. This section summarizes those studies and the context in which they were conducted. The results are consolidated in **Table 2-2** below for comparison.

Table 2-2: Previous Forecast Summary

Calendar Year	TAF[1]	FAA AF[2]	LATS[3]	IASP[4]	AMP P1 (2007)[5]
2009 (actual)	33,516	33,516	33,516	33,516	33,516
2015	37,103	38,868	29,100	28,437[5]	36,214
2020	41,095	43,976	32,000	30,933[5]	45,346
2030	50,471	52,932	37,800	36,601[6]	71,274[6]

1. *Terminal Area Forecast – Federal Aviation Administration, 2009). TAF values apply federal fiscal year.*
2. *Aerospace Forecast – Federal Aviation Administration, 2010-2030*
3. *Washington Aviation System Plan, Long-Term Air Transportation Study (Washington Department of Transportation, July 2009)*
4. *Idaho Airport System Plan, Individual Airport Summary – Pullman-Moscow Regional Airport (Idaho Transportation Department, Division of Aeronautics, 2009)*
5. *Pullman-Moscow Regional Airport, Master Plan Phase 1 – Airspace (Mead & Hunt, Inc, July 2007)*
6. *Projection interpolated between published forecast intervals.*
7. *Projection extrapolated beyond published forecast period using the end-period growth rates.*

- **Terminal Area Forecast (TAF) 2009–2030 (FAA, December 2009)** – The TAF is the FAA's official forecast for airports included in the National Plan of Integrated Airport Systems—NPIAS. The TAF is used primarily to support federal budgeting and planning needs. The FAA uses the TAF as a benchmark for comparing and approving master plans and other forecasts for individual airports. The TAF projects that PUW's annual enplanements will reach 50,471 by 2030. The TAF assumes a compounded annualized growth rate (CAGR) of 2.05% through 2015, followed by a progressively increasing CARG of 2.05% to 2.08% between 2015 to 2020.

- **Aerospace Forecasts FY 2010–2030 (FAA, March 2010)** – The FAA Aerospace Forecast is a macro forecast for aviation activity in the US. It provides details about growth within the individual aviation segments as opposed to specific airport activity. The Aerospace Forecast projects that regional seats per mile will increase from 55 (2009) to 65 (2030) with a corresponding increase in average trip length from 457 miles to 588 miles. This means that regional carriers will continue the transition to larger airplanes flying longer segments. The forecast makes note of significant growth in the 70 to 90 seat airplane group, and corresponding retirement of 50-seat regional jets. It also notes an anticipated decline in service between city pairs that are less than 750 miles apart. Air travel on the whole is expected to recover over 2009 and 2010 with a return to profitability driven by a return in corporate travelers and ability to raise fares. Nationwide, enplanements are projected to increase 0.4% in 2010 and 2.6% thereafter.

- **Long-Term Air Transportation Study (LATS) (Washington Department of Transportation, July 2009)** The LATS study also uses a 2030 planning year horizon. It projects Washington passenger enplanements will increase at a 2.5% CAGR while airline operations will increase at a 2.1% CAGR. It notes that Seattle and Spokane account for 96% of Washington's total enplanements. This ratio is expected to remain through the study period, leaving small communities at risk of losing scheduled commercial passenger airline service. It also notes that the peak passenger demand at PUW may reach 93% of its terminal capacity within the forecast horizon. The threshold to begin planning work is 60% of capacity so PUW's passenger terminal may need to be evaluated for expansion. PUW's enplanements are projected to increase to 37,800 by 2030. The LATS report projected 26,200 enplanements at PUW in 2010. PUW's 2010 enplanements are anticipated to exceed those experienced in 2009 (32,443). The analysis used in the study was completed in 2005, before Horizon Air converted to the larger Q400 aircraft.

- **Idaho Airport System Plan (Idaho Transportation Department, 2008)** – Idaho's plan includes an individual airport summary report for PUW since Idaho entities participate in the airport's operation. The plan projects an increase in PUW enplanements of 1.70% per year during the planning horizon. The report uses a 2007 base year volume of 24,856 enplanements and projects 34,800 enplanements by 2027.

- **Airport Master Plan, Phase 1 – *Airspace Feasibility* (Mead & Hunt, 2007)** – The majority of the forecasting effort for this document was completed ahead of the U.S. recession in 2005 and 2006. The report projected that the planned conversion to larger aircraft would help stimulate local travel demand. It also included better all-weather approaches that had several positive impacts. It removed constraints and was expected to recapture leaked passengers and prompt the addition of new service. To model these changes, the Phase 1 report applied a 3.06% CAGR between 2005 and 2010 followed by a more aggressive 4.62% CAGR associated with improved facilities. The Phase 1 forecast projected 28,897 enplanements in 2010 and 56,874 enplanements by 2025.

Independent Analysis

The independent analysis was conducted specifically for this master plan, and used a variety of models to estimate future passenger enplanements at PUW. The analysis first considered the primary influences and evaluated various regression and share models. It then assessed the specific airline market dynamics in place and defined several scenarios before making a final recommendation.

Primary Demand Influences

Many factors influence passenger travel demand and the level of interest by airlines for serving that demand. Most are beyond the control of the individual airport operator including the overall airline strategy, economic cycles, and community composition. Nonetheless, they do impact demand at the airport and are part of the calculation process. This plan identifies the following primary demand influences for PUW.

- **Proximity to Spokane and Lewiston** — PUW-area travelers have a great deal of choice in selecting an airport. Spokane is 75 miles north and Lewiston is 35 miles south. Spokane has a greater choice of airlines, flight frequency, and destinations. However, it's less convenient for travelers who travel to Seattle or Boise or for those using the Alaska Air network due to driving distance to access Spokane. Lewiston offers a Delta hub-connection at Salt Lake City.
- **Proximity to Population and Employment Centers** — Although PUW is located between competing airports, PUW's location is central to the Pullman-Moscow population and its employment centers, making it the most convenient airport for passengers in these communities. The area's ability to attract new business and residents is well-documented and is expected to improve over the 20-year forecast horizon.
- **Social and Economic characteristics** — The population around PUW includes a highly transient university population, and has a median age lower than the U.S. average. The area's economy is concentrated in growing industries including technology and medical services. These social characteristics likely contribute to the higher propensity of the area's population to travel. This directly influences passenger choice between PUW and Lewiston with PUW having a clear advantage for both travelers and airlines alike.
- **PUW's Airport Infrastructure** — Reliability is another consideration often cited by the local population for choosing an airport. During the winter months when weather-related cancellations and delays are higher at PUW, demand shifts to other airports. An airline market analysis revealed that many passengers opt to travel on the Horizon/Alaska network from Spokane or Lewiston where travel costs and routings are similar. PUW will likely retain a large portion of this leaked travel segment over time as infrastructure and technology improvements make air service more reliable.

- **Increasing Fleet Size** — The size of the airplanes serving regional airports has been increasing since 2001. Flight segment lengths have also increased. The emerging business model across the industry aims to improve the profit margin by transporting more passengers over longer distances. The move by Horizon to the Q400 aircraft is a reflection of an industry wide shift to larger aircraft. The change to the Q400 is an indicator that service will increase at PUW over time.

Alaska/Horizon Air Q400

- **Competing Airline Strategies** — The corporate structure of Horizon Airlines, its relationship to Alaska Airlines and competition between airlines all impact demand forecasts. Horizon's route choices and marketing will be made by Alaska Air beginning in 2011. Alaska's influence over Horizon is expected to increase over time, and could lead to the elimination of the Horizon brand name. If that happens, the linked service between Pullman and Lewiston will receive a critical review for operability and profitability. This scenario could mean reduced service for each airport, withdrawal from one airport or potentially a withdrawal from both airports. If withdrawal is considered from one airport, PUW may have an advantage. Alaska/Horizon might consider PUW's accessibility as a natural barrier to entry for small jet operators. This is especially true if the new entrant carriers at Lewiston draw significant passenger volume from its network. Alternatively, PUW's facilities could be perceived as less advantageous than Lewiston's if Alaska/Horizon has concerns about service reliability. Finally, in the current consolidated environment, a merger between Alaska and another large carrier seems likely during the 20-year forecast period of this plan.

Regression Models

Regression modeling, including time trend extrapolation, involves comparing one or more independent variables with a dependent variable. Here, the model was used to establish a correlation between independent variables including population, employment and income with the dependent variable of passenger enplanements. Forecasts of passenger enplanements can then be projected as a factor of the independent variables. The key to regression modeling is identifying a reasonably reliable degree of historic correlation between the independent and dependent variables. At PUW, like other single-airline or low volume airports, the correlation between passenger boardings and the standard independent variables was poor. The highest correlation was found with increases and decreases in flight frequency. Here, minor changes have significant results on reporting activity within any given reporting period. As a result, regression models have not been carried forward for further consideration.

Share Analysis

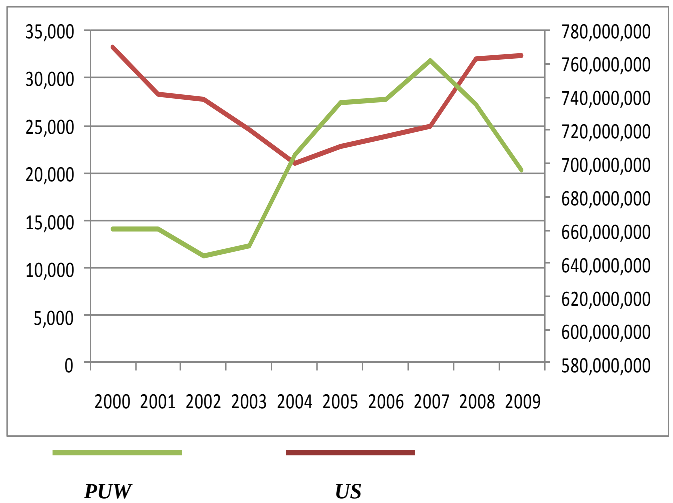
This macro-forecasting technique involves assessing PUW's specific activity as a function of a larger market share. The 1999 Master Plan correlated PUW's boardings with those of the Seattle-Tacoma International Airport (Sea-Tac). As with the regression models and those of the prior master plan, no trend can be shown to exist (**Exhibit 2-2**). The same conclusion can be drawn when comparing PUW's enplanements with enplanements for the state of Washington and national enplanements for the U.S. (**Table 2-3** below).

Table 2-3: Historic Passenger Enplanements

CY	Airport Boardings			
	PUW	SEA-TAC	WA State	Total US
2000	33,221	13,853,299		660,222,828
2001	28,291	13,978,247	15,155,648	660,222,828
2002	27,794	12,752,655	14,819,257	643,776,534
2003	24,569	12,974,543	14,980,580	650,808,785
2004	20,980	13,910,447	16,124,519	705,306,663
2005	22,874	14,253,934	16,501,336	736,162,135
2006	23,838	14,603,413	16,956,698	738,364,097
2007	24,856	15,117,907	17,903,549	762,282,686
2008	32,108	15,963,252	18,360,850	735,296,907
2009	32,443	14,911,310	17,680,430	695,908,763

Source: Air Carrier Activity Information System (ACAIS) database

Exhibit 2-2: Annual Enplanements (PUW vs. total US)



Market Assessment

Mead & Hunt conducted an airline market assessment in 2006 and again in 2010. Those reports provide detailed insight as to what is occurring within PUW's potential passenger pool (see **Appendix C,** *Market Outlook and Airline Assessment).* **Exhibit 2-3** depicts PUW's catchment area—the geographic area it serves. The catchment area is based on drive-time to PUW and competing airports. It is bordered to the south by Lewiston and to the north by Spokane. It is comprised of 30 zip codes and has a population of approximately 78,000 (2009). Passengers within the catchment area should utilize PUW. Passengers opting to use another airport are described as being "leaked" or "diverted". **Exhibit 2-4** shows the catchment areas current airport use, whereby PUW retains 26% of the aggregate demand. Just over half (52%) opt to use Spokane International Airport (GEG).

Exhibit 2-3: PUW Catchment Area

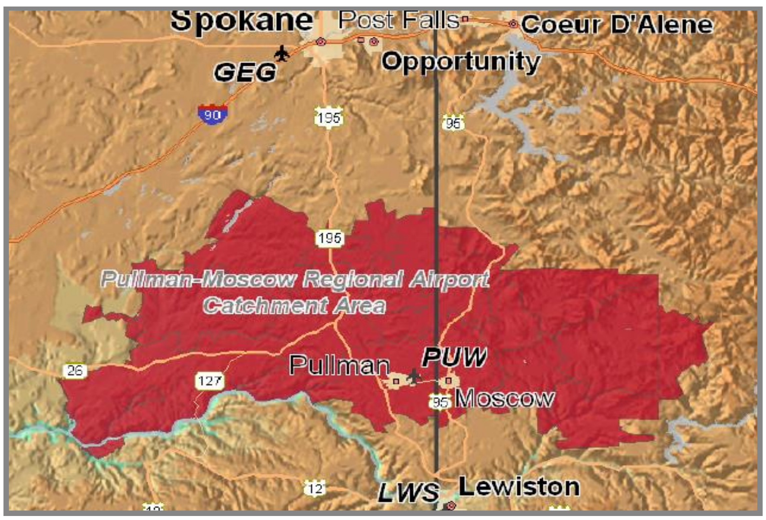


Exhibit 2-4: Current Use in Catchment Area

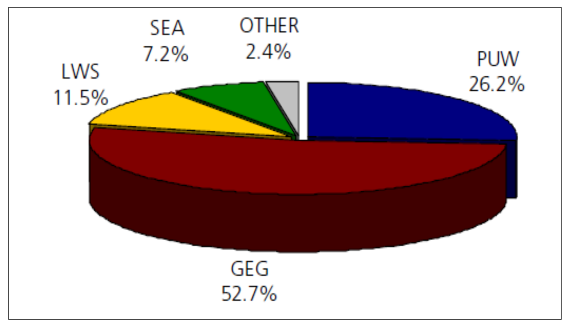


Table 2-4: Airport Use – Domestic and International Comparison				
Rank	Originating Airport	Passengers	2009 %	2006 %
Domestic				
1	Spokane, WA	117,431	53	55
2	Pullman-Moscow, WA	59,020	27	27
3	Lewiston, WA	27,030	12	12
4	Seattle, WA	12,892	6	5
5	Other	4,840	2	1
Subtotal		**221,213**	**100**	**100**
International				
1	Spokane, WA	17,395	50	50
2	Pullman-Moscow, WA	7,912	23	23
3	Seattle, WA	5,611	16	21
4	Lewiston, WA	2,357	7	5
5	Other	1,234	4	1
Subtotal		**34,509**	**100**	**100**
Domestic and International				
1	Spokane, WA	134,826	53	55
2	Pullman-Moscow, WA	66,932	26	27
3	Lewiston, WA	29,387	12	12
4	Seattle, WA	18,503	7	6
5	Other	6,074	2	1
Total		**255,722**	**100**	**100**

Other airports include PDX, BOI, PSC, YKM, EAT, ALW

Table 2-4 details passengers by domestic and international itineraries. 27% of domestic and 23% of international travelers used PUW. Retention has changed little since the previous analysis conducted in 2006.

The market assessment provides a basis for estimating the area's passenger travel market in terms of both its population and their propensity to use air transportation. It identifies the most popular destinations and routes. Forecasts for the catchment area can be assessed as a function of population that cannot be reliably predicted for PUW alone. Catchment area forecasts using this model assume that the propensity to travel measured in terms of trips generated per person, remains constant, and that the catchment area's population grows 0.93% annually. PUW-specific forecasts can then be estimated as a percent of the retained catchment area passenger demand. Airport developments which improve reliability may enhance retention over time, which further improves with additional airline service. **Table 2-5** summarizes projected catchment area enplanements and PUW-specific enplanements for current retention (26%) and recaptures 5% and 10% of catchment area enplanements, respectively.

Table 2-5: Market-Based Enplanement Forecast					
Forecast Year[1]	Catchment Population[2]	Catchment Enplanements[3]	PUW 26% Capture	PUW 31% Capture	PUW 36% Capture
2010	78,725	129,050	32,745[4]	40,006	46,458
2015	82,455	135,164	35,143	41,901	48,659
2020	86,361	141,567	36,807	43,866	50,964
2025	90,452	148,273	38,851	45,965	53,378
2030	94,737	155,297	40,377	48,142	55,907

1. Calendar Year
2. Constant 1.64 PUW enplanements per person based on CY 2009.
3. Applies a capture of 25.37% reflective of CY 2009 retainage based on 32,443 PUW enplanements and 78,000 catchment area population.

Source: Woods & Poole Economics

Forecasting Scenarios

Based on the information available, the following three scenarios are considered as 20-year possibilities that airport management should consider in planning contingencies moving forward.

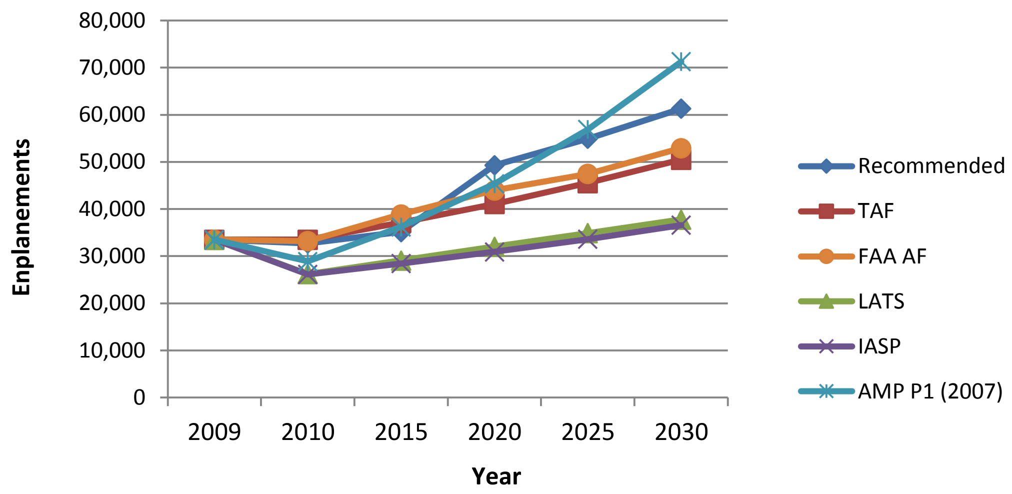
- **Airline Scenario 1, *Status Quo***— This scenario assumes that catchment area passengers will increase over time as a function of population growth and that PUW's share of passengers will remain 26% over the forecast horizon.
- **Airline Scenario 2, *5% Market Recapture***—PUW is able to recapture 5% of its leaked market share by making airport improvements that improve reliability and the associated passenger perceptions.
- **Airline Scenario 3, *10% Market Recapture***—PUW recaptures 10% of its leaked market share. In this case, airline operators recognize improved reliability and stimulate additional growth through a combination of schedule and frequency improvements, marketing, and service to additional markets.

Additional scenarios are also recognized that include market share recapture greater than 10% as well as the potential for reduced, disrupted, and discontinued airline service. Recapture above 10% may be possible with successful airline experimentation. Recapture above 10% can also occur during a forecast scenario of greater than 20 years as the service continues to build off its own success. Discontinuation is also a possibility given the dependence of PUW on a single regional carrier operating a single airplane-type.

Recommended Passenger Enplanement Forecast

This master plan recommends the selection of a hybrid of the three market-based scenarios described above where Scenario 1 is applied to the short term before airfield improvements and Scenario 2 is applied immediately following those improvements. **Exhibit 2-5** identifies the master plan preferred forecasts in comparison with others discussed in this section.

Exhibit 2-5: Enplanement Forecast Comparison



Year	Recommended	TAF	FAA AF	LATS	IASP	AMP P1 (2007)
2009	33,516	33,516	33,516	33,516	33,516	33,516
2010	32,745	33,516	33,214	26,200	26,138	28,897
2015	35,143	37,103	38,868	29,100	28,437	36,214
2020	49,286*	41,095	43,976	32,000	30,933	45,346
2025	54,933*	45,536	47,475	34,900	33,608	56,888
2030	61,307*	50,471	33,516	37,800	36,601	71,274

**Assumes new runway available by 2016*

1. *Terminal Area Forecast – (Federal Aviation Administration, 2009). TAF values apply federal fiscal year.*
2. *Aerospace Forecast – Federal Aviation Administration, 2010-2030*
3. *Washington Aviation System Plan, Long-Term Air Transportation Study (Washington Department of Transportation, July 2009)*
4. *Idaho Airport System Plan, Individual Airport Summary – Pullman-Moscow Regional Airport (Idaho Transportation Department, Division of Aeronautics, 2009)*
5. *Pullman-Moscow Regional Airport, Master Plan Phase 1 – Airspace (Mead & Hunt, Inc, July 2007)*
6. *Projection interpolated between published forecast intervals.*
7. *Projection extrapolated beyond published forecast period using the end-period growth rates.*

2.2 Airline Operations

Airline operations are normally projected as a function of average seat capacity and average load factor--the percentage of seats that are filled. Since PUW has a single airline operating a single airplane-type, the calculation was relatively straightforward using the recommended enplanement forecasts of **Table 2-6**. It is anticipated that aircraft seating capacity will remain constant. It is anticipated that the airline will continue to operate out of PUW to the Seattle and Boise markets as a tag service with Lewiston. No new carriers are expected at PUW during this period.

Load Factor Analysis

Load factor (LF) is a measure of how much an airline's carrying capacity is used. Load factor is measured in terms of passenger miles flown as a percentage of seats available. Currently, PUW conducts five daily "turns", or arrival/departure cycles, on its airline apron. The current schedule includes three daily arrivals from Seattle, two daily departures to Seattle, a one-stop [Lewiston] departure to Boise, a one-stop [Lewiston] departure to Seattle, and a one-stop [Lewiston] arrival from Boise. One of the Seattle arrivals deplanes at PUW and continues to Lewiston (LWS), but does not board any outbound passengers from PUW. Because all of the Horizon flights operating at PUW are combined with passengers going to or from LWS, some assumptions must be made with respect to the combined PUW-LWS service. In particular, LWS's contribution to average load factor over time must be assigned a value. The following two scenarios were considered in this regard:

- **LF Analysis Scenario 1, *Combined PUW-LWS Service*** – This scenario assumes that Horizon will continue to operate its PUW-LWS service as a single, combined market. The main benefit in doing this is to retain service to a market that may not be viable if decoupled. In this scenario, it is anticipated that LWS passengers would account for 42.66% of the combined enplanements based on PUW's current 26% retention of its market share. PUW's recapture of up to 10% of its diverted market would result in a decrease of LWS's proportionate share to 35% by 2030. The existing flight schedule could accommodate the combined demand through 2020, after which, an additional "turn" (2 daily operations) would be required. When combined with the daily departures to LWS that do not load passengers, a total of 4,380 operations at PUW would be necessary to support Scenario 1.

- **LF Analysis Scenario 2, *Alaska Consolidation to PUW*** – This scenario assumes that Horizon will proceed with its efforts to eliminate the combined service, choosing to consolidate its operation at PUW after 2010 and before 2015. The analysis assumes that half of the LWS passengers will commute to PUW, and the other half will elect to use another airport, airline, or transportation mode. Although enplanements at PUW would increase considerably, the combined reduction in total passengers would likely result in a reduction in aircraft operations in the short term. The four daily flights between the two airports would also be eliminated. In this scenario, total air carrier operations at PUW are estimated to be about 1,000 fewer than Scenario 1 by year 2030.

Table 2-6: Load Factor Analysis Scenarios

Load Factor (LF) Analysis Scenario 1, Combined PUW-LWS Service

Year	Enplanements			Average Annual Seats			Load Factor	Operations		
	PUW	LWS*	Combined	2 daily departures	3 daily departures	4 daily departures		Boarding Ops	Non-boarding Ops	Total Ops
2010	32,745	24,358	57,103		83,220		68.62%	2,190	1,460	3,650
2015	35,143	26,142	61,274		83,220		73.64%	2,190	1,460	3,650
2020	43,886	27,380	71,266		83,220		85.64%	2,190	1,460	3,650
2025	49,533	28,677	78,210			110,960	70.49%	2,920	1,460	4,380
2030	55,907	30,036	85,943			110,960	77.45%	2,920	1,460	4,380

* LWS boardings account for 42.66% of combined PUW-LWS boardings based on 26% PUW catchment area capture of Table 2-4 through forecast pe
Non-boarding operations consist of 2 daily departures to LWS that do not load passengers at PUW times 2 (to include landings in the operations va
Flights require a minimum load factor of 65% for departures.

Load Factor (LF) Analysis Scenario 2, Alaska Service Consolidates at PUW

Year	PUW	LWS*	Combined	2 daily departures	3 daily depar-tures	4 daily departures	Load Factor	Boarding Ops	Non-boarding Ops	Total Ops
2010	32,745	24,358	57,103		83,220		68.62%	2,190	1,460	3,650
2015	48,214	0	48,214	55,480			86.90%	1,460	0	1,460
2020	57,576	0	57,576		83,220		69.19%	2,190	0	2,190
2025	63,872	0	63,872		83,220		76.75%	2,190	0	2,190
2030	70,925	0	70,925			110,960	63.92%	2,920	0	2,920

* LWS boardings account for 29% of combined PUW-LWS boardings based on 26% PUW catchment area capture of Table 2-3 through 2010 prior to consolidation at PUW. 50% of LWS's Alaska network passengers will board at PUW following Alaska station consolidation; the rest will either board at another airport or use another airline network. PUW's passenger values increase. PUW non-boarding operations are discontinued after 2010 following Alaska station consolidation. Flights require a minimum load factor of 65% for departures.

Air Carrier Operations Summary and Recommendations

This master plan projects that air carrier operations will increase from 4,000 operations in 2010 to 4,380 operations by 2030 (**Table 2-7** adjacent) over the 20-year horizon. The projection is based on the load factor analysis of the previous section and the need to apply conservative planning principals forming an adequate response to growth. For comparison, the FAA TAF is a straight-line 4,000 operations over the same period.

Table 2-7: Air Carrier Operations Forecast

Year	Air Carrier Operations
2010	4,000
2015	4,092
2020	4,186
2025	4,282
2030	4,380

2.3 Based Aircraft Forecasts

The FAA defines based aircraft as those that are "operational and air worthy" and typically based at the facility for a majority of the year. Projections of based aircraft are used primarily to plan hangar and apron development, as well as other landside facilities such as vehicle parking. They also provide a means for estimating the number of operations being conducted by based aircraft. This section will review PUW's current and past volume of based aircraft, the various factors that influence demand for based aircraft and previously published forecasts of based aircraft at PUW. Based on these factors, a recommended forecast for based aircraft will be presented for use in this plan along with the rationale behind it.

Historical Perspective

The number of aircraft based at PUW has changed only modestly over the last 20 years. Data from the 1999 Master Plan, the LATS Study, and other sources show slightly different numbers for any given year, but all fall into the same general range as indicated by the TAF. Single-engine aircraft dominate the based aircraft fleet mix. Since 1997, the airport has added three singles engine, two turbo-props, and three jets. **Table 2-8** summarizes the historic based aircraft record by aircraft category.

Table 2-8: Historic Based Aircraft by Category

Year	Single Engine	Multi Engine	Turbo Prop	Turbo Jet	Helicopter	Total
1997	53	7	0	0	0	60
1998	55	6	3	0	1	65
1999	55	6	3	0	1	65
2000	55	6	3	0	1	65
2001	55	6	3	0	1	65
2002	55	7	1	1	0	64
2003	55	7	1	1	0	64
2004	56	7	1	1	0	65
2005	56	7	2	3	0	68
2006	58	7	2	3	0	70
2007	59	7	2	3	0	71
2008	58	7	2	3	0	70
2009	57	7	2	3	0	69

Sources: PUW, WSASP Database 2010 Airport Facilities Report, 1999 Pullman-Moscow Regional Airport Master Plan Update.

Demand Influences

Demand, or the desire to base an airplane at an airport, is normally assessed in terms of "natural" or "unconstrained" demand. That differentiation is important because PUW's space available for aircraft storage is fully occupied with limited opportunity for expansion beyond one or two airplanes. Although the airport is near capacity, this master plan asserts that the limitation is only now fully realized and that the existing composition of based aircraft is, in fact, a realistic reflection of "unconstrained" demand. The ability to accommodate additional airplanes is non-existent until some development constraints are resolved and new airplane storage capacity is added.

Outside of capacity, the primary influences on demand are differentiated by the aviation segment and can be summarized as follows:

- **Facilities and Services Available**— Factors such as runway length, instrument approaches, lighting, and weather aids directly influence the type of activity that can be reasonably accommodated. The airfield factors are important for business and corporate operators in particular given their more demanding operational needs. Maintenance services, fuel, and availability of Airport Rescue and Firefighting (ARFF) are also attractive to many airplane owners. The facilities and services available at PUW capture a majority of airplane owners in the vicinity.

- **Proximity to Other Airports**— Airports compete with each other if the driving time between them is 30 to 60 minutes and either airport meets that owner's basic requirements. In this case, airplane owners make a value decision where the total cost is usually a primary consideration. Large business operators may evaluate and compare PUW with LWS for example, while smaller airplane owners may also consider Port of Whitman (S94), located 22 miles northwest of PUW.

- **Economic Makeup of Locality**— Based aircraft projections are calculated through a combination of the demand from business and personal use. A business looking to establish a presence in the Pullman-Moscow region may assess the aviation access requirements in addition to other business needs in the community such as available labor and proximity to related businesses. The area has been acknowledged by both government and trade organizations as a top location to live, work, and establish a business. In terms of private airplane owners, projections for based aircraft are a function of the size of the population and the prevalence for aircraft ownership. PUW will have more based aircraft than competing airports given its proximity to the region's population, business, economic, and education centers.

- **Regulation and Cost**— Regulatory changes often drive the cost for owning and operating aircraft. For example, airplane certification and inspection is highly regulated for purposes of enhancing safety. Should these requirements increase, they may translate into higher costs for aircraft parts and maintenance. Regulatory changes within the past decade have increased the cost of ownership and made fractional aircraft ownership a reality. This trend is accelerating the growth of business jets, charter services, and potentially a new generation of very light jets (VLJs). Most recently, many states have enacted new taxes on aviation users for registration, fuel, parts, and services. Higher regulatory costs tend to disproportionately impact operators of small airplanes in terms of long-term trends in the national fleet mix.

- **National Trends**—Long-term trends will be reflected in future volume and mix of aircraft across all airports. The most significant trends include:
  - Consistent long-term growth of business and corporate jet airplanes
  - Continued rapid expansion of the helicopter fleet
  - Continued decline in light piston airplanes with some potential for recovery in the long term; and
  - The anticipated emergence and growth of unmanned aerial vehicles (UAVs) into civil applications

Attrition of Older Aircraft—PUW's current based aircraft fleet is comprised primarily of single-engine piston aircraft. Most of these aircraft are more than 35 years old. On a national scale, they are retiring at a much faster rate than their newer generation replacements. PUW should anticipate an evolving fleet mix in favor of larger turbine airplanes over the planning period. Although the mix will most certainly evolve this way, light piston airplanes will continue to dominate the based fleet mix through planning year 2030 and beyond.

Review of Published Forecasts

Based aircraft projections for PUW range from 78 to 105 as summarized in **Table 2-9**.

Table 2-9: Currently Published PUW Forecasts of Based Aircraft

Year	TAF[1]	LATS[2]	IASP[3]	AMP-P1[4]
2010	72	69[5]	69[5]	74
2015	74	77[6]	72[6]	81
2020	76	85[6]	75[6]	88
2025	78	95[6]	79[6]	96
2030	78	105	82[7]	104[7]

1. *Terminal Area Forecast (FAA, 2009). TAF values apply federal fiscal year.*
2. *Exhibit ES-17, Washington Aviation System Plan, Long-Term Air Transportation Study (Washington Department of Transportation, July 2009)*
3. *Idaho Airport System Plan, Individual Airport Summary - Pullman-Moscow Regional Airport (Idaho Transportation Department, Division of Aeronautics, 2008)*
4. *Pullman-Moscow Regional Airport, Master Plan Phase 1 – Airspace (Mead & Hunt, Inc, July 2007)*
5. *Number of based aircraft as of September 2010.*
6. *Value interpreted between reported values using percent growth method.*
7. *Value extrapolated beyond reported value using percent growth method.*

Independent Analysis and Forecast Recommendation

Forecasts using time-trend analysis, population growth models, national based aircraft fleet growth, and national fleet mix trends were also prepared and are summarized in **Table 2-10**.

Table 2-10: Forecasts Using Other Methodology

Year	Time Trend[1]	Population Growth[2]	National GA Inventory Growth[3]	National Growth by A/C Class[4]
2010	70	69	69	69
2015	73	72	72	70
2020	77	76	75	71
2025	81	79	79	73
2030	85	83	83	77

1. *Time trend for total based aircraft based on data contained in Table 2-6.*
2. *Population Growth assumes constant number of based aircraft per person, applying an annualized growth rate of 0.93%.*
3. *National GA Inventory Growth applies the national growth rate of 0.9% for the entire U.S. Fleet (FAA Aerospace Forecasts FY 2010-2030).*
4. *National Growth by Aircraft Class applies the national growth rate applied to turbo-jets, turbo-props, helicopters (assuming one based helicopter by 2015), and piston airplanes (FAA Aerospace Forecasts FY 2010-2030).*

The forecast range for based aircraft is between 77 and 85 if the Phase 1 and LATS projections are removed. This is a fairly narrow margin with a difference of only 10%. It is noted that the Phase 1 forecast was entirely centered on turbo-props and turbo-jets with only a cursory review of the single and multi-engine piston fleet. It is also likely that Washington State's LATS system plan copied the Phase 1 recommendation and extrapolated the forecast to fit that's study's planning horizon. Given the narrow range of the remaining projections, this master plan recommends the most aggressive forecast, the time-trend analysis (85 based aircraft by 2030), to ensure conservative planning principals are applied during the facility requirements stage of the plan. Aircraft mix will likely play the most significant role in that effort.

Based Aircraft Mix

The determination of based aircraft mix analyzed and compared PUW's current mix with the US GA fleet and then allocated this ratio based on the total 2030 forecast from the previous section. **Exhibit 2-6** includes the based aircraft mix for PUW in comparison with the entire US general aviation fleet. Note that the projection is for growth in all of the airplane categories that use PUW. Growth in piston aircraft favors single engine piston as an anticipated result of the new LSA classification while multi-engine piston airplanes are projected to remain constant through the 20-year forecast period **Table 2-11**.

Exhibit 2-6: Fleet Mix Forecast

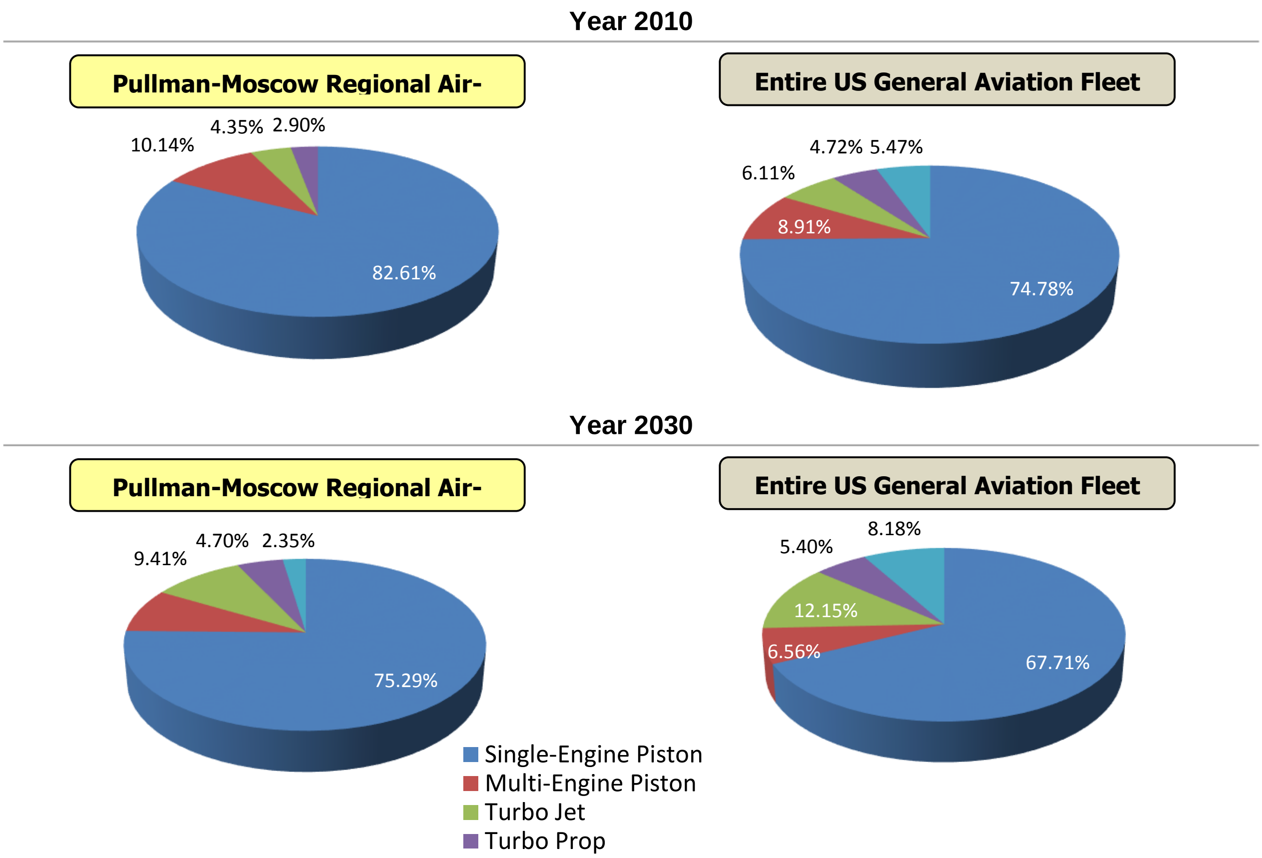


Table 2-11: PUW Fleet Mix

Year	SEP[1]	MEP[2]	TJ[3]	TP[4]	HC[5]	TOTAL
2010	57	7	3	2	0	69
2015	59	7	4	2	1	73
2020	60	7	5	3	2	77
2025	62	7	6	3	2	80
2030	64	7	8	4	2	85

1. *Single-engine piston airplane accounts for all light airplanes and light sport aircraft (LSA).*
2. *Multi-engine piston*
3. *Turbo-jet airplanes*
4. *Turbo-prop airplanes*
5. *Helicopter/rotorcraft both turbine and piston engine*

2.4 Forecasts of Non-Scheduled Operations

Non-scheduled operations are all aviation operations other than scheduled air service. This classification forms the majority of operations at PUW and includes air charters, air taxis, general aviation and military operations. Unlike the air carrier operations, which can be projected with a reasonable degree of probability, non-scheduled operations fluctuate.

Part 121 Air Charter

Part 121 Air Charter operations are a distinct segment of PUW's operational profile because of the size of the aircraft that are involved, and the demands these larger aircraft have on airport facilities. The charter flights are usually tied directly to sporting events at the two universities: Washington State University (WSU) and the University of Idaho (UI). The charter flights transport the two universities and their opponents to sporting events. Home games also tend to draw large private airplanes and air taxi operations to the airport. This results in apron congestion and a high volume of pedestrian traffic from loading and unloading aircraft.

Both area schools, and many of the inbound schools, bid and renew charter contracts every one to three years and air carrier operators typically fulfill these contracts. This results in the use of aircraft such as the Bombardier Q400, Airbus 319, Boeing 737, and in some instances Boeing 757 and 767 aircraft. Both the WSU and UI charter contracts specify PUW's use. Alternative airports such as Lewiston (LWS) or Spokane (GEG) are used as needed due to limited ramp space, inclement weather or high temperatures, and the climb limitations imposed by PUW's surrounding topography.

In 2008 there were 62 annual operations and 2009 there were 42 annual operations (31 and 21 departures respectively) by large turbo-jet aircraft at PUW for sport-related charter flights. Estimated 140-150 annual operations used alternate airports. This master plan will assume a constant number of sporting events and charter flights over the planning horizon. It also anticipates that airport improvements will be completed by 2016 and will assist greatly in recapturing nearly all of the intended PUW charter activity. It is anticipated that the aircraft mix will remain evenly split between Large Turbo-Prop or Regional Jets and Large Turbo-Jet aircraft, with 757 and 767 sized aircraft continuing to utilize alternate airports. PUW's Air Charter Forecast is shown in **Table 2-12**.

Table 2-12: Part 121 Air Charter Operations and Aircraft Mix Forecast				
Year	Large Turbo-Prop & Regional Jets (Bombardier Q400 & RJ)	Large Turbo-Jet (Boeing 737)	Diverted Flights (GEG/LWS)	Total
2010	22	50	152	224
2015	30	60	134	224
2020	116	104	4	224
2025	116	104	4	224
2030	116	104	4	224

Year 2020 numbers assume new runway alignment completion by 2016

Air Taxi and General Aviation

Air Taxi (AT) and General Aviation (GA) represent the majority of aircraft operations at PUW. The range of activities includes, but is not limited to:

- Personal use aviation for recreation and business;
- Flight training;
- Business and corporate aviation;
- Air ambulance and other emergency service;
- Aircraft maintenance; and
- On-demand air taxi service.

Aircraft types range from single-engine piston airplanes to large corporate jet aircraft. For consistency with FAA forecasts, operations in this category are divided into itinerant (operations between airports) and local (flight operations within the general vicinity of PUW).

PUW does not have a control tower, and there are no reliable counts of annual operations from which to accurately assess historical activity. The estimates of activity included in the FAA TAF were reviewed to assess the volume of activity since 1990. The TAF shows an increase in itinerant operations, and a decline in local operations. This is generally consistent with activity profiles for comparable airports.
The TAF projects that total GA operations will increase from 25,000 (2008) to 26,941 (2030) with all of the increase applied to itinerant operations (0.63% per year) and no change in local activity. The Washington State LATS projects that GA operations statewide will increase at a CAGR of 1.6%, but has a lower projection for the Palouse region of 0.63%. Meanwhile, the Idaho State Aviation System Plan projects that operations at PUW will increase from 30,000 to 82,000 between 2007 and 2027 (4.68% annualized CAGR).

An independent analysis was conducted using a 2010 starting projection of 25,000 total general aviation operations, broken into 13,000 transient and 12,000 local operations. The first analysis applied the population growth rate of 0.93% to the transient segment and zero growth in local operations. This resulted in total general aviation operations projections of 28,000 by 2030. The second applied a ratio of 362 operations per based aircraft to derive a 2030 projection of 31,000 total general aviation operations.

The master plan recommendation assumes total operations will increase from 25,000 to 35,000, with the growth mostly by itinerant operations, as shown in **Table 2-13**. It is assumed that this level of activity has been experienced and exceeded at PUW within the past 20 years, and that the major change affecting planning outcomes is the continued shift to transient operations and larger aircraft. The total operations by airplane classification are identified in **Table 2-14**.

Table 2-13: Non-Scheduled General Aviation Operations Forecast

Year	Itinerant	Local	Total
2010	13,000	12,000	25,000
2015	15,450	12,050	27,500
2020	17,920	12,080	30,000
2025	20,350	12,150	32,500
2030	22,700	12,300	35,000

Table 2-14: General Aviation Operations by Aircraft Type (Itinerant/Local)

Aircraft Type	2010	2015	2020	2025	2030
Single-Engine Piston	10,400/10,800	12,220/10,800	14,000/10,800	15,450/10,800	16,800/10,800
Multi-Engine Piston	390/1,200	374/1,200	320/1,200	270/1,200	230/1,200
Large Turbo Jet[1]	520/0	690/0	900/0	1,140/0	1,400/0
Med Turbo Jet[2]	910/0	1,162/0	1,430/0	1,880/0	2,310/0
Turbo Prop	780/0	1,000/0	1,260/0	1,580/0	1,900/0
Helicopter	0/0	4/50	10/80	30/150	60/300
TOTAL	25,000	27,500	30,000	32,500	35,000

1. Large Turbo Jet examples include but are not limited to; Boeing 737 series, Airbus A320 series, CRJ-900, Cessna Citation X, and Bombardier Global Express.
2. Medium Turbo Jet examples include but are not limited to: Beech Premier I, Cessna Citation II, Dassault Falcon 20, Learjet 40, and Raytheon Hawker 800

Military/Government

PUW experiences a small number of itinerant military/government operations. The TAF applies a flat 80 annual itinerant military/government operations which will be applied to the master plan.

2.5 Forecasts Summary and TAF Comparison

For reference, **Table 2-15** contains a summary of all aviation forecasts described in this chapter. **Table 2-16** compares the master plan's forecast with the current (2009) FAA TAF.

Table 2-15: Aviation Forecast Summary

	2010	2015	2020	2025	2030
Annual Passenger Enplanements	32,745	35,143	49,286	54,933	61,307
Annual Aircraft Operations	29,152	31,762	34,486	37,082	39,680
Commercial Scheduled Airline	4,000	4,092	4,186	4,282	4,380
Part 121 Air Charter	72	90	220	220	220
Itinerant Military	80	80	80	80	80
General Aviation	25,000	27,500	30,000	32,500	35,000
Itinerant	13,000	15,450	17,920	20,350	22,700
Local	12,000	12,050	12,080	12,150	12,300
Based Aircraft	69	73	77	80	85
Single-engine piston	57	59	60	62	64
Multi-engine piston	7	7	7	7	7
Turbo jet	3	4	5	6	8
Turbo prop	2	2	3	3	4
Helicopter	0	1	2	2	2

Table 2-16: Comparing Airport Planning (AP) and TAF Forecast

	Year	Airport Forecast	TAF	AF/TAF (% Difference)
Passenger Enplanements				
Base year	2010	32,745	33,516	-2.3%
Base year plus 5 years	2015	35,143	37,103	-5.3%
Base year plus 10 years	2020	49,286*	41,095	19.9%
Base year plus 15 years	2025	61,307*	50,471	20.6%
Commercial Operations				
Base year	2010	4,000	4,000	0.0%
Base year plus 5 years	2015	4,092	4,000	2.3%
Base year plus 10 years	2020	4,186	4,000	4.7%
Base year plus 15 years	2025	4,380	4,000	9.5%
Total Operations				
Base year	2010	29,110	29,522	-1.4%
Base year plus 5 years	2015	31,712	29,961	5.8%
Base year plus 10 years	2020	34,486*	30,412	13.4%
Base year plus 15 years	2025	37,082*	31,357	20.1%

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

**Reflects new runway in use after 2015*

Chapter 3: Airside Facilities Requirements

Overview

This chapter analyzes existing airside facilities and aviation activity at Pullman-Moscow Regional Airport (PUW) to determine required airside facility improvements. The analysis and conclusions contained in this chapter will be used to develop and analyze airside alternatives in Chapter 4. They will also be used to support the development of "Purpose and Need" documentation for the environmental review process, as required by the National Environmental Policy Act (NEPA). A complementary review of landside facilities will be provided in Chapter 6. The following airside facility requirements are determined in this chapter for the critical design aircraft at PUW.

- Airport Reference Code (ARC) Dimensional Requirements
- Runway Length Requirements
- Instrument Approach Procedure Requirements
- Runway Location and Orientation Requirements
- Runway Pavement Strength Requirements
- Taxiway Requirements
- Visual and Electronic Aid Requirements
- Runway Signage and Marking Requirements

3.1 Critical Design Aircraft

In order to determine the required dimensions and facilities for PUW, it is necessary to identify the Airport's critical design aircraft or critical aircraft, defined in the following excerpt. According to FAA Order 5090.3C, *Field Formulation of the National Plan of Integrated Airport Systems*:

> *"Airport dimensional standards (such as runway length and width, separation standards, surface gradients, etc.) should be selected which are appropriate for the critical aircraft that will make substantial use of the airport in the planning period. Substantial use means either 500 or more annual itinerant operations, or scheduled commercial service. The critical aircraft may be a single aircraft or a composite of the most demanding characteristics of several aircraft. The critical aircraft (or composite aircraft) is used to identify the appropriate Airport Reference Code for airport design criteria."*

There are two critical design aircraft categories that make substantial use of the Airport. The first category includes large turboprop aircraft used for scheduled commercial service. The dimensional and performance characteristics of these aircraft will be used in Section 3.3 to determine the appropriate Airport Reference Code (ARC) and associated dimensional standards for PUW. The second category includes large jet aircraft used for general aviation (GA) and charter operations. The performance characteristics of these aircraft will be used in Section 3.4 to determine the runway length requirements for the Airport's primary runway.

3.2 Airport Reference Code (ARC) Dimensional Requirements

With the exception of runway length which is addressed in Section 3.4, an airfield's dimensional requirements are determined based on the Airport Reference Code (ARC) of the critical design aircraft, as defined by FAA Advisory Circular (AC) 150/5300-13, *Airport Design*. An ARC consists of a letter and a Roman numeral. The letter refers to the aircraft approach category, which is a grouping of aircraft based on the operational characteristics of aircraft approach speed:

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

The Roman numeral contained in the ARC refers to an Airplane Design Group (ADG), which is a grouping of airplanes based on the physical characteristics of wingspan or tail height. When an airplane's dimensions correspond to two separate categories, the most demanding category should be used. The groups are presented in **Table 3-1**.

Table 3-1: Airplane Design Groups (ADG)

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

Source: FAA AC 150/5300-13 Airport Design

For the purpose of determining the ARC for PUW's airfield, the critical design aircraft are those used for scheduled commercial service. Scheduled commercial service at PUW is provided by Alaska Airlines now operated by Horizon Air, which has historically utilized a variety of turboprop-powered aircraft. The historical trend of PUW's commercial fleet has been towards increasingly larger and more demanding turboprop aircraft with larger seat capacities.

An aircraft operation is one take-off or one landing. A "touch and go" operation counts as two operations.

Prior to 1994, PUW was served by smaller B-II turboprop aircraft with capacities in the 15- to 30-seat range, such as the Metros and BAE Jetstreams. In the mid-1990s, a switch was made to the 37-seat B-III Bombardier Q200. In the late 2000s, the Q200 was replaced with the 76-seat C-III Bombardier Q400. In 2009, the Q400 conducted 2,590 operations at PUW; as a result the Q-400 is the most demanding aircraft that meets the significant use threshold of 500 or more annual operations. The C-III Q400 is utilized as the critical aircraft for airside dimensional standards. As the critical design aircraft changed over time, so too did the associated design standards for the Airport. Critical B-II, B-III and C-III dimensional standards are presented and compared to existing airfield design standards in **Table 3-2**. The table also identifies the Airport's compliance status with each dimensional standard.

Table 3-2 presents existing runway conditions and compares them to B-II, B-III and C-III critical design standards. The comparison demonstrates the existing design standard conflicts and underscores the need for corrective action. It also sets a standard for the Airport's near and long term design needs. The following sections describe each of the design standard conflicts in more detail.

Table 3-2: Runway Design Standard Differences for Airport Reference Codes B-II, B-III, and C-III				
Airport Reference Code	**Existing Conditions**	**B-II**	**B-III**	**C-III**
Representative Aircraft		**Metro**	**Bombardier Q200**	**Bombardier Q400**
Period as Primary Air Carrier Aircraft		**Pre-1994**	**1994 to 2007**	**2008 to Present**
Runway Width	100 feet	75 feet	100 feet	100 feet
Is Runway 5/23 In Compliance?		*YES*	*YES*	*YES*
Shoulder Width	10 feet	10 feet	20 feet	20 feet
Is Runway 5/23 In Compliance?		*YES*	**NO**	**NO**
Blast Pad Width and Length[1]	None	95 x 150 feet	140 x 200 feet	140 x 200 feet
Is Runway 5/23 In Compliance?		**NO**	**NO**	**NO**
Runway OFZ Width and Length[1]		400 x 200 feet	400 x 200 feet	400 x 200 feet
Is Runway 5/23 In Compliance?		**NO**/YES	**NO**/YES	**NO**/YES
RSA and Length[1]		150 x 300 feet	300 x 600 feet	500 x 1,000 feet
Is Runway 5/23 In Compliance?		YES/**NO**	YES/YES[2]	YES/YES[2]
ROFA Width and Length[1]		500 x 300 feet	800 x 600 feet	800 x 1,000 feet
Is Runway 5/23 In Compliance?		*YES/YES*	**NO/NO**	**NO/NO**
Centerline to Taxiway Centerline	200 feet	240 feet	300 feet	400 feet
Is Runway 5/23 In Compliance?		**NO**	**NO**	**NO**
Centerline to Aircraft Parking Area	265 feet	250 feet	400 feet	500 feet
Is Runway 5/23 In Compliance?		*YES*	**NO**	**NO**
Centerline to Holdline	150 feet	200 feet	200 feet	250 feet
Is Runway 5/23 In Compliance?		**NO**	**NO**	**NO**
Crosswind Component	13 knots	13 knots	16 knots	16 knots
Is Runway 5/23 In Compliance?		**NO**	*YES*	*YES*
FAA Land Use Guidlines				
RPZ Dimensions[3]	1,000 x 500 x 700 feet[3]	1,000 x 500 x 700 feet[3]	1,000 x 500 x 700 feet[3]	1,700 x 500 x 1,010 feet[3]
Is Runway 5/23 In Compliance?		*YES*	*YES*	**NO**
Building Restriction Line (BRL) [3]	394 feet[3]	495 feet[3]	745 feet[3]	745 feet[3]
Is Runway 5/23 In Compliance?		**NO**	**NO**	**NO**

1. Length beyond Runway End.
2. Met with a displaced threshold
3. See Airside Alternatives Chapter

Design standards shown are for existing approach minimums of one statute mile or greater. More demanding standards may apply if approach minimums of less than one statute mile are implemented.

RPZ: Runway Protection Zone
RSA: Runway Safety Area
OFZ: Obstacle Free Zone
ROFA: Runway Object Free Area

Sources: AC 150/5300-13 Airport Design

Current Modification to Design Standards at PUW

Recognizing the need to mitigate the increasingly non-standard conditions on the airfield at PUW resulting from the larger commercial aircraft, the Airport implemented these corrective actions in 2006 and developed special operational procedures for commercial flight crews with coordination from the commercial service provider:

- The RSA was graded to 250 feet beyond the pavement edge on the south end.
- The Runway 5 threshold was displaced 290 feet to provide 600-foot long approach RSAs and 1,000-foot departure RSAs.
- The transponder landing system (TLS) and all associated obstacles within the RSA were removed.
- Intermediate hold short lines were painted on the aircraft parking aprons to provide 265 feet of clearance from the runway centerline.
- Educational materials were developed and distributed to based and transient pilots.
- Prior permission required (PPR) documents were revised to include required common traffic advisory frequency (CTAF) procedures for C-III aircraft, as well as disclosing non-standard conditions.
- Non-standard conditions and restrictions were published in the FAA Airport/Facility Directory.
- An operational notice with specific taxiing instructions was posted in the fixed base operator (FBO) building and on the Airport website.

Concurrent with these mitigation actions, the Airport requested a temporary “Modification to Design Standards” from the FAA that is contained in **Appendix B**. This temporary solution was granted with several conditions. One condition requires the airport owner to take appropriate action within a reasonable time to implement an Airport Layout Plan (ALP) approved by the FAA and showing ARC-III design standards. This Master Plan Update will produce the required ALP. The “Modification to Design Standards” allows PUW to operate with the existing airfield configuration; however, there are airfield operational inefficiencies, the usable runway length does not meet the requirements of some existing users, and safety areas are not 100% compliant. In the short-term, operations are allowed to continue provided the Airport is working towards a long-term solution that will meet the required design standards.

Runway Centerline Separation Requirements

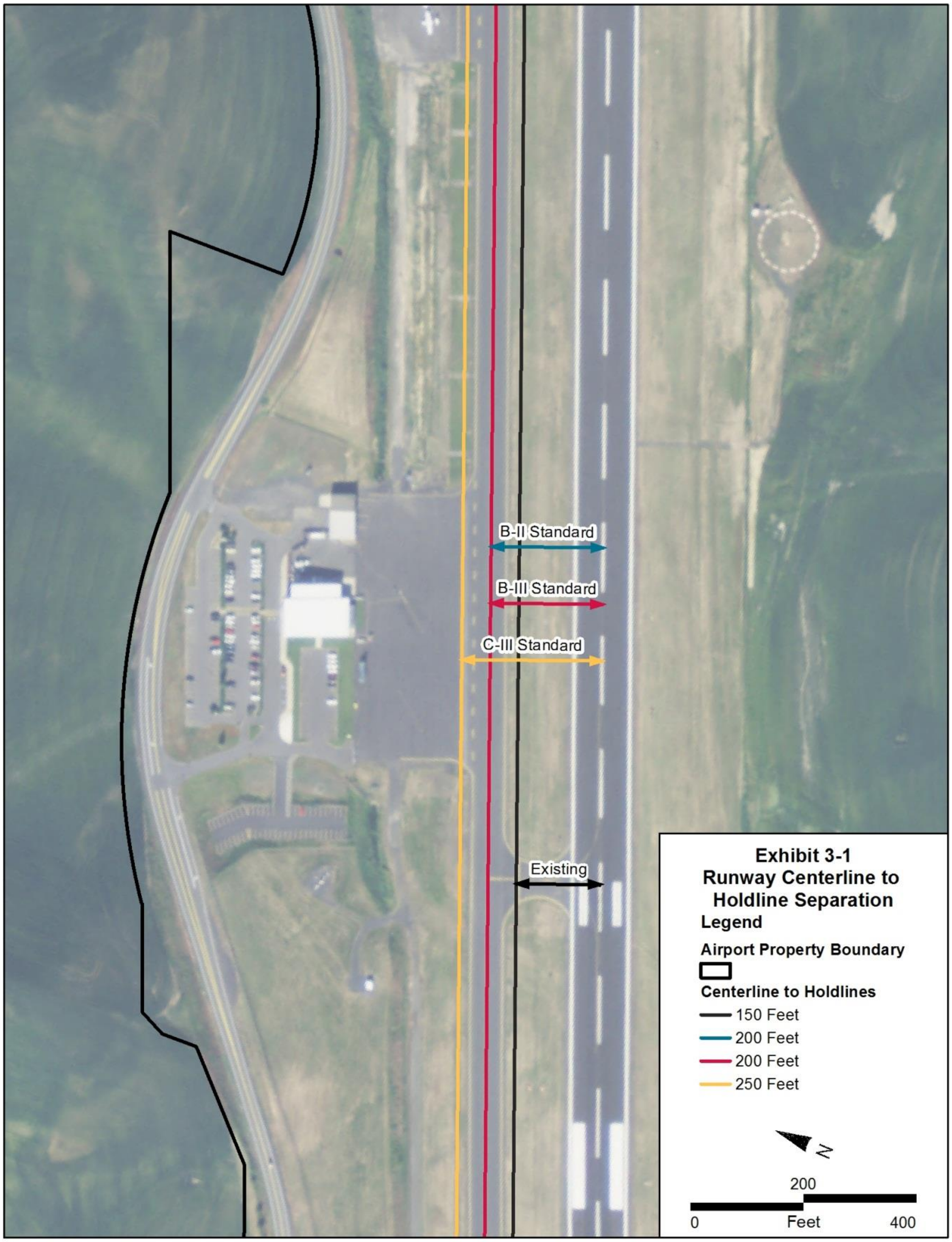
Separation standards are intended to maintain safe operating distances between aircraft operating on the ground or parked in designated areas and those aircraft that are taking-off and landing in the runway environment. These include separations between the runway centerline and the aircraft holdline, parallel taxiway centerline, and aircraft parking areas. Table 3-2 compares existing conditions at PUW with FAA design requirements for ARC B-II, B-III and C-III categories.

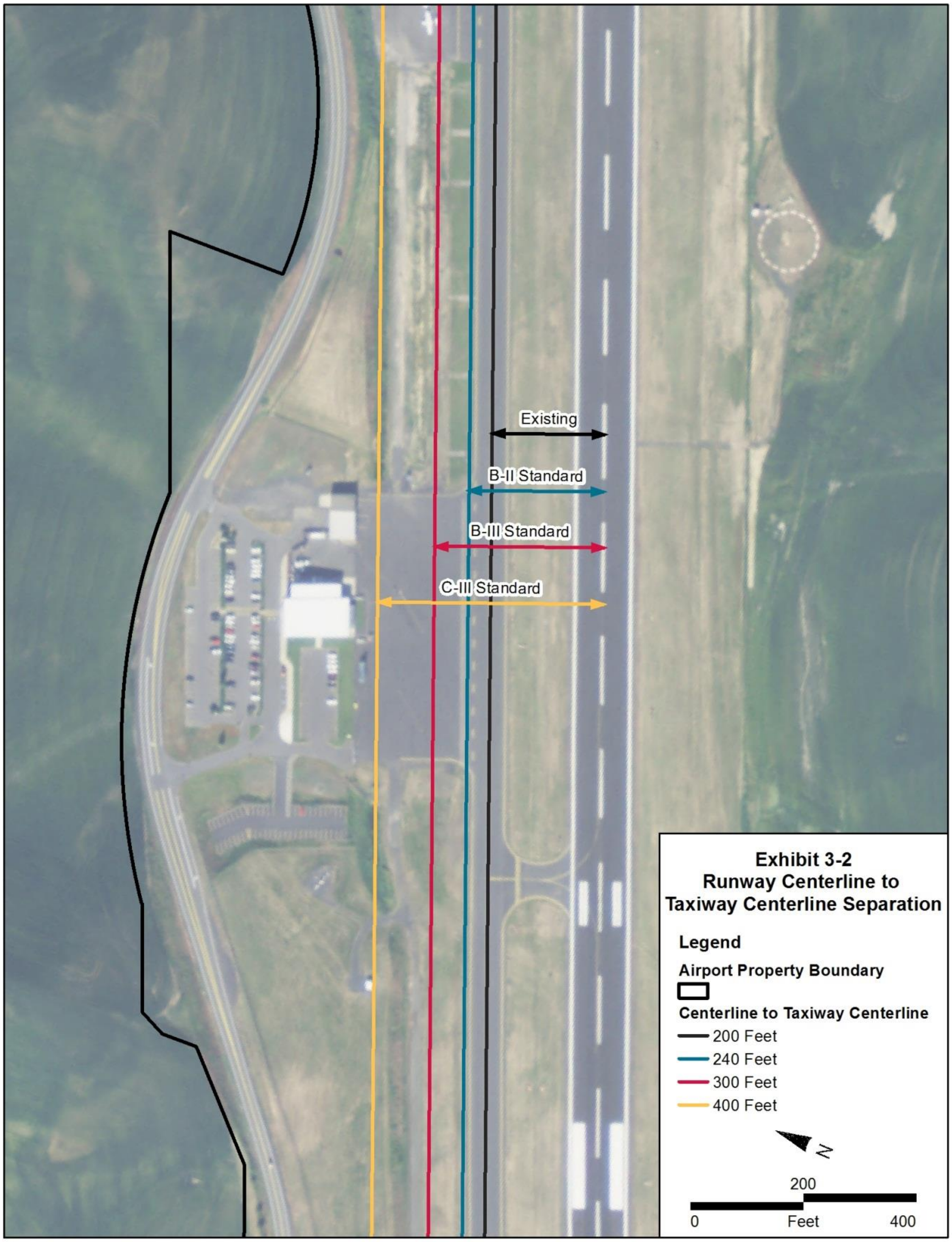
The existing runway centerline to holdline separation is presented and compared to B-II, B-III, and C-III standard separations in **Exhibit 3-1**. The existing runway centerline to holdline separation is 150 feet. This is less than the required B-II and B-III standards of 200 feet, and less than the required C-III standard of 250 feet.

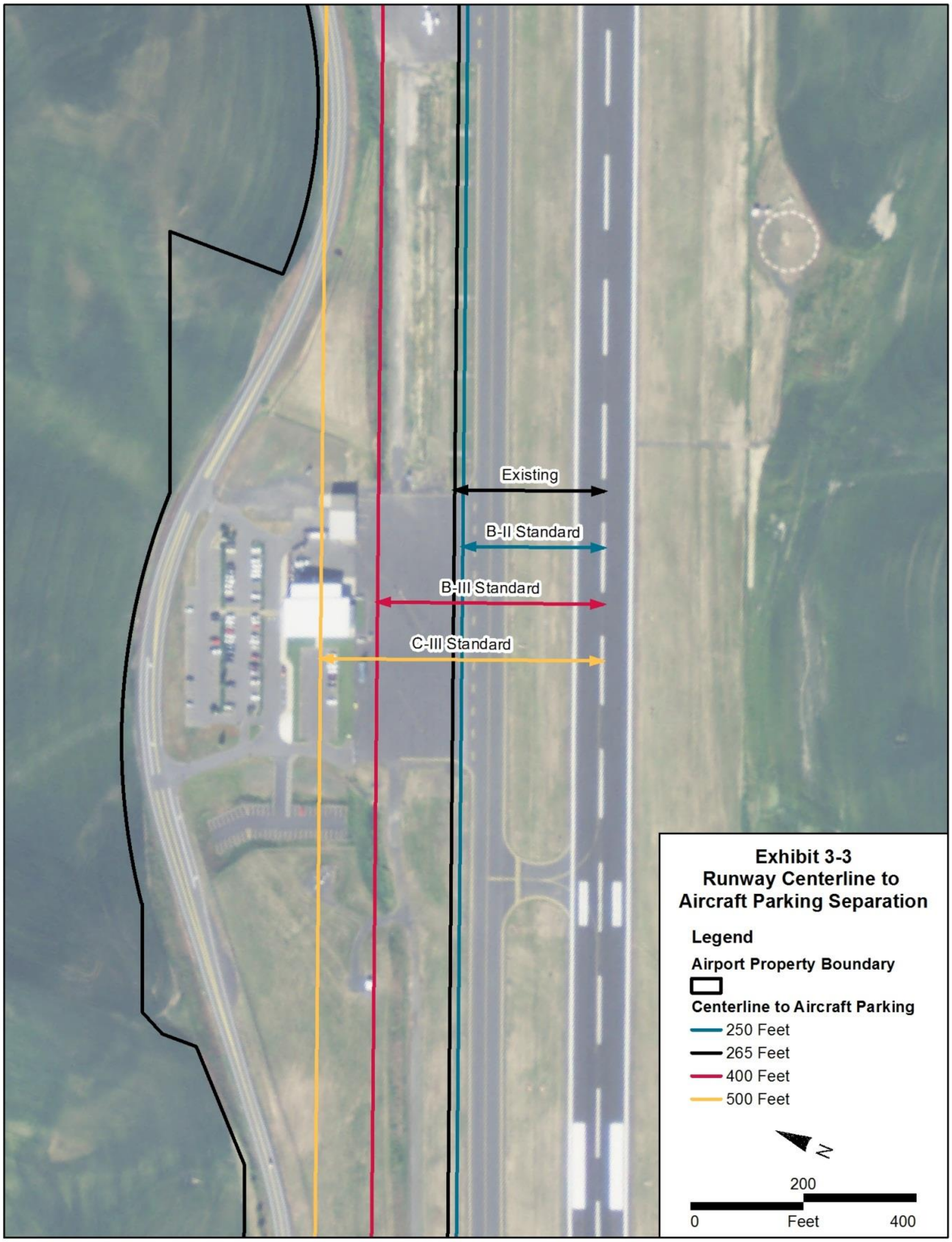
The existing runway centerline to taxiway centerline separation is presented and compared to B-II, B-III, and C-III standard separations in **Exhibit 3-2**. The existing runway centerline to taxiway centerline separation is 200 feet. This is less than the required B-II standard of 240 feet, less than the required B-III standard of 300 feet, and less than the required C-III standard of 400 feet.

The existing runway centerline to aircraft parking area separation is presented and compared to B-II, B-III, and C-III standard separations in **Exhibit 3-3**. The existing runway centerline to aircraft parking area separation is 265 feet. This is in compliance with the required B-II standard of 250 feet. However, this is less than the required B-III standard of 400 feet, and less than the required C-III standard of 500 feet.

The “Modification to Design Standards” allows for large aircraft operations to continue at PUW; however the resulting sub-standard centerline separation standards add to the operational inefficiencies present at PUW with aircraft ground holds during large aircraft operations, and ultimately need to be addressed to comply with airfield design criteria.


B-II Standard
B-III Standard
C-III Standard
Existing
Exhibit 3-1
Runway Centerline to Holdline Separation
Legend
Airport Property Boundary
Centerline to Holdlines
150 Feet
200 Feet
200 Feet
250 Feet
N
200
0
Feet
400


Existing
B-II Standard
B-III Standard
C-III Standard
Exhibit 3-2
Runway Centerline to
Taxiway Centerline Separation
Legend
Airport Property Boundary
Centerline to Taxiway Centerline
200 Feet
240 Feet
300 Feet
400 Feet
N
200
0
Feet
400


Existing
B-II Standard
B-III Standard
C-III Standard
Exhibit 3-3
Runway Centerline to
Aircraft Parking Separation
Legend
Airport Property Boundary
Centerline to Aircraft Parking
250 Feet
265 Feet
400 Feet
500 Feet
N
200
0
Feet
400

3.3 Runway Protection Areas

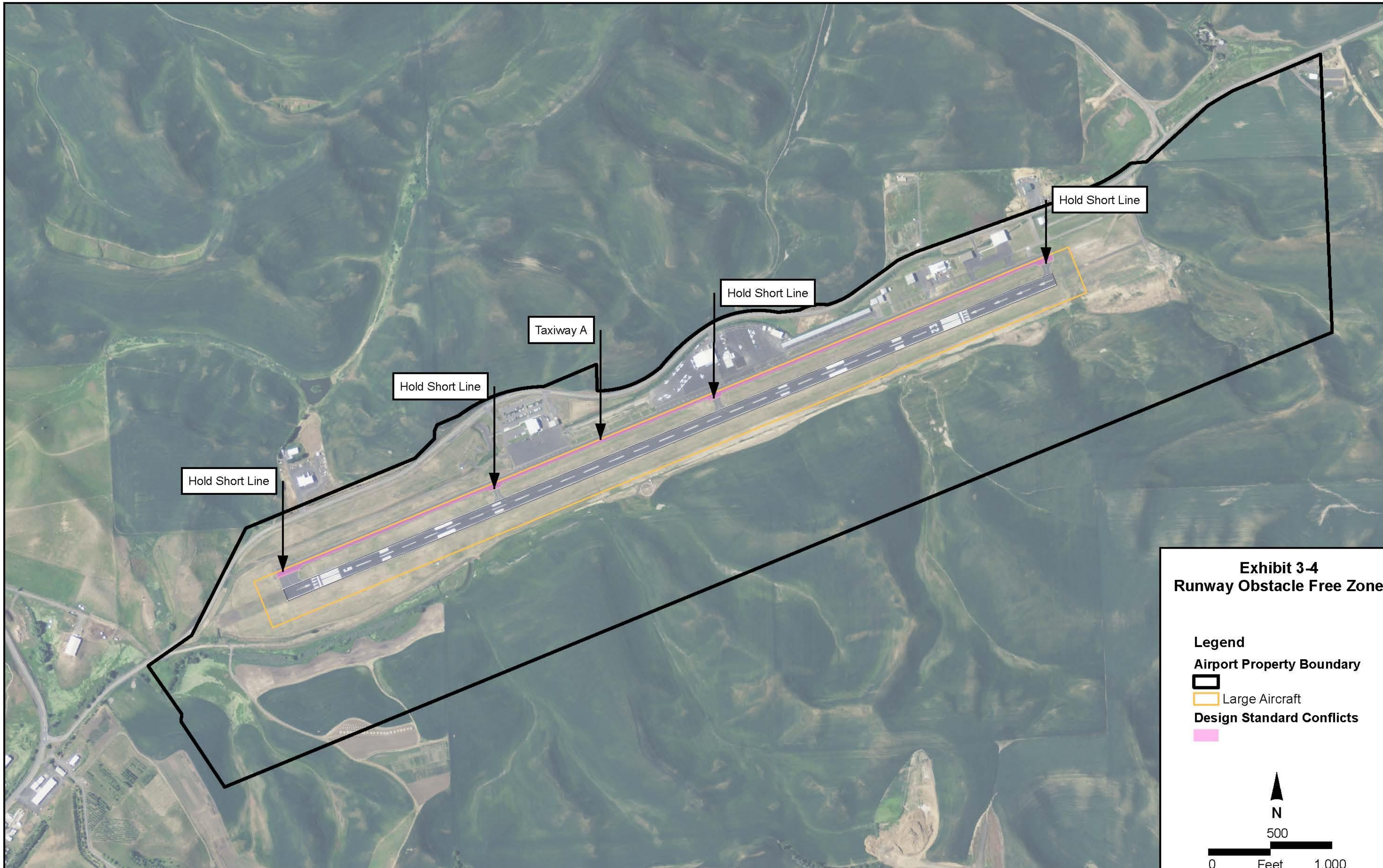
There are several different runway protection areas that are put in place by the FAA to enhance the operational safety and efficiency of aircraft and other users of the Airport in the air and on the ground. These protections also prevent encroachment that might hinder the operational capacity of the airport both now and in the future. This section addresses the runway Obstacle Free Zone (OFZ), the Runway Safety Area (RSA) and the Runway Object Free Area (ROFA) in text and through graphic examples.

Runway Obstacle Free Zone (OFZ) Requirements

A runway Obstacle Free Zone (OFZ) is a volume of airspace centered above the runway centerline. The runway OFZ is a three dimensional space that, unlike other safety related areas, is governed by a standard that is independent of the ARC. At PUW, the OFZ dimensions are based on standards for an airport serving large aircraft which is to say any aircraft with a maximum take-off weight of 12,500 pounds or more. For the purposes of this report, the “Large Aircraft” designation for the OFZ is synonymous with the ARC C-III standard for other safety areas.

The runway OFZ extends 200 feet beyond each end of the runway. As required by AC 150/5300-13, *Airport Design*, the runway OFZ requires clearing of object penetrations, and precludes taxiing and parked airplanes. The only object penetrations allowed in the runway OFZ are frangible visual navigational aids that must be located in the OFZ because of their function. These are specially designed navigational aids that break or tear away easily in the event of a collision.

The runway OFZ associated with large aircraft at PUW are presented in **Exhibit 3-4** along with existing design standard conflicts. At PUW there are currently several design standard conflicts related to the OFZ. Most are associated with aircraft holding positions and the parallel taxiway and one is associated with the surrounding terrain. Upgrading the airport to C-III standards will remedy the design standard conflict for the aircraft hold short lines and parallel taxiway. Grading will be required to mitigate terrain issues.


Hold Short Line
Hold Short Line
Taxiway A
Hold Short Line
Hold Short Line
Exhibit 3-4
Runway Obstacle Free Zone
Legend
Airport Property Boundary
Large Aircraft
Design Standard Conflicts
N
500
0
Feet
1,000

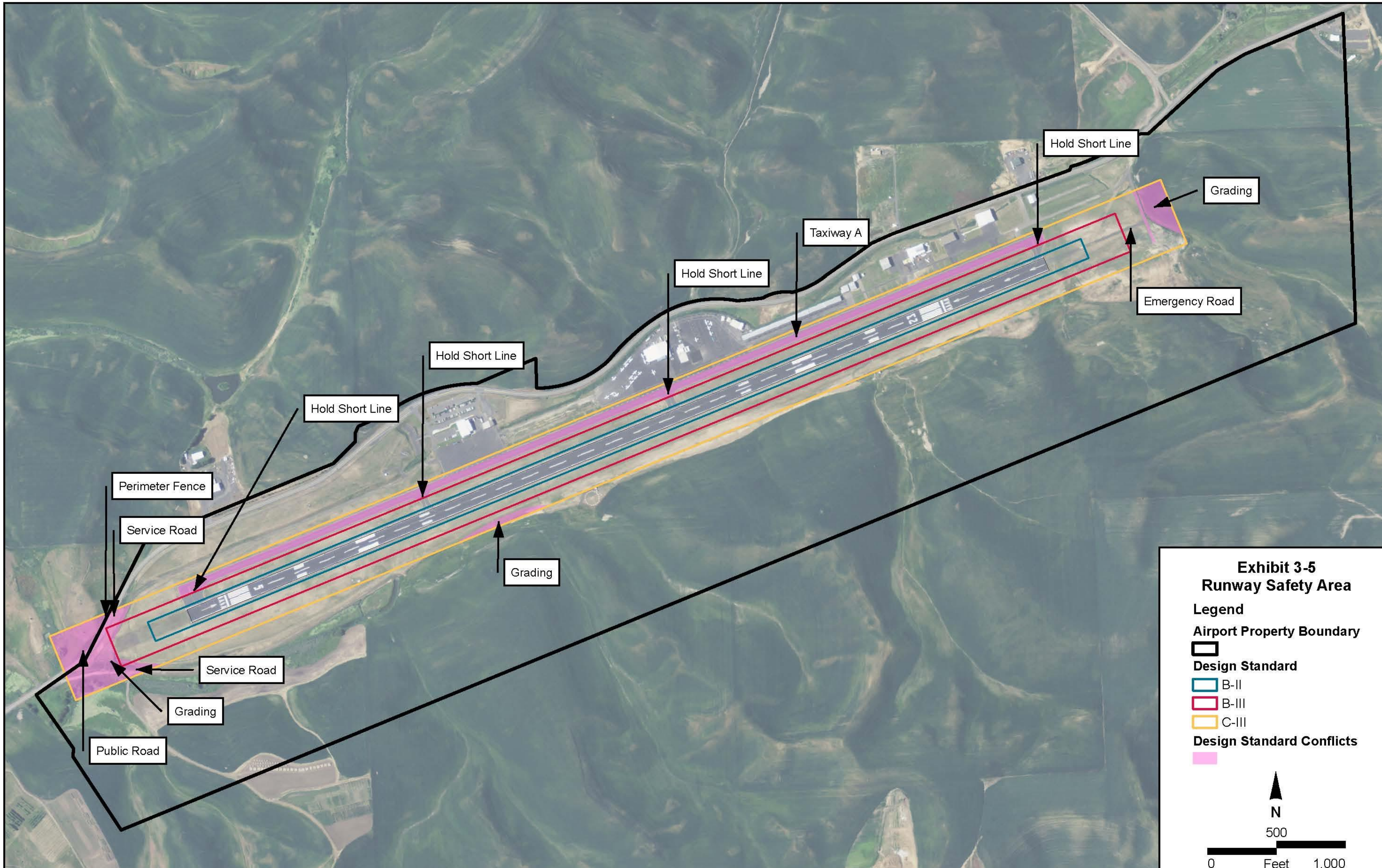
Runway Safety Area (RSA) Requirements

A Runway Safety Area (RSA) is a rectangular area surrounding the runway and centered on the runway centerline. The RSA is 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. As required by AC 150/5300-13, *Airport Design*, and FAA Order 5200.8, *Runway Safety Area Program*, an RSA must be:

- Cleared and graded and have no potentially hazardous ruts, humps, depressions, or other surface variations;
- Drained by grading or storm sewers to prevent water accumulation;
- Capable, under dry conditions, of supporting snow removal equipment, aircraft rescue and firefighting equipment, and the occasional passage of aircraft without causing structural damage to the aircraft; and
- Free of objects, except for objects that need to be located in the RSA because of their function.

The RSAs associated with B-II, B-III, and C-III aircraft at PUW, and design standard conflicts, are presented in **Exhibit 3-5.** To provide an RSA that is conditionally compliant with C-III design standards, each runway threshold has been displaced on both Runway Ends and the associated operating distances have been published with the FAA. However, the threshold displacements and declared distances significantly reduce usable runway lengths and do not eliminate RSA design standard conflicts located to the north and south of the Runway 5/23. To comply with C-III RSA design requirements for the existing runway, the parallel taxiway, aircraft hold position markings, a short segment of Airport Road, and several service roads require relocation. In addition, grading is needed on the site in order for the Airport to comply with RSA design requirements.

This Page Intentionally Left Blank


Hold Short Line
Grading
Taxiway A
Hold Short Line
Emergency Road
Hold Short Line
Hold Short Line
Perimeter Fence
Service Road
Grading
Service Road
Grading
Public Road
Exhibit 3-5
Runway Safety Area
Legend
Airport Property Boundary
Design Standard
B-II
B-III
C-III
Design Standard Conflicts
N
0
500
1,000
Feet

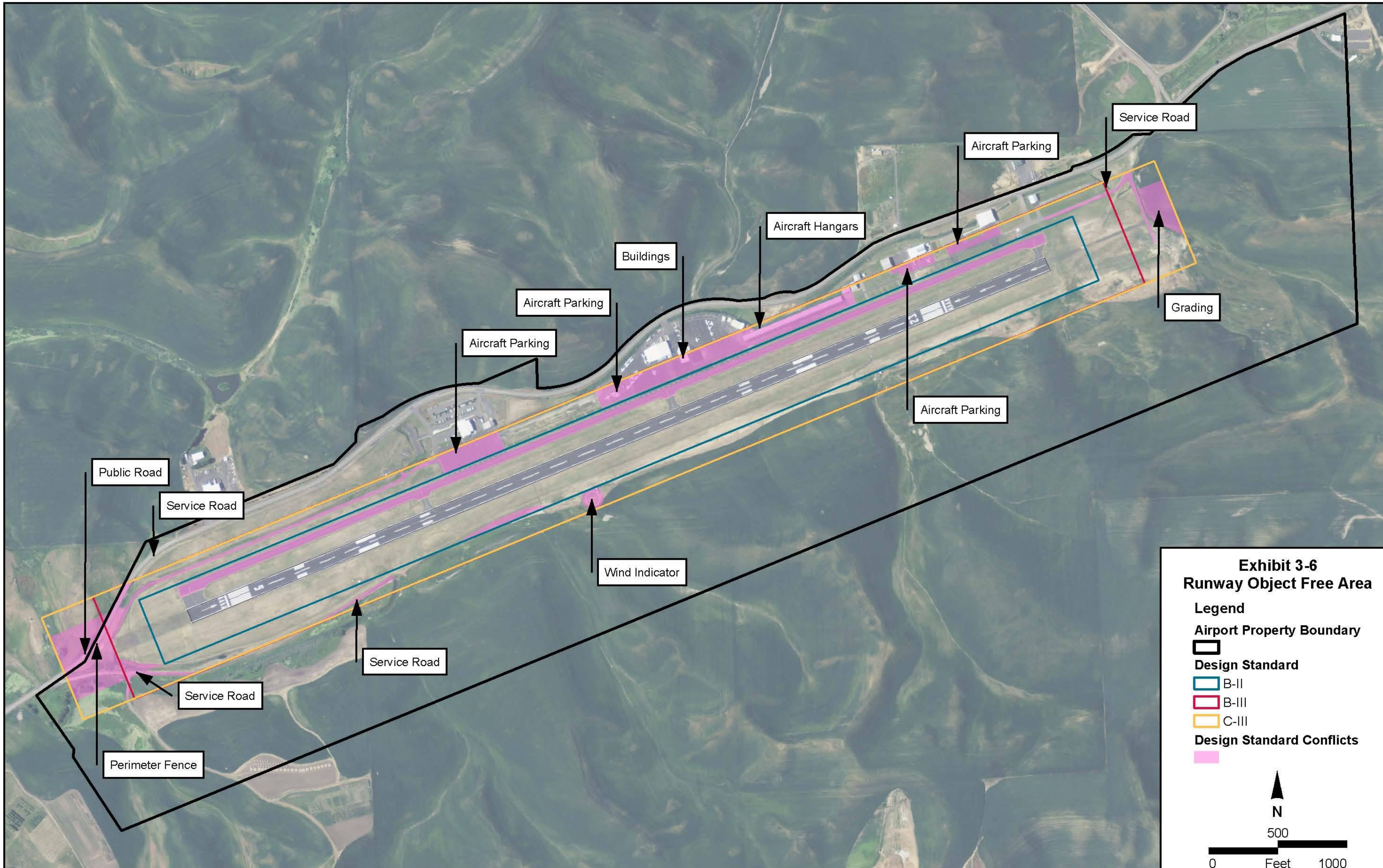
Runway Object Free Area (ROFA) Requirements

The Runway Object Free Area (ROFA) is an area on the ground provided to enhance the safety of aircraft operations by having the area free of objects. Like an RSA, a ROFA is a rectangular area surrounding the runway and centered on the runway centerline. However, the ROFA is larger than the RSA and has no specific grading standards. FAA AC 150/5300-13 requires that the ROFA be clear of:

- All above ground objects protruding above the RSA edge elevation;
- Objects non-essential for air navigation or aircraft ground maneuvering purposes;
- Parked aircraft; and
- Agricultural operations.

The ROFAs associated with B-II, B-III, and C-III aircraft at PUW are presented in **Exhibit 3-6** along with the associated design standard conflicts. Since the C-III design standards require a larger ROFA than the B-II and B-III design standards, there is an associated increase in the resulting design standard conflicts. The C-III design standard conflicts include aircraft parking areas, aircraft hangars and other buildings, the entire parallel taxiway, portions of Airport Road, several service roads, the airport perimeter fence, and terrain. To comply with C-III ROFA design requirements for the existing runway, the parallel taxiway, aircraft hold position markings, a short segment of Airport Road, aircraft parking areas, airport perimeter fencing in multiple locations, and several service roads would need to be relocated.

This Page Intentionally Left Blank


Service Road
Aircraft Parking
Aircraft Hangars
Buildings
Aircraft Parking
Aircraft Parking
Grading
Aircraft Parking
Public Road
Service Road
Wind Indicator
Service Road
Service Road
Perimeter Fence
Exhibit 3-6
Runway Object Free Area
Legend
Airport Property Boundary
Design Standard
B-II
B-III
C-III
Design Standard Conflicts
N
500
0
Feet
1000

3.4 Runway Length & Width Requirements

This section presents a summary of near-term (5-year) runway length and width requirements for the critical design aircraft at PUW. Utilizing the five-step procedure for determining required runway lengths at airports described in FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design,* this section identifies the required runway lengths for the following three key PUW user groups:

- General Aviation (GA) Jet Operators
- Commercial Air Carriers
- Part 121 Charter Operators

FAA AC 150/5325-4B was issued to provide runway length standards for new runways and extensions to existing runways based on the projected critical design aircraft for the airport in question. For federally-funded runway projects, AC 150/5325-4B establishes a required "substantial use threshold" of 500 or more annual itinerant operations by an individual aircraft, or a category of aircraft with similar operating characteristics. AC 150/5325-4B states that the required runway length is "the longest resulting length after any adjustments for all the critical design aircraft under evaluation."

General Aviation (GA) Jet Operator Runway Length Requirements

Operational data collected from the FAA Enhanced Traffic Management System Counts (ETMSC) database from 2005 through 2009 at PUW shows an average of 722 annual operations by General Aviation (GA) jet operators utilizing *Large Aircraft with a Maximum Take-off Weight (MTOW) up to and including 60,000 Pounds* (hereafter referred to as *Large Aircraft up to 60,000 Pounds)*. These operational totals include both based and transient aircraft activity.

Based and transient GA jet aircraft types include 45 jet aircraft makes and models. Transient GA jet aircraft operating at PUW are owned and operated by users throughout the United States, including small businesses, large corporations, fractional ownership companies, charter operators, flight training businesses, government agencies, medical evacuation businesses, and recreational pilots. These transient aircraft accounted for approximately 40% of operations by *Large Aircraft up to 60,000 Pounds* from 2005 through 2009.

AC 150/5325-4B provides separate runway length charts for two subcategories of *by Large Aircraft up to 60,000 Pounds*: *Aircraft that make up 75% of the Fleet* (hereafter referred to as 75% of Fleet) and *the Remaining 25% of Aircraft that make up 100% of the Fleet* (hereafter referred to as Remaining 25% of Fleet). Because there was an average of 722 annual operations by *Large Aircraft up to 60,000 Pounds* from 2005 through 2009 – 416 of which were conducted by 75% of Fleet aircraft and 306 of which were conducted by Remaining 25% of Fleet aircraft, totaling 722 annual operations for 100% of the Fleet – 75% of Fleet runway length requirements are justified at PUW, as 722 exceeds the “substantial use threshold” of 500 annual itinerant operations.

For *Large Aircraft up to 60,000 Pounds*, the required runway length is determined according to a family grouping of aircraft having similar performance characteristics and operating weights. The method yields required runway lengths for two distinct family groupings within the 75% of Fleet and Remaining 25% of Fleet subcategories by dividing them based on useful loads. The FAA provides four family groupings for which runway length requirements are determined under this method: 75% of Fleet at 60% Useful Load, 75% of Fleet at 90% Useful Load, Remaining 25% of Fleet at 60% Useful Load, and Remaining 25% of Fleet at 90% Useful Load.

Useful Load is the difference between the empty weight of the aircraft and the MTOW. The empty weight of the aircraft does not include crew, usable fuel, passengers, baggage, or cargo.

Airport elevation, seasonal temperature and weather variations, and runway conditions each contribute to the predicted performance of aircraft operations. To determine the required runway lengths for these four family groupings, airport elevation (2,556 feet MSL) and mean maximum daily temperature of the hottest month (83°F) were applied to the AC 150/5325-4B performance charts. The performance chart results, adjusted for wet or slippery runway conditions, are presented in **Table 3-3,** and additional information can be found in **Appendix D**.

Table 3-3: PUW Runway Length Requirements for Large Aircraft up to 60,000 Pounds, Adjusted for Wet or Slippery Runway Conditions

Family Grouping	Runway Length
75% of Fleet at 60% Useful Load	5,500 feet
75% of Fleet at 90% Useful Load	7,100 feet
Remaining 25% of Fleet at 60% Useful Load	6,250 feet
Remaining 25% of Fleet at 90% Useful Load	8,700 feet

Sources: AC 150/5325-4B Runway Length Requirements for Airport Design, January 2011 FAA Airport/Facility Directory, PUW Master Plan Study Phase I

PUW general aviation jet operators have a variety of flight purposes, origins, and destinations, with different haul length and useful load requirements. Generally, longer haul lengths require higher useful loads to accommodate fuel carriage. The average of 722 operations over the five year period conducted by *Large Aircraft up to 60,000 Pounds* in 2009 are categorized by haul length in **Table 3-4**.

Table 3-4: Haul Lengths for Operations at PUW by Large Aircraft up to 60,000 Pounds, 2009

Haul Length Range	Aircraft Operations	Percentage of Total
499 NM or less	280	40%
500 NM to 999 NM	148	21%
1,000 NM or greater	274	39%

Source: Flightaware.com
NM = Nautical miles

As shown in **Table 3-4**, 60% of operations by *Large Aircraft up to 60,000 Pounds* at PUW in 2009 involved haul lengths of greater than 500 nautical miles, two-thirds of which involved haul lengths greater than 1,000 nautical miles. Aircraft operations with long haul lengths typically necessitate high useful loads. Because the design objective for the main primary runway is "to provide a runway length for all aircraft that will regularly use it without causing operational weight restrictions", the 7,100 foot length shown in Table 3-3 for the family grouping 75% of Fleet at 90% Useful Load of *Large Aircraft up to 60,000 Pounds* is selected as the runway length requirement for GA jet operators at PUW.

Commercial Air Carrier Runway Length Requirements

Until 2008, the Bombardier Q200 was used on scheduled flights from PUW to Seattle-Tacoma International Airport (SEA) and Lewiston-Nez Perce County Airport (LWS). In 2008, the 37-seat Q200 was replaced with the 76-seat Bombardier Q400. There were 2,592 operations by the Q400 in 2009, which exceeds the "substantial use threshold" of 500 annual itinerant operations. Because the Q400 is the only aircraft utilized at PUW for commercial air carrier operations, it is the aircraft within this key user group "that will require the longest runway length at MTOW."

The Q400 is considered a *Large Aircraft with a MTOW of more than 60,000 Pounds* under the AC 150/5325-4B procedure. As a result, the airport planning manual (APM) published by the aircraft manufacturer was consulted to determine runway length requirements. Based on charts contained in the APM, the takeoff runway length requirement for the Q400 is 6,600 feet at 60% useful load, and the landing runway length requirement is 4,600 feet at maximum landing weight (MLW) in dry conditions. Although the FAA does not allow length adjustments for turboprop aircraft, there are weather conditions at PUW that prevent arrival of a Q400 at MLW. The 60% useful load factor was selected for Commercial Air Carrier operations based on the operator's current stage length and load capacity needs.

Part 121 Charter Operator Runway Length Requirements

Special consideration should be given to operations by Part 121 charter operators. Aircraft used most frequently by these operators at PUW are the Airbus A319 and the Boeing 737-800. These aircraft operations are associated with charter flights conducted by commercial air carriers – such as Alaska Airlines and Frontier Airlines. They serve the Washington State University (WSU) and University of Idaho (UI) athletic teams as well as visiting teams to the area. These aircraft conducted an average of 50 annual operations at PUW from 2005 to 2009. In December 2010, three Part 121 charter operators (Alaska Airlines, Frontier Airlines, and Allegiant Air) were contacted to assess their operational runway length requirements. A summary of the correspondence is contained in **Appendix D**.

Both the Airbus A319 and the Boeing 737-800 are considered *Large Aircraft over 60,000 Pounds* under the AC 150/5325-4B procedure. As a result, the APMs for these aircraft were consulted to determine their runway length requirements. Based on charts contained in the APM, the takeoff runway length requirement for the Airbus A319 at PUW is between 6,800 and 7,100 feet at 90% useful load, and the takeoff runway length requirement for the Boeing 737-800 at PUW is between 8,000 and 9,300 feet at 90% useful load. The 90% useful load factor was selected for Part 121 Charter operations based on the operators' current stage lengths and because these flights are often "heavily loaded" with sports teams and equipment.

Runway Width Requirements

Charter activity at PUW is expected to increase over the forecast period. Currently these charters are utilizing Airbus A319 and the Boeing 737-800 which are categorized in *AC 150/5300-13, Airport Design* as having a MTOW greater than 150,000lbs. Runway design criteria discussed in section 3.2 Airport Reference Code (ARC) Dimensional Requirements states that C-III design standards require a runway width of 100 feet. For runways supporting operations of aircraft greater than 150,000lbs., a provision is made for a runway width of 150 feet. For planning purposes a runway width of 150 feet will be considered for PUW.

Runway Length and Width Requirements Summary

Although Part 121 charter operators require the longest runway lengths of the three key user groups at PUW, these lengths are not justified because operations by the Airbus A319 and the Boeing 737-800 do not meet the "substantial use threshold" of 500 annual itinerant operations. The annual operations of the other two key user groups – GA jet operators and commercial air carriers – both exceed the "substantial use threshold" of 500 annual itinerant operations. The runway length requirement for *Large Aircraft up to 60,000 Pounds* utilized by GA jet operators is 7,100 feet. The runway length requirement for the Bombardier Q400 aircraft utilized by commercial air carriers is 6,600 feet.

Because 7,100 feet is "the longest resulting length after any adjustments for all the critical design aircraft under evaluation" whose annual itinerant operations exceed the "substantial use" criterion, PUW should plan to implement the 7,100 foot runway length in the near-term.

Based on the requirements of the key PUW user groups, a 7,100-foot runway length is required in the near-term. A technical memorandum, contained in **Appendix D** to this Master Plan Study Phase II, provides detailed runway length analysis for the key user groups. A letter was received from the FAA concurring with this finding, and is contained in **Appendix E**.

3.5 Instrument Approach Procedure Requirements

Runway 5/23 currently has three instrument approach procedures (hereafter referred to as “approaches”). These procedures assist pilots who utilize PUW during adverse weather conditions that prevent flying under visual conditions. Two of these approaches provide guidance to Runway End 5, and one provides guidance to Runway End 23. One of the approaches to Runway End 5 provides aircraft position information based on signals from ground-based radio beacons, while the other provides position information based on signals from global positioning satellites (GPS). The approach to Runway End 23 also provides position information based on GPS signals. Specific information about existing instrument approach procedures is included in the Inventory Chapter.

The three approaches available at PUW have higher visibility minimums and decision heights than most approaches at commercial service airports. This means that a pilot must be able to see the runway from a greater distance and greater altitude in order to land. These high minimums and decision heights are due to the topographical relief or rising terrain to the north, south, and east of the Airport. Man-made structures located west of the Airport on the WSU campus are another contributing factor. These visibility minimums and decision heights reduce the reliability of PUW’s airfield, especially during the winter months when instrument meteorological conditions (IMC) are more frequent. However, improving the approaches at PUW will require new facilities and more stringent obstruction clearance standards. Implementing these standards will require removal or mitigation of hazards associated with terrain and man-made structures. This section presents:

- The need for improved approaches at PUW
- The required runway design standards and facilities associated with various approach types and visibility minimums
- The obstruction clearance standards that will need to be analyzed for the range of runway improvement alternatives developed in a subsequent chapter of this Master Plan Update.

All-Weather Reliability

As a general rule, approaches should be aligned into the prevailing winds or those occurring most frequently during IMC. At PUW, southwest winds typically prevail during IMC so the corresponding optimal approach direction is from the northeast. However, topography surrounding PUW dictates a primary approach from the west/southwest. As a result, tailwind approaches and landings are common.

Aircraft operators are limited to 10-15 knot tailwind components for both arrivals and departures; when this threshold is exceeded, the airplane has two options. It must either circle to land in the opposite direction if the ceiling and visibility are sufficient for a circling approach, or the landing must be aborted and conducted at an alternate airport.

As discussed in Chapter 1, IMC occur 5.5% of the time at PUW. However, the frequency of IMC increases during the winter months, occurring 6.7% of the time in November, 16.2% of the time in December, 16.5% of the time in January, and 8.9% of the time in February. These seasonal weather conditions, combined with the current visibility and ceiling minimums, contribute to a high level of flight cancellations, delays, and re-routings during these months.

Approximately 80% of all cancellations, delays, and re-routings at PUW occur during the winter months. The frequency of cancellations, delays, and re-routings during the winter months coincides with the high demand period surrounding major holidays such as Thanksgiving and Christmas, as well as high demand associated with the end and beginning of semesters at WSU and UI. The number of commercial air service flights canceled or re-routed from 2006 through 2009 is presented by month in **Table 3-5**.

Table 3-5: Commercial Air Service Flight Cancellations and Re-Routings by Month, 2006 to 2009

Month	Year				Number of Monthly Cancellations and Re-Routings (Average)	Percentage of Monthly Flights Cancelled or Re-Routed (Average)
	2006	2007	2008	2009		
January	14	40	23	63	35	11.2%
February	10	32	11	13	17	5.7%
March	9	7	11	10	9	2.9%
April	6	2	1	4	3	1.2%
May	2	0	8	2	3	1.2%
June	2	0	1	0	1	0.3%
July	6	0	3	0	2	0.8%
August	3	3	2	1	2	0.8%
September	0	1	0	7	2	0.7%
October	6	1	0	0	2	0.6%
November	25	25	14	14	20	7.0%
December	21	27	53	11	28	10.1%
Annual Total	**104**	**138**	**127**	**125**	**124**	**3.6%**

Source: U.S. DOT T-100 Trans-stats

The minor shifts in runway orientation analyzed in the Master Plan Study Phase I will not appreciably alter the circling minimums from those in place today. A straight-in approach from the northeast with lower ceiling and visibility minimums will greatly improve all-weather reliability and reduce flight cancellations, delays, and re-routings.

The surrounding topography also restricts departures, particularly jet aircraft departures to the west on Runway 5. Jet operators must often depart on Runway 23 or reduce their operating weight or both. Because all-weather winds favor both directions equally, operators will often elect to depart on Runway 23 with a tailwind. Occasionally, these procedures significantly affect the overall operational utility of the runway. Because the rising terrain east of the Airport cannot feasibly be removed or lowered, it will continue to be a factor affecting jet departures.

Runway Design Standards for Future Visibility Minimums

There are two criteria that determine appropriate runway design standards required by AC 150/5300-13, *Runway Design*. The first criterion is the ARC. As discussed in Section 3.2, the appropriate ARC for Runway 5/23 is C-III. The second component is the lowest approach visibility minimum available for each Runway End. Based on the existing approach procedures available at PUW, this visibility minimum is 1 statute mile. The runway design standards shown in the C-III column of Section 3.2, **Table 3-2** correspond to those for a 1 statute mile visibility minimum.

The potential for future reductions in approach visibility minimums should be considered in the design of airfield facilities. The Phase I Master Plan conducted a preliminary analysis of the airfield configuration that would lead to the Airport obtaining Category I (CAT I) approach minimums, or half mile visibility and cloud ceiling height of 200 feet. The *Airside Alternatives* chapter will present alternatives that will provide a path to obtaining these lower approach minimums. Assuming that the airfield remains a C-III airfield, reductions in visibility minimums below 1 statute mile will not result in changes in the following design standards:

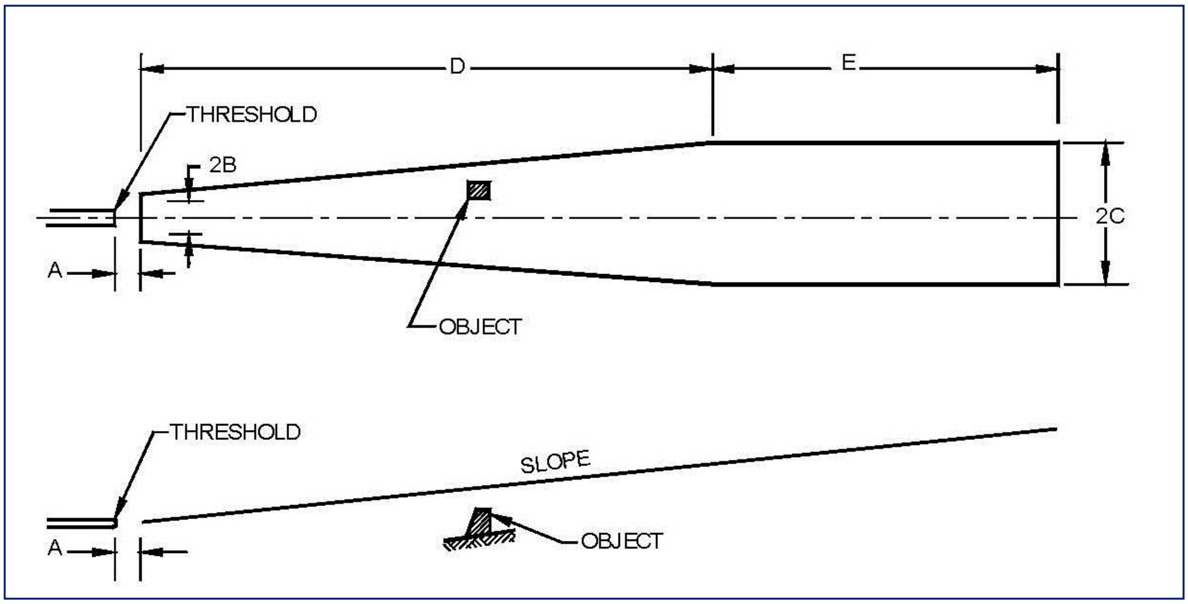
- Runway centerline to holdline separation
- Runway centerline to taxiway centerline separation
- Runway centerline to aircraft parking area separation
- Runway width
- Shoulder width
- Blast pad width and length
- RSA width and length
- Runway OFZ width and length
- ROFA width and length

The only AC 150/5300-13 design standard that would change as a result of visibility minimum reductions is the RPZ dimensions. This design standard would not require a reconfiguration of the airfield, but may require the acquisition of additional property. RPZ requirements are discussed in further detail in Chapter 6.

Approach Threshold Siting Surface Requirements

An approach threshold siting surface is a trapezoidal shape with five main dimensions and a specific slope. Clearance requirements are established based on a combination of three factors: the type of aircraft using the Airport currently and any new aircraft forecast to use the Airport during the planning horizon; landing visibility minimums; and the types of instrumentation available for the runway. A schematic diagram of an approach threshold siting surface is presented in **Exhibit 3-7**.

Exhibit 3-7: Approach Threshold Siting Surface Schematic Diagram



Source: AC 150/5300-13, *Airport Design*

The dimensions and slope of an approach threshold siting surface vary depending on the lowest planned approach visibility minimums for the specific end of the runway. The dimensions and slope of approach threshold siting surfaces for 1 statute mile, 3/4 statute mile, and less than 3/4 statute mile approach visibility minimums are presented in **Table 3-6**.

Table 3-6: Threshold Siting Surface Differences for Future Visibility Minimums							
		Dimension (See Exhibit 3-7)					Surface Slope
Visibility Minimum	Planning Period	A	B	C	D	E	
1 Statute Mile	Existing	0	200	500	1,500	8,500	20:1
3/4 Statute Mile	Near Term	200	400	1,900	10,000	10,000	20:1
< 3/4 Statute Mile	Long Term	200	400	1,900	10,000	10,000	34:1
Dimension D is a nominal value for planning purposes; actual length dependent on TERPS criteria.							

Source: AC 150/5300-13 Airport Design (Appendix F)

As shown in **Table 3-6**, the approach threshold siting surface increases in size as approach visibility minimums are reduced below 1 statute mile. When the approach visibility minimum is reduced below ¾-statute mile, the surface remains the same size but the surface slope becomes more restrictive. To ensure compatibility with future approach improvements, new thresholds at PUW should meet the runway siting surface standard associated with ¾-statute mile visibility minimums.

Airfield Facility Requirements for Future Approach Types and Approach Minimums

Airfield facility requirements for new approaches are identified in Appendix 16 of AC 150/5300-13, *Airport Design*. The facility requirements vary depending on both the approach type and the lowest planned visibility minimums. For the purpose of this facility requirements analysis, it is assumed that the future approach type will ultimately provide for CAT I Approach minimums; and be either an instrument landing system (ILS) approach, or an approach procedure with vertical guidance/ required navigational performance (APV-RNP), such as a Localizer Performance with Vertical Guidance (LPV) approach. The airfield facility requirements for an ILS approach RNP are presented in **Table 3-7** and the airfield facility requirements for an APV are presented in **Table 3-8**.

Table 3-7: ILS Facility Requirements for Different Approach Visibility Minimums

Approach Minimum	**< 1 Statute Mile**	**< 3/4 Statute Mile**
Precision Obstacle Free Zone	Not Required	Required
Is Runway 5/23 In Compliance?	YES	**NO**
Minimum Runway Length	4,200 feet	
Is Runway 5/23 In Compliance?	YES	YES
Runway Markings	Non-Precision	Precision
Is Runway 5/23 In Compliance?	YES	YES
Holding Position Signs & Markings	Non-Precision	Precision
Is Runway 5/23 In Compliance?	YES	YES
Runway Edge Lights	HIRL/MIRL	
Is Runway 5/23 In Compliance?	YES	YES
Parallel Taxiway	Required	
Is Runway 5/23 In Compliance?	YES	YES
Approach Lighting System	Recommended	MALSR, SSALR, or ALSF
Is Runway 5/23 In Compliance?	**NO**	**NO**
Runway Design Standards	≥ 3/4 Statute Mile Approach Visibility Minimums	< 3/4 Statute Mile Approach Visibility Minimums
Is Runway 5/23 In Compliance?	**NO**	**NO**

Sources: AC 150/5300-13 Airport Design

Table 3-8: APV-RNP Facility Requirements for Different Approach Visibility Minimums

Approach Minimum	**> 1 Statute Mile**	**1 Statute Mile**	**< 1 Statute Mile**	**< 3/4 Statute Mile**
Precision Obstacle Free Zone	Recommended			Required
Is Runway 5/23 In Compliance?	**NO**	**NO**	**NO**	**NO**
Minimum Runway Length	3,200 feet			4,200 feet
Is Runway 5/23 In Compliance?	YES	YES	YES	YES
Runway Markings	Non-Precision			Precision
Is Runway 5/23 In Compliance?	YES	YES	YES	YES
Holding Position Signs & Markings	Non-Precision			Precision
Is Runway 5/23 In Compliance?	YES	YES	YES	**NO**
Runway Edge Lights	MIRL/LIRL		HIRL/MIRL	
Is Runway 5/23 In Compliance?	YES	YES	YES	YES
Parallel Taxiway	Recommended		Required	
Is Runway 5/23 In Compliance?	YES	YES	YES	YES
Approach Lighting System	Recommended		Required	
Is Runway 5/23 In Compliance?	**NO**	**NO**	**NO**	**NO**
Runway Design Standards	≥ 3/4 Statute Mile Approach Visibility Minimums			< 3/4 Statute Mile Approach Visibility Minimums
Is Runway 5/23 In Compliance?	**NO**	**NO**	**NO**	**NO**

Sources: AC 150/5300-13 Airport Design

As shown in **Table 3-7** and **Table 3-8**, there are several new facilities that must be in place or conditions that must be met prior to provision of either ILS or APV-RNP approaches with visibility minimums lower than those currently in place. These include a compliant precision obstacle free zone, approach lights, precision runway markings and precision holding position signs and markings.

Part 77 Clearance Requirements

Imaginary surfaces are conceptual safety planes surrounding an airport. Civil airport imaginary surfaces are defined in the Code of Federal Regulations (CFR) Title 14, Part 77. The main purpose of these surfaces is to identify and chart obstacles that are too close to a runway. All airports that accept federal funding are required to make reasonable efforts to keep these surfaces free from additional obstacle penetrations. Objects penetrating one or more imaginary surfaces are evaluated by the FAA to assess the hazard potential.

There are five different imaginary surfaces defined in CFR 14 Part 77: (1) primary, (2) approach, (3) transitional, (4) horizontal, and (5) conical. The primary surface is a rectangular surface longitudinally centered on a runway, with the same elevation as the nearest point on the centerline. The approach surface is a trapezoidal surface longitudinally centered on the extended runway centerline, extending outward and upward from each end of the primary surface. The transitional surface extends outward and upward from the sides of the primary and approach surfaces at right angles to the runway centerline at a slope of 7 to 1. The horizontal surface is a plane 150 feet above the airport elevation, with a specified radius from the center of each end of the primary surface. The conical surface extends outward and upward from the edge of the horizontal surface at a slope of 20 to 1 for a horizontal distance of 4,000 feet.

A plan view of typical FAR Part 77 surfaces is presented in **Exhibit 3-8**. An isometric view is presented in **Exhibit 3-9**.

Exhibit 3-8: Typical FAR Part 77 Imaginary Surfaces – Plan View

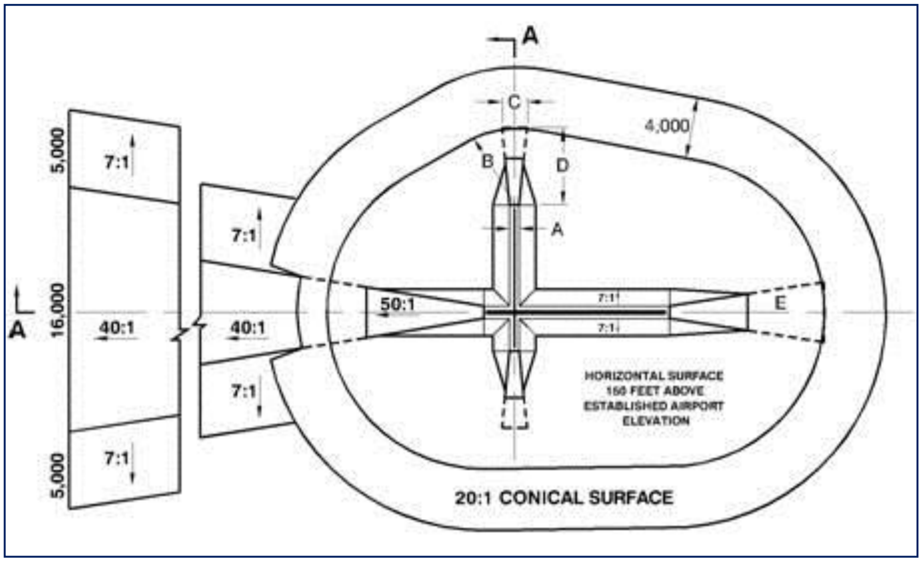
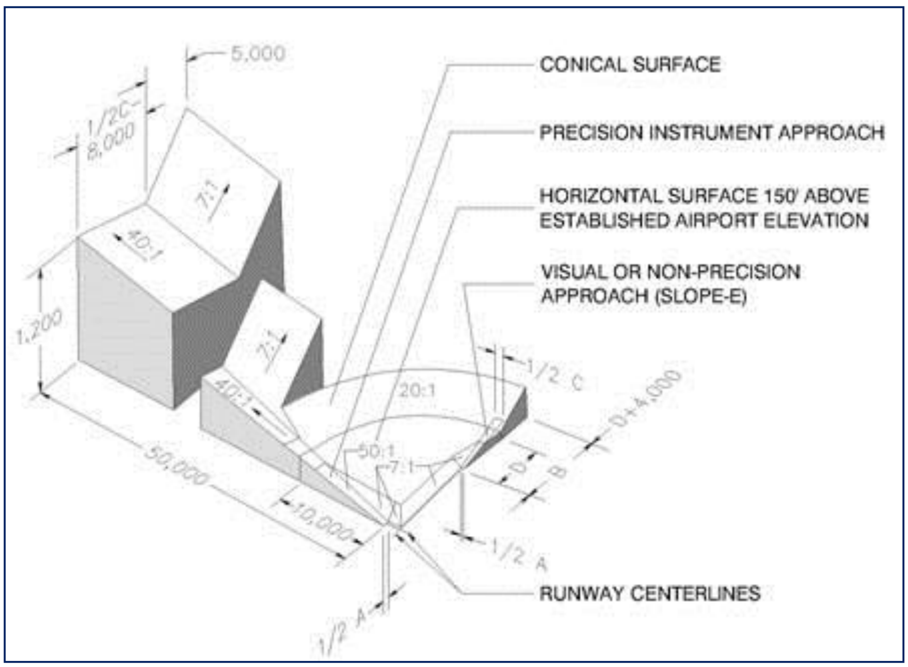


Exhibit 3-9: Typical FAR Part 77 Imaginary Surfaces – Isometric View



The dimensions and slopes of Part 77 surfaces for a specific runway are dependent on three factors:

- The type of approaches available to each Runway End (i.e. visual, non-precision, or precision);
- Whether the runway is constructed for and intended to be used by aircraft with a maximum gross weight greater than 12,500 pounds; and
- The lowest available approach visibility minimums to each Runway End.

The Part 77 surfaces that currently apply to Runway 5/23 are those for non-precision instrument runways with minimums greater than ¾-statute miles. The dimensions and slopes of these surfaces, as well as those for future approach scenarios, are presented in **Table 3-9**.

Table 3-9: Civil Airport Imaginary Surface Dimensions for Future Approach Minimums

Approach Type Approach Procedure Minimums Planning Horizon	**Non-Precision > 3/4 Statute Mile Existing**	**Non-Precision 3/4 Statute Mile Near-Term**	**Precision All Long-Term**
Primary Surface			
Width	500 feet	1,000 feet	1,000 feet
Length Beyond Runway End	200 feet	200 feet	200 feet
Approach Surface			
Outer Width	3,500 feet	4,000 feet	16,000 feet
Horizontal Distance	10,000 feet	10,000 feet	10,000 feet
Slope	34:1	34:1	50:1
Additional Horizontal Distance	None	None	40,000 feet
Additional Slope	None	None	40:1
Transitional Surface			
Slope	7:1	7:1	7:1
Horizontal Surface			
Height	150 feet	150 feet	150 feet
Radius	10,000 feet	10,000 feet	10,000 feet
Conical Surface			
Slope	20:1	20:1	20:1
Horizontal Distance	4,000 feet	4,000 feet	4,000 feet

Sources: CFR 14 Part 77, Objects Affecting Navigable Airspace

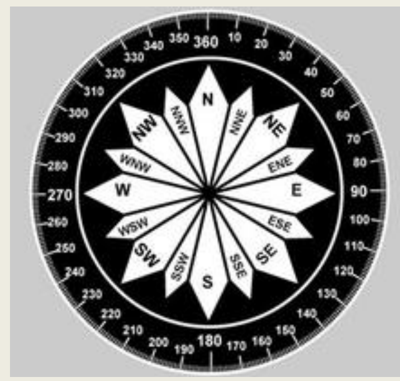
There are currently numerous penetrations to the Part 77 surfaces at PUW including penetrations to the primary surface, transitional surface, and approach surface by terrain and man-made structures. These penetrations to the Part 77 surfaces results in the need to displace the runway thresholds at both ends and raise the standard instrument approach minimums. This ultimately contributes to all-weather reliability issues during inclement weather. Future runway improvement alternatives should seek to eliminate Part 77 penetrations to the maximum extent feasible.

3.6 Wind Coverage

According to AC 150/5300-13, *Airport Design*, "runway location and orientation are paramount to airport safety, efficiency, economics, and environmental impacts." There are several factors that must be considered when determining the optimum runway location and orientation, including historic prevailing winds, airspace availability, environmental factors, obstructions to air navigation, and local topography.

Runways are named according to the magnetic compass bearing of the runway centerline in either direction, rounded to the nearest 10 degrees and with the trailing "0" dropped.

For Example: the compass in an aircraft on final approach to Runway 12 would have a bearing between 115° and 125°.



As part of this facility requirements analysis, consideration is given to the crosswind coverage of the existing runway orientation, and to the crosswind coverage of potential orientations of a new primary runway. AC 150/5300-13, *Airport Design*, states that the "desirable wind coverage for an airport is 95 percent." Wind coverage crosswind components are specific to the ARC for an airport. **Table 3-10** presents all-weather and instrument flight rules (IFR) wind coverage percentages for the existing Runway 5/23 orientation and other slightly different orientations.

Table 3-10: Wind Coverage for Potential Runway Orientations at PUW

Runway Orientation	All-Weather Wind Coverage	IFR Wind Coverage
3/21	99.70%	99.56%
4/22	99.75%	99.69%
5/23*	**99.76%**	**99.75%**
6/24	99.64%	99.66%
7/25	99.29%	99.45%

**Bold text indicates current alignment*
Source: National Oceanic and Atmospheric Administration, National Climatic Data Center, Station 72785 Pullman-Moscow AP, WA. Period of Record 1995-2004

As discussed in Chapter 1, winds at PUW are primarily out of the east and southwest. During periods of inclement weather having lower cloud ceilings and visibilities, winds from the southwest become more concentrated. As shown in **Table 3-10**, the current runway orientation provides the best possible all-weather and IFR wind coverage percentages, which are well above the desirable 95 percent. However, slight rotations of the current orientation have a minimal impact on wind coverage.

3.7 Runway Pavement Strength Requirements

The FAA provides guidance for runway pavement design in AC 150/5300-13 *Airport* Design and FAA FAARFIELD runway design software. The current pavement strength ratings for Runway 5/23 are 57,000 pounds for single-wheel type landing gear; 75,000 pounds for dual-wheel type landing gear; 95,000 pounds for two single-wheels in tandem type landing gear; and 135,000 pounds for two dual-wheels in tandem type landing gear. Airfield pavements are designed to withstand repeated use by the heaviest aircraft operating at the Airport over a 20-year period with regular maintenance. Representative aircraft types for the four landing gear categories and their gross weights are presented in **Table 3-11**.

Table 3-11: Typical Aircraft by Landing Gear Type and Gross Weight

Aircraft by Landing Gear Type	Gross Aircraft Weight
Single Wheel Type	
Citation II/Bravo	14,800 lbs.
Learjet 35/36	18,500 lbs.
Citation Excel	20,200 lbs.
Learjet 45	21,500 lbs.
Learjet 60	23,500 lbs.
Dual Wheel Type	
Hawker 800	28,000 lbs.
Citation Sovereign	30,300 lbs.
Citation X	36,100 lbs.
Canadair Challenger 604	47,600 lbs.
Bombardier Dash-8 Q400	64,500 lbs.
CRJ-900	84,500 lbs.
Airbus A319	166,500 lbs.
Boeing 737	174,200 lbs.
Two Single Wheels in Tandem Type	
C-130 Hercules	175,000 lbs.
Two Dual Wheels in Tandem Type	
Boeing 757	273,000 lbs.

Source: 2009 Aviation Week & Space Technology Aerospace Sourcebook

The heaviest aircraft operating most frequently at PUW have either single-wheel type or dual-wheel type landing gear. The existing single-wheel type landing gear rating of 57,000 pounds is adequate for the majority of aircraft with this landing gear type. However, the existing dual-wheel type landing gear rating of 75,000 pounds is not adequate for larger commercial and charter aircraft expected to use the Airport in the future, such as the CRJ-900, the Airbus A319, or the Boeing 737. Future runway pavement improvements should be designed to accommodate these aircraft. It is not expected that there will be significant use of PUW by aircraft with two single-wheels in tandem type or two dual-wheels in tandem type landing gear.

3.8 Taxiway and Taxilane Requirements

Taxiway/taxilane design standards are largely dependent on the wheel base and wheel tracks of the largest aircraft expected to use the Airport. For the purpose of this analysis, the wheel base and track for the CRJ-900, Airbus A319, and Boeing 737 should be used to establish design standards for taxiways, taxilanes, and pavement fillets at PUW. The wheel base and track information for these aircraft are presented in **Table 3-12**.

Table 3-12: Large Aircraft Wheel Base and Track

Aircraft Model	Wheel Base	Track
Bombardier Dash-8 Q400	547.3 in (13.9 m)	346.0 in (8.8 m)
CRJ-900	681.0 in (17.3 m)	162.0 in (4.1 m)
Airbus A319	434.6 in (11.0 m)	298.8 in (7.6 m)
Boeing 737	676.0 in (17.2 m)	275.5 in (7.0 m)

Source: Airport Planning Manuals

Runway 5/23 has a full-length parallel taxiway with two midfield connector taxiways and a connector taxiway on both Runway Ends. The taxiways are 60 feet wide. Each end of the parallel taxiway has a paved apron for engine run-ups and system tests prior to takeoff.

Taxiway design standards vary depending on airplane design group. Taxiway standards associated with design groups II and III are presented in **Table 3-13**.

Table 3-13: Taxiway Design Standards for Airplane Design Groups II and III

Airplane Design Group	Existing	II	III
Taxiway Width	60 feet	35 feet	50 feet
Are Taxiways In Compliance?		YES	YES
Taxiway Shoulder Width	10 feet	10 feet	20 feet
Are Taxiways In Compliance?		YES	**NO**
TSA Width	90 feet	79 feet	118 feet
Are Taxiways In Compliance?		YES	**NO**
TOFA Width	77 feet[1]	131 feet	186 feet
Are Taxiways In Compliance?		**NO**	**NO**

Sources: AC 150/5300-13 Airport Design

1. TOFA is not compliant on north side due to proximity to aircraft parking areas

TSA: Taxiway Safety Area
TOFA: Taxiway Object Free Area

As shown in **Table 3-13**, only Design Group II standards are compliant with the exception of the Taxiway Object Free Area (TOFA). Similar to the ROFA, the TOFA clearing standards prohibit service vehicle roads, parked airplanes, and above ground objects, except for those needed for air navigation or aircraft ground maneuvering purposes. The aircraft parking area is 77 feet from the taxiway centerline and inside both design group II and design group III TOFAs.

The future taxiway system should conform to Design Group III standards, presented in **Table 3-13**. The exact location and configuration of the future taxiway system will depend on engineering, safety, operational, and functional considerations associated with the preferred runway alternative. Phase I Master Plan investigated alternatives to remedy taxiway design conflicts. The *Airside Alternatives* chapter will further develop taxiway design alternatives.

3.9 Visual and Electronic Aid Requirements

Airport visual and electronic aids consist of instruments and equipment that assist pilots with navigation on the airfield and within the vicinity of the airport while in flight. The airfield at PUW is equipped with the following visual and electronic aids.

- White/green rotating beacon
- Lighted wind sock and segmented circle
- Runway End identifier lights (REILs)
- Precision approach path indicator (PAPI) lights
    - Runway 05: 2-box, 3-degree glidepath
    - Runway 23: 4-box, 4-degree glidepath
- High intensity runway edge lighting (HIRL)

As discussed in Section 3.5, implementation of a new ILS or APV-RNP approach will require the installation of an approach lighting system. Installation of an ILS will require a localizer antenna array and a glide slope antenna. A localizer antenna array is typically installed 1,000 feet from the Runway End opposite of the approach end. A glide slope antenna is typically installed 400 lateral feet from the runway centerline and 1,000 longitudinal feet from the approach end of the runway. Implementation of an APV-RNP approach would not require this equipment.

3.10 Runway Signage and Marking Requirements

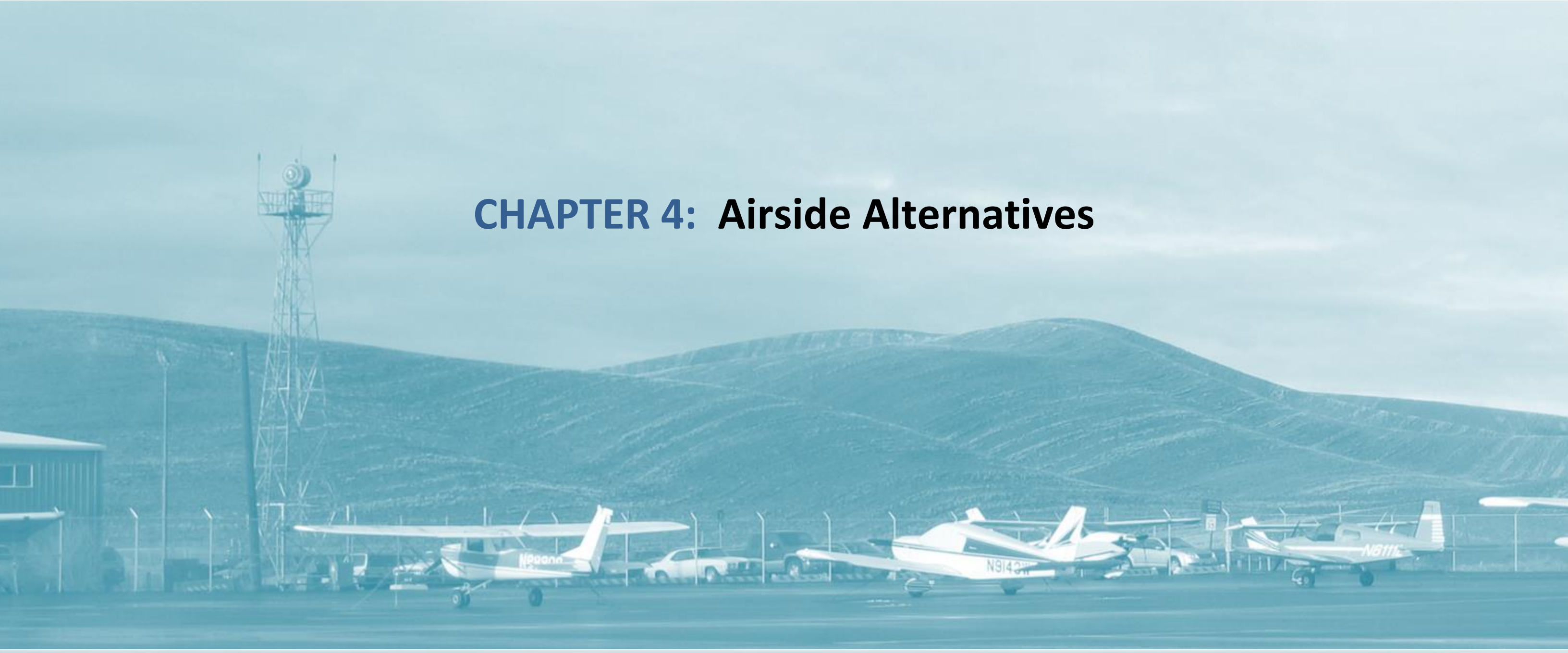
Runway 5/23 is currently equipped with a standard lighted airfield signage system. This system includes guidance signs indicating relative position on the airfield and runway distance remaining signs. Runway improvement alternatives should include replacement of the existing airfield signage system.

Runway 5/23 is currently equipped with precision instrument approach pavement markings and displaced thresholds markings. The *Airside Alternatives* chapter will investigate the possibility of eliminating the displaced thresholds through design improvements.

3.11 Airside Facility Requirements Summary

Based on the most demanding aircraft using PUW in 2008 and 2009, the ARC for Runway 5/23 should be C-III. The airfield at PUW is not in compliance with FAA airport design standards associated with the C-III designation. Achieving compliance with these design standards will require modification to existing airfield facilities. Development of alternatives to achieve compliance with C-III design standards should consider the need for lower visibility approach minimums into the Airport, the requirements for implementing such approaches, and the need for additional runway length and configuration.

CHAPTER 4: Airside Alternatives



Overview

Achieving compliance with Airport Reference Code (ARC) C-III design standards, and other airside facility requirements described in Chapter 3, will require extensive changes to the existing airfield at Pullman-Moscow Regional Airport (PUW). For over a decade, the Airport sponsor has considered a wide range of airside development alternatives for meeting these requirements. This chapter identifies airside alternatives that have been considered during prior studies, and documents the rationale for carrying some alternatives forward while eliminating others. The chapter then summarizes the outcome of Phase 1 of this Master Plan Update, and refines the preferred runway alignment selected in Phase 1 into four separate airside alternatives based on runway length. The feasibility of implementing each of these four alternatives is then explored, and a preferred airside alternative is selected for near-term implementation. A conceptual construction plan is then presented, and the performance of the preferred airside alternative is measured against FAA objectives for new runways.

This chapter is organized into the following sections:

- Airside Alternatives Identified by Previous Studies
- Phase 1 Airside Alternatives
- Phase 2 Airside Alternatives
- Construction Feasibility Analysis
- Preferred Airside Alternative
- Conceptual Construction Phasing Plan
- FAA Objectives for New Runways
- Airside Alternatives Summary

4.1 Airside Alternatives Identified by Previous Studies

There have been several planning studies completed related to airside development alternatives at PUW. These studies built on one another and culminated in Phase 1 of this Master Plan Update, completed in 2007. Using alternatives identified in these studies as a starting point, Phase 1 resulted in the selection of a preferred runway alignment that can meet FAA design parameters at PUW.

Airside alternatives identified by previous planning studies, and decisions made by FAA and the Airport sponsor related to study recommendations, are summarized in the following sections:

- 1977 Quad Cities Regional Aviation Planning Study
- 1999 Airport Master Plan
- 2004 Airport Site Investigation and Instrument Runway Designation Report

1977 Quad Cities Regional Aviation Planning Study

In 1977, a regional aviation planning study was completed that evaluated consolidating PUW and Lewiston-Nez Perce County Airport (LWS) into a single regional airport. The study was prompted by a regional aviation system plan report, completed in 1973, that recommended the construction of a "new regional jet facility to serve the region's air carrier needs." The study formulated five air transportation system alternatives, the following three of which were analyzed in some detail:

- Maintain commercial service to the existing airports at PUW and LWS.
- Construct a new regional airport and terminate commercial service to PUW and LWS.
- Initiate an intermodal regional air service concept involving ground transfer to Spokane International Airport (GEG) for all commercial service.

The 1977 study evaluated the three alternatives based on a range of criteria, including environmental, economic, and political impacts. The study concluded that, while it was technically feasible to develop a new regional airport at several potential sites in the Genesee-Uniontown area, there was no clear or present justification for a new regional airport. The study further concluded that the GEG intermodal concept "would result in a substantial increase in access cost, gross inconvenience, and possible economic loss to the region." The study made the following three recommendations:

- A new centrally located regional air carrier airport should not be considered.
- PUW and LWS should be expanded and improved according to indicated needs.
- The region should continue to promote and support commercial service at PUW and LWS.

1999 Airport Master Plan

An Airport Master Plan for PUW was completed in 1999. The Airport was already facing some of the design standard issues at the time that are currently being addressed by this Master Plan Update. The plan report noted that PUW was "out of compliance with many FAA design standards and lacked the ability to accommodate larger regional jet transport aircraft and provide all-weather aircraft landing and takeoff capabilities." At the time, the Airport was classified as a short haul primary commercial service airport with an Airport Reference Code (ARC) of B-III. As such, it was already operating under modified standards. The 1999 plan utilized ARC C-III design standards for long range planning in order to provide flexibility for the long-term Airport growth. The 1999 plan identified and compared the following four airside alternatives to determine the most advantageous course of action:

- **Alternative 1** – Construct a new 7,300-foot runway 400 feet south of and parallel to the existing runway, and convert the existing runway to a parallel taxiway.
- **Alternative 2** – Construct a new parallel taxiway 60 feet south of the existing taxiway, and construct a new 7,300-foot runway 260 feet south of the existing runway.
- **Alternative 3** – Rotate the existing runway and taxiway system approximately 10 degrees counterclockwise.
- **Alternative 4** – Relocate the Airport.

The 1999 plan determined that the difference in environmental impacts among the first three alternatives was negligible. According to the Airport Master Plan report, cost estimates for these three alternatives were also similar.

The 1999 plan identified Alternative 3 as the preferred airside alternative. This recommendation was made because it would:

- Meet design criteria for both ARC B-III and C-III aircraft, enhance Airport safety, and allow occasional use of the Airport by narrow-body commercial passenger jet aircraft such as the Boeing 737.
- Accommodate a precision instrument approach to the western end of the runway and a non-precision instrument approach to the eastern end.
- Shift the approach to the western runway end to the south, thereby reducing noise and safety concerns associated with aircraft overflights of the City of Pullman and Washington State University.
- Accommodate an approach lighting system beyond the western runway threshold.
- Open up new areas on the Airport for new landside development.

- Allow considerable expansion of the commercial and general aviation (GA) aircraft parking aprons.

With community input, Alternative 3 was chosen as the preferred airside alternative by the Airport Board. The FAA determined that further study would be needed prior to offering its formal support for pursuing this alternative. In the meantime, the FAA agreed to support mitigation measures to reduce deviations from current standards for the existing airfield. The preferred airside alternative was shown on the Airport Layout Plan (ALP) for the purpose of future zoning and land use protection decisions.

2004 Airport Site Investigation and Instrument Runway Designation Reports

In 2001, a planning study was initiated for developing and expanding GA facilities at the Airport, while also identifying alternatives for reducing or eliminating non-standard airfield design conditions. When the study began, the Airport was classified as an ARC B-III facility. Near the end of the planning process, Horizon Air announced that they would soon transition their commercial fleet to the Bombardier Q-400 aircraft. This announcement changed the focus of the planning study because the fleet change would shift the Airport from an ARC B-III to an ARC C-III classification. The immediate planning need became identifying alternatives for compliance with FAA airfield design geometry standards and other FAA recommendations associated with the C-III classification.

Rather than finish the planning study under the original scope of services, the report was completed under a revised scope. The work completed as part of the initial planning process was included as an informational appendix. Initially, the study considered the following five airside alternatives:

- **No-Action Alternative** – Keeping the status quo, leaving non-compliant physical design and FAR Part 77 airspace penetration issues unaddressed.
- **Alternative 1** – Construct a new 7,300-foot runway 400 feet south of and parallel to the existing runway, and convert the existing runway to a parallel taxiway.
- **Alternative 2** – Construct a new parallel taxiway 60 feet south of the existing taxiway, and construct a new 7,300-foot runway 260 feet south of the existing runway.
- **Alternative 3** – Rotate the existing runway and taxiway system approximately 10 degrees counterclockwise.
- **Alternative 4** – Relocate the parallel taxiway 400 feet south of the existing runway.

Under the revised scope, Alternative 1 and Alternative 3 were further explored as preliminary design solutions. The revised scope also included development of an Instrument Runway Designation Report. This report evaluated proposed instrument approaches to the existing runway, Alternative 1, and Alternative 3.

The Airport Site Investigation and Instrument Runway Designation Reports were published in 2004. The reports made a preliminary determination recommending Alternative 3 as the preferred alternative, but also declared a need for additional information prior to making a final determination.

4.2 Phase 1 Airside Alternatives

Phase 1 of this Master Plan Update was completed in 2007. The purpose of Phase 1 was to establish a preferred runway alignment at the existing Airport site to achieve compliance with C-III design standards and also achieve lower approach procedure minimums to improve accessibility during the winter season. The preferred runway alignment identified in Phase 1 will be used as a starting point for development of airside alternatives in subsequent sections of this chapter.

Multiple runway configurations were analyzed as part of the Phase 1 study. An initial screening evaluation considered a broad range of conceptual runway alignments, including the following:

- **Alternative 1A** – This alternative considered a rotated runway alignment that fits on top of the ridgeline just south of the existing runway. It was determined that additional refinements would be required to assess the feasibility of connecting taxiways and to resolve terrain penetrations to airspace surfaces beyond each runway end.
- **Alternative 1B** – This alternative considered a runway alignment on top of the southern ridgeline that would be independent of the existing runway. The purpose of this alternative was to eliminate complications associated with constructing connecting taxiways to existing landside facilities. The new runway would serve as the new air carrier runway, while the old runway would serve GA operations and eventually be phased out. This alternative would require the relocation of numerous landside facilities to the top of the ridge.
- **Alternative 2A** – This alternative considered retaining the existing runway, and extending and upgrading it to comply with C-III standards. This alternative would require demolition and reconstruction of adjacent airport facilities, Airport Road realignment, relocation of off-airport residences, and significant earthwork to extend the runway and improve instrument approaches and departures.
- **Alternative 2B** – Like the Alternative 1 considered in the 2004 Airport Site Investigation Study, this alternative considered a new 7,300-foot runway 400 feet south of and parallel to the existing runway, and converting the existing runway to a parallel taxiway.
- **Alternative 2C** – Like the Alternative 3 considered in the 2004 Airport Site Investigation Study, this alternative considered rotating the existing runway and taxiway system approximately 10 degrees counterclockwise. This alternative also shifts the new runway to the south to allow for future landside development.

- **Alternative 2D** – Similar to Alternative 2C, this alternative considered rotating the existing runway and taxiway system, but in the opposite direction. This option would avoid approach and departure issues associated with hills east of the Airport, and reduce overflights of the City of Pullman and Washington State University.
- **Alternative 2E** – This alternative considered a rotated runway alignment similar to Alternative 2D, but on the hill north of Airport Road. This alternative would require reconfiguration of landside facilities in the reverse direction, and realignment of Airport Road to the south of these facilities.
- **Alternative 3** – This alternative considered relocating the airport. The alternative was presented as being representative of the full range of potential sites that would need to be explored as part of a site selection study.

These conceptual runway alignment alternatives were then evaluated based on the following list of criteria:

- Compliance with C-III design standards
- Approach and departure clearances
- Ultimate runway length potential
- Ultimate landside development potential
- Construction impacts to existing operations
- Airfield impacts
- Road impacts
- Infrastructure impacts
- Earthwork volumes
- Environmental considerations
- Long-range flexibility
- Airfield maintenance impacts
- Airport operational impacts
- Land use impacts

The initial screening evaluation selected Alternatives 2B and 2C as the finalist runway alignment alternatives. These two alternative alignments were each subsequently refined into nine specific alternatives differing in terms of runway length, FAR Part 77 surfaces, and approach minimums, resulting in a total of 18 distinguishable alternatives.

The Phase 1 investigation identified Alternative 2C as the most financially feasible for achieving compliance with C-III standards within the confines of the existing airport site. Preliminary cost estimates for variants of Alternative 2C ranged from a total of $37 million to $79 million, while preliminary cost estimates for variants of Alternative 2B ranged from a total of $71 million to $191 million. The primary reason for its reduced cost is that Alternative 2C conforms more closely to the existing topography at PUW and, as a result, involves significantly less earthwork than Alternative 2B. Alternative 2C also provides more opportunities for future runway lengthening and results in more land becoming available for future development of landside facilities.

The airspace analysis conducted for Phase 1 concluded that both Alternative 2B and 2C would be capable of providing an approach from the west with standard Category I approach minimums (½ mile visibility and 200-foot decision height). The airspace analysis also concluded that Alternative 2C has a slight advantage in terms of aircraft departure and missed approach clearances. On the whole, neither alternative runway alignment was found to be clearly superior in terms of airspace clearance requirements.

A major disadvantage to Alternative 2C was the resulting disruptions of Airport operations during construction. The runway realignment proposed by Alternative 2C was expected to force construction activities onto the existing runway or associated clear areas for extensive periods of time. However, Phase 1 also concluded that there were no other financially feasible alternatives.

At the conclusion of Phase 1, the Airport sponsor selected Alternative 2C as the preferred runway alignment for achieving compliance with C-III design standards and lower approach procedure minimums. Phase 1 recommended that additional investigations be undertaken to confirm the validity of the preliminary cost assumptions, including geotechnical, drainage, constructability, and project phasing assessments.

Because the preferred alignment presented many challenges to the FAA and the Airport sponsor, Phase 1 investigations were expanded to further define several primary issues to a significantly higher degree of reliability. These efforts collected and assessed additional information regarding the following:

- Site geology, for the purposes of identifying sub-surface soil types and their suitability for the proposed construction, and establishing the presence or absence of significant rock material;
- Presence or absence of significant groundwater within the limits of proposed cut and fill areas; and
- Delineation of existing wetlands on the Airport site.

The results provided sufficient justification of the physical feasibility of the preferred runway alignment. The data is used in subsequent sections of this chapter to evaluate project constructability.

4.3 Phase 2 Airside Alternatives

This section presents four airside alternatives which meet the criteria and standards specified in Chapter 3, *Airside Facility Requirements* to the maximum extent feasible. The main difference between the four alternatives is the runway length available for aircraft operations.

All of the Phase 2 airside alternatives utilize both the runway alignment and the location and elevation for the western runway threshold identified as Alternative 2C from Phase 1. This threshold location was chosen based on the aircraft approach analysis completed as part of the Phase 1 study, and will be fixed for all subsequent evaluation of airside alternatives. The configuration of the airfield complex is the same for all four alternatives with the exception of the far eastern end of the runway. All four alternatives include installation of a medium-intensity approach lighting system with runway alignment indicator lights (MALSR) beyond the western runway end. The four alternatives include the following:

- **Alternative 1** – 6,700-foot Runway
- **Alternative 2** – 7,100-foot Runway
- **Alternative 3** – 8,000-foot Runway
- **Alternative 4** – 8,000-foot Runway with Displaced Threshold

Alternative 1: 6,700 Foot Runway

Alternative 1 retains the existing runway length of 6,700 feet. This alternative is considered the baseline alternative for comparison and analysis with longer runway lengths. Alternative 1 is shown on **Exhibit 4-1**.

Alternative 2: 7,100 Foot Runway

Alternative 2 provides the required near-term runway length of 7,100 feet identified in Chapter 3. This is the runway length approved for near-term construction based on the Airport's current activity and fleet mix. FAA concurrence with this runway length justification is contained in **Appendix E**. Alternative 2 is shown on **Exhibit 4-2**.

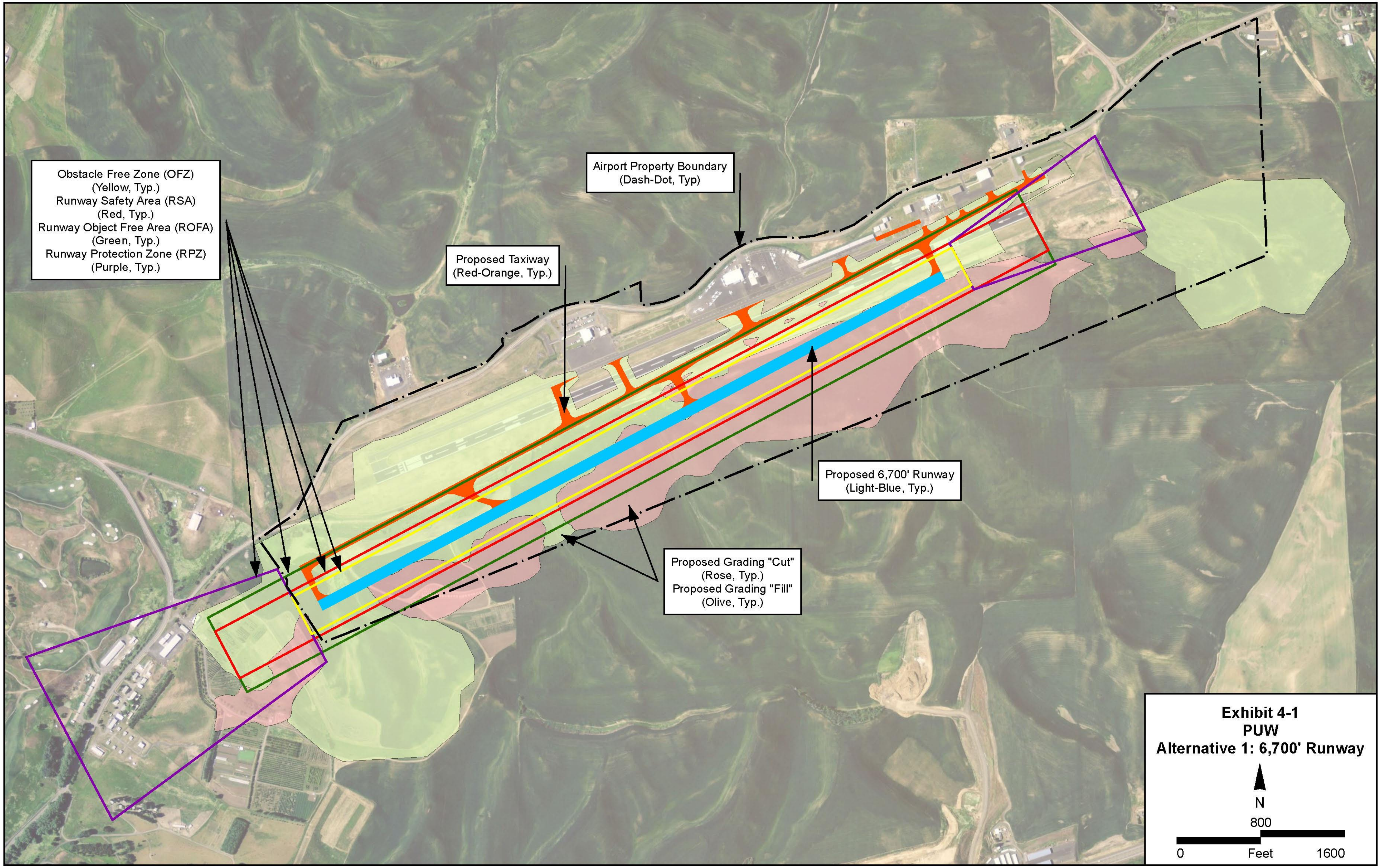
Alternative 3: 8,000 Foot Runway

Alternative 3 provides a runway length of 8,000 feet. This is the ultimate runway length desired by the Airport sponsor. This alternative was evaluated to determine impacts associated with an ultimate extension to this length. Alternative 3 is shown on **Exhibit 4-3**.

Alternative 4: 8,000 Foot Runway with Displaced Threshold

The 8,000 foot runway length provided by Alternative 3 for all aircraft operations in both directions will require an extremely large amount of earthwork on the eastern end of the runway to create the required obstacle clearance surfaces. While Alternative 3 and Alternative 4 both provide the long-term runway length of 8,000 feet, Alternative 4 includes a 500 foot displaced threshold on the eastern end of the runway. Alternative 4 was developed to reduce earthwork requirements beyond the eastern end of the runway while still providing the 8,000 foot length for takeoff operations to the west. This alternative reduces the runway length available for takeoff operations to the east and for landing operations in both directions to 7,500 feet. Alternative 4 is shown on **Exhibit 4-4**.

This Page Intentionally Left Blank


Obstacle Free Zone (OFZ)
(Yellow, Typ.)
Runway Safety Area (RSA)
(Red, Typ.)
Runway Object Free Area (ROFA)
(Green, Typ.)
Runway Protection Zone (RPZ)
(Purple, Typ.)
Airport Property Boundary
(Dash-Dot, Typ)
Proposed Taxiway
(Red-Orange, Typ.)
Proposed 6,700' Runway
(Light-Blue, Typ.)
Proposed Grading "Cut"
(Rose, Typ.)
Proposed Grading "Fill"
(Olive, Typ.)
Exhibit 4-1
PUW
Alternative 1: 6,700' Runway
N
800
0
Feet
1600

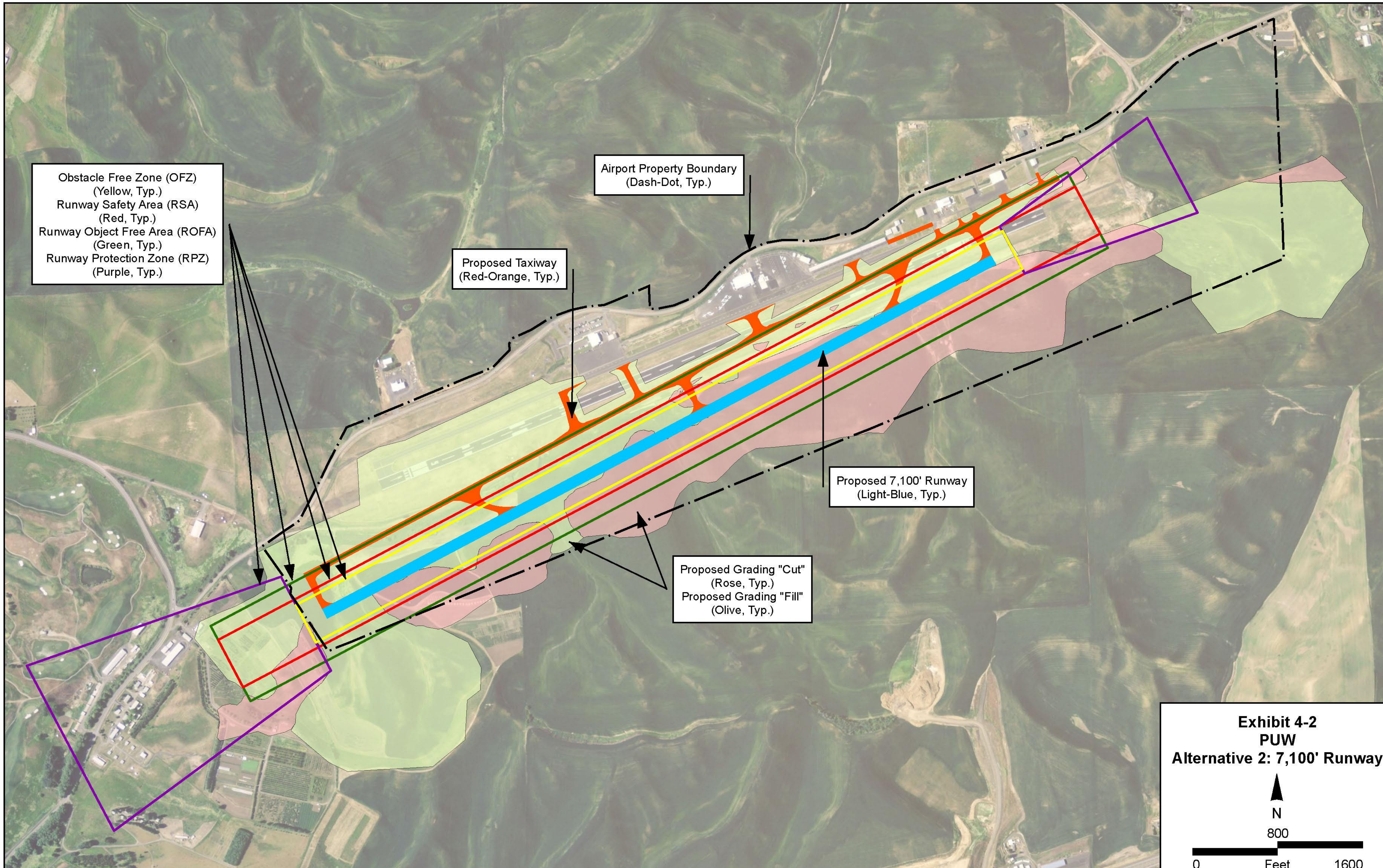


Exhibit 4-2
PUW
Alternative 2: 7,100' Runway

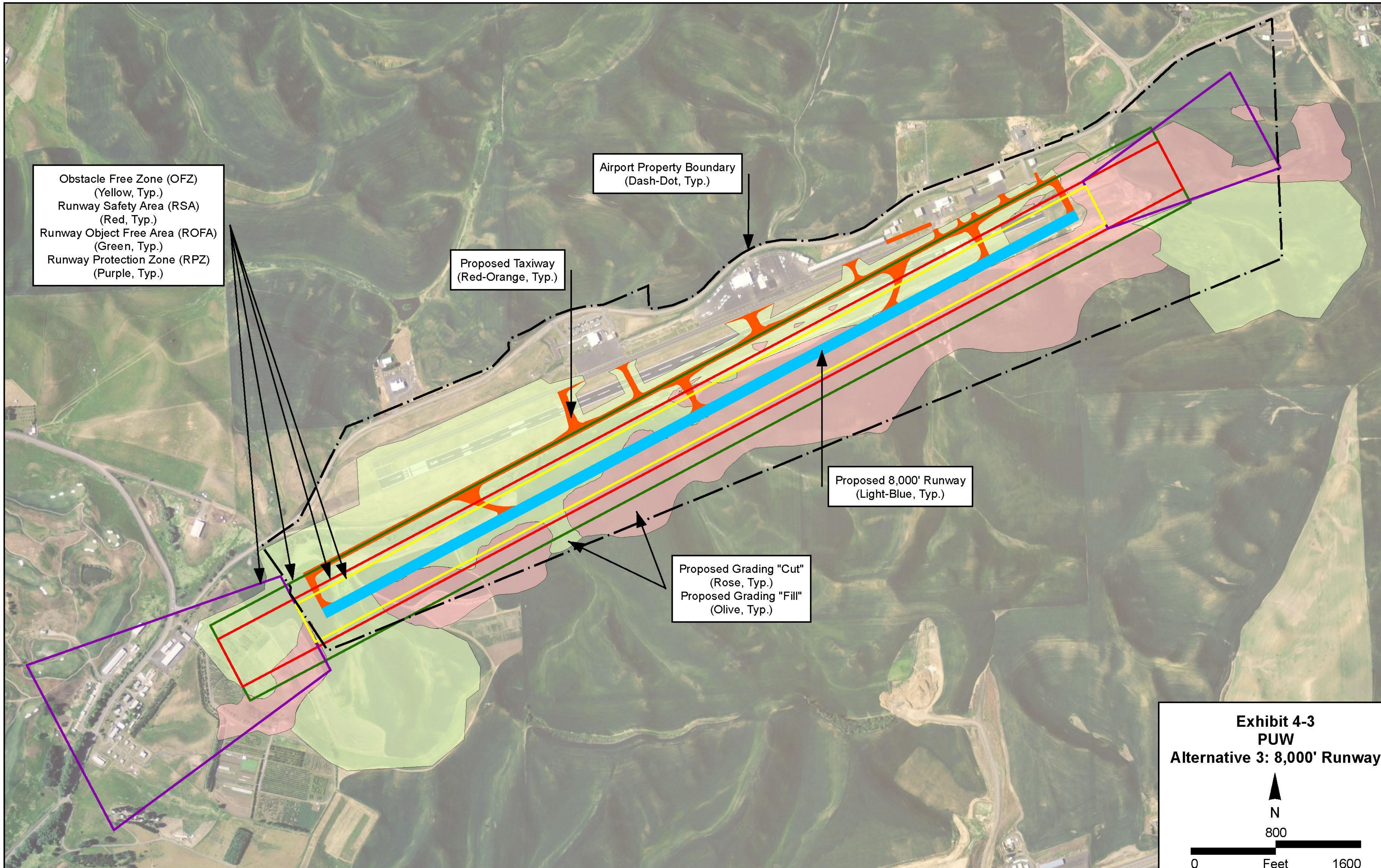
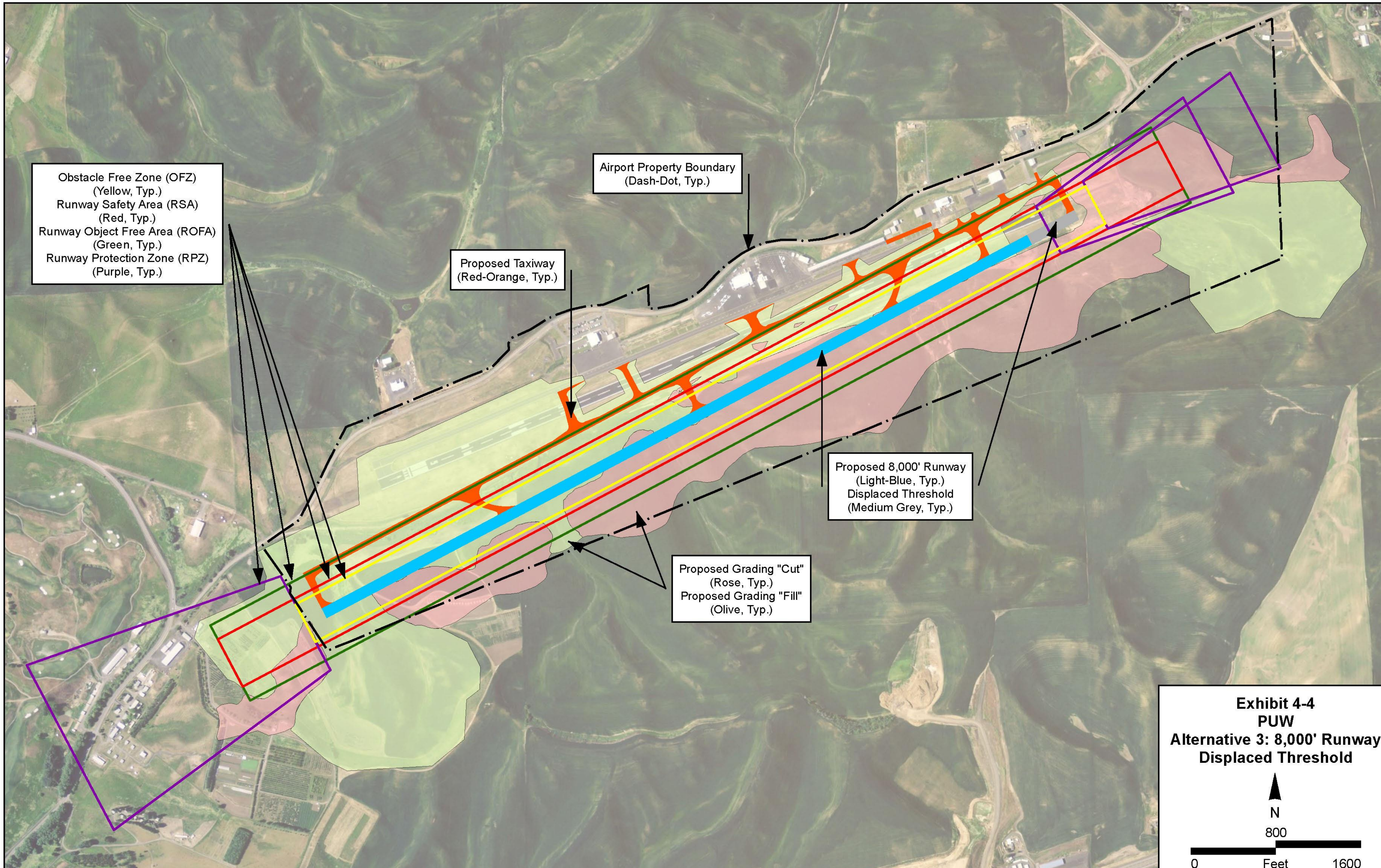


Exhibit 4-3
PUW
Alternative 3: 8,000' Runway


Obstacle Free Zone (OFZ)
(Yellow, Typ.)
Runway Safety Area (RSA)
(Red, Typ.)
Runway Object Free Area (ROFA)
(Green, Typ.)
Runway Protection Zone (RPZ)
(Purple, Typ.)
Airport Property Boundary
(Dash-Dot, Typ.)
Proposed Taxiway
(Red-Orange, Typ.)
Proposed 8,000' Runway
(Light-Blue, Typ.)
Displaced Threshold
(Medium Grey, Typ.)
Proposed Grading "Cut"
(Rose, Typ.)
Proposed Grading "Fill"
(Olive, Typ.)
Exhibit 4-4
PUW
Alternative 3: 8,000' Runway
Displaced Threshold
N
800
0
Feet
1600

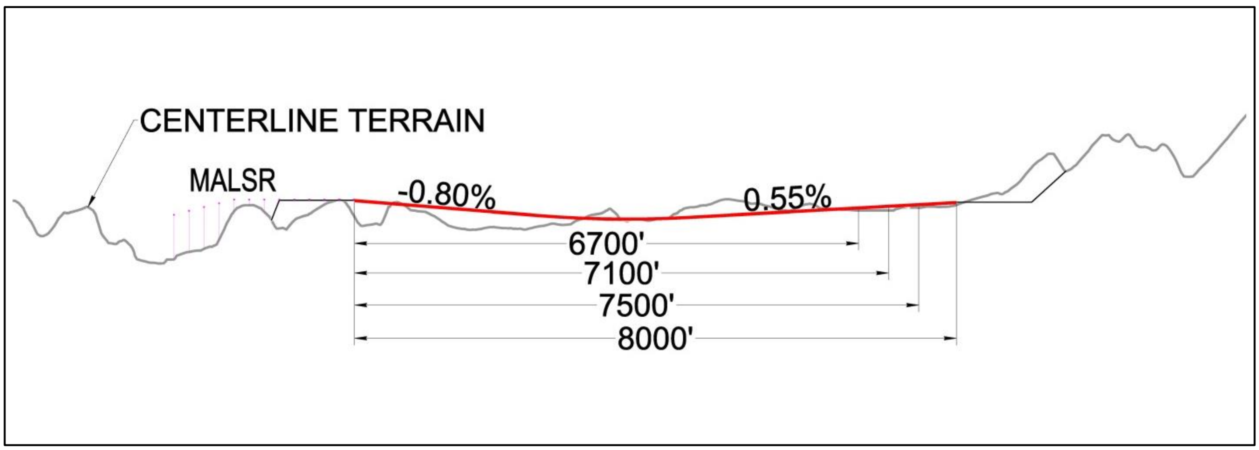
4.4 Construction Feasibility Analysis

A detailed preliminary construction feasibility analysis for the four Phase 2 airside alternatives was completed by T-O Engineers in May 2011. While the analysis is preliminary, the results found that all four Phase 2 airside alternatives are feasible from a construction standpoint and that there are no fatal flaws. The following sections summarize key issues identified by the feasibility analysis. The complete technical memorandum is included in **Appendix F**.

Preliminary Runway Profile and Grading Concept

The conceptual runway profile is similar for all four alternatives, except that alternatives with longer runway lengths have added length on the eastern end of the runway. The runway profile concept is presented in **Exhibit 4-5**.

Exhibit 4-5: Airside Alternative Runway Profile Concept



Source: T-O Engineers

The four airside alternatives are all primarily massive earthmoving or grading projects, creating a very large pad on which the proposed airfield can be constructed. Cuts to depths greater than 80 feet will be required in the hills south and east of the existing airfield to construct the new airfield to design grades and provide adequate airspace clearances. Fills to depths greater than 50 feet will be required on the west end of the runway to build it up to an elevation suitable for aircraft approach. Estimated earthwork cut and fills quantities for the four alternatives are summarized and compared in **Table 4-1**.

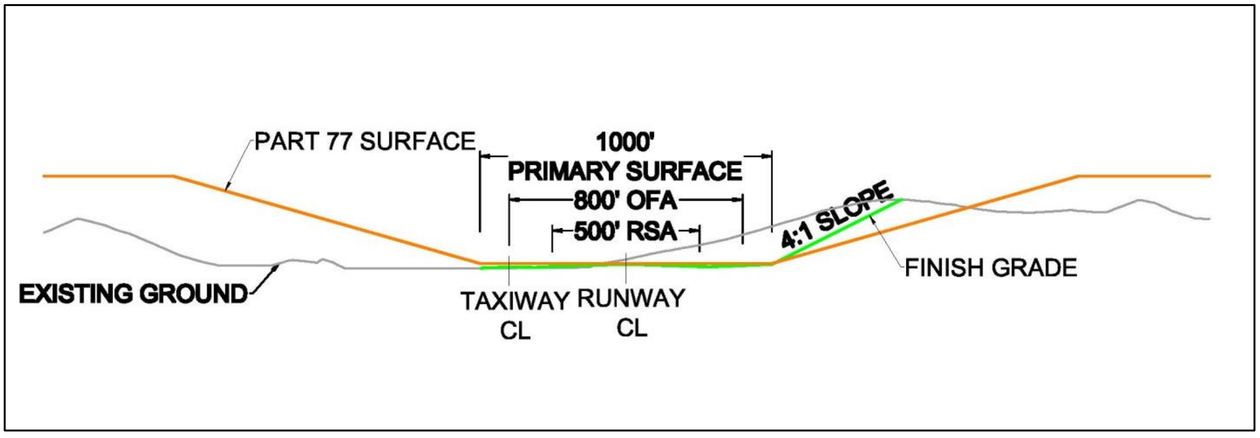
Table 4-1: Alternative Earthwork Cut and Fill Quantities, in Millions of Cubic Yards			
Alternative	**Cut**	**Fill**	**Excess Cut**
Alternative 1: 6,700 Foot Runway	4.4	2.8	1.6
Alternative 2: 7,100 Foot Runway	4.8	2.8	2.0
Alternative 3: 8,000 Foot Runway	6.9	3.1	3.8
Alternative 4: 8,000 Foot Runway with Displaced Threshold	6.5	3.1	3.4

Source: T-O Engineers

As shown in **Table 4-1**, each alternative will result in a significant amount of cut beyond what will be needed to construct the airfield. On-site disposal areas are preferred for this excess cut material due to lower disposal costs. The construction feasibility analysis contained in **Appendix F** identifies several sites as possible locations to dispose of the excess material.

A cross section view of the airfield grading concept, viewed from the proposed western runway threshold, is presented in **Exhibit 4-6**. This concept is generally consistent across all four alternatives. The concept does not meet criteria for the FAR Part 77 transitional surface south of the proposed runway. The proposed 4:1 transitional surface is shown with the green line while the 7:1 slope required by FAR Part 77 transitional surface is shown with the red line. Grading for the airside alternatives uses a stabilized 4:1 slope, primarily to control project costs. However, evaluation of obstructions was performed with full Part 77 compliance in mind.

Exhibit 4-6: Airside Alternative Runway Grading Concept (Cross Section View)



Source: T-O Engineers

Grading plans were developed based on a geotechnical report prepared by GeoEngineers as part of the Phase 1 supplemental investigations. Information in the geotechnical report reveals minimal impact to bedrock and groundwater resources associated with the four airside alternatives. However, additional geotechnical investigation will be required for design. Although major impacts are not anticipated, further analysis could potentially reveal additional bedrock or groundwater impacts that could change the approach to the project.

Survey information used to develop the profile and grading concepts was gathered from several sources, none of which are to the accuracy requirements of airfield design. Due to the large project area, differences in elevation could have a significant impact on final cost estimates and actual construction costs. A full topographic survey of the entire project area will be required before design.

Pavement Section Analysis

The construction feasibility analysis included preparation of preliminary runway pavement section designs for the future runway, parallel taxiway, and connecting taxiways using both flexible pavement (hot mix asphalt) and rigid pavement (Portland cement concrete). The sections were designed to withstand seasonal frost and aircraft weights in excess of 100,000 pounds. Life cycle costs for the two pavement designs were then estimated and compared for the two pavement types to determine which option offered the most economic benefit. The analysis determined that the total life cycle costs of the two pavement designs are within 5% of each other. According to FAA Advisory Circular 150/5320-6E, *Airport Pavement Design and Evaluation*, differences in life cycle costs of less than 10% are considered insignificant. A final decision regarding pavement type will need to be made during design based on funding availability, construction timing and maintenance considerations.

Land Acquisition and Land Use Impacts

This Master Plan recommends that all land within the runway protection zones (RPZ) and building restriction lines (BRL) for the preferred airside alternatives be subject to either fee simple acquisition or an avigation easement prior the opening of the new runway. An RPZ is a trapezoidal area centered about the extended runway centerline whose function is to enhance the protection of people and property on the ground. The RPZ for PUW is shown on **Exhibit 4-7** and **Exhibit 4-8**. As the name suggests, a BRL is a line that designates suitable building area locations on the airport.

FAA Advisory Circular (AC) 150/5300-13, *Airport Design*, recommends that control and maintenance of RPZ areas be achieved through "the acquisition of sufficient property interest" by the airport owner. FAA AC 150/5300-13 further requires that a BRL be placed on an ALP to identify suitable building area locations. According to FAA Policy and Procedures Memorandum (PPM) 5300.1B, *Runway Protection Zone and Airport Object Clearing Policy*, the BRL should encompass all areas with less than 35 foot clearance under the FAR Part 77 surfaces, where feasible. FAA PPM 5300.1B recommends fee simple acquisition of areas within a BRL. If fee simple acquisition is not feasible, these areas should be controlled by an appropriate avigation easement.

Based on preliminary engineering analysis and best land use practices, some combination of fee simple acquisition and avigation easements will be required in the agricultural area south of Airport Road on the WSU campus. Fee simple acquisition may be required in areas of proposed grading and fill material disposal activities, while avigation easements may be adequate to control land uses outside of these areas but within the RPZ and BRL. It is expected that an avigation easement will be sufficient to control land uses north of Airport Road, assuming that this area remains in use as a golf course. There are two 500-gallon fuel tanks and a fertilizer building located on golf course property north of Airport Road and one 2,200 gallon underground fuel tank located on WSU property south of Airport Road. The fuel tanks and fertilizer building will need to be relocated prior to opening the new runway.

At this preliminary planning phase, two preliminary property acquisition and easement scenarios were developed. Scenario A, presented in **Exhibit 4-7**, involves fee simple acquisition of all agricultural fields in use by the WSU HLA Department. Scenario B, presented in **Exhibit 4-8**, involves fee simple acquisition for only those portions of the agricultural fields that will be needed for grading and fill material disposal activities. Both scenarios assume avigation easements will adequately control the use of most agricultural buildings within the RPZ and BRL immediately adjacent to Airport Road.

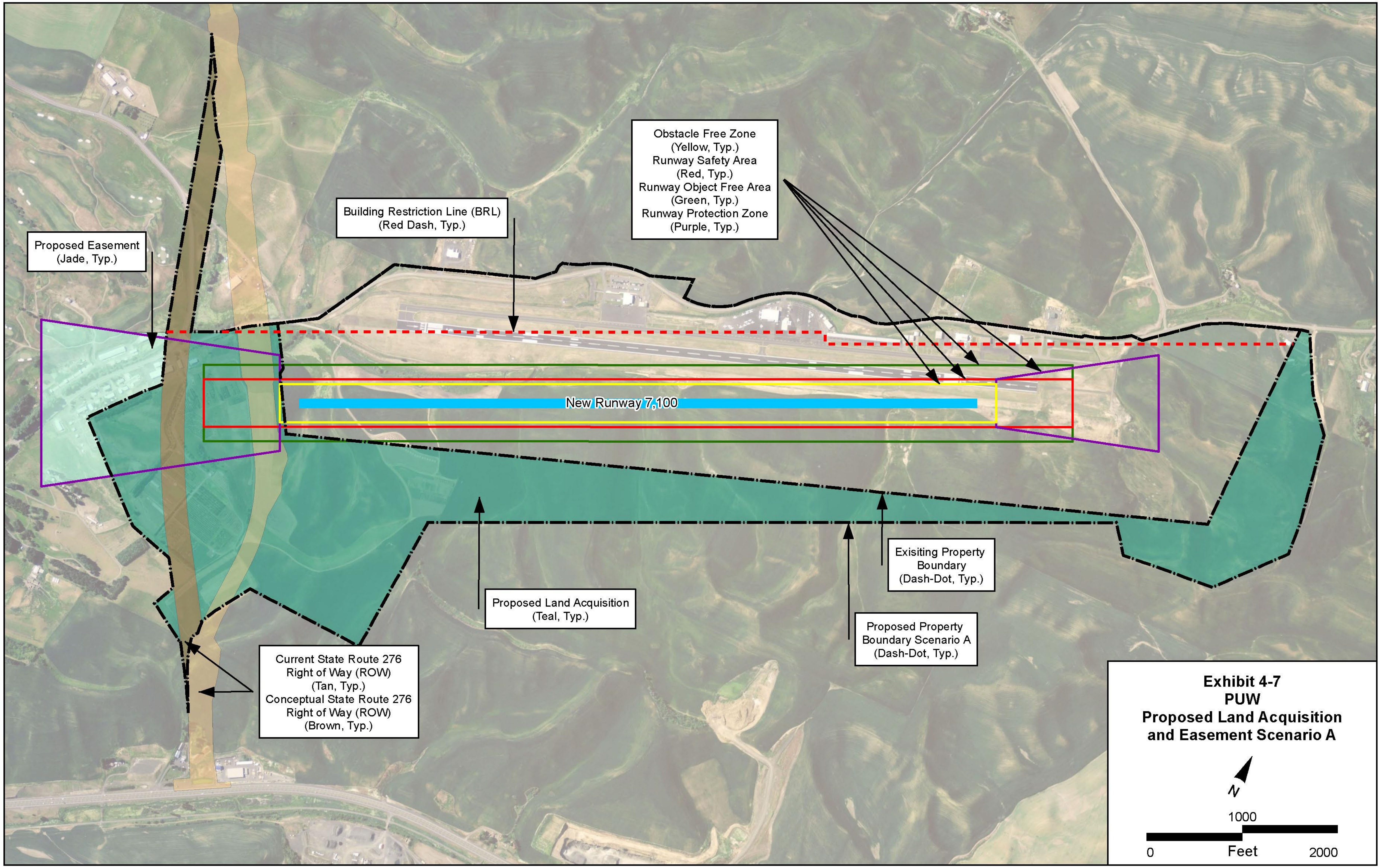
Both scenarios are conceptual ideas and a starting point for future exploration of site requirements and official agreement between the FAA, the Airport, and WSU. Based on challenging topography and best land use practices, none of the new land acquisition areas are expected to be available for future development of new landside facilities. Furthermore, the land acquisition and easement areas are not expected to vary across the four Phase 2 airside alternatives.

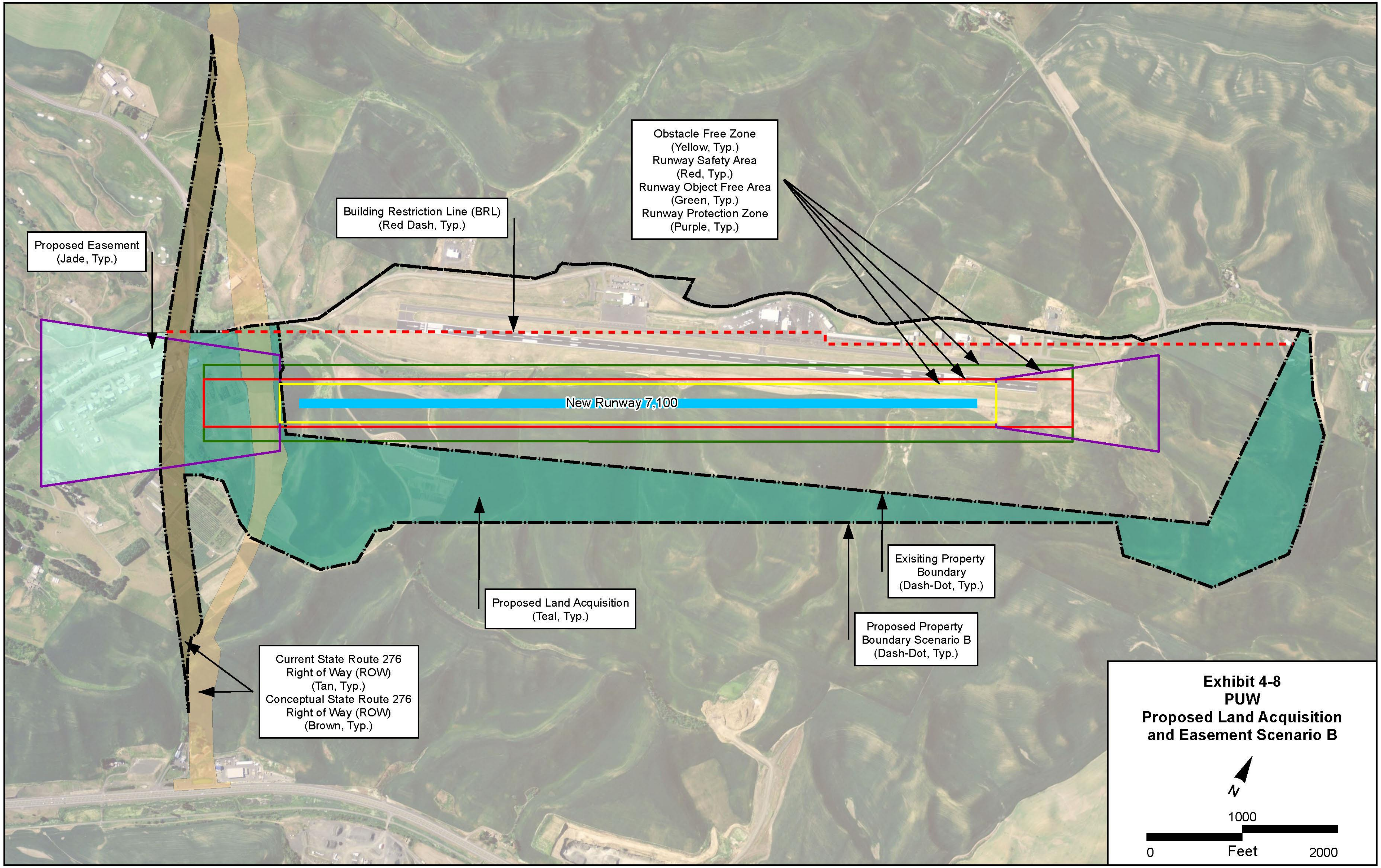
Future State Highway 276 Route

In February 2007, the Washington Department of Transportation (WSDOT) released a Route Development Plan for a new State Highway 276. As planned, State Highway 276 begins at an intersection with U.S. Highway 195 northwest of the City of Pullman and ends at an intersection with State Highway 270 just to the south of the Airport, acting as a bypass around the north side of the city. The future State Highway 276 bypass route crosses the Runway Safety Area (RSA) of the preferred airside alternatives immediately west of the runway threshold. The Right-of-Way (ROW) for the State Highway 276 project was purchased in the 1970's. The ROW is currently used by WSU primarily for agricultural research and education. WSU would be required to relocate their facilities when the highway is constructed.

The FAA does not permit highways or roads within the RSA, as a result the existing alignment of State Highway 276 bypass must be modified. Coordination with the Washington State Department of Transportation Eastern Region and Aeronautics Division, the FAA, WSU, Whitman County, the City of Pullman, and the Airport has resulted in a plan that would preserve the future State Highway 276 corridor by relocating the ROW to the west outside of the RSA. The existing ROW owned by the State of Washington within the proposed airport property boundary would be made available for Airport use. In return, the Airport would provide a replacement ROW that would maintain the State Highway 276 corridor for future development. WSU would be permitted to utilize the relocated ROW for research and education until road construction begins. The State Highway 276 bypass project is not anticipated to be constructed for at least 10 years. Further refinement of the proposed ROW realignment and the potential impacts to WSU facilities will be required during the Environmental Assessment for the proposed runway project. The location of the future State Highway 276 existing and proposed ROW is shown in relationship to the west end of the relocated runway on **Exhibit 4-7** and **Exhibit 4-8**.

This Page Intentionally Left Blank

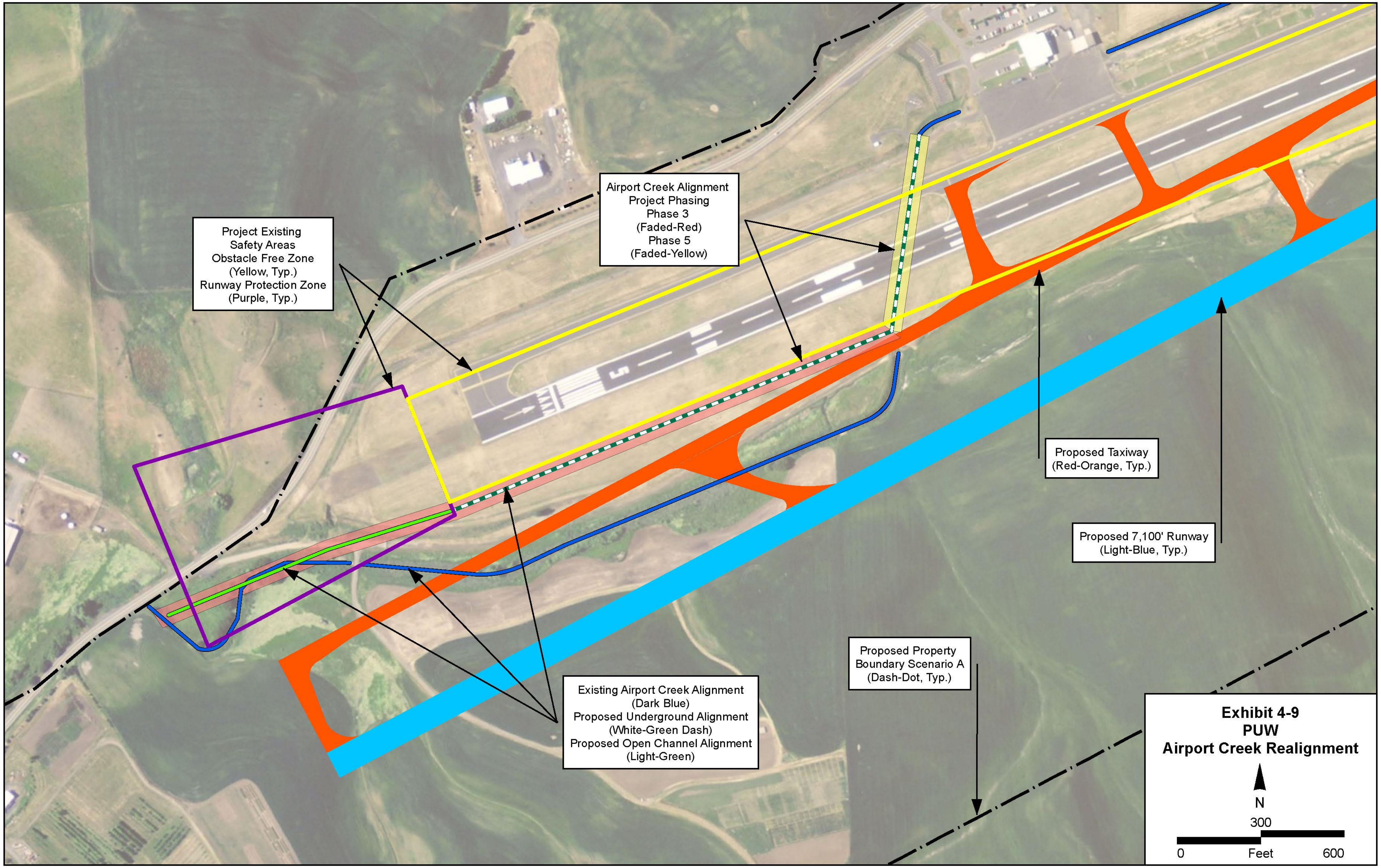

Obstacle Free Zone
(Yellow, Typ.)
Runway Safety Area
(Red, Typ.)
Runway Object Free Area
(Green, Typ.)
Runway Protection Zone
(Purple, Typ.)
Building Restriction Line (BRL)
(Red Dash, Typ.)
Proposed Easement
(Jade, Typ.)
New Runway 7,100
Exisiting Property
Boundary
(Dash-Dot, Typ.)
Proposed Land Acquisition
(Teal, Typ.)
Proposed Property
Boundary Scenario A
(Dash-Dot, Typ.)
Current State Route 276
Right of Way (ROW)
(Tan, Typ.)
Conceptual State Route 276
Right of Way (ROW)
(Brown, Typ.)
Exhibit 4-7
PUW
Proposed Land Acquisition
and Easement Scenario A
N
1000
0
Feet
2000


Obstacle Free Zone
(Yellow, Typ.)
Runway Safety Area
(Red, Typ.)
Runway Object Free Area
(Green, Typ.)
Runway Protection Zone
(Purple, Typ.)
Building Restriction Line (BRL)
(Red Dash, Typ.)
Proposed Easement
(Jade, Typ.)
New Runway 7,100
Exisiting Property
Boundary
(Dash-Dot, Typ.)
Proposed Land Acquisition
(Teal, Typ.)
Proposed Property
Boundary Scenario B
(Dash-Dot, Typ.)
Current State Route 276
Right of Way (ROW)
(Tan, Typ.)
Conceptual State Route 276
Right of Way (ROW)
(Brown, Typ.)
Exhibit 4-8
PUW
Proposed Land Acquisition
and Easement Scenario B
N
1000
0
Feet
2000

Airport Creek Relocation

An existing drainage ditch known as Airport Creek traverses the Airport property. It currently runs to the southwest, immediately south of and parallel to Airport Road, before crossing underneath the existing runway just west of the passenger terminal. After crossing underneath the runway, Airport Creek continues west until leaving existing Airport property and crossing underneath Airport Road. A portion of Airport Creek will need to be re-routed to minimize runway and taxiway crossings, accommodate future landside development, and allow for construction of the new runway and taxiway system. An analysis was performed to determine potential alignments that would accommodate future maintenance needs with minimal impacts to the proposed airfield and future development areas. The proposed Airport Creek relocation alignment is presented in **Exhibit 4-9**. The proposed alignment would pipe a portion of the creek underground just north of the new parallel taxiway. This proposed alignment does not vary across the four Phase 2 airside alternatives.

This Page Intentionally Left Blank


Project Existing
Safety Areas
Obstacle Free Zone
(Yellow, Typ.)
Runway Protection Zone
(Purple, Typ.)
Airport Creek Alignment
Project Phasing
Phase 3
(Faded-Red)
Phase 5
(Faded-Yellow)
Proposed Taxiway
(Red-Orange, Typ.)
Proposed 7,100' Runway
(Light-Blue, Typ.)
Proposed Property
Boundary Scenario A
(Dash-Dot, Typ.)
Existing Airport Creek Alignment
(Dark Blue)
Proposed Underground Alignment
(White-Green Dash)
Proposed Open Channel Alignment
(Light-Green)
Exhibit 4-9
PUW
Airport Creek Realignment
N
300
0
Feet
600

Stormwater Management

The overall storm water management approach for the Airport Creek drainage area will need to be assessed during design. The new runway and associated improvements will impede natural drainage of this area. Also, near-term construction of the new 7,100 foot runway will add over 80 acres of new impervious areas. The stormwater runoff from this additional 80 acres will need to be mitigated in a way that treats pollutant runoff while reducing overall stormwater discharge from airport property to pre-development flows. The construction feasibility analysis took into consideration flat-bottomed grassy swales adjacent to the new runway and parallel taxiway, drained by a new storm sewer system with inlets on either side of runway. The analysis suggested that a separate detention basin may be required in the northwest corner of Airport property so that stormwater runoff is not injected directly into Airport Creek.

Wetlands

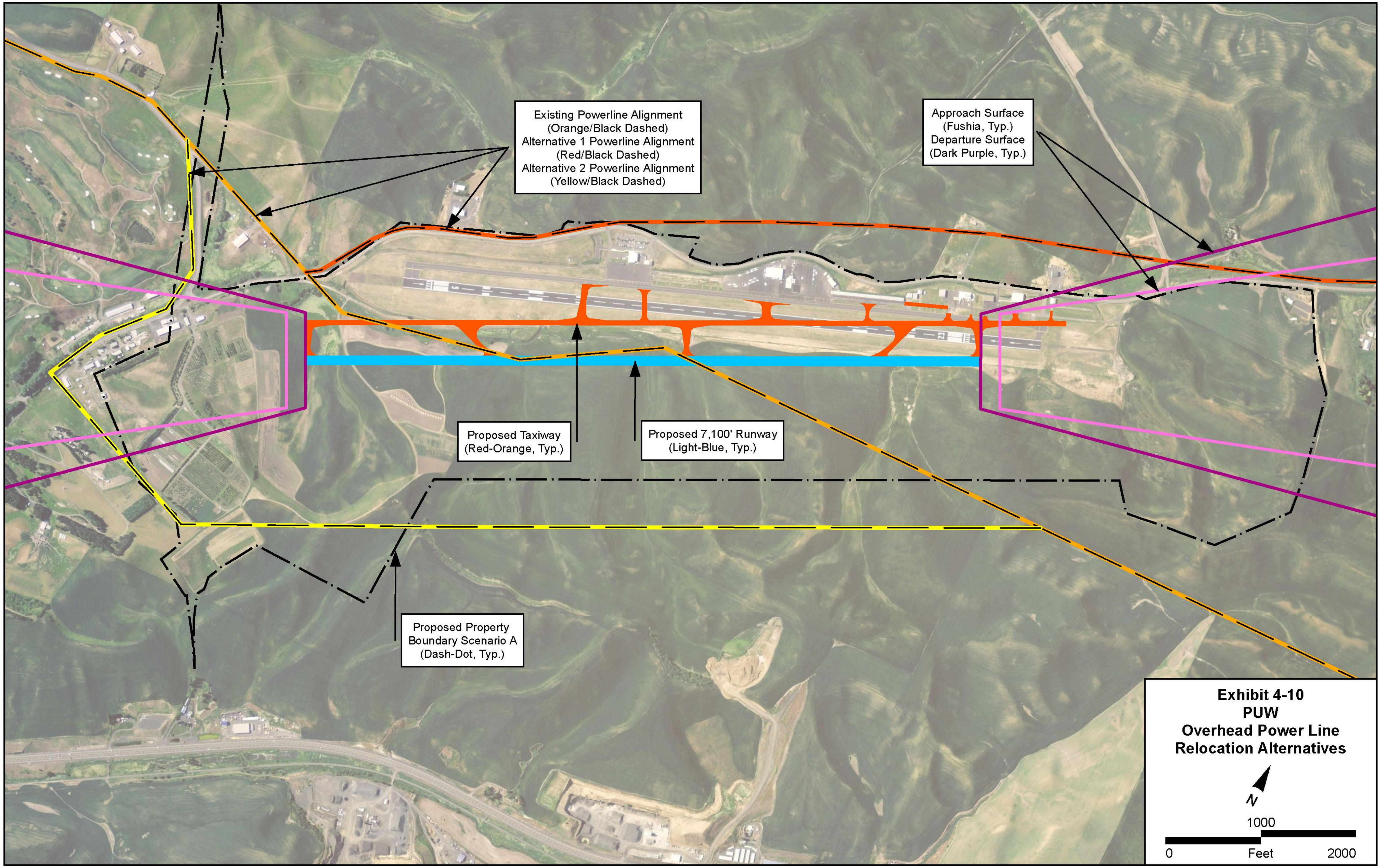
A wetland delineation report was completed by J-U-B Engineers in October 2009 as part of the Phase 1 supplemental investigations, found in **Appendix H**. This delineation report identified multiple wetland areas both on and around the Airport. According to the construction feasibility analysis, 14.7 acres of wetlands identified by the 2009 delineation will be impacted by each of the four airside alternatives. This area includes riverine, depressional, and sloped wetlands of varying quality. There are also recent wetland disturbances that have occurred along Airport Creek that will need to be mitigated as part of the proposed runway realignment project.

Wetlands disturbed by the proposed project will need to be replaced both in function and value. It is expected that land will need to be purchased and prepared by the Airport to satisfy the mitigation requirements. Also, a new wetland delineation study will likely be needed to determine if any changes in wetland boundaries have taken place. Specific wetland mitigation strategies will be investigated during the environmental review process.

Power Line Relocation

An electrical power distribution line owned by Avista Corporation currently runs from southeast to northwest across the hills south of the Airport. The power line then crosses under the existing Runway 5 approach before continuing northwest. This power line must be relocated in the area surrounding the Airport to accommodate grading associated with each of the four Phase 2 airside alternatives.

Several power line relocation alternatives were evaluated and reviewed by Avista during the Phase 2 planning process. Two alternative alignments were identified that will be outside the proposed grading areas for each of the four airside alternatives. These alignments are presented in **Exhibit 4-10**. The first alternative would connect with the existing power line southeast of the Airport, generally follow Airport Road to the north past the east end of the airport, and then continue to follow Airport Road west along the northern edge of the Airport property. The second alternative would connect with the existing line on the hills south of the airport, head west and cross to the north under the western approach to the new runway. The proposed runway elevation and existing terrain would permit construction of a power line in either location with no conflict to aircraft approaches and departures. However, if an Instrument Landing System (ILS) is installed on the new runway, the second alternative could conflict with ILS radio signals. The power line relocation alternatives will need to be further evaluated during project design.


Existing Powerline Alignment
(Orange/Black Dashed)
Alternative 1 Powerline Alignment
(Red/Black Dashed)
Alternative 2 Powerline Alignment
(Yellow/Black Dashed)
Approach Surface
(Fushia, Typ.)
Departure Surface
(Dark Purple, Typ.)
Proposed Taxiway
(Red-Orange, Typ.)
Proposed 7,100' Runway
(Light-Blue, Typ.)
Proposed Property
Boundary Scenario A
(Dash-Dot, Typ.)
Exhibit 4-10
PUW
Overhead Power Line
Relocation Alternatives
N
1000
0
Feet
2000

Estimated Construction Costs

Total construction costs for each alternative were estimated as part of the construction feasibility analysis, and are presented in **Table 4-2**. These estimates are conservative and do not include costs for environmental analysis and engineering. Due to the large number of variables involved, these estimates will need to be continually revised during project design and development.

Table 4-2: Estimated Construction Cost

Alternative	Total Estimated Cost
Alternative 1: 6,700 Foot Runway	$55,763,500
Alternative 2: 7,100 Foot Runway	$58,972,000
Alternative 3: 8,000 Foot Runway	$69,195,500
Alternative 4: 8,000 Foot Runway with Displaced Threshold	$66,550,500

Source: T-O Engineers

4.5 Preferred Airside Alternative

The Phase 2 airside alternatives were compared and evaluated by the Airport sponsor, the FAA Seattle Airports District Office (ADO), and consultant team based on criteria specified and described in the construction feasibility analysis. A decision matrix that compares the alternatives against these criteria is presented in **Table 4-3**.

Table 4-3: Phase 2 Airside Alternatives Decision Matrix

Criteria	Alternative 1: 6,700-foot Runway	Alternative 2: 7,100-foot Runway	Alternative 3: 8,000-foot Runway	Alternative 4: 8,000-foot Runway with Displaced Threshold
Runway Length Justification	Justified	Justified	Not Yet Justified	Not Yet Justified
Runway Profile Concept	Identical			
Estimated Earthwork Cut	4.4 million CY	4.8 million CY	6.9 million CY	6.5 million CY
Estimated Earthwork Fill	2.8 million CY	2.8 million CY	3.1 million CY	3.1 million CY
Estimated Earthwork Excess Cut	1.6 million CY	2.0 million CY	3.8 million CY	3.4 million CY
Land Acquisition and Easements	Identical			
Land Use Impacts	Identical			
Airport Creek Relocation	Identical			
Stormwater Management Impacts	Similar but Slightly Greater Impact for Longer Lengths			
Estimated Wetland Impact	Identical (14.7 acres)			
Power Line Relocation	Identical			
Total Estimated Construction Cost	$55,763,500	$58,972,000	$69,195,500	$66,550,500

Source: T-O Engineers and Mead & Hunt

There are three primary evaluation criteria on which the four alternatives differ significantly: runway length justification, earthwork requirements and total estimated construction cost. Based on coordination with the FAA Seattle ADO and the runway length analysis contained in **Appendix D**, the runway lengths associated with Alternative 1 and Alternative 2 are currently justified for near-term (5 year) implementation. Although the 8,000 foot runway length associated with Alternative 3 and Alternative 4 is not justified for near-term implementation, this is the ultimate runway length desired by the Airport sponsor and will be considered the long-term (20 year) runway length. A future planning effort to justify this longer length will be needed after the new runway is operational. The construction feasibility analysis did not identify any fatal flaws that would impede long-term extension to the 8,000 foot runway length.

The estimated amount of fill needed to construct both Alternative 1 and Alternative 2 to airfield design grades is roughly the same. However, Alternative 2 will require approximately 400,000 additional cubic yards of cut material that will require disposal. This additional excess cut represents approximately 9% more total excess cut material than Alternative 1. Largely as a result of this excess cut, Alternative 2 will also cost approximately $3.2 million more to construct. This additional cost represents approximately 6% more total cost than Alternative 1.

The Airport sponsor has selected Alternative 2 as its preferred airside alternative for near-term implementation. Based on the construction feasibility analysis, stakeholder input, and FAA Seattle ADO input, it is expected that the marginal excess cut and estimated total cost differences associated with Alternative 2 will not prevent its near-term implementation. An 8,000 foot runway length will be included on the updated ALP as the sponsor desired, long-term runway length.

4.6 Conceptual Construction Phasing Plan

Phasing the various elements of the preferred airside alternative will be complex and challenging. Construction will need to be phased to accommodate a number of factors including the limited length of the construction season at PUW due to weather; funding constraints; and the sponsor's desire to maintain Airport operations with minimal closures. The following sections describe a general five step construction phasing plan for the preferred airside alternative. A more detailed plan will need to be developed during the design phase.

Phase 1 – Environmental Review Process

Prior to construction of the preferred airside alternative, an environmental study will be required for National Environmental Policy Act (NEPA) compliance. At this time, it is expected that an Environmental

Assessment (EA) will be sufficient for NEPA compliance and that an Environmental Impact Statement (EIS) will not be required. An EA will take 18 to 24 months to complete while an EIS, if required for the NEPA process, could take three years or longer. The environmental study process is scheduled to begin in 2012.

Phase 2 – Design, Land Acquisition, Wetland Mitigation, and Power Line Relocation

Project design will begin following completion of the NEPA process and continue throughout subsequent phases. Individual design efforts for different elements of the project will likely take place for each construction year. The land acquisition and easement process will need to be completed prior to breaking ground. Wetland mitigation will also be completed during this phase, which will include extensive agency coordination, permitting, land acquisition and construction of mitigation improvements. Avista Corporation will also need to begin design and construction of the relocated power line, and remove the existing power line. Phase 2 improvements are presented in **Exhibit 4-11**.

Phase 3 – Initial Site Preparation

Significant earthwork will begin on the east side of the airfield at the beginning of Phase 3, with a significant amount of cut from this area being disposed of nearby or on-site. Work will also begin on the relocation of Airport Creek. Temporary culverts will be installed to divert the creek and allow for earthwork on the west side of the airfield. Earthwork will then begin on the west side of the airfield with an initial focus on cut and fill inside the runway safety area (RSA) for the new runway. Storm sewer systems will need to be installed concurrently with the earthwork. Phase 3 improvements are presented in **Exhibit 4-12**.

Phase 4 – Initial Pavement Construction and Continued Earthwork

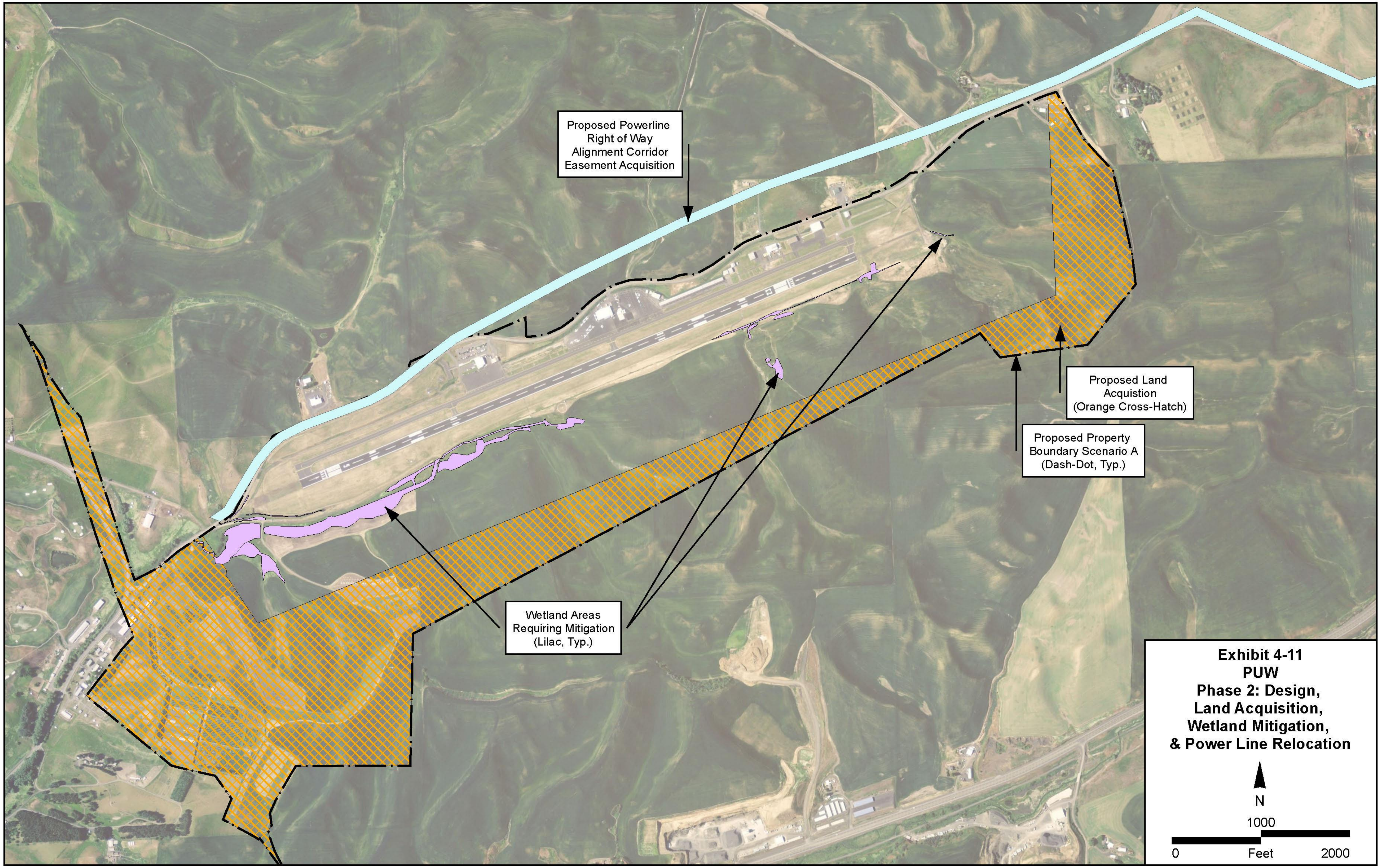
During Phase 4, major airfield systems will be constructed or installed, including runway and connector taxiway pavement sections, airfield lighting and signage systems, the approach lighting system, and stormwater management system pipes. Like Phase 3, these improvements will be focused inside the RSA for the new runway. It is expected that the new runway and portions of the parallel taxiway will open for use at the end of this phase. However, a temporarily relocated threshold approximately 2,000 feet from the east end of the new runway will be necessary to complete Phase 5 work. In addition, extensive coordination with the FAA will be necessary to expedite design of instrument approach procedures and installation of the associated NAV-AIDS to the new runway ends so that procedures are in place when the runway opens. Phase 4 improvements are presented in **Exhibit 4-13**.

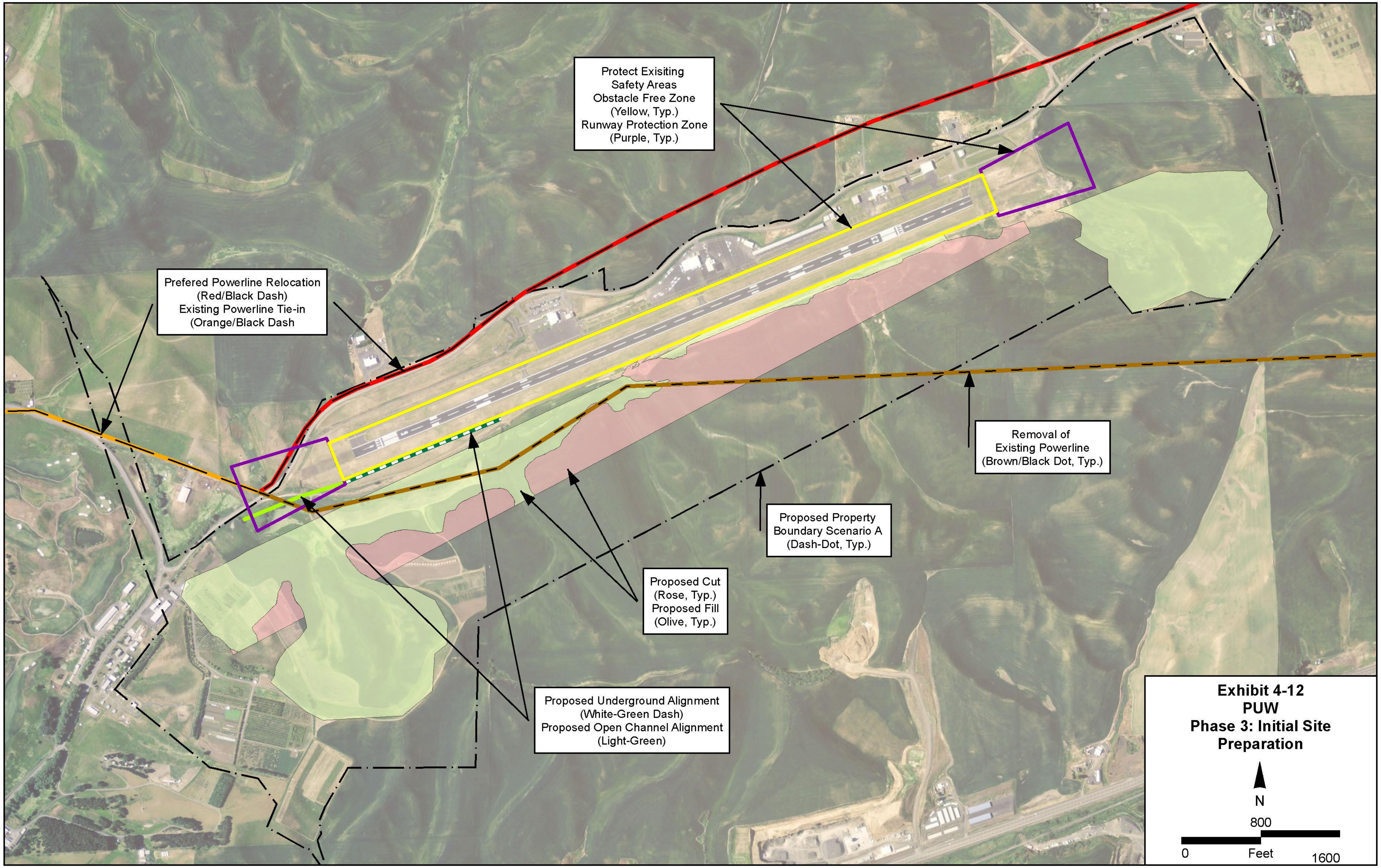
Phase 5 – Parallel Taxiway

Remaining construction work outside the new runway RSA will occur during Phase 5, the most significant of which will be the installation of parallel taxiway pavement sections. Airport Creek relocation activities will resume and be completed, with existing pipe removed and a new culvert installed. Demolition of existing asphalt and utilities along the existing runway will begin during this phase as well. Phase 5 improvements are presented in **Exhibit 4-14**.

Airport Closures and Oparational Disruptions

One of the major goals of the Airport sponsor and the surrounding community is to minimize airport closure during construction. This goal will impact construction phasing decisions and may require an approach that is more costly or takes longer to complete. At least one runway closure will be required during Phase 4 to construct connector taxiways to existing facilities and to connect new airfield lighting and signage to the airfield electrical system. In addition, many existing hangars will be without direct access to their facilities during Phase 5 while parallel and connector taxiways are constructed on the east end of the airfield.


Proposed Powerline Right of Way Alignment Corridor Easement Acquisition
Proposed Land Acquistion (Orange Cross-Hatch)
Proposed Property Boundary Scenario A (Dash-Dot, Typ.)
Wetland Areas Requiring Mitigation (Lilac, Typ.)
Exhibit 4-11
PUW
Phase 2: Design, Land Acquisition, Wetland Mitigation, & Power Line Relocation
N
1000
0
Feet
2000


Protect Exisiting
Safety Areas
Obstacle Free Zone
(Yellow, Typ.)
Runway Protection Zone
(Purple, Typ.)
Prefered Powerline Relocation
(Red/Black Dash)
Existing Powerline Tie-in
(Orange/Black Dash
Removal of
Existing Powerline
(Brown/Black Dot, Typ.)
Proposed Property
Boundary Scenario A
(Dash-Dot, Typ.)
Proposed Cut
(Rose, Typ.)
Proposed Fill
(Olive, Typ.)
Proposed Underground Alignment
(White-Green Dash)
Proposed Open Channel Alignment
(Light-Green)
Exhibit 4-12
PUW
Phase 3: Initial Site
Preparation
N
800
0
Feet
1600

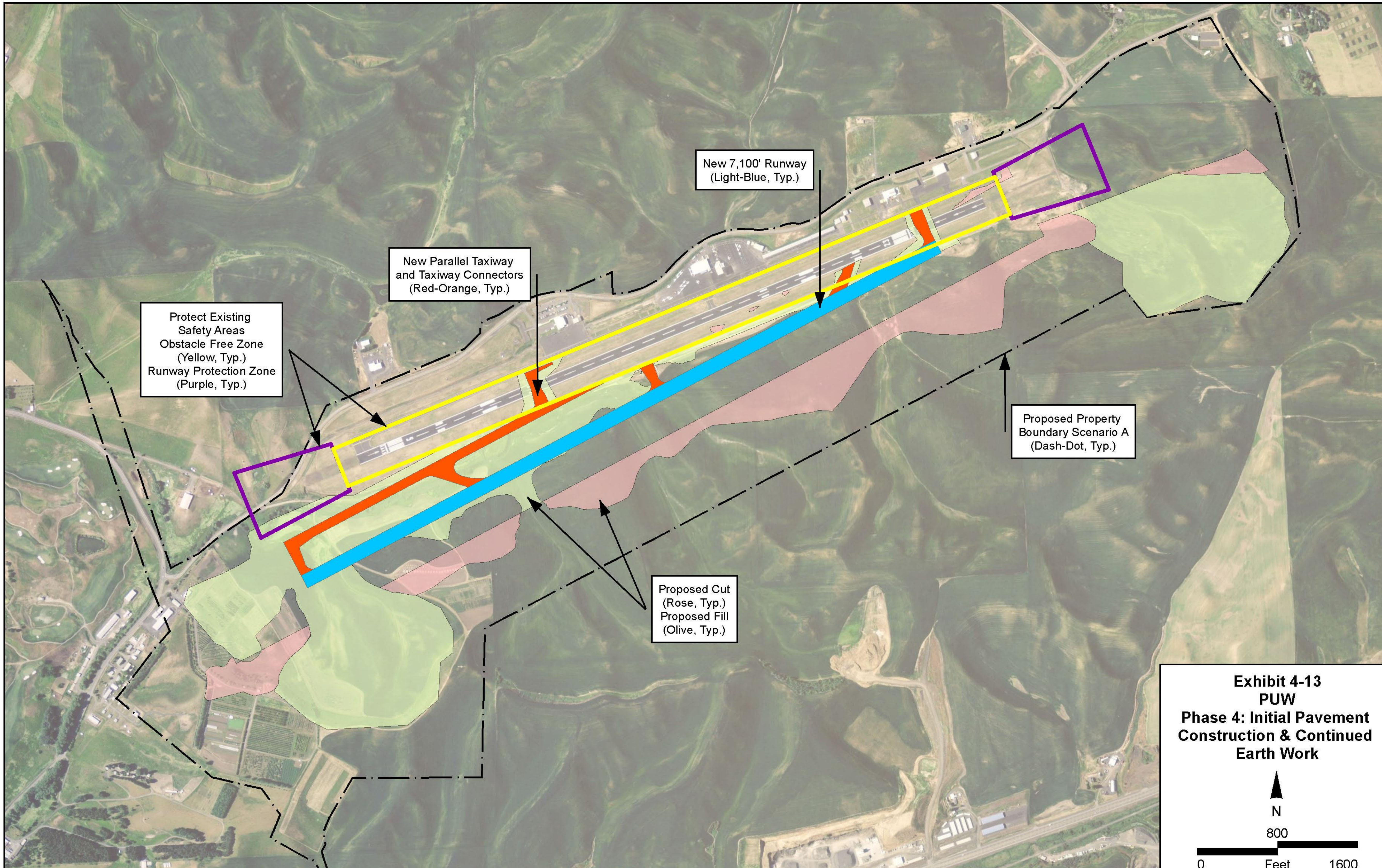
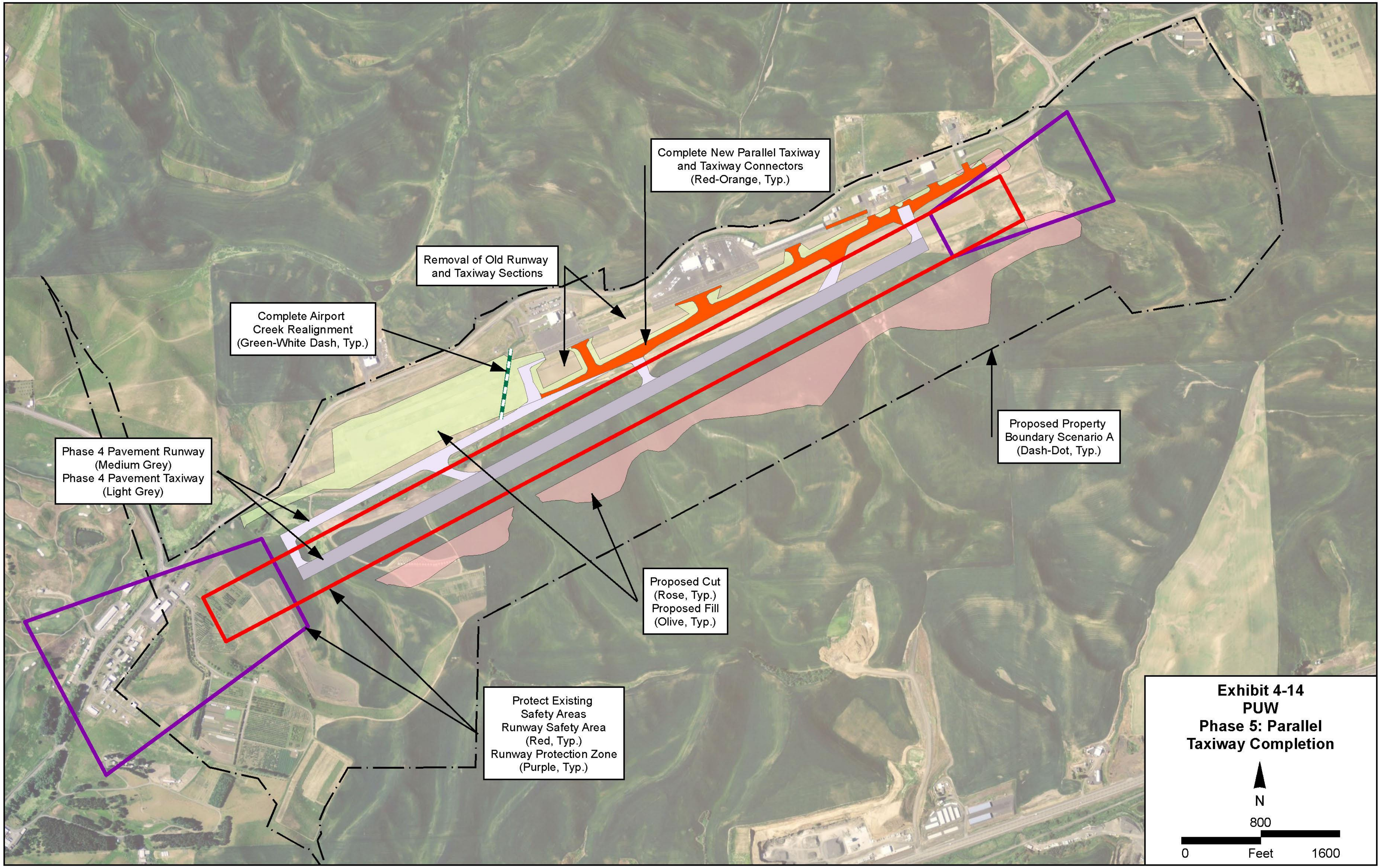


Exhibit 4-13
PUW
Phase 4: Initial Pavement Construction & Continued Earth Work


Complete New Parallel Taxiway
and Taxiway Connectors
(Red-Orange, Typ.)
Removal of Old Runway
and Taxiway Sections
Complete Airport
Creek Realignment
(Green-White Dash, Typ.)
Phase 4 Pavement Runway
(Medium Grey)
Phase 4 Pavement Taxiway
(Light Grey)
Proposed Property
Boundary Scenario A
(Dash-Dot, Typ.)
Proposed Cut
(Rose, Typ.)
Proposed Fill
(Olive, Typ.)
Protect Existing
Safety Areas
Runway Safety Area
(Red, Typ.)
Runway Protection Zone
(Purple, Typ.)
Exhibit 4-14
PUW
Phase 5: Parallel
Taxiway Completion
N
800
0
Feet
1600

4.7 FAA Objectives for New Runways

The substantial financial investment associated with the preferred airside alternative demands that it meet the criteria and standards specified in Chapter 3, *Airside Facility Requirements*, to the maximum extent feasible. This is both reasonable and prudent when planning for the long-term viability of the Airport and it is also in line with FAA objectives for airport safety. In a perfect world, all new runways would achieve FAA objectives by meeting all applicable design criteria. However, individual circumstances sometimes warrant that some design criteria cannot be met.

This section summarizes criteria for an “ideal” new runway at PUW, as outlined in Chapter 3, and highlights the differences between an “ideal” new runway and the Sponsor-selected preferred airside alternative. There are a few instances where the Sponsor selected preferred airside alternative does not meet all of the FAA safety standards for an “ideal” new runway. The purpose of this exercise is to formally acknowledge that although there are many advantages, there are also a few limitations to the proposed runway alignment. This will provide documentation of the project understanding between the Airport sponsor and the FAA going forward. “Ideal” new runway criteria described in Chapter 3 are summarized, and the performance of the preferred airside alternative is measured against each criterion, in **Table 4-4**.

Table 4-4: Performance of the Preferred Airside Alternative Against FAA Objectives for New Runways	
FAA Criteria Type	**Does the Preferred Airside Alternative Meet the Criteria?**
Critical Design Aircraft (ARC C-III) Airfield Dimensional Requirements	
Runway Width	Yes
Runway Shoulder Width	Yes
Traditional Runway Safety Area (RSA)[1]	Yes
Runway Object Free Area (ROFA)	Yes
Runway Obstacle Free Zone (OFZ)	Yes
Runway Centerline to Taxiway Centerline Separation	Yes
Runway Centerline to Aircraft Parking Apron Separation	Yes
Runway Centerline to Holdline Separation	Yes
Taxiway Width	Yes
Taxiway Shoulder Width	Yes
Taxiway Safety Area (TSA)	Yes
Taxiway Object Free Area (TOFA)	Yes
Other Critical Design Aircraft Requirements	
Runway Length	Yes
95% Crosswind Coverage	Yes
Pavement Strength	Yes
Wheel Base and Track	Yes
FAA Land Use Guidelines	
Runway Protection Zone	TBD[2]
Building Restriction Line	TBD[2]
Instrument Approach Procedure Airspace Surface Requirements	
Ultimate FAR Part 77 Primary Surface	Yes
Ultimate FAR Part 77 Approach Surface – Western Runway End (< 3/4 statute mile visibility minimum)	TBD[3]
Ultimate FAR Part 77 Approach Surface – Eastern Runway End (3/4 statute mile visibility minimum)	Yes
Ultimate FAR Part 77 Transitional Surface (7:1)	No
Ultimate Approach Threshold Siting Surface – Western Runway End (< 3/4 statute mile visibility minimum)	TBD[3]
Ultimate Approach Threshold Siting Surface – Eastern Runway End (3/4 statute mile visibility minimum)	Yes
Ultimate Departure Threshold Siting Surface (40:1) – Western Runway End	No
Ultimate Departure Threshold Siting Surface (40:1) – Eastern Runway End	TBD[3]
Ultimate Precision OFZ – Both Runway Ends	Yes

1. Although the existing runway has a compliant RSA, RSA compliance is currently achieved utilizing declared distances, and not through clearing and grading beyond the pavement ends (traditional RSA). The preferred airside alternative will provide a traditional RSA.
2. Compliance with FAA land use guidelines is pending FAA coordination and the land acquisition/avigation easement acquisition process.
3. Compliance with these airspace surfaces is pending relocation of an electrical power distribution line located beyond the western end of the runway.

Source: T-O Engineers and Mead & Hunt

As shown in **Table 4-4**, there are only two areas where the preferred airside alternative does not meet FAA objectives for new runways. The first objective is compliance with Part 77 transitional surface requirements south of the proposed runway. Terrain in this area will be graded to a 4:1 stabilized slope as part of the preferred airside alternative in both the near and long-term. Grading to a 7:1 stabilized slope is considered cost prohibitive. As mitigation for this non-standard condition, notes regarding non-standard slopes in this area will be published in appropriate FAA documents and directives to promote pilot awareness.

The second FAA objective at issue is the object and terrain clearing requirements for the departure threshold siting surface beyond the ultimate eastern runway end. This issue is associated only with the long-term runway design at 8,000'. Man-made structures and natural terrain in this area will continue to penetrate this surface in the long-term. It is considered cost prohibitive to perform the earthwork and structure removal activities required to achieve full compliance with this standard. As mitigation for this non-standard condition, it is expected that a departure procedure will be published to notify and direct pilots departing toward the east.

There are several other FAA objectives for new runways that have not yet been resolved but are expected to be met by the preferred alternative. These include land use policies, land acquisitions, avigation easement acquisitions, and power line relocation. These issues are pending Airport sponsor coordination with the FAA, WSU, and/or the Avista Corporation.

4.8 Airside Alternatives Summary

The Airport sponsor has selected Phase 2 airside Alternative 2 as its preferred airside alternative for near-term implementation. This alternative involves construction of a new 7,100 foot long runway, rotated approximately 10 degrees counterclockwise and shifted south from the existing runway location, with a new full parallel taxiway, connector taxiway system, and approach lighting system. The sponsor has selected this alternative, in coordination with the FAA, because it finds that it is the best alternative for achieving compliance with C-III design standards, near-term runway length requirements, and lower approach procedure minimums at the existing Airport site. A conceptual construction phasing plan has been developed for implementation of the preferred airside alternative. Completion of a Federal EIS will be required for NEPA compliance prior to design and construction.

An 8,000 foot runway length will be included as the sponsor desired, long-term runway length on the updated ALP.

This Page Intentionally Left Blank

CHAPTER 5: Landside Facility Requirements and Development Concepts

Overview

Implementation of the preferred intermediate-term (10-year) and long-term (20-year) airside alternatives will have a significant impact on the landside facilities at PUW. The relocation of the runway will require a reconfiguration of landside facilities at PUW as well. This reconfiguration will open up new opportunities for landside development and will also require the relocation of some existing facilities.

The preferred airside alternatives, facility removals and recommended property acquisitions will present several landside opportunities over the intermediate- and long-term planning horizons. This chapter demonstrates intermediate-term and long-term landside facility scenarios at PUW based on existing and forecasted airport activity. First, the future landside facility requirements are analyzed. Next, areas at PUW that will become available for potential landside development and redevelopment are identified. Intermediate and long-term development concepts to accommodate future landside facility needs are then shown in the identified development areas. At this planning stage, the landside development concepts are schematic. A more detailed analysis of landside facility development will be needed when the runway is relocated and other intermediate-term airside improvements are made.

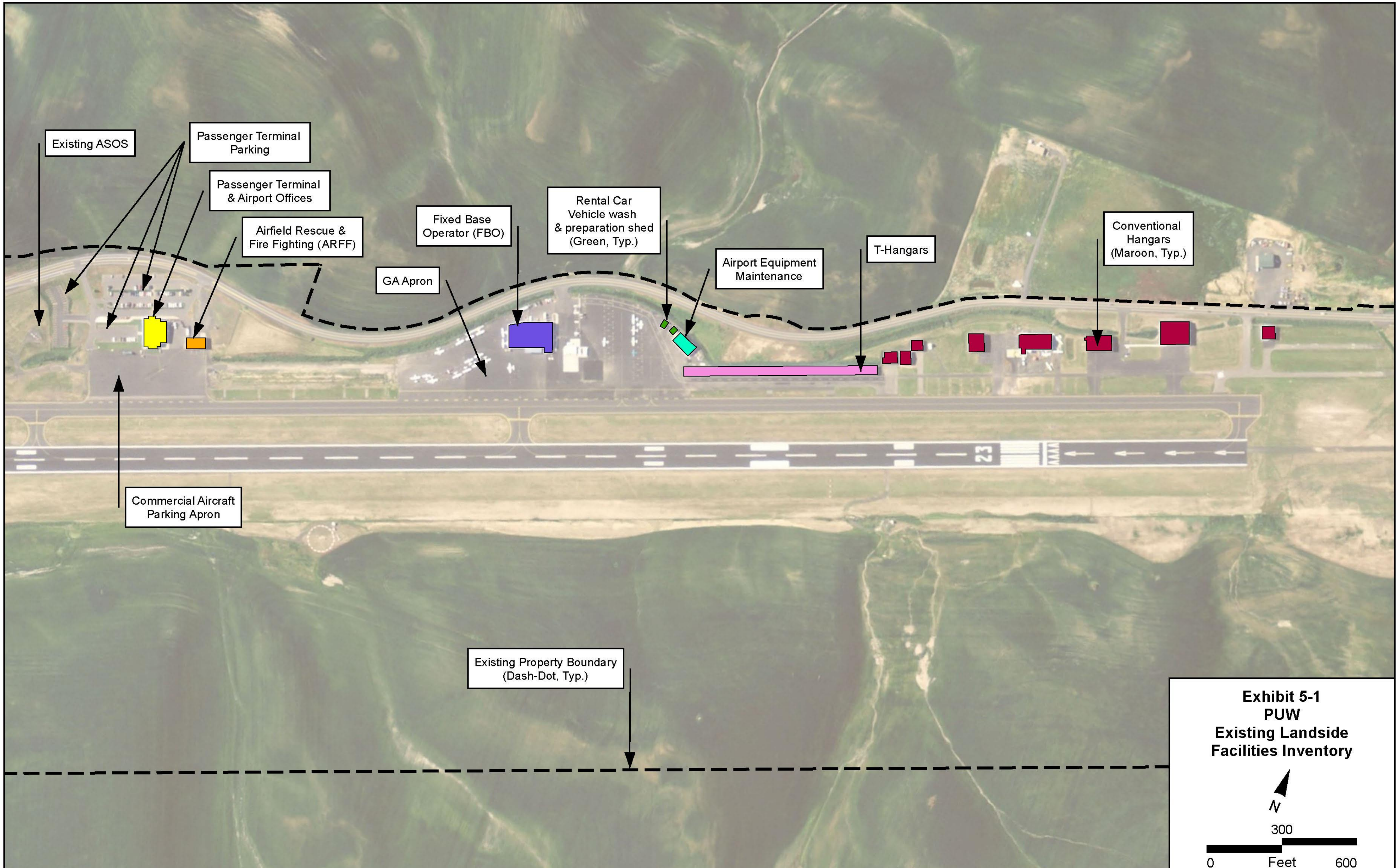
This chapter is organized into the following sections:

- Landside Facility Requirements
- Potential Landside Development and Redevelopment Areas
- Landside Development Concepts
- Summary

5.1 Landside Facility Requirements

The following sections determine landside facility needs through a two-step process. First, the existing landside facilities are described. To this end, an inventory of existing landside buildings is presented in **Exhibit 5-1**. Then the PUW Master Plan forecasts are used to guide an analysis of future landside facility needs including these landside features:

- Passenger Terminal Building
- Vehicle Access, Circulation, Parking and Rental Car Facilities
- Commercial Aircraft Parking Apron
- Aircraft Rescue and Firefighting (ARFF) Facilities
- General Aviation (GA) and Fixed Base Operator (FBO) Facilities
- Air Cargo Facilities
- Airport Equipment Maintenance and Storage Facilities
- Air Traffic Control Tower (ATCT)
- Automated Surface Observation System (ASOS)
- Airport Business Park
- Recommended Property Acquisitions and Easements
- Future State Highway 276 Route


Existing ASOS
Passenger Terminal Parking
Passenger Terminal & Airport Offices
Airfield Rescue & Fire Fighting (ARFF)
Fixed Base Operator (FBO)
GA Apron
Rental Car Vehicle wash & preparation shed (Green, Typ.)
Airport Equipment Maintenance
T-Hangars
Conventional Hangars (Maroon, Typ.)
Commercial Aircraft Parking Apron
Existing Property Boundary (Dash-Dot, Typ.)
23
Exhibit 5-1
PUW
Existing Landside Facilities Inventory
N
300
0
Feet
600

Passenger Terminal Building

The PUW passenger terminal is a one-story building with a footprint of 10,000 square feet (SF). The terminal accommodates passenger processing and holding areas, TSA security screening and staff areas, airport staff office space, rental car company counter and office space, airline counter and operations space, baggage claim and processing areas, restrooms and snack machines, and a public lobby.

Passenger terminal building space requirements are driven largely by passenger enplanements. In 2010, PUW had 32,745 enplanements, equating to 0.305 SF of terminal space per enplanement. **Table 5-1** presents a forecast of passenger terminal space requirements that maintains this ratio over the 20-year forecast period. As shown in **Table 5-1**, PUW will require 15,050 SF of terminal space in the intermediate-term and 18,725 SF of terminal space in the long-term. The intermediate- and long-term landside development concepts will provide for these passenger terminal building footprint sizes.

Table 5-1: Passenger Terminal Building Space Requirements Forecast

	Planning Year		
	Baseline (2010)	Intermediate-Term (2020)	Long-Term (2030)
Passenger Enplanements	32,745	49,286	61,307
Passenger Terminal Space	10,000 SF	15,050 SF	18,725 SF

Vehicle Access, Circulation, Parking and Rental Car Facilities

Ground access to PUW is provided via Airport Road. The PUW passenger terminal building can be accessed by the one-way driveway loop that runs west to east along the parking area. Part of this loop serves as a semi-circular terminal frontage road for passenger drop-offs. There are additional driveways located along Airport Road that grant access to the fixed base operator (FBO) and corporate hangar facilities, as well as badge access gated driveways serving airport maintenance staff, emergency personnel and airport tenants.

Airport Road currently runs along the base of hills located to the immediate north of existing landside airport facilities. This location minimized required cuts and fills during road construction. However, it also constrains the area available for current landside facilities and future airport expansion. Relocation of Airport Road would allow for future, organic growth in some existing landside functional areas, particularly the general aviation (GA) functional areas on the east side of the airfield. There are three auto parking lots in the passenger terminal complex including a 34-space rental car and employee lot; a 173-space passenger lot; and an 11-space airport staff lot. Auto parking space requirements in the passenger terminal complex typically increase at a similar rate to passenger enplanements. The forecast for auto parking space requirements presented in **Table 5-2** is based on the forecast of passenger enplanements. The forecast shows a future need for an additional 110 parking spaces in the intermediate-term and an additional 189 parking spaces in the long-term. The intermediate- and long-term landside development concepts provide for these parking spaces.

The design of internal circulation and parking facilities considers the needs of motor coach vehicles as well as personal vehicles. Currently at PUW, the internal circulation and parking layout restricts the parking and maneuvering of motor coaches and busses. This has created ground access problems for tour groups and university athletic teams at the Airport. To address this issue, future landside scenarios include a dedicated motor coach/bus parking area. Overhead shelters are also proposed in this area to protect passengers and cargo from the weather during the loading and unloading processes. This area may also be used by public transportation agencies in the future.

Table 5-2: Passenger Terminal Complex Auto Parking Space Requirements Forecast

	Planning Year		
	Baseline (2010)	**Intermediate-Term (2020)**	**Long-Term (2030)**
Passenger Enplanements	32,745	49,286	61,307
Passenger Parking Spaces	173	260	324
Rental Car & Employee Parking Spaces	34	51	64
Airport Staff Parking Spaces	11	17	21
Total Terminal Area Parking	**218**	**328**	**409**

Another design feature of parking and circulation areas is exterior lighting. At PUW, the current exterior lighting is insufficient to meet the needs of the traveling public. During focus group sessions, passengers and other users commented that the parking lots are too dark at night and requested additional exterior lighting. Pavement condition is another design feature that will be improved in the long-term as parking lots and drives are reconstructed. In the intermediate-term, pavement will be maintained and improved by patching and other spot treatments. A final design consideration for the parking areas is the elevation difference between parking areas and the terminal building, which currently limits accessibility to those with mobility challenges.

As future landside facilities are designed, overall layout and functional proximity of operations will be considered. For example, the two small car wash buildings used by the rental car companies are currently located adjacent to the GA apron. The distance between these buildings and the rental car parking lot causes operational inefficiencies for the rental car operators. To address this issue, the long-term landside development concept should reserve an area for a new car wash facility closer to the rental car parking lot.

Commerical Aircraft Parking Apron

The existing commercial aircraft parking apron has an area of 13,000 square yards (SY) and is capable of accommodating two Bombardier Q400 aircraft simultaneously. Space is provided in the secure apron area for ground service equipment parking and maneuvering, baggage make-up and baggage return. At times, this space is inadequate to serve the current, combined commercial and charter activity at PUW.

Peak demand for the aircraft parking apron is generated by two primary factors. One is the use of charter aircraft to support university athletics and other events, especially during the fall. These Part 121 charter aircraft include the Boeing 737 or the Airbus A319, which often stay overnight at PUW. The other factor is inclement weather, especially during winter months, which results in delays and cancellations of scheduled commercial flights. Current airport activity suggests the need for enough space on the commercial aircraft apron to accommodate Part 121 charter aircraft while also accommodating Bombardier Q400 aircraft.

The intermediate- and long-term landside development concepts include expansion of the commercial aircraft apron to simultaneously accommodate two Bombardier Q400s and two Boeing 737s. The total apron space required to accommodate these four aircraft simultaneously will depend on the configuration of the aircraft parking positions. However, based on aircraft wingspans and lengths of the Bombardier Q400 and Boeing 737, it is expected that at least 15,000 SY of additional apron space will be required to accommodate all four aircraft.

Aircraft Rescue and Fire Fighting (ARFF) Facilities

The Aircraft Rescue and Fire Fighting (ARFF) building is located to the immediate east of the passenger terminal building. The ARFF building has three vehicle bays and a building footprint of approximately 3,400 SF. The airport will be adding a new firefighting vehicle by the summer of 2011, and expects to add an additional 3,500 SF ARFF vehicle bay to accommodate the new vehicle for a total of 6,900 SF. A 420,000-gallon water tank connected to the fire hydrant supply line sits on top of a hill north of Airport Road across from the airline terminal. The water line enters Airport property near the ARFF building, extends to the east and terminates near the far end of the airfield. Multiple sub-surface fire hydrants are connected to the water line.

Commercial airport certification requirements contained in Federal Aviation Regulations (FAR) Part 139 designate the ARFF Index of an airport based on the length of the longest air carrier aircraft with an average of five departures per day. The ARFF Index of an airport determines ARFF personnel, equipment, extinguishing agent, readiness and response requirements. ARFF Index ratings range from Index A (aircraft length less than 90 feet) to Index E (aircraft length of at least 200 feet). Because there is no air carrier aircraft that currently has an average of five departures per day from PUW, the Airport was initially designated as an ARFF Index A airport. After a recent re-certification inspection by the FAA, the Airport was moved to an Index B rating. Index B is based on an aircraft between 90 and 126 feet in length. Based on the air carrier operation forecasts contained in Chapter 2, the Index B classification will meet the needs of PUW throughout the 20-year planning horizon.

The expanded square footage of the ARFF building is expected to be adequate in both the intermediate- and long-term. However, the ARFF facility is outdated and its current location permits improperly parked commercial aircraft to block emergency response vehicles. In addition, implementation of the preferred airside alternatives will result in increased emergency response times due to longer ARFF vehicle driving distances to both runway ends. The intermediate-term landside development concept should reserve a preferred site for a new, relocated ARFF facility. The location for a future ARFF facility is based on several considerations, but the primary issue is the readiness and response of emergency vehicles. To this end, the location of the ARFF building must allow at least one ARFF vehicle to reach the midpoint of the farthest runway and initiate discharge of extinguishing agent within three minutes of alarm.

General Aviation (GA) and Fixed Base Operator (FBO) Facilities

The existing GA tie-down and hangar area is located on the eastern end of the airfield. It is physically separated from the passenger terminal complex. The GA area contains 51 aircraft tie-down spaces, 24 T-hangar spaces, 8 conventional hangars, one large FBO hangar and a GA aircraft parking apron measuring 16,000 SY.

PUW currently has one FBO located at midfield. The FBO provides a range of services to support GA operators including aircraft rental and charter, aircraft maintenance and fueling, flight training, catering services for corporate and charter operators, crew rest areas, and hangar space. The FBO has a dedicated parking lot with 34 auto parking spaces available for staff, customer and visitor use located near the northeast corner of the FBO hangar.

An analysis was performed in order to determine a forecast of future GA facility requirements. The analysis used the existing GA facilities and existing fleet mix as a baseline and then extrapolated future facility requirements based on the based aircraft fleet mix forecast in Chapter 2. In addition, the GA facility requirements forecast anticipates the following:

- 50 percent of based piston aircraft will be stored on tie-downs.
- 40 percent of based piston aircraft will be stored in T-hangar spaces.
- 10 percent of based piston aircraft will be stored in conventional hangars.

- 1,250 SF of hangar/tie-down space will be provided for each based piston aircraft.
- All turbojet, turboprop and helicopter aircraft will be stored in conventional hangars.
- 5,000 SF of hangar space will be provided for each based turbojet aircraft.
- 2,500 SF of hangar space will be provided for each based turboprop aircraft.
- 1,250 SF of hangar space will be provided for each based helicopter aircraft.
- Excess capacity of 40 percent will be provided for tie-downs.
- Excess capacity of 20 percent will be provided for T-hangars.
- Excess capacity will not be provided for conventional hangars.

The GA facility requirements forecasts for the intermediate-term and long-term are presented in **Table 5-3**.

Table 5-3: GA Tie-down, T-hangar, & Conventional Hangar Requirements Forecast

	Total Aircraft	Tie-downs		T-hangars		Conventional hangars	
		Spaces	Area	Spaces	Area	Spaces	Area
Baseline (2010)							
Single Engine Piston	57	29	36,250 SF	22	27,500 SF	6	7,500 SF
Multi Engine Piston	7	3	3,750 SF	3	3,750 SF	1	1,250 SF
Turbojet	3	0	0	0	0	3	15,000 SF
Turboprop	2	0	0	0	0	2	5,000 SF
Helicopter	0	0	0	0	0	0	0
Excess Capacity		13	16,250 SF	5	6,250 SF	0	0
Total		**45**	**56,250 SF**	**30**	**37,500 SF**	**12**	**28,750 SF**
Intermediate-Term (2020)							
Single Engine Piston	60	30	37,500 SF	24	30,000 SF	6	7,500 SF
Multi Engine Piston	7	3	3,750 SF	3	3,750 SF	1	1,250 SF
Turbojet	5	0	0	0	0	5	25,000 SF
Turboprop	3	0	0	0	0	3	7,500 SF
Helicopter	2	0	0	0	0	2	2,500 SF
Excess Capacity		14	17,500 SF	5	6,250 SF	0	0
Total		**47**	**58,750 SF**	**32**	**40,000 SF**	**17**	**43,750 SF**
Long-Term (2030)							
Single Engine Piston	64	32	40,000 SF	26	32,500 SF	6	7,500 SF
Multi Engine Piston	7	3	3,750 SF	3	3,750 SF	1	1,250 SF
Turbojet	8	0	0	0	0	8	40,000 SF
Turboprop	4	0	0	0	0	4	10,000 SF
Helicopter	2	0	0	0	0	2	2,500 SF
Excess Capacity		14	17,500 SF	6	7,500 SF	0	0
Total		**49**	**61,250 SF**	**35**	**43,750 SF**	**21**	**61,250 SF**

Based on the GA facility requirements forecast in **Table 5-3**, additional T-hangar and conventional hangar space will be required in both the intermediate- and long- term. The intermediate- and long-term landside development concepts both address this need. It is expected that existing tie-down space will be adequate for both the intermediate- and long-term. However, for planning purposes, the long-term landside development concept will reserve an area for additional tie-downs. If the existing ratio of based aircraft to FBO hangar space is maintained, existing FBO hangar space will be adequate in the intermediate-term but an additional FBO hangar will be required in the long-term.

PUW also accommodates occasional use by transient helicopter aircraft for military and medical evacuation operations. However, the airport does not currently have a designated and dedicated helicopter landing area. The intermediate and long-term landside development concepts should provide for a dedicated helipad location.

Air Cargo Facilities

PUW does not currently have regularly scheduled air cargo operations by carriers such as FedEx and UPS. However, air cargo operators may use PUW on a scheduled basis in the future. For planning purposes, the intermediate- and long-term landside development concepts will reserve areas for future air cargo facilities.

Airport Equipment Maintenance and Storage Facilities

Airport staff performs a variety of functions to support airport operations. These include maintenance of grass infield areas both on and off the airfield, removal of snow and ice during winter months, collection of parking lot fees, and regular inspections and maintenance of pavements and buildings. Airport maintenance equipment includes large lawn mowers, snow removal equipment, sand application equipment and a pick-up truck for airfield and runway inspections. There is one airport equipment maintenance and storage building located east of the FBO and west of the GA hangars. This building has total floor space of approximately 4,000 SF.

As the airport expands and other airport facilities are added, additional maintenance and storage facilities will be required. A forecast of airport equipment maintenance and storage facility space requirements is presented in **Table 5-4.** The projected increase in square footage is proportional to the forecasted increases in the size and number of airport facilities. The intermediate- and long-term landside development concepts will identify areas to satisfy the anticipated future space needs.

Table 5-4: Airport Equipment Maintenance and Storage Facility Space Requirement Forecast			
	Planning Year		
	Baseline (2010)	Intermediate-Term (2020)	Long-Term (2030)
Maintenance and Storage Facility Space	4,000 SF	6,000 SF	8,000 SF

Air Traffic Control Tower (ATCT)

The primary purpose of an air traffic control tower (ATCT) is to ensure that adequate physical separation is maintained between aircraft in the airspace surrounding an airport, and in the aircraft operating area (AOA) on the ground. Air traffic controllers located in an ATCT provide instructions and local weather information to pilots in the air and on the ground.

PUW does not currently have an ATCT. Criteria for determining whether an airport qualifies for an ATCT are described in Federal Aviation Regulations (FAR) Part 170, *Establishment and Discontinuance Criteria for Air Traffic Control Services and Navigational Facilities*. FAR Part 170 requires a detailed benefit cost analysis (BCA) to determine an airport's eligibility for an ATCT, which has not yet been done at PUW.

However, given the increase in design standards associated with the intermediate- and long-term airside alternatives, PUW may need an ATCT in the future. Siting criteria for ATCTs is contained in FAA Order 6480.4A, *Airport Traffic Control Tower Siting Process*. For planning purposes, the intermediate- and long-term landside scenarios will identify and reserve a site for future construction of an ATCT.

Automated Surface Observation System (ASOS)

An ASOS is a weather sensing and reporting system that collects aviation-related weather information and disseminates it via digitized voice broadcasts and printed reports. Information collected by an ASOS includes temperature, humidity, visibility, cloud ceiling and precipitation data. PUW currently has an ASOS located to the west of the overflow parking lot in the passenger terminal complex.

FAA guidance for the siting of ASOS is provided in FAA AC 150-5300-13, *FAA Airport Design*, and Order 6560.20, *Siting Criteria for Automated Weather Observing Systems*. These state that an ASOS should be located 1,000 to 3,000 feet from the runway end, and 750 to 1,000 feet from the runway centerline. Based on this guidance, the ASOS should be relocated as a result of the runway relocation included in the preferred airside alternatives. The intermediate- and long-term concepts will identify a preferred site for the relocated ASOS.

Airport Business Park

Many airports have business parks in which they lease airport-owned land and/or buildings to business tenants. Airports are attractive locations for many commercial and industrial businesses because they provide easy access to air transportation for employees and goods. Commercial and industrial development at an airport is beneficial to the airport as well. First, private development at the airport can increase an airport's operating revenues through lease payments. Second, it has the potential to increase passenger enplanements and aircraft operations by attracting more corporate users. Private development at the airport, like private development in other locations, also has a positive economic impact on the surrounding community.

PUW does not currently have an airport business park—a dedicated area for private development. For planning purposes, the long-term landside development concept will identify and reserve an area for future airport business park development. This area should have convenient access to Airport Road and should be buffered from aircraft operations in order to provide an attractive location for prospective business tenants.

Landside Facility Requirements Summary

The intermediate- and long-term landside facility requirements are summarized in **Table 5-5**. These requirements will be used in subsequent sections to develop intermediate- and long-term landside development concepts.

Table 5-5: Landside Facility Requirements Summary

Facility	Planning Year		
	Baseline (2010)	Intermediate-Term (2020)	Long-Term (2030)
Passenger Terminal Building	10,000 SF	15,050 SF	18,725 SF
Passenger Terminal Complex Auto Parking	218 spaces	328 spaces	409 spaces
Commercial Aircraft Parking Apron	13,000 SY	25,000 SY	25,000 SY
GA Tie-downs	51 spaces (63,750 SF)	47 spaces (58,750 SF)	49 spaces (61,250 SF)
GA T-hangars	24 spaces (30,000 SF)	32 spaces (40,000 SF)	35 spaces (43,750 SF)
GA Conventional Hangars	8 buildings (38,000 SF)	17 spaces (43,750 SF)	21 spaces (61,250 SF)
FBO Hangars	1	1	2
Airport Equipment Maintenance and Storage	4,000 SF	6,000 SF	8,000 SF
Potential New and/or Relocated Facilities			
Airport Road Relocation			
ARFF Building Relocation			
Air Cargo Facilities			
Air Traffic Control Tower			
Airport Business Park			
ASOS Relocation			
Dedicated Helipad			
Parking Lot Lighting			
Recommended Property Acquisitions and Easements			
Fuel Tank and Fertilizer Building Relocations			
Rental Car Wash Facility Relocation			

5.2 Potential Landside Development and Redevelopment Areas

The following sections identify areas on Airport property that may become available for landside development or redevelopment as a result of the preferred airside alternatives and other future actions. They also identify areas where future landside development or redevelopment may no longer be possible. These areas were determined based on standard safety and clearance setbacks associated with the new runway and taxiway configuration, the proposed route for long-term relocation of Airport Road, and discussions with Airport staff and the Master Plan Technical Advisory Committee.

Intermediate Landside Development and Redevelopment Areas Gained

This section identifies development and redevelopment areas that may be gained as a result of the new runway and taxiway configuration. These areas are shown in **Exhibit 5-2**.

An area of approximately 14 acres on the west side of the existing Airport property is not currently developed due to constraints from airfield safety areas, airspace surfaces and rolling topography. This area extends from the overflow parking lot west of the terminal to the western edge of the existing Airport property. The west landside area will expand and may become available for future landside development and use in the intermediate-term as a result of the preferred airside alternatives, which will rotate the current runway and raise the elevation.

The feasibility and possible configuration of facilities in the intermediate-term, west landside development area will be determined, in large part, by the relocation of Airport Creek. The preferred airside alternatives will require that either the exposed portion of Airport Creek be piped underground along its existing course, or that the course of the creek be altered. While the relocation of Airport Creek through the development area has some design benefits, it will limit land uses and space because of long-term maintenance concerns associated with an underground pipe. To maximize developable land and potential uses, the intermediate-term landside development concept anticipates Airport Creek will not be routed through the west landside development area.

The preferred airside alternatives will also provide new flexibility for future build-out and redevelopment of the existing passenger terminal complex. The Airport’s ability to expand and improve the configuration of facilities in the passenger terminal complex is constrained due to airfield safety areas, airspace surfaces and topography associated with the existing runway location. The preferred airside alternatives will remove many of these constraints and present new opportunities for expanding the passenger terminal complex in order to meet the needs of Airport staff, passengers and operators more efficiently and effectively. An intermediate landside redevelopment area of approximately 15 acres will be designated for future reconfiguration and expansion of facilities in the passenger terminal complex.

Intermediate Landside Development and Redevelopment Areas Lost

This section identifies potential development and redevelopment areas that may be lost as a result of the new runway and taxiway configuration. These areas are shown in **Exhibit 5-2** and are described below.

With the exception of the FBO hangar, all existing GA hangars at PUW are within the BRL associated with the preferred airside alternatives. There are two reasons that it is not considered feasible by this Master Plan to remove all existing GA facilities located within the BRL. One is the anticipated cost of relocating the GA hangars, taxiways and aprons. The other is the lack of available space for replacing these facilities while also accommodating future growth in landside facility needs. Although the GA hangars are within the BRL, analysis of the FAR Part 77 surfaces with relation to the actual GA hangar heights indicates that the FAR Part 77 surfaces clear all but one of the existing hangars. That hangar is the easternmost conventional hangar.

An area approximately 3.5 acres in size immediately east of the GA hangars is currently undeveloped. Site preparation for future GA use has already been completed in this area, including construction of taxilanes for future based aircraft hangars. However, this area will become undevelopable with the runway relocation due to required airfield safety areas and airspace surfaces.

The area containing GA hangars that do not penetrate the FAR Part 77 surfaces is approximately 15 acres in size. Discussion with the FAA will be required to determine whether the existing GA hangars will be permitted to remain in their current locations once the runway has been relocated. It is expected that the hangars will be allowed to remain in their current locations, but that redevelopment of the area will not be permitted once the hangars have outlived their useful lives. The Airport should consider developing a long-term plan for relocating all GA hangars in this area to an alternate area outside of the BRL.

This Page Intetnionally Left Blank

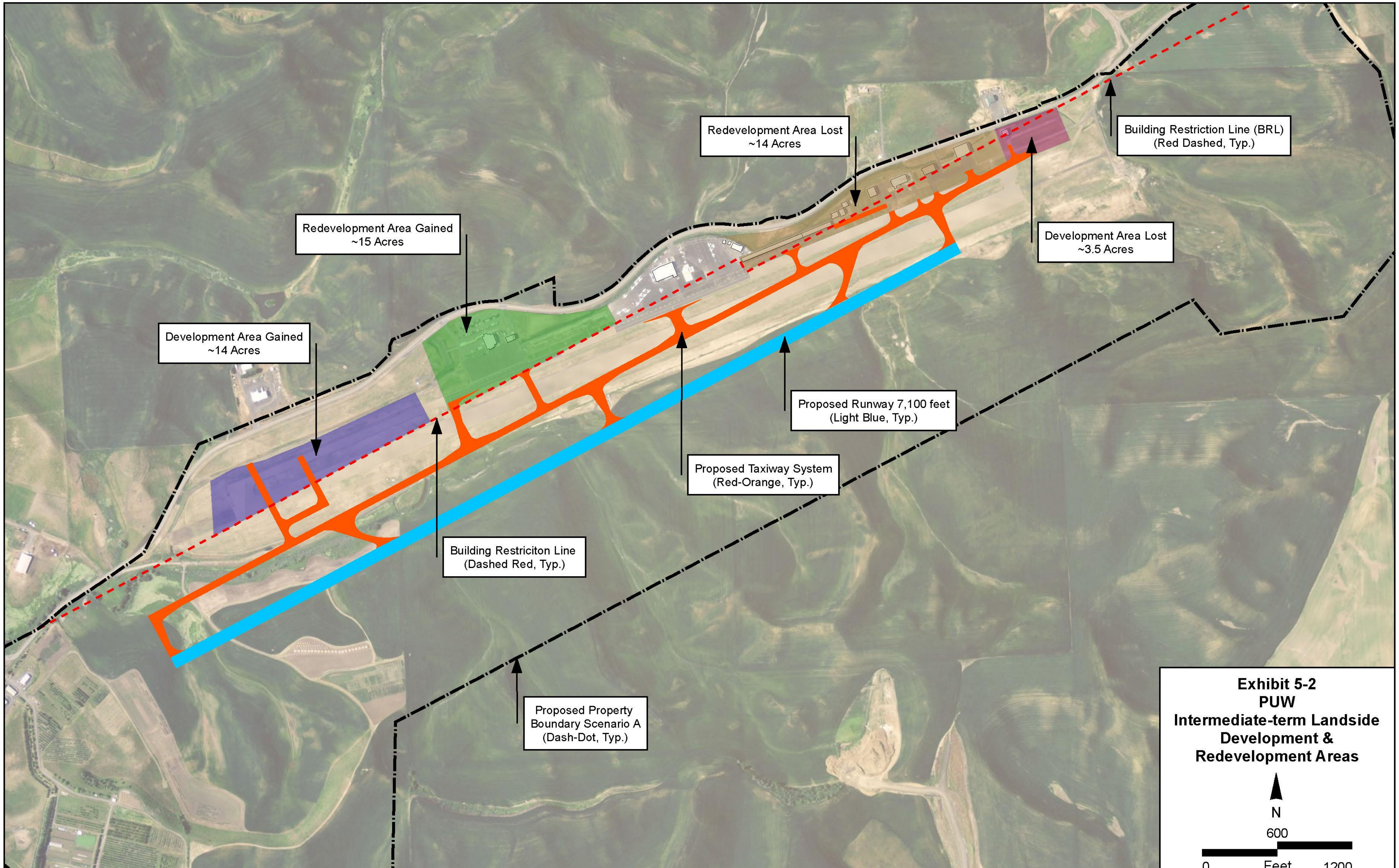


Exhibit 5-2
PUW
Intermediate-term Landside Development & Redevelopment Areas

Long-Term Landside Development and Redevelopment Areas

Long-term build out of the preferred airside alternatives to an ultimate 8,000-foot runway length is not expected to result in additional developable land for landside facilities. However, the proposed relocation of Airport Road would eliminate many constraining forces on future landside facilities. The relocation of Airport Road along the proposed route shown in **Exhibit 5-3** will create an additional 50 acres of land adjacent to the Airport that could be acquired for landside development. It is recommended that the Airport acquire this land in the event of Airport Road relocation.

Although there is additional landside development area available in the long-term, its topography is likely to make landside development expensive. Earthwork and improvements including extensive grading, off-site fill material disposal, retaining wall structures and stabilized slopes will be needed to make the land in this area suitable for landside development. These alterations will add to the development cost and will also significantly reduce the buildable land area. Due to uncertainties associated with Airport Road relocation and the cost and feasibility of landside facility site preparation, the long-term landside development concept will not present specific recommendations regarding facility locations in this area.

Relocation of existing airport equipment maintenance/storage and rental car wash facilities will open up an area of approximately one acre for future redevelopment. This area is located adjacent to the GA apron and to the immediate northwest of the existing T-hangar buildings.

This Page Intentionally Left Blank

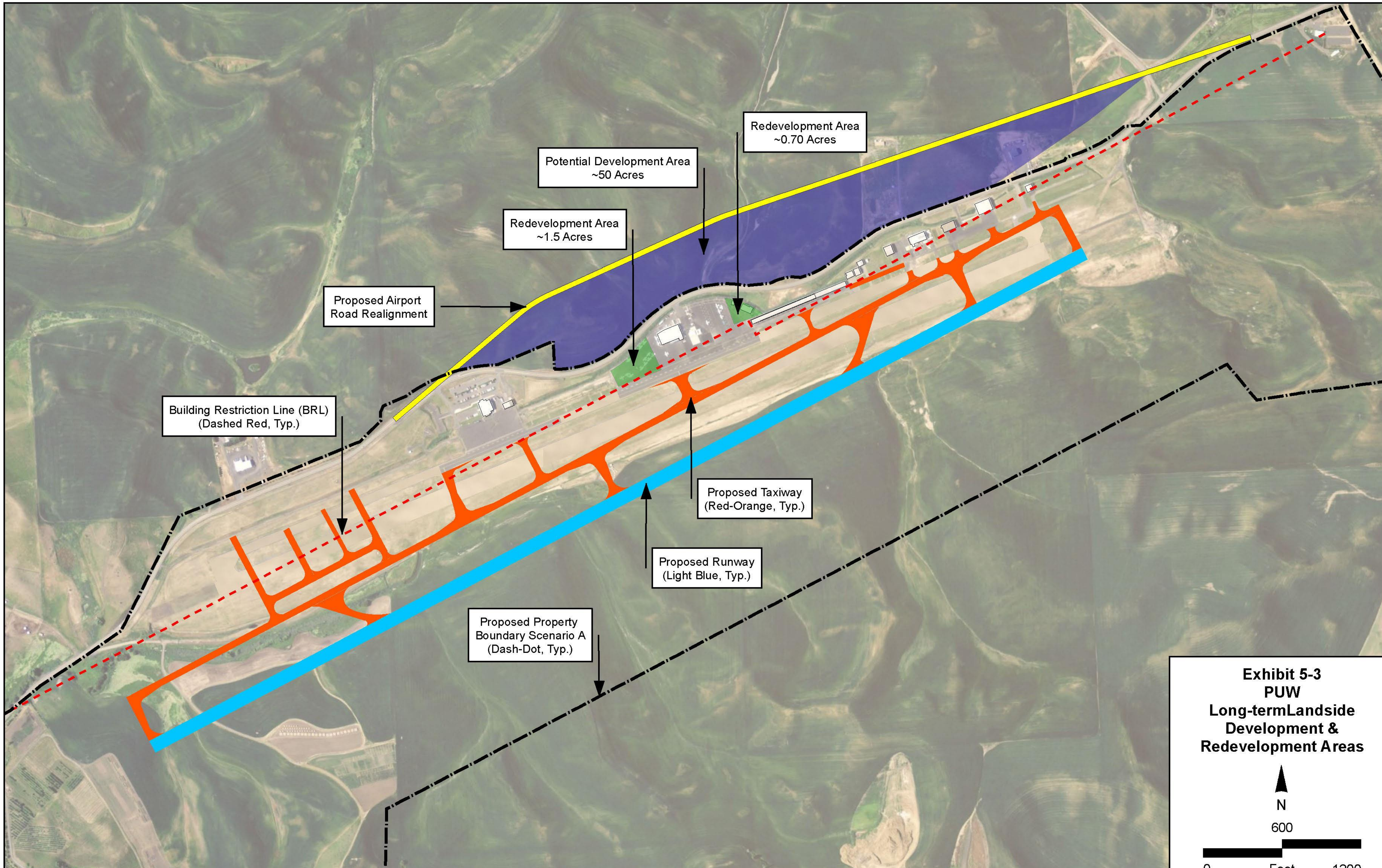


Exhibit 5-3
PUW
Long-termLandside
Development &
Redevelopment Areas

5.3 Landside Development Concepts

The following sections present intermediate- and long-term development concepts for accommodating projected landside facility requirements within the previously identified landside development and redevelopment areas. As noted earlier in the chapter, these concepts are schematic in nature. It is anticipated that a more detailed study of landside facility development and reconfiguration will be completed once runway relocation is underway.

Intermediate-Term Development Concept

The intermediate-term (10-year) landside development concept is based on the landside facility requirements and development/redevelopment areas presented in the previous sections. The intermediate-term concept is presented in **Exhibit 5-4**, and includes the following components.

Passenger Terminal Building Expansion - The intermediate-term concept expands the existing passenger terminal building by 5,050 SF to accommodate expected growth in passenger enplanements. The expansion will occur to the west of the existing terminal, within the existing parking lots designated for rental car and employee parking.

Commercial Aircraft Parking Apron Expansion - The intermediate-term concept expands the existing commercial aircraft parking apron by 15,000 SY to simultaneously accommodate two Bombardier Q400 aircraft and two Boeing 737 aircraft. The expansion will occur to the west, south and east of the existing commercial aircraft parking apron.

ARFF Building Relocation - The intermediate-term concept relocates the ARFF building to the area between the commercial aircraft parking apron and the GA parking apron. This location is ideal for an ARFF facility because it is located close to the midpoint of the proposed runway, allowing for the fastest possible emergency response times to both ends of the runway. This location will also provide dedicated ARFF vehicle access to the parallel taxiway, which is not possible at the current location. The concept includes a new parking lot for ARFF employees and potential ATCT employees.

Airport Equipment Maintenance and Storage - The intermediate-term concept co-locates new airport equipment maintenance and storage space with the relocated ARFF building. Co-location with ARFF will allow for lower operational costs and provide better operational efficiency.

Existing ARFF Building Conversion for Air Cargo Use - The intermediate-term concept converts the existing ARFF building for use as an air cargo facility. The building's location on the existing commercial aircraft parking apron will allow for parking and unloading of air cargo aircraft, and its proximity to

Airport Road will allow easy vehicle access. Converting this building to air cargo use in the intermediate-term will maximize its utility and useful life once ARFF operations have been relocated.

Future ATCT Facility Site - The intermediate-term concept reserves a site for a future ATCT facility immediately to the east of the relocated ARFF building. It is expected that this site's location near the center of the airfield will provide adequate controller line-of-sight for all aircraft movement areas. However, a site selection study will be required to comply with FAA Order 6480.4A and determine if this site is the best option for a future ATCT.

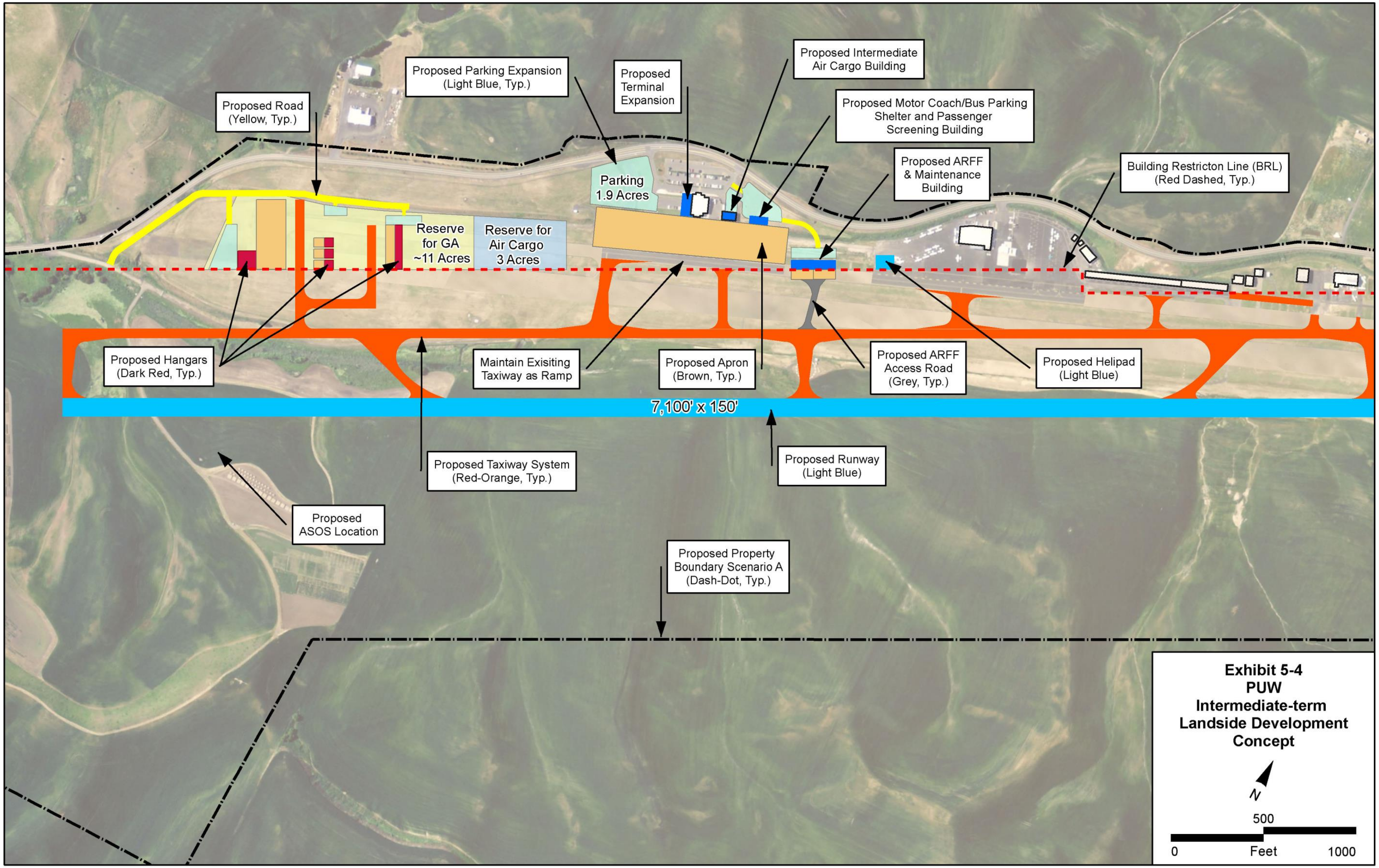
ASOS Relocation - Two potential ASOS relocation sites were analyzed for the intermediate-term concept. One potential site is located north of the relocated runway, while the other potential site is located south of the relocated runway. Of these two sites, only the north side ASOS relocation site met FAA siting criteria. However, the north side relocation site would significantly reduce the developable area for other landside facilities. The intermediate-term concept anticipates that the south side ASOS relocation site will best meet weather observation needs while also allowing for future growth in landside facilities. Discussion with the FAA will be needed for confirmation of this ASOS relocation site.

Parking Lot Expansion - The intermediate-term concept expands the existing auto parking areas within the passenger terminal complex to accommodate growth in passenger enplanements. The intermediate-term expansion will occur adjacent to the existing overflow lot west of the terminal. This expansion will provide for future growth in parking space requirements while also replacing parking spaces lost as a result of the terminal building expansion. An expansion area of approximately 1.5 acres is proposed to meet these needs.

Covered Motor Coach/Bus Parking Area - The intermediate-term concept includes a new covered, curbside shelter for motor coach passengers in the area between the existing parking lot and the future, relocated ARFF building.

New GA Hangar Area - The intermediate-term concept reserves an area of approximately eleven acres on the far west end of the existing Airport property for new GA hangar facilities. The concept anticipates the construction of four new conventional hangars and one new 12-unit T-hangar in the intermediate-term. This includes space for the associated aprons, taxilanes and ground vehicle access and parking. The new GA hangar area includes additional developable land for long-term build out of GA facilities.

Dedicated Helipad - The intermediate-term concept identifies a dedicated helipad area on the GA apron next to the existing FBO hangar.



Proposed Parking Expansion (Light Blue, Typ.)
Proposed Terminal Expansion
Proposed Intermediate Air Cargo Building
Proposed Motor Coach/Bus Parking Shelter and Passenger Screening Building
Proposed Road (Yellow, Typ.)
Proposed ARFF & Maintenance Building
Building Restricton Line (BRL) (Red Dashed, Typ.)
Parking 1.9 Acres
Reserve for GA ~11 Acres
Reserve for Air Cargo 3 Acres
Proposed Hangars (Dark Red, Typ.)
Maintain Exisiting Taxiway as Ramp
Proposed Apron (Brown, Typ.)
Proposed ARFF Access Road (Grey, Typ.)
Proposed Helipad (Light Blue)
7,100' x 150'
Proposed Taxiway System (Red-Orange, Typ.)
Proposed Runway (Light Blue)
Proposed ASOS Location
Proposed Property Boundary Scenario A (Dash-Dot, Typ.)
Exhibit 5-4
PUW
Intermediate-term
Landside Development
Concept
N
0
500
1000
Feet

Long-Term Development Concept

The long-term (20-year) landside development concept builds on the intermediate-term concept and takes into account build out of the preferred airside alternatives to an ultimate 8,000-foot runway length. Although the concept considers potential relocation of Airport Road, it does not specifically depict any new landside facilities in this area. The long-term concept is presented in **Exhibit 5-5**, and includes the following components.

Passenger Terminal Building Replacement - The long-term concept anticipates that the existing passenger terminal building will reach the end of its useful life and require demolition and reconstruction. It is expected that the replacement terminal building will be located on or near the site of the existing terminal building.

Parking Lot Reconstruction, Reconfiguration and Expansion - The long-term concept includes additional expansion of existing auto parking areas to accommodate growth in passenger enplanements. The concept anticipates that the parking lot pavement will reach the end of its useful life and will need to be replaced. When the parking lot is reconstructed, it should be reconfigured to accommodate ground vehicle movement and passenger loading/unloading as efficiently and effectively as possible. It is expected that an additional expansion area of approximately one acre will be needed to meet long-term parking requirements.

Rental Car Wash Facility - The long-term concept relocates the existing rental car wash facilities to new facilities located closer to the rental car parking area. The new rental car wash facility will be located near the existing overflow parking lot west of the existing commercial airline terminal building.

Tie-down Expansion Area - Relocation of the airport equipment maintenance/storage and rental car wash facilities will result in an acre of land becoming available for redevelopment adjacent to the existing GA apron. The long-term concept redevelops this area as a GA aircraft tie-down expansion area.
New Air Cargo Building - The long-term concept relocates air cargo operations from the existing ARFF building to a new facility with a dedicated cargo aircraft parking apron. The new air cargo facility will be located to the immediate west of the expanded commercial aircraft parking apron.

Additional GA/FBO Hangars - The long-term concept anticipates construction of additional hangars at the west end GA hangar development area identified as part of the intermediate concept. The concept assumes construction of four additional conventional hangars and one additional 12-unit T-hangar along with associated aprons, taxilanes and ground vehicle access and parking. The long-term concept also takes into consideration the potential need for a new or expanded FBO hangar near the existing FBO facilities.

Airport Business Park - The long-term concept takes into consideration future development of an airport business park. There will be limited areas suitable for development on existing Airport property for the foreseeable future. These areas are located in close proximity to the runway and, as such, should be reserved for aviation-related uses. However, the proposed relocation of Airport Road may allow for a dedicated business park area north of the existing Airport Road. A business park located in this area will have convenient access to Airport Road and will be located such that it provides an attractive location for prospective business tenants. The Airport should consider the benefits of making the area “development ready” by providing utilities to the site and offering a build to suit development option.

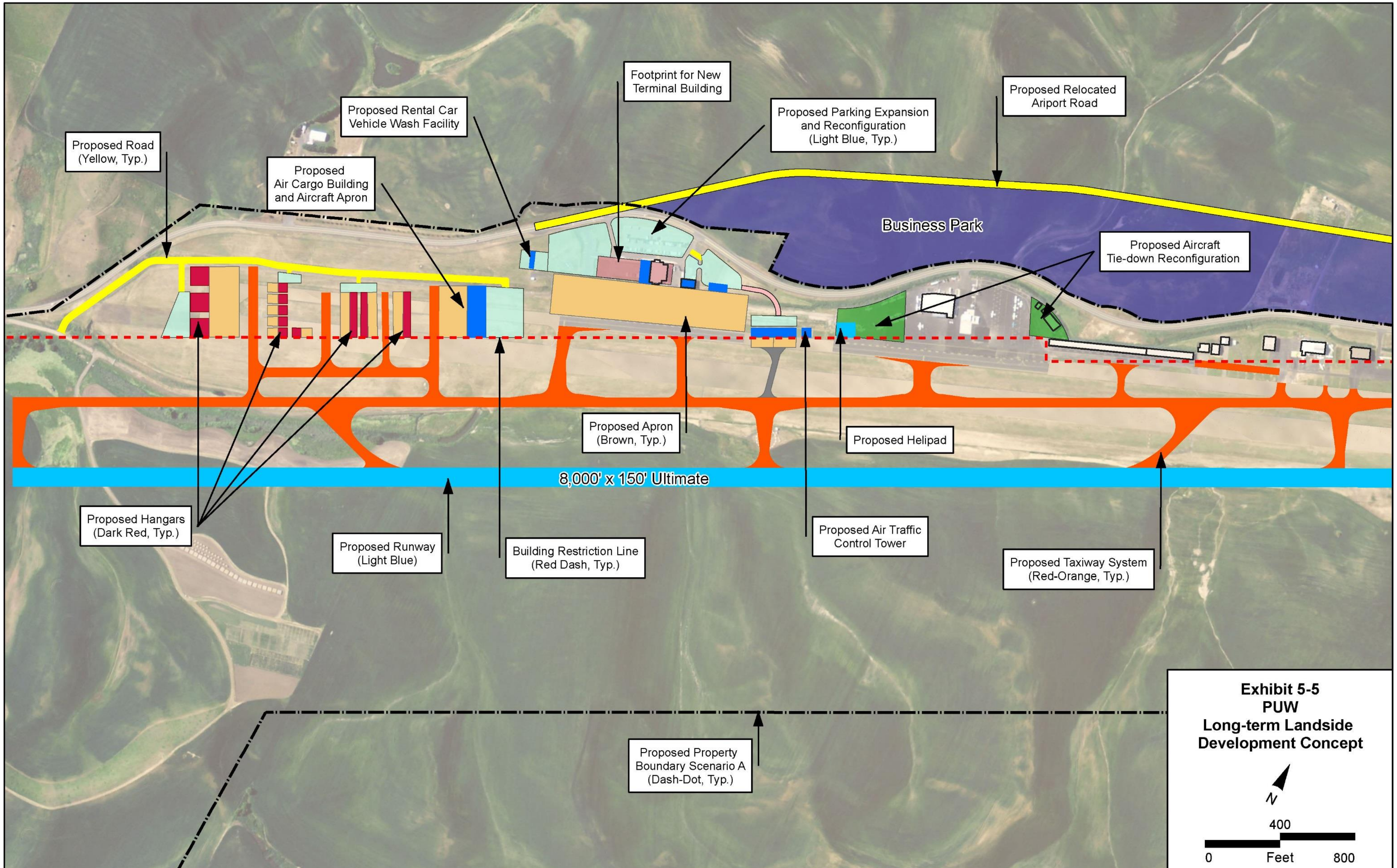


Exhibit 5-5
PUW
Long-term Landside Development Concept

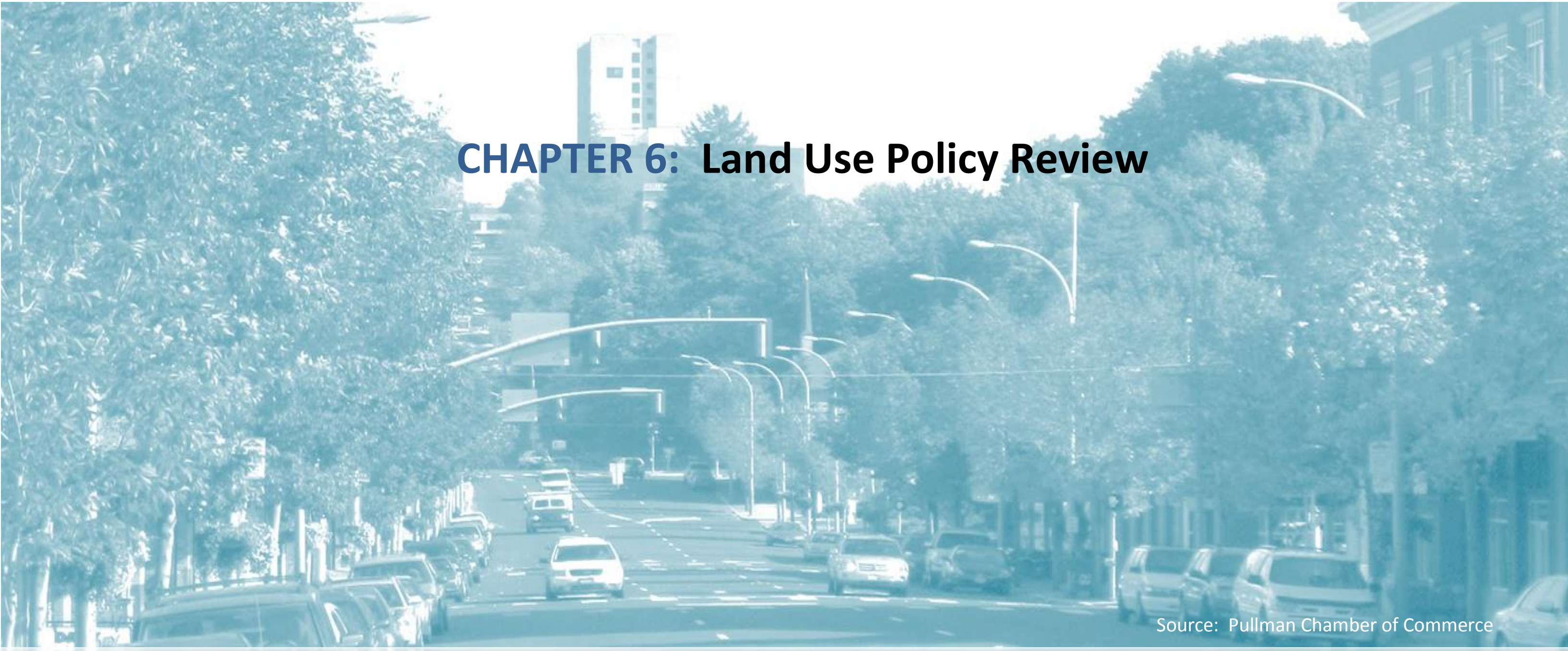
5.4 Summary

The proposed airfield changes, including the runway relocation, will reshape the landside facilities at PUW. In the intermediate-term and long-term scenarios at PUW, there will be additional landside development area on the northwest side of the relocated runway. This area is proposed for a variety of new and expanded uses including a business park, GA hangars and air cargo facilities. Future plans also include expansions of the terminal building, apron area and auto parking areas and new combined ARFF and Maintenance Building and a new helipad area. Some of the development at the east end of the Airport that currently sits in front of the BRL is expected to transition to the west end over time.

The concepts presented in this chapter are a first step towards planning for a new system of landside facilities. The exhibits demonstrate an intermediate- and long-term future that looks very different than the PUW of today. In addition to providing a description of the intermediate- and long-term future at PUW, Chapter 7 presents a Capital Improvement Program to prioritize the intermediate-term landside facility requirements into specific planning years. Potential funding sources for these facilities are also identified in Chapter 7.

This Page Intentionally Left Blank

CHAPTER 6: Land Use Policy Review



Source: Pullman Chamber of Commerce

Overview

Airport land use compatibility is a planning activity that coordinates planning efforts between an airport, the host community, neighboring communities, transportation organizations and major institutions. The coordinated planning efforts are designed to bring about a collection of positive outcomes including safety, efficiency, comfort and economic prosperity. The goals of airport safety include protecting people and property on the ground, minimizing injury to aircraft occupants, and preventing the creation of flight hazards. Airport land use compatibility planning practices also protect the public's investment in the airport and in community infrastructure around the airport. In addition, airport land use compatibility practices strive to minimize the incompatibility between routine operations at an airport and adjacent land uses—especially those caused by noise and vibration. When airports and communities grow in a coordinated manner, the economic impacts of the airport may be maximized in the region.

This chapter explores the federal and state land use regulations and guidelines that are in place to support and direct airport land use compatibility efforts. Then a land use compatibility analysis is performed on both the existing and future conditions around the airport. Land uses and noise are both considered. Areas of existing or potential conflicts are identified and recommendations are made for corrective or preventative action. Finally, an instructional land use compatibility section is included for the region around PUW. This third section can be used in the community as a stand-alone resource for planning staff, commission members and others with land use authority.

6.1 Federal Land Use Regulations and Guidance

The Planning System

The *National Plan of Integrated Airport Systems* (NPIAS) provides the framework for national aviation planning activity for a 10-year planning horizon and is published every two years. The NPIAS identifies public-use airports across the country whose operations are important to the national interest. As a result, airports included in the NPIAS are eligible for federal funding for planning and improvement projects. This system was created under the Airport and Airway Improvement Act of 1982.

Planning for aviation may also be done at the state level. Here the state's transportation department documents the existing network of airports and plans for future needs of the system. This effort considers the creation of new airports and expansion at existing airports. Goal setting and public involvement are part of the planning process.

A master plan is also created for each individual airport. Master plans are developed according to the guidance provided by FAA Advisory Circular (AC) 150/5070-6, titled *Airport Master Plans* (June 1985). Master plans project future aviation activity over an extended planning horizon, identify improvements to meet future demand, and consider funding sources. Some elements of a master plan must be approved by the FAA.

Public Funding of Airports

The Federal Airport Act of 1946 created the Federal Aid to Airports Program (FAAP), a grants-in-aid program for public-use airports. The overall goal of the program was to support the development of a coordinated, national system of civil airports. The FAAP was replaced by the Airport and Airway Development Act in 1970. The Airport and Airway Development Act empowered the Secretary of Transportation to make grants for airport planning and improvement projects to maintain a safe and efficient nationwide system of public-use airports. To this end, airports that accept grant funding also accept several obligations or "grant assurances" designed to keep the airport functioning safely and efficiently. The assurances may become part of the final grant offer or may be recorded in restrictive covenants to property deeds.

The Airport and Airway Improvement Act of 1982 was adopted more recently. The provisions related to grant assurances remained intact through this legislative amendment and are expected to remain part of the funding program over the long term. The 1982 legislation also requires that airport planning activities coordinate with other transportation planning activities, which is another tool for integrating land use compatibility into the aviation planning process.

Grant Assurances

Grant assurances are obligations of the airport that are put in place when grant funds are accepted. Their purpose is to assure that the airport continues to operate safely and efficiently over time. In total, there are 39 grant assurances. One example of a general obligation is Grant Assurance 1 that requires projects to comply with all other Federal laws. Some assurances address planning practices generally. Grant Assurance 6 requires that the project be reasonably consistent with the plans of public agencies in which the project is located, and Grant Assurance 7 requires that consideration be given to local interests. Grant Assurances 20 and 21 speak directly to airport land use compatibility and recognize compatibility as an important tool for maintaining both safety and operational efficiency. They read as follows:

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.

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.

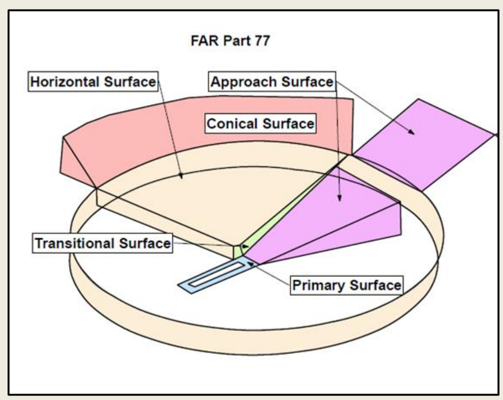
If an airport fails to comply with grant assurances, the FAA may place sanctions on the airport and may even require that the grant funds be repaid.

Safety and Efficiency Through Design

The FAA has established physical design standards for airports to support safety and efficiency. Most of those standards are contained in FAA's AC 150/5300-13, titled *Airport Design.* Its primary focus is on dimensional standards for airport runways, taxiways and other aircraft operating areas and safety areas. Safety areas are located beyond the runway ends. The property associated with these safety areas may or may not be owned by the airport. Airports are strongly encouraged to own the immediate safety areas beyond the runway and as a result, property acquisition is eligible for grant funding. In lieu of ownership, use restrictions may be recorded for off-airport properties through an avigation easement. These constraints address height restrictions but may not include other elements of airport land use compatibility such as hazardous uses and wildlife hazards. Additional areas located beyond airport property may not be controlled by easement at all but may still pose land use compatibility challenges that result in operating restrictions for the airport. This symbiotic relationship between on- and off-airport land uses underscores the need for effective airport land use compatibility initiatives.

Another FAA Advisory Circular directly related to airport land use compatibility is AC 150/5200-33, titled *Hazardous Wildlife Attractants on or near Airports*. This guide addresses the unwanted interaction between aircraft and wildlife. Bird strikes during flight and the interaction of animals and bird species with aircraft on the ground is a safety hazard to aviation. This AC identifies land uses that have the potential to attract hazardous wildlife to or in the vicinity of public-use airports such as sanitary landfills and open water, including wetland mitigation areas, and recommends that these uses be located outside of safety areas.

FAR Part 77 Surfaces Part 77 surfaces are those areas established in relation to the airport and to each runway consistent with FAR Part 77 in which any object extending above these imaginary surfaces, by definition, is an obstruction.



Source: FAA

Federal Aviation Regulations (FARs) are FAA policies that guide the development of implementation tools such as the AC resources noted previously. Several FARs address airport land use compatibility issues including navigable airspace and noise. FAR Part 77, *Objects Affecting Navigable Airspace*, is the guiding policy for airspace protection. It defines a set of imaginary surfaces that extend out from the runway in all directions. These surfaces are used to define the navigable airspace that should be protected through height limitations to promote safe and efficient airport operations. The protection area extends two to three miles around airport runways and approximately 9.5 miles from the ends of runways that have a precision instrument approach. FAR Part 77 also requires that the FAA be notified of proposed construction or alteration of objects that would be tall enough to break the plane of the imaginary surfaces.

To support the policy requirement of FAR Part 77, a review process is in place to evaluate proposed development around an airport. The process is described in AC 70/7460-2J, *Proposed Construction or Alteration of Objects that May Affect the Navigable Airspace*. The AC sets criteria for on- and off-airport construction requiring FAA notification. The title of the required notification form, *Form 7460-1*, has become synonymous with the process itself. When a request is submitted, the FAA renders a decision as to whether or not the proposed project is hazardous to the navigable airspace. However, the response has no regulatory authority. Land use authority to prevent obstructions rests solely with the local unit of government responsible for zoning. This divided process highlights the need for coordinated land use policies and cooperative decision-making to preserve the airport's operating efficiency.

There are other FARs that address airport land use compatibility through noise regulations. These regulations only apply to airports in the federal system of airports (NPIAS).

- **FAR Part 36**, *Noise Standards: Aircraft Type and Airworthiness Certification*, sets the noise limits that all newly produced aircraft must meet as part of their airworthiness certification.
- **FAR Part 91**, *General Operating and Flight Rules*, sets many of the rules by which aircraft flights within the United States are to be conducted, including rules governing noise limits.
- **FAR Part 150**, *Airport Noise Compatibility Planning*, implements the *Safety and Noise Abatement Act of 1979*. These regulations establish a voluntary program that airports can use to conduct airport noise compatibility planning. Part 150 prescribes a system for measuring airport noise impacts and presents guidelines for identifying incompatible land uses. Part 150 studies are eligible for federal funding both for the study itself and for implementation.
- **FAR Part 161**, *Notice and Approval of Airport Noise and Access Restrictions,* implements the *Airport Noise and Capacity Act of 1990* that was designed to balance local needs for airport noise abatement with national needs for an effective air transportation system. An extensive cost-benefit analysis of proposed restrictions is required and the analysis requirements are closely tied to the process set forth in FAR Part 150.

Environmental Regulation

Another federal regulation that impacts planning and design at airports is the National Environmental Policy Act (NEPA) of 1969. The Act established a commitment on behalf of the federal government to consider the impacts of a proposed project on the environment and community around it. For federally funded projects, and most state funded projects, the Act establishes a framework for the environmental review process. This is another example of an overlap between airport and community planning activities. Airport master plans should lay a foundation for the NEPA review process.

6.2 State Land Use Regulations and Guidance

The State of Washington provides guidance and regulation to encourage best practices in community land use planning and airport land use compatibility. The Revised Code of Washington (RCW) is a compilation of all permanent state laws including aeronautic laws, the Planning Enabling Act and the Growth Management Act. The Washington Administrative Code (WAC) is a compilation of regulations from executive branch agencies issued by authority of statutes. Like legislation, regulations are a source of primary law in Washington State. Both resources contain regulations related to airport land use compatibility.

Aeronautic Laws

Most aeronautics laws are found under RCW Title 14. The *Municipal Airports Act* is RCW 14.07 and 14.08; adopted in 1941 and most recently modified in April 2009. It provides for the acquisition and sponsorship of airports by Washington cities, towns, counties, port districts and airport districts. The *Airport Zoning Act* is RCW 14.12; adopted in 1945 and most recently modified in April 2009. This Act defines an airport hazard as "any structure or tree or use of land which obstructs the airspace required for the flight of aircraft in landing or taking-off at an airport or is otherwise hazardous to such landing or taking-off of aircraft." It allows local jurisdictions to adopt zoning controls to protect critical airspace from obstructions.

The Planning Enabling Act

Washington's *Planning Enabling Act* is Chapter 36.70 of the RCW. The Act is a set of state laws that describe planning authorities and responsibilities for towns, cities and counties. The Act defines airports as essential public services (RCW 36.70A.200) and recognizes them as part of the multi-modal transportation system (RCW 36.70A.070). The following sections are especially applicable to airport land use compatibility planning:

RCW 36.70.320 Comprehensive plan requires that counties prepare a comprehensive plan. Other provisions establish similar requirements for cities and towns. Comprehensive plans are required to include both a land use and a circulation element and the community must consult with aviation interests prior to plan adoption.

RCW 36.70.547 General aviation airports mandates that every local unit of government discourage the siting of incompatible land uses adjacent to a general aviation airport if the airport is operated for the benefit of the public. It is to be done both through the comprehensive plan and development regulations. In addition, there must be formal consultation by the local unit of government with aviation stakeholders before a comprehensive plan is adopted.

The Act also includes a mandate that the Washington State Department of Transportation's Aviation Division (WSDOT Aviation) provide technical assistance to communities during their planning process.

Growth Management Act (GMA)

The *Growth Management Act* (GMA) was adopted in 1990. It expands on the Planning Enabling Act's requirements for comprehensive planning in the most densely populated and fastest growing counties in Washington State. Whitman County is classified as "partially planning" under GMA and as such is required to create critical area ordinances and a shoreline ordinance. There are other provisions of the GMA that do not apply to Whitman County.

Washington Administrative Code (WAC)

Airport land use compatibility is also present in the Washington Administrative Code (WAC). WAC 365-196-455 is titled *Land use compatibility adjacent to general aviation airports*. Its language mirrors that of the Planning Enabling Act with respect to comprehensive plans and development regulations. Local units of government must discourage the siting of incompatible land uses adjacent to any public-use general aviation airport in the community. Before a comprehensive plan is adopted, consultation with airport owners and managers, private operators, general aviation pilots, ports and the aviation division of WSDOT is required. WAC 365-196-455 also references the state law related to the siting of essential public services.

The WAC also includes recommendations for formal consultation when a change is proposed to the comprehensive plan or zoning regulations that would affect airport operations. The WAC notes that the following are considered incompatible land uses:

- Residential encroachment
- High intensity uses such as K-12 schools, hospitals and major sporting events
- Airspace and height hazard obstructions
- Noise and safety issues

Washington State Airport Land Use Compatibility Regulations and Guidelines

Washington State regards land use compatibility between airports and surrounding land uses as a topic of statewide importance. In the statewide Growth Management Act (GMA), airports are defined as “essential public facilities” and counties and cities planning under the act must address the siting of these facilities in their comprehensive plans (RCW 36.70A.200). In addition, the GMA requires towns, cities and counties to discourage development of incompatible land uses adjacent to public-use airports through adoption of comprehensive plan policies and development regulations (RCW 37.70.547).

WSDOT Aviation’s responsibility under the GMA is to advocate for the preservation and protection of public-use airports. WSDOT, though, does not have regulatory authority over local land use decisions. Rather, its role is to offer technical assistance to local entities by providing local decision makers with the best available information about airport land use compatibility.

Toward this end, WSDOT Aviation has published the *Airports and Compatible Land Use Guidebook,* January 2011. The Guidebook is designed to help airports, communities and jurisdictions work cooperatively and proactively towards preventing incompatible development around airports in the state. Jurisdictions can use the tools and resources found in the guidelines to develop policies and development regulations that discourage the encroachment of incompatible land use adjacent to public-use general aviation facilities. The Guidebook emphasizes airspace protection and discourages development of residential buildings, schools, hospitals and other medical facilities adjacent to airports, especially in the extended centerline of the airport runway. Most industrial and commercial land uses are identified as airport-compatible. The Guidebook will be explored in more detail as an implementation tool later in this chapter.

6.3 Local Land Use Controls and Impacts

The role of local land use agencies is critical to the effective execution of airport land use compatibility initiatives. As noted previously, the federal government provides regulations and funding for airport facilities but has no land use authority. The FAA reviews and makes recommendations on land use issues and looks to airports to actively discourage incompatible land uses around the airport. However, neither the FAA nor the airport can regulate or permit activities located off of the airport. That role is reserved exclusively for local units of government with planning and zoning authority. Regional entities with established communication networks and common goals may offer additional support. This section explores the regional organizations and local land use authorities around PUW.

Region

The Palouse Regional Transportation Planning Organization (PRTPO) is part of the Southeast Washington Economic Development Association (SEWEDA). The organization serves Asotin, Columbia, Garfield and Whitman Counties. Founded in 1985, SEWEDA was created to promote economic vitality in the region. In 1992, SEWEDA added the role of the PRTPO to its list of services. As the regional transportation planning organization, the PRTPO plans for distribution of federal transportation dollars in the region. The group operates with a Policy Board of Directors and Technical Advisory Committee—each committee includes representatives from each of the four counties. The PRTPO already plays an important role in the region; however, there are numerous opportunities to expand the role of this organization as a leader in regional transportation planning initiatives.

County

PUW is located in the southwest section of Whitman County; a largely rural and agricultural area in the southwest part of Washington State called the Palouse region. The Whitman county seat is located in Colfax. The City of Moscow, Idaho, is located in Latah County, and is the county seat. PUW is located between Pullman and Moscow and serves the populations of both counties. Whitman County has land use authority over some of the area included in the current and future airport safety zones. These areas are largely agricultural, which is generally compatible to airport operations. However, planning and development review processes should evaluate airport land use compatibility on a case by case basis. Even in an agricultural zone, site features like open water or unique uses like wind turbines can be incompatible with airport operations. Latah County's land use authority does not extend into either the Airport's current or future safety areas and, as a result, will have minimal impacts on the Airport's operation.

The Port of Whitman County is an economic development organization that is also dedicated to the preservation of multi-modal transportation. This organization does not have land use authority. However, it is uniquely situated to support the development of new commercial and industrial development sites on the airport and the continued growth of air travel for business travelers and future cargo opportunities.

Local Land Use Regulation

City of Pullman

The City of Pullman is the largest urban area in Whitman County, is home to Washington State University and has an estimated 2009 population of 27,600. The City of Pullman offers a full range of urban utilities and services to the community. A full-time planning staff performs planning functions and administers the zoning ordinance for areas within the city limits. Most areas within the city have been developed and are currently being used; there are very few vacant parcels. In the city's comprehensive plan, the future land use map also assigns future land use classifications to areas outside the city limits that will be annexed in the future. The City of Pullman is responsible for land use decisions within several of the Airport's safety compatibility zones. The size of the area is expected to increase over time and the urban development patterns need to be carefully coordinated to support airport land use compatibility.

City of Moscow

The City of Moscow is the county seat for Latah County and home to the University of Idaho. Moscow is located on the westernmost border of the county and the state's north central region. It is the county's largest city with a 2005 population of 21,700. The City of Moscow offers a full complement of urban services and has a community development department that carries out planning and zoning functions for the city. The airport safety areas do not include land in the City of Moscow so land use decisions are not expected to impact airport land use compatibility directly. However, the city has the opportunity to support the goals of the airport in a variety of ways. The City's Transportation Committee, for example, will guide the development of a multi-modal transportation plan in the near future, which can coordinate with the regional transportation goals of the Airport.

Washington State University

Washington State University (WSU) is located on the west end of the current and future runway and has land use control of critical areas of the Airport's safety compatibility zones. Although WSU is located in the City of Pullman, it is autonomous with respect to planning and land use regulation. The City has designated the WSU campus as a single zoning district where zoning review and permitting requirements are waived. The Capital Planning and Development (CPD) Department at WSU is responsible for sustaining, planning and improving the university's built environment and carries out the planning and development review functions of the university. Land use coordination with the CPD Department is essential to promoting airport land use compatibility and protecting the airport's critical airspace.

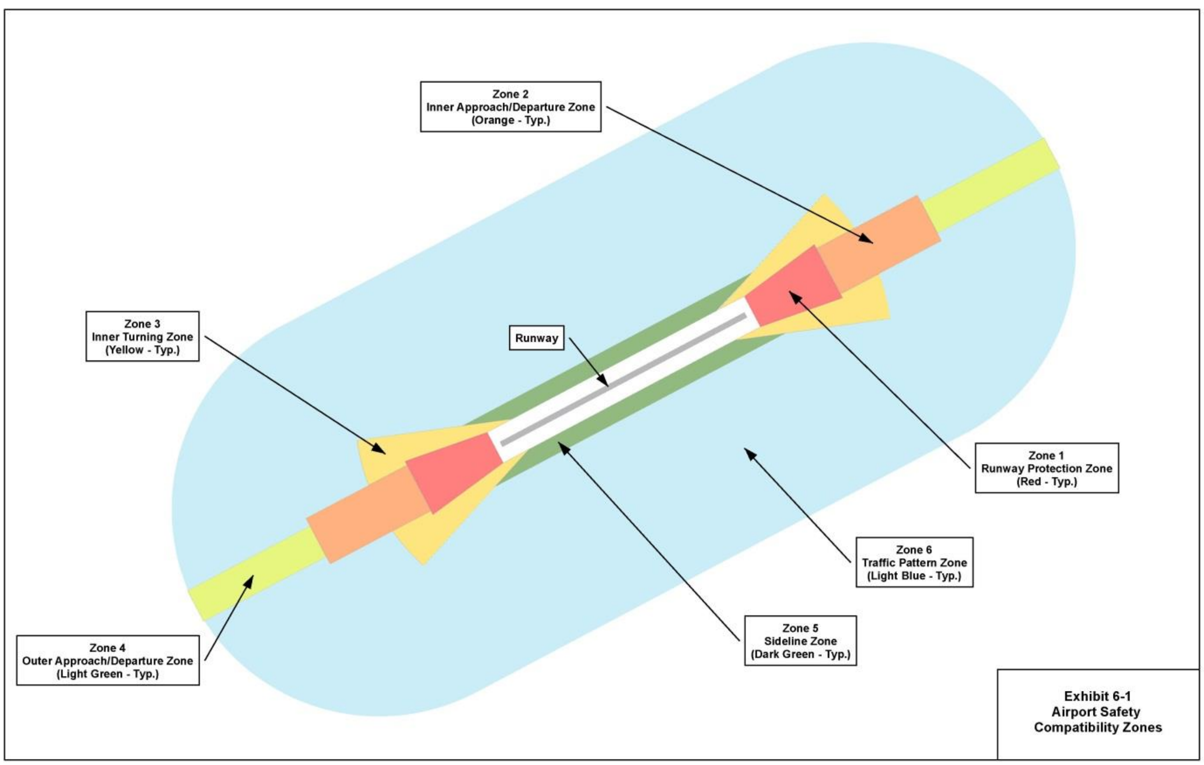
Issue Identification / Gap Analysis

Methodology

The WSDOT *Airport and Compatible Land-Use Program Guidebook* (January 2011) includes a reference to the 2002 *California Airport Land Use Planning Handbook* and its comprehensive examination of accident locations. As a result of the original analysis, a hierarchy of six distinct safety zones called Airport Safety Compatibility Zones (ASCZ) was developed based on different risk factors. Each zone also has a distinct set of compatible land uses. The zones are included in appendix F of the WSDOT Airport and Compatible Land-Use Program Guidebook and were used in this land use compatibility analysis. The resulting zones are shown in **Exhibit 6-1**. The zones are:

- Zone 1: Runway protection zone
- Zone 2: Inner approach and departure zone
- Zone 3: Inner turning zone
- Zone 4: Outer approach and departure zone
- Zone 5: Sideline zone
- Zone 6: Traffic pattern zone

Exhibit 6-1: Airport Safety Compatibility Zones



Source: Mead & Hunt

The area covered by the ASCZ for each runway configuration in the planning study impacts property in the City of Pullman, Whitman County and the WSU campus. Land use data for the City of Pullman and Whitman County was available geographically and was used to compare recommended land uses for the ASCZ with existing and future land uses in both municipalities. Areas of conflict are identified and corrective action is explored in the analysis section. Before analysis, the ASCZs are explored in general as an educational tool for land use planners in the region. Then, the six zones are applied to the current runway, the proposed runway at 7,100 feet and the proposed runway at 8,000 feet. Because the results are identical for each scenario, they are shown on a single exhibit. Results for the City of Pullman are shown on **Exhibit 6-2** and for results for Whitman County are shown on **Exhibit 6-3**.

Airport Safety Compatibility Zones (ASCZ)

Zone 1 is the Runway Protection Zone (RPZ), as defined by FAA criteria, located directly off each runway end. As a result, the most restrictive set of recommendations apply to this area:

- Airport ownership of property encouraged
- Prohibit all new structures
- Prohibit residential land uses
- Avoid nonresidential uses except if very low intensity in character and confined to the sides and outer end of the area

Zone 2 is the Inner Approach and Departure Zone, extending beyond the RPZ. Zone 2 also extends along the sides of the RPZ if the RPZ is narrow. Zone 2 encompasses areas overflown at low altitudes – typically only 200 to 400 feet above runway elevation. This is a substantial risk area. Out of all near-airport aircraft accidents in the US, 30 to 50 percent of these occur in Zones 1 and 2. As a result, the following basic compatibility qualities apply to this area:

- Prohibit residential uses except on large, agricultural parcels
- Limit nonresidential uses to activities that attract few people (unacceptable use examples: shopping centers, restaurants, theaters, multi-story office buildings and labor intensive manufacturing centers)
- Prohibit schools, day care centers, hospitals, nursing homes
- Prohibit hazardous uses (e.g. above ground fuel storage)

Zone 3 is the Inner Turning Zone that extends out at a wider angle from Zone 1. It encompasses locations where aircraft are typically turning from the base to final approach legs of the final traffic patterns and are descending from traffic pattern altitude. This zone also includes the area where departing aircraft transition from takeoff power to a climb mode and begin to turn to their en route heading. As a result, the following basic compatibility qualities apply to this area:

- Limit residential uses to very low densities (if not deemed unacceptable due to noise)
- Avoid nonresidential uses having moderate or higher usage intensities (e.g., major shopping centers, fast food restaurants, theaters)
- Prohibit schools, large day care centers, hospitals, nursing homes
- Avoid hazardous uses (e.g., aboveground fuel storage)

Zone 4 is the Outer Approach /Departure Zone, extending out from the runway centerline beyond Zone 2. Risk in this area is the result of approaching aircraft flying at less than traffic pattern altitude. As a result, these basic compatibility qualities apply to this area:

- In undeveloped areas, limit residential uses to very low densities (if not deemed unacceptable due to noise); if alternative uses are impractical, allow higher densities as infill in urban areas
- Limit nonresidential uses as in Zone 3
- Prohibit schools, large day care centers, hospitals, nursing homes

Zone 5 is the Sideline Zone, encompassing close-in area that is adjacent and lateral to the runway. These areas are not normally overflown. The primary risk in this area is with aircraft losing directional control on takeoff. On most airports, these areas are usually on airport property. The following basic compatibility qualities apply to this area:

- Avoid residential uses unless airport related (noise usually a factor)
- Allow all common aviation-related activities provided that height-limit criteria are met
- Limit other nonresidential uses similarly to Zone 3, but with slightly higher usage intensities
- Prohibit schools, large day care centers, hospitals, nursing homes

Zone 6 is the Traffic Pattern Zone, encompassing all areas used as part of regular traffic patterns. The risk in this zone is relatively low but there is a concern over uses for which the potential consequences of an accident are severe. As a result, these basic compatibility qualities apply to this area:

- Allow residential uses
- Allow most nonresidential uses; prohibit outdoor stadiums and similar uses with very high intensities

- Avoid schools, large day care centers, hospitals, nursing homes

Local Land Use Classification Categories

Land use within the ASCZ is directed by three different local land use authorities: the City of Pullman; Whitman County and Washington State University. Each entity is essentially autonomous in its ability to assign land use classifications or approve development proposals. Coordination and cooperation is encouraged but is not legally required. A brief summary of the current and future zoning classifications for the City and County are provided here.

Current Zoning Regulations

The City of Pullman administers a Zoning Ordinance based on a Comprehensive Land Use Plan. Land use categories for planning purposes in the Comprehensive Plan include Low Density Residential, High Density Residential, and Commercial, Industrial, Public and WSU categories. At the implementation level, the Zoning Ordinance includes five separate residential categories, two commercial categories and three industrial classifications.

Currently, the airport property itself is part of the city but the land around the airport is surrounded by WSU and Whitman County property. The City of Pullman shows plans for future commercial zoning around the airport as part of future plans for a boundary expansion through annexation. In addition, the City also makes use of several floating zones for Planned Residential Development, Manufactured Housing Development, Recreational Vehicle Parks and the “Limited” zone that functions like a special use permit. The location of a floating zone is established as part of the planning review process. When a floating zone is proposed, the Airport Safety Zones should be part of the zoning review process since each of the floating zones has the potential to be a high intensity use.

The City’s Zoning Ordinance includes an Airport Overlay zone to provide special consideration for areas around the airport. As currently written, the Airport Use Restriction Overlay district in the City’s Zoning Ordinance is defined as “all areas where the existing or potential airport-related noise levels exceed 65 Ldn (day-night average)” [17.95.020.11]. By that definition, according to the noise analysis, the overlay zone is applicable only on airport property. There is also a Height Restriction Overlay district based on the Part 77 surface language, which is an effective reference for height. The combined district restricts any use that in any way endangers aircraft operations and restricts some uses that may be impacted by airport noise, including residential and educational uses.

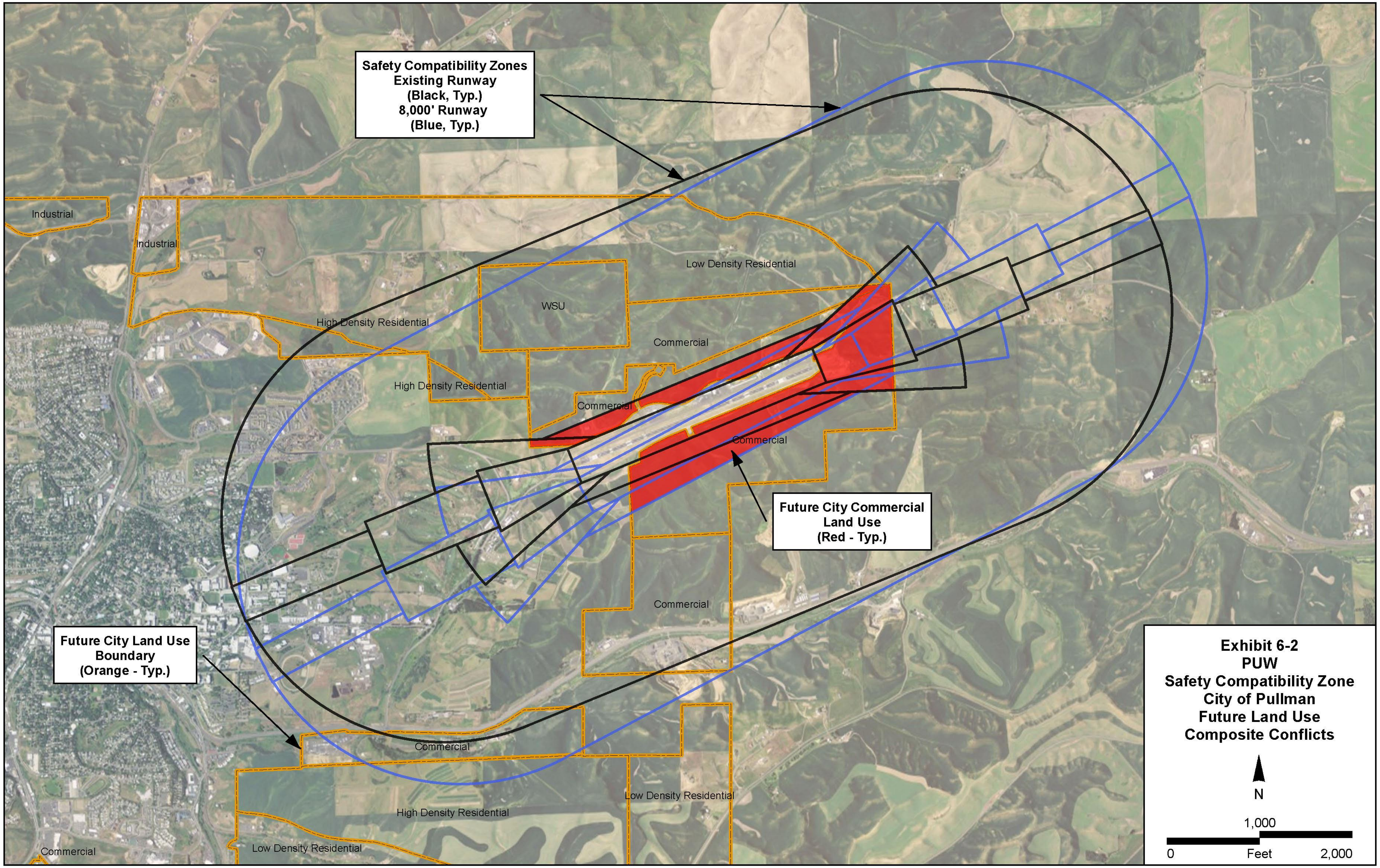
Although most of Whitman County is sparsely populated agricultural and open land, zoning districts around the Airport include the Cluster Residential District, Light Industrial District, Heavy Commercial

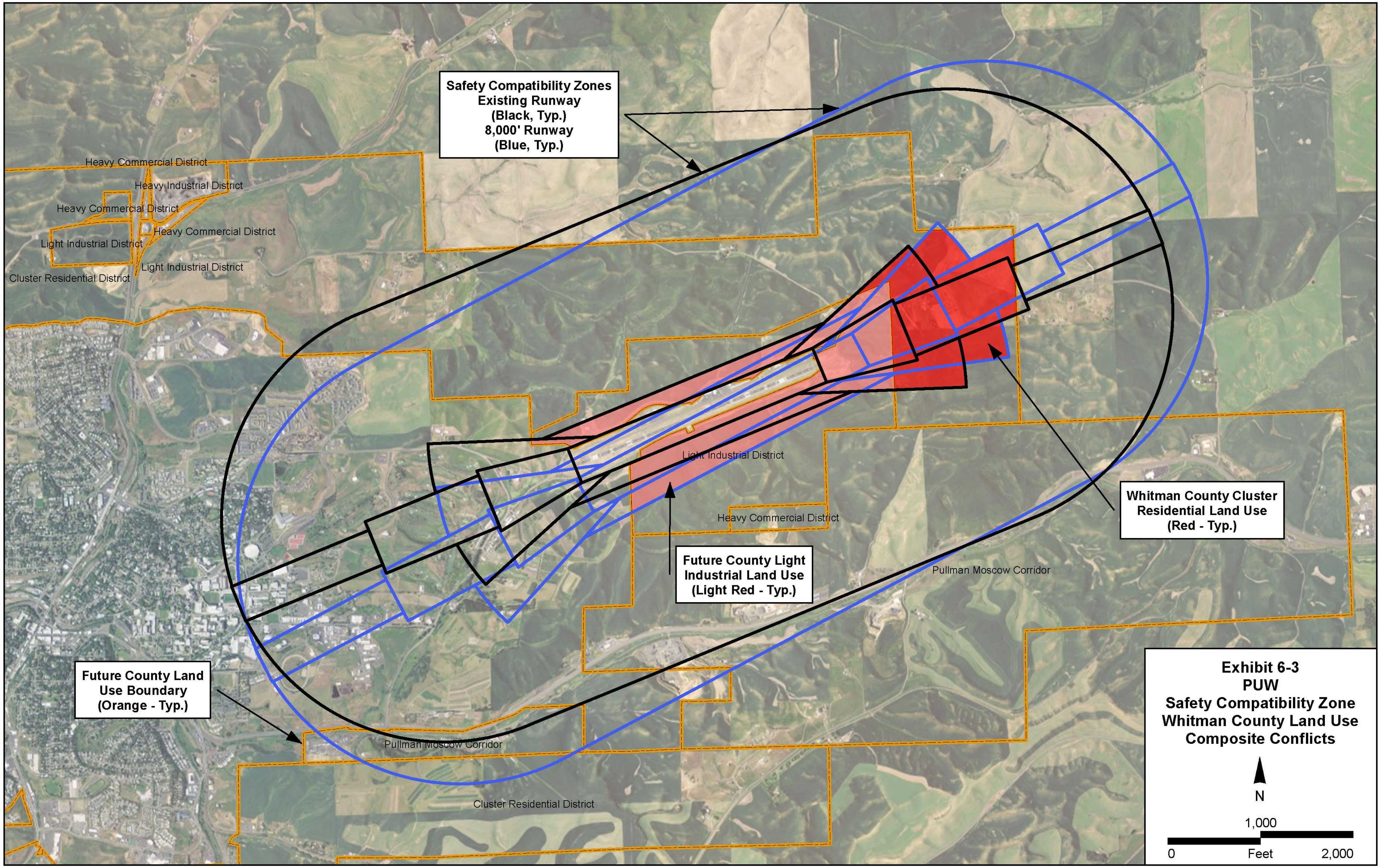
District and the Pullman Moscow Corridor district. Whitman County's Zoning Ordinance includes an Airport Landing Zone Overlay District, which is defined by the Part 77 Surfaces. It contains height limitations, restricts public assembly uses and glare producing materials, and addresses development in noise sensitive areas.

While both the city and county ordinances have many positive attributes and take a step in the right direction, a more comprehensive approach to airport land use compatibility is presented later in this chapter and is recommended as a replacement to the current zoning ordinance language in both communities. Recommendations include defining the Airport Overlay zone by the limits of the ACSZ, restricting land uses based on safety zone recommendations, and providing for conditional use restrictions to address glare, smoke and wildlife hazards more specifically.

An analysis of the surrounding land uses concluded that there were no current conflicts with the City of Pullman's current zoning land use designations. The "City Future" map (**Exhibit 6-2**) shows parcels that are outside of the city limits but included within the City's urban growth area. These parcels will likely be annexed into the City at some point in the future. The County map (**Exhibit 6-3**) shows parcels that are in Whitman County. No analysis was performed on WSU property because the university zone doesn't clearly translate to traditional land use types. However, the information in this section can be used by campus planning staff for independent evaluation. Alternatively, the City may choose to exercise its land use authority over the university property with regard to an airport overlay zone.

This Page Intentionally Left Blank


Safety Compatibility Zones
Existing Runway
(Black, Typ.)
8,000' Runway
(Blue, Typ.)
Industrial
Industrial
Low Density Residential
WSU
High Density Residential
Commercial
High Density Residential
Commercial
Commercial
Future City Commercial
Land Use
(Red - Typ.)
Commercial
Future City Land Use
Boundary
(Orange - Typ.)
Commercial
Low Density Residential
High Density Residential
Low Density Residential
Commercial
Exhibit 6-2
PUW
Safety Compatibility Zone
City of Pullman
Future Land Use
Composite Conflicts
N
1,000
0
Feet
2,000


Safety Compatibility Zones
Existing Runway
(Black, Typ.)
8,000' Runway
(Blue, Typ.)
Heavy Commercial District
Heavy Industrial District
Heavy Commercial District
Heavy Commercial District
Light Industrial District
Light Industrial District
Cluster Residential District
Light Industrial District
Heavy Commercial District
Whitman County Cluster
Residential Land Use
(Red - Typ.)
Future County Light
Industrial Land Use
(Light Red - Typ.)
Pullman Moscow Corridor
Future County Land
Use Boundary
(Orange - Typ.)
Pullman Moscow Corridor
Cluster Residential District
Exhibit 6-3
PUW
Safety Compatibility Zone
Whitman County Land Use
Composite Conflicts
N
0
1,000
Feet
2,000

Issue Identification / Gap Analysis

The Future Land Use Composite Conflicts for the City of Pullman identifies conflicts with commercial land use at the east end of the runway in Safety Zone 1 and directly adjacent to both sides of the runway in Safety Zone 5. The County Composite Conflicts map shows a conflict with Cluster Residential in Safety Zones 1, 2 and 3 and with the Light Industrial district in Safety Zones 1, 3 and 5. In each case, the parcel in question is larger than the safety zone and only the safety zone conflict is shaded on the map.

Safety Zone 1, the RPZ, is a very high risk area and has the most restrictive recommendations including airport ownership of the property where possible, prohibition of all new structures and avoidance of all residential and most nonresidential uses.

Safety Zone 2, the Inner Approach and Departure Zone, is a substantial risk area as well. Land use compatibility guidelines in Zone 2 prohibit residential uses except on large, agricultural parcels and restrict most commercial and institutional uses.

Safety Zone 3 is the Inner Turning Zone and is a transition zone for smaller aircraft on takeoff and approach. Land use compatibility guidelines in Zone 3 limit residential uses to very low densities, which may be compatible with the cluster development zone depending on design.

Safety Zone 5 prohibits residential uses altogether. Some commercial uses may be appropriate but special limitations should be placed on the type of permitted commercial use as well as the site design in this area.

In each of these Safety Zones, commercial uses that serve large groups of people including restaurants, shopping centers and theaters should not be permitted. Also, uses with hazardous materials such as gas stations should be prohibited. Site design criteria should carefully regulate off-site impacts including lighting, glare, smoke and open water.

Regulatory action is implemented through zoning regulations, which may be in the form of an overlay zone in the existing zoning ordinance or developed as a separate regulatory ordinance. Zoning ordinance amendments may be developed independently or cooperatively through a joint planning effort between the city and the county. Implementation can also be done independently or through a joint planning initiative. The WSU land is an anomaly in the current airport land use compatibility equation in its current semi-autonomous position. A comprehensive land use compatibility effort for PUW must include WSU as a cooperative partner or as part of the City’s regulatory actions.

6.4 Noise

Since the introduction of the turbo jet aircraft in the late 1950s, aircraft noise has been the primary driver of airport land use compatibility conflicts. Noise related issues are challenging in part because the perception of an acceptable level of noise varies from person to person, varies depending on location and activity and varies depending on time of day.

As part of this planning process, federal noise standards for airports were used to perform a noise analysis for the current and proposed runway alignment at PUW. Areas of existing and potential conflicts were identified and are noted in this section.

FAA Guidance

The primary federal regulation guiding and controlling planning for aviation noise compatibility on and around airports is Federal Aviation Regulation (FAR) Part 150, *Airport Noise Compatibility Planning*. The goal of the Part 150 process is to mitigate the noise impacts that airports have on the surrounding area while maintaining the efficiency of the national aviation system. Part 150 establishes voluntary standards for measuring, mapping and analyzing noise compatibility. Grant funding is available to implement noise mitigation measures identified thought the Part 150 process.

Part 150 was created by the authority of the Aviation Safety and Noise Abatement Act of 1979. Prior to that, the FAA published the 1976 Aviation Noise Abatement Policy. In earlier legislation, the Noise Control Act of 1972 was enacted to protect Americans from noise levels high enough to jeopardize health and welfare and the Aircraft Noise Abatement Act of 1968 required the FAA to develop and enforce safe standards for noise generated by aircraft.

Advisory Circular (AC) 36-1, *Noise Levels for U.S. Certificated and Foreign Aircraft* and 14 CFR Part 36, *Noise Standards: Aircraft Type and Airworthiness Certification,* defines standard aircraft noise levels used for the Part 150 process and other aviation noise analysis.

Aircraft Noise Analysis

This section compares noise exposure levels for 2010 with projected noise exposure levels for 2015 and 2020 based on the new runway alignment. The following analysis identifies the location of noise contours in relation to adjacent land uses. Noise contours are incorporated into land use analysis for the City of Pullman, Whitman County and Washington State University. Runway improvements identified in Chapter 3 are included in the 2015 and 2020 noise analysis.

Methodology

To prepare a noise exposure map, the FAA Integrated Noise Model 7.0 (INM) requires information concerning the number of aircraft operations, the types of aircraft (fleet mix), the time of day (day or night) that activity occurs, runway utilization patterns and the typical flight tracks of aircraft. Coordination with airport staff and the FAA and evaluation of the aviation demand forecasts presented in Chapter 2 provided the necessary information to model existing and future noise exposure levels at PUW. Data input into INM are included in **Appendix J.**

Aircraft Fleet Mix

PUW has a diverse fleet mix. In 2010, scheduled commercial service was provided by the Horizon Air's Bombardier Q400 aircraft. Charter service is provided by Bombardier Q400, Airbus 319 and Boeing 737. General aviation aircraft types include single-engine piston, multi-engine piston, medium and large turbo jets and turbo props. Helicopters and military transport aircraft are also part of the fleet mix. PUW's fleet mix was developed based on information from FAA databases, Flight Aware and airport management.

Airport Operations

The frequency of aircraft operations are based on the FAA-approved aviation activity forecasts. Existing and forecasted itinerant operations are divided evenly into approach and departure operations. Local operations are classified as touch-and-go operations.

Daytime-Nighttime Operations

Nighttime operations occur between 10:00 pm and 7:00 am. INM assigns "penalties" to nighttime operations because aircraft noise is perceived to be louder at night when ambient sound levels are lower. The proportions of daytime and nighttime activity for commercial operations are based on published flight schedules, which indicate 33 percent of flights are nighttime operations. Airport management estimates that 95 percent of GA and military aircraft operations occur during the daytime, and five percent occur during the nighttime.

Runway Utilization

Runway utilization includes the number, location and orientation of the active runways, as well as the directions and types of operations that occur on each runway. Runway utilization depends primarily on wind direction and speed, but is also a function of aircraft operator procedures. Runway utilization percentages are presented in **Table 6-1**.

Table 6-1: Runway Utilization	
Runway End	**Percent of Annual Operations**
05	60%
23	40%

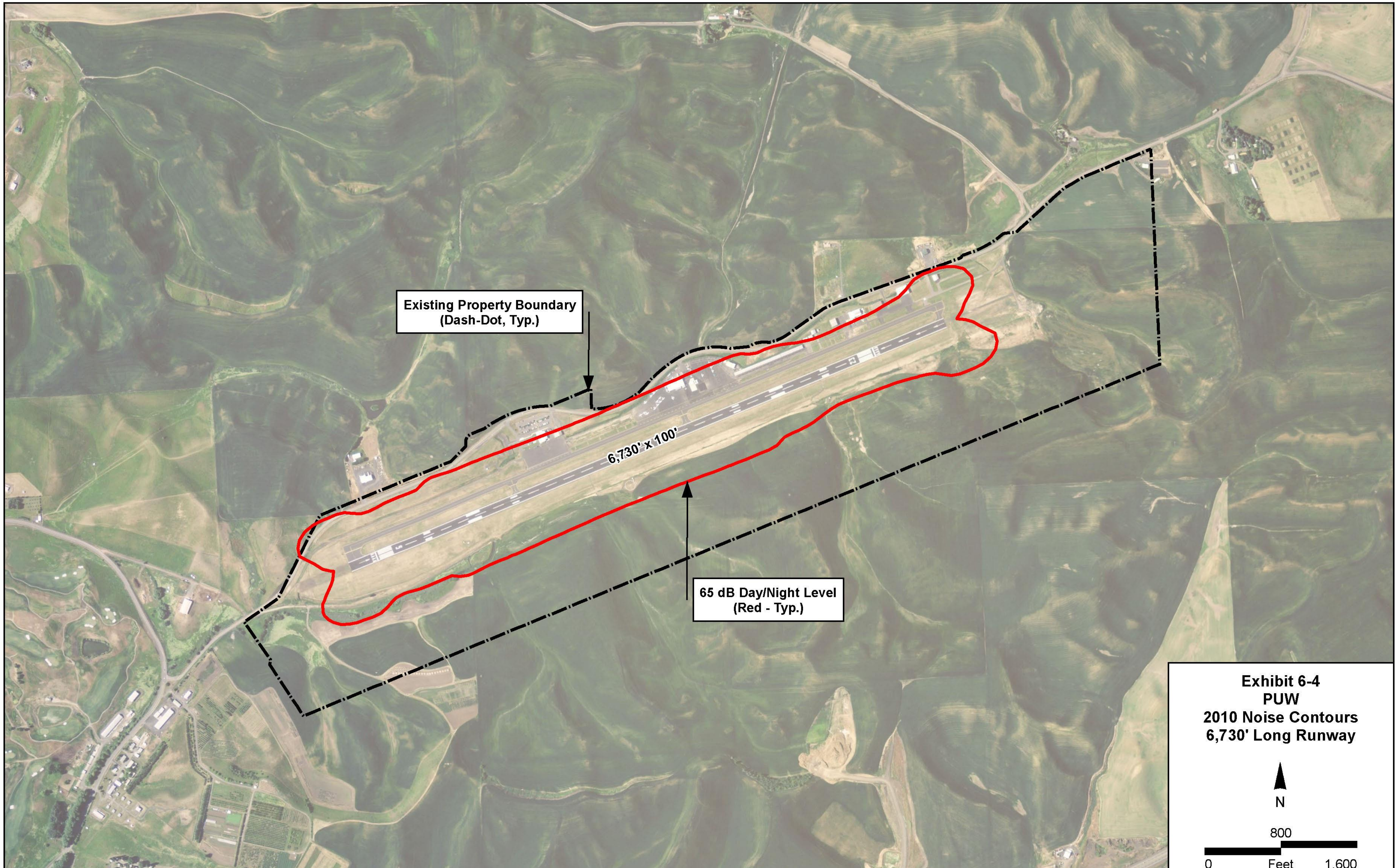
Source: Airport Management Estimate

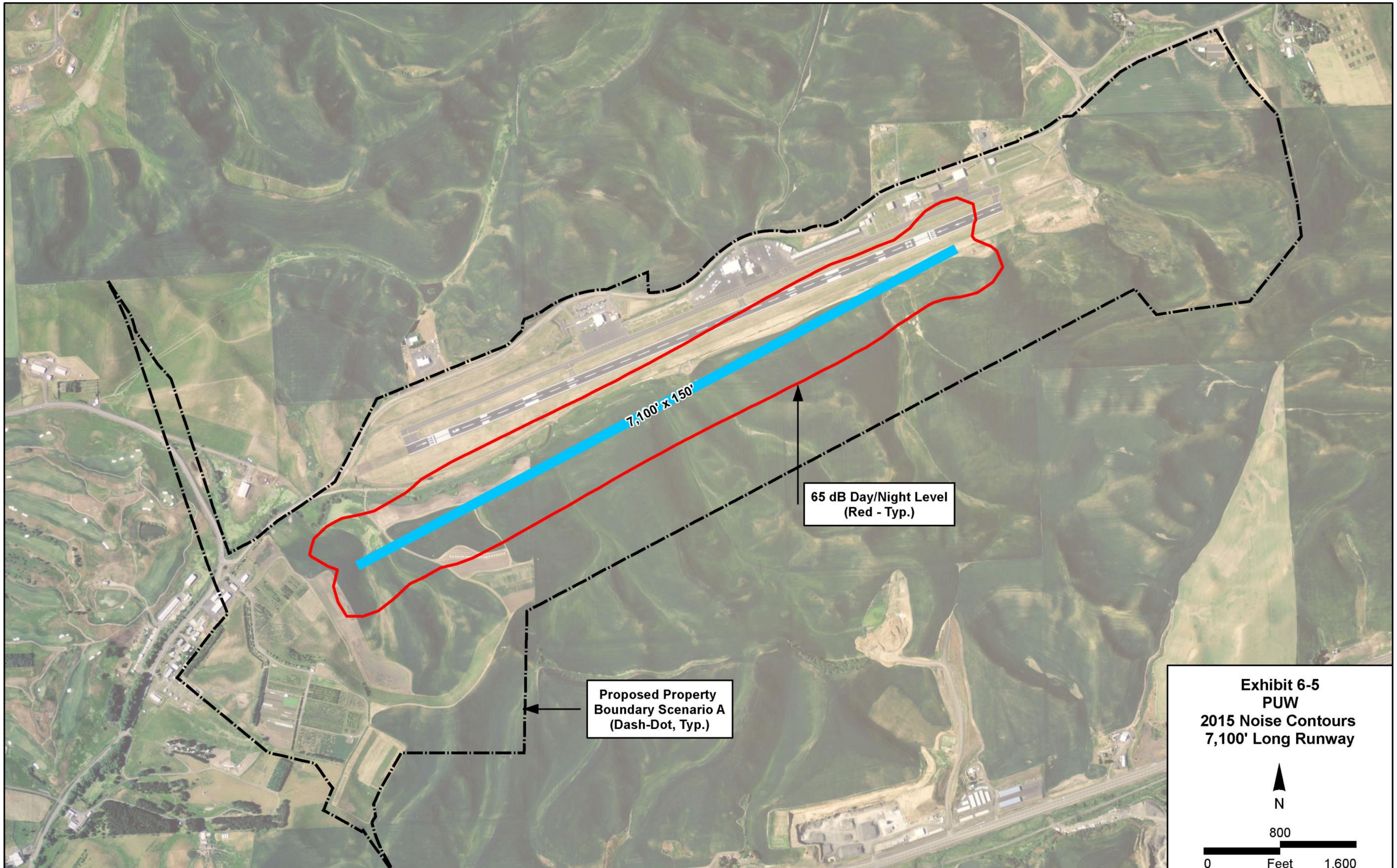
Flight Tracks

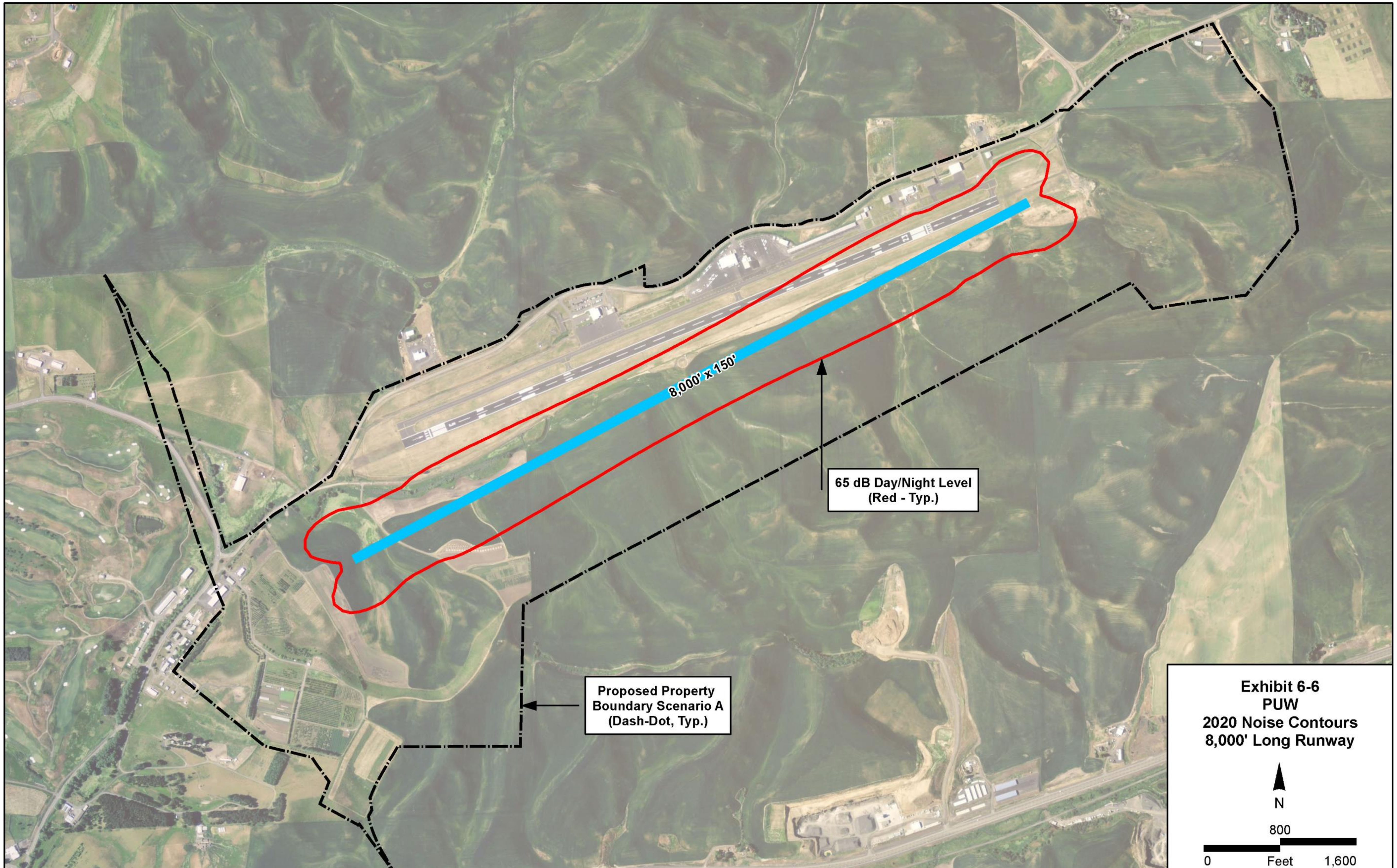
Flight track information represents the path over the ground followed by an aircraft. At airports without an airport traffic control tower, the FAA suggests consolidating approach, departure, and touch-and-go flight tracks into average flight tracks. Average flight tracks are included in **Appendix J.** Flight tracks were developed with airport management.

Analysis

The following exhibits show aircraft noise exposure contours at PUW in relation to the Airport and surrounding areas. **Exhibit 6-4** shows contours for 2010, **Exhibit 6-5** shows forecasted noise contours for 2015 and **Exhibit 6-6** shows forecasted noise contours for 2020.


Existing Property Boundary
(Dash-Dot, Typ.)
6,730' x 100'
65 dB Day/Night Level
(Red - Typ.)
Exhibit 6-4
PUW
2010 Noise Contours
6,730' Long Runway
N
800
0
Feet
1,600


7,100' x 150'
65 dB Day/Night Level
(Red - Typ.)
Proposed Property
Boundary Scenario A
(Dash-Dot, Typ.)
Exhibit 6-5
PUW
2015 Noise Contours
7,100' Long Runway
N
800
0
Feet
1,600


8,000' x 150'
65 dB Day/Night Level
(Red - Typ.)
Proposed Property
Boundary Scenario A
(Dash-Dot, Typ.)
Exhibit 6-6
PUW
2020 Noise Contours
8,000' Long Runway
N
800
0
Feet
1,600

Noise Summary

There are very few developed parcels of land currently located near the airport. Noise sensitive land uses near the Airport include some single-family residential development to the east and agricultural research buildings associated with WSU to the west. The 65 DNL contour is contained within the airport property boundary for existing and forecasted operations. Consideration has been given to proposed airport improvements. There are no noise compatibility issues for regulatory or remedial consideration at PUW.

Although the 65 DNL contour is the FAA's threshold for significant noise impacts, WSDOT Guidebook appendix B indicates that there are shortcomings with the DNL evaluation system. "Noise contours fail to fully explore the relationship and interaction between aircraft and the community." Noise contours represent the average day-night sound level for a year of operations. Individual over-flights by particular aircraft or peak operations are not reflected in noise contours.

Aircraft over-flight is another method of evaluating land use compatibility. Aircraft operations from the two runway ends at PUW have been evaluated for potential over-flight impacts. High impacts pass directly above noise sensitive land uses, medium impacts pass near but not directly above noise sensitive land uses near the Airport, and low impacts do not pass above or near noise sensitive land use. Potential over-flight noise impacts are presented in **Table 6-2**.

Table 6-2: Potential Over-flight Noise Impacts

Runway	2010 Operations	Approach	Departure
05	60%	Medium	Low
23	40%	Low	Medium

In addition to noise, the WSDOT Guidebook includes Airport Safety Compatibility Zones (ASCZ) that can be used to help municipalities plan land use surrounding airports. ASCZs consider aircraft noise and common locations of aircraft accidents around airports.

6.5 Land Use Action Plan (Implementation Toolbox)

Airports and the surrounding communities have a symbiotic relationship. Impacts from the airport are felt directly and indirectly in the community and vice versa. Some of the airport impacts on the community are negative including noise, vibration, odor and accident risks. Others are positive including economic impacts and quality of life elements. This relationship is easy to understand for everyone who has heard an airplane fly overhead or who has flown to a vacation destination.

The other side of the equation, the impact that communities have on airports, may not be as obvious to residents and local officials. Development around an airport can have a direct, negative impact on airport safety, efficiency and economic viability. These impacts come from tall buildings and structures and even tall trees that can be hazardous to aircraft. They can also be a result of incompatible urban development near an airport that may directly interfere with aviation operations and compromise safety areas. However, an effective airport land use compatibility effort from the local community supports development around the airport while providing for public safety. This, in turn, supports the local economy, the community's quality of life and the public investment in the airport. Airport land use compatibility is a win-win situation for the airport and the surrounding communities.

Incompatible Land Uses

Height

The idea that tall buildings and objects are incompatible with airport activity is fairly intuitive. Even without extensive technical knowledge, it makes sense that objects extending into the air near the runway can get in the way of an airplane on approach or departure, which can cause accidents. In addition to the hazard presented by tall structures, they can also restrict an airport's operational efficiency. For example, an airport may have to stop using the end of an existing runway to avoid the object, which shortens the runway's operational length. As communities consider airport land use compatibility issues, a better understanding of the conflict is helpful to creating an effective local policy.

When considering height conflicts, community planners need to think about both location and types of conflicts. Height restrictions correspond specifically to airspace protection areas defined by the Part 77 Surfaces around an airport. This means that tall structures can impact areas miles beyond the end of the runway. Communities should also think about the variety of solid objects that can cause conflict with aviation activity. The list of potential height hazards includes building and other built structures, trees, high terrain, power lines, construction cranes and sometimes even mobile objects such as vehicles on a road.

Height regulation is a critical example of the need for airport land use compatibility cooperation between airports and local governments. Although there is an FAA review process through FAA Form 7460-1, the review process results in a “Determination of Hazard” that has no impact on the permitting process. Neither the FAA nor the local airport administration has regulatory authority to prohibit the development of tall structures in critical airspace. Only the local land use agency has land use permitting authority. The process also depends on local zoning officials who are in a “boots on the ground” position to identify the need for an airspace review as part of the review and permitting process.

There are several challenges to effective implementation. One is the complexity of communicating the location of the three-dimensional Part 77 Imaginary Surfaces on a two-dimensional zoning map or in zoning ordinance text. At the most basic level, a perimeter ring on the zoning map can be used to indicate the area in which structure height may be an issue. Development within the area can be flagged for a height review by the FAA, WSDOT staff or the airport manager through an airport overlay zone provision.

Another challenge is the need for ongoing communication between local units of government and the community airport about long-range planning goals. The local community should communicate at least annually with the airport to understand plans for runway extensions or new types of instrument approach procedures. This will help protect the long-term airspace needs of the airport through local land use zoning regulation, which takes time to amend.

Airport Safety and Accident Data

Some airport land use compatibility issues are related to public safety. These initiatives are based on an analysis of accident data and the associated implications for the safety of aircraft operations in the air and for people and structures on the ground. The WSDOT *Airport and Compatible Land-Use Program Guidebook* (January 2011) references the 2002 *California Airport Land Use Planning Handbook* and its comprehensive examination of accident locations around general aviation airports nationwide. The WSDOT *Airport and Compatible Land-Use Program Guidebook* incorporates the Airport Compatibility Safety Zones (ACSZ) from the *California Airport Land Use Planning Handbook* analysis. Unlike the original data that appear as a scatter graph, the safety zones are identified as areas with regular geometric patterns to facilitate implementation. The hierarchy of safety zones is based on the varying degree of risk in each area and is associated with a distinct set of compatible land uses. The ACSZs are included in appendix F of the WSDOT *Airport and Compatible Land-Use Program Guidebook*. The ACSZs and their associated compatible land use provisions can be imported by local land use authorities into an airport overlay zoning district.

Statistically, accidents are most likely to occur in Zone 1 at the runway ends and least likely in Zone 6, which includes all of the area used regularly for aviation approach and departure activity. Each zone has an associated set of compatible and incompatible land uses. **Table 6-3** summarizes them generally by location in relationship to the runway.

Table 6-3: Airport Land Use Compatibility Matrix			
	Near runway ends	***Within runway approaches***	***Beneath traffic patterns***
Agricultural	Compatible if not wildlife attractant	Compatible if not bird attractant	Compatible if not wildlife attractant
Utilities/ transportation	Incompatible (Avoid)	Compatible	Compatible
Parks / recreation	Incompatible	Compatible if low density	Compatible
Industrial	Compatible at low intensity	Compatible if it does not produce airspace obstructions or have bulk amounts of hazardous materials	Compatible if it does not produce airspace obstructions
Retail / service	Incompatible	Compatible at low intensity	Compatible
Offices	Incompatible	Compatible at low intensity	Compatible
Light Industrial	Compatible at low intensity	Incompatible	Compatible
Places of worship	Incompatible	Incompatible	Incompatible
Residential	Incompatible	Incompatible	Incompatible
Children's schools	Incompatible	Incompatible	Incompatible
Hospitals	Incompatible	Incompatible	Incompatible

Local land use regulation should incorporate the specific ACSZ recommendations into an overlay zone or zoning district designations within the airport's area of influence.

Noise

The earliest driver of airport land use compatibility was noise conflicts. There is no question that noise from aircraft operations can be disruptive to residential, educational and other land uses. Noise conflicts reduce the quality of life for residents and may create an adversarial relationship between the airport and portions of the community.

Noise related issues are challenging in part because the perception of an acceptable level of noise varies from person to person, varies depending on location and activity and varies depending on time of day. A noise that might go unnoticed in the middle of the day at a commercial shopping area might be unacceptable in the middle of the night in a residential neighborhood.

Sound is measured in units of decibels (dbA). An increase of 10 dbA represents sounds that are perceived to be twice as loud. Sound levels of 65 dbA are annoying to most individuals. Constant or repeated exposure to levels of 90 dbA or higher can lead to hearing loss. The table (**Table 6-4**) below provides examples of various sound levels:

Table 6-4: Sound Levels Generated by Various Sources of Noise

Sound Level	dbA
Quiet library, soft whispers	30
Living room, refrigerator	40
Light traffic, normal conversation, quiet office	50
Air conditioner at 20 feet, sewing machine	60
Exposure to the following sound levels can be annoying	
Vacuum cleaner, hair dryer, noisy restaurant	70
Average city traffic, garbage disposals, alarm clock at 2 feet	80
Constant exposure to the following sound levels can lead to hearing loss	
Subway, motorcycle, truck traffic, lawn mower	90
Garbage truck, chain saw, pneumatic drill	100
Rock band concert in front of speakers, thunderclap	120
Gunshot blast, jet plane	140
Rocket launching pad	180

Source: Deafness Research Foundation

This measurement scale is incorporated into the system of definitions, analysis and mitigation tools set forth in federal noise guidelines and regulations. Federal regulations provide direction to address regulatory challenges. For noise conflicts associated with existing development, FAR Part 150, *Airport*

Noise Compatibility Planning, establishes a voluntary program that can be used by airports to conduct airport noise compatibility planning and implementation.

As part of this planning process, federal noise standards for airports were used to perform a noise analysis for the current and proposed runway alignment at PUW. There were no areas of concern based on the 65 dbA contours since these areas are contained on the airport property through the planning period of 2020.

Hazardous Uses

In some instances, land uses that are generally compatible with airport activity may include operational or design elements that make them incompatible with aviation activity. Most are related to features that obscure a pilot's view or imitate navigational elements of the airport. The following are all incompatible elements:

- Smoke, steam and smog
- Glare and dust
- Light emissions
- Thermal plumes
- Flammable liquids

These are incompatible elements that can be part of an agricultural, commercial or industrial land use. Because these elements are related to specific site design or operations rather than overall land use categories, they need to be addressed as part of the plan review process rather than through the zoning district regulation. Planning staff should be aware of these conflicts and consider airport land use compatibility issues during the development review process. A Conditional Use Permit may be an effective way to address airport land use compatibility within the ASCZ.

Wildlife Hazards

Wildlife hazards are another category of aviation hazard. Wildlife hazards include collisions between aircraft and birds in the air and aircraft and animals on the runway. Termed "wildlife strikes," this hazard causes both human deaths and destruction of aircraft at an alarming rate nationwide. Airport land use compatibility regulations for adjacent communities should be aimed at preventing site design features that attract wildlife near the airport, including open water features, wetlands, sewage ponds and fountains. Airports may develop a wildlife management plan that can be further coordinated with local zoning requirements. FAA AC 150 / 5200-33, *Hazardous Wildlife Attractants on or near Airports* (1997) and an FAA manual titled *Wildlife Hazard Management at Airports* are technical resources on the topic.

Airport Land Use Compatibility Resources

Communities and planning staff in Washington have a wealth of resources for airport land use compatibility from WSDOT Aviation. The office has a webpage portal to a range of resource documents and contact information at http://www.wsdot.wa.gov/aviation. There is a "planning" category that includes links to all of the following:

- The State's 20-Year Aviation System Plan
- The Washington State Long-Term Air Transportation Study (LATS)
- Washington State Aviation Policy
- *Land Use Compatibility*
- Height Hazards
- Participating in the Planning Process—A Guide for Airport Advocates

For airport land use compatibility, the WSDOT *Airport Land-Use Compatibility Guidebook* (2011) is a primary resource for communities in Washington. The guidebook is an update to a 1999 state guidebook on the same topic. Also, WSDOT Aviation staff provides an Airport Land Use Compatibility Technical Assistance Program to assist communities with local efforts to promote airport land use compatibility.

There are many other examples of other airport land use compatibility resources listed on the WSDOT Aviation website too. They include national resources from the FAA and the American Planning Association, other state guidebooks, and regional and local examples of implementation efforts. For example, the Airport Cooperative Research Program (ACRP) of the Transportation Research Board (TRB) produced a national resource titled *Enhancing Airport Land Use Compatibility - Report 27;* California, Oregon, Florida, Iowa and other states have developed airport land use compatibility guidebooks; and the Puget Sound Regional Council has been a leader in Washington, promoting airport land use compatibility.

Implementation Steps

Chapter 2 of the WDSOT Guidebook provides a Step by Step Compatibility Process that is an implementation guide for communities. This PUW Phase II Airport Master Plan addresses many if not all of the items in the first three steps:

- Step 1: Getting Started and Gathering Data
- Step 2: Delineate the Airport Area of Influence
- Step 3: Identify Compatibility Concerns

The next steps in the Compatibility Process are done through the community's Comprehensive Plan and zoning ordinance. The process can be undertaken by a single entity or may be pursued collectively through a joint planning effort. A joint planning effort offers the opportunity for a consistent, universal approach to airport land use compatibility even if the resulting products are adopted independently.

Model Policy Language and Regulations

Communities can find a good starting place for policy and regulatory language in the WSDOT Guidebook and on the WSDOT Aviation website. While each community will want to modify and customize these resources to fit their own unique attributes and goals, there is no need to "reinvent the wheel." Communities can also find support resources through WSDOT's Airport Land Use Compatibility Technical Assistance Program. Professional planning consultants are another resource for local planning initiatives.

Appendix J in the WSDOT Guidebook is titled "Comprehensive Plan Goals and Policies." This material is offered for use by communities in creating or updating planning documents.

The ACRP Report, *Enhancing Airport Land Use Compatibility - Report 27* includes a comprehensive model zoning ordinance. It gives basic guidance but also offers best practices for jurisdictions that want to go somewhat further in ensuring compatibility. It provides a range of options for consideration and can be adopted either as a stand-alone ordinance or integrated into a local zoning district or overlay district.

6.6 Conclusion

When an airport and its surrounding communities work together to promote airport land use compatibility, the result is a win-win situation. Compatibility measures improve safety and efficiency at the airport while preserving opportunities for future expansion. In the community, land use compatibility improves public safety, protects the public investment in the airport infrastructure and improves the community's quality of life.

Guidance and leadership on compatibility starts at the federal level. Grant assurances and the Form 7640-1 review process are both in place to advance the cause. The State of Washington provides broad support to airport land use compatibility through state law, the WAC and dedicated resources through WSDOT Aviation. But the power of implementation rests solely with the local unit of government. Only the City of Pullman and Whitman County have the regulatory authority to implement zoning regulations and approve development applications.

Airport land use compatibility includes several different considerations. Specific land uses near the runway are important considerations that can be guided by the ACSZ included in the State of Washington's *Airports and Compatible Land Use Guidebook*. In addition, the development design of individual parcels in the area can address off-site impacts including steam, smoke and glare that can be hazards to aviation. Both uses and design regulations can improve safety for both aircraft in the air and people on the ground. Noise is a longstanding compatibility issue between airports and nearby uses. At PUW, there are no off-site noise impacts from the current or future runway configurations as defined by current regulatory practices although the 55 DBL contour lines reach adjacent parcels and may cause disruption for noise sensitive uses. Tall structures and wildlife hazards are other important considerations with specific federal guidelines.

This master plan provides baseline data defining the areas of influence and analyzes for noise and land use compatibility—the first three recommended steps from the *Airports and Compatible Land Use Guidebook*. All of these combine to create a solid starting point for protecting and improving airport land use compatibility around PUW. There is a wealth of resources available to guide implementation efforts, including a model ordinance from ACRP Report 27, the revised state guidebook, the land use compatibility resources on the WSDOT aviation website and the Airport Land Use Compatibility Technical Assistance Program. Both the City of Pullman and Whitman County have recognized the need for airport land use compatibility through current provisions in the zoning ordinance. However, those provisions can be strengthened to provide clearer, more comprehensive regulatory authority in the future.

CHAPTER 7: Capital Improvement Plan (CIP)

Source: Pullman Chamber of Commerce

Overview

The runway realignment project at the Pullman-Moscow Regional Airport (PUW) is a major undertaking. This planning effort has established the justification for the project from an operational perspective and the feasibility of the improvements from an engineering point of view. This chapter analyzes the capacity of PUW's Airport Board to undertake the recommended airfield development program from a financial perspective over the course of the next seven (7) years. The work associated with the proposed runway realignment project will require a total investment of approximately $62.2 million between fiscal years 2012 and 2018. Funding from the following sources is necessary in order to complete the projects contained in this program:

Funding Source	Amount	Percent (%) of Total
FAA Discretionary	$ 49,942,875	80.32.0%
FAA Entitlement	$ 6,000,000	9.7%
Washington/Idaho DOTs	$ 3,107,938	5.0%
PUW Member Jurisdictions	$ 2,362,474	3.5%
Passenger Facility Charges	$ 903,619	1.0%
	$ 62,158,750	100%

The details of these funding opportunities will be more fully described later in this chapter. The primary focus of the Board is to secure sufficient federal, state, Passenger Facility Charge (PFC) revenues, and local resources to undertake this critical airfield safety and development program within the timeframe noted. Beyond the construction project, the Board needs to understand its capability to generate sufficient revenues to fund ongoing operations and obligations. To this end, this chapter also includes an analysis of historical and forecasted operating revenues and expenditures for PUW. The following factors were considered in the development of this financial feasibility analysis:

- Projections of enplaned passengers were used to derive Federal Aviation Administration (FAA) Airport Improvement Program (AIP) entitlements and Passenger Facility Charge (PFC) revenues required to complete the program
- The need for this program to be completed in the most efficient and timely manner possible to ensure compliance with FAA Safety Standards as well as the efficient operation of PUW and its long-term financial viability
- The construction schedule for the completion of the proposed runway realignment project through four distinct work phases
- Utilization of planning-level cost estimates for the overall program
- A funding plan for the capital improvement plan (CIP) utilizing AIP Entitlement and Discretionary Funds, some combination of funding from the Washington State Department of Transportation (WSDOT) and the Idaho Transportation Department (ITD) grants, PFC revenues and contributions from the five member jurisdictions responsible for operation of PUW
- PUW's existing financial structure, airline agreement, and agreements with other major tenants
- Actual revenues and expenses for the period fiscal year (FY) 2006 through FY2010
- Budgeted revenues and expenses for the Airport for FY2011
- Projections of revenues, expenses, and net cash flows from the operation of the Airport between FY2012 through FY2018 based on historical actual (FY2006–2010) and budgeted (FY2011)
- A detailed cash flow analysis for the planning period FY2012 through FY2018 identifying the sources and uses of funds applied to the CIP

These analytical techniques are consistent with industry practices for similar studies which are used to evaluate the feasibility of large-scale airport capital improvement plans. While the approach and assumptions in this analysis are reasonable, the outcome is indeed based on assumptions of future trends and events which may not materialize. Achievement of the proposed CIP, as well as the operating results described herein, is dependent upon the occurrence of future events. Variations from the projected future trends and events may impact the project outcome.

7.1 Airport Capital Improvement Plan

All airports receiving federal AIP funding are required to maintain a current CIP with the FAA. A CIP identifies projects to be undertaken at an airport over a specified period of time. The CIP estimates the order of implementation, calculates total project costs, and identifies funding sources. The CIP presented herein focuses entirely on completion of the runway realignment project and proposes that it be phased and financed over a seven-year period (FY2012-187). This approach is depicted on **Table 7-1**, *Capital Improvement Plan*, and is described below:

Fiscal Year 12: Conduct Environmental Assessment

Before construction can begin on the airfield development program, PUW will need to conduct an Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA). This phase of work will evaluate all areas of impact related to the project including its impact on the existing airport property, property expected to be acquired through the AIP process, and the surrounding community. The EA will take approximately 18-24 months to complete.

Fiscal Year 14: Construct Phase I (Design Only), Land Acquisition, & Utility Relocation

This project phase involves the development of design documents for the runway realignment project. The design includes a relocated 7,100-foot runway, parallel taxiway, vertical guidance system, approach lighting, subsurface edge drains, stormwater infrastructure, lighting, signage, and other miscellaneous items.

Once the EA is completed and approved by the FAA, PUW can proceed with the acquisition of land required for completion of the runway realignment project. The preliminary planning documents indicate that approximately 268 acres will require fee simple acquisition, avigation easements, or a combination of both to be purchased from multiple landowners such as Washington State University (WSU), WSDOT and private landowners. Additional land will be needed for the wetland mitigation program. Finally, the impact of the runway realignment on existing navigational aids will be evaluated to determine if these facilities require relocation. They may need to be moved to the east and west end of the runway based on future runway approach and departure procedures. The overall scope of work for this phase will involve preparation of fee and review appraisals, landowner negotiations, preparation of purchase agreements, payment of closing costs, and acquisition of avigation easements.

This phase also contains design work by Avista Utilities associated with the transmission line relocation and decommissioning of the existing transmission lines that cross airport property. The overall scope of work for this phase includes purchase of utility easements, access road design, transmission tower design, and line calculations. Avista will also install the relocated transmission line and move the existing transmission line off airport property during this phase.

Finally, implementation of the wetland mitigation plan on property to be purchased in the land acquisition phase will be undertaken to allow for disturbance of existing wetlands in subsequent construction phases.

Fiscal Year 16: Construct Phase II

Phase II construction includes completion of an earthwork embankment at the east end of the realigned runway end, Airport Creek relocation, and earthwork on the west end of the project once the creek relocation portion is complete. Work located inside the new Runway Safety Area (RSA) will be the primary focus of this phase.

Fiscal Year 17: Construct Phase III

Phase III involves construction of the pavement section, lighting and signage items, airfield lighting vault, MALSR, stormwater management system, and miscellaneous grading of the realigned runway and parallel taxiway outside of the existing runway obstacle free zone (OFZ). The majority of the work in this phase will be concentrated within the new RSA and intersection of the existing runway OFZ. The existing runway will remain operational during Phase III with the exception of one closure to construct access points to existing facilities. At a minimum, all connecting taxiways will be constructed to the RSA of the new runway to avoid future runway closures in Phase IV. At the end of this phase, the new runway will open for use.

Fiscal Year 18: Construct Phase IV

Phase IV will complete the remaining work outside of the new RSA. The realigned runway will be operational with a temporarily relocated threshold. The threshold will be relocated to approximately 2,000 feet (5,000 total runway length) to account for the additional grading on the east end of the approach. The final portion of Airport Creek will be relocated, the existing runway and utilities will be demolished and remaining portion of the taxiways will be constructed. Cost estimates depicted in **Table 7-1** are based on a planning level of detail. They include contingencies and design and construction management fees. They are escalated for inflation at a 4.0 percent annual rate to more accurately reflect anticipated construction-year dollar amounts. While accurate for master planning purposes, actual project costs will likely vary from these planning estimates once project design and engineering estimates are developed.

This Page Intentionally Left Blank

Table 7-1 Capital Improvement Plan

			Project Funding Sources				
Year	**Project**	**Total Cost**	**FAA Entitlement**	**Discretionary**	**State DOTs**	**PFC**	**Local/ Unidentified**
2012	Planning - Conduct Environmental Assessment	$2,000,000	$1,000,000	$800,000	$100,000	$100,000	$0
	Apron Rehabilitation	$250,000	$0	$225,000	$12,500	$12,500	$0
	Year 2012 – 2013 Total Project Costs	$2,250,000	$1,000,000	$1,025,000	$112,500	$112,500	$0
2014	Construct Runway -- Phase I (Design)	$12,200,000	$2,000,000	$8,980,000	$610,000	$202,393	$407,607
	Acquire Land/Easements	$2,470,000	$0	$2,223,000	$123,500	$123,500	$0
	Year 2014 - 2015 Total Project Costs	$14,670,000	$2,000,000	$11,203,000	$733,500	$325,893	$407,607
2016	Construct Runway -- Phase II	$10,559,410	$1,000,000	$8,503,469	$527,971	$152,015	$375,956
	Year 2016 Total Project Costs	$10,559,410	$1,000,000	$8,503,469	$527,971	$152,015	$375,956
2017	Construct Runway -- Phase III	$27,038,795	$1,000,000	$23,334,916	$1,351,940	$155,055	$1,196,885
	Year 2017 Total Project Costs	$27,038,795	$1,000,000	$23,334,916	$1,351,940	$155,055	$1,196,885
2018	Construct Runway -- Phase IV	$7,640,545	$1,000,000	$5,876,491	$382,027	$158,156	$223,871
	Year 2018 Total Project Costs	$7,640,545	$1,000,000	$5,876,491	$382,027	$158,156	$223,871
	TOTAL PROJECT COSTS FY 2012 - FY 2018	**$62,158,750**	**$6,000,000**	**$49,942,875**	**$3,107,938**	**$903,619**	**$2,204,318**

Sources: *T-O Engineers, Inc.*
Pullman - Moscow Regional Airport
Mead & Hunt, Inc.

7.2 Funding for the Program

Table 7-1 presents an overall funding strategy for completion of PUW's Airfield Development Program based on the phased approach to accomplishing all necessary construction and other related program elements described above. The program requires an investment of approximately $62.2 million with allocations of $6.0 million (FAA Entitlement), $49.9 million (FAA Discretionary), $3.1 million (WSDOT and IDT), $903,619 (PFC Revenue pay-as-you-go) and $2.20 million (PUW member jurisdictions). It is important to note that that these funding estimates represent the amount of project costs that are eligible for federal and State funding, not necessarily the level at which projects included in the Program would ultimately be funded from these sources. As a result, the levels of federal and State participation may not be attainable within the timeframe delineated in this analysis. Accordingly, one of the primary intents of this analysis is to demonstrate the level of commitment and funding from all available sources to realize completion of the recommended Program over the course of the next seven (7) years.

FAA funding participation in the proposed plan is based on the AIP as reauthorized in 2012. To this end, this analysis assumes continuance of AIP and PFC funding through the planning period absent major changes to appropriation levels by Congress. However, in the past, the AIP has experienced fluctuations in levels of funding and interruptions in availability of resources. Despite historical fluctuations in authorized appropriations and current potential threats to existing funding levels, the controlling objectives of this proposed plan are to maximize the use of resources from the AIP and PFC revenues and to minimize costs to the Airport and local funding requirements. Descriptions of both funding sources and anticipated timing of funding allocations are discussed in detail below.

Federal AIP Grants

Federal grants for the FY2012-2018 PUW Airfield Runway Realignment Project are expected to be made available through the FAA's AIP program. On February 14, 2012 President Obama signed into law the FAA Modernization and Reform Act of 2012, the current AIP legislation which provides both Entitlement funds and Discretionary grant allocations for eligible projects undertaken by an airport sponsor. As a general rule, only those airport projects that are related to non-revenue producing facilities, such as the PUW Airfield Improvement Program, are eligible for receipt of federal funds under this program. The FAA Modernization and Reform Act of 2012 provides up to ninety (90) percent federal funding for eligible total project costs as opposed to the ninety-five (95) percent federal aid funding formula provided for under the previous FAA reauthorization legislation known as Vision 100 – Century of Flight Authorization Act of 2003. The net effect of this change in federal funding for this critical safety Program is a shift of $3,107,938 from the FAA to State and local sources.

The AIP is authorized by Chapter 471 of Title 49 of the United States Code (U.S.C.). Title 49 U.S.C., Section 47104(a) authorizes the FAA Administrator to make grants for airport planning and development. AIP grants assist with the development of public-use airports served by air carriers, commuters, air cargo and general aviation. Entitlement funding is awarded based on formula and Discretionary funding is awarded through a prioritization process. For the purpose of considering entitlement grant-in-aid funding, PUW is categorized as a non-hub primary airport.

Pursuant to AIP funding guidelines, each primary airport funding apportionment is based on the number of passenger boardings at an airport. If Congress enacts legislation allocating full funding, the minimum amount apportioned to the sponsor of a primary airport is $650,000 and the maximum is $22 million (Title 49 U.S.C., Section 47114(c)(1)(B)). These allocations are calculated as follows:

- $7.80 for each of the first 50,000 passenger boardings
- $5.20 for each of the next 50,000 passenger boardings
- $2.60 for each of the next 400,000 passenger boardings
- $0.65 for each of the next 500,000 passenger boardings
- $0.50 for each passenger boarding in excess of 1 million

Also, for any fiscal year in which the total amount made available under Title 49 U.S.C., Section 48103 is $3.2 billion or more, the amount to be apportioned to a sponsor is increased by doubling the amount that would otherwise be apportioned under the formula. Under this scenario, the minimum apportionment to an airport sponsor is increased to $1 million rather than $650,000, and the maximum apportionment to a sponsor is increased to $26 million rather than $22 million. The FAA Modernization and Reform Act of 2012 provides annual authorized funding levels for AIP in the amount of $3.35 billion per year for federal fiscal years 2012 through 2015. Provided the annual appropriation by Congress is equal to or greater than $3.2 billion, the minimum entitlement for primary airports (i.e. an airport with a minimum of 10,000 enplaned passengers) will total $1.0 million a year during this period. As such, PUW is projected to receive the $1.0 million minimum in AIP Entitlements throughout this planning period.

Table 7-2, *Projected Airport Entitlement Funds and Passenger Facility Charge Revenue***,** forecasts projected FAA Entitlement funds during the period FY2012-18 based on the “2 percent model” developed by PUW on July 7, 2011. The projected annual entitlement funds presented in this table are based on total enplanements at the Airport from the calendar year two years prior. For example, entitlements for FY2012 are based on enplanements from FY2010. Notwithstanding the potential for reductions in federal aid, PUW’s AIP entitlements for the period FY2012 through FY2018 are expected to be $1.0 million per year or $7.0 million total.

Table 7-2 Projected Airport Entitlement Funds and Passenger Facility Charge Revenue				
Fiscal Year	Projected Enplanements 1/	Entitlement Funds	Passenger Facility Charges (PFC) 2/	Total Funds
2012	36,256	$1,000,000	$143,247	$1,143,247
2013	36,981	$1,000,000	$146,112	$1,146,112
2014	37,721	$1,000,000	$149,034	$1,149,034
2015	38,475	$1,000,000	$152,015	$1,152,015
2016	39,245	$1,000,000	$155,055	$1,155,055
2017	40,029	$1,000,000	$158,156	$1,158,156
2018	40,830	$1,000,000	$161,320	$1,161,320
TOTAL PROJECTED REVENUE		**$7,000,000**	**$1,064,940**	**$8,064,940**

Sources: FAA Air Carrier Activity Information System
Mead & Hunt, Inc.
Notes: 1/ Includes charters.
2/ Assumes a net collection of $4.39 per eligible enplaned

The AIP program also allows for discretionary funding to be made available from the FAA to provide financial support for major capacity- or safety-related projects. The CIP, as presented in **Table 7-1**, anticipates that FAA Discretionary funds totaling approximately $49.9 million will be made available to PUW through this program over the next four years. The likelihood of receiving the required level of discretionary funding is considered extremely high because of the important airfield safety enhancements that will result from this work; however, at this juncture, the FAA has not authorized or committed to funding this program. While there is no guarantee that this aid will be made available until such time as the FAA releases grants for these respective elements of the program, such action is considered favorable.

State of Washington Department of Transportation and Idaho Transportation Department

The recommended plan proposes securing $3.11 million in grant-in-aid funding from the State of Washington Department of Transportation (WSDOT) or the Idaho Transportation Department (ITD) or from a combination of both agencies to provide 5.0 percent of the non-federal share of the overall program.

WSDOT's Airport Aid Grant Program provides financial assistance to many of the state's 138 public airports and focuses on the preservation of airport capacity throughout its state system. Any municipality or federally recognized tribe that owns a public-use airport can apply for funding through the program. Each year, WSDOT solicits grant funding requests from eligible airport sponsors who must demonstrate the benefits of the proposed project to the state as well as justification for the project. Benefits may include safety, security, environmental protection or planning. Airport Aid Grants are awarded up to a single-grant maximum of $250,000 and a five percent local match is required from the sponsor.

ITD's airport grant-in-aid funding is vested in the Idaho Transportation Board. Pursuant to Idaho Code, the Board has adopted rules pertaining to the award of funds for eligible airport projects throughout the state. Allocations made by the Board are required to meet high priority needs and achieve maximum benefit and use of available funds. The Idaho Airport Aid Program is available only to public entities that own or lease and operate a landing facility that is open to the public without use restrictions. The program consists of grants, small projects, maintenance and acquisition of safety supplies. The Board uses the following parameters to allocate discretionary funding:

- The project will result in the preservation or acquisition of existing aircraft landing facilities in danger of being closed or sold for non-aviation use
- The project is at an existing landing facility where need is demonstrated. Projects must provide benefits associated with aircraft landing facility utilization on a statewide basis
- The project will result in the development of new, additional aircraft landing facilities in areas of greatest need
- The project will enhance the safe operation of aircraft
- Maximum federal funding is being provided for the project
- Requested funds will be utilized to protect prior public investments

When Federal aid is utilized for eligible projects, the Board may consider awarding State funding assistance for up to fifty percent of the non-federal share of the eligible project.

The need for funding assistance from WSDOT as well as the Idaho Transportation Board for this project cannot be understated. Without grant-in-aid allocations totaling 5.0 percent of the overall program ($3.11 million) by these state agencies, the ability of the Airport Board to complete this project is seriously jeopardized given limited PFC revenue streams, the potential constrained ability of PUW's member jurisdictions to participate in this project, and the lack of available airport operating revenue to support this work. As noted in **Table 7-1**, state financial assistance totaling $3.11 million is required over the course of this phased program. Most challenging will be fiscal year 2017 when $1,351,940 in state financial assistance is needed. Fiscal Year 2014 will also prove to be critical for receipt of state aid as $733,500 is needed. Without receipt of state grant-in-aid totaling $3.11 million for this program, it is unlikely the Airport Board will be in a position to complete this program in a timely and prudent manner. Accordingly, it is important for the Airport Board to engage immediately in a dialogue with both WSDOT and ITD about funding availability.

Passenger Facility Charge (PFC) Revenue

In addition to AIP funding and grants from the States of Washington and Idaho, PUW has the ability to levy an Airport PFC to provide locally generated funds for implementation of its CIP. Collection of a PFC is authorized under the Aviation Safety and Capacity Expansion Act of 1990 and Part 158 of the Federal Aviation Regulations, the Passenger Facility Charge Program (14 CFR, Part 158). PFCs are collected for enplaning passengers at an airport and these funds are used to finance all or portions of capital improvements identified by the Airport Sponsor and approved by the FAA. To be eligible for PFC funding, a project must preserve or enhance safety, security, or capacity of the national air transportation system; reduce or mitigate airport noise from an airport; or provide opportunities for enhanced competition between or among air carriers.

For purposes of this analysis, it is assumed that PUW will continue to collect a $4.50 PFC beyond completion of this project. The Airport's existing authority to impose a PFC expires on January 1, 2013.

As indicated, PFC collections for the Airport are projected to total $903,619 over the planning period and are programmed exclusively to the completion of the runway realignment program on a "pay-as-you-go" basis. The Airport Board should make sure that the necessary PFC application forms are filed with the FAA in a timely manner so collections can continue without interruption beyond January 1, 2013 for its airfield development program.

PUW Member Jurisdictions

PUW is a regional airport that is operated under an inter-local agreement. As a result of the agreement, PUW receives funding contributions from the City of Pullman, the City of Moscow, Latah County, Whitman County and Washington State University. The funding equation for the runway relocation project includes a collective contribution from these member jurisdictions of $2,204,318 or 3.5 percent of the total project cost. This contribution is both significant and necessary to the completion of the project.

As demonstrated in **Table 7-2**, passenger activity at PUW is expected to generate $1,064,940 in PFC revenues during the seven-year period between FY2012 and FY2018. The full, non-federal share is 10.0 percent of the total project cost or approximately $6.2 million. PFC revenue is not enough to meet the required non-federal grant match outright or to retire debt service payments associated with a bond issue or other financing mechanism. Simply put, expected passenger activity during the next ten to fifteen years is not expected to generate sufficient revenue to enable the Airport Board, or any of its member jurisdictions, to consider debt financing for the entire non-federal share of this program.

Public debt financing for the entire required non-federal match for this Program would entail the City of Pullman, or another member jurisdiction, issuing 30-year general obligation bonds. Assuming these bonds were issued at a 4.0 percent rate of interest, the monthly principal and interest payments would total approximately $29,600 or $355,200 each year. Over seven years, this amount of debt service required to retire a portion of these bonds would total $2,131,200 which is 2.4 times greater than the amount of revenue PUW is expected to generate from annual PFC collections during the period FY2012-2018.

Public debt financing for half of the required non-federal match would translate to monthly debt payments of $14,800 per month or $177,600 per year. Again, this amount exceeds projected PFC revenue expected to be collected by PUW during this period. Based on these scenarios, it does not appear that debt financing supported exclusively by PFC revenues is a plausible option for financing the required ten (10) percent or 5.0 percent non-federal share of the Program.

Based on this analysis, funding allocations totaling $2.204 million from member jurisdictions are as equally important to the success of this program as funding from the state transportation agencies.

7.3 Funding Plan Analysis

Table 7-3, *Capital Improvement Plan Funding Analysis*, depicts the required annual allocations of funding from all revenue sources combined in order to complete the runway realignment program. As previously stated, the most critical element for the successful implementation of this plan is receipt of $3.11 million from state grant-in-aid funding and allocations totaling $2.204 million from PUW's member jurisdictions. Assuming these entities allocate the amount of funding requested, PFC revenues are generated as programmed, and the requisite funding is provided by the FAA AIP program, it is reasonable to assume that completion of this program is attainable within the proposed timeframe. Although it is reasonable to assume that the program is achievable, the Airport Board should be cognizant of the following factors that could impact the viability of this financing plan and be prepared to devise strategies and action plans to address them.

State and Local Funding Support of Program

PUW needs to make its strongest case to its local sponsors as well as to the Departments of Transportation in Washington and Idaho for needed funding for the program. However, it is possible that these entities may not be in a position collectively to support PUW at the desired levels.

Potential Impact: At this point in time, there appears to be limited options for attaining the necessary non-federal and PFC share ($6.2 million) for this program. Without sufficient revenue streams to retire debt for the entire non-federal share, the only plausible alternatives are to further phase construction of the overall program or structure the PFC such that a portion of the project is debt financed or both. As previously discussed, further phasing could produce positive results for securing the non-federal share. However, in doing so, it is also likely to increase overall costs as a result of factors such as inflation and increased engineering design fees. In this scenario, PUW will be required to obligate future PFC revenues toward this program which would likely be at the expense of other needed airport improvement projects such as an air carrier terminal expansion and pavement rehabilitation project.

Impact on the Airport Board's Fiscal Agent

The City of Pullman is responsible for the maintenance of budgetary, revenue and expenditure accounts for the Pullman-Moscow Airport Board. As such, the City will need to provide close coordination and review of cash flow requirements for the project. This is especially critical during FY2017 when approximately $27 million in construction activity will take place.

Potential Impact: Although the City of Pullman will have the ability to coordinate construction advance payments through the FAA AIP program, it may need to seek temporary, short-term bridge financing for the program.

Project Phasing

Another potential variable for the Airport Board to consider is the appropriateness of the proposed phasing plan and ability of construction contractors to complete $10.6 million (FY2016) and $27.0 million (FY2017) of work within 18-24 month construction windows. The ability to complete work within these timeframes is a function of both the complexity and phasing of work as well as the length of the construction season in the region.

Potential Impact: Should it be determined that the scopes of work envisioned in Phases I – IV cannot be completed within the timeframes depicted in the capital plan, additional phasing of the program will be necessary. While additional phasing would extend the financing period for this program and create the opportunity to supplant state and local funding contributions with additional PFC revenues, such action would likely increase the overall cost of the program and delay the completion of this needed safety and capacity project.

Existing PFC Program

In March 2009, the FAA approved an application submitted by the Airport Board to impose a PFC totaling $256,000 to be used for a myriad of projects at PUW. Outside of a project to delineate wetlands in the proposed area for realignment of the runway, none of the program elements included in this PFC program is related to the airfield improvement program. Furthermore, it is projected that the collection period for this PFC application will expire on January 1, 2013.

Potential Impact: Since the FAA is expected to award funding for the EA in FY2012, the Board may need to amend its current PFC program to include funding for its share of this study and defer action on several approved projects in order to ensure that sufficient local funding is available to match federal aid being provided for the EA.

Table 7-3 Capital Improvement Plan Funding Analysis (Project Descriptions for each Year are included in Section 7-1)								
Year	Capital Improvement Costs	Required FAA Entitlements	Anticipated FAA Discretionary	Anticipated State Funds	Passenger Facility Charges	Required PFC Funds	Annual PFC Balance	Local/Unidentified Funds
2012	$2,250,000	$1,000,000	$1,025,000	$112,500	$143,247	$112,500	$30,747	$0
2013	$0	$0	$0	$0	$146,112	$0	$176,859	$0
2014	$14,670,000	$2,000,000	$11,203,000	$733,500	$149,034	$325,893	$0	$407,607
2016	$10,559,410	$1,000,000	$8,503,469	$527,971	$152,015	$152,015	$0	$375,956
2017	$27,038,795	$1,000,000	$23,334,916	$1,351.940	$155,055	$155,055	$0	$1,196,885
2018	$7,640,545	$1,000,000	$5,876,491	$382.027	$158,156	$158,156	$0	$223,871
CIP TOTAL	**$62,158,750**	**$6,000,000**	**$49,942,875**	**$3,107,938**		**$903,619**		**$2,204,318**

Sources: Pullman - Moscow Regional Airport
Mead & Hunt, Inc.

7.4 Conclusions and Recommendations – Capital Plan

Assuming state and local funding allocations totaling $5.304 million are provided for the program, PFC revenues are generated as programmed ($1,064,940) and the requisite funding is provided by the FAA AIP program ($55.9 million), it is reasonable to assume that completion of this program is attainable within the proposed timeframe. The following initiatives are recommended action steps for the Airport Board to support the allocation of the requisite funding:

- Enter into a dialogue with WSDOT and IDT about the feasibility of funding the required 5.0 percent share for the program ($3.11 million)
- Engage with its member jurisdictions about the allocation of $2.204 million to fund the balance of the non-federal share not covered by PFC revenues and state transportation grants
- Pursue an amendment to its PFC program to redirect funding to the EA project and other runway realignment project elements
- Consider partially funding the non-federal share with debt if state and local funding sources are unable to provide funding as detailed in this plan
- Develop a financing and cash flow plan with the City of Pullman so that sufficient resources will be available throughout all phases of construction

7.5 Airport Financial Structure

Although the Airport is owned and operated by the Pullman-Moscow Regional Airport Board, the City of Pullman acts as the Board’s fiscal agent and is responsible for maintaining its budgetary, revenue and expenditure accounts. The City reports the Airport’s financial results within its combined financial statements and maintains discrete financial records to account for the itemized revenues, expenses and segregated funds of the Airport. The City also prepares an Annual Financial Report on the Airport’s financial condition. The City’s fiscal year runs currently with the calendar year, using a modified accrual basis for reporting the Board’s financial results. In September of each year, the Airport Board adopts its proposed operating budget for the next fiscal year. The Pullman City Council and Moscow City Council also approve the Airport’s annual budget. Moreover, the member jurisdictions representing the Board currently provide annual funding through a multi-jurisdictional agreement to underwrite the cost of providing airport services.

For purposes of this analysis, historical revenues were derived from the U.S. Department of Transportation, FAA Form 5100-27 *Operating and Financial Summaries* for FY2006-2010 for PUW while historical expenditures were obtained from City of Pullman, WA, *Revenue Status Reports* (FY2006-2010) for the Airport Board. Fiscal Year 2011 data is based on the Airport Board's adopted budget. All ensuing fiscal year projections align with the functional categories defined in the above referenced reports and are based on historical actual results, input from airport management, and industry trends.

Through its annual Form 5100-27, the FAA has established three broad functional areas for tracking airport revenues, including Passenger Airline Aeronautical Revenue, Non-Passenger Aeronautical Revenue and Non-Aeronautical Revenue. The City of Pullman reports airport expenses in the following five functional areas:

- Salaries and Wages
- Personnel Benefits
- Supplies
- Other Services and Charges
- Intergovernmental Professional Services

In order to aid this analysis and provide a clearer understanding of historical trends, these five broad categories were expanded to incorporate additional line item detail for the following revenue and expenditure sub-accounts:

Revenues

- Airline Landing Fees
- Terminal Arrival Fees, Rents & Utilities
- Hangar Rentals
- Fuel Sales or Fuel Flowage Fees
- Apron Charges/Tie-Down Fees
- Terminal Area Rental/Other Charges
- Rental Auto Concession
- Food & Beverage Services
- Terminal Services & Other
- Public Parking Facility
- Miscellaneous Revenue
- Interest Income
- Land and Non-Terminal Facilities
- Miscellaneous Revenue

Expenditures

- Office & Operating Supplies
- Repair and Maintenance Supplies
- Minor Equipment
- Professional Services
- Communication
- Travel
- Advertising
- Operating Rentals & Leases
- Insurance
- Public Utility Services
- Repairs & Maintenance
- Miscellaneous

The Airport Board does not currently have in effect a lease and use agreement for scheduled airlines. However, charges of $15.00 per square foot for occupied terminal building space for all tenants and a landing fee of $1.00 per thousand pounds of certified landed weight for scheduled air carrier operations and $1.35 per thousand pounds of certified landed weight for unscheduled air carrier/charter aircraft were adopted as part of its annual budget for FY2012. The Board maintains a lease with its full-service Fixed Based Operator (FBO) as well as concession agreements with rental car agencies serving PUW. It also holds a myriad of land and hangar leases and operates the public parking facility. These sources constitute the majority of operating revenue for the Airport Board.

Historical and Projected Airport Revenues

Table 7-4 depicts the Airport's historical revenues from FY2006 through FY2010 along with budgeted revenues for FY2011. During this six-year period, total airport revenue experienced strong growth increasing at a 7.0 percent compounded annual growth rate (CAGR) from $354,898 in FY2006 to approximately $487,000 in FY2011 (budgeted). This represents a net increase of $133,000 in revenue for this period.

This Page Intentionally Left Blank

Table 7-4 Historical Airport Revenues

	Historical					
	2006	**2007**	**2008**	**2009**	**2010**	**Budget 2011**
AIRLINE REVENUES						
LANDING AREA						
Airline Landing Fees	$54,416	$55,762	$90,486	$77,600	$106,917	$97,000
TERMINAL AREA						
Terminal Arrival Fees, Rents & Utilities						17,100
Terminal Area Apron Charges	-	-	-	-	2,980	-
Total Airline Revenue	***$54,416***	***$55,762***	***$90,486***	***$77,600***	***$109,897***	***$114,100***
INTERLOCAL REVENUE -- JURISDICTIONS	***$113,884***	***$127,711***	***$133,211***	***$133,211***	***$119,211***	***$119,211***
NON-AIRLINE REVENUES						
AIRFIELD AREA						
Hangar Rentals	8,640	8,640	9,331	10,800	12,277	38,839
Fuel Sales or Fuel Flowage Fees	14,828	12,427	12,551	13,195	14,467	15,000
Apron Charges/Tie-Down Fees	5,610	4,740	3,050	4,240	-	
TERMINAL AREA						
Terminal Area Rental/Other Charges	36,721	36,721	63,900	60,272	60,272	62,000
Rental Auto Concessions	46,098	46,058	47,195	38,057	35,913	42,000
Food and Beverage Services	1,781	3,168	1,796	1,371	1,406	1,200
Terminal Services & Other	85	997	4,875	4,683	2,260	2,300
PARKING AREA						
Public Parking Facility	29,921	55,372	67,461	56,449	71,272	60,000
ADMINISTRATION						
Miscellaneous Revenue	4,271	6,644	6,350	-	-	
Interest Income	2,715	340	17		377	
OTHER AREAS						
Land and Non-Terminal Facilities	32,422	37,104	37,591	40,052	28,510	30,100
Miscellaneous Revenue	3,506	-	-	-	2,508	2,600
Total Non-Airline Revenue	***$186,598***	***$212,211***	***$254,117***	***$229,119***	***$229,262***	***$254,039***
TOTAL AIRPORT REVENUE	**$354,898**	**$395,684**	**$477,814**	**$439,930**	**$458,370**	**$487,350**
Annual Enplanements	23,838	24,856	32,108	32,443	35,233	35,546
AIRLINE COST PER ENPLANEMENT	$2.28	$2.24	$2.82	$2.39	$3.12	$3.21

Sources: U.S. Department of Transportation, FAA Form 5100-27 Operating & Financial Summary (FY2006-2010),PUW
City of Pullman, WA Adopted FY2011 Operating Budget, PUW Airport Board

Non-airline sources of revenue account for approximately 50 percent of the Airport's revenue base while the Airport Board's member jurisdictions contribute 26 percent and airline revenues provide the balance of overall operating funds or 23 percent. Generators of non-airline revenue include rental car concession fees, parking revenue and terminal area rental and other use charges. Revenues from these activities provide approximately 66 percent of all non-airline revenue ($164,000 FY2011 Budget). Public parking and terminal area rental and other use charges experienced significant growth during this period, increasing at annual compounded rates of 15 and 11 percent respectively. This is consistent with the robust passenger growth experienced at the Airport during this same timeframe. While rental car concession fee growth typically mirrors increases in passenger levels, PUW witnessed a 2.0 percent decrease per year in fees from rental cars. This suggests that perhaps the Board's concession agreement should be evaluated for enhanced revenue streams or that inbound passengers may be relying less on rental cars for ground transportation in the greater Pullman-Moscow region. Annual operating revenue support from member jurisdictions remained relatively level during this period increasing 1.0 percent per year. However, in 2009, one member of the Board indicated that it was not in a position to continue its annual funding support due to current economic conditions. As such, total revenue from member jurisdictions went from approximately $133,000 in 2009 to $119,211 in Fiscal Years 2010 and 2011—a decrease of $14,000.

It is noteworthy that PUW provides a very favorable operating environment for air carriers as reflected in its airline cost per enplaned passenger calculation. This metric is a key efficiency benchmark of an airport's reliance on airline rents and fees. It conveys the relative "cost of doing business" for an airline at an airport as reflected in an airline's ability to spread its airport operating expenses among its passengers. For FY2011, the airline cost per enplaned passenger ratio for PUW is expected to be $3.21. This is well below industry trends for non-hub commercial service airports. Airline fees at PUW grew at a CAGR of 12 percent during the period FY2006 through FY2011 (Budget). The cost per enplaned passenger ratio went from $2.28 to $3.21 during this time. However, this increase was driven by Horizon Air changing its aircraft mix to the Dash-8 400 series aircraft which increased airline landed weight.

Estimates of the Airport's future revenues were developed based on historical trends from FY2006 through FY2010, the Airport's FY2011 adopted budget, and an analysis of future revenue potential at the Airport. **Table 7-5** presents revenues for FY2011 (Budget) and projected revenues for the period from FY2012 through FY2018 which is the end of the short-term planning period for the Airport's CIP.

This Page Intentionally Left Blank

Table 7-5 Projected Airport Revenues

		Budget	Projected						
	2010	2011	2012	2013	2014	2015	2016	2017	2018
AIRLINE REVENUES									
LANDING AREA									
Airline Landing Fees	$106,917	$97,000	$103,790	$111,055	$118,829	$127,147	$136,048	$145,571	$151,291
TERMINAL AREA									
Terminal Arrival Fees, Rents & Utilities	-	$17,100	$17,955	$18,853	$19,795	$20,785	$21,824	$22,916	$23,878
Terminal Area Apron Charges	2,980	-							
Total Airline Revenue	***$109,897***	***$114,100***	***$121,745***	***$129,908***	***$138,625***	***$147,932***	***$157,872***	***$168,486***	**$175,169**
INTERLOCAL REVENUE -- JURISDICTIONS	***$119,211***	***$119,211***	***$120,000***	***$120,000***	***$120,000***	***$120,000***	***$120,000***	***$120,000***	**$120,000**
NON-AIRLINE REVENUES									
AIRFIELD AREA									
Hangar Rentals	$12,277	$38,839	$40,781	$42,820	$44,961	$47,209	$49,569	$52,048	$54,270
Fuel Sales or Fuel Flowage Fees	$14,467	$15,000	$21,000	$21,210	$21,422	$21,636	$21,853	$22,071	$23,267
Apron Charges/Tie-Down Fees	-	-		-	-	-	-	-	
TERMINAL AREA	-	-		-	-	-	-	-	
Terminal Area Rental/Other Charges	$60,272	$62,000	$65,100	$68,355	$71,773	$75,361	$79,129	$83,086	$87,240
Rental Auto Concessions	$35,913	$42,000	$57,600	$58,752	$74,252	$75,737	$77,252	$78,797	$87,465
Food and Beverage Services	$1,406	$1,200	$1,200	$1,200	$1,200	$1,200	$1,200	$1,200	$1,200
Terminal Services & Other	$2,260	$2,300		-	-	-	-	-	
PARKING AREA	-	-		-	-	-	-	-	
Public Parking Facility	$71,272	$60,000	$65,400	$71,286	$77,702	$84,695	$92,317	$100,626	$105,694
ADMINISTRATION									
Miscellaneous Revenue	0	0							
Interest Income	$377	-		-	-	-	-	-	
OTHER AREAS									
Land and Non-Terminal Facilities	$28,510	$30,100	$31,605	$33,185	$34,845	$36,587	$38,416	$40,337	$42,124
Miscellaneous Revenue	$2,508	$2,600							
Total Non-Airline Revenue	***$229,262***	***$254,039***	***$282,686***	***$296,808***	***$326,154***	***$342,425***	***$359,737***	***$378,165***	**$401,260**
TOTAL AIRPORT REVENUE	**$458,370**	**$487,350**	**$524,431**	**$546,716**	**$584,779**	**$610,358**	**$637,609**	**$666,651**	**$696,429**
Annual Enplanements	35,233	35,546	36,257	36,982	37,721	38,476	39,245	40,030	40,830
AIRLINE COST PER ENPLANEMENT	$3.12	$3.21	$3.36	$3.51	$3.67	$3.84	$4.02	$4.21	$4.34

Sources: U.S. Department of Transportation, FAA Form 5100-27 Operating & Financial Summary (FY2006-2010),PUW
City of Pullman, WA Adopted FY2011 Operating Budget, PUW Airport Board
Mead & Hunt, Inc.

Based on a review of the Airport's financial results for the period FY2006 through FY2011 (Budget) and discussions with airport management, it is evident that the growth in both aeronautical and non-aeronautical sources of revenue were generated primarily through increases in passenger and general aviation activity during this period versus deployment of a market-based approach to setting airport rates and charges. The upcoming runway realignment project is perhaps the largest capital improvement program undertaken at PUW since its original construction. As the Airport Board moves forward, it will need to make sure that all fees and charges are set at a level that meets FAA's grant assurance for "financial self-sufficiency" and avoids increased cost burdens to its member jurisdictions. The completion of the proposed airfield realignment project and corresponding removal of the FAA's operating restrictions is a key to PUW's long-term self-sufficiency.

While the Airport's ability to achieve full financial self-sufficiency is critically linked to completion of its runway realignment project, an ongoing evaluation of its fee structure is an immediate action step recommended for PUW. For its adopted FY2012 budget, the Airport Board incorporated adjustments to several key revenue generating areas to bring its rates and charges more in-line with its cost structure, market and peer facilities. To this end, the Board adjusted airline landing fees, ground rental rates, rental car concession fees, its fuel flowage fee structure, and general aviation aircraft parking fees. This action establishes a strong foundation for PUW ensuring that as it goes forward it has a formal rates and charges policy that is consistent with FAA grant assurances and one that is fair, reasonable, non-discriminatory as well as reflective of a market-based approach to ratemaking. Moreover, such proactive and business-based measures will offer the basis for PUW achieving rates for lease of its facilities and land that will yield the results depicted in **Table 7-5**. The financial pro-forma presented herein includes assumptions of future revenue sources and growth rates. For instance, it is assumed that annual operating contributions from the Board's member jurisdictions will remain relatively constant during the period. Descriptions of key revenue sources and assumptions for growth during the ensuing five-year period are provided below for clarification purposes.

Airline Landing Fees

For FY2012, scheduled commercial airlines operating at the Airport will be charged a landing fee of \$1.00 per thousand pounds of landed weight. Unscheduled air carrier and charter operators are scheduled to be charged \$1.35 per thousand pounds of landed weight. The Board does not have a current airport and airline use agreement in effect and its FY2012 rate is the first adjustment to this fee structure in a number of years. As previously noted, total airline landing fee revenue for FY2011 is anticipated to be \$97,000. Projections of future airline landing fee revenues assume the Board establishes a new airport and airline use agreement, adopts a compensatory ratemaking approach to setting airline fees, and periodically adjusts its rate base going forward to reflect the airline's use and cost impact on the Airport. Should these assumptions be realized, the Board can expect this source of revenue to increase from $97,000 to $151,291 over the next seven years. As the Board embarks on its airfield realignment project, it should closely align its landing fee with anticipated airline landed weight estimates. Calculations should also take into full consideration the impact of runway closures that will be required for the airfield construction work and the effect such inactivity will have on overall revenues.

Terminal Arrival Fees, Rents & Utilities

For Budget Year 2011, the Airport Board established a new fee for airline use of its air carrier terminal building and assumed this would generate approximately $17,000 in new revenue. It is recommended that this airline charge be incorporated into the proposed airport and airline use agreement along with all landing fees and other airline charges. Assuming 5.0 percent growth in rates during the planning period, this charge could generate approximately $24,150 in revenue for the Airport by FY2018.

Non-Airline Revenue

Four key sources of non-airline revenue offer opportunities to build the Airport's capacity to achieve self-sufficiency in the coming years based on historical trends and propensity to generate income:

Fuel Flowage Fees

Fuel flowage fees are a per gallon fee for aviation fuel sold and dispensed at PUW. The fee is designed to compensate the Airport for the infrastructure and safety measures it must provide for fueling operations on airport property. This fee is charged to aircraft owners, operators and fuel providers. For FY2012, PUW evaluated its fuel flowage fee structure and determined that this charge ($0.05 per gallon at the time) had not been adjusted for quite some time. Based upon an evaluation of current fuel flowage fees at comparable facilities, the Board determined that a fee of $0.07 per gallon was reasonable and appropriate. Implementation of this revised fee structure is expected to yield approximately $23,000 in revenue by FY2018.

Terminal Area Rentals

Terminal area rentals represent fees received by the Board for rent of all terminal area space except for airline operations. Revenues from these activities increased from $36,721 in FY2006 to an expected level of $62,600 in FY2011, translating to a CAGR of 11 percent during this period. Moving forward, it is assumed that the Board will continue to set rates using a market-based approach and that this source of revenue will increase from current levels to $87,465 in FY2018 representing an annual growth rate of 5 percent.

Public Parking Facility

Public parking facility revenues represent fees collected from the Airport's 173-stall surface parking facility. When the Board's concession agreement with a private operator expired in 2006, the Airport assumed responsibility for all aspects of public parking operations at PUW. As a result, parking revenues of $29,000 in FY2006 are expected to reach $60,000 in FY2011; translating to a CAGR of 15 percent during this period. Although FY2011 (Budget) parking revenues are anticipated to trail FY2010 results, this is an isolated event due to several extended periods of closure for runway rehabilitations in the current year. Future projections of public parking revenue are based on projections of passenger activity previous results and an ongoing strategy to charge fair, reasonable and market-based fees. For FY2012, Long-Term automobile parking rates are set at $4.00/day, $28/week and $80/month. Based upon current fees and the above strategy, public parking revenue is projected to increase from an expected level of $60,000 in FY2011 to $105,694 in FY2018.

Land Rental and Non-Terminal Facilities

Historically, rents received for the non-aeronautical use of airport property have generated an average of approximately $33,000 each year. Non-aeronautical uses include farming and other University-related uses. Here again, it is vital that these activities are assessed fair, reasonable and non-discriminatory fees and charges consistent with a market-based approach. This approach determines fees based on sources including local commercial real estate rates, peer assessments and appraisals. For its FY2012 budget, PUW's rates for lease of land reflect this market-based approach through the establishment of a $0.135/SF per annum (currently $0.10) charge for all new leases and those scheduled for adjustment in year five of their terms. Going forward, PUW is set to recalculate this fee for FY2013 to $0.165/SF per annum. Achieving these rate adjustments for non-aeronautical use of airport property during the planning period will yield an additional $7,000 in revenue for the Board by FY2018 ($42,124).

As previously noted, rental auto concession revenue experienced a decrease of 2.0 percent per year between FY2006 and FY2011 (Budget). This source of revenue includes all fees associated with rental auto agency operations at the Airport. Rental auto concession revenues have decreased from $46,098 in FY2006 to $42,000 in FY2011 (Budget). Prior to FY2012, PUW assessed a per car rental day fee of $3.50 as well as $0.10/SF per annum for leased space and $10/parking stall per year to each rental car operator. For its FY2012 budget, PUW modified this fee structure by increasing the per car rental day fee to $5.00. This action is expected to yield an additional $15,500 in revenue for PUW in FY2012.

Although such a measure has the potential to stabilize overall rental car concession fee revenue, it is possible that PUW's approach to this major non-airline revenue source may not be aligned with its peer airports. Based upon a survey of non-hub commercial airports with annual enplanements ranging from 29,000 to 37,500 and with 3-5 rental car operators serving these respective markets, PUW lies about middle of this grouping in terms of passengers; however, PUW lags practically all with regards to overall rental car revenues. According to FY2010 data obtained from FAA Form 127 Financial Reports for these airports, the average rental car concession fee derived at these facilities was $116,111 while PUW reported revenue of approximately $36,000, amounting to $80,000 less than its peers on average.

Airport Code	Airport Location	2010 Revenue	2010 Passengers	No. Agencies
GUC	Gunnison, CO	$41,675	37,316	3
GTR	Columbus, GA	$160,948	36,329	5
TWF	Twin Falls, ID	$95,391	35,576	3
ABY	Albany, GA	$259,044	35,494	4
PUW	Pullman-Moscow, WA	$35,913	35,248	4
DBQ	Dubuque, IA	$107,141	33,861	3
BQK	Brunswick, GA	$159,319	30,059	3
ALW	Walla Walla, WA	$69,460	29,064	3
	AVG.	$116,111		

It is recommended that within the next two (2) years, PUW increase its current per day rate from $5.00 to $6.00 and initiate a competitive rental car concession process. Achieving both measures will move PUW towards a structure that is more closely aligned with current airport industry ratemaking policies and fees resulting in the airport receiving a percentage of each rental car transaction and/or a minimum annual guarantee of revenue from each operator. Moving in such a direction will enable PUW to become more closely aligned with its peer airports and move toward financial self-sufficiency.

For purposes of this analysis, projections of future rental auto concession revenues were developed based on projected passenger activity levels and changes to the per day fee structure for FY2012 and adjusting this rate to $6.00 day in FY2014. As shown in **Table 7-5**, rental auto concession revenue is projected to increase from $42,000 in FY2011 to $87,465 FY2018, representing a CAGR of approximately 11.0 percent. Assuming the Airport Board is capable of modifying the terms and conditions of its rental car concession agreement, this rate of growth and corresponding flow of revenue could be increased above this growth rate to yield a higher stream of funds for the Airport.

Beyond consideration of adjusting its fee structure for rental car concessions, the Board is encouraged to explore the feasibility of enacting a Customer Facility Charge (CFC) for rental car specific facility improvements at the Airport. Revenue generated through a CFC will provide an alternative stream of revenue with which the Board can make specific improvements to rental car parking areas as well as ticket counter and office areas without encumbering other Board funding sources. For FY2012, PUW has also established aircraft parking fees and charges to its general aviation customers that are consistent with FAA's grant assurance requirements for market-based methodologies. Going forward, the airport aims to collect fees based upon the following schedule to be adjusted as market conditions warrant:

Aircraft Parking Fees

1. Aircraft (less than 12,500 lbs MTOW):

   $5 /night $50 /month and $325/Annual

2. Aircraft (greater than 12,501 lbs MTOW) and small Rotary-wing (greater than 4,000 lbs MTOW):

   $10.00/night

3. Aircraft (between 15,001-45,000 MTOW) and Rotary-wing (between 4,001 -6000 MTOW):

   $15.00/night

4. Aircraft (greater than 45,001 MTOW) and Rotary-wing (greater than 6,001 MTOW):

   $20.00/night

Note: Maximum Take-off Weight (MTOW)

Monthly and Annual Parking fees for aircraft over 12,501 lbs and Rotary-wing over 4,000 lbs are evaluated and valued by the airport on a case by case basis factoring size, weight, and available space. While PUW has established this fee structure effective FY2012, future forecasts of revenue presented in **Table 7-5** do not reflect this fee adjustment.

Summary of Airport Revenue

As shown in **Table 7-5**, total revenues at PUW are projected to increase from $487,350 in FY2011 to $696,429 in FY2018, representing a CAGR of approximately 5.4 percent. These projections were developed by examining several key business factors that have an impact on major elements of airport revenue. While such estimates are believed reasonable, actual levels of future revenue may differ from these projections. Examples of factors that could impact future levels of airport revenue include changes in the level of passenger and general aviation activity at the Airport and the success of the Board in setting its rates and fees to reflect broad market trends and charges. Of critical importance to the Board is its ability to modify its rental car concession agreement and establish rates and charges for its terminal facilities, its other buildings and land rentals consistent with market trends. Through adoption of its airport fee and rate structure for FY2012, PUW made significant strides toward achieving a rate making policy based upon market conditions consistent with FAA grant assurance requirements. The adopted adjustments to its landing fee structure, rental car concession fees, fuel flowage rate and aircraft parking fee rates for general aviation aircraft are anticipated to generate new revenues and provide PUW with greater ability to achieve financial sustainability. In the spirit of adopting a more formal ratemaking policy for use of airport property, it is recommended that going forward PUW:

- Develop and adopt a formal rates and charges policy building upon its FY2012 effort.
- Enter into negotiations to establish a written airport/airline lease and use agreement.
- Solicit formal proposals from rental car concession companies that will lead to the establishment of a concession agreement reflective of current airport practices.
- Conduct a formal appraisal of airport property to ensure its lease rates are market-based.
- Ensure that long-term land and use agreements have provisions that enable rate adjustments to be achieved based upon current appraisals or another acceptable metric.
- Utilize airports offering comparable services and in communities with similar demographics generating substantially similar performance metrics as peer markets for benchmarking overall rates and charges.

Success in these areas could yield higher revenue than projected here which would reduce the need for the member jurisdictions to contribute to airport operations and thereby lead to achievement of financial self-sufficiency as established in FAA grant assurances.

Historical and Projected Operating Expenses

The Airport’s historical operating expenses for FY2006 through FY2011 (Budget) are presented in **Table 7-6**. Since FY2009, personnel expenses including salaries, labor, and employee benefits have consistently represented the largest category of airport expenditures. During FY2011, personnel costs will total $238,562 which is approximately 52 percent of all operating expenses for the Airport. The next largest components of total airport operating expenditures are public utility services ($74,310), repairs and maintenance ($35,849), and professional services ($34,244). Estimates of the Airport’s future operating expenses were developed based on a review of historical trends and the Airport’s adopted FY2011 budget. **Table 7-7** presents actual FY2010 expenses, budgeted expenses for FY2011, and projected operating expenses for the period FY2012 through FY2018.

Table 7-6 Historical Airport Operating Expenses

	Historical					
	2006	2007	2008	2009	2010	Budget 2011
OPERATING EXPENSES						
Regular Salaries & Wages	$139,404	$144,608	$151,216	$164,695	$162,730	$164,044
Overtime	-	364	215	-	466	-
Employee Benefits	27,253	33,691	53,312	57,473	59,135	74,518
SubTotal: Salaries, Wages & Benefits	***$166,657***	***$178,663***	***$204,743***	***$222,168***	***$222,331***	***$238,562***
Office & Operating Supplies	8,200	10,953	15,313	12,104	11,905	19,538
Repair & Maintenance Supplies	7,010	8,947	7,443	8,662	6,494	7,500
Minor Equipment	777	15,685	767	417	761	-
Professional Services	43,264	44,350	39,491	42,948	36,879	34,244
Communication	5,304	5,692	6,185	5,666	6,517	7,475
Travel	5,364	4,874	3,921	4,817	2,186	4,100
Advertising	(1,377)	806	1,408	588	531	600
Operating Rentals & Leases	0	0	0	0	0	450
Insurance	28,049	28,504	25,976	27,182	30,809	32,500
Public Utility Services	54,254	54,716	60,089	58,317	60,976	74,310
Repairs & Maintenance	14,602	20,975	29,261	23,216	22,619	35,849
Miscellaneous	28,947	10,845	13,754	6,010	5,963	2,250
SubTotal: Other Services & Charges	***$194,394***	***$206,347***	***$203,608***	***$189,927***	***$185,640***	***$218,816***
Total Operating Expenses	***$361,051***	***$385,010***	***$408,351***	***$412,095***	***$407,971***	***$457,378***
NON-OPERATING EXPENSES						
Intergovernmental Professional Services	$33,590	$34,972	$26,426	$27,847	$28,353	$39,640
External Taxes & Operating Assessment	3,610	3,991	4,792	3,174	5,092	0
Total Non-Operating Expenses	***$37,200***	***$38,963***	***$31,218***	***$31,021***	***$33,445***	***$39,640***
TOTAL AIRPORT EXPENSES	**$398,251**	**$423,973**	**$439,569**	**$443,116**	**$441,416**	**$497,018**

Source: City of Pullman, WA, Revenue Status Reports (FY2006-2010), PUW Airport Board
City of Pullman, WA Adopted FY2011 Operating Budget, PUW Airport Board

Table 7-7 Projected Airport Expenses

	Budget		Projected						
	2010	2011	2012	2013	2014	2015	2016	2017	2018
OPERATING EXPENSES									
Regular Salaries & Wages	$162,730	$164,044	$168,965	$174,034	$179,255	$184,633	$190,172	$195,877	$200,461
Overtime	$466	-							
Employee Benefits	$59,135	$74,518	$80,479	$86,918	$93,871	$101,381	$109,491	$118,251	$128,952
SubTotal: Salaries, Wages & Benefits	***$222,331***	***$238,562***	***$249,445***	***$260,952***	***$273,127***	***$286,014***	***$299,663***	***$314,128***	***$329,413***
Office & Operating Supplies	$11,905	$19,538	$20,320	$21,132	$21,978	$22,857	$23,771	$24,722	$27,085
Repair & Maintenance Supplies	$6,494	$7,500	$7,575	$7,651	$7,727	$7,805	$7,883	$7,961	$8,166
Minor Equipment	$761	-							
Professional Services	$36,879	$34,244	$34,586	$34,932	$35,282	$35,634	$35,991	$36,351	$36,714
Communication	$6,517	$7,475	$7,737	$8,007	$8,288	$8,578	$8,878	$9,189	$9,592
Travel	$2,186	$4,100	$4,141	$4,265	$4,393	$4,525	$4,661	$4,801	$5,295
Advertising	$531	$600	$600	$600	$600	$600	$600	$600	$609
Operating Rentals & Leases	$0	$450	$450	$450	$450	$450	$450	$450	$450
Insurance	$30,809	$32,500	$33,475	$34,479	$35,514	$36,579	$37,676	$38,807	$39,944
Public Utility Services	$60,976	$74,310	$78,769	$83,495	$88,504	$93,815	$99,444	$105,410	$112,789
Repairs & Maintenance	$22,619	$35,849	$37,283	$38,774	$40,325	$41,938	$43,616	$45,360	$49,488
Miscellaneous	$5,963	$2,250	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000
SubTotal: Other Services & Charges	***$185,640***	***$218,816***	***$227,935***	***$236,786***	***$246,061***	***$255,780***	***$265,969***	***$276,650***	***$293,132***
Total Operating Expenses	***$407,971***	***$457,378***	***$477,380***	***$497,738***	***$519,187***	***$541,794***	***$565,632***	***$590,778***	***$622,545***
NON-OPERATING EXPENSES									
Intergovernmental Professional Services	$28,353	$39,640	40,829	42,054	43,316	44,615	$45,954	$47,332	$48,752
External Taxes & Operating Assessment	5,092	0							
Total Non-Operating Expenses	***$33,445***	***$39,640***	***$40,829***	***$42,054***	***$43,316***	***$44,615***	***$45,954***	***$47,332***	***$48,752***
TOTAL AIRPORT EXPENSES	**$441,416**	**$497,018**	**$518,209**	**$539,792**	**$562,503**	**$586,409**	**$611,586**	**$638,110**	**$671,297**

Source: City of Pullman, WA, Revenue Status Reports (FY2006-2010), PUW Airport Board
City of Pullman, WA Adopted FY2011 Operating Budget, PUW Airport Board
Mead & Hunt, Inc.

These operating expense categories represent all expenses associated with the day-to-day operations of the Airport. Major expense categories, and the assumptions used to project those expenses, are discussed in the following sections.

Salaries and Labor

Salaries and labor represent all personnel expenditures for the current 4.5 full time equivalent (FTE) airport employees who provide airport management, parking, maintenance, and public safety services. Between FY2006 and FY2011 (Budget), these costs increased from $139,404 to $164,044. As shown in **Table 7-7**, future salaries and labor expenses are projected to increase from $164,044 in FY2011 to $200,461 in FY2018, representing a compounded annual increase of approximately 3.0 percent. These projections were developed based on an estimated rate of inflation and assume that no additional staffing is added by the Airport Board during this period.

Employee Benefits

Employee benefits expenses include fringe benefit costs, such as wage-related taxes, health care, and employee pensions. Employee benefit expenses increased from $27,253 in FY2006 to $74,518 in FY2011 (Budget). During this period, two notable spikes occurred between FY2007/08 and FY2010/11. While the latest increase is partially due to a change in how the Board provides employee benefits for its Airport Director, the initial surge was due solely to changes in employer rates for its retirement and health care plans. This category of airport operating expense is projected to increase at approximately 8.0 percent per year from $74,518 in FY2011 to $128,952 in FY2018. As with any public sector employer, the cost of the Board’s investment for both employee health care and defined benefit retirement plans is a significant concern. To this end, the Board should closely monitor and evaluate proposed plan and premium changes for all benefit plans moving forward and be prepared to address the budgetary impacts of such changes.

Public Utility Services

Public Utility Service expenses are comprised of the charges for electricity for terminal and airfield facilities, natural gas for heating, and water and sewage charges. These expenditures have ranged from a low of $54,254 in FY2006 to a high of $74,310 in FY2011, yielding a compounded annual increase of approximately 6.0 percent. As shown in **Table 7-7**, utility expenses are projected to increase from $74,310 in FY2011 to $112,789 in FY2018, representing a compounded annual increase of approximately 6.0 percent. Future utilities expenses were projected based on historical actual costs. During the upcoming five-year period, the Airport is encouraged to undertake a full energy audit to determine what, if any, measures can be taken to reduce cost through reduced energy consumption.

Repairs and Maintenance

Repairs and maintenance expenses represent the cost of maintaining and repairing all of the Airport's grounds and facilities as well as snow removal. This category of expenditures grew at an annual rate of 20.0 percent between the years of FY2006 and FY2011 increasing from $14,602 to $35,849. The bulk of these increases are due to extraordinary snow removal operations required during the three most recent winter periods. As shown in **Table 7-7**, maintenance and repair expenses at the Airport are projected to increase from $35,849 in FY2011 to $49,488 in FY2018. It is assumed that the Airport's rate of growth in this expenditure category will not continue as in the past but will moderate to a growth level of 4.0 percent per year.

Professional Services

Professional Service expenses represent the annual costs of providing contract services to aid in the efficient operation of the Airport such as legal and other various consulting services. This expense actually decreased over the past five years from $43,264 in FY2006 to $34,244 in FY2011 (Budget). As shown in **Table 7-7**, these expenditures are projected to increase from $34,244 in FY2011 to $36,714 in FY2018, representing a compounded annual increase of approximately 1.0 percent.

In addition to the operating expense categories described above, it is important for the Airport Director and the Board to remain vigilant in their examination of all expenditures in order to fully understand trends and reduce costs whenever prudent. To this end, focusing on the trends for Communications and Office/Operating Supplies could possibly yield savings or cost restructuring opportunities. While Office and Office Supply expenditures constitute only 4.3 percent of the Airport's budget, their cost grew at a CAGR of 19.0 percent from $8,200 in FY2006 to $19,538 in FY2011 (Budget). Likewise, Communication expenses appear to have grown at an elevated rate of 7 percent during this same period from $5,304 to $7,475. This accounts for 2.0 percent of total operating expenditures. Although these amounts may seem trite, close scrutiny of expenditures across all levels furthers the Board's ability to attain financial self-sufficiency.

The Airport also incurs non-operating expenses associated with the payment of taxes as well as an Intergovernmental Professional Services fee paid to the City of Pullman. The Intergovernmental Professional Services fee is an indirect cost allocated to the Airport by the City of Pullman to provide fiscal agent and budgetary services. The City, through the preparation of a cost allocation plan, estimates these annual costs for the Airport and, as shown in **Table 7-6**, this category of expense increased from $33,590 in FY2006 to $39,640 in FY2011 (Budget). It is expected that these costs will increase modestly between FY2011 and FY2018, increasing from $39,640 to approximately $48,752 or by 3.0 percent per year during this period.

Summary of Projected Total Airport Expense

Adding the Airport's operating expenses to non-operating expenses yields the Airport's total annual expenditures. As shown in **Table 7-6**, Airport Expenditures increased from $398,251 in FY2006 to $497,018 in FY2011 reflecting a CAGR of 5.0 percent. As previously discussed, this change was primarily the result of the increased cost of salaries, employee benefits, repairs and maintenance, and utility services. Projected increases in the Airport's total expenses are presented in **Table 7-7**. It is forecast that expenditure levels will increase from $497,018 in FY2011 to approximately $671,297 in FY2018, continuing at the current growth rate of 5.0 percent and requiring $141,092 in additional revenue or expenditure savings in order to reach a break-even point in that year.

Cash Flow Analysis

This section sets forth a discussion of the Airport's projected cash flow from Operating Activities **(Table 7-8)** for the period FY2012 through FY2018. Given the revenue and expenditure assumptions and trends discussed in this chapter, it is projected that PUW member jurisdictions could experience a total decrease of $114,000 in funding support for airport operations over the next seven (7) years based upon:

- The Airport achieves increases in its revenue base through modifications to its rate structure as implemented in FY2012 and as further recommended herein;
- The Airport posts increased air carrier passenger and general aviation activity as projected in this Master Plan;
- The Airport continues to monitor and evaluate all expenditures

Table 7-8 Projected Airport Cash Flow from Operating Activities

	Projected						
	2012	2013	2014	2015	2016	2017	2018
CASH FLOW – OPERATING ACTIVITIES							
Airport Revenue	524,431	546,716	584,779	610,358	637,609	666,651	696,429
Operating Expense	518,209	539,792	562,503	586,409	611,586	638,110	671,297
Net Revenue	6,222	6,924	22,276	23,948	26,023	28,541	25,132
Reduction in Sponsor Funding Required to Breakeven	(6,222)	(6,924)	(22,276)	(23,948)	(26,023)	(28,541)	(25,132)

Source: Mead & Hunt, Inc.

Ultimately, it should be the goal of the Airport to deploy initiatives aimed at reducing or eliminating the need for annual funding contributions from its member jurisdictions. In the long term, the completion of the runway realignment project and the elimination of operating constraints will allow PUW to make progress on such an initiative. In the short term, closer scrutiny of expenses and additional revenue enhancements beyond what is described above could further mitigate the need for increased contributions during the next five-year period.

Conclusion

Based on the foregoing analysis, including its underlying assumptions, the CIP recommended for the Airport is expected to be both feasible and implementable. Moreover, the Airport is capable of sustaining its operations during the next six (6) years without placing extended or undue burdens on its member jurisdictions, tenants, operators and concessionaires.