AUBURN MUNICIPAL AIRPORT | AIRPORT MASTER PLAN

CITY OF AUBURN WASHINGTON

CENTURY WEST ENGINEERING CORPORATION

Parametrix

CITY OF AUBURN

AUBURN MUNICIPAL AIRPORT | AIRPORT MASTER PLAN REPORT

FINAL REPORT, MAY 2015

PREPARED FOR

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IN ASSOCIATION WITH

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J – WSDOT Grant Assurances

K – FAA ALP Approval Letter

Glossary

Chapter 1 – Introduction & Project Overview

Chapter 1 – Introduction and Project Overview

The City of Auburn is updating the Airport Master Plan for Auburn Municipal Airport (S50) in cooperation with the Federal Aviation Administration (FAA) to address the airport's needs for the next twenty years. The Airport Master Plan will provide specific guidance in making the improvements necessary to maintain a safe and efficient airport that is economically, environmentally, and socially sustainable.

Study Purpose

The purpose of the Airport Master Plan is to define the current, short-term and long-term needs of the Airport through a comprehensive evaluation of facilities, conditions and FAA airport planning and design standards. The study will also address elements of local planning (land use, transportation, environmental, economic development, etc.) that have the potential of affecting the planning, development and operation of the airport. FAA Advisory Circular 150/5070-6B Airport Master Plans defines the specific requirements and evaluation methods established by FAA for the study.

Project Need

Auburn Municipal Airport is included in the federal airport system—the National Plan of Integrated Airport Systems (NPIAS). Participation in the NPIAS is limited to public use airports that meet specific FAA activity criteria. The FAA recognizes NPIAS airports as being vital to serving the public needs of air transportation. In doing so, the FAA recognizes that access to the nation's air transportation system is not limited to commercial air service. There are more than 3,300 NPIAS airports, of which more than 75 percent are general aviation airports similar to Auburn Municipal. Auburn Municipal is one of five

NPIAS airports in King County (Auburn, SEATAC, King County International/Boeing Field, Renton Municipal, and Vashon). Other nearby NPIAS airports are located in Puyallup (Pierce County/Thun Field) and Tacoma (Tacoma Narrows). The nearest scheduled commercial air service is available at Seattle-Tacoma International Airport (SEATAC), less than 10 miles northwest of Auburn.

NPIAS airports are eligible for federal funding of improvements through FAA programs such as the Airport Improvement Program (AIP). However, to maintain eligibility for funding, the FAA requires airports to periodically update their master plans as conditions change in order to maintain current planning.

This project updates the 2002 Airport Master Plan (W&H Pacific), which has provided the primary airport planning guidance for the Airport over the last ten years. As many of the previous airport master plan recommendations have been implemented, the need now exists to update the long-term planning for the Airport. In addition to addressing changing local conditions, recently updated FAA standards and current trends within the aviation industry also need to be reflected in updated airport planning. When completed, the 2012-2032 Airport Master Plan and Airport Layout Plan (ALP) will replace the previous master plan and will meet the FAA's requirement to maintain current planning.

Project Funding

Funding for the Airport Master Plan Update is being provided through an FAA Airport Improvement Program (AIP) grant (90%) with a local match (10%) provided by the City of Auburn. The AIP is a dedicated fund administered by FAA with the specific purpose of maintaining and improving the nation's public use airports. The AIP is funded exclusively through fees paid by users of general aviation and commercial aviation and the funds can only be for eligible aviation related projects.

Airport History

According to local records[1], the City of Auburn began investigating the feasibility of building an airport in 1962. Then Mayor Shaughnessey appointed a committee to investigate potential locations for the airport and potential funding options. Eleven different sites were evaluated over the next four years (1962-1965). Eventually, the City authorized a full feasibility study for the airport to be located adjacent to the City's sewer treatment plant. The study concluded that "an airport in Auburn would contribute significantly to the local economy if it had modern facilities, such as a well lit paved runway, covered hangars, and paved tie-down areas that would attract pilots to the airport." The Auburn City Council passed an ordinance in 1968 to raise $450,000 through bonds, for site acquisition and development. Auburn Municipal Airport opened in 1969 with a 2,900' asphalt runway and adjacent paved taxiway. The Airport was renamed Auburn Municipal Airport – Dick Scobee Field in 1986 in honor of Dick Scobee, former Auburn resident

[1] White River Museum – History of the Auburn Municipal Airport

and NASA Space Shuttle Commander. As the airport owner (sponsor) of record, the City of Auburn is responsible for conforming to all applicable FAA regulations, design standards and grant assurances.

History of Airport Planning and Development

As noted earlier, major components of Auburn Municipal Airport were constructed in 1969. Since its original construction, the City has continued to modernize every part of the Airport including the runway-taxiway system; aircraft parking aprons; airfield lighting; fixed base operator (FBO) facilities; aviation fuel storage and dispensing; security fencing; stormwater drainage; utilities; and aircraft hangars. Private investment on the Airport has also been substantial, in particular with hangar construction.

Planning for Auburn Municipal Airport has been updated on a regular basis since the Airport's initial construction in 1969. The last two FAA-funded airport master plan updates were completed in 2002 and 1993. The City's commitment to long-term planning is reflected in the condition, configuration, and functional capabilities of the Airport. Improvements completed since the last master plan include parallel taxiway and aircraft hold area upgrades, property acquisition and hangar construction on the east side of the runway. The primary areas of recent hangar development are north of the aircraft fueling area and tiedown area (between 23rd and 26th Streets NE), in the northeast corner of the airport, and near the southeast corner of the airport.

Auburn Municipal Airport is included in the City of Auburn's Innovation Partnership Zone (IPZ), created in 2012. The IPZ is a defined geographic area that will support sustainable development of business and industrial clusters with research components to support new products, markets, workforce development and employment. The IPZ designation also provides significant benefits in competing for public development funds and private investment. In Auburn, IPZ partners include private sector businesses serving diverse industrial segments, research and education institutions, and the City of Auburn. A complete description of the City of Auburn IPZ designation is provided in **Appendix A.**

The previous planning studies, the 2002 ALP drawings, subsequent airfield design drawings, recent aerial photography, available mapping and survey data, and local planning studies will be used as primary information sources for preparing the updated Airport Master Plan and ALP.

Study Organization

Work in progress on the Airport Master Plan Update will be documented in a series of technical memoranda (presented as draft chapters). The chapters are prepared to document progress in the study, facilitate the review of preliminary results, and to obtain input early and throughout the master planning process. The draft chapters are not finished products. Inevitably, certain information compiled in the chapters becomes obsolete during the planning process as conditions change or new information becomes available. In these instances it is not intended to revise and re-issue the chapters, but rather, to reflect new information in subsequent chapters or in the draft and final Airport Master Plan reports.

The draft chapters and supporting documents were prepared over a period of approximately 18 months. Each draft chapter was reviewed locally and also by the FAA and Washington Department of Transportation - Aviation Division (WSDOT) for consistency with federal and state regulations, policies and standards.

The 2012-2032 Auburn Municipal Airport Master Plan includes the following chapters:

- *Chapter 1 – Introduction and Project Overview*
- *Chapter 2 – Inventory of Existing Conditions*
- *Chapter 3 – Aviation Activity Forecasts*
- *Chapter 4 – Airport Facility Requirements*
- *Chapter 5 – Airport Development Alternatives*
- *Chapter 6 – Environmental Review*
- *Chapter 7 – Financial and Development Program*
- *Chapter 8 – Airport Layout Plan*
- *Chapter 9 – Airport Land Use Compatability*
- *Chapter 10 – FAA Compliance Review*

Local Citizen Participation

The City of Auburn is committed to an inclusive, transparent planning process and has made all project work products available for public review. The public involvement element of the Airport Master Plan Update provided several ways for all interested individuals, organizations, or groups to participate in the project.

First, all draft work products developed during the project were made available for public review and comment. Links to the documents were posted on the City's webpage to allow for convenient access, review and comment. Copies of the draft work products were available for public review and comment at

the airport manager's office and City Hall throughout the project. Comment forms were also available for both electronic and printed versions of the draft work products.

Second, a series of public meetings were held during the project to facilitate public participation. The public meetings included periodic study sessions and briefings with the Auburn Airport Board and City Councilmembers. The project team presented information, provided updates on study progress and identified upcoming decision points during these meetings. The project team utilized a variety of tools to encourage citizen participation, including surveys, and project updates posted on the City's webpage.

Third, a local planning advisory committee (PAC) was formed to assist the project team in reviewing draft technical working papers and to provide input into the planning process. The composition of the PAC provided an effective blend of airport users, neighbors, local business, local government representation, and other interests. Representatives from the FAA Seattle Airports District Office and the Washington Department of Transportation - Aviation Division (WSDOT) served as *ex officio* members of the PAC. The PAC met throughout the project, reviewed and commented on draft work products, discussed key project issues and provided local knowledge and expertise to the planning process.

The PAC meetings were open to public and public comment was encouraged. Public input was integral to the planning process, ensuring that all interested stakeholders had an opportunity to participate in the project.

Summary

The FAA-defined airport master planning process requires a sequential, systematic approach which leads to selection of a preferred development option for the airport that is integrated into the Airport Layout Plan (ALP) and Airport Capital Improvement Program (ACIP). To meet this goal, the Airport Master Plan Update will:

- *Provide an updated assessment of existing facilities and activity;*
- *Forecast airport activity measures (design aircraft, based aircraft, aircraft operations, etc.) for the current 20-year planning period;*
- *Examine previous planning recommendations (2004 Airport Master Plan) as appropriate, to meet the current and projected airport facility needs, consistent with FAA airport design standards;*
- *Determine current and future facility requirements for both demand-driven development and conformance with FAA design standards;*
- *Provide consistency between airport planning and land use planning to promote maximum compatibility between the airport and surrounding areas;*
- *Prepare an updated Airport Layout Plan (ALP) drawing set to accurately reflect current conditions and master plan facility recommendations; and*

- *Develop an Airport Capital Improvement Program (ACIP) that prioritizes improvements and estimates project development costs and funding eligibility for the 20-year planning period.*
- *Evaluate airport sponsor compliance with FAA Airport Improvement Program (AIP) grant assurances.*

The preparation of this document may have been supported, in part, through the Airport Improvement Program financial assistance from the Federal Aviation Administration as provided under Title 49, United States Code, 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 with appropriate public laws.

Chapter 2 – Inventory of Existing Conditions

Chapter 2 – Inventory of Existing Conditions

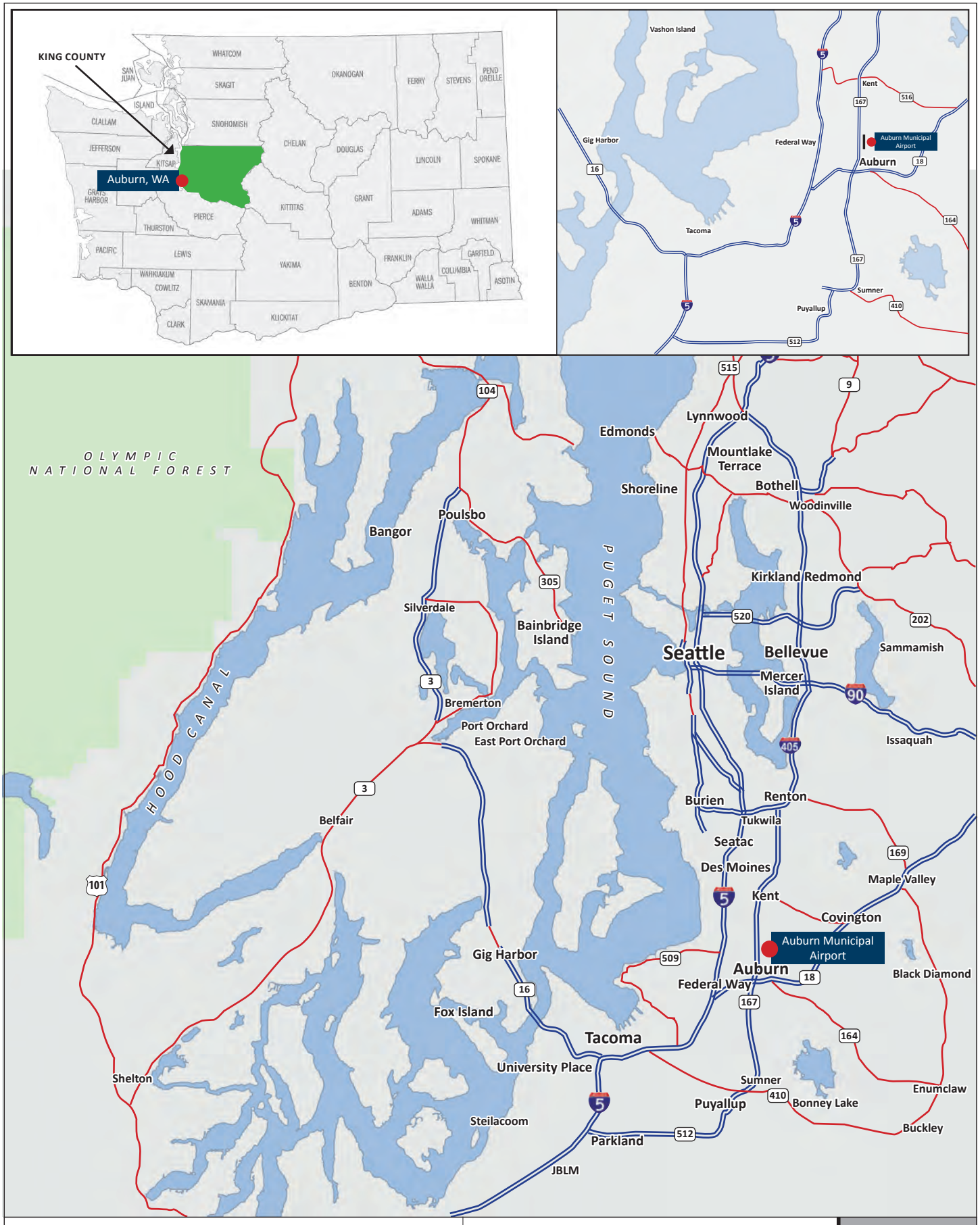
The purpose of this chapter is to document the existing facilities and conditions at Auburn Municipal Airport (Airport Identifier Code: S50). The airport is owned and operated by the City of Auburn, Washington.

This project replaces the airport's 2002-2022 master plan update[1] which will serve as a primary source for inventory data. However, where available, more current or comprehensive data have been included in the chapter to illustrate current conditions. Existing airfield facilities were examined during on-site inspections to update facility inventory data and recent aerial photography was used to provide a current view of existing facilities. The consultants also worked closely with airport management staff to review the current facility and operational data maintained by the City.

Airport Locale

Auburn is an incorporated city located in southwest King County and a small area of northeastern Pierce County, approximately 26 miles south of Seattle and 13 miles northeast of Tacoma. Auburn is bordered by the cities of Kent, Federal Way, Pacific, Sumner and Algona, and unincorporated King and Pierce County. The Muckleshoot Indian Reservation is located near the southeastern corner of the Auburn city limits. Within the Puget Sound region, King County is bordered by Snohomish County (north) and Pierce County (south). Kitsap, Kittitas, and Chelan counties also border King County to the west and east. A location and vicinity map for Auburn Municipal Airport is provided in **Figure 2-1**.

[1] Auburn Municipal Airport Master Plan Update 2001-2020 (W&H Pacific, December 2002)



AUBURN MUNICIPAL AIRPORT | AIRPORT MASTER PLAN

LOCATION MAP | **FIG. 2-1**

CENTURY WEST ENGINEERING CORPORATION

Auburn Municipal Airport is located in North Auburn, about 1 mile north of downtown Auburn, east of Highway 167 and U.S. Interstate 5, and north of Highway 18. Surface access to the airport is provided by local surface streets and Highway 167 and 18, which connect to U.S. Interstate 5 (I-5) and 405 (I-405). The airport is bordered by major arterial roadways on its south and north ends (15th Street N.E. and 30th Street N.E.). Access to the developed east side of the airport is provided via D Street and E Street N.E., which connect to Auburn Way North via 22nd and 26th Street N.E. and to 15th Street N.E. The north hangar area is accessed directly from 30th Street N.E.

As noted in the Introduction chapter, Auburn Municipal Airport has been in continuous aviation use since its initial construction as a small airstrip in 1969-70. The airport serves Auburn, Federal Way, Kent and greater King County. There are ten (10) publicly-owned, public use airports located within 35 nautical miles of Auburn. The majority of the airports are general aviation, although SEATAC, King County International (Boeing Field), Snohomish County (Paine Field), and Renton also accommodate transport aircraft, either in commercial service or related to aircraft manufacturing. There are numerous privately-owned airports in the vicinity of Auburn, including nearby Crest Airpark, which is public use. The significance of the airport service area will be discussed in detail in the aviation activity forecasts (Chapter 3).

Physical Geography

Auburn is located south of Seattle on the east side of the Puget Sound. The low areas surrounding Puget Sound are characterized by coastal forest lands, rolling hills and plentiful water sources. Auburn is located in the Green River Valley, bordered by the foothills of the Cascade Range to the east and the West Hills areas of Des Moines, Kent and Federal Way to the west. Two major water sources in the local area include the White River and Green River. The White River borders the southern edge of the City of Auburn and winds east to connect to the Green River. The Green River begins near South Seattle and winds south-south east through the northeast portion of Auburn and east into the Cascades. Lake Tapps Reservoir is located south of downtown Auburn and was originally created by Puget Sound Energy (PSE) for power generation. Hydropower operations stopped in 2004 and the area is now used for many different recreational activities.

Auburn Municipal Airport is located in a low-lying valley floor, 63 feet above mean sea level (MSL). Nearby Seattle-Tacoma International Airport (8.1 miles northwest) sits on an elevated plain at 433 feet MSL. Moderate mountainous terrain along the east side of the Green River Valley begins about 15 miles from the airport and extends into the Cascade Range. Maximum elevation figures (MEF) depicted on the Seattle VFR Terminal Area Chart (TAC) indicates the highest terrain elevations are found within 25 miles at 6,500 feet MSL, to the south and east (north of Mt. Rainer). Areas to the immediate south, north and west have low-lying terrain surrounding Puget Sound ranging from 2,400 to 4,500 feet MSL.

Climate

Auburn has a temperate maritime-influenced climate with mild winter and warm summer temperatures that are characteristic of the east side of Puget Sound. The region produces moderate rain and occasional snow during the winter months, usually in conjunction with periodic storm events, but does not normally experience extended periods of freezing temperatures.

Historic climatic data (1948-2005) for the local area is available from the National Weather Service observation site in Kent (station number 454169), located approximately 4 miles north of the airport.2 The data indicate that July and August are typically the warmest months; December and January are the coldest. On a monthly basis, the average maximum temperature is 78.0 degrees Fahrenheit (July) and the average minimum temperature is 46.2 degrees (December and January). Annual precipitation averages 39.13 inches, with approximately 45 percent occurring in the three-month period from November to January, where monthly totals normally approach 6 inches. Precipitation during the summer months averages about 1.2 inches per month.

Historical Aviation Activity

Auburn Municipal Airport accommodates a wide variety of aeronautical activity, including small single- and multi-engine aircraft, civilian helicopters, and occasional business class turbine aircraft. The current runway length of 3,400 feet is the primary determinant in fixed-wing aircraft usage, particularly limiting multi-engine turboprop and business jet aircraft. Auburn Municipal Airport is classified as a Reliever airport in the National Plan of Integrated Airport Systems (NPIAS) defined by the Federal Aviation Administration (FAA). Reliever airports are intended to provide additional general aviation capacity to nearby commercial service airports. Four of the five Reliever airports in Washington are located in the Puget Sound region (Auburn, Renton, Paine Field, and Harvey Field); Felts Field in Spokane is also designated a Reliever airport by FAA.

Auburn Municipal Airport currently has several commercial tenants providing aircraft maintenance or other services. Northwest Aviation College (NAC), a private flight training school located on the airport, closed in 2012. In recent years, NAC operated a fleet of 10 fixed wing aircraft generating approximately 40,000 annual operations at Auburn Municipal Airport. Airport Management Group (AMG), the City of Auburn's contract airport manager, provides on-site airport management and aircraft fueling.

According to airport management records, Auburn Municipal Airport currently has 274 based aircraft (February 2013). As an airport without an air traffic control tower, actual counts of aircraft takeoffs and landings (operations) are not regularly maintained. The 2002 airport master plan estimated 141,000 operations and 276 based aircraft in 2000. This estimate reflected significant flight school air traffic associated with Northwest Aviation College, which ended operations at the airport in early 2012. A detailed analysis of aviation activity data will be presented in the updated Aviation Activity Forecasts (Chapter 3). Current airport activity is summarized in **Table 2-1**.

[2] The Weather Channel

TABLE 2-1: AUBURN MUNICIPAL AIRPORT (S50) BASED AIRCRAFT AND OPERATIONS

AIRCRAFT TYPE	NUMBER AT AIRPORT
Based Aircraft *February 2013 Airport Management Count*	
Single-Engine Piston	262
Multi-Engine Piston	8
Turboprop	0
Turbojet	0
Rotorcraft	4
Other	0
Total Based Aircraft	**274**
Annual Aircraft Operations ➢ 2002 Airport Master Plan Estimate (2000) ➢ 2012 Estimate (see Forecast chapter)	 96,136 --

Airfield Facilities

Auburn Municipal Airport has one runway (16/34) that is oriented in a north/south direction (160-340 degree magnetic heading). The runway is equipped with lighting and visual guidance indicators (VGI) and has a full length parallel taxiway on its east side. All existing landside development (hangars, aircraft parking, etc.) is located on the east side of the airport. An undeveloped area (approximately 23 acres) is located near the southwest corner of the airport.

Auburn Municipal Airport does not have an air traffic control tower and is classified as a non-towered airport. At non-towered airports, pilots are responsible for proper communication and aircraft operation, including maintaining adequate separation from other aircraft in flight or on the runway-taxiway system. The airport has common traffic advisory frequency (CTAF)/Unicom for communications on the ground and in the vicinity of the airport. **Table 2-2** summarizes airport data. **Figure 2-2** depicts existing airfield facilities.

TABLE 2-2: AIRPORT DATA

AIRPORT NAME / DESIGNATION	AUBURN MUNICIPAL AIRPORT (S50)
Airport Owner	City of Auburn
Date Established	1970
Airport Category	National Plan of Integrated Airport Systems (NPIAS): Reliever (General Aviation) FAA Airport Reference Code: B-I (small) (per the 2002 ALP) Washington State Aviation System Plan: Regional Service
Airport Acreage	Approximately 110 Acres as indicated on current FAA Airport Master Record Form 5010-1
Airport Reference Point (ARP) Coordinates	N 47º 19.66' W 122º 13.60'
Airport Elevation	63 feet Mean Sea Level (MSL)
Airport Traffic Pattern Configuration/Altitude	Right Traffic (Rwy 16)/Left Traffic (Rwy 34) • Fixed wing pattern 1,063 feet above mean sea level (MSL) / 1,000 feet above ground level (AGL) • Helicopter pattern: 563 feet above mean sea level (MSL) / 500 feet above ground level (AGL)

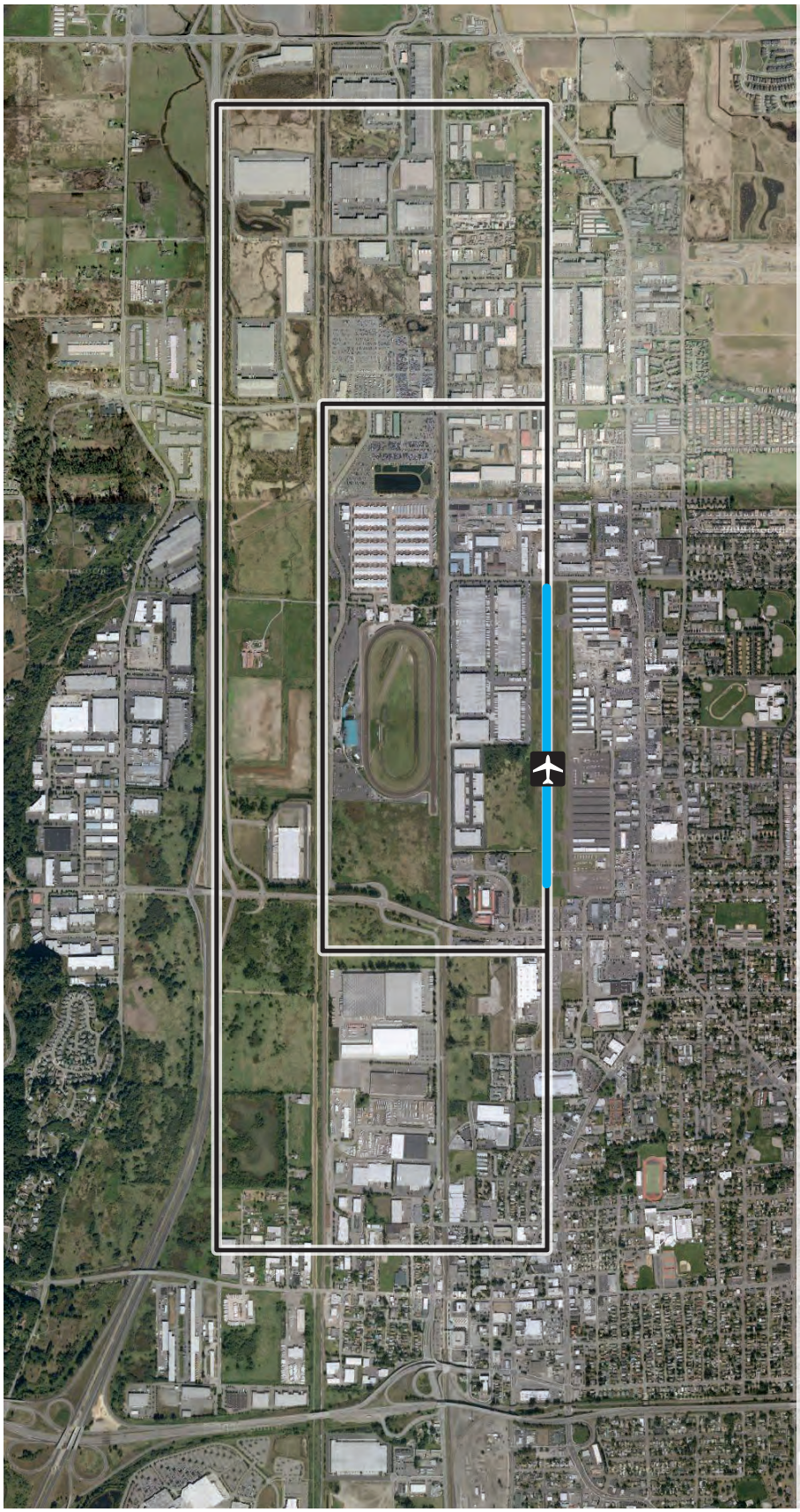
The published airfield elevation is 63 feet above mean sea level (MSL).[3] The traffic patterns for both runway ends are located on the west side of the runway and pilots are advised to avoid noise sensitive areas east of the airport and hospital facilities located 1 mile south of the runway. The traffic pattern for Runway 34 is standard left traffic (left hand turns within the pattern), while Runway 16 has a right traffic pattern (right turns within the pattern). Wind conditions typically dictate which runway end is in use and the direction of flight in the traffic pattern. The traffic pattern altitude for fixed wing aircraft is 1,000 feet above ground level (1,063 feet MSL); the traffic pattern altitude for helicopters is 500 feet above ground level (563 feet MSL). **Figure 2-3** depicts the traffic patterns for Auburn Municipal Airport.

[3] Surveyed by the National Geodetic Survey. Datums: National Geodetic Vertical Datum of 1988 (NGVD 88); North American Datum of 1983 (NAD 83)

AUBURN MUNICIPAL AIRPORT | AIRPORT MASTER PLAN

EXISTING CONDITIONS | **FIG. 2-2**

CENTURY WEST ENGINEERING CORPORATION



Noise sensitive areas run south to north on both the east and west side of the airport

Fixed wing fly westside pattern 1,000′ MSL over highway

Rotorcraft fly westside pattern 500′ MSL over RR tracks

Rotorcraft must remain clear of fixed wing aircraft

All aircraft shall avoid making turn prior to reaching 500′ MSL while departing

LHT for RWY 34 and RHT for RWY 16

Fixed wing aircraft entering pattern from the east are expected to over flight the airport east to west at 1,500′ MSL and enter on the downwind on 45

Over flight of Emerald Downs and their stables is prohibited

CITY OF AUBURN WASHINGTON

Runway

RUNWAY 16/34

Runway 16/34 is 3,400 feet long and 75 feet wide with an asphalt surface. The original runway pavement was constructed in 1969 (2,900' x 75') and a south extension (500' x 75') was added in 1983. The entire runway was rehabilitated in 2004 with a 2" asphalt overlay.[4] The runway is equipped with edge lighting and visual approach aids. The effective gradient of the runway is approximately 0.19 percent, with the high point (63 feet MSL) located at its south end (Runway 34 threshold). The runway is served by a full length parallel taxiway (Taxiway A) on its east side with 5 exit taxiways (Taxiways C-G).

The runway has basic (visual) markings on both ends, consistent with current visual and nonprecision instrument (circling) approach capabilities. The runway markings (white paint) include runway designation numbers, and centerline stripe. Yellow taxiway lead-in lines are painted on the runway at each of the five exit taxiways. All runway markings are consistent with FAA standards for configuration, color, and approach type (basic visual approach/non-precision instrument). The markings were observed to be in good condition during a recent site visit.

TABLE 2-3: RUNWAY 16/34 DATA

Dimensions	3,400 x 75 feet
Bearing	S 00°52'25" W (True)
Effective Gradient	0.19%
Surface/Condition	Asphalt/Good
Markings	Basic/Visual: Runway Landing Designation Numbers, Centerline Stripes, Taxiway Lead-In Lines (good condition)
Lighting	Runway Edge, Threshold, Vertical Guidance Indicators, Runway End Identifiers (See Table 2-6)
Signage	Mandatory, Location, and Directional (internally illuminated)

Airfield Pavement Strength

Runway 16/34 has a published weight bearing capacity of 12,500 pounds for aircraft equipped with single wheel landing gear.[5] A single wheel 12,500 pound rating is the FAA standard for runways designed to serve single-engine and multi-engine piston, single-engine and multi-engine turboprops, small business jets and very light jets (VLJ) with operating weights at or below 12,500 pounds. The airport's taxiways, aprons, and hangar taxilanes also have pavement designs that are consistent for use by small aircraft.

[4] 2005 Pavement Management Report – Auburn Municipal Airport

[5] FAA 5010-1 Airport Record Form; FAA Airport/Facility Directory (A/FD) Northwest U.S.

During a recent site inventory, runway and main taxiway pavements were observed to be in good or very good condition, consistent with age. Some apron and taxilane pavements are showing wear with isolated areas of distress.

Runway Wind Coverage

It is generally preferable for aircraft to land and takeoff directly into the wind, although varying wind conditions often require crosswind operations at airports. When wind conditions exceed the capabilities of a specific aircraft, use of a crosswind runway (when available) may occur. At airports with single runways, occasional periods of strong crosswinds often limit operations until conditions improve.

The FAA-recommended planning standard is that primary runways should be capable of accommodating at least 95 percent of wind conditions within the prescribed crosswind component. This component is based on a direct crosswind (90 degrees to the direction of flight) of 10.5 knots (12 miles per hour) for small aircraft and 13 knots (15 miles per hour) for larger general aviation aircraft. Transport and larger military aircraft are typically designed to accommodate higher crosswind components. Aircraft are able to tolerate increasingly higher wind speeds as the crosswind angle is reduced and moves closer to the direction of flight.

The wind roses depicted on the 2002 Airport Layout Plan graphically illustrate the favorable relationship between the runway alignment, local wind conditions and terrain. It is assumed that SEATAC airport wind data was used to develop the wind rose based on the close proximity of the airport (8 miles northwest) and the same 160-340 degree runway alignments. The wind roses indicate 98.9 percent coverage in all-weather conditions and 99.2 percent coverage during instrument weather conditions, both of which exceed the FAA crosswind coverage standard for small aircraft.

Taxiways

Auburn Municipal Airport has a full length parallel taxiway on the east side of Runway 16/34 that provides access to the entire runway and adjacent aprons and landside facilities. A system of taxilanes provides access to aircraft parking aprons and hangar development areas on the east side of the airport. It is noted that the taxiway designations on the airport have changed slightly since the 2002 airport master plan. The five exit taxiways that were previously designated Taxiways A-E are now designated Taxiways C-G and the parallel taxiway is designated Taxiway A. **Table 2-4** summarizes existing taxiway facilities. **Figures 2-2 and 2-3**, presented earlier in the chapter, depict the major taxiways on the airfield.

TAXIWAY A

Taxiway A is the east parallel taxiway for Runway 16/34. Taxiway A is 25 feet wide and has a runway separation of 240 feet. Taxiway A has five exit taxiway connections to the runway. The number and location of the exit taxiways promotes efficient aircraft movement in the runway-taxiway system.

The parallel taxiway and exit taxiways were reconstructed (widened and/or reconfigured) in 2009 and are in very good to excellent condition. The previous configuration included closely-spaced dual taxiways (20 feet wide) on the northern half of the parallel taxiway which have been replaced with a single 25-foot wide taxiway.

Taxiway A has a centerline stripe with striping connecting to each runway exit taxiway and adjacent hangar or apron taxilanes. The east edge of Taxiway A is marked with a dashed yellow stripe where it abuts adjacent apron or taxilane paved areas. The striping and markings on the parallel taxiway are in very good condition. Taxiway A is equipped with medium intensity taxiway lighting (MITL) and has extensive lighted airport directional and informational signage.

Taxiway A has four aircraft hold areas (varying sizes) located adjacent to the taxiway on its west (interior) side. The hold areas are at both ends of the runway (adjacent to Taxiways C and G) and adjacent to two interior exit taxiways (Taxiways D and F). The hold areas are marked with centerline stripes along their inner edges, but do not have markings indicating the edge of parallel taxiway object free area (OFA), which is used to define wingtip clearance to a fixed or moveable object for taxiing aircraft.

TAXIWAYS C-G (RUNWAY 16/34 EXITS)

Runway 16/34 has five 90-degree exit taxiways (C-G) that connect the runway and the east parallel taxiway (Taxiway A). The exit taxiways vary in width from 30 to 40 feet and are approximately 190 feet long. The exit taxiways are equipped with blue medium intensity taxiway edge lighting (MITL) and are marked with aircraft hold lines located 125 feet from runway centerline. The aircraft hold lines (and accompanying signage) are located at the edge of the runway obstacle free zone (OFZ), a protected area surrounding the runway that is kept free of taxiing or holding aircraft, except when accessing or exiting the runway. As noted earlier, taxiway lead-in lines are located on the runway and connect with the exit taxiway centerlines. The striping and markings on the major taxiways are in good condition.

ACCESS TAXILANES AND TAXIWAYS

Auburn Municipal Airport has several access taxilanes serving aircraft hangar areas on the east side of the runway. The three paved aircraft aprons on the airport also have defined taxilanes to provide access to aircraft parking and fueling. The condition of the taxilanes range from fair to good, although some sections were rated "poor" in the most recent pavement inspection in 2012. Most of the taxilanes are marked with yellow centerline stripes that vary in condition from poor (faded or worn) to good.

North Hangar Access Taxiway

The north hangar area is served by a taxiway that extends beyond the north end of Taxiway A. The taxiway is approximately 35 feet wide and is semi-parallel to the extended runway centerline (approximately 245 to 250 feet east of runway centerline). The access taxiway connects to five east-west stub taxilanes located between five rows of hangars.

North Hangar Area Taxilanes

The north hangar area has five east-west stub taxilanes located between rows of multiple-unit hangars (City of Auburn, Auburn Hangar Owners Association – AHOA, Auburn Flyers Condo, Jim Jacobson). All of the hangars are oriented in rows perpendicular to the runway and use the stub taxilanes to connect to the north access taxilane and Taxiway A, which provides direct access to all other areas of the airfield. The spacing between hangar rows (taxilane object free area) varies from approximately 70 to 80 feet.

Auburn Condo Hangar Association (ACHA) Taxilanes

The ACHA hangar area located near mid-runway is served by four east-west taxilanes that connect to a north-south taxilane located near the east end of the area to form a taxilane loop. The taxilanes provide access to seven multi-unit hangars. Four hangars are dual-sided and one hangar is one-sided, oriented in rows perpendicular to the runway and use the stub taxilanes to connect to Taxiway A. Two hangars located along the west edge of the development are oriented north-south with west-facing doors. The spacing between hangar rows (taxilane object free area) varies greatly from approximately 40 to 60 feet. The narrowest taxilane clearance (<40 feet) is on the north-south taxilane that fronts the hangars located at the rear (east end) of the development. The clearance between buildings in this area is reduced by electrical panels and protective bollards installed on the east ends of the east-west oriented hangars and by vehicles parked in the taxilane. Non-movement areas are marked (yellow cross hatching) at the west end of four hangars located directly adjacent to Taxiway A.

South Hangar Area Taxilanes

The south hangar area consists of eight rows of multi-unit hangars (City of Auburn and Auburn Flyers Condo) and eight stub taxilanes located between the south and central aircraft parking aprons. The hangar rows are oriented perpendicular to the runway and the stub taxilanes connect directly to Taxiway A. A narrow paved vehicle access lane extends along the eastern end of the development, between the hangar ends and the adjacent security fence. Except for the southern-most hangar row which has north-facing units, the other hangars in this area are dual-sided T-hangars. The spacing between hangar rows (taxilane object free area) varies from approximately 75 to 80 feet, although vehicles parked on adjacent taxilanes reduce actual wingtip clearance for taxiing aircraft.

The northern-most taxilane in this area provides access to the north units in Hangar Row 2 (including the aircraft wash rack located near the east end of the hangar) and to 7 aircraft tiedowns located on the south side of Building "506" which currently accommodates airport management offices and commercial lease space.

South Access Taxiway

The south access taxiway extends from the intersection of Taxiway A and Taxiway C to the southwest corner of the south tiedown apron. The taxiway is 20 feet wide and extends approximately 300 feet, parallel to the extended runway centerline (approximately 210 feet east of runway centerline).

Auburn Flight Service (FBO Access Taxilanes)

Two paved access taxilanes extend from Taxiway A to a small apron adjacent to the Auburn Flight Service hangar. The taxilanes are approximately 20 feet wide and 325 feet long and provide access to 8 adjacent paved aircraft parking pads and the northern row of grass tiedowns. A grass-surfaced aircraft parking area located adjacent the hangar has an unpaved taxilane located between the tiedown rows that also connects to Taxiway A. The taxilanes are located within the lease area and are privately funded and maintained.

TABLE 2-4: TAXIWAY DATA (AUBURN MUNICIPAL AIRPORT)

TAXIWAY	DESCRIPTION	DIMENSIONS/CONFIGURATION
Taxiway A	East Parallel Taxiway	3,400 x 25' with five exit taxiways Asphalt surface w/ yellow centerline stripe and outer edge stripe; MITL (Blue)
Taxiways C, D, E, F, G	90-degree Exit Taxiways for Runway 16/34 and Parallel Taxiway (A)	190' (Length of section between runway edge and parallel taxiway edge) Widths Vary: 30 to 40 feet Asphalt surface w/ centerline stripe; taxiway lead-in lines from runway; aircraft hold lines at each runway connection (125' from runway centerline); MITL (Blue) Exit Locations (distance from runway ends 34/16): C – Rwy 34 threshold (0'/3,400') D – (525'/2,875') E – (1,425'/1,975') F – (2,425'/975') G – Rwy 16 threshold (3,400'/0')
North Hangar Area Access Taxiway	Taxiway extending beyond north end of Taxiway A	Approximately 500 x 30' Asphalt surface w/ centerline stripe and connections with stub taxilane centerline stripes
North Hangar Taxilanes	Taxilanes within hangar area (continuous pavement between all hangars)	Widths of useable pavement between hangars vary from 70 to 80' Asphalt surface w/ centerline stripes
ACHA Hangar Taxilanes	Taxilanes within hangar area (continuous pavement between all hangars)	Widths of useable pavement between hangars vary from 40 to 60' Asphalt surface w/ centerline stripes; non-movement areas marked at west end of hangars directly adjacent to Taxiway A
South Hangar Taxilanes	Taxilanes within hangar area (continuous pavement between all hangars)	Widths of useable pavement between hangars vary from 75 to 80' Asphalt surface w/ centerline stripes
Auburn Flight Service FBO Taxilanes	2 paved and 1 grass taxilanes within FBO lease area serving aircraft parking and hangar	Paved Taxilanes: 325 x 20' Asphalt surface w/ centerline stripes Grass Taxilane: 285 x 18'
Apron Taxilanes *(north, central and south aprons)*	Apron/ Tie Down Taxilanes	Taxilanes between or adjacent to tiedown rows and aircraft fueling area; Asphalt surface w/ centerline stripes Taxilane clearances (to adjacent tiedowns) vary from 62 to 80 feet (less clearance when tiedowns are occupied)

Aircraft Apron

Auburn Municipal Airport has three paved apron areas located on the east side of Runway 16/34 that accommodate local and visitor aircraft tiedowns, airport management offices, and aircraft fueling. The airport also has a grass tiedown apron and eight paved parking positions located at the south end of the airport leased to Auburn Flight Service. The aprons are currently configured with a total of 169 small airplane tiedowns, although not all tiedowns are marked or actively used. **Table 2-5** summarizes the existing apron facilities at the airport.

NORTH TIEDOWN APRON

The north tiedown apron is located near mid-field, north of exit taxiway E and the aircraft fueling area, and immediately south of the ACHA hangar area. The apron accommodates small airplane parking and is configured with two east-west tiedown rows served by two adjacent taxilanes that connect directly to Taxiway A. The center row is double-sided with 13 tail-in tiedowns (designated N 01-13). The southern row originally included 7 north-facing tail-in tiedown positions, although three tiedowns at the west end of the row are not currently available. The tiedowns in the south row are not numbered. The apron originally included a northern row of 7 tiedowns that were eliminated to provide access to 5 south-facing units in an adjacent T-hangar that was constructed since the last master plan was completed. In its current configuration, the north tiedown apron has **17 useable tiedowns**. Vehicle access to the north tiedown apron is provided through the automated gate located adjacent to the airport management office.

CENTER TIEDOWN APRON

The center tiedown apron is located near mid-field, directly in line with exit taxiway E and immediately north of the south hangar area. The apron accommodates aircraft loading/unloading and parking for transient aircraft, based aircraft parking, and aircraft fueling. The airport management office is located in Building "506," formerly used by Auburn Flight Service/Northwest Aviation College located adjacent to the apron. Vehicle access to the center tiedown apron is provided through the automated gate located adjacent to the airport management office.

The center apron has four taxilane connections (striped) to Taxiway A. The outer section of the apron directly abuts Taxiway A and includes the aircraft fueling area and 10 visitor aircraft tiedowns (marked inside a 200 x 52' rectangle). The fuel island is oriented east-west with two pumps located at the east end. Taxilane centerline striping extends from Taxiway A to aircraft fueling positions on the north and south sides of the tank. A small office is located near the fuel tanks at the northwest corner of the center apron.

The main tiedown area is configured with four east-west tiedown rows served by three adjacent taxilanes. The two center rows are double-sided with 16 and 17 tail-in tiedowns (designated C07-39). The outer (western most) tiedown position in the northern double-sided row is not currently used (not marked or numbered) due to its proximity to the fueling island and taxilanes. The north row has 6 south-facing

tiedowns (designated C 01-06) and the south row has 5 north-facing tiedowns (designated C40-44). There are 11 tiedowns located adjacent to Building "506" which was formerly used as a flight school; 4 tiedowns are located in front of the building (west/northwest frontage) and 7 tiedowns are located on a small section of apron south of the building. In its current configuration, the center tiedown apron and south extension has **65 useable tiedowns**.

SOUTH TIEDOWN APRON

The south tiedown apron is located at the southeast corner of the airport, adjacent to Taxiway C and the south end of the runway. The apron accommodates parking for transient and based aircraft. A section of the apron is leased to a local line controlled model aircraft club (NW Skyraiders). A combination lock pedestrian gate is located on the south side of the apron adjacent to a motel. Vehicle access to the apron is provided through two automated gates located on the south and east sides of the apron.

The south apron has two taxilane connections to Taxiway A. The primary taxilane connection is located at the northwest corner of the apron where Taxiway A and C meet at the Runway 34 end. A bypass taxiway extends south of Taxiway C to an aircraft hold area and connects at the southwest corner of the apron.

The south apron is configured with four east-west tiedown rows served by three adjacent taxilanes. The two center rows are double-sided with 21 tail-in tiedowns each (42 total); the north row has 11 tiedowns and the south row has 10 tiedowns. It is noted that the northern two rows of tiedowns are numbered (S01-11 and S12-32) and the southern two rows are not numbered. In its current configuration, the south tiedown apron has **63 useable tiedowns**.

AUBURN FLIGHT SERVICE APRON (FBO LEASE)

Auburn Flight Service, a local fixed base operator (FBO) providing aircraft maintenance services, leases the area immediately north of the south tiedown apron. The leased area includes aircraft parking (a grass surfaced apron with 16 tiedowns and 8 paved tiedown pads), a commercial hangar, vehicle parking, a small apron, and dual access taxilanes that connect to Taxiway A. In its current configuration, the south FBO lease area has **24 designated tiedowns** with additional paved apron space to accommodate 4 to 6 more aircraft.

TABLE 2-5: AIRCRAFT APRONS (AUBURN MUNICIPAL AIRPORT)

APRON	DESCRIPTION
North Tiedown Apron	Approximately 350 x 230' (8,940 square yards) Asphalt Concrete Current Use: Small airplane tiedowns located north of the fueling area and hangar frontage (north edge) Tiedowns: 17 small airplanes
Center Apron	Approximately 498 x 330' (18,260 square yards) Asphalt Concrete Current Use: Small airplane tiedowns (local and transient), aircraft fueling, access to adjacent commercial buildings Tiedowns: 65 small airplanes
South Tiedown Apron	Approximately 498 x 330' (18,260 square yards) Asphalt Concrete Current Use: Small airplane tiedowns (transient and based aircraft parking) Tiedowns: 63 small airplanes
Auburn Flight Service FBO Lease Apron (south)	Approximately 285 x 115' (3,600 square yards) Grass surface; 8 Asphalt parking pads (325 x 55' - 1,990 square yards) and adjacent paved taxilane. Current Use: Small airplane tiedowns, FBO services (aircraft maintenance) Tiedowns: 24 small airplanes
Total Number of Designated Aircraft Parking Positions	**169 small airplane tiedowns**

Airport Lighting and Signage

Auburn Municipal Airport accommodates day and night operations in visual weather conditions and day operations in instrument meteorological conditions (IMC). The airport's published instrument approach indicates that night procedures are not authorized.

The runway is equipped with lighting systems that are consistent with current approach requirements and runway use. The runway-taxiway system has extensive illuminated signage that provides directional, location, and runway clearance information to pilots. **Table 2-6** summarizes the categories of airport lighting currently used at the airport. All airfield lighting observed during recent site visits appeared to be in fair condition or better and fully operational.

TABLE 2-6: TYPES OF AIRPORT LIGHTING USED AT AUBURN MUNICIPAL AIRPORT

CATEGORY	TYPE	CONDITION
Airport Lighting	Airport Rotating Beacon (white/green dual lens) Operates on dusk-dawn photocell switch	Good/Fair
Runway Lighting	Medium Intensity Runway Lighting (MIRL) (white lenses) Threshold Lighting (red/green lenses) Runway End Identifier Lights (REIL) (white strobes) Pilot-Activated (via CTAF radio frequency)	Good
Visual Guidance Indicators	4-Light VASI (red/white lenses) • Rwy 16: (V4R) 4.5 degree glide path • Rwy 34: (V4L) 4.0 degree glide path Operate Continuously	Good
Taxiway Lighting	Medium Intensity Taxiway Lighting (blue) on Taxiway A and runway exits (Taxiways C-G) Pilot-Activated (via CTAF radio frequency)	Excellent
Airfield Signage	Mandatory, Location, and Directional	Fair
Other Lighting	Obstruction lights, lighted wind cone/segmented circle, flood lighting in hangar, fuel areas.	Good

AIRPORT LIGHTING

The airport has a rotating beacon mounted on the roof (west end) of the T-hangar located immediately south of the center tiedown apron on the east side of the airport. The beacon was relocated since the last master plan from an off-airport site on "B" Street NW, approximately ¼ mile west of the runway. Rotating beacons are used to indicate the location of an airport to pilots at night or during reduced visibility. The beacon provides sequenced white and green flashing lights (representing a lighted land airport) that rotate 360 degrees to allow pilots to identify the airport from all directions from several miles.

An illuminated wind cone is located on the west side of the runway and is located in the segmented circle. A second unlighted wind cone is located near the end of Runway 34 (@ Taxiway D) on the west side of the runway.

The rotating beacon and lighted wind cone operates on an automatic dusk-dawn photocell switch. The runway lighting and taxiway lighting are pilot-activated using the common traffic advisory frequency (CTAF) 122.8 MHz. The visual guidance indicators operate continuously. All airfield lighting reportedly functions normally.

RUNWAY LIGHTING

Runway 16/34 has medium intensity runway edge lighting (MIRL) and runway end identifier lights (REIL).

- **MIRL:** The MIRL system includes white edge lights and runway threshold lights. The threshold light fixtures have split lenses (green/red) indicating the beginning and end of the runway.

- **REIL:** Runway 16/34 is equipped with runway end identifier lights (REIL), which consist of two high-intensity sequenced strobe lights that mark the end of the runway to assist pilots in establishing visual contact with the runway environment during periods of darkness or reduced visibility.

Visual Guidance Indicators: Runways 16 and 34 are equipped with a 4-light Visual Approach Slope Indicators (VASI). The VASI projects light along an established glide path to a runway end, with red and white colored lights indicating the aircraft's vertical position (above, below, or on glide path) relative to the defined glide path. The VASI at both runway ends have slightly steeper glide path angles (4 and 4.5 degrees to address close in obstruction clearance) compared to the standard 3-degree glide path.

Taxiway Lighting: The runway exit taxiways and the parallel taxiway at Auburn Municipal Airport are equipped with blue medium intensity taxiway edge lighting (MITL). The MITL system was installed new in 2009 as part of the parallel taxiway reconstruction/reconfiguration. The MITL fixtures are mounted on individual concrete foundation pads and are in excellent condition.

Airfield Signage: The runway-taxiway system has internally illuminated mandatory instruction signs (red background with white letters/numbers) marking the aircraft holding positions at each of the taxiway connections with the runway [34-16, etc.]; the signs also include taxiway direction/designations [B, C, D, → etc.] with yellow background and black numbers/letters. The signs are located to coincide with the painted aircraft hold lines on each taxiway that connects to the runway.

Other Lighting: Overhead lighting is available in the terminal area and main aircraft parking aprons, the aircraft fueling area, and in various hangar areas. Some hangars also have exterior wall-mounted flood lights. Red obstruction lights are mounted on the tops of several structures, antennae, and other items on, and in the vicinity of the airfield.

Agricultural Aircraft Facilities

Auburn Municipal Airport does not accommodate locally based aerial applicators and there are no designated agricultural aircraft loading areas on the airport.

Helicopter Facilities

Auburn Municipal Airport accommodates regular helicopter activity from both locally-based and transient aircraft. All helicopter operations (takeoffs and landings) at the airport currently utilize the runway-taxiway system. The airport currently has four based helicopters, two of which are used in flight training. The airport also accommodates regular helicopter activity from area flight schools located at Boeing Field and other nearby airports. Most of the helicopter flight training activity involves work within the traffic pattern since the airport does not have a designated practice area outside the runway environment. A small gravel pad used for helicopter training is located on the west side of the runway, approximately 180 feet west of the runway centerline and 400 feet north of the Runway 34 end. The

airport does not currently have designated parking areas for helicopters, although airport management is currently considering adding helicopter parking on the south aircraft tiedown apron.

Airfield Pavement Condition

The Washington State Department of Transportation (WSDOT) Aviation Division maintains the Airport Pavement Management System (APMS) for Washington airports in the Washington State Aviation System Plan (WSASP) and the Federal Aviation Administration (FAA) National Plan of Integrated Airport Systems (NPIAS). The APMS is a tool to identify pavement system needs, make programming decisions for funding, provide information for legislative decision making, and assist local jurisdictions with planning decisions with the goal of maximizing the useful life of pavements and reducing long-term pavement costs throughout the system.

Through visual inspections and use of MicroPAVER computer software, existing pavement conditions are determined and future conditions are predicted for each airfield pavement section being evaluated (runway, parallel taxiway, apron, etc.). Large sections of pavement are generally divided into small units to provide multiple inspection points that can capture isolated areas of distress in addition to providing an overall indication of condition. For example, Runway 16/34 consists of two primary sections originally constructed 14 years apart; within these two sections, the APMS defines 45 individual 75 x 75' square units. The pavements are rated using a Pavement Condition Index (PCI), which has a scale of 0 (failed) to 100 (excellent). The PCI quantifies the types, severities, and amounts of distress present in the pavement visual inspections then predicts future condition based on pavement type, design, wear, climate, etc. The program also identifies the preventive maintenance or rehabilitative measures needed to extend the useful life of the pavement.

On-site pavement inspections and management reports are periodically updated to assist airports in the ongoing maintenance of airfield pavements. The most recent APMS inspection conducted at Auburn Municipal Airport was in September 2012. Preliminary data was provided by WSDOT Aviation for this study, although the complete report will not be available until later in 2013. **Table 2-7** summarizes airfield pavement conditions for Auburn Municipal Airport based on the 2012 and the previous (2005) inspections. The following distress categories are noted in various 2012 pavement inspections sheets: "*longitudinal and transverse cracking, alligator cracking, patching, rutting, weathering/raveling, depression, and swelling.*" Pavements reconstructed in 2009 (parallel taxiway, portions of the exit taxiways, new aircraft hold areas) had no distresses observed in the 2012 inspection.

Updated 2012 report data will be added to this chapter and used elsewhere in the master plan when it is available. Based on the 2012 inspection, the major airfield pavements are rated 70 or above, although some apron and hangar taxilane pavements are in the 45-70 range, and some isolated areas are rated below 45. The lower rated pavements will require rehabilitation or reconstruction early in the planning period while the useful lives of other pavement sections can be extended well into the planning period through regular pavement maintenance.

The branch report contained in the 2005 pavement study indicated that the airport had 1.284 million square feet (SF) of active airfield pavement, which equals approximately 29.5 acres of surface area, not including the two leased areas on the airport with tenant constructed pavement.

TABLE 2-7: SUMMARY OF AIRFIELD PAVEMENT CONDITION (S50)

PAVEMENT	SECTION DESIGN/AGE	2012 PCI RATING[1,2]	2005 PCI RATING[2]
Runway 16/34	**Full Runway: 2" Asphalt Overlay 2004** North Section (from Rwy 16 end to Txy D): 2" AC, 18" Aggregate Base (1969) South Section (From Rwy 34 end to Txy D) 2" AC; 3" Aggregate Base, 11" Aggregate. Subbase (1983)	81 76	100 100
Taxiway A (East Parallel Taxiway)	**New Construction (Reconfigured) 2009** 2.5" AC, 3" Base Course, 9" Aggregate Base (2009)	100	N/A
Exit Taxiways C, D, E, F	East 2/3: Reconstructed (2009) 2" AC, 3" Aggregate Base, 11" Aggregate Subbase West 1/3: (1969): 2" AC, 18" Aggregate Subbase	100 61	69-96
Exit Taxiway G	2" AC, 18" Aggregate Base (1969)	60	73
North Hangar Access Taxiway	3" AC, 2" Crushed Aggregate Base, 13" Aggregate Subbase (1999)	75	96
South Apron Access Taxiway (south of Rwy 34)	2" AC, 3" Aggregate Base, 11" Aggregate Subbase (1986)	71	68
North Tiedown Apron (north of fuel)	Unknown AC, Unknown Base (1986)	65	79
Center Apron/Main Apron	Front Section (fuel area, visitor parking, south section) Unknown AC, Unknown Base (1972) Main Section (tiedowns) Unknown AC, Unknown Base (1989) Outer Strip (adjacent to Taxiway A) 2" AC, 18" Aggregate Base (1969)	45 76 29	61 91 56
South Tiedown Apron	2" AC, 3" Aggregate Base, 11" Aggregate Subbase (1982)	71	88
North Hangar Taxilanes	3" AC, 2" Crushed Aggregate Base, 13" Aggregate Subbase (1999)	75	96
ACHA Hangar Taxilanes	**Not rated (lease area)**	--	--
South Hangar Taxilanes	Unknown AC, Unknown Base, Unknown Subbase (1972)	45	55-74
Auburn Flight Service South FBO Taxilanes	**Not rated (lease area)**	--	--

1. *WSDOT Airport Pavement Management System, Applied Pavement Technology, 2012*
2. The Pavement Condition Index (PCI) scale ranges from 0 to 100, with seven general condition categories ranging from "failed" to "excellent." For additional details, see *AUBURN MUNICIPAL AIRPORT 2012 PAVEMENT MANAGEMENT REPORT.*

The condition of the airfield pavements observed during site visits performed as part of the master plan update (Fall 2012) were generally consistent with the APMS pavement evaluations. The most common pavement wear appears to be drainage related (depressions, etc.), minor fuel/oil damage in tiedown positions, and where different pavement sections meet (parallel taxiway and adjacent aprons, etc.). Surface

cracking is minor to moderate ranging from <.25 inches to approximately 1.5 to 2 inches. The airfield pavements appear to be well maintained with regular crackfilling and vegetation control.

Note: A pavement rehabilitation project was conducted in the summer 2014 that included crackfill, isolated repair, slurry seal, and repainting markings. The work will be reflected in the next scheduled PCI inspection in 2015 or 2016.

Landside Facilities

HANGARS AND AIRPORT BUILDINGS

Auburn Municipal Airport accommodates a variety of aviation-related buildings including aircraft storage hangars, commercial and mixed-use hangars and office/classroom space. All existing structures are located on the east side of the airport. The west side of the airport has 23 acres (currently undeveloped) that was planned for future aviation-related development in the last master plan. **Figure 2-2**, presented earlier in this chapter**,** depicts the existing buildings on the airport. **Table 2-8** summarizes existing aviation use buildings located at the airport.

North Hangar Area

The north hangar area is located adjacent to the north access taxiway that extends beyond Taxiway A. The north hangar area accommodates 5 rows of multi-unit hangars including two City-owned T-hangars (40 units) located at the north end of the development (Hangar Rows 9 and 10); four T-hangars and two conventional hangars (34 units) owned by Auburn Hangars Owners Association (AHOH); two multi-unit hangars (7 units – AFC2) owned by Auburn Flyers Condos; and one conventional hangar owned by Jim Jacobson. The north hangar area has a total of 82 units (hangar doors), although some hangars are capable of accommodating multiple aircraft. Vehicle access to the north hangar area is provided from 30th Street NE through an automated (key card) gate located at the northeast corner of the airport. A second vehicle gate on 30th street (in line with the north hangar access taxiway) is padlocked and provides emergency or other supervised access only. The north hangar area has no designated vehicle parking spaces; vehicles are observed parking inside hangars and on the taxilanes between hangars.

Auburn Condo Hangar Association (ACHA) Hangar Area

The ACHA hangar area is located near mid-runway with seven multi-unit hangars, including 4 T-hangars (35 units) and three executive hangars (11 units). The ACHA area has a total of 46 units (hangar doors). Vehicle access to the north hangar area is provided from E Street NE through an automated (key card) gate located on the east side of the hangar area. The ACHA hangar area has no designated vehicle parking spaces; vehicles are observed parking inside hangars and on the taxilanes between hangars.

South Hangar Area

The south hangar area is located between the center and south tiedown aprons. The south hangar area accommodates 8 rows of multi-unit hangars including seven City-owned T-hangars (105 units) located in Hangar Rows 2 through 8. The city-owned hangars include 6 twin-engine units and 99 single-engine units. The east end of the northern-most T-hangar (Hangar Row 2) has been modified to include

commercial space (Air Tech Instruments) and an enclosed aircraft wash rack. The units in Hangar Row 2 have hangar doors. All of the other city-owned hangars in Rows 3-8 are open front units that are designed to accommodate doors. Auburn Flyers Condos owns five multi-unit hangars (19 units – AFC1 and AFC3) located on the west end of Hangar Row 8 and in another row immediately north of Auburn Flight Service.

The south hangar area has a total of 124 units (hangar doors), although some hangars are capable of accommodating multiple aircraft. Vehicle access to the south hangar area is provided from E Street NE through two automated (key card) gates located near the north and south ends of the development. A narrow vehicle lane extends along the eastern edge of the hangar development between the ends of the hangars and the airport perimeter fence. The south hangar area has no designated vehicle parking spaces; vehicles are observed parking inside hangars and on the taxilanes between hangars.

Auburn Flight Service Hangar

Auburn Flight Service owns a mixed use hangar located between the south hangar area and the south tiedown apron. The building includes office space, hangar space and restrooms. The building has dedicated vehicle access from E Street NE with 35 vehicle parking spaces.

Building "506"

Building "506," is located on the south end of the center tiedown apron. The city-owned building includes airport management office space, restrooms and other leaseable space. The building has 11 adjacent aircraft tiedowns with additional tiedowns located on the center apron. The building has dedicated vehicle access from E Street NE with 33 vehicle parking spaces.

Office

A small office building (formerly airport management office) is located adjacent to the center tiedown apron and includes offices, and restrooms. The building has 7 vehicle parking spaces located on the north side of the center tiedown apron. The building is located adjacent to controlled access vehicle gate which is used to access adjacent aprons and hangars.

TABLE 2-8: AVIATION USE BUILDINGS AT AUBURN MUNICIPAL AIRPORT (SOUTH TO NORTH)

	BUILDING	USE/CONFIGURATION	LOCATION
1	Auburn Flight Service	Operations, Office, Hangar	North of South Tiedown Apron
2	Conventional Hangar (Auburn Flyers Condo Association)	Aircraft Storage (3 units)	North of Auburn Flight Service; South of Hangar Row 8
3	Conventional Hangar (Auburn Flyers Condo Association)	Aircraft Storage (3 units)	North of Auburn Flight Service; South of Hangar Row 8
4	Conventional Hangar (Auburn Flyers Condo Association)	Aircraft Storage (3 units)	North of Auburn Flight Service; South of Hangar Row 8
5	T-Hangar (Auburn Flyers Condo Association)	Aircraft Storage (2 units)	West end of Hangar Row 8

6	T-Hangar (Auburn Flyers Condo Association)	Aircraft Storage (8 units)	Middle of Hangar Row 8
7	T-Hangar (City Owned)	Aircraft Storage (6 units) twin-engine open front	East end of Hangar Row 8
8	T-Hangar (City Owned)	Aircraft Storage (17 units) open front	Hangar Row 7
9	T-Hangar (City Owned)	Aircraft Storage (17 units) open front	Hangar Row 6
10	T-Hangar (City Owned)	Aircraft Storage (17 units) open front	Hangar Row 5
11	T-Hangar (City Owned)	Aircraft Storage (17 units) open front	Hangar Row 4
12	T-Hangar (City Owned)	Aircraft Storage (17 units) open front	Hangar Row 3
13	T-Hangar (City Owned)	Aircraft Storage (14 units), Aircraft Wash Rack, Commercial Tenant	Hangar Row 2
14	Building "506" (City Owned)	Airport Management Offices, restrooms	South side of Center Apron
15	Office (City Owned)	Office, restroom	North side of Center Apron
16	Fuel Building	Fuel system controls	North of Center Apron
17	T-Hangar (Auburn Condo Hangars Association)	Aircraft Storage (9 units)	ACHA Hangar Area; North of N. Tiedown Apron
18	T-Hangar (Auburn Condo Hangars Association)	Aircraft Storage (9 units)	ACHA Hangar Area; North of N. Tiedown Apron
19	T-Hangar (Auburn Condo Hangars Association)	Aircraft Storage (9 units)	ACHA Hangar Area; North of N. Tiedown Apron
20	T-Hangar (Auburn Condo Hangars Association)	Aircraft Storage (9 units)	ACHA Hangar Area; North of N. Tiedown Apron
21	Executive Hangar (Auburn Condo Hangars Association)	Aircraft Storage (4 units)	ACHA Hangar Area; North of N. Tiedown Apron
22	Executive Hangar (Auburn Condo Hangars Association)	Aircraft Storage (4 units)	ACHA Hangar Area; North of N. Tiedown Apron
23	Executive Hangar (Auburn Condo Hangars Association)	Aircraft Storage (3 units)	ACHA Hangar Area; North of N. Tiedown Apron
24	Conventional Hangar (Jim Jacobson)	Aircraft Storage (1 unit)	North Hangar Area
25	Executive Hangar (Auburn Flyers Condo Association)	Aircraft Storage (3 units)	North Hangar Area
26	Executive Hangar (Auburn Flyers Condo Association)	Aircraft Storage (4 units), Commercial Tenant	North Hangar Area
27	T-Hangar (Auburn Hangars Owners Association)	Aircraft Storage (9 units)	North Hangar Area
28	T-Hangar (Auburn Hangars Owners Association)	Aircraft Storage (7 units)	North Hangar Area
29	Conventional Hangar (Auburn Hangars Owners Association)	Aircraft Storage (1 unit)	North Hangar Area
30	T-Hangar (Auburn Hangars Owners Association)	Aircraft Storage (8 units)	North Hangar Area
31	T-Hangar (Auburn Hangars Owners Association)	Aircraft Storage (8 units)	North Hangar Area
32	Conventional Hangar (Auburn Hangars Owners Association)	Aircraft Storage (1 unit)	North Hangar Area
33	T-Hangar (City Owned)	Aircraft Storage (20 units)	Hangar Row 10
34	T-Hangar (City Owned)	Aircraft Storage (20 units)	Hangar Row 9

Vehicle Access and Parking

Surface access to Auburn Municipal Airport is provided via State Highway 167, 15th Street NW, Auburn Way North and other surface streets. The airport has several different entrances including 26th Street and 22nd Street off of Auburn Way North and D Street NE off of 15th Street. E Street NE acts as a frontage road and provides access to the main office, all hangars and tiedown parking areas. The east landside area of the airport has several automated controlled access vehicle gates located adjacent to aircraft parking aprons and hangar areas.

Auburn Municipal Airport has approximately 75 designated automobile parking spaces located adjacent to commercial use buildings including 35 spaces at Auburn Flight Service, 33 spaces at Building "506," 7 spaces at the airport office and a small parking area located at the east end of Hangar Row 2, south of the center apron. There are no designated auto parking spaces adjacent to aircraft parking aprons or hangar areas. Vehicles are observed parked in the taxilanes between hangar rows or inside hangars.

Airspace and Navigational Aids

AIRSPACE CLASSIFICATIONS

Airspace within the United States is classified by the FAA as "controlled" or "uncontrolled" with altitudes extending from the surface upward to 60,000 feet above mean sea level (MSL). Controlled airspace classifications include Class A, B, C, D, and E. Class G airspace is uncontrolled.

Aircraft operating within controlled airspace are subject to varying levels of positive air traffic control that are unique to each airspace classification. Requirements to operate within controlled airspace vary, with the most stringent requirements associated with very large commercial airports in high traffic areas. Uncontrolled airspace is typically found in remote areas or is limited to a 700 or 1,200-foot AGL layer above the surface and below controlled airspace. **Figure 2-4** illustrates and describes the characteristics of the airspace classifications defined by the FAA.

LOCAL AREA AIRSPACE STRUCTURE

Figure 2-5 depicts nearby airports, notable obstructions, special airspace designations and instrument flight rules (IFR) routes in the vicinity of Auburn Municipal Airport, as identified on the Seattle Terminal Area Chart (TAC) and the IFR Enroute Low Altitude Chart (L-1/L-2).

Auburn Municipal Airport is located in an area of Class G airspace that begins at the ground surface and extends to 700 feet MSL. Between 700 feet and 3,000 feet above Auburn Municipal is Class E airspace. At 3,000 ft MSL the second layer of Seattle Tacoma International Airport (SEATAC) Class B airspace begins and extends upward to 10,000 feet MSL.

Class G airspace is designated "uncontrolled" and is airspace that was not otherwise designated at Class A, B, C, D or E. Radio communication is not required for visual flight rules (VFR) operations in Class E or G airspace, although pilots are encouraged to use the common traffic advisory frequency (CTAF) when operating at the airport. Pilots are required to contact air traffic control (ATC) prior to operating within

Class B airspace. Aircraft are required to obtain an ATC clearance prior to operating in Class E airspace during instrument flight rules (IFR).

East-West Visual Flight Rules (VFR) Flyways over SEATAC are located approximately 3 to 4 nautical miles north of Auburn Municipal Airport. The "Mariner" and "Seahawk" transitions allow aircraft to cross the SEATAC runways (requires air traffic control clearance) at an altitude of 1,500 to 2,000 feet MSL.

Auburn Municipal Airport is located within the 30-nautical mile veil of Mode C transponder airspace that surrounds Seattle-Tacoma International Airport. The Mode C airspace extends from the surface upward to 10,000 feet above mean sea level (MSL). Aircraft operating in the airspace are required to be equipped with a Mode C Transponder, with only a few exceptions. A transponder is an electronic device that produces a response that enables aircraft to be identified on radar and aircraft collision avoidance systems.

Large areas of Class E airspace associated with enroute instrument airways and transition to terminal airspace extend in all directions beyond the Class E airspace associated with local area airports. This category of Class E airspace has a floor established at 700 feet MSL.

The local fixed wing airport traffic pattern altitude is 1,000 feet above ground level (AGL) (1,063' MSL) with right traffic on Runway 16 and standard left traffic on Runway 34. The helicopter traffic pattern altitude is 500 feet AGL. The traffic patterns for both runway ends are located on the west side of the runway, as depicted previously in **Figure 2-3.**

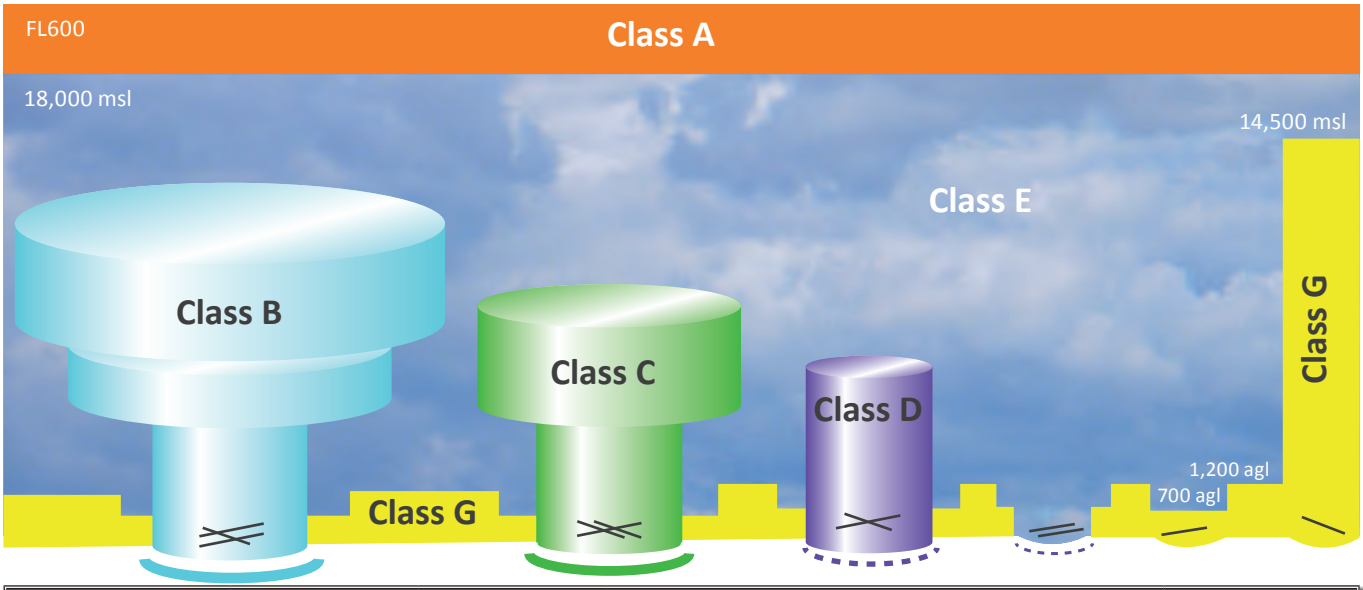
The Seattle VORTAC[6], located 7.3 miles northwest of the airport supports nearby enroute air navigational routes and instrument approach procedures to several area airports. Eight separate enroute airways converge in this area. Local airport operations and flight activity is not directly affected by the enroute airspace due to the minimum enroute altitudes that are well above the local airport traffic pattern altitude.

SPECIAL USE AIRSPACE

Areas of special use airspace (SUA) in the vicinity of Auburn Municipal Airport include the Restricted Airspace R-6703A, 6703B, 6703C, and 6703D, located approximately 26 nautical miles southwest, between Joint-Base Lewis McChord (JBLM) and Olympia. For national security reasons aircraft are not allowed to fly through restricted airspace without permission from the controlling agency or facility.

The nearest Military Operations Area (MOA) is the Rainer 1/2/3 MOA (26 miles southwest). MOAs are designated to segregate VFR and IFR traffic from military operations. The restrictions associated with Rainier MOA 1, 2 and 3 begin at 2,000 and extend upward to 9,000 feet MSL. When a MOA is active, IFR traffic may be cleared through the area when air traffic control can ensure IFR separation; otherwise traffic will be rerouted. Although VFR operations are not restricted in an MOA, pilots are advised to exercise extreme caution while flying within, near, or below an active MOA. Prior to entering an active MOA, pilots are encouraged to contact the controlling agency for traffic advisories due to the frequently changing status of these areas.

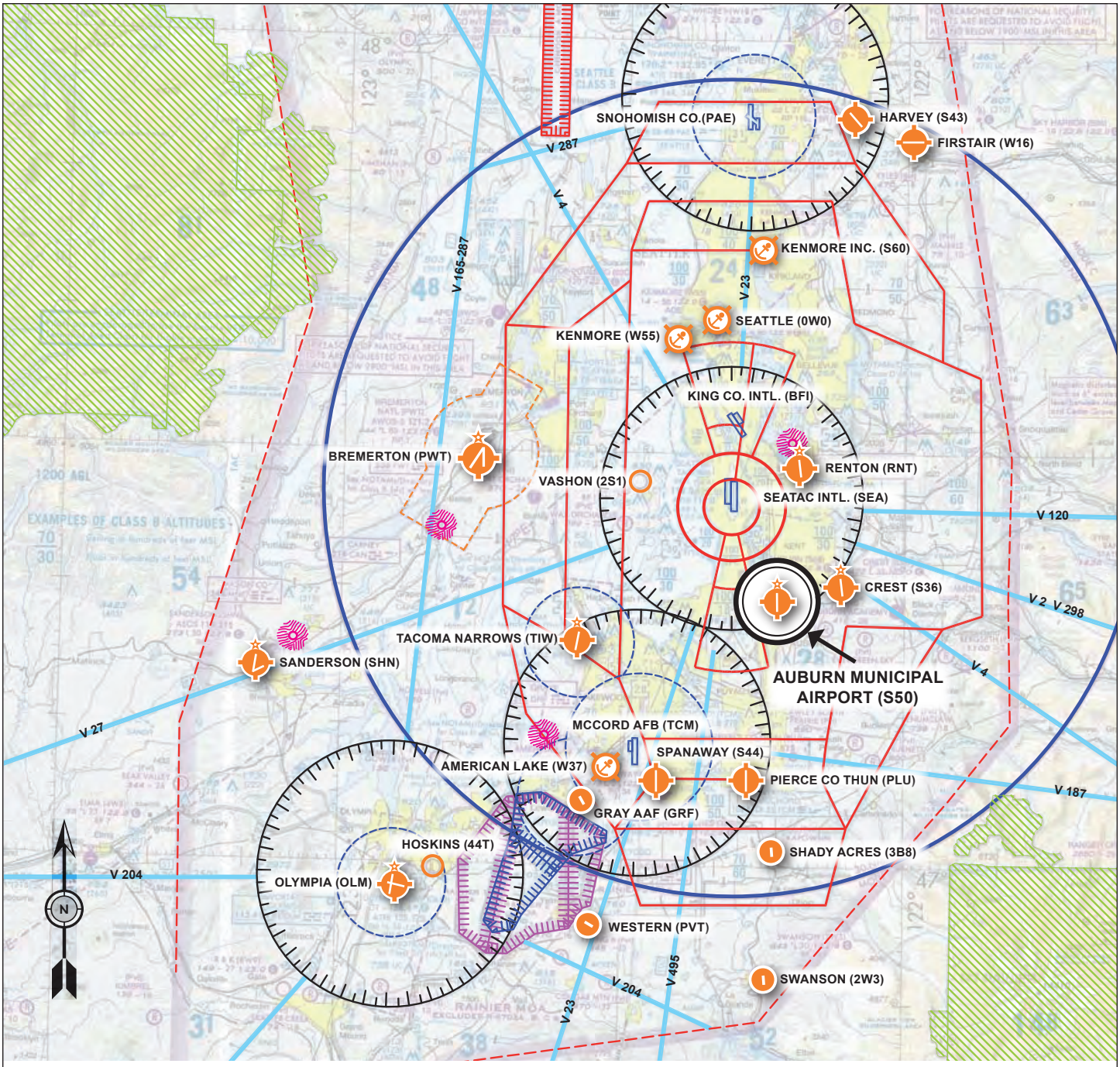
[6] Very high frequency Omnidirectional Radio range (VOR) combined with UHF frequencies (Tactical Air Navigation – TACAN)



COMMUNICATION REQUIREMENTS AND WEATHER MINIMUMS

	Class A	Class B	Class C	Class D	Class E	Class G
Airspace Class Definition	Generally airspace above 18,000 feet MSL up to and including FL 600.	Generally multi-layered airspace from the surface up to 10,000 feet MSL surrounding the nation's busiest airports	Generally airspace from the surface to 4,000 feet AGL surrounding towered airports with service by radar approach control	Generally airspace from the surface to 2,500 feet AGL surrounding towered airports	Generally controlled airspace that is not Class A, Class B, Class C, or Class D	Generally uncontrolled airspace that is not Class A, Class B, Class C, Class D, or Class E
Minimum Pilot Qualifications	Instrument Rating	Student*	Student*	Student*	Student*	Student*
Entry Requirements	IFR: ATC Clearance VFR: Operations Prohibited	ATC Clearance	IFR: ATC Clearance VFR: Two-Way Communication w/ ATC	IFR: ATC Clearance VFR: Two-Way Communication w/ ATC	IFR: ATC Clearance VFR: None	None
VFR Visibility Below 10,000 msl**	N/A	3 Statute Miles	3 Statute Miles	3 Statute Miles	3 Statute Miles	Day: 1 Statute Mile Night: 3 Statute Miles
VFR Cloud Clearance Below 10,000 msl***	N/A	Clear of Clouds	500 Below 1,000 Above 2,000 Horizontal	500 Below 1,000 Above 2,000 Horizontal	500 Below 1,000 Above 2,000 Horizontal	500 Below 1,000 Above 2,000 Horizontal***
VFR Visibility 10,000 msl and Above**	N/A	3 Statute Miles	3 Statute Miles	3 Statute Miles	5 Statute Miles	5 Statute Miles
VFR Cloud Clearance 10,000 msl and Above	N/A	Clear of Clouds	500 Below 1,000 Above 2,000 Horizontal	500 Below 1,000 Above 2,000 Horizontal	1,000 Below 1,000 Above 1 Statute Mile Horizontal	1,000 Below 1,000 Above 1 Statute Mile Horizontal

*Prior to operating within Class B, C or D airspace (or Class E airspace with an operating control tower), student, sport, and recreational pilots must meet the applicable FAR Part 61 training and endorsement requirements. Solo student, sport, and recreational pilot operations are prohibited at those airports listed in FAR Part 91, appendix D, section 4.
**Student pilot operations require at least 3 statue miles visibility during the day and 5 statute miles visibility at night.
***Class G VFR cloud clearance at 1,200 agl and below (day); clear of clouds.



LEGEND			
	Airport with other than hard-surfaced runways		Class B Airspace
	Seaport		Class D Airspace
	Airports with hard-surfaced runways 1,500 ft. to 8,069 ft.		Class E Airspace
	Airports with hard-surfaced runways greater than 8,069 ft.		Mode C Veil
	Non-Directional Radiobeacon (NDB)		Class E Airspace with floor 700' above surface
	Compass Rose		Military Operations Area (MOA)
	Victor Airways		Prohibited, Restricted, Warning, and Alert Areas

Navigational Aids and Weather

There are no ground based navigational aids located on the airport. However, numerous ground based navigation aids are located within 30 nm of the airport. The nearest facilities include the Seattle VORTAC[7] located 8 miles northwest of the airport and the Renton nondirectional beacon (NDB), located 10 nautical miles north.

Auburn Municipal Airport does not have an automated weather observation system located on the airport. The nearest weather observations are located at SEATAC (8 miles northwest), Renton Municipal Airport (10 miles north), Pierce County Airport – Thun Field (14 miles south), and Tacoma Narrows Airport (15 miles west). The RNAV GPS-A instrument approach for Auburn utilizes the SEATAC altimeter setting. The SEATAC Automatic Terminal Information Service (ATIS) provides altimeter setting, wind data, temperature, dewpoint, density altitude, visibility, precipitation and cloud/ceiling data. **Table 2-9** summarizes existing navigational aids and related items.

TABLE 2-9: NAVIGATIONAL AIDS AND RELATED ITEMS

TYPE	FACILITIES
Electronic Navigational Aids	None on Field Renton Non-directional Beacon (NDB) (10 nm N) 353 LHz Seattle/Metro VORTAC (8 nm NW) 116.8 MHz
Weather Observation	Seattle ASOS /ATIS (118.0 MHz) Renton ASOS (132.675 MHz) Thun Field AWOS-3 (128.575 MHz) Tacoma Narrows ASOS / ATIS (118.5 MHz)
Communication	Unicom/Common Traffic Advisory Frequency (CTAF)(122.8 MHz) Seattle App/Dep Control (123.85 MHz)

Instrument Procedures

Instrument approach and departure procedures are developed by the FAA using electronic navigational aids to guide aircraft through a series of prescribed maneuvers in and out of an airport's terminal airspace. The procedures are designed to enable continued airport operation during instrument meteorological conditions (IMC), but are also used during visual conditions, particularly in conjunction with an instrument flight plan. The capabilities of each instrument approach are defined by the technical performance of the procedure platform (ground based navigational aids or satellite navigational aids) and the presence of nearby obstructions, which may affect the cloud ceiling and visibility minimums for the approach, and the routing for both the approach and missed approach procedure segments. The aircraft approach speed and corresponding descent rate may also affect approach minimums for different types of aircraft.

[7] Very high frequency Omnidirectional Radio range (VOR) combined with UHF frequencies (Tactical Air Navigation – TACAN)

Auburn Municipal Airport has one published non-precision instrument approach, the RNAV-GPS (A). The current procedure provides electronic course guidance from the south with a final approach course of 331 degrees. The approach is classified as a "circling" procedure with a minimum descent altitude of 1,320 feet MSL (1,257 feet AGL) and a minimum visibility requirement of 1¼ miles. The instrument approach is authorized for small aircraft only (Approach Category A and B) with approach speeds of less than 121 knots (nautical miles per hour). The procedure is not authorized at night. Airport management indicates that the night restriction is due to an FAA requirement that an updated obstruction survey be completed to evaluate existing obstacles within the defined approach and missed approach airspace. The airport has a standard instrument departure (Auburn One Departure (Obstacle)) designed for obstacle clearance for both runway ends. The existing instrument approach capabilities for Auburn Municipal Airport are summarized in **Table 2-10.**

The Airport also utilizes a departure procedure, Auburn One Departure, for departing aircraft that uses the Seattle NDB and McChord NDB. Pilots are provided with specific departure procedures for obstacle clearance when departing either Runway 16 or 34. Copies of the instrument approach and departure procedure charts are included in **Appendix B**.

TABLE 2-10: INSTRUMENT PROCEDURES (AUBURN MUNICIPAL AIRPORT)

APPROACH	APPROACH CATEGORY A		APPROACH CATEGORY B		APPROACH CATEGORY C		APPROACH CATEGORY D	
	Ceiling	Vis.	Ceiling	Vis.	Ceiling	Vis.	Ceiling	Vis.
RNAV/GPS-A								
Circling	1,320	1¼	1,320	1½	n/a		n/a	

Approach Categories are based on the approach speed of an aircraft in the landing configuration (typically 1.3 times the stall speed Vso).
Approach Categories:
***Category A**: 0-90 knots (Cessna 172, Beechcraft Bonanza, Piper Seneca, Cessna Caravan, Pilatus PC-12)*
***Category B**: 91-120 knots (Beechcraft Baron 58, King Air 200, Cessna 310-441, Citation Bravo)*
***Category C**: 121-140 knots (Learjet 45, Canadair Challenger, Boeing 737, MD80)*
***Category D**: 141-165 knots (Gulfstream 550)*
Ceiling: Lowest permitted height of clouds in feet above ground level (AGL)
Vis: Minimum visibility required in statute miles
Source: National Ocean Service Instrument Approach Plates

Airport Support Facilities/Services

AIRCRAFT FUEL

Auburn Municipal Airport has 100-octane low lead (100LL) aviation gasoline (AVGAS) available for sale through Airport Management Group (AMG). The airport's fueling island is located on the western section of the center apron. The City of Auburn owns the fuel storage and dispensing system that includes one above ground double-wall 12,000 gallon tank and 2 pumps. 24 hour self-fueling (credit card payment)

is available. Jet fuel is not currently available at the airport. **Table 2-11** summarizes existing aviation fueling facilities on the airport.

TABLE 2-11: AVIATION FUEL STORAGE (AUBURN MUNICIPAL AIRPORT)

STORAGE TYPE	LOCATION/FACILITIES
Fixed Point Fuel Storage Tank and Dispensing Facilities	1 – Aboveground 12,000 gallon tank (AVGAS) (City owned) Fueling Island 24-hour Card Lock System – 2 AVGAS pumps (City owned)
Jet Fuel	None
Automobile Gasoline	None

FIXED BASE OPERATORS (FBO)

Auburn Municipal Airport has several commercial tenants providing a variety of aviation services including Cornerstone Aviation (leasing space from Auburn Flight Service), Airtech Instruments (instrument sales, repair), Atomic Helicopters (flight training), BNC Maintenance (aircraft maintenance), Galvin Aviation (flight training) and Fair Aircraft Appraisal (aircraft maintenance and services). Airport Management Group (AMG) manages aircraft fueling operations at the airport in addition to providing airport management services to the City of Auburn.

PUBLIC RESTROOMS

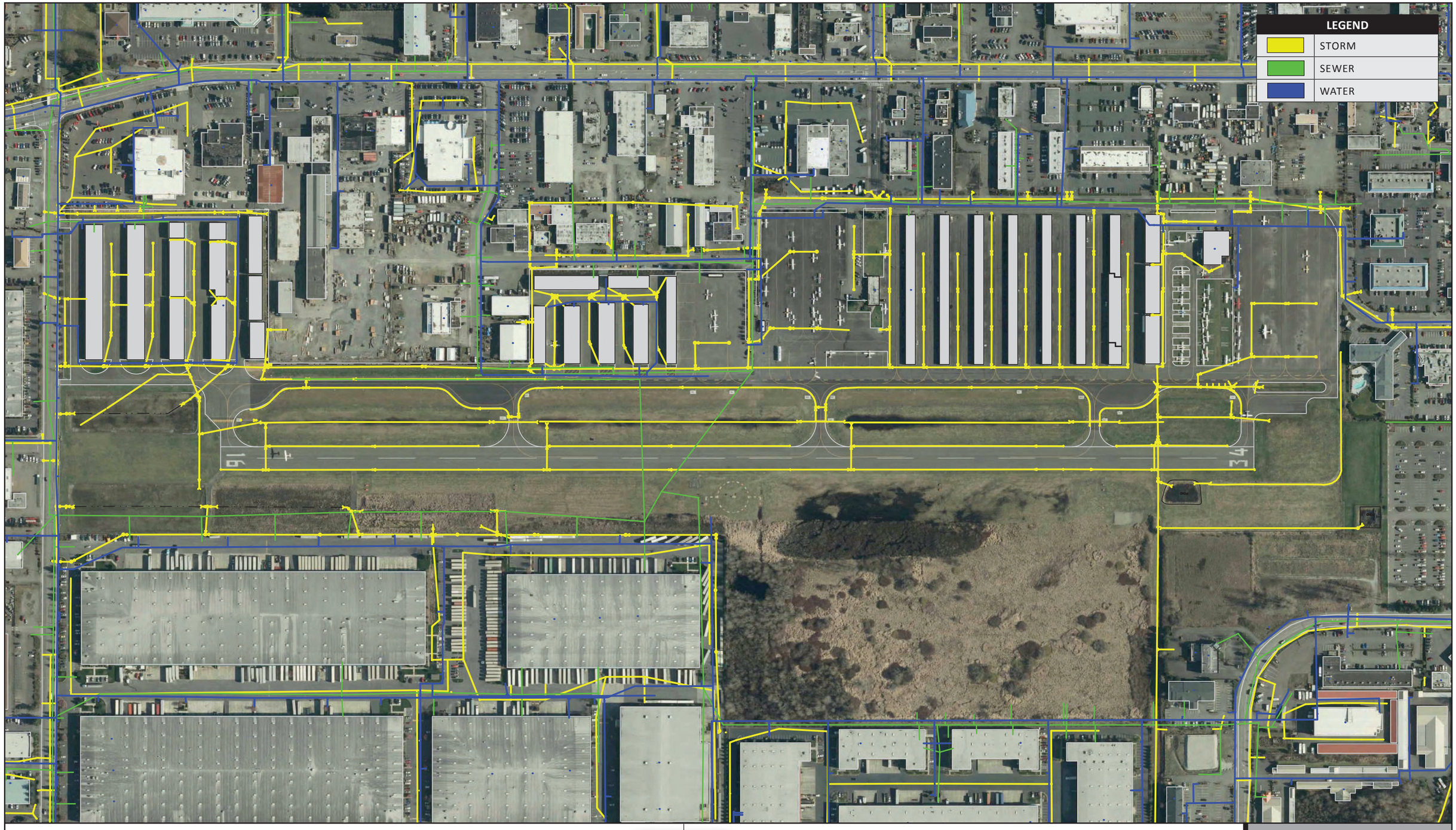
Public restrooms are located in the airport operations building. Several portable chemical toilets are located on the airfield and several private T-hangars have indoor restrooms. The commercial buildings on the airport have restrooms for their employees and customers.

Fencing & Security

The airport has an extensive fencing and gate system that covers the entire airfield. The fencing is standard 7-foot chain link with numerous swing gates (locked) located around the perimeter. There are several electronic controlled (key card) sliding vehicle gates and some combination lock pedestrian gates located along the perimeter of the east landside area, providing controlled access to apron and hangar areas.

Utilities

The developed areas of Auburn Municipal Airport have water, natural gas, sanitary sewer, electrical, and telephone/internet service. **Figure 2-6** depicts the locations of the major utilities serving Auburn Municipal Airport.



AUBURN MUNICIPAL AIRPORT | AIRPORT MASTER PLAN

EXISTING UTILITIES | **FIG. 2-6**

CITY OF AUBURN WASHINGTON

CENTURY WEST ENGINEERING CORPORATION

WATER

Water service for the airport property is provided by the City of Auburn. The water system enters the property in several locations providing service to the north hangar area, the central hangar area, the airport office, and south hangar area.

The north hangar area is served with an 8" looped water main connected in two locations on 30th Street NE. Two hydrants are located along 30th Street NE, and three hydrants are located on the east side of the east drive aisle.

The central hangar area is served with an 8" water main connected through 26th Street NE and then extending south along the east taxiway to the hangar area. The main loops through the hangars providing water services. There are two fire hydrants located in front of the hangar area along the east taxiway.

The airport office is served with an 8" main extending from 23rd Street NE. There are two fire hydrants along the entrance road to the office and just north of the central tie down area.

An 8" water main parallels the southern hangar area in the E Street NE right of way. There are service lines for Building "506" (formerly Northwest Aviation College) and the wash rack. Fire hydrants are evenly spaced in the E St. NE. right of way.

The southern tiedown area and FBO is served from the 8" main in E Street NE where it transitions onto the airport property just south of the southern hangar where there is a fire hydrant. The main then extends south to 16th Street NE. There is one fire hydrant located just west of the FBO providing service to the tie down area.

Water mains of various sizes (8", 12", and 16") have been extended just outside the western perimeter of the airport property and currently serve the warehouses and business to the west.

Fire protection is provided by the Valley Regional Fire Authority.

SANITARY SEWER

The City of Auburn owns and operates the sanitary sewer system serving the airport property and serves the same buildings that have water service.

The northern hangar area is served by a sewer main that is extended from 30th Street NE along the eastern hangar access road.

The central east side of the airport property is served by a sewer main the parallels the north section of the east parallel taxiway along the frontage of the central hangar area, to the airport office. This main serves the central hangars and the office. The sewer main crosses RWY 16/34 in two locations between Exits E and F at approximately the midpoint of the runway. The sewer then extends to the north along the western airport boundary and connects to the sewer main in 30th Street NE.

The FBO in the south tiedown area and the wash rack located in the NE corner of the south hangar area are both served by the sewer main in E Street NE. This main flows north and connects to the main crossing RWY 16/34 at midfield.

STORMWATER

The airport has a storm water drainage system that utilizes a series of building roof drains, catch basins, swales and culverts. Three detention points are located on the airport property in the northwest corner. The City of Auburn maintains a Stormwater Pollution Prevention Plan (SWPPP) for Auburn Municipal Airport that complies with the Industrial Stormwater General Permit (ISWGP) Condition S3.A.1 through 3. The "Best Management Practices" or BMP's outlined in these sections provide adequate methods to control and treat stormwater pollution. They are also consistent with the 2005 Stormwater Management Manual for Western Washington (SWMM.) Examples of the BMP's include providing proper disposal of waste oil and fuel, having an emergency spill response and cleanup plan, and adequate monitoring of the aircraft fuel tanks to ensure no leakage is unnoticed.

The airport property contains two drainage basins. Basin 0 is located at the south end of the airport and includes the south aircraft tie down apron, the FBO office and parking lot, the southernmost row of hangars in the south hangar area, the adjacent portion of Taxiway A, and approximately 250' of Runway 34. Stormwater runoff from Basin 0 is collected in a series of catch basins, pipes, swales, and ponds that ultimately join together to flow west approximately 200' north of the end of Runway 34. The stormwater then enters a swale that continues west, off the airport property, and joins the City stormwater system along B Street NW. There is a small area along the southern fence line that routinely floods and encroaches on the southernmost Taxiway and run up area. It should also be noted that D Street NE and the southern end of E Street NE are also connected to the storm system as it passes through the airport.

Basin 1 contains the entire airport area north of Basin 0. This basin also is a series of catch basins, pipes, swales, and ponds. The entire basin flows to the north. The runoff from the hangar areas, aprons, and taxiways are collected in a pipe that runs along the east side of parallel Taxiway A and discharges to the City stormwater system in 30th Street NE. The runoff from RWY 16/34 is collected in underdrains that parallel both sides if the runway. These underdrains are routed to the swales between the runway and parallel Taxiway. The swales ultimately flow to the north and also discharge to the City stormwater system in 30th Street NE.

The three large ponds along the northwest property line primarily collect and treat stormwater from the large warehouse area west of the airport. The ponds are connected with culverts and drain to the City stormwater system in 30th Street NE. The three ponds are covered with netting so they do not attract birds.

The swale between the 30th Street NE and the northernmost hangar experiences flooding that encroaches on the hangar taxiway. Also the small grassy area at the west end of the northernmost hangar experiences flooding that encroaches on Taxiway A.

POWER

Electrical service is provided by Puget Sound Energy and enters the airport on the east side. Most electrical service lines located on the airport are underground with some overhead lines serving buildings along the east side of the airport.

GAS

Natural gas service is provided by Puget Sound Energy and enters the airport on the east side.

Land Use Planning and Zoning

Land use planning and zoning for the Airport and in the immediate vicinity are administered by the City of Auburn. Areas north, south, west and east of the Auburn city limits are under the jurisdiction of King County or adjacent municipalities of Kent, Algona, Pacific, and Federal Way. Municipal zoning for the airport and its surrounding area is depicted in **Figure 2-7**. Additional detail on airport land use, noise and land use compatibility will be provided in the Environmental and Land Use Compatibility chapters later in the master plan.

COMPREHENSIVE PLAN LAND USE DESIGNATION

The Comprehensive Plan is a guidance document which expresses the way in which the city seeks to grow and develop. The City of Auburn Comprehensive Plan land use designation for Auburn Municipal Airport is "**Public and Quasi-Public**". The stated purpose of this land use designation is to reflect the coordinated effort of local officials to designate an area of significant size needed to provide public or quasi-public services to the community, and which are not more appropriate for inclusion in another designation. The "Public and Quasi-Public" designation of the Airport is consistent with the community-serving transportation and economic development function of the Airport. Examples of other uses also encompassed by the "Public and Quasi-Public" designation elsewhere in the City includes large churches, large private schools and similar uses. Industrial and commercial uses affiliated with or managed by educational institutions may also be classified as a public use and permitted on a conditional basis.

COMPREHENSIVE PLAN LAND USE DESIGNATIONS IN THE VICINITY

The land use designations in the vicinity of the Auburn Municipal Airport include: "Light Industrial", "Heavy Industrial", and "Heavy Commercial". Properties to the west of the Airport are designated "Light industrial" and the purpose of this designation is specifically to reserve quality lands for the City's economic development goals while providing a location attractive for manufacturing, processing and assembling land use activities that benefit from quality surroundings and appropriate commercial retail uses that benefit from the location, access, physical configuration, building types of these properties. Lighter Industrial and heavy commercial uses may be permitted in this land use designation. By contrast, the "Heavy Industrial" land use designation of properties located to the north and east provides for a wide

range of heavier commercial uses involving extensive storage or heavy vehicular movement meeting both a local and regional need for such services.

AIRPORT ZONING

Auburn Municipal Airport is zoned "**Airport Landing Field District (LF)**". The LF district zoning is intended to accommodate the operation and management of the Auburn Municipal Airport. Inherent in the operation and management of the Airport is avoiding actions that endanger the lives and property of users of the Auburn Municipal Airport and of occupants of land or property in the vicinity of the airport. This zoning classification establishes certain zones which include all of the land lying beneath the approach, transitional, horizontal, and conical surfaces consistent with Federal Air Regulations (FAR) Part 77 as amended. The LF District accounts for approximately 110 acres in the City of Auburn, or 0.57% of the total city area. This LF District exists at only one location within the City and only implements the "Public and Quasi-Public" Land Use Designation of the City's Comprehensive Plan. Zoning for the Airport and its surrounding area is depicted in **Figure 2-7**. The City of Auburn LF District zoning ordinance (Auburn City Code Chapter 18.38) is included in **Appendix C**.

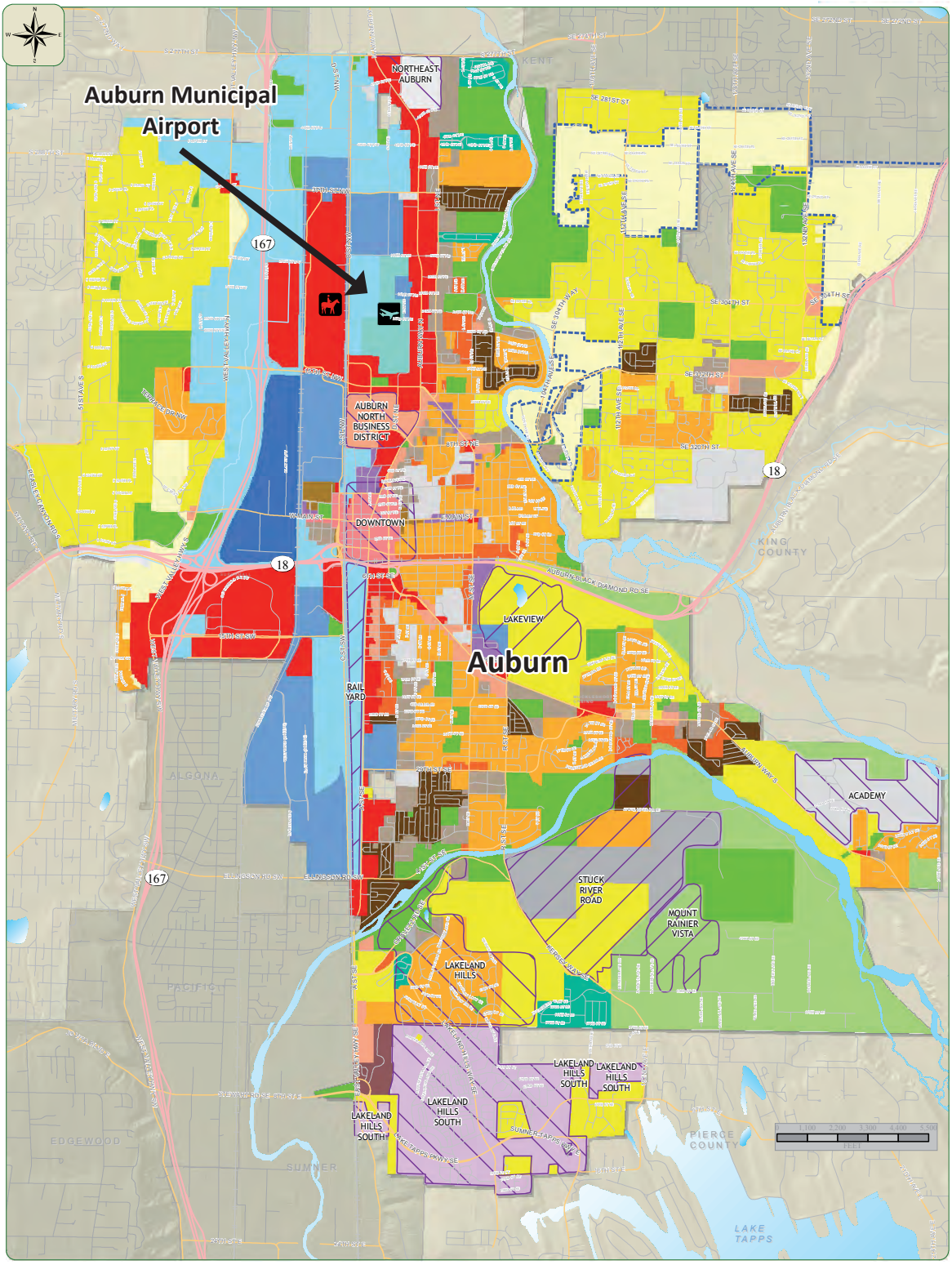
AIRPORT VICINITY ZONING

The zoning classification of properties in the vicinity of the Airport includes Light Industrial (M1), Heavy Industrial (M2) and Heavy Commercial (C3) districts.

AIRPORT OVERLAY ZONE

The City of Auburn LF District zone includes elements of airport overlay zoning, including height restrictions within the runway FAR Part 77 imaginary surfaces. Specific protective elements within the basic zoning designations in the vicinity of the airport will be described in the land use compatibility section of the master plan.

Airport overlay zoning is intended to prevent airspace obstructions around airports by establishing height limitations based on an airport's FAR Part 77 airspace surfaces. Airport overlay zoning may also limit land use and densities, as outlined in airport land use compatibility guidelines created by WSDOT Aviation Division.


Auburn Municipal Airport
NORTHEAST AUBURN
AUBURN NORTH BUSINESS DISTRICT
DOWNTOWN
Auburn
LAKEVIEW
RAIL YARD
ACADEMY
STUCK RIVER ROAD
MOUNT RAINIER VISTA
LAKELAND HILLS
LAKELAND HILLS SOUTH
ALGONA
PACIFIC
EDGEWOOD
SUMNER
KENT
KING COUNTY
PIERCE COUNTY
LAKE TAPPS
167
18
Political Boundaries
City of Auburn
Surrounding Cities
King and Pierce Counties
Transportation
Arterials
Highways
Locals
Land Use Boundaries
Urban Separators Overlay
Adopted Special Plan Areas
Proposed Special Plan Areas
Zoning Designations
C1 Light Commercial District
C2 Central Business District
C3 Heavy Commercial District
CN Neighborhood Shopping District
DUC Downtown Urban Center
EP Environmental Park District
I Institutional Use District
Lakeland Hills South PUD
LF Airport Landing Field District
M1 Light Industrial District
M2 Heavy Industrial District
P1 Public Use District
PUD Planned Unit Development
R1 Residential 1 DU/Acre
R5 Residential 5 DU/Acre
R7 Residential 7 DU/Acre
R10 Residential 10 DU/Acre
R20 Residential 20 DU/Acre
Residential Conservancy
RMHC Residential Manufactured/Mobile Home Units
RO Residential Office District
RO-H Residential Office District (Hospital)
TV Terrace View
UNC Unclassified Use District

Data Sources:

- City of Auburn airport records
- **Auburn Municipal Airport – Airport Layout Plan** (W&H Pacific, December 2002)
- **Auburn Municipal Airport - 2012 Preliminary Pavement Data (**Applied Pavement Technology, Inc., September 2012)
- **Auburn Municipal Airport - 2012 Pavement Management Report** (Applied Pavement Technology, Inc., February 2013)
- **FAA Airport Master Record Form (5010-1)**
- **Airport/Facility Directory (AFD) –Northwest U.S.** (U.S. DOT, Federal Aviation Administration, National Aeronautical Charting Office)
- **Seattle Sectional Aeronautical Chart and Terminal Area Chart; IFR Enroute Low Altitude (L-1/L-2) Chart** (U.S. DOT, Federal Aviation Administration, National Aeronautical Charting Office)
- **Instrument Approach Procedure Charts (FAA NACO**) RNAV (GPS) A approach
- **City of Auburn Development Code and Zoning Mapping**
- **City of Auburn Comprehensive Plan**
- Puget Sound Regional Council **"Preparing Busy General Aviation Airports for Next Generation Technologies"** (May 2013)
- WSDOT Aviation - **Long Term Air Transportation Study (LATS)** (2007)

A glossary of aviation terminology and a list of acronyms have also been provided to describe technical items and aviation jargon commonly in use.

Chapter 3 – Aviation Activity Forecasts

Chapter 3 – Aviation Activity Forecasts

The overall goal of aviation activity forecasting is to prepare forecasts that accurately reflect current conditions, relevant historic trends, and provide reasonable projections of future activity, which can be translated into specific airport facility needs anticipated during the next twenty years and beyond.

Introduction

This chapter provides updated forecasts of aviation activity for Auburn Municipal Airport (S50) for the twenty-year master plan horizon (2012-2032). The forecasts presented in this chapter are consistent with Auburn Municipal Airport's current and historic role as a general aviation reliever airport.

Unless specifically noted, the forecasts of activity are unconstrained and assume that the City of Auburn will be able to make the facility improvements necessary to accommodate anticipated demand. Through the evaluation of airport development alternatives later in the master plan, the City of Auburn will consider if any unconstrained demand will not or cannot be reasonably met.

The FAA-defined airport master plan forecasting process for general aviation airports is designed to address elements critical to airport planning by focusing on two key activity segments: based aircraft and aircraft operations (takeoffs and landings). Detailed breakdowns of these are also provided including aircraft fleet mix, activity peaking, distribution of local and itinerant operations, and the determination of the critical aircraft, also referred to as the design aircraft.

The design aircraft represents the most demanding aircraft type or family of aircraft that uses an airport on a regular basis (a minimum of 500 annual takeoffs & landings). The existing and future design aircraft are used to define the airport reference codes (ARC) to be used in airfield planning. FAA airport design

standards are organized into several different ARC groupings, each reflecting the physical requirements of that aircraft type. The activity forecasts also provide consistency in evaluating future demand-based facility requirements such as runway and taxiway capacity, aircraft parking and hangar capacity, and other planning evaluations such as airport noise.

FORECAST PROCESS

The Federal Aviation Administration (FAA) provides guidance on forecasting aviation activity in airport master planning projects. **FAA Advisory Circular (AC) 150/5070-6B, Airport Master Plans**, outlines seven standard steps involved in the forecast process:

1) **Identify Aviation Activity Measures**: The level and type of aviation activities likely to impact facility needs. For general aviation, this typically includes based aircraft and operations.
2) **Review Previous Airport Forecasts**: May include the FAA Terminal Area Forecast (TAF), state or regional system plans, and previous master plans.
3) **Gather Data**: Determine what data are required to prepare the forecasts, identify data sources, and collect historical and forecast data.
4) **Select Forecast Methods**: There are several appropriate methodologies and techniques available, including regression analysis, trend analysis, market share or ratio analysis, exponential smoothing, econometric modeling, comparison with other airports, survey techniques, cohort analysis, choice and distribution models, range projections, and professional judgment.
5) **Apply Forecast Methods and Evaluate Results**: Prepare the actual forecasts and evaluate for reasonableness.
6) **Summarize and Document Results**: Provide supporting text and tables as necessary.
7) **Compare Forecast Results with FAA's TAF**: Follow guidance in FAA Order 5090.3C, Field Formulation of the National Plan of Integrated Airport Systems. In part, the Order indicates that forecasts should not vary significantly (more than 10 percent) from the TAF. When there is a greater than 10 percent variance, supporting documentation should be supplied to the FAA. The aviation demand forecasts are then submitted to the FAA for their approval.

   Master Plan forecasts for operations and based aircraft for general aviation airports are considered to be consistent with the TAF if they meet the following criteria: Where the 5- or 10-year forecasts exceed 100,000 total annual operations or 100 based aircraft:
   a. Forecasts differ by less than 10 percent in the 5-year forecast and 15 percent in the 10-year period, or
   b. Forecasts do not affect the timing or scale of an airport project, or
   c. Forecasts do not affect the role of the airport as defined in the current version of FAA Order 5090.3C.

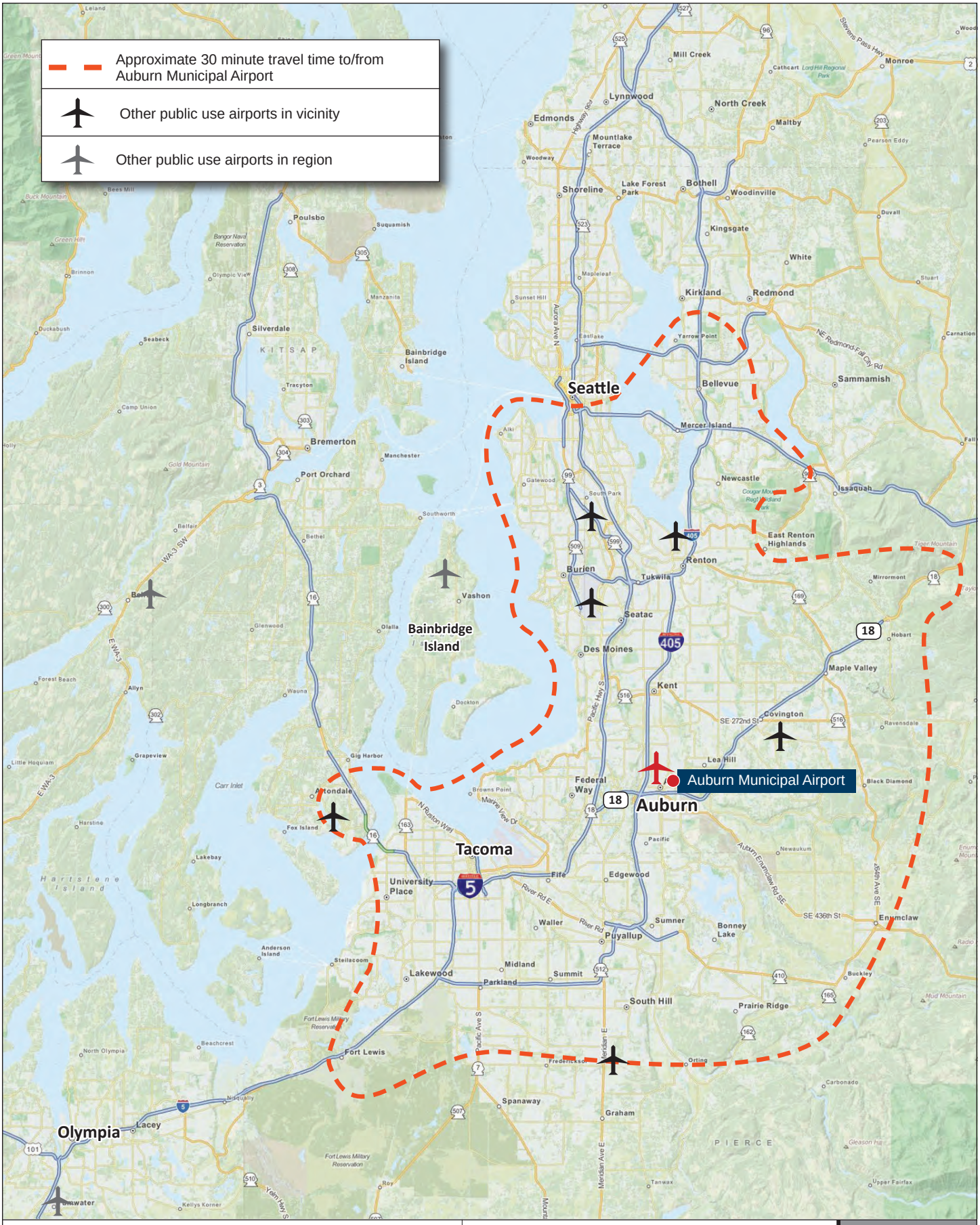
Aviation activity can be affected by many influences on the local, regional, and national levels, making it virtually impossible to predict year-to-year fluctuations of activity over twenty years with any certainty. In addition, major unexpected events such as the terrorist attacks of 9/11 2001 or the recent economic recession have the potential to render any forecast obsolete when the effects of these events are deep or prolonged. Therefore, it is important to remember that aviation activity forecasts are to serve only as guidelines. Planning must be flexible enough to respond to a range of unforeseen developments -- either positive or negative. The use of development reserves for demand-driven facility needs such as hangar space or aircraft parking provides airport management with the ability to respond to unanticipated demand and preserve long-term aviation use areas on the airport.

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

Airport Service Area

The airport service area refers to the geographic area surrounding an airport that generates most "local" activity. The population, economic characteristics and number of competing airports within an airport's service area are important factors in defining locally-generated demand for aviation facilities and services. With numerous airports nearby, service areas often overlap, creating competition between airports for items such as hangar space, fuel and aviation services. Demand generated by transient users can also be influenced by competition from nearby airports. In both cases, demand factors usually include cost, convenience and the quality of facilities or services available.

A 30-minute surface travel time is often used to approximate the boundaries of a service area for a typical general aviation airport in an urban area. In addition to Auburn Municipal Airport, there are four publicly-owned airports and several privately owned airports that accommodate general aviation activity within 30 minutes of Auburn, which creates significant competition among airports and eliminates the need to travel long distances to access desired airport facilities or services. **Figure 3-1** illustrates the approximate boundary of an approximate 30-minute drive from the local area, which encompasses large areas of King County and areas of adjacent Pierce County.



AUBURN MUNICIPAL AIRPORT | AIRPORT MASTER PLAN

AIRPORT SERVICE AREA | **FIG.3-1**

CENTURY WEST ENGINEERING CORPORATION

Table 3-1 lists the publicly-owned, public use airports within a 30 nautical mile radius of Auburn Municipal Airport. It is noted that most of the public use airports listed provide competitive facilities and services with master plans that provide for future facility expansion. Competing airports located beyond a 30-minute travel time typically have less impact on local airport activity due to the redundancy provided by closer facilities. In contrast, the service area for a commercial airport often extends beyond two hours due the relatively small number of airports with scheduled airline service.

TABLE 3-1: PUBLIC AIRPORTS IN VICINITY OF AUBURN MUNI. AIRPORT *(WITHIN 30 NAUTICAL MILES)*

AIRPORT	LOCATION	RUNWAY DIMENSION (FEET)	SURFACE	LIGHTED RUNWAY?	FUEL AVAILABLE?
Renton Municipal	10 NM N	5,382 x 200	Asphalt	Yes	Yes
Boeing Field – King County Int'l.	13 NM N	10,000 x 200 (primary runway)	Asphalt	Yes	Yes
Seattle Tacoma Int'l.	8 NM NW	11,901 x 150 (primary runway)	Asphalt	Yes	No GA services
Pierce County - Thun Field (Puyallup)	14 NM S	3,650 x 60	Asphalt	Yes	Yes
Tacoma Narrows	15 NM W	5,002 x 150	Asphalt	Yes	Yes
Vashon Airport	13 NM NW	2,001 x 60	Turf	Yes	No
Bremerton National Airport	24 NM W	6,000 x 150	Asphalt	Yes	Yes

Significant Market Factors Related to Auburn Municipal Airport:

- Auburn Municipal Airport has historically been among the most active general aviation airports in the Puget Sound Region.
- The Airport has historically been prominent in local flight training activities.
- The Airport's geographic location and quality of facilities provide competitive advantages/development opportunities needed to retain existing aircraft and attract new aircraft from within the local area and for aircraft relocating to the area in the future.
- The Airport has land available to accommodate aviation facility reconfiguration and expansion for general aviation needs.
- As a non-towered airport, Auburn Municipal Airport provides relative simplicity and convenience of operations.

- The Airport's proximity to several major state and interstate highways provides efficient surface access within the local area and overall region.
- Commercial and industrial development in the Puyallup-Auburn-Kent corridor combined with efficient surface access to the airport is also complimentary to local airport activity.

Regional Factors:

- The Puget Sound region will continue to be Washington's largest population and economic center and among Washington's most active general aviation markets.
- Several airports in the Puget Sound region are facing development constraints that may limit future expansion or significantly increase the cost of new development for tenants.
- Increased surface travel times in the I-5 and I-405 corridors are anticipated as the region continues to grow, making proximity and overall accessibility more valuable.

These factors suggest that Auburn Municipal Airport will continue to be among the area's most active airports and has the potential to expand on its historic base to become an increasingly viable alternative for a wide range of general aviation users. Looking forward, the ability to offer competitive land lease rates, ready-to-build hangar sites, and building rental space that is in demand (mixed use hangars, storage hangars, etc.) will be significant competitive factors. The availability of services that cater to business and general aviation aircraft owners/operators such as aircraft servicing is also important for attracting both locally based and transient aircraft.

Socioeconomic Trends and Forecasts

AREA ECONOMY

Historically, downturns in general aviation activity often occur during periods of weak economic conditions and growth typically coincides with favorable economic conditions. It is evident that the recent economic recession and the slow recovery that followed, has constrained general aviation activity locally, statewide and throughout the national airport system. However, as indicated in the FAA's national long term aviation forecasts, the overall strength of the U.S. economy is expected to sustain economic growth over the long-term, which will translate into modest to moderate growth in aviation activity.

In December 2012, King County's unemployment rate was 6.1 percent, more than 2 percentage points below the statewide unemployment rate (8.2%). Pierce County's unemployment rate in December 2012 was 8.5 percent, slightly higher than the statewide rate. The median household income in King County in 2010 was $65,383, nearly 20 percent above Washington's median household income level of $54,888. Pierce County's median household income in 2010 was $55,531, slightly higher than the statewide

average. Pierce County has a relatively high percentage of government employment compared to King County (22 % compared to 14%), mostly due to Joint Base Lewis-McChord.

The 2011 Washington State Data Book identified the leading employment sectors in King and Pierce Counties (in 2010):

King County

1) Wholesale/Retail Trade (15%)
2) Government (14%)
3) Health Care & Social Assistance (10%)
4) Manufacturing (9%)
5) Professional/Technical Services (8%)

Pierce County

1) Government (22%)
2) Wholesale/Retail Trade (16%)
3) Health Care & Social Assistance (14%)
4) Accommodation/Food Services (8%)
5) Manufacturing (6%)
6) Construction (6%)

The Auburn-Kent Valley is a prime industrial and commercial area that accommodates a wide range of businesses and industry including high tech and aerospace. The Auburn Boeing plant is among the largest local employers. The Auburn plant is part of Boeing's Fabrication Division and includes machining, tooling, equipment services, tube and duct, and other specialty production lines.

The planned completion of upgrades to State Route 167 at the south connection between Puyallup and Tacoma will improve accessibility and transportation of goods within the corridor, which will in turn allow the area to accommodate future economic growth.

POPULATION

In broad terms the population within an airport's service area affects the type and scale of aviation facilities and services that can be supported. Although a large number of airport-specific factors can affect activities at an airport, changes in population often reflect other broader economic conditions which may also affect airport activity. Since it is difficult to identify specific connections between general aviation airport activity and individual economic indicators such as growth in personal income, unemployment rates, or business spending, population trends generally provide a broad measure of an area's economic health. Regions with flat or declining populations often have weak underlying economic conditions. In contrast, higher rates of population growth often characterize a growing economy that can stimulate individual and business use of general aviation.

HISTORIC POPULATION

As noted earlier, the airport service area for Auburn Municipal Airport extends beyond the local community and includes large areas of King and Pierce Counties. An examination of local and two-county historic population provides a basis for comparing the area's growth with historic activity at the airport.

Annual estimates of population for Washington cities and counties are developed by the Washington Office of Financial Management (OFM) to support local planning. The annual OFM estimates, coupled with the U.S. Census, conducted every ten years, provide an indication of local area population trends over an extended period. Population growth in King/Pierce Counties has been moderate (averaging 1.36 percent annual growth rate) over the last forty years, typically growing at a rate slightly higher than Washington's statewide population, which has averaged about 1.66 percent annually since 1980. Population growth within the City of Auburn (incorporated area) has outpaced county and statewide growth over the 30-year period, although annexation, particularly the Lea Hill area in 2008, has significantly expanded city population. As a result of the local expansion, Auburn's share (in percentage) of county and statewide population has nearly doubled. Historic population data for Pierce County, King County, City of Auburn, and Washington are summarized in **Table 3-2.**

TABLE 3-2: HISTORIC POPULATION

	1980	1990	2000	2010	2012	*AVERAGE ANNUAL GROWTH RATE (AAGR) 1980-2012*
King County	1,269,898	1,507,319	1,737,034	1,931,249	1,957,000	*1.26%*
Pierce County	485,643	586,203	700,820	795,225	808,200	*1.62%*
Combined 2-County Population	1,755,541	2,093,237	2,437,854	2,726,474	2,765,200	*1.36%*
Washington	4,132,156	4,866,692	5,894,121	6,724,540	6,817,770	*1.66%*
2-County % of WA Population	42.3%	43.0%	41.4%	40.6%	40.6%	
Auburn (incorporated area)	26,417	33,650	40,314	70,180	71,240	*3.15%*
Auburn % of 2-County Area	1.5%	1.6%	1.7%	2.6%	2.6%	
Auburn % of WA Population	0.6%	0.7%	0.7%	1.0%	1.1%	

Source: U.S. Census data; Washington Office of Financial Management annual estimate (April, 2012).

POPULATION FORECASTS

Washington Office of Financial Management (OFM)

Long-term county population forecasts are prepared by the Washington Office of Financial Management (OFM) to support local and statewide planning. The OFM forecasts are developed through three growth scenarios (Low, Intermediate, High) reflecting a range of growth assumptions ranging from very conservative to very optimistic. The Intermediate projections are routinely used by local governments for comprehensive planning due to their balanced, mid-range outlook. The OFM forecasts are summarized in **Table 3-3**.

TABLE 3-3: KING COUNTY, PIERCE COUNTY & WASHINGTON POPULATION FORECASTS

YEAR	KING COUNTY	PIERCE COUNTY	COMBINED 2-COUNTY AREA	WASHINGTON
2010[1]	1,931,249	795,225	2,726,474	6,724.540
2012[2]	1,957,000	808,200	2,765,200	6,817,770
2015	2,012,782[3]	831,944[3]	2,844,726[3]	7,029,758[4]
2020	2,108,814[3]	876,565[3]	2,985,379[3]	7,182,231[4]
2025	2,196,202[3]	923,912[3]	3,120,114[3]	7,570,617[4]
2030	2,277,160[3]	967,601[3]	3,244,761[3]	7,951,595[4]
2035	2,350,576[3]	1,006,614[3]	3,357,190[3]	8,301,547[4]
Avg. Annual Growth Rate (AAGR)2010-2035	*0.79%*	*0.95%*	*0.84%*	*0.85%*

1. 2010 U.S. Census Data
2. Washington Office of Financial Management (OFM) Annual Estimate (April 1)
3. OFM Forecast Population 2000-2040 (Intermediate Projection)
4. OFM Forecast of State Population (November 2012)

The 2010-2040 OFM Intermediate forecasts for King County and Pierce County project sustained modest growth through 2040 (0.79 and 0.95 percent average annual rate of growth, respectively). The OFM 2012 Forecast of The State Population[1] projects Washington's annual statewide growth to average 0.85 percent through 2040. A comparison of the OFM Intermediate forecast and the recently updated statewide population forecast shows that the combined King County and Pierce County population is expected to account for about 40.4 percent of Washington population in 2035, down slightly from 40.6 percent in 2010.

[1] Forecast of The State Population (Washington Office of Financial Management, November 2012)

The 2012 OFM estimates for King County and Pierce County combined (2,765,200) falls between the 2010 and 2015 Intermediate projections for each county, indicating that forecast is currently providing an effective projection of growth. Anticipated growth within two-county area is considered to be an indicator of future economic strength that will affect activity at Auburn Municipal Airport.

National General Aviation Activity Trends

The first decade of the 21st Century was tumultuous for General Aviation. The industry was battered by poor economic conditions and steadily rising fuel prices that slowed growth and negatively impacted elements such as aircraft manufacturing, on-demand air travel, aircraft ownership, and aircraft utilization levels. Ongoing concerns over the potential replacement and future availability of aviation gasoline (AVGAS) have also created uncertainty within general aviation. On a national level, most measures of General Aviation activity declined sharply through the second half of the decade and have only recently started to show modest signs of improvement.

Data maintained by the FAA show significant system-wide declines of several key general aviation activity indicators between 2000 and 2011 (AVGAS consumption -36%; piston aircraft hours flown -36%; active piston aircraft -9%; active GA pilots -2%). The FAA's updated long term forecasts are significantly tempered to reflect current and recent historic conditions. Although the FAA maintains a favorable long-term outlook, many of the activity segments associated with piston engine aircraft and AVGAS consumption are not projected to return to "pre-recession" levels until the 2020 to 2030 timeframe.

These expectations reflect a variety of industry specific factors and broad-based measures and forecasts of economic health such as gross domestic product (GDP), consumer price index, oil prices and interest rates. The FAA acknowledges several risks to its forecast assumptions related to rising oil prices, public perceptions of business and corporate aviation, broad national and international governmental fiscal policy concerns, and environmental concerns. The FAA notes that improvement for business and corporate aviation is largely based upon the future prospects of economic growth and corporate profits.

The FAA indicates that the 2012 general aviation forecasts have been updated to rely heavily on discussions with industry experts conducted at a workshop co-hosted by FAA and the Transportation Research Board (TRB) in July 2011 along with the results of the 2010 General Aviation and Part 135 Activity Survey. The forecast assumptions have been updated by FAA analysts to reflect more recent data and developing trends, as well as further information from industry experts. Although some segments of general aviation are expected to grow at moderately high rates, most measures of the general aviation industry suggest modest, sustained growth in the range of 1 to 2 percent annually is expected over the next 20 years. The FAA's annual growth assumptions for individual general aviation activity segments are summarized in **Table 3-4.**

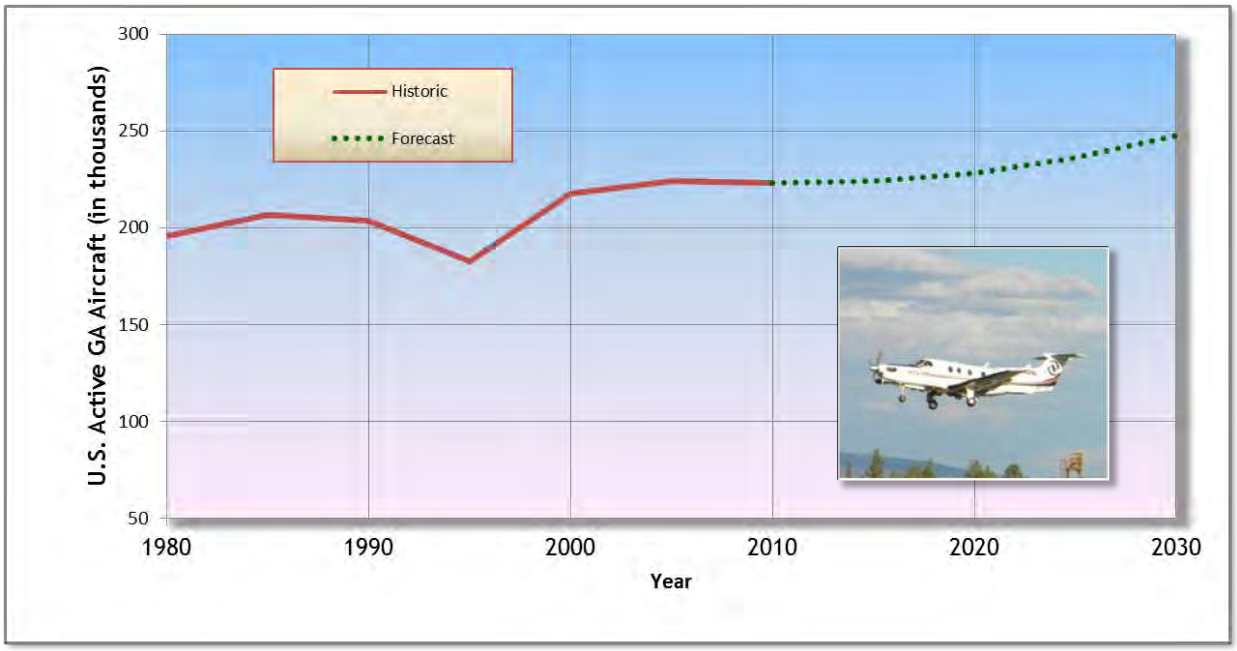
TABLE 3-4: FAA LONG RANGE FORECAST ASSUMPTIONS (U.S. GENERAL AVIATION)

ACTIVITY COMPONENT	FORECAST ANNUAL AVERAGE GROWTH RATE (2012-2032)
Components with Annual Growth Forecast < 0%	
Single-Engine Piston Aircraft in U.S. Fleet	-0.2%
Multi-Engine Piston Aircraft in U.S. Fleet	-0.5%
Hours Flown - GA Fleet (Piston AC)	-0.1%
Student Pilots (Indicator of flight training activity)	-0.1%
Components with Annual Growth Forecast < 1%	
Private Pilots	0.1%
Commercial Pilots	0.4%
Airline Transport Pilots	0.6%
Instrument Rated Pilots	0.4%
Active Pilots (All Ratings, excluding Airline Transport)	0.3%
GA Operations at Towered Airports (all AC types)	0.3%
AVGAS (Gallons consumed - GA only)	0.2%
Active GA Fleet (# of Aircraft)	0.6%
Turboprop Aircraft in U.S. Fleet	0.9%
Components with Annual Growth Forecast 1%-2%	
Experimental Aircraft in U.S. Fleet	1.2%
Components with Annual Growth Forecast >2%	
Sport Pilots	6.0%
Helicopter Pilots	3.0%
Turbine Helicopters in U.S. Fleet	3.0%
Piston Helicopters in U.S. Fleet	2.7%
Light Sport Aircraft in U.S. Fleet	2.1%
Turbojet Aircraft in U.S. Fleet	4.0%
Hours Flown - GA Fleet (Turbine AC)	4.0%
Hours Flown – Experimental AC/Light Sport AC	2.6%/3.5%
Jet Fuel (Gallons consumed – GA only)	3.9%

Source: FAA Long Range Aerospace Forecasts (FY 2012-2032)

The FAA's long term forecasts predict that the U.S. active general aviation aircraft fleet will grow modestly at an average annual rate of 0.6 percent between 2012 and 2032. The active fleet is expected to increase from 222,520 aircraft in 2011 to 253,205 in 2032 (+30,685) which is an overall increase of approximately 14 percent. However, within that overall growth is a projected decline in active single engine piston aircraft (-2.3%) and multi-engine piston aircraft (-9.2%). These declines reflect attrition of an aging fleet which is not fully offset by new aircraft production. Encouraging areas within the general aviation fleet are found in experimental aircraft (+29%), sport aircraft (+53%), and business jet (+129%) growth through 2032. The very light jet (VLJ) [2] portion of the business jet segment is expected to overcome several early setbacks and depressed market demand to become a growing percentage of the business jet fleet. **Figure 3-2** depicts the FAA forecast for active general aviation aircraft in the United States between 2012 and 2032.

FIGURE 3-2: US ACTIVE GENERAL AVIATION AIRCRAFT FORECAST



The industry segments with potential for affecting future activity at Auburn Municipal Airport include changes in the single-engine piston fleet, which is tempered somewhat by growth in light sport aircraft and experimental aircraft. Continued strength in turbine aircraft manufacturing, particularly for single-engine turboprops and very light jets/small business jets that are capable of operating on runway lengths comparable to Auburn's, and for turbine helicopters is another significant trend within general aviation. Student pilot numbers, while not projected to grow dramatically, are expected to remain relatively steady

[2] Very Light Jets (VLJ) are small jet-powered aircraft (weighing less than 12,500 pounds) with airport-related performance characteristics (takeoff weight, approach speed, runway length requirements, physical dimensions, passenger load, etc.) comparable to a high-performance light twin-engine aircraft.

at approximately 115,000 through 2032. The FAA expects the number of active private pilots to increase slightly, although the number of sport pilots is expected to more than triple over the next twenty years. The number of helicopter pilots is projected to nearly double over the next twenty years.

Overview of Recent Local Events

Auburn Municipal Airport was affected by the same conditions that affected airports across the country during the recent economic recession and sluggish recovery. As noted above, moderate unemployment continues to be a drag on the local economy. A review of events at the airport over the last ten years underscores the impact of the economic recession that effectively created a "pre-recession" period that included hangar construction and growth in aircraft activity followed by a recession and post-recession period that is marked with a decline in aircraft utilization (hours flown, fuel used, etc.) and slower hangar construction. Several significant events have occurred at the airport since the last master plan was completed in 2002. These events are summarized below.

NORTHWEST AVIATION COLLEGE

The closure of a local flight school in April 2012 affected several activity measures at the airport—most very recently, although some activity appears to have begun to slow during the recent economic recession, several years ahead of the closure. Between 2000 and 2012, the number of based aircraft at Auburn Municipal Airport decreased by less than 1 percent (276 to 274), although the number of aircraft associated with the flight school went from 20 to 0. In 2000, the flight school's fleet of 20 aircraft accounted for 7 percent of the airport's 276 based aircraft. Over the next several years, the aging flight training fleet was replaced with 10 newer, more reliable aircraft. Following the closure of the flight school, the aircraft were sold (8 aircraft left the airport and 2 remain on the airport). Accounting for the loss of flight school aircraft, the number of based aircraft not associated with the flight school increased by 18 during this period. In recent years it is estimated that the flight school generated approximately 8,000 flight hours annually (approximately 40,000 operations), down from 12,000 hours (60,000 operations) at its peak. The 2002 airport master plan estimated 141,000 annual operations in 2000. It is estimated that Northwest Aviation College operations accounted for 28 percent of total airport operations in 2000. The flight school accounted for less than 5 percent of airport operations in 2012 as business operations were winding down. According to airport management, Northwest Aviation College accounted for roughly 60 percent of the airport's annual aviation gasoline (AVGAS) volume until recently. The airport's 2012 AVGAS volume declined by 43 percent over the previous year, which coincided with the flight school closure. The reductions in aviation activity associated with the closure of Northwest Aviation College are not expected to be replaced without an equivalent flight school being located at the airport.

HANGAR CONSTRUCTION

Closely following completion of the last airport master plan in 2002, several privately-funded hangars were constructed at the airport, increasing hangar capacity by approximately 127 units. However,

according to airport management, the majority of aircraft currently residing in the new hangars relocated from open-front city hangars and aircraft tiedown aprons, with a smaller number of aircraft relocating from other airports. The impact on the airport's based aircraft fleet was not as dramatic as anticipated in the 2002 master plan based aircraft forecast, but contributed to the net increase in non-flight training aircraft (+18) between 2000 and 2012.

AVIATION FUELING

A review of aviation fuel delivery volumes at Auburn Municipal Airport was conducted to help evaluate the impact of activity trends on airport operations. While overall economic conditions since 2007 have been generally weak, the impact of Northwest Aviation College flight operations on fuel activity is evident, particularly the sharp decline between 2011 and 2012. Airport management estimates that the flight school accounted for up to 60 percent of airport fuel volumes in recent years. It appears that during this period, non-flight school AVGAS volumes remained relatively stable with a slight increase that could be partly attributed to a small increase in non-flight school based aircraft. **Table 3-5** summarizes AVGAS deliveries at the airport during the last six years (2007-2012).

TABLE 3-5: AUBURN MUNICIPAL AIRPORT - AVIATION FUEL (ANNUAL GALLONS DELIVERED)

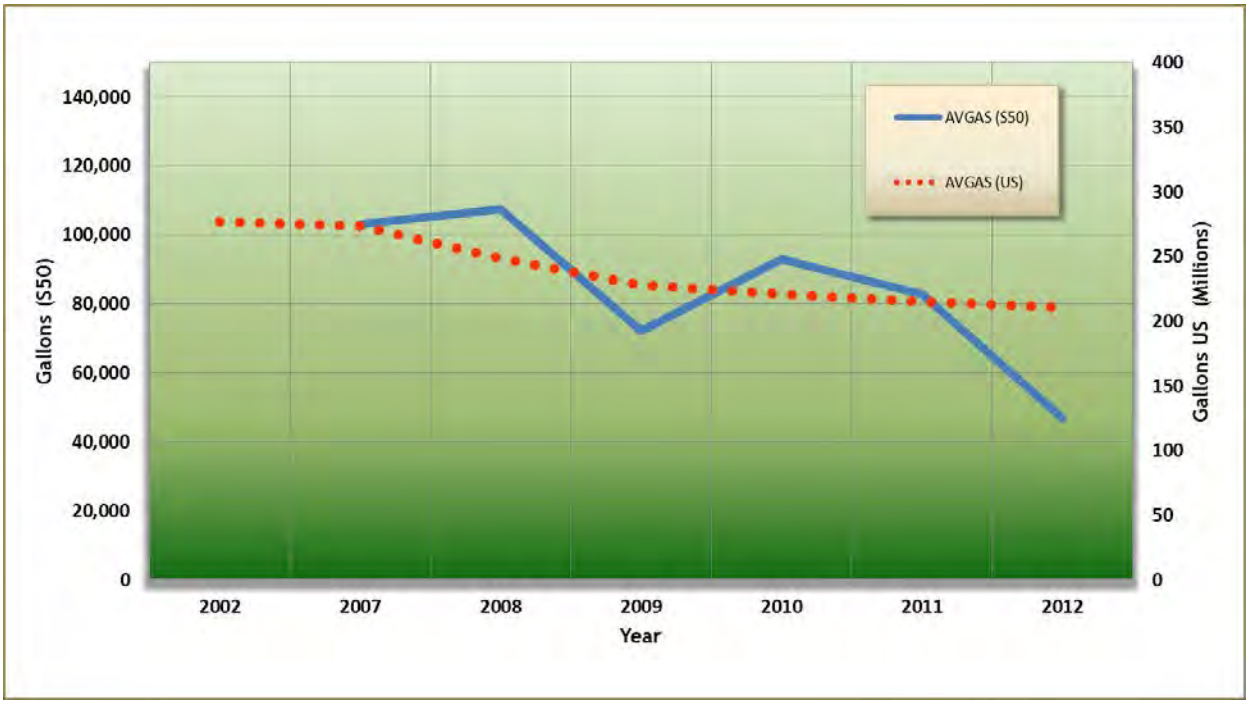
	2007	2008	2009	2010	2011	2012
AVGAS (100LL)	102,957	107,316	72,059	92,867	82,799	46,825
NET CHANGE FROM PREVIOUS YEAR	--	+4.2%	-32.9%	+28.9%	-10.8%	-43.5%

Source: Airport fuel records

Local/National Trend Comparison: The fueling trends at Auburn Municipal Airport are generally consistent with general aviation fuel consumption trends documented by the FAA throughout the U.S. during the same period. **Figure 3-3** illustrates the recent historic aviation fuel trends for Auburn Municipal Airport (left axis) and the U.S. (right axis).

Nationally, AVGAS consumption levels dropped every year between 2000 and 2011, ending 35 percent below 2000 levels. Contributing factors include economic recession, rising fuel prices, the ever-increasing cost of aircraft operation, use of alternative fuels (auto gas), and a shrinking piston-engine fleet (-9% between 2000 and 2011). The latter factor does not appear to have influenced AVGAS fueling trends at Auburn Municipal, although the economic factors have broad impacts that are evident at virtually every general aviation airport. A review of the statewide aircraft taxable fuel distribution data provided by WSDOT Aviation for the period 2007 through 2012 shows a 22 percent overall decline in AVGAS volumes with minor year-to-year fluctuations. This trend is generally consistent with national fueling activity and it generally signals a decline in aircraft utilization (hours flown, gallons of fuel consumed, etc.).

FIGURE 3-3: AUBURN (S50) AND US AVIATION GASOLINE (AVGAS) CONSUMPTION TRENDS



Historic Aviation Activity

For Auburn Municipal Airport, aircraft operational data (takeoffs and landings, touch and go landings, etc.) are limited to estimates. As a non-towered airport, no record of activity is regularly maintained. However, a review of estimates contained in state aviation system plans, previous airport master plans, and FAA Terminal Area Forecast (TAF) data provides a general indication of activity at the airport over time. Based aircraft counts are updated periodically either as part of a master plan or by airport management for other purposes.

FAA TERMINAL AREA FORECAST (TAF) DATA

The Federal Aviation Administration (FAA) Terminal Area Forecast (TAF) is maintained for airports that are included in the National Plan of Integrated Airport System (NPIAS). **Table 3-6** summarizes recent historic based aircraft and aircraft operations estimates for the airport from the TAF. The TAF is periodically updated and adjusted as more specific airport activity data are available. When reviewing FAA TAF data, it is important to note that when there is no change from year to year it often indicates a lack of data, rather than no change in activity. Similarly, a large change in data in a single year may follow updated reporting that captures changes that occurred over several years. Small changes in year-to-year activity that extend through the forecast typically reflect assumed growth rates that are not frequently updated. TAF aircraft operations estimates in the ten years prior to 2000 ranged from 143, 000 to 165,908. The TAF data in 2000 was revised to reflect the

base year (2000) documented in the 2002 Airport Master Plan forecasts. The consistent year-to-year growth reflected in the operations data since 2000 appears to follow an assumed pre-defined annual growth rate which does not reflect specific local events or fluctuating economic conditions. It is noted that the TAF based aircraft estimate for 2012 (343) is 69 higher (+25%) than the 2012 airport management count (274). Based on recent fuel delivery records and the closure of the local flight school, the recent TAF estimates of aircraft operations also appear to be well above current activity levels.

TABLE 3-6: FAA TAF DATA – AUBURN MUNICIPAL AIRPORT

YEAR	GA AIRCRAFT OPERATIONS	BASED AIRCRAFT	RATIO: GA OPERATIONS PER BASED AIRCRAFT
2002	145,636	277	526
2003	148,272	284	522
2004	150,882	277	545
2005	153,518	277	554
2006	155,862	305	511
2007	158,242	305	519
2008[1]	160,657	312	515
2009[1]	163,110	319	511
2010[1]	165,600	326	508
2011[1]	168,129	335	502
2012[1]	170,695	343	498

1. FAA Terminal Area Projected (Forecast) Activity; previous years are presented as historical (all data based on estimates)

CURRENT ESTIMATE OF ACTIVITY

The 2002 airport master plan estimated 276 based aircraft and 141,000 annual aircraft operations for 2000. The estimates were relatively consistent with other FAA activity estimates at the time and are believed to have been reasonably accurate.

Based Aircraft

The airport's current based aircraft count of 274 (late 2012) is slightly lower than the 276 based aircraft estimated in 2000 (-0.7%) for the Master Plan. However, as noted earlier, the 2000 based aircraft count included 20 aircraft in the Northwest Aviation College fleet and 256 other aircraft. The events associated with the flight school closure were noted above. With this accounted for, non-flight school aircraft at the airport increased from 256 to 274 (+7.0%), which reflects an average annual growth rate (AAGR) of **0.57 percent**.

Auburn Municipal Airport has traditionally accommodated primarily single- and multi-engine piston aircraft and small helicopters. All current fixed-wing based aircraft are included in Airplane Design Group I (ADG I), although the airport accommodates transient ADG II aircraft that are capable of operating on the existing 3,400-foot runway. ADG I includes aircraft with wingspans less than 49 feet; ADG II includes aircraft with wingspans from 49 to 79 feet. A description of aircraft classifications is provided later in the chapter.

Aircraft Operations

The 2002 Airport Master Plan developed an estimate of aircraft operations (takeoffs and landings) based on a seasonal assessment of activity. Aircraft operations for 2000 were estimated at 140,976, which was rounded to 141,000. With a based aircraft fleet of 276 aircraft, the ratio of operations per based aircraft was 511 (141,000/276 = 511). The master plan operations estimate was approximately 15 percent lower than the FAA's TAF estimate for 1999 and it appeared to be consistent with activity ratios generated by general aviation reliever airports during the period. The activity ratio was also consistent with airports having significant flight training activity. In 2000, the ratio of operations per based aircraft (not including local flight training aircraft) was 395 (101,000/256 = 395), which is consistent with medium size general aviation airports with significant transient activity, including flight training from nearby airports.

FAA GUIDANCE FOR ESTIMATING AIR TRAFFIC AT NON-TOWERED AIRPORTS

The FAA provides planning guidance for estimating activity at general aviation airports without control towers, including the use of activity ratios to project aircraft operations from the number of based aircraft at the airport. In the absence of actual aircraft operations counts, the ratios of activity are generally adequate for airport planning purposes. The FAA developed "typical" operations ratios for general aviation airports based on recent observations at airports throughout the United States. The suggested range is 250 to 450 operations per based aircraft (for small airports with low activity to high activity airports in urban areas). The ratios are intended to reflect operations from both locally-based and transient aircraft and they have been tempered slightly from previous recommended ratios developed for FAA NPIAS general aviation airports to reflect industry and economic trends experienced over the last decade.

The 2002 Airport Master Plan estimate of general aviation operations (141,000) with 276 based aircraft reflect an operations to based aircraft ratio of 511, which is slightly above the high end of the typical range but provides a reasonable "pre-recession" estimate of activity. The closure of the local flight school and the significant decline in AVGAS fueling volumes experienced at Auburn Municipal Airport in recent years, coupled with nearly level based aircraft totals suggests a decline in overall aircraft activity and average aircraft utilization has occurred.

In order to develop updated forecasts of aircraft operations, an estimate of current activity is needed. Using the 2002 airport master plan's activity measures as a baseline, several adjustments were made to reflect specific events.

- Three months of Northwest Aviation College activity in 2012 was estimated at 3,000 operations.
- A 15 percent reduction in non-flight training aircraft utilization was assumed (compared to 2000) to reflect national and statewide aviation trends and the portion of reduced on-airport AVGAS volumes not attributed to the closure of Northwest Aviation College. The 2000 ratio of 395 operations per (non-flight training) based aircraft was reduced to approximately 336 (395 x .85 = 335.75) for 2012.
- An area helicopter flight school (Atomic Helicopters) bases two aircraft at Auburn Municipal Airport, although most flight training activity is conducted at Boeing Field. According to airport management, the aircraft are repositioned to Boeing Field as needed. For planning purposes, it is estimated that the two aircraft currently generate approximately 1,700 annual operations, most of which is related to repositioning the aircraft between the two airports, with some flight training conducted on the airport. The estimated annual activity translates into an average of about 5 operations per day.

Based on the factors noted above, an estimate of aircraft operations for 2012 was developed as follows:

A. Northwest Aviation College Aircraft Operations (Jan-Mar): 3,000

B. Non Flight Training Based Aircraft (272) x 336 operations per based aircraft ratio (captures local and transient aircraft activity, including transient flight training)

C. Locally-Based Flight Training Helicopters (2) x 856 operations

2012 General Aviation Operations (Auburn Municipal Airport)

A. = 3,000 Operations

B. 272 x 335.75(≈336) = 91,324 Operations

C. 2 x 856 = 1,712 Operations

A+B+C = 96,036 General Aviation Operations

96,036/274 (Based Aircraft) = 351 GA Operations per Based Aircraft

The 2012 estimate of general aviation operations (96,036) is approximately 32 percent lower than the 2000 estimate of activity (141,000). A detailed distribution of current traffic is provided in the forecast of aircraft operations later in the chapter.

Aviation Activity Forecasting

EXISTING FORECASTS

Several existing aviation activity forecasts are available for comparison with current activity, recent historic trends, and the updated forecast scenarios prepared for the master plan. However, it is noted that all of the existing aviation activity forecasts for Auburn Municipal Airport were completed before the start of the recent economic recession that began in the 4th quarter of 2007. Five years after the beginning of recession, many segments of general aviation activity have not returned to pre-recession levels. As an example, the precipitous declines in piston aircraft hours flown and AVGAS consumption documented by FAA throughout the national aviation system during the last decade were not anticipated in forecasts commonly produced between 2000 and 2007.

The existing forecasts are presented unmodified and therefore do not reflect recent events and may be obsolete (in actual numbers). However, the long-term growth rates reflected in the existing forecasts are typically within the range found at many general aviation airports and provide a useful basis of comparison. The existing forecasts and their respective average annual growth rates are summarized below and later in **Table 3-7 and depicted in Figure 3-4**. For the purposes of comparison, the existing forecasts have been interpolated or extrapolated to correspond to the nearest master plan forecast years.

2002 AIRPORT MASTER PLAN

The 2002 Airport Master Plan forecasts projected based aircraft at Auburn Municipal Airport to increase from 276 to 377 between 2000 and 2022, which reflects an average annual growth rate of **1.57 percent**. Operations were projected to increase from 141,000 to 193,189 during the same period, reflecting an average annual growth rate of **1.59 percent**.

The airport's 2012 based aircraft count (274) is 67 aircraft below (-19.7%) the 2010 forecast of 341 based aircraft. The 2012 operations estimate of 96,036 is 45 percent below the 2010 forecast of 174,891 operations. The master plan forecasts did not anticipate the significant local and national events that negatively affected air traffic at the airport and do not reflect current conditions or recent activity trends.

FAA TERMINAL AREA FORECAST (TAF)

The FAA's 2008 TAF forecast update projects based aircraft at Auburn Municipal Airport to increase from 305 to 463 (+52%) between 2007 and 2025, which represents average annual growth of **2.35 percent**. The 2012 TAF forecast for based aircraft (343) is 69 aircraft (20%) above the 2012 based aircraft count for the airport. General aviation aircraft operations are projected to increase from 158,342 to 207,962 between 2007 and 2025, which represents average annual growth of **1.53 percent**. The 2012 operations forecast of 158,342 is approximately 65 percent higher than the 2012 operations estimate (96,036) prepared for the master plan update. As noted earlier, the TAF forecasts have not been adjusted to reflect

a variety of airport-specific and national factors and do not appear to reflect current conditions or recent activity trends at the airport.

2007 WSDOT AVIATION LONG TERM AIR TRANSPORATION STUDY (LATS)

The 2007 WSDOT Aviation Long Term Air Transportation Study (LATS) contains based aircraft and operations forecasts for Washington's public use airports for the 2007-2030 timeframe. Based aircraft are projected to increase from 305 to 353 (+16%) between 2002 and 2030, which represents average annual growth of **0.59 percent**. General aviation aircraft operations are projected to increase from 137,250 to 158,850 during the same period, reflecting an average annual growth rate of **0.59 percent**. Annual air taxi operations were estimated at 6,100 and military operations were estimated at 100 in the base year of the forecasts (2005) and were then maintained unchanged through the 25-year forecast period.

Updated Forecasts

BASED AIRCRAFT

Several updated projections of based aircraft at Auburn Municipal Airport have been prepared based on a review of recent socioeconomic data, existing aviation activity forecasts and current conditions. The existing and updated forecasts are summarized in **Table 3-7** and depicted in **Figure 3-4**. Note that the previously prepared forecasts are not adjusted to reflect the 2012 based aircraft count (274).

ADJUSTED FAA TERMINAL AREA FORECAST (TAF) (2.35% ANNUAL GROWTH)

The existing FAA TAF based aircraft forecast for Auburn Municipal Airport was updated by applying the growth rate to the updated 2012 based aircraft count of 274 aircraft. With this one-time adjustment, based aircraft are projected to increase from 274 to 388 (+42%) between 2012 and 2027, which represents average annual growth of **2.35 percent**.

U.S. ACTIVE GENERAL AVIATION FLEET MARKET SHARE (0.64% AND 0.92% ANNUAL GROWTH)

Auburn Municipal Airport accounted for approximately 0.123 percent of the U.S. active general aviation fleet in 2012, down from 0.127 percent in 2000. This trend is reflective of the nominal decline in based aircraft at the airport, but it does not provide a complete picture of the flight school/non-flight school shifts in based aircraft numbers. The underlying theme in U.S. general aviation activity forecasts is very modest growth. Since expectations are low system-wide, it is very feasible for individual airports to outpace national growth with events such as new hangar construction or attracting new tenants to the airport.

Two market share projections were developed using the U.S. general aviation fleet forecast model. The first projection assumes that current market share of 0.123 percent is maintained through the planning period. Based aircraft are projected to increase from 274 in 2012 to 311 in 2032, which represents an average annual growth rate of **0.64 percent.** The second projection assumes that Auburn's market share

will gradually increase from 0.123 to 0.130 percent by the end of the planning period. This upward movement assumes that the airport will marginally increase market share in part based on its ability to grow an established large based aircraft population due to availability of services and other favorable market factors. In this projection, based aircraft increase from 274 in 2012 to 329 in 2032, which represents an average annual growth rate of **0.92 percent.**

PUGET SOUND REGIONAL TRANSPORTATION ORGANIZATION (RTPO) MARKET SHARE (0.57% TO 1.65% ANNUAL GROWTH)

The Washington Long Term Air Transportation Study (LATS) long-term aviation activity forecasts, prepared in 2007, provides based aircraft forecasts for the state's RTPOs. For the Puget Sound RTPO, which includes King, Pierce, Kitsap and Snohomish Counties, there were 3,798 general aviation aircraft based at public airports in 2005. Auburn Municipal Airport accounted for approximately 6.47 percent of Puget Sound RTPO based aircraft in 2005. The LATS forecast projects Puget Sound RTPO based aircraft to increase from 3,798 to 5,434 by 2030, which reflects a 43 percent overall increase and an average annual growth rate of 1.44 percent.

Three market share projections were developed using the LATS Puget Sound RTPO forecasts. For each, the LATS Puget Sound RTPO forecast for 2030 was extrapolated to 2032 by using the average annual growth rate (1.34%) from the 2025 to 2030 forecast period. The first projection assumes that Auburn's current market share of 6.47 percent is maintained through the planning period. Based aircraft are projected to increase from 274 in 2012 to 361 in 2032, which represents an average annual growth rate of **1.39 percent.**

The second projection assumes that Auburn's market share will gradually increase from 6.47 to 6.8 percent by the end of the planning period. In this projection, based aircraft increase from 276 in 2012 to 380 in 2032, which represents an average annual growth rate of **1.65 percent.**

The third projection assumes that Auburn's market share will decrease from 6.47 to 5.5 percent by the end of the planning period. This does not indicate a decline in based aircraft for the airport, just a slower rate of growth than is projected within the entire Puget Sound RTPO. In this projection, based aircraft increase from 276 in 2012 to 307 in 2032, which represents an average annual growth rate of **0.57 percent.**

POPULATION/ BASED AIRCRAFT RATIO (0.84% ANNUAL GROWTH)

The combined population of King and Pierce County in 2012 was 2,765,200.[3] Auburn's 2012 based aircraft count of 274 yields a ratio of approximately 0.991 based aircraft per 10,000 residents. A projection was developed using the current Washington Office Financial Management Intermediate population forecast for the two counties and maintaining population to based aircraft ratios. In this projection, based

[3] Washington OFM Annual Estimate of Population, April 1, 2012.

aircraft increase from 276 in 2012 to 330 in 2032, which represents an average annual growth rate of **0.84 percent.**

This projection assumes that the current relationship between regional population and based aircraft will remain constant over the next twenty years. Although there is no strong correlation between historic population and based aircraft growth at the airport, this projection provides an indication of airport growth that would essentially mirror overall anticipated growth within the region.

Summary

The preferred forecast noted above from the draft aviation activity forecast working paper was the **Puget Sound RTPO Maintain Market Share** projection. The projection was based on the airport's strategic location within the region, historic activity levels and site specific development potential which provide sufficient basis to grow in line with the overall Puget Sound region. Based aircraft were projected to increase from 274 in 2012 to 361 in 2032, which represents a net increase of 87 aircraft and an average annual growth rate of 1.39 percent. Although the preferred based aircraft forecast was revised per FAA review (see below), it is recommended that the long-term development reserves be based on the higher projection.

Following review of the master plan draft forecast working paper, the FAA Seattle Airports District Office provided the following direction: "- Pg. 23, Based Aircraft Forecasts: The preferred is very optimistic for what we are seeing with national trends. Given the regional trends and the activity that Auburn is able to accommodate, I believe that the US GA Fleet (Increase Share) is very reasonable and fitting for Auburn."[4] Based on this input, the U.S. GA Fleet Increased Market Share projection will be used as the selected based aircraft forecast for the master plan. In this forecast, based aircraft increase from 274 in 2012 to 329 in 2032, which represents a net increase of 55 aircraft and an average annual growth rate of 0.92 percent. The use of long term development reserves is recommended to address potential growth beyond forecast levels.

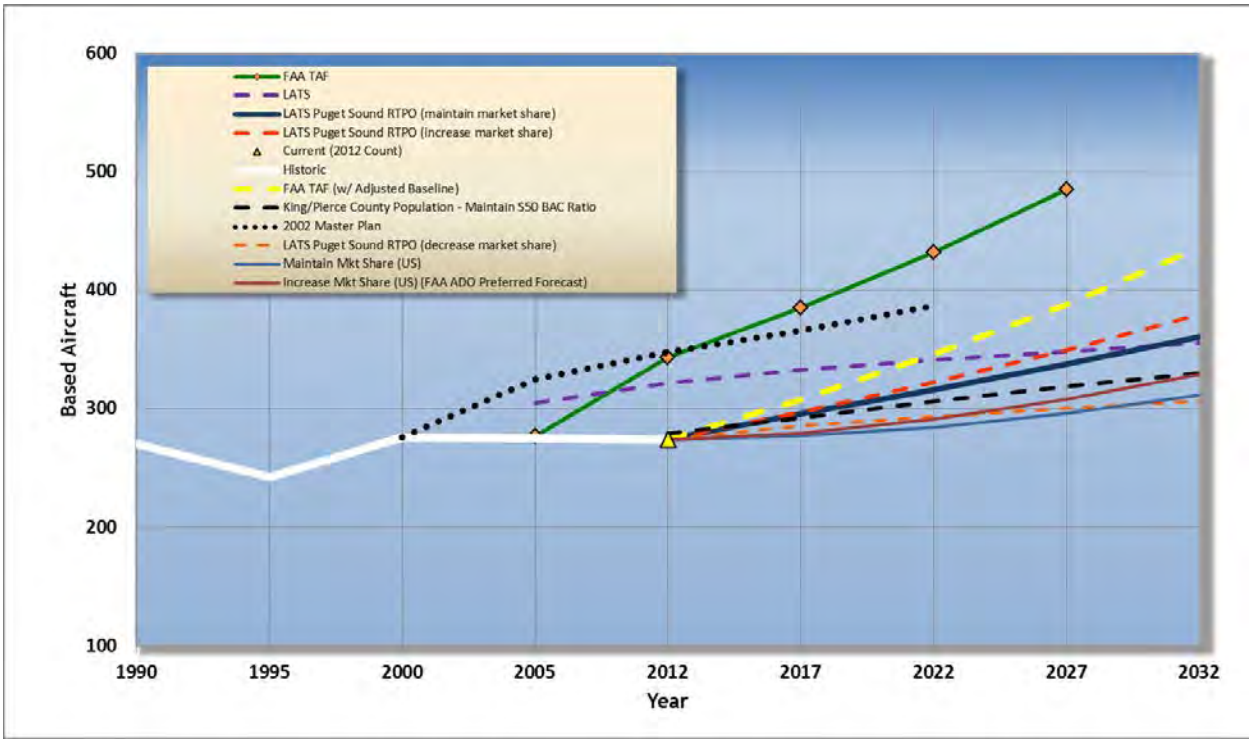
[4] Email correspondence (4/16/13) from Deepeka.Parashar@faa.gov, FAA Seattle ADO

TABLE 3-7: SUMMARY OF BASED AIRCRAFT FORECASTS (AUBURN MUNICIPAL AIRPORT)

EXISTING FORECASTS	2012	2017	2022	2027	2032	AAGR[2]
2002 Airport Master Plan	348[1]	366[1]	387[1]	--	--	1.56%
WSDOT LATS	322[1]	333[1]	341[1]	348[1]	356[1]	0.59%
FAA Terminal Area Forecast	343	385	432	485[1]	--	2.35%
UPDATED FORECASTS	**2012**	**2017**	**2022**	**2027**	**2032**	**AAGR[2]**
FAA TAF% with Adjusted Baseline	274	308	346	388[1]	--	2.35%
US GA Fleet (Maintain Current Share)	274	277	284	296	311	0.64%
US GA Fleet (Increase Share) ***(FAA Recommended Forecast)***	**274**	**280**	**291**	**308**	**329**	**0.92%**
Puget Sound RTPO Market Share (Maintain Current Share) [3]	274	296	316	338	361	1.39%
Puget Sound RTPO Market Share (Increase Share) [3]	274	297	322	350	380	1.65%
Puget Sound RTPO Market Share (Decrease Share) [3]	274	286	293	300	307	0.57%
King/Pierce County Population Ratio (Maintain Current Ratio of S50 BAC to Population)	279	292	306	319	330	0.84%

1. Interpolated/Extrapolated to fit forecast year
2. Average Annual Growth Rate (over defined forecast period)
3. Utilizes 2007 WSDOT LATS Based Aircraft Forecast for Puget Sound Regional Transportation Planning Organization (RTPO)

FIGURE 3-4: AUBURN MUNICIPAL AIRPORT - BASED AIRCRAFT FORECASTS



AIRCRAFT OPERATIONS

Updated aircraft operations projections have been developed for comparison with existing forecasts in order to identify a selected forecast for the master plan. The updated operations forecasts utilize the 2012 estimate (96,036) as the base for new projections. Several forecasting methods were used to reflect specific conditions.

CONSTANT AND INCREASING OPERATIONS RATIO PROJECTIONS (1.38% AND 1.93% ANNUAL GROWTH)

These projections were developed using an FAA-recommended methodology for estimating airport operations at non-towered general aviation airports. This method was also selected as the preferred forecast in the 2002 Airport Master Plan that utilized a static ratio of approximately 512 general aviation operations per based aircraft through the planning period. For the updated projection, the 2012 estimate of 96,036 general aviation operations and 274 based aircraft provides a ratio of approximately 350 operations per based aircraft that is used as a benchmark from which to move forward. The current ratio reflects recent fuel trends and current flight training activity at the airport.

The **constant ratio projection** maintains the 350 operations per based aircraft ratio through the twenty-year planning period. The projection assumes that current aircraft utilization will remain at current levels and growth in aircraft operations will be driven primarily by a net increase in based aircraft. The **increasing ratio projection** assumes a gradual increase from 350 to 390 operations per based aircraft

through the planning period. The ratio of 390 operations per based aircraft is comparable to the levels of non-flight school activity at the airport in 2000. This projection reflects the assumption that as the recent economic downturns ease, the airport will be capable of sustaining significantly stronger growth in activity both in terms of growth in based aircraft and increased utilization per aircraft, although equivalent replacement of Northwest Aviation College flight training activity is not assumed.

The range of operations ratios presented in these projections are consistent with the FAA's current guidance on estimating activity at medium size general aviation airports and are tempered to reflect the FAA's modest long term growth expectations for general aviation activity.

The constant ratio projection results in general aviation aircraft operations increasing from 96,036 to 126,382 by 2032, which represents an average annual growth rate of **1.38 percent.** The increasing ratio projection results in general aviation aircraft operations increasing from 96,036 to 140,825 by 2032, which represents an average annual growth rate of **1.93 percent.**

MARKET SHARE U.S. TOWERED AIRPORTS (0.45% AND 0.98% ANNUAL GROWTH)

These projections were developed as a market share projection (general aviation operations) for airports with FAA and contract air traffic control towers. The basis for this projection is that the characteristics of Auburn Municipal Airport are similar to several towered northwest airports with predominantly general aviation activity such as Tacoma Narrows Airport, or Felts Field in Spokane. Two market share projections were developed based on the FAA forecast of general aviation operations at towered airports. This activity segment is forecast to increase from 25.96 to 27.76 million operations between 2011 and 2032.

The **maintain market share projection** assumes that Auburn Municipal Airport's 2012 market share (0.038%) will continue through 2032. The **increasing market share projection** assumes that the current market share will gradually increase from 0.038 to 0.042 percent by 2032.

The maintain ratio projection results in general aviation aircraft operations increasing from 96,036 to 105,016 by 2032, which represents an average annual growth rate of **0.45 percent.** The increase market share projection results in general aviation aircraft operations increasing from 96,036 to 116,615 by 2032, which represents an average annual growth rate of **0.98 percent.**

PUGET SOUND REGIONAL TRANSPORTATION ORGANIZATION (RTPO) MARKET SHARE (0.72% TO 2.08% ANNUAL GROWTH)

The Washington Long Term Air Transportation Study (LATS) long-term aviation activity forecasts, prepared in 2007, includes general aviation operations forecasts for the Puget Sound RTPO. The LATS forecast projects Puget Sound RTPO general aviation operations to increase from 1,358,117 in 2005, to 2,068,251 in 2030, which reflects a 52 percent overall increase and an average annual growth rate of 1.70

percent. Auburn Municipal Airport accounted for approximately 6.2 percent of Puget Sound RTPO general aviation operations in 2012.

Three market share projections were developed using the LATS Puget Sound RTPO forecasts. For each, the LATS Puget Sound RTPO forecast for 2030 was extrapolated to 2032 by using the average annual growth rate (1.57%) from the 2025 to 2030 forecast period. The first projection assumes that Auburn's current market share of 6.2 percent is maintained through the planning period. Aircraft operations are projected to increase from 96,036 in 2012 to 132,290 in 2032, which represents an average annual growth rate of **1.61 percent.**

The second projection assumes that Auburn's market share will gradually increase from 6.2 to 6.8 percent by the end of the planning period. In this projection, aircraft operations increase from 96,036 to 145,092 in 2032, which represents an average annual growth rate of **2.08 percent.**

The third projection assumes that Auburn's market share will decrease from 6.2 to 5.2 percent by the end of the planning period. This does not indicate a decline in aircraft operations for the airport, just a slower rate of growth than is projected within the entire Puget Sound RTPO. In this projection, aircraft operations increase from 96,036 to 110,953 in 2032, which represents an average annual growth rate of **0.72 percent.**

FLIGHT SCHOOL SCENARIO (3.25% ANNUAL GROWTH)

This projection is based on a scenario where large scale flight training activity returns to Auburn Municipal Airport early in the planning period. The airport's historic role in area flight training may be attributed at least in part to the airport's geographic location, facilities and mix of traffic. The primary assumption in this scenario is that activity comparable to that generated by Northwest Aviation College until 2012 could be replaced with an independent flight program or a program affiliated with an established education institution. In this scenario, flight training levels would begin lower (assume 5 flight training aircraft) and gradually increase to recent levels (10 flight training aircraft) by the end of the planning period. The overall impact of this scenario would be an additional 20,000 to 40,000 operations in addition to activity generated by other users. This scenario assumes that the ratio of operations per based aircraft for non-flight school aircraft would gradually increase from approximately 350 to 390 due to the increase in transient flight activity associated with an active flight training airport. Since this scenario cannot be predicted with any certainty, it is recommended as the upper end of the forecast envelope that can be used to define long-term development reserves.

Summary

The **Increasing Operations Per Based Aircraft** projection is recommended as the preferred aircraft operations forecast for the Auburn Municipal Airport Master Plan. This projection is driven in part by the airport's strategic location within the region, historic aviation activity levels and types, access to a large user base, and growing levels of fixed wing and helicopter flight training in the Puget Sound region. The

close proximity to other airports in the area allows for convenient access by flight schools for primary training, pattern work and other activities that can be accommodated at a less congested airport.

Note: Based on a change in the preferred based aircraft forecast noted earlier, the preferred aircraft operations forecast was adjusted. The rising aircraft activity ratios were unchanged and were applied to revised based aircraft totals for each forecast year. Aircraft operations are projected to increase from 96,036 in 2012 to 128,375 in 2032, which represents an average annual growth rate of **1.46 percent.**

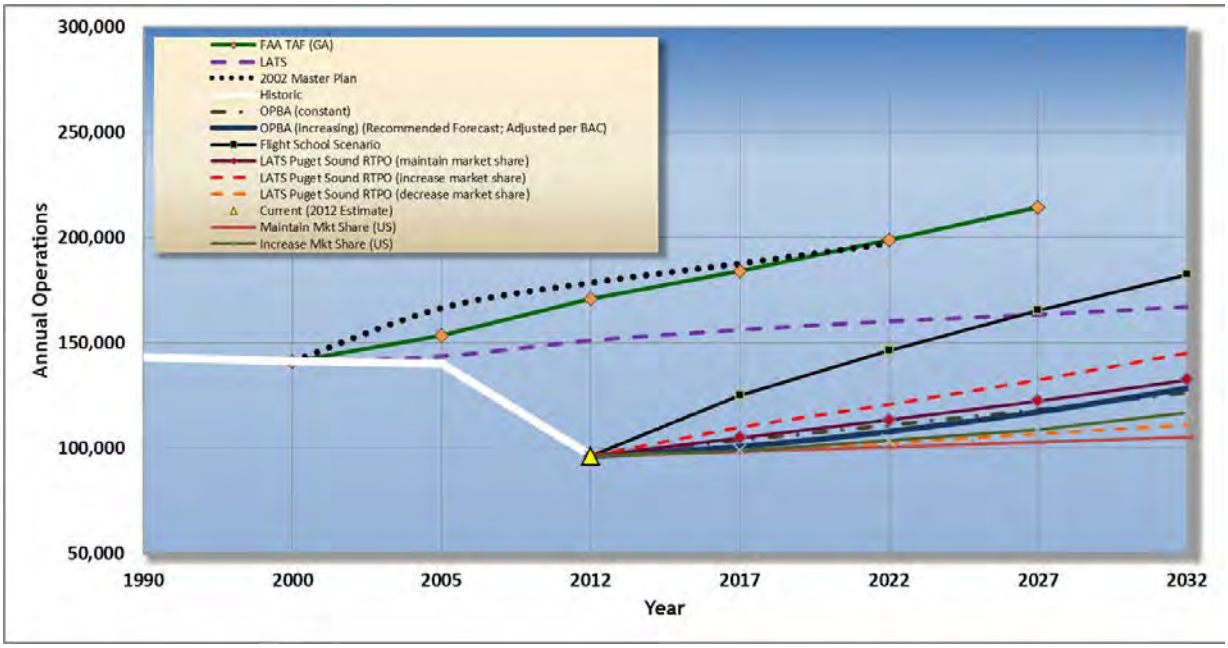
The existing and updated aircraft operations forecasts are summarized in **Table 3-8** and depicted in **Figure 3-5**. It is recognized that the range of updated operations forecasts for the airport are lower than the previous master plan forecasts. This is due in large part to weak economic conditions which have affected activity locally and throughout the national general aviation system. The FAA's current long-term general aviation activity forecasts have been tempered significantly compared to the agency's "pre-recession" forecasts.

TABLE 3-8: SUMMARY OF GENERAL AVIATION OPERATIONS FORECASTS (AUBURN MUNICIPAL AIRPORT)

EXISTING FORECASTS	2012	2017	2022	2027	2032	AAGR[2]
2002 Airport Master Plan	178,406[1]	187,507[1]	197,072[1]	--	--	1.59%
WSDOT LATS	150,986[1]	155,992[1]	160,087[1]	163,273[1]	166,914[1]	0.56%
FAA Terminal Area Forecast	170,695	184,129	198,623	214,374[1]	--	1.53%
UPDATED FORECASTS	**2012**	**2017**	**2022**	**2027**	**2032**	**AAGR[2]**
US GA Fleet (Maintain Current Share)	96,036	98,129	100,316	102,609	105,016	0.45%
US GA Fleet (Increase Share)	96,036	98,589	103,439	108,516	116,615	0.98%
Operations Per Based Aircraft Ratio Constant	96,036	103,601	110,643	118,207	126,382	1.38%
Operations Per Based Aircraft Ratio Increasing *(Recommended Forecast, Adjusted Per Based Aircraft Rev.)*	**96,036**	**100,659**	**107,760**	**117,013**	**128,375**	**1.46%**
Puget Sound RTPO Market Share (Increase Current Share) [3]	96,036	104,870	113,232	122,351	132,290	1.61%
Puget Sound RTPO Market Share (Increase Current Share) [3]	96,036	109,944	120,537	132,218	145,092	2.08%
Puget Sound RTPO Market Share (Increase Current Share) [3]	96,036	98,104	102,274	106,544	110,953	0.72%
Flight School Scenario	96,036	124,962	146,279	165,172	182,234	3.25%

1. Interpolated/Extrapolated to fit forecast year
2. Average Annual Growth Rate (over defined forecast period)
3. Utilizes 2007 WSDOT LATS Based Aircraft Forecast for Puget Sound Regional Transportation Planning Organization (RTPO)

FIGURE 3-5: AUBURN MUNICIPAL AIRPORT GENERAL AVIATION OPERATIONS FORECAST



Local and Itinerant Operations

The FAA TAF and the 2002 master plan forecasts reflect a 38 to 40 percent local and 60 to 62 percent itinerant traffic distribution for forecast operations. Local operations are conducted in the vicinity of an airport and include flights that begin and end at the airport. These include local area flight training, touch and go landings, flightseeing, and other flights that do not involve a landing at another airport. Itinerant operations include flights between airports, including cross country flights.

For forecasting purposes, maintaining a 40%/60% split between local and itinerant operations at Auburn Municipal Airport appears to be reasonable. Local and itinerant data for each forecast year are summarized in **Table 3-14**.

Design Aircraft

As noted earlier, the selection of design standards for airfield facilities is based upon the characteristics of the aircraft that are expected to use the airport. The **design aircraft** is defined as the most demanding aircraft type operating at the airport with a minimum of 500 annual itinerant operations, as described by the Federal Aviation Administration (FAA):

"Substantial Use Threshold. Federally funded projects require that critical design airplanes have at least 500 or more annual itinerant operations at the airport (landings and takeoffs are considered as separate operations) for an individual airplane or a family grouping of airplanes. Under unusual circumstances, adjustments may be made to the 500 total annual itinerant operations threshold after considering the

circumstances of a particular airport. Two examples are airports with demonstrated seasonal traffic variations, or airports situated in isolated or remote areas that have special needs."

The FAA groups aircraft into five categories (A-E) based upon their approach speeds. Aircraft Approach Categories A and B include small propeller aircraft, many small or medium business jet aircraft, and some larger aircraft with approach speeds of less than 121 knots (nautical miles per hour). Categories C, D, and E consist of the remaining business jets as well as larger jet and propeller aircraft generally associated with commercial and military use with approach speeds of 121 knots or more. The FAA also establishes six airplane design groups (I-VI), based on the wingspan and tail height of the aircraft. The categories range from Airplane Design Group (ADG) I, for aircraft with wingspans of less than 49 feet, to ADG VI for the largest commercial and military aircraft.

The combination of airplane design group and aircraft approach speed for the design aircraft creates the Airport Reference Code (ARC), which is used to define applicable airfield design standards. Aircraft with a maximum gross takeoff weight greater than 12,500 pounds are classified as "large aircraft" by the FAA; aircraft 12,500 pounds and less are classified as "small aircraft."

A list of typical general aviation and business aviation aircraft and their respective design categories is presented in **Table 3-9. Figure 3-6** illustrates representative aircraft in various design groups.

TABLE 3-9: GENERAL AVIATION AIRCRAFT & DESIGN CATEGORIES

AIRCRAFT	AIRCRAFT APPROACH CATEGORY	AIRPLANE DESIGN GROUP	MAXIMUM GROSS TAKEOFF WEIGHT (LBS)
Grumman American Tiger	A	I	2,400
Cessna 182 (Skylane)	A	I	3,100
Cirrus Design SR22	A	I	3,400
Cessna Corvallis TT	A	I	3,600
Cessna 206 (Stationair)	A	I	3,614
Beechcraft Bonanza A36	A	I	3,650
Socata/Aerospatiale TBM 850	A	I	7,394
Beechcraft Baron 58	B	I	5,500
Cessna 340	B	I	5,990
Cessna Citation Mustang	B	I	8,645
Embraer Phenom 100	B	I	10,472
Cessna Citation CJ1+	B	I	10,700
Beech King Air B200	B	I	11,800
Piper Malibu (PA-46)	A	II	4,340
Cessna Caravan 675	A	II	8,000
Pilatus PC-12	A	II	10,450
Cessna Citation CJ2+	B	II	12,500
Cessna Citation II	B	II	13,300
Cessna Citation CJ3	B	II	13,870
Beech King Air 350	B	II	15,000
Cessna Citation Bravo	B	II	15,000
Embraer Phenom 300	B	II	17,968
Dassault Falcon 20	B	II	28,660
Bombardier Learjet 55	C	I	21,500
Beechcraft Hawker 800XP	C	II	28,000
Gulfstream 200	C	II	34,450
Gulfstream III	C	II	69,700
Learjet 35A/36A	D	I	18,300

Source: AC 150/5300-13, as amended; aircraft manufacturer data.

A-I

12,500 lbs. or less (small)

Beech Baron 55
Beech Bonanza
Cessna 182
Piper Archer
Piper Seneca

B-I

12,500 lbs. or less (small)

Beech Baron 58
Beech King Air 100
Cessna 402
Cessna 421
Piper Navajo
Piper Cheyenne
Cessna Citation I

A-II, B-II

12,500 lbs. or less (small)

Super King Air 200
Cessna 441
DHC Twin Otter
Cessna Caravan
King Air C90

B-II

Greater than 12,500 lbs.

Super King Air 300, 350
Beech 1900
Jetstream 31
Falcon 20, 50
Falcon 200, 900
Citation II, Bravo XLS+
Citation CJ3

A-III, B-III

Greater than 12,500 lbs.

DHC Dash 7
DHC Dash 8
Q-300, Q-400
DC-3
Convair 580
Fairchild F-27
ATR 72
ATP

C-I, D-I

Lear 25, 35, 55, 60
Israeli Westwind
HS 125-700

C-II, D-II

Gulfstream II, III, IV
Canadair 600
Canadair Regional Jet
Lockheed JetStar
Citation X
Citation Sovereign
Hawker 800 XP

C-III, D-III

Boeing Business Jet
B 727-200
B 737-300 Series
MD-80, DC-9
Fokker 70, 100
A319, A320
Gulfstream V
Global Express

C-IV, D-IV

B-757
B-767
DC - 8-70
DC - 10
MD - 11
L 1011

D-V

B - 747 Series
B - 777

Current and Future Design Aircraft

Based on existing and forecast activity levels, the existing and future design aircraft for Runway 16/34 is a piston multi-engine aircraft included in Aircraft Approach Category B and Airplane Design Group I (Airport Reference Code: B-I). These aircraft typically weigh less than 12,500 pounds and are categorized as "small" airplanes.

Based on the practical limits on runway length (4,000 feet or less, defined by existing roadways), it appears that the reasonable upper limit of capabilities at Auburn Municipal Airport is associated with turboprops, very light jets, and small business jets that do not require longer runway lengths. The growing number of single-engine turboprops (Cessna Caravan, Pilatus PC12, Piper Meridian, TBM700/850, etc.), many of which are included in ARC A-II, are ideally suited for the airport. Single engine turboprops can operate from shorter runways and are often alternatives to more expensive or older multi-engine turboprops and older high performance piston aircraft. Similarly, very light jets or smaller conventional business jets, such as the Cessna Mustang routinely operate on runways that can accommodate multi-engine piston aircraft. General aviation aircraft manufacturing trends clearly indicate a shift toward turbine aircraft for business aircraft and the development of more aircraft capable of operating on shorter runways will significantly increase the airport's access to business aviation activity.

Based on these factors, the updated aviation activity forecasts reflect growth in turbine aircraft activity during the current planning period, with ADG II (A/B) operations nearing the FAA's substantial use threshold by the end of the planning period. Due to the potential for the number of ADG II aircraft operations to increase beyond current expectations, it is recommended that development reserves and setbacks consistent with Airport Reference Code A/B-II be maintained for the runway–taxiway system. The existing runway width (75 feet) and runway-parallel taxiway separation (240 feet) already meet ADG II standards for this type of aircraft. The reserves would effectively maintain current airfield capabilities and do not represent an upgrade or expansion in facilities. A detailed discussion of design aircraft considerations will be provided in the Facility Requirements chapter.

Air Taxi and Military Operations

Air taxi activity includes operations regulated by the FAA under FAR Part 135, including on-demand passenger service (charter and fractional), small parcel transport (cargo), and air ambulance activity. Auburn Municipal Airport has not historically accommodated significant levels of air taxi activity. The FAA TAF historical activity and forecast does not include any air taxi operations. However, based on the potential for new on-demand air taxi service using a variety of general aviation aircraft, charter and fractional aircraft ownership, it is reasonable to assume that Auburn could accommodate limited (50 to 150 annual operations) activity during the twenty year planning period.

Historically, military operations at Auburn Municipal Airport have been very limited and they are not expected to increase during the current planning period. The FAA TAF historical activity and forecast

does not include any military operations. 50 annual military operations are projected through the planning period to account for occasional activity, primarily helicopters used by National Guard or other military/government agencies for search and rescue, emergency response or law enforcement.

Operational Peaks

It is estimated that peak month activity at Auburn Municipal Airport occurs during the summer (typically July or August) and accounts for approximately 12 percent of annual aircraft operations. This level of peaking is consistent with the mix of airport traffic and is expected to remain relatively unchanged during the planning period. Peak day operations are defined by the average day in the peak month (design day) and the busy day in the typical week during peak month (busy day); the peak hour within the design day represents the design hour. The design day is calculated by dividing peak month operations by 30. The busy day is estimated to be 25 percent higher than the average day in the peak month (design day x 1.25). The design hour operations are estimated to equal 15 percent of design day operations. Operational peaks for each of the forecast years are summarized in **Table 3-10**.

TABLE 3-10: PEAK GENERAL AVIATION OPERATIONS FORECAST

ACTIVITY	2012	2017	2022	2027	2032
Annual Operations	96,036	100,659	107,760	117,013	128,375
Peak Month Operations (12%)	11,524	12,079	12,931	14,042	15,405
Design Day (average day in peak month)	372	390	417	453	497
Busy Day	465	487	521	566	621
Design Hour Operations (assumed 15% of design day)	56	58	63	68	75

Instrument Flight Activity

Flight activity data for aircraft operating under instrument flight rules in the national airspace system is tracked by FlightAware, a company that developed live flight tracking services for commercial and general aviation. Instrument flight plan data for calendar years 2006 and 2012 (see **Table 3-11**) were acquired to help gauge instrument activity at Auburn Municipal Airport. The data captures all civil aircraft filing instrument flight plans listing Auburn Municipal Airport either as the originating airport or the destination airport. Military aircraft are not included in the FAA instrument flight plan data. The 2006 data was selected to represent a typical "pre-recession" level of activity and the 2012 data represents current activity, which was approximately 34 percent below 2006 levels. It appears that the 2012 activity reflects the lingering impacts of weak economic conditions and the slow recovery. It is also noted that the instrument approach serving the airport is currently restricted and is not authorized for night use. Airport management indicates that the FAA restricted night instrument procedures until an obstruction

survey can be completed to verify location and elevations of potential airspace penetrators in the vicinity of the airport. It is reasonable to assume that instrument activity at the airport will increase as economic conditions improve, the nighttime restriction is removed, or if the current approach minimums were improved. Based on current traffic estimates, instrument operations currently appear to account for about 1 percent of overall operations. The level of instrument approaches (in actual instrument weather conditions) appears to be approximately 1 percent of total itinerant landings.

TABLE 3-11: INSTRUMENT OPERATIONS - AUBURN MUNICIPAL AIRPORT (2006/2012)

ARC	REPRESENTATIVE AIRCRAFT	2006	2012
A-I	Cessna 182/Beechcraft Baron 55/TBM700	1,165	780
B-I	Beechcraft Baron 58/Beechcraft King Air 90/Cessna Citation CJ1	50	24
A-II	Cessna Caravan/Pilatus PC12	14	7
B-II	Cessna Citation Bravo/Beechcraft King Air 200/Falcon 50	0	0
--	Blocked (aircraft type and N number withheld at request of owner)	3	1
--	Helicopter	0	0
	Total Instrument Operations	**1,232**	**812**

Source: FlightAware

Aircraft Fleet Mix

BASED AIRCRAFT

The airport's current mix of based aircraft is projected to become more diverse during the current planning period reflecting growth in turbine aircraft (turboprop, very light jet, business jet), helicopters and light sport aircraft. Single engine turboprops and very light jets/small business jets are capable of operating on runways less than 4,000 feet under most common weather conditions experienced in Auburn. The projected changes in the based aircraft fleet mix at Auburn Municipal Airport are generally consistent with broader trends identified by FAA regarding the composition of the general aviation fleet as a whole. The forecast based aircraft fleet mix is summarized in **Table 3-12**.

Figures 3-7 and 3-8 depict the current (2012) and long term (2032) distribution of based aircraft by type, which is predominantly single-engine piston, followed by multi-engine piston, helicopter, light sport aircraft and business jet.

FIGURE 3-7: AUBURN MUNICIPAL AIRPORT - BASED AIRCRAFT FLEET MIX (2012)

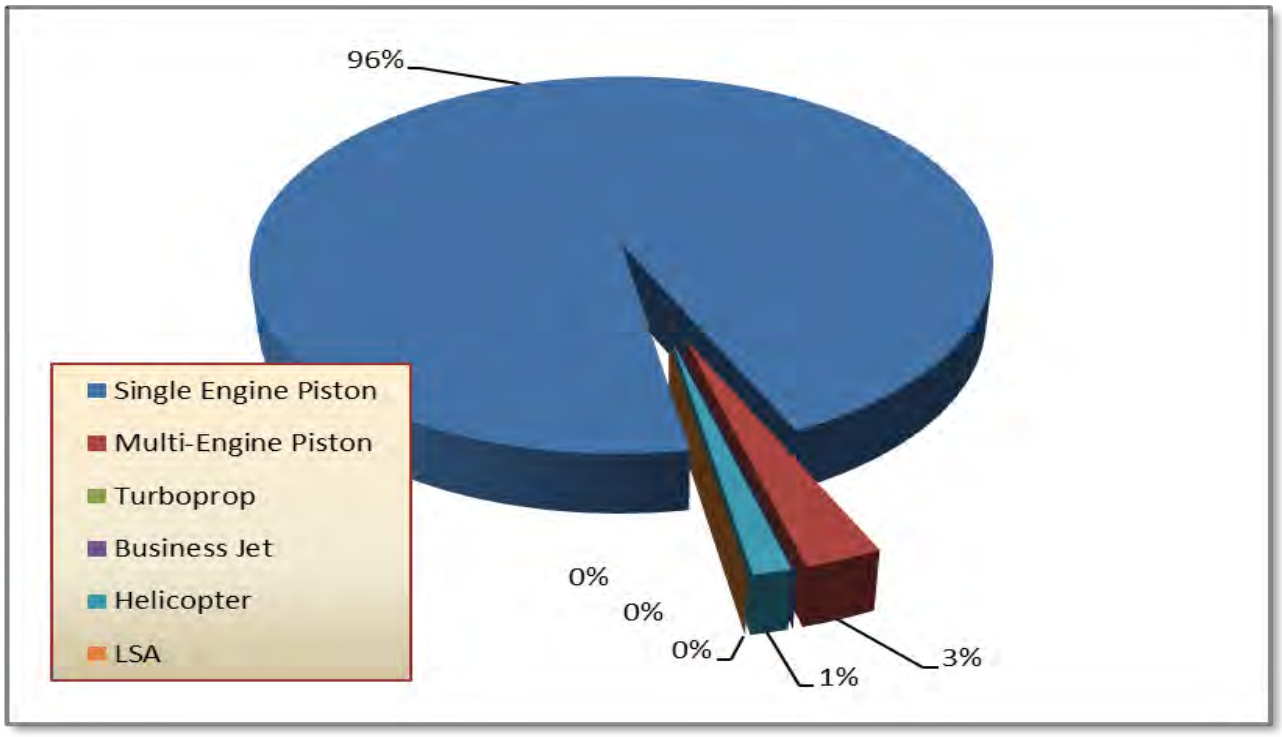


FIGURE 3-8: AUBURN MUNICIPAL AIRPORT – FORECAST BASED AIRCRAFT FLEET MIX (2032)

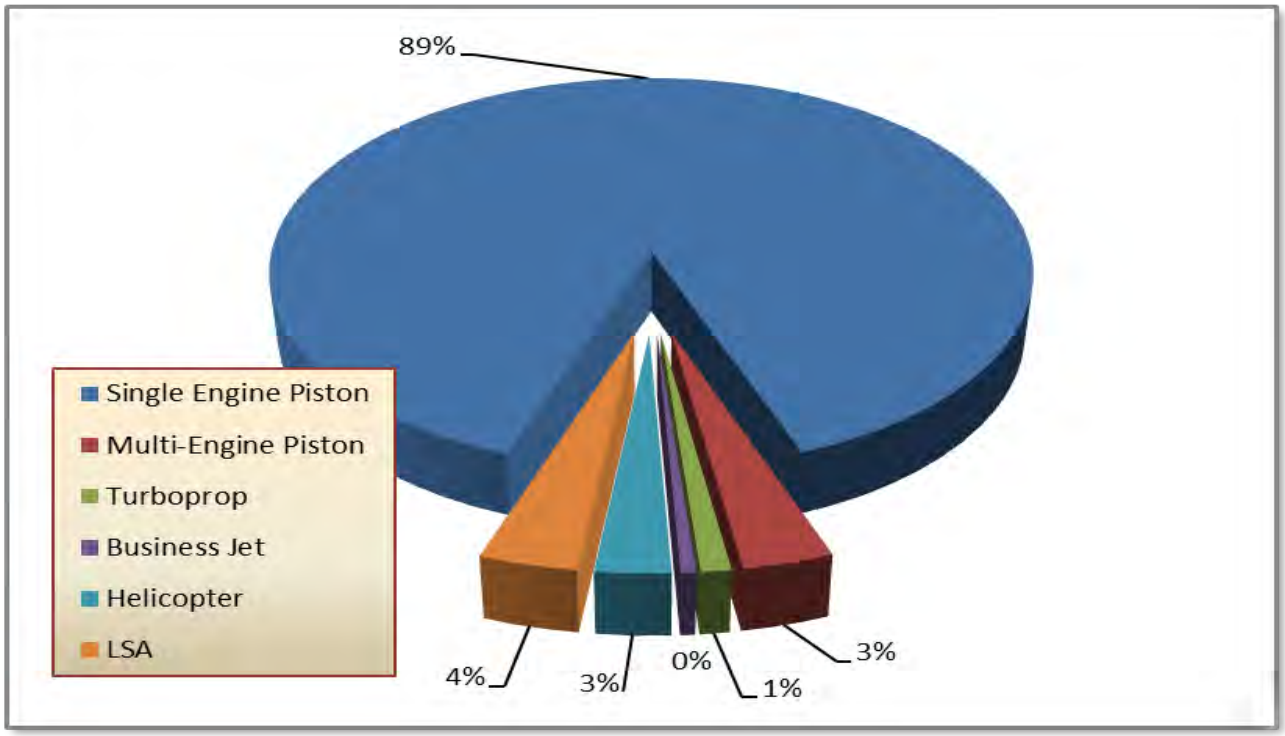


TABLE 3-12: FORECAST BASED AIRCRAFT FLEET MIX

ACTIVITY	2012	2017	2022	2027	2032
Single Engine Piston	262 (96%)	264 (94%)	268 (92%)	278 (90%)	292 (89%)
Multi-Engine Piston	8 (3%)	8 (3%)	10 (3%)	11 (3%)	11 (3%)
Turboprop	0 (0%)	1 (<1%)	2 (<1%)	3 (1%)	3 (1%)
Business Jet/VLJ	0 (0%)	0 (0%)	1 (<1%)	2 (<1%)	2 (<1%)
Light Sport Aircraft	0 (0%)	2 (1%)	5 (<2%)	8 (3%)	12 (4%)
Helicopter	4 (1%)	5 (<2%)	5 (<2%)	6 (2%)	9 (3%)
Total Based Aircraft (100%)	**274**	**280**	**291**	**308**	**329**

Note: Percentages may not sum due to independent rounding

AIRCRAFT OPERATIONS

The current aircraft operations fleet mix is estimated to closely follow the airport's based aircraft composition, with new turbine aircraft and helicopter operations that will complement the airport's established base of single-engine and multi-engine piston aircraft. Currently, single and multi-engine piston aircraft account for approximately 96 percent of airport operations followed by helicopter and multi-engine piston operations. Although single engine piston aircraft will continue to generate the majority of aircraft operations at Auburn Municipal Airport through the planning period, their portion of overall traffic is expected to gradually decline as other aircraft types become more common. The forecast aircraft operations fleet mix is summarized in **Table 3-13**.

TABLE 3-13: GA FORECAST AIRCRAFT OPERATIONS FLEET MIX (NO MILTARY OR AIR TAXI)

AIRCRAFT TYPE	2012	%	2017	%	2022	%	2027	%	2032	%
Single Engine Piston/LSA	92,214	96.0	96,519	95.9	101,920	94.6	109,403	93.5	119,955	93.4
Multi Engine Piston	800	<1.0	1,000	<1.0	1,200	1.1	1,240	1.0	1,400	1.1
Turboprop	20	<0.1	100	0.1	240	0.2	380	0.3	420	0.3
Jet	2	<0.1	20	<0.1	100	<0.1	190	0.2	200	0.2
Helicopter	3,000	3.0	3,020	3.0	4,300	4.0	5,800	5.0	6,400	5.0
Total Operations (100%)	**96,036**	**100**	**100,659**	**100**	**107,760**	**100**	**117,013**	**100**	**128,375**	**100**

Note: Percentages may not sum due to independent rounding

Forecast Summary

The recommended based aircraft and operations forecasts for Auburn Municipal Airport reflect the capabilities of the airport and the dynamics within its airport service area. Growth is projected to be modest, well within the airport's current development and functional capacity. The long term forecasts also reflect the broad national expectation of improving economic conditions and demand for aviation services over the next twenty years and beyond. A coming shortage of qualified pilots faces the airline industry as current pilots reach mandatory retirement. Other growing activity segments will require qualified pilots for both fixed wing aircraft and helicopters. The use of general aviation aircraft for business travel will continue to reflect commercial air service options and limits, particularly for travel to/from smaller cities and sparsely populated areas. The preferred forecasts are summarized in additional detail in **Table 3-14.**

As with any long term facility demand forecast, it is recommended that long term development reserves be protected to accommodate demand that may exceed current projections. For planning purposes, a reserve capable of accommodating a doubling of the 20-year preferred forecast demand should be adequate to accommodate unforeseen facility needs during the current planning period. However, should demand significantly deviate from the airport's recent historical trend, updated forecasts should be prepared to ensure that adequate facility planning is maintained. In particular, the potential for the airport to accommodate a large scale flight training operation could quickly push aircraft operations levels back to pre-recession activity levels.

TABLE 3-14: FORECAST SUMMARY

ACTIVITY	2012	2017	2022	2027	2032
Itinerant Operations					
General Aviation	57,622	60,395	64,656	70,208	77,025
Air Taxi	50	80	120	130	140
Military	50	50	50	50	50
Total Itinerant Operations	**57,722**	**60,525**	**64,826**	**70,388**	**77,215**
Local Operations (all GA)	38,414	40,263	43,104	46,805	51,350
Total Local & Itinerant Operations	**96,136**	**100,788**	**107,930**	**117,193**	**128,565**
Based Aircraft	**274**	**280**	**291**	**308**	**329**
Operations Per Based Aircraft (GA)	351	360	370	380	390
Aircraft Operations By Type (ARC)					
Single Engine Piston (A-I)	92,248	96,539	101,970	109,473	120,025
Multi-Engine Piston (B-I)	810	1,040	1,220	1,240	1,400
Single Engine Turboprop (A-II)	10	70	200	340	360
Multi-Engine Turboprop (B-I)	16	40	50	60	90
Multi-Engine Turboprop (B-II)	0	10	30	30	30
Business Jet (B-I)	0	16	102	190	200
Business Jet (B-II)	2	4	8	10	10
Helicopter Operations	3,000	3,020	4,300	5,800	6,400
Military	50	50	50	50	50
Total – All Operations	**96,136**	**100,789**	**107,930**	**117,193**	**128,565**
Subtotal - Turboprop Operations	26	120	280	430	480
Subtotal - Jet Operations	2	20	110	200	210
Total Turbine Fixed Wing Operations	28	140	390	630	690
Subtotal - ARC I Turbine Operations (A/B)	**16**	**56**	**158**	**250**	**290**
Subtotal - ADG II Turbine Operations (A/B)	**12**	**84**	**238**	**380**	**400**

Fifty-Year Forecast

Per the airport master plan project scope of work, fifty-year demand forecasts were prepared by extrapolating the average annual growth rates (AAGR) for the recommended 20-year based aircraft and aircraft operations forecasts. The purpose of the 50-year projection is to provide an estimate of demand that can be used to approximate long-term aviation use land requirements for the airport. **Table 3-15** summarizes the 50-year, and intermediate 30- and 40-year based aircraft and aircraft operations projections.

TABLE 3-15: 50-YEAR FORECAST

ACTIVITY	2012	2032	AAGR 2012-2032	2042	2052	2062
Total Local & Itinerant Operations	96,136	128,565	1.46%	148,676	171,933	198,828
Based Aircraft	274	329	0.92%	361	395	433
Operations Per Based Aircraft (GA)	351	390	--	412	435	459

Chapter 4 – Airport Facility Requirements

Chapter 4 – Airport Facility Requirements

The airport facility requirements analysis uses the results of the inventory and forecasts contained in Chapters Two and Three, as well as established planning criteria to determine the future facility needs for Auburn Municipal Airport for the current twenty year planning period.

Introduction

The evaluation of airport facility requirements can be divided into two broad primary categories: airside and landside. **Airside** facilities include runways, taxiways, navigational aids and lighting systems. **Landside** facilities include hangars, fixed base operator (FBO) facilities, aircraft parking apron, helicopter parking, aircraft fueling, surface access and automobile parking, utilities, and other related items. All airfield items are evaluated based on established standards from the Federal Aviation Administration (FAA).

The facility requirements evaluation is used to identify the adequacy or inadequacy of existing airport facilities and identify what new facilities may be needed during the planning period based on forecast demand. Potential options and preliminary costs for providing these facilities will be evaluated in the Airport Development Alternatives (Chapter Five), to determine the most cost effective and efficient means for meeting projected facility needs.

Organization of Materials

This chapter evaluates facility requirements from two perspectives: (1) conformance of existing facilities with Federal Aviation Administration (FAA) airport design and airspace planning standards; and (2) new demand based facility needs that reflect the updated aviation activity forecasts presented in Chapter Three.

The evaluation of current and future conformance with FAA airport design standards and airspace planning criteria will be reflected on the updated FAA approved Airport Layout Plan. The evaluation of demand driven items will reflect in gross numbers, new facility needs such as runway length requirements, hangar spaces and aircraft parking positions based on forecast demand and the needs of the design aircraft. Items such as lighting and navigational aids are evaluated based on the type of airport activity, airport classification and capabilities.

The updated inventory of existing facilities presented in Chapter Two, is used to evaluate conformance with FAA standards. **Figures 4-1, 4-2, and 4-3** illustrate the location of the non-conforming items identified for the airport design standards described in this chapter. **Figure 4-1** depicts the runway-taxiway system and the north hangar area. **Figure 4-2** depicts the east landside area (south section). **Figure 4-3** depicts the east landside area (mid-runway section).

The most common nonstandard items identified in this evaluation are aircraft (wingtip) obstruction clearances for taxilanes located in hangar areas, apron tiedowns and adjacent to the aircraft fueling area. Although the clearances vary, most aircraft movements occur without incident. However, as facilities are updated or replaced (aircraft parking or hangars), new facilities should be designed to conform with appropriate design standards. It is also observed that vehicles are routinely parked adjacent to taxilanes, within object free areas (OFA), which is not consistent with FAA wingtip clearance standards for taxiing aircraft. Restricting vehicle parking adjacent to defined taxilanes should be considered to address this non-conforming item. The runway and west parallel taxiway meet all applicable FAA design standards.

Detailed definitions of the standards and their application at the airport are provided throughout the chapter. The reader is encouraged to consult the Glossary of Aviation Terms provided previously to clarify technical information.

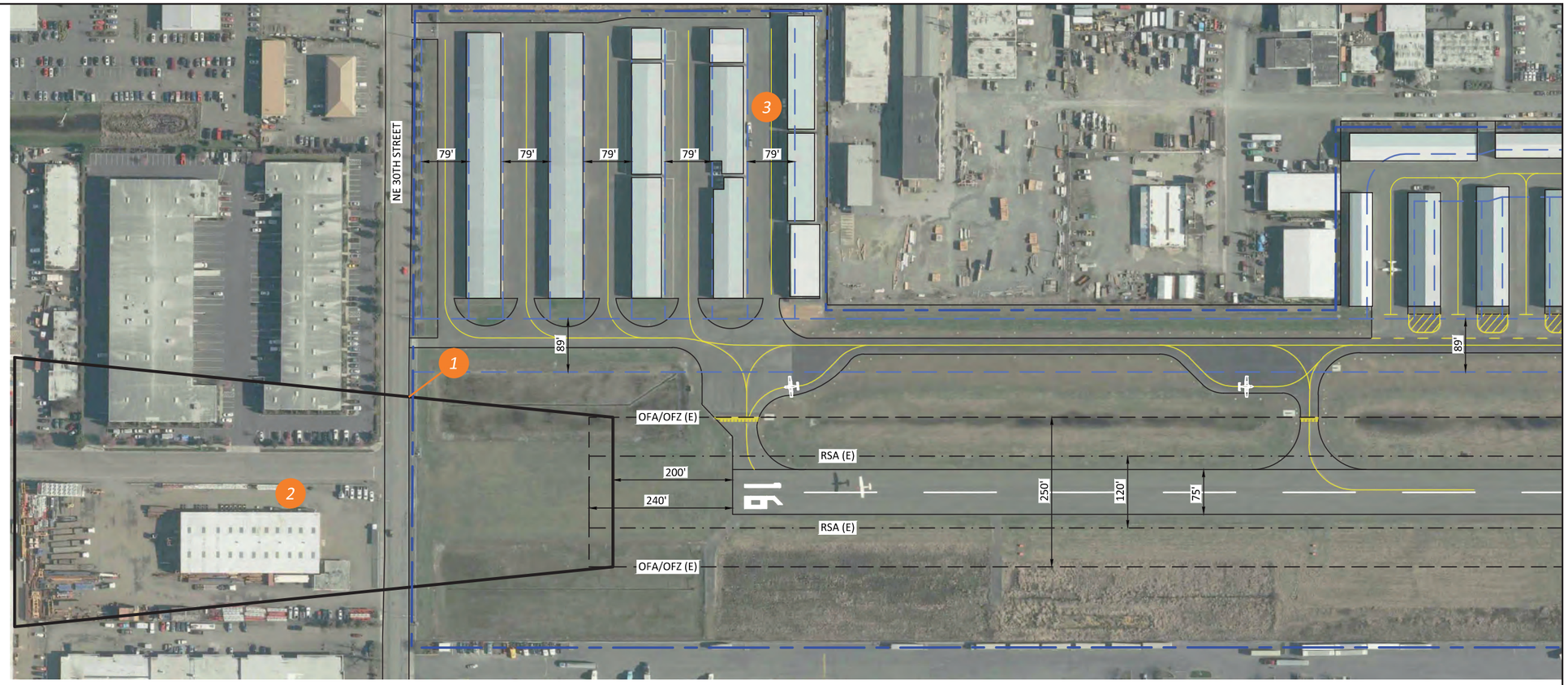
1 RPZ - ROAD

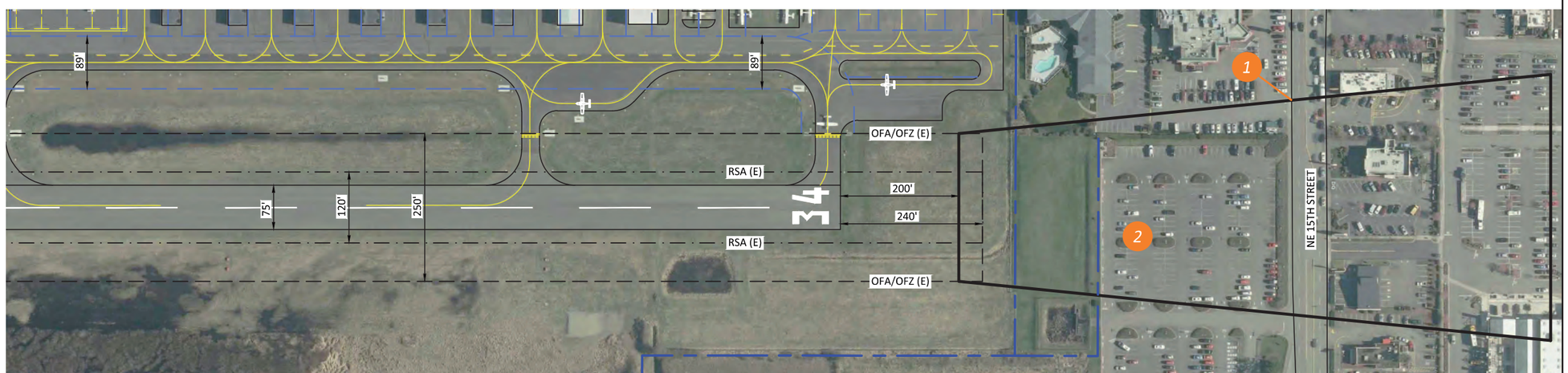
2 RPZ - NON-AIRPORT PROPERTY OWNERSHIP

3 TAXILANE OFA (PARKED VEHICLES) *

TAXILANE/TAXIWAY OBJECT FREE AREA

* PARKED VEHICLES OBSERVED IN VARIOUS HANGAR ROWS.





AUBURN MUNICIPAL AIRPORT | AIRPORT MASTER PLAN

AIRFIELD CONFORMANCE | **FIG. 4-1**

CENTURY WEST ENGINEERING CORPORATION

1 TAXILANE OFA (HANGARS)

2 TAXILANE OFA (PARKED AC)

3 TAXILANE OFA (PARKED VEHICLES) *

4 RPZ (AIRPORT CONTROL)

TAXILANE/TAXIWAY OBJECT FREE AREA

* PARKED VEHICLES OBSERVED IN VARIOUS HANGAR ROWS.

NE E STREET

NE D STREET

79'

75'

77'

89'

125'

245'

60'

TAXIWAY ADGI—
OBJECT FREE AREA

OFA/OFZ (E)

RSA (E)

RUNWAY 16-34

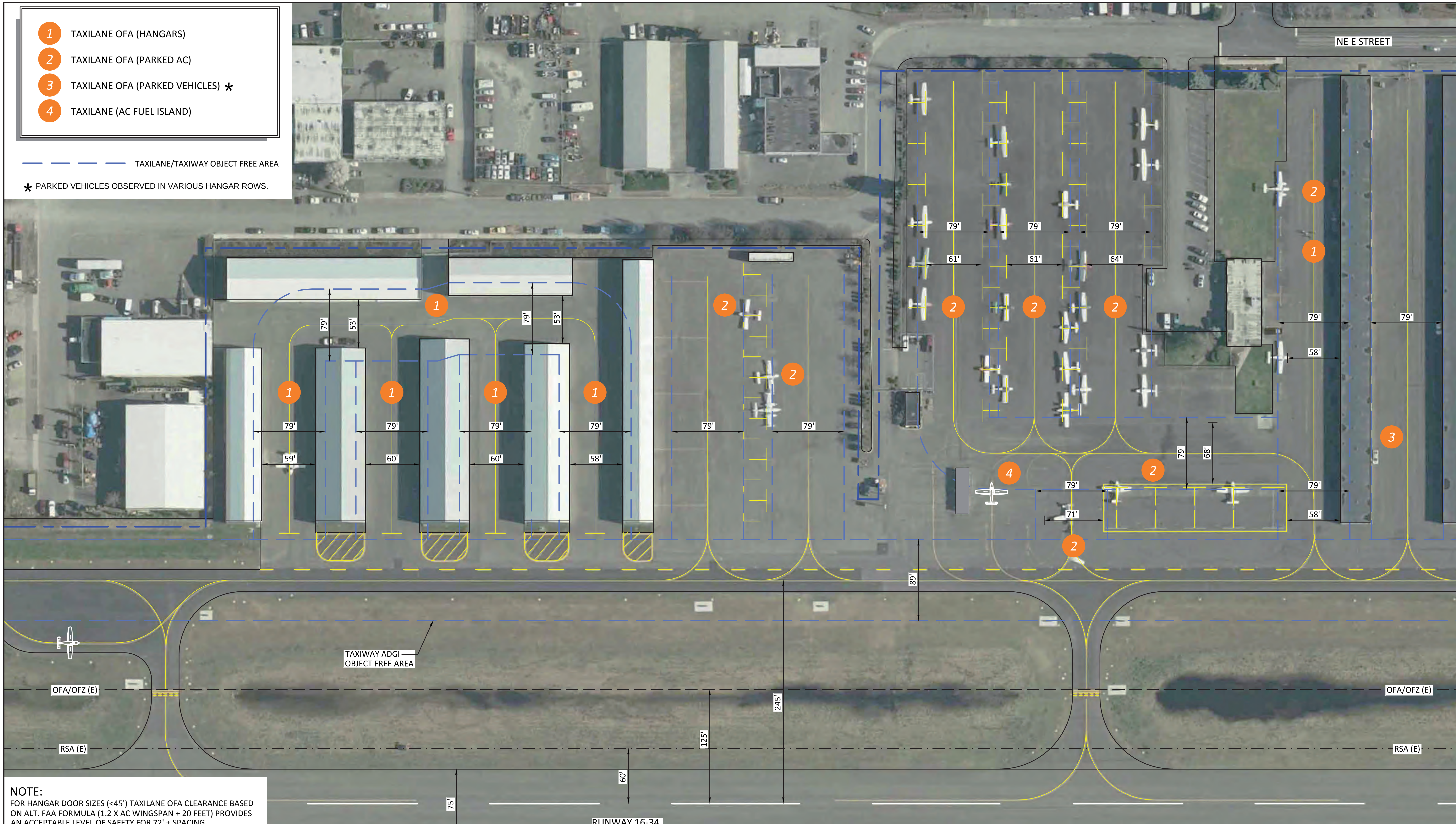
NOTE:
FOR HANGAR DOOR SIZES (<45') TAXILANE OFA CLEARANCE BASED ON ALT. FAA FORMULA (1.2 X AC WINGSPAN + 20 FEET) PROVIDES AN ACCEPTABLE LEVEL OF SAFETY FOR 72' + SPACING.

AUBURN MUNICIPAL AIRPORT | AIRPORT MASTER PLAN

CITY OF AUBURN WASHINGTON

EAST LANDSIDE (SOUTH AREA) CONFORMANCE | FIG. 4-2

CENTURY WEST ENGINEERING CORPORATION



NOTE:
FOR HANGAR DOOR SIZES (<45') TAXILANE OFA CLEARANCE BASED ON ALT. FAA FORMULA (1.2 X AC WINGSPAN + 20 FEET) PROVIDES AN ACCEPTABLE LEVEL OF SAFETY FOR 72' + SPACING.

AUBURN MUNICIPAL AIRPORT | AIRPORT MASTER PLAN

CITY OF AUBURN WASHINGTON

EAST LANDSIDE (NORTH AREA) CONFORMANCE | **FIG. 4-3**

CENTURY WEST ENGINEERING CORPORATION

2001-2020 Airport Master Plan Update Overview

The 2001-2020 Auburn Municipal Airport Master Plan Update[1] provided recommendations for airport facility improvements for the twenty year planning period that extended to 2020. The projects summarized in **Table 4-1** were included in the twenty year capital improvement program (CIP) for the master plan. The projects were reviewed to identify those which have been completed (noted in the table). The previously recommended improvements which have not been implemented will be revalidated, modified or eliminated based on the updated assessment of facility needs, current FAA guidelines and the elements of the Airport Master Plan preferred development alternative.

Note: several pavement sections were included in a 2014 rehabilitation (slurry seal, repair, crackfill, etc.) project that was completed after the original facility requirements assessment in Table 4-1. These projects are identified (2014 project).

TABLE 4-1: SUMMARY OF 2001-2020 AIRPORT MASTER PLAN UPDATE RECOMMENDED PROJECTS AND CURRENT STATUS

COMPLETED? YES/NO	PROJECTS
	Phase I (2001-2005)
No	Property Acquisition (Park & Ride Grass, Pacific Concrete, and west side)
No	Property Acquisition (southwest vacant parcel)
Yes	Noise Abatement Sign Replacement
No	Displace Runway 16 Threshold
No	Adjust/Relocate VASIs
Yes	Hangars Unlimited Hangar Construction (2 Hangars – North Hangar Area)
No	Airport Security Fencing and Grading
No	Parallel Taxiway Slurry Seal (*Parallel Taxiway was reconfigured/reconstructed in 2009 and rehabilitated in 2014*)
No	Phase I Development of 3.5 acre site
Yes	Hangar Construction (southernmost hangar pad - North Hangar Area)
Yes	Runway Rehabilitation and Airfield Overlay (2014 Rehab Project)
Yes	Runway and Connector Taxiway Lighting Replacement (2014 Rehab Project)
Yes	Connector Taxiway and Hold Apron Overlay (2004 and 2014 Rehab Project)
No	Hangar Taxilane and Apron Overlay (2014 Rehab Project)
No	Transient and Northern Based Aircraft Apron Slurry Seal (2014 Rehab Project)
No	Phase II Development of 3.5 acre site
No	Airport Access Signing and Parking Improvements
No	Property Acquisition and Airport Security Fencing (Park & Ride)

[1] Auburn Municipal Airport Master Plan Update 2001-2020 (W&H Pacific, December 2002)

Yes	North Taxilane Fog Seal (2014 Rehab Project)
Yes	South Apron Slurry Seal (2014 Rehab Project)
No	Wetland Mitigation (west side property)
	Phase II (2006-2010)
Yes	ALP Update *(2012-2032 Master Plan & ALP Update)*
Yes	Parallel Taxiway and Apron Construction *(relocated/reconfigured parallel taxiway)*
Yes	Taxiway Lighting and Airport Signing Reconstruction
Yes	Hold Apron Construction
No	West Side Development – Parallel Taxiway and Taxilane Construction
No	West Side Development – Hangar Construction (4 buildings)
No	West Side Development – Access Road and Utilities Construction
	Phase III (2011-2020)
Yes	ALP Update *(2012-2032 Master Plan & ALP Update)*
Yes	Airport Office Relocation (2014 Project)
No	Transient Apron Reconfiguration
No	Property Acquisition and Airport Security Fencing (Hotel property)
No	Additional Runway Pavement Construction
No	Connector Taxiway and Hold Apron Construction & Parallel Taxiway Extension
No	Reconstruct Hangars – Phase I
No	Reconstruct Hangars – Phase II

Source: 2001-2020 Airport Master Plan Update (Chapter 7, Proposed Capital Improvement Projects)

In addition to the master plan recommended items noted above, the airport had a considerable amount of privately-funded hangar construction near mid-runway and in the south hangar area.

Design Aircraft

As indicated in Chapter 3 (Aviation Activity Forecasts), the current and future design aircraft identified for Auburn Municipal Airport is a light twin-engine (piston) aircraft, included in **Aircraft Approach Category B** and **Airplane Design Group I (Airport Reference Code (ARC): B-I).** This aircraft weighs less than 12,500 pounds, which places it in the "small" airplane category.

The design aircraft represents the most demanding aircraft using the airport on a regular basis (minimum of 500 annual operations) and determines the appropriate airport design standards for the current twenty year planning period. The continued use of standards consistent with "small aircraft" and "utility" runways, as defined in FAR Part 77, is appropriate for Runway 16/34 for both the ADG I standards and the ADG II reserve option described below.

OPTION: ADG II DEVELOPMENT RESERVE

As noted in the forecast chapter, Auburn Municipal Airport accommodates limited Airplane Design Group II (ADG II) activity and this activity is expected to grow during the current planning period. It is recognized that runway length limits the type of ADG II aircraft that can be accommodated at the Airport on a regular basis. Based on the previous master plan's recommended runway length (3,953 feet) or the practical limits on runway length defined by existing roadways (approximately 4,000 feet), it appears that turboprops and other turbine aircraft capable of operating on these runway lengths are a realistic market segment for Auburn Municipal Airport.

Single engine turboprops in particular represent a potential growth market for the Airport based on aircraft manufacturing trends and practical airfield capabilities. According to manufacturer data, single-engine models accounted for 63 percent of worldwide turboprop deliveries since 2001 and have averaged nearly 70 percent of deliveries over the last five years. Single-engine turboprops including the Cessna Caravan, Pilatus PC12, Piper Meridian, and TBM700/850 are ideally suited to operate at Auburn Municipal Airport. Although the forecast levels of ADG II activity are expected to remain below 500 annual operations during the current planning period, activity is expected to grow steadily. Based on these factors, it is suggested that the City consider defining ADG II development reserves and setbacks for the runway–taxiway system to preserve long term capabilities. The existing runway width (75 feet) and runway-parallel taxiway separation (240 feet) already meet basic ADG II standards. The ADG II reserves would effectively maintain current airfield capabilities and do not represent a significant upgrade or expansion in facilities.

The evaluation of design standards presented later in the Facility Requirements chapter will be based on the current and future design aircraft and corresponding Airport Reference Code (ARC): B-I (small) for the current instrument approach capabilities. The equivalent standards for ADG II (ARC A/B-II) will be noted where applicable to assist the City in determining whether defining development reserves for Runway 16/34 and the parallel taxiway is beneficial.

Figures 4-5 and 4-6, presented later in the chapter, depict specific items defined by the ADG II development reserve and the equivalent ADG I standard. In general, the required setbacks for the runway or parallel taxiway will be greater for the ADG II reserve compared to the ADG I standard. Increased separation setbacks may require relocation of existing items (aircraft parking positions, etc.) and affect the location of new structures (hangars, etc.). The information is intended to provide the City with sufficient understanding of potential advantages and disadvantages in their long-term planning decisions.

Airport Design Standards

Federal Aviation Administration (FAA) **Advisory Circular (AC) 150/5300-13A, Airport Design**, serves as the primary reference in planning airfield facilities. **Federal Air Regulation (FAR) Part 77.25, Objects Affecting Navigable Airspace**, defines airport imaginary surfaces which are established to protect the airspace immediately surrounding a runway. The airspace and ground areas surrounding a runway should be free of obstructions (i.e., structures, parked aircraft, trees, etc.) to the greatest extent possible to provide a safe operating environment for aircraft. **FAA Order 8260.3B - United States Standard for Terminal Instrument Procedures (TERPS)** defines protected airspace surfaces associated with instrument approaches and departures.

Table 4-2 summarizes existing facility dimensions and dimensional standards based on small airplanes included in ADG I (Airport Reference Code: B-I (small) and the equivalent standards for ADG II (ARC: A/B-II). It is noted that there is no "small airplane" equivalent currently defined for ADG II. However, the popularity of single engine turboprops weighing less than 12,500 pounds creates significant activity generated by "small" ADG II aircraft.Both standards assume the “utility” runway designation will be maintained.

Figures 4-1, 4-2, and 4-3 presented earlier in the chapter illustrate nonstandard runway or taxiway conditions noted in the sections below**. Figure 4-1** also depicts the footprint of the runway safety area, object free area, obstacle free zone, and runway protection zones that are associated with the current runway based on 1-mile approach visibility minimums and ARC B-I, small.

TABLE 4-2: AIRPORT DESIGN STANDARDS SUMMARY (DIMENSIONS IN FEET)

FAA STANDARD	RUNWAY 16/34 *EXISTING CONDITIONS*[1]	AIRPLANE DESIGN GROUP I *A&B AIRCRAFT (SMALL AIRCRAFT) APPROACH VISIBILITY ≥ 1- MILE*	(RESERVE) AIRPLANE DESIGN GROUP II *A&B AIRCRAFT (SMALL AIRCRAFT) APPROACH VISIBILITY ≥ 1- MILE*
Runway Length	3,400	2,950/3,500 [6]	4,060 [9]
Runway Width	75	60	75
Runway Shoulder Width	10	10	10
Blast Pad Width	-	80	95
Blast Pad Length	-	60	150
Runway Safety Area (RSA)			
• Width	120	120	150
• Length Beyond Departure End	240	240	300
• Length Prior to Landing Threshold	240	240	300
Runway Obstacle Free Zone (ROFZ)			
• Width	250	250	250
• Length Beyond Runway End	200	200	200
• Length Prior to Landing Threshold	200	200	200
Runway Object Free Area (ROFA)			
• Width	250	250	500
• Length Beyond Runway End	240	240	300
• Length Prior to Landing Threshold	240	240	300
Approach/Departure Runway Protection Zone (RPZ)			
• Length	1,000	1,000	1,000
• Inner Width	250	250	250
• Outer Width	450	450	450
Runway Centerline to:			
• Parallel Taxiway/Taxilane Centerline	240 [2]	150	240
• Aircraft Parking Line	295 [3]	125/284.5 [7]	305.5 [10]
• Building Restriction Line	307/251 (east/west) [4]	307/376 [8]	307/376[8]
Taxiway Width	25	25	35
Taxiway Shoulder Width	10	10	10
Taxiway Safety Area Width	49	49	79
Taxiway Object Free Area Width	89	89	131
Taxiway Centerline to Fixed/Movable Object	44.5	44.5	65.5
Taxilane Object Free Area Width	<79 [5]	79	115
Taxilane Centerline to Fixed/Movable Object	<39.5 [5]	39.5	57.5

Table 4-2 Notes:

1. Existing published airfield dimensions effective March 2013 (FAA Airport/Facility Directory).
2. Taxiway reconstructed/reconfigured in 2009.
3. Nearest aircraft parking (transient tiedowns, south of fuel island) is located approximately 295 feet east of runway centerline.
4. The nearest structures (hangars) on the east side of the runway are approximately 307 feet from runway centerline. No on-airport structures located on west side of runway. 2002 ALP depicts 251-foot west BRL and 307-foot east BRL.
5. Main apron clearances from taxilane centerlines to aircraft fueling position, aircraft tiedowns, and hangars vary (less than ADG I standard).
6. Per FAA Runway Length Model: Runway lengths required to accommodate 95 and 100 percent of the small airplane fleet (12,500 pounds or less) at Auburn Municipal Airport. 78 degrees F, 7-foot change in runway centerline elevation.
7. 284.5 feet is required to clear the ADG I taxiway object free area for the existing 240-foot runway-east parallel taxiway separation. The nearest aircraft parking position are located 295 feet from runway centerline, which will accommodate an aircraft tail height of approximately 24.2 feet without penetrating the 7:1 transitional surface that extends from the existing visual (250 feet wide) primary surface; the clearance would be reduced to approximately 6.4 feet of tail height if the primary surface was widened (500 feet wide) for straight-in nonprecision instrument approaches. The ADG I (small) standard of 125 feet applies to runway without a parallel taxiway.
8. The east BRL (307 feet from runway centerline) can accommodate a 26-foot tall structure (typical medium/large hangar roof heights) without penetrating the 7:1 transitional surface that extends from the existing visual (250 feet wide) primary surface. The clearance at the existing BRL would be reduced to approximately 8 feet if the primary surface was widened (500 feet wide) for straight-in nonprecision instrument approaches and a BRL of 376 feet would be required to accommodate hangars with 18-foot roof elevations.
9. Per FAA Runway Length Model: Runway lengths required to accommodate small airplanes with more than 10 seats at Auburn Municipal Airport. 78 degrees F, 7-foot change in runway centerline elevation.
10. Distance required to clear ADG II taxilane OFA for existing east parallel taxiway.

INSTRUMENT APPROACH NOTE:

As noted in the Inventory chapter, the existing instrument approach for Auburn Municipal Airport is a nonprecision approach with a visual final approach segment. The approach is classified as a "circling" or "circle to land" procedure since it requires pilots to establish visual contact with the airport environment at or before a fixed "missed approach point" and land while maintaining visual contact with the runway. The approach descent minimums are relatively high (1,257 feet AGL) and appear to reflect the effect of numerous obstructions (towers, power lines, etc.) and local airspace structure in the vicinity of the Airport.

The potential may exist to improve existing approach minimums—either through development of a straight-in nonprecision approach to a particular runway end or development of a new "circling" procedure. Preliminary coordination with the FAA Flight Procedures Office is being conducted during the master plan update with the goal of defining basic feasibility and the amount of improvement that may be possible. It is anticipated that the FAA will provide a general indication of feasibility in time for consideration in the master plan.

For the purposes of the facility requirements analysis, a preliminary assessment of the impacts on existing aircraft parking and building setbacks has been conducted to assist in the City's evaluation of potential options. If development of a straight-in procedure is feasible, it can be compared with the existing or a new "circling" procedure and the City can weigh the relative advantages and disadvantages of each option in order to determine the best path forward.

For any approach, the degree of improvement is dependent on the number, elevation and location of nearby obstructions within the protected TERPS[2] airspace for both the approach and missed approach paths and the compatibility with other defined airspace in the local area. Development of a new approach will require an updated obstruction survey and a formal process for procedure development, flight check, and publishing.

Table 4-3 summarizes the changes in airport development setbacks/clearances that would be associated with a change in instrument approach type for Runway 16/34. **Figure 4-4** depicts the primary surfaces and transitional surface setbacks (shown in 10-foot intervals) for both the existing "circling" instrument approach and a potential straight-in approach.

[2] TERPS: Terminal Instrument Procedures, as defined in FAA Order 8260.3B

TABLE 4-3: COMPARISON OF KEY DEVELOPMENT SETBACKS/CLEARANCES FOR CIRCLING AND STAIGHT-IN INSTRUMENT APPROACHES FOR RUNWAY 16/34

ITEM	RUNWAY 16/34 *Circling Approach Procedure* *(Utility – Visual, Current Standard, as depicted on 2002 Airspace Plan)*	RUNWAY 16/34 *Straight-In Approach Procedure* *(Utility Non-Precision Instrument)* *(Optional Future Standard)*
Width of Primary Surface	250 feet	**500 feet**
Approach Surface Length/Slope	5,000 feet / 20:1	5,000 feet / 20:1
Runway Setback Required to Clear 8-foot aircraft tail height	181 feet (284.5 feet required to clear existing east parallel taxiway OFA)	**306 feet**
Maximum Building Height at Existing East BRL (307 feet from runway centerline)	26 feet	**8.1 feet**
Maximum Building Height at Existing West BRL (251 feet from runway centerline)	18 feet	**0.1 feet**
Runway Setback Required to Clear 15-foot structure	230 feet (284.5 feet required clear existing east taxiway OFA)	**355 feet**
Runway Setback Required to Clear 25-foot structure	300 feet	**425 feet**
Runway Setback Required to Clear 35-foot structure	370 feet	**495 feet**

The primary change for Runway 16/34 associated with a straight-in instrument approach would be an increase in the width of the protected area surrounding the runway (primary surface) from the existing 250 feet to 500 feet and a 125-foot shift of the 7:1 transitional surface on each side of the runway. The transitional surface is a sloping airspace surface that extends outward and upward from the sides of the primary surface to an elevation 150 feet above the runway. Items such as parked aircraft, fueling facilities, hangars, buildings, etc., are sited to avoid penetrating the protected airspace surfaces. It appears that numerous existing hangars and parked aircraft on the east side of the runway would penetrate the shifted transitional surface.

The primary result of upgrading the airspace surfaces would be a need to eliminate/relocate existing aircraft parking positions that penetrate the reconfigured airspace and adjust setbacks for new buildings to avoid transitional surface penetrations. Existing structures/objects that penetrate the reconfigured airspace would typically be surveyed and lighted (red obstruction light). The approach surface slope for nonprecision instrument approaches on utility runways is 20:1, the same as required for visual approaches. Please see the FAR Part 77 Airspace section later in the chapter for a description of the primary and transitional surfaces.

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SETBACKS BASED ON INSTRUMENT APPROACH TYPE | **FIG. 4-4**

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Runway Safety Area (RSA)

The FAA defines runway safety area (RSA) as *"A defined surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway."* Runway safety areas are most commonly used by aircraft that inadvertently leave (or miss) the runway environment during landing or takeoff.

By FAA design standard, the runway safety area *"shall be:*

(1) cleared and graded and have no potentially hazardous ruts, humps, depressions, or other surface variations;

(2) drained by grading or storm sewers to prevent water accumulation;

(3) 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

(4) free of objects, except for objects that need to be located in the runway safety area because of their function. Objects higher than 3 inches above grade should be constructed on low impact resistant supports (frangible mounted structures) of the lowest practical height with the frangible point no higher than 3 inches. Other objects such as manholes, should be constructed at grade. In no case should their height exceed 3 inches."

The recommended transverse grade for the RSA located along the sides of a runway ranges between 1½ and 5 percent from runway shoulder edges. The recommended longitudinal grade for the first 200 feet of RSA beyond the runway end is 0 to 3 percent. The remainder of the RSA must remain below the runway approach surface slope. The maximum negative grade is 5 percent. Limits on longitudinal grade changes are plus or minus 2 percent per 100 feet within the RSA.

The RSA for Runway 16/34 appears to meet FAA dimensional and surface condition standards along the sides and at both ends of the runway. The RSA appears be free of physical obstructions, except items permitted by FAA that are installed on frangible (break away) supports (runway lights, information/directional signs, runway end identifier lights and VASI). The storm water detention ponds located near the north end of the runway are located beyond the RSA for both ADG I and II (reserve).

The grass surfaced area at the south end of the runway extends approximately 285 feet to the adjacent parcel (grass area on the north side of the Metro Park & Ride lot). The parcel and the adjacent developed parking lot area are identified for future airport acquisition on the 2002 ALP as part of a south runway extension. This recommendation will be reevaluated as part of the alternatives analysis. The grass surfaced area beyond the north end the runway extends approximately 530 feet to the airport perimeter fence. The runway extensions depicted on the 2002 ALP were configured with displaced thresholds and 240-foot RSAs extending at both ends of the future 3,953-foot runway.

Runway pavement edges should be periodically inspected to ensure that grass, dirt or gravel build ups do not exceed 3 inches. The RSA should be regularly cleared of brush or other debris and periodically graded and/or compacted to maintain FAA standards, as needed.

Any future runway extensions will require corresponding RSA improvements based on the applicable design standard. A summary of the RSA requirements based on the existing/future B-I (small) ARC and the reserve A-II ARC is presented below:

Existing/Future Standard	***Reserve***
ARC B-I Small	***ARC A/B -II***
Runway Safety Area (RSA) 120 feet wide and extends 240 feet beyond each departure end of runway.	 150 feet wide and extends 300 feet beyond each departure end of runway.
The RSA appears to be free of built items except those with locations fixed by function on break-away mounts. The RSA surface appears to meet gradient and compaction standards. Periodic inspection/verification maintenance and clearing is required.	The majority of the RSA reserve for the existing runway can be accommodated within existing airport property, although the south end is limited by property ownership. Future runway extensions may require use of declared distances (reduced useable runway length available) for some operations. The same surface gradient and surface standards apply.

Runway Object Free Area (ROFA)

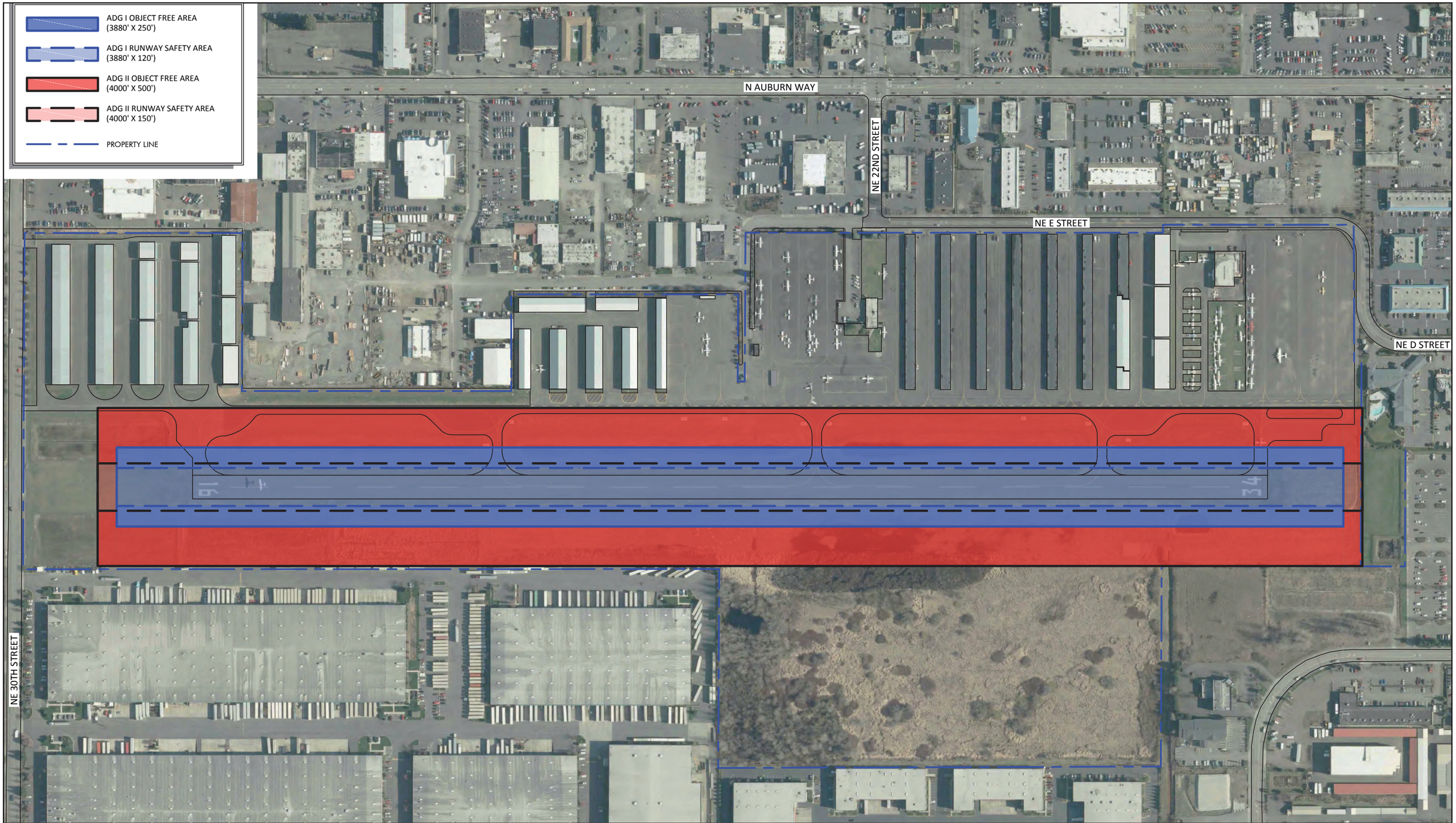
Runway object free areas (ROFA) are two dimensional surfaces intended to be clear of ground objects that protrude above the runway safety area edge elevation. Obstructions within the object free area may interfere with aircraft flight in the immediate vicinity of the runway. The FAA defines the object free area clearing standard:

"The object free area clearing standard requires clearing the object free area of above ground objects protruding above the runway safety area edge elevation. Except where precluded by other clearing standards, it is acceptable to place objects that need to be located in the object free area for air navigation or aircraft ground maneuvering purposes and to taxi and hold aircraft in the object free area. Objects non-essential for air navigation or aircraft ground maneuvering purposes are not to be placed in the object free area. This includes parked airplanes and agricultural operations."

The ROFA for Runway 16/34 appears to be free of physical obstructions (excluding navigational aids, lighting, airfield signs, etc.) and meets FAA dimensional standards. The ROFA should be periodically inspected to remove any protruding objects and clear vegetation. However, unlike runway safety areas, the OFA does not require a prepared surface capable of supporting an aircraft. Any future runway extensions will require corresponding object free area improvements based on the applicable design standard. A summary of the ROFA requirements based on the existing/future B-I (small) ARC and the reserve A-II ARC is presented below:

Existing/Future Standard	*Reserve*
ARC B-I Small	***ARC A/B -II***
Runway Object Free Area (ROFA) 120 feet wide and extends 240 feet beyond each departure end of runway.	 500 feet wide and extends 300 feet beyond each departure end of runway.
The ROFA appears to be free of built items except those with locations fixed by function on break-away mounts. The ROFA surface appears to meet gradient and standards. Periodic maintenance and clearing is required.	The majority of the OFA reserve for the existing runway can be accommodated within existing airport property, although the south end is limited by property ownership. Future runway extensions may require use of declared distances (reduced useable runway length available) for some operations. The protective netting and support structures for the storm water detention ponds adjacent to the runway would need to remain at or below runway elevation (≤3 inches) to avoid penetrating the ROFA. The same surface gradient and clearing standards apply.

Figure 4-5 depicts the runway safety area and runway object free area for the existing Runway 16/34 for both the ARC B-I (Small) and ARC A-II (reserve).



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RUNWAY SAFETY AREA & OBJECT FREE AREA
(ADG I & ADG II RESERVE) | **FIG. 4-5**

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Obstacle Free Zone (OFZ)

Obstacle free zones (OFZ) are planes of clear airspace extending upward above runways that are intended to protect close-in obstructions that may create hazards for aircraft. The FAA defines the following clearing standard for the OFZ:

"The obstacle free zone clearing standard precludes taxiing and parked airplanes and object penetrations, except for frangible visual NAVAIDs [navigational aids] *that need to be located in the obstacle free zone because of their function."*

The FAA defines four types of obstacle free zones based on approach capabilities, runway configuration and type of aircraft use. For Runway 16/34 only the *Runway* OFZ is required. Other OFZ types designed for runway ends with approach lights, significantly lower approach visibility minimums, or precision instrument approaches are not applicable to Runway 16/34.

The FAA defines the Runway Obstacle Free Zone as:

"The runway OFZ [obstacle free zone] *is a defined volume of airspace centered above the runway centerline. The runway OFZ is the airspace above a surface whose elevation at any point is the same as the elevation of the nearest point on the runway centerline. The runway OFZ extends 200 feet beyond each end of the runway."*

The FAA recommended ROFZ width for Runway 16/34 is 250 feet, based on the design aircraft (B-I small). This dimension also applies to a typical "small" ADG II airplane that is capable of operating on the existing or previously planned runway lengths.

Based on a recent visual inspection conducted during the master plan inventory, no penetrations to the existing runway OFZ were observed, other than the runway lights, VASI units, runway end identifier lights, directional signage, and distance remaining signs which have locations fixed by function. All items currently located within the runway OFZ meet the FAA frangibility (break away) standard. Aircraft hold lines are located 125 feet from runway centerline on each of the exit taxiways connecting to the runway, which keeps holding aircraft entirely outside the runway OFZ.

Taxiway Safety Area

Taxiway safety areas (TSA) serve a similar function as runway safety areas and use the same design criteria for surface condition (see description of runway safety area provided earlier in this chapter), with varying dimensions based on airplane design group. The main taxiways on the airfield are designed to accommodate the same design aircraft as the runway (Airplane Design Group I). The ADG I standard TSA dimension is 49 feet, centered on the taxiway, extending 24.5 feet each side of centerline. Based on the existing 25-foot width on the parallel taxiway, the outer edge of the TSA extends 12 feet beyond the taxiway pavement edge (for sections bordered by grass). The ADG II taxiway safety area standard width is 79 feet (39.5 feet from centerline), which is approximately 27 feet from the edge of the parallel taxiway.

Items within TSAs that have locations fixed by function (taxiway edge lights, reflectors, signs, etc.) must be mounted on frangible (break away) mounts. Based on a recent visual inspection conducted during the master plan inventory, the parallel taxiway and exit taxiways appear to meet the surface condition and obstruction clearing standards required for taxiway safety areas.

As with runway safety areas, the ground surface located immediately adjacent to the taxiways periodically requires inspection/verification maintenance or improvement to adequately support the weight of an aircraft or an airport vehicle. Grading and/or soil compaction within taxiway safety areas should be completed as needed, and grass, brush or other debris should be regularly cleared to maintain FAA standards. Taxiway pavement edges should be periodically inspected to ensure that grass, dirt or gravel build ups do not exceed 3 inches.

It is noted that safety area standards do not apply to *taxilanes* typically located within hangar developments or aircraft parking aprons. Taxilanes provide aircraft access within a parking or hangar area; taxiways provide aircraft access between points on the airfield and serve runways (e.g. parallel taxiways and exit taxiways).

Taxiway/Taxilane Object Free Area

Taxiway and taxilane object free areas (OFA) are intended to provide unobstructed taxi routes (adequate wingtip clearance) for aircraft. The outer edge of the OFA defines the recommended distance from taxiway or taxilane centerline to a fixed or moveable object. The FAA clearing standard prohibits service vehicle roads, holding or parked aircraft, and above ground objects (hangars, parked vehicles, other built items, etc.), except for objects with locations that are fixed by function (navigational aids, airfield signs, etc.).

All taxiways and taxilanes at Auburn Municipal Airport are designed to meet ADG I standards, or the corresponding Taxiway Design Group I (TDG I) standards (new in 2012). The FAA added taxiway design groups in the last major update (9/28/12) of its Airport Design advisory circular (AC 150/5300-13A). The standards are based on the outer main gear width and cockpit to main gear distance. Some design elements associated with taxiways remain under airplane design group, while others are included under taxiway design group. Most aircraft that are included in ADG I will also be included in TDG I. For the purposes of this discussion, the standards will be combined (ADG/TDG I).

TAXIWAYS

The standard ADG/TDG I taxiway OFA width dimension is 89 feet, which extends outward 44.5 feet from centerline in both directions. As with the taxiway safety area, any items within the taxiway OFA that have locations fixed by function, must be frangible (break away mount) to meet the FAA clearing standard.

Parallel Taxiway and Exit Taxiways

The parallel taxiway (Taxiway A) was reconfigured/reconstructed in 2009 and the runway separation was increased to 240 feet (ADG II standard), although the width (25 feet) is based on ADG I standards. The five exit taxiways (Taxiways C-G) were modified to connect with the reconfigured Taxiway A. The ADG I OFA for the parallel taxiway and exit taxiways appear to be free of obstructions. **Figure 4-6** depicts the ADG I and ADG II (reserve) object free areas for the existing Taxiway A; the larger ADG II OFA impacts several existing parking positions.

Aircraft hold areas on Taxiway A (adjacent to Taxiways D, F, and G) are located on the interior (runway) side of the parallel taxiway. Taxi striping directs aircraft to the western side of the hold area (located approximately 68 feet from the centerline of Taxiway A). This portion of the hold area keeps aircraft clear of the adjacent taxiway OFA. However, the remainder of the hold area is unmarked and does not identify the setback required for holding aircraft to clear the taxiway OFA.

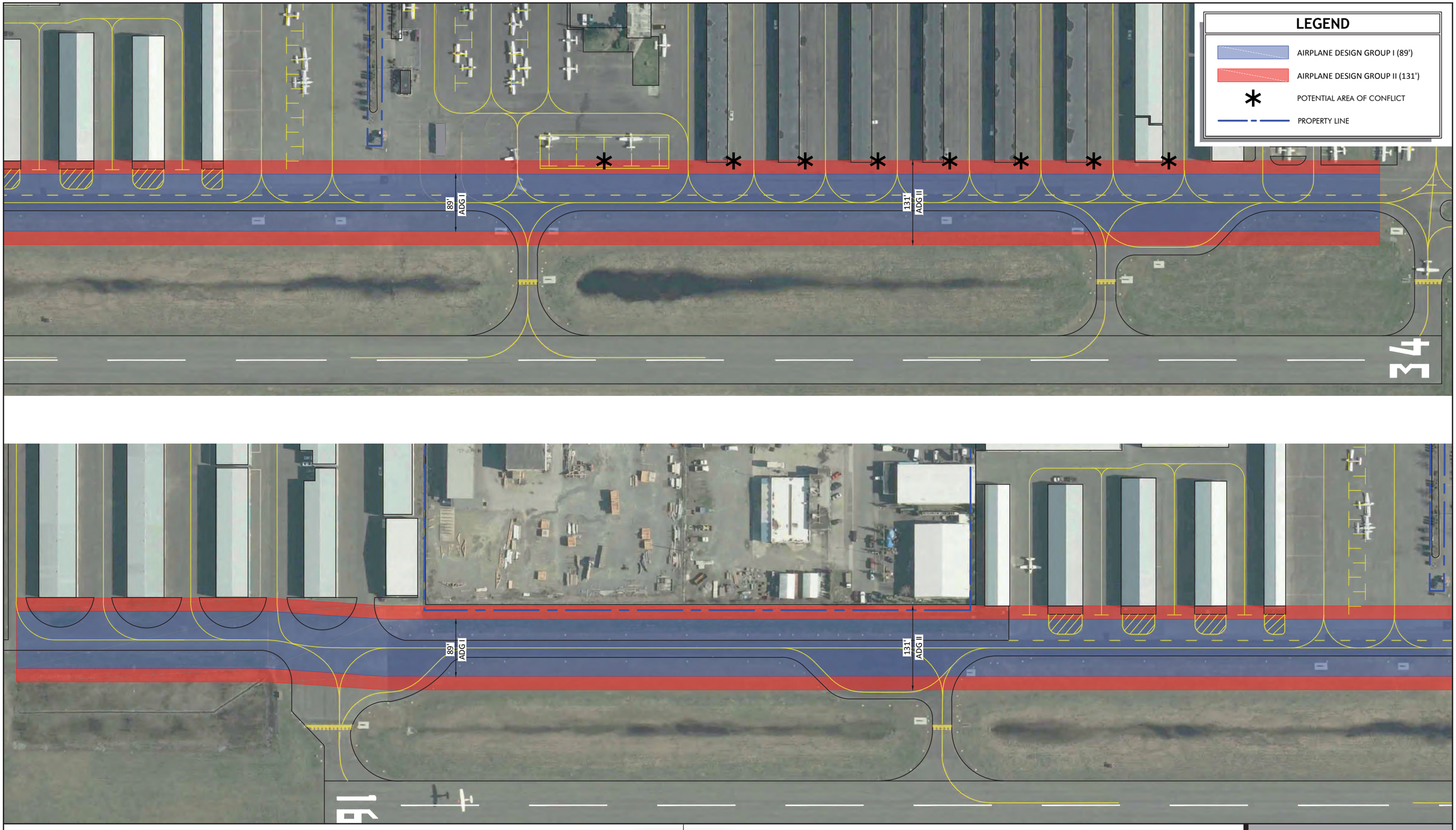
North Hangar Access Taxiway

The north hangar access taxiway extends beyond the north end of Taxiway A and the end of Runway 16. The taxiway OFA appears to be free of obstructions. The eastern side of the structure supporting protective netting over the northeast stormwater detention area is located approximately 40 feet from the taxiway centerline. The height of the structure varies with much of the detention area below runway and taxiway grade to accommodate drainage flow. The height of the structure located within 44.5 feet of the taxiway centerline should be verified to ensure that it does not exceed 3 inches above grade, or verify that the structure meets FAA frangibility through field survey standards.

South Access Taxiway

The south access taxiway extends beyond the south end of Taxiway A along the western side of the south tiedown apron and connects to an aircraft holding area south of Taxiway C and the south end of Runway 34. The taxiway OFA appears to be free of obstructions.

It is noted that the south access taxiway and the taxilane located along the east edge of the south aircraft hold area are parallel with approximately 52 feet of separation (centerline to centerline). The ADG I standard for parallel taxiway/taxilane centerline to centerline separation is 69 feet.



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PARALLEL TAXIWAY OFA (AG I & ADG II RESERVE) | **FIG. 4-6**

CENTURY WEST ENGINEERING CORPORATION

TAXILANES

The Airport has a variety of taxilanes including apron taxilanes and hangar taxilanes that serve predominantly ADG I aircraft. The ADG I taxilane OFA standard dimension is 79 feet wide, extending 39.5 feet from centerline.

North Hangar Area Taxilanes

The north hangar area has five stub taxilanes providing access to adjacent hangars. As noted in the Inventory chapter, the clearances provided on these taxilanes (measured as the opening between hangar rows) vary between approximately 70 and 80 feet. Vehicles observed parked in front of hangars along the taxilanes are obstacles within the taxilane OFA.

Auburn Condo Hangar Association (ACHA) Taxilanes

The ACHA hangar area is served by four east-west taxilanes that connect to Taxiway A and a north-south taxilane that serves the eastern row of hangars. The south units in the southern-most hangar are accessed via the north aircraft parking apron. The clearances provided on the hangar taxilanes vary between approximately 50 and 60 feet. The clearance provided for the north-south taxilane is reduced to approximately 40 feet by electrical panels and protective bollards installed on the east ends of the east-west hangars. Vehicles observed parked in front of hangars along the taxilanes are obstacles within the taxilane OFA.

It appears that the taxilanes were privately developed within the hangar lease area and were not built to FAA standards. These taxilanes are not rated in WSDOT pavement management reports for the airport, which generally indicates privately developed/leased pavements that are not maintained by the Airport. No action is currently required by the Airport.

South Hangar Area Taxilanes

The south hangar area has eight stub taxilanes providing access to adjacent hangars. The clearances provided on these taxilanes vary between approximately 75 and 80 feet. Vehicles observed parked in front of hangars along the taxilanes are obstacles within the taxilane OFA.

Note: FAA Taxilane OFA Clearance

The FAA allows a modification to standards for Taxilane OFA clearance based on the following formula: 1.2 x airplane wingspan plus 20 feet. Using this formula, small hangars with 40-foot wide doors can accommodate most small single-engine and some smaller multi-engine aircraft. Assuming 1-foot of wingtip clearance on both sides, a 40-foot wide door opening could accommodate an aircraft with up to a 38-foot wing span. Based on an aircraft with a 38-foot wingspan, the corresponding taxilane OFA clearance derived from this formula would be approximately 66 feet (38' x 1.2 + 20' = 65.6'). For comparison, a Cessna 172 and 182 both have wingspans of 36 feet; a Cessna 150 has a wingspan of 33.3

feet. Hangars with larger door openings, capable of accommodating larger aircraft would require increased taxilane OFA width using this formula.

Relocation of hangars to meet taxilane OFA standards is not common, although any new or replacement hangars (and the associated taxilanes) should be planned to meet the applicable ADG I taxilane object free area clearance standard. A modification to FAA standards using the FAA-defined formula, providing an acceptable level of safety, should be noted for these hangars.

South Apron Taxilanes

The south tiedown apron has three east-west taxilanes that have 79 feet of clearance between the adjacent tiedown "T" markings. However, since the OFA clearance is measured from the taxilane centerline to a fixed/moveable object (parked aircraft), aircraft located in the tiedowns actually penetrate the taxilane OFA. For most small airplanes, the front portion of the aircraft extends 3 to 5 feet forward of the tiedown markings (into the adjacent taxilane). This can reduce the 79-foot opening on the taxilanes to less than 70 feet. When larger aircraft, such as twin-engine aircraft, are parked in the small airplane tiedowns, the adjacent taxilane clearance is reduced even more.

Main Apron Taxilanes

The main tiedown apron has three east-west taxilanes, a north-south taxilane located between the west ends of the tiedown rows and the transient aircraft parking positions, and an access taxilane located near Taxiway E with clearances varying from 61 to 71 feet between the adjacent marked parking positions. The actual clearances from the taxilane centerlines and adjacent parked aircraft is considerably less than the ADG I standard (79 feet). The aircraft fueling area located at the north end of the main apron is adjacent to taxilanes that extend from the apron to the parallel taxiway. The fuel storage tank and pumps and the aircraft fueling positions on the north and south sides of the tank are partially within defined taxilane OFAs.

North Apron Taxilanes

The north tiedown apron has two east-west taxilanes that have 79 feet of clearance between the adjacent tiedown "T" markings. However, the clearance provided from the taxilane centerlines to parked aircraft (fixed/moveable object) is less than the ADG I taxilane OFA standard.

Auburn Flight Service (FBO) Access Taxilanes

The FBO lease area is served by two paved and one grass surfaced east-west taxilanes that connect to Taxiway A. The clearances provided on the taxilanes (to adjacent parked aircraft) are considerably less than the ADG I OFA standard (79 feet). It appears that the taxilanes were privately developed within the lease area and were not built to FAA standards. These taxilanes are also not rated in WSDOT pavement management reports for the Airport.

Figure 4-2 and **Figure 4-3,** presented earlier in the chapter illustrate the nonstandard taxilane clearances on existing aprons. When required by FAA, changes in parking configurations are typically implemented when the apron areas are rehabilitated, reconfigured, or expanded. Options for addressing existing apron configuration and conforming to OFA clearance standards will be included in the alternatives analysis. All new aircraft parking aprons should be designed to provide standard taxilane OFA clearances to the adjacent parked aircraft, rather than tiedown anchors. Options for providing additional vehicle parking adjacent to hangar areas should also be considered in the alternatives evaluation.

Building Restriction Line (BRL)

A building restriction line (BRL) identifies the minimum setback required to accommodate a typical building height, such as a T-hangar or large conventional hangar, based on the ability to remain clear of all runway and taxiway clearances on the ground, and the protected airspace surrounding a runway. Taller buildings are located progressively farther from a runway in order to remain beneath the 7:1 Transitional Surface slopes that extend laterally from both sides of a runway.

EAST BRL (307 FEET FROM RUNWAY CENTERLINE)

The 2002 Airport Layout Plan depicts a 307-foot BRL on the east side of Runway 16/34. The 307-foot BRL can accommodate structures with roof heights up to 26 feet above runway elevation (at the BRL) without penetrating the runway transitional surface associated with the existing visual approach. Taller structures can be accommodated with increased runway separation. Most hangar rows on the airport are oriented east-west, with the west ends of each row aligned with the BRL. Most of the hangars have roof peak heights ranging from approximately 16 to 26 feet. No existing hangars or other structures are listed as obstructions on the 2002 Airspace Plan.

WEST BRL (251 FEET FROM RUNWAY CENTERLINE)

There are no structures (on airport property) located on the west side of Runway 16/34. The 2002 Airport Layout Plan depicts the west BRL 251 feet from runway centerline, which can accommodate structures with roof heights up to 18 feet above runway elevation without penetrating the existing runway transitional surface.

The nearest off-airport structures on the west side of the runway are located approximately 380 feet from runway centerline. The structures are not listed as obstructions on the 2002 Airspace Plan, but the roof heights for the close-in structures should be verified during a future obstruction survey.

Instrument Approach Upgrade Note:

As noted earlier, the potential development of a straight-in instrument approach to either runway end requires a 500-foot wide primary surface, compared to current 250-foot wide primary surface. The impact on the BRLs for Runway 16/34 would be a 125-foot lateral shift (to maintain the same building heights) of the transitional surface and the beginning of its 7:1 slope. The 26-foot vertical clearance provided by the

existing 307-foot east BRL would be reduced to approximately 8 feet and all existing buildings located along the BRL would penetrate the transitional surface. A future BRL would be needed to site new buildings. The 26-foot building height provided by the east BRL would require an increase to 432 feet, while a T-hangar or smaller conventional hangar (18-foot typical roof peak) would require a 376-foot BRL. These setbacks may be feasible for future redevelopment options for the east landside areas and new development on the west side of the runway. However, in both cases, the increased airspace footprint would reduce the amount of developable land available to site buildings. **Figure 4-4**, presented earlier in the chapter illustrates the changes in setbacks that would be associated with an upgrade to a straight-in instrument approach.

Runway Protection Zones (RPZ)

The FAA provides the following definition for runway protection zones:

"The RPZ's [runway protection zone] *function is to enhance the protection of people and property on the ground. This is achieved through airport owner control over RPZ's. Such control includes clearing RPZ areas (and maintaining them clear) of incompatible objects and activities. Control is preferably exercised through the acquisition of property interest in the RPZ. The RPZ is trapezoidal in shape and centered about the extended runway centerline. The RPZ's begins 200 feet beyond the end of the area useable for takeoff or landing."*

Runway protection zones (RPZ) with buildings, roadways, or other items do not fully comply with FAA standards. It is recognized that realigning major surface roads located within the runway protection zone may not always be feasible. It is recommended that airport sponsors control the RPZs through ownership whenever possible. Alternatively, avigation easements[3] should be acquired where the airport purchases an easement that limits the height of any constructed items and may limit types of uses or activities that are allowed in the area.

The 2002 Airport Layout Plan depicts existing and future RPZs for Runway 16 and 34 based on standards for small aircraft and approach visibility minimums ("visual and not lower than 1-mile"). The RPZ dimensions are 250 x 450 x 1,000 feet. This standard is consistent with the current and future design aircraft and the existing circling and potential straight-in nonprecision instrument approaches. Since the 2002 ALP drawing depicts future displaced thresholds for both runway ends, separate arrival and departure RPZs are identified. The departure RPZs would begin 200 feet beyond the end of the useable runway; the arrival RPZs would begin 200 feet beyond the displaced thresholds.

[3] An avigation easement (*avigation = aviation + navigation*) involves the purchase of airspace rights over a particular defined ground area. The easement normally limits the maximum height of any natural or built items and may include provisions restricting the type of activities permitted. Compensation is negotiated between the airport owner and property owner.

Note: FAA Guidance of RPZs and Roads (Fall 2012)

In October 2012, the FAA released new guidance regarding runway protection zones and roads. In short, the policy directs airport sponsors to evaluate any planned changes to existing RPZs that introduce or increase the presence of roads in RPZs. Existing roads within RPZs are also to be evaluated during master planning to determine if feasible alternatives exist for realignment of roads outside RPZs or for changes to the RPZs themselves. Any proposed increase in the length of Runway 16/34 is subject to review by FAA headquarters in Washington D.C. The evaluation of the RPZ configuration will be included in all runway evaluation options to be addressed in the alternatives analysis.

Aircraft Parking Line

The aircraft parking line (APL) represents the minimum setback required for locating aircraft parking in order to clear the adjacent runway-taxiway system. The location of the APL is generally determined by the more demanding of runway airspace clearance and taxiway obstruction clearance.

The 2002 Airport Layout Plan does not depict APLs on either side of Runway 16/34, but existing aircraft parking areas are depicted. The nearest aircraft parking areas (transient parking positions located south of the fuel island) are located approximately 285 feet east of runway centerline; other aircraft tiedowns are located as close as 295 feet from runway centerline. At 285 feet from runway centerline, an aircraft tail height of approximately 22.8 feet can be accommodated without penetrating the current visual runway transitional surface that extends outward along the sides of the runway. Most small single-engine aircraft have tail heights less than 9 feet. Multi-engine piston aircraft typically have tail heights ranging from 9 to 13 feet, and turboprops and small business jets typically range from 14 to 17 feet.

Two specific factors discussed in this chapter have the potential of affecting existing aircraft parking configurations. First, the potential development of a straight-in instrument approach would require larger airspace surfaces and increased runway setbacks for aircraft parking. With a 500-foot wide primary surface, a 306-foot setback would be required to accommodate a typical single engine airplane with a tail height of 8 feet, which represents a loss of approximately 20 feet of apron for parking directly adjacent to Taxiway A. The existing tail height clearance at 285 feet would be reduced to approximately 5 feet with expanded nonprecision instrument airspace. Small aircraft parked in the western row (facing west) of transient tiedowns on the main apron (south of the fuel island) would penetrate the transitional surface by an average of 1 to 3 feet. **Figure 4-4**, presented earlier in the chapter illustrates the changes in setbacks that would be associated with an upgrade to a straight-in instrument approach.

The second item is related to the ADG II object free area reserve for Taxiway A. Based on the existing parallel taxiway location (240 feet from runway centerline), the minimum aircraft parking setback would be 305.5 feet to accommodate the taxiway OFA. This is virtually identical to the change that would be triggered by an upgrade in instrument approach capabilities, but it is important to remember that this separation would be also required for the current "circling" instrument approach capabilities coupled with

ADG II design standards. Depending on the City's preference with regard to these items, options for relocation/reconfiguration of aircraft parking positions may be included in the development alternatives.

Figures 4-4 and 4-6, presented earlier in the chapter depict the increased setbacks associated with upgraded instrument approach capabilities and the taxiway OFA clearances associated with ADG I and ADG II (reserve).

Runway - Parallel Taxiway Separation

Runway 16/34 has a full length east parallel taxiway with runway separation of 240 feet, which exceeds the ADG I standard, but meets the ADG A/B-II standard. The 2002 Airport Layout Plan depicts a future west parallel taxiway with 225 feet runway separation, consistent with ADG I standards.

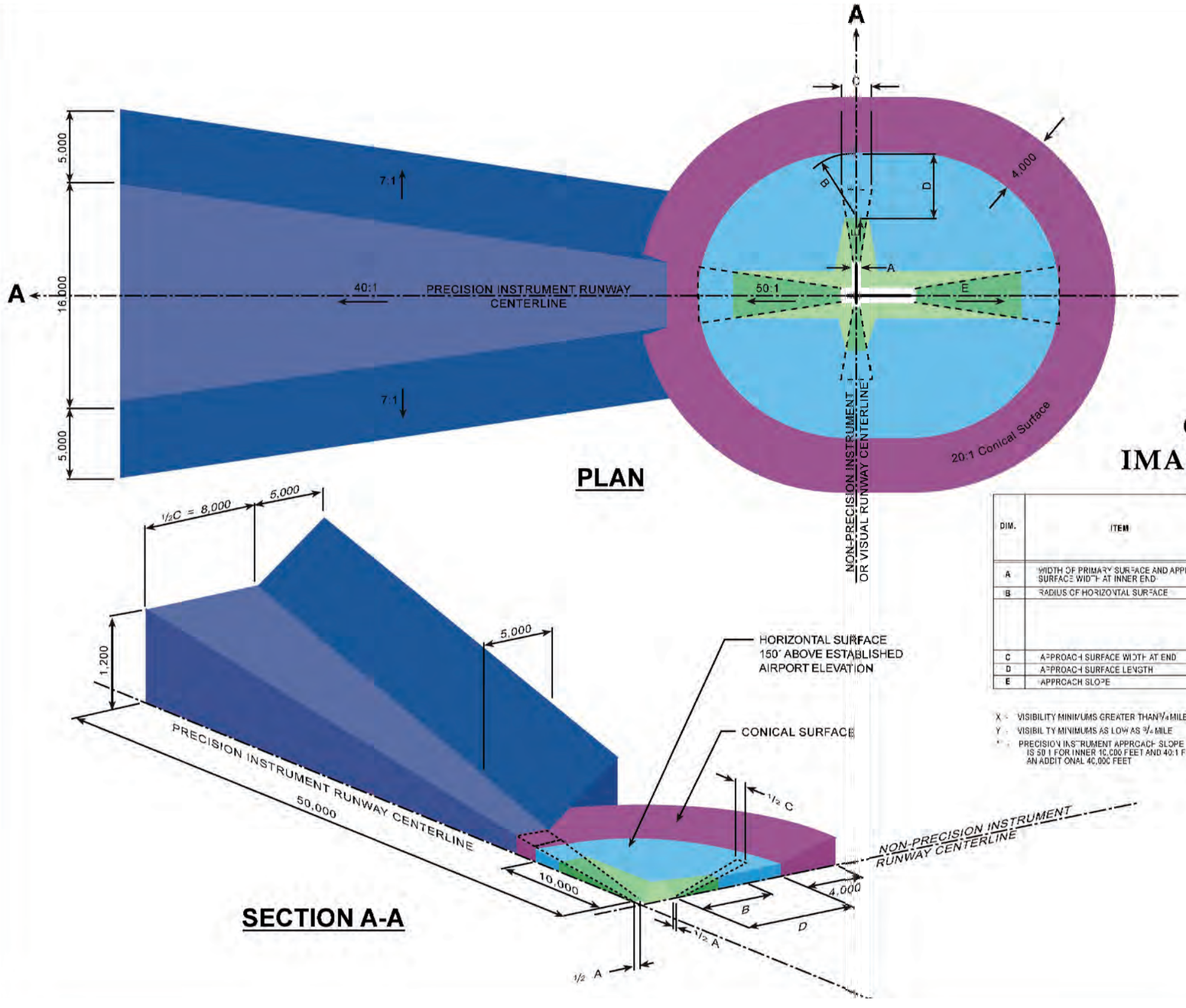
FAR Part 77 Surfaces

Airspace planning for U.S. airports is defined by Federal Air Regulations (FAR) Part 77 – Objects Affecting Navigable Airspace. FAR Part 77 defines imaginary surfaces (airspace) to be protected surrounding airports. **Figures 4-7 and 4-8** on the following pages illustrate plan and isometric views of generic Part 77 surfaces. **Table 4-4** summarizes the airspace surface dimensions for Auburn Municipal Airport based on current and future approach options.

TABLE 4-4: FAR PART 77 AIRSPACE SURFACES

ITEM	RUNWAY 16/34 *(Utility - Visual) (Current Standard, as depicted on 2002 Airspace Plan)*	RUNWAY 16/34 *(Utility Non-Precision Instrument) (Optional Future Standard)*
Width of Primary Surface	250 feet	**500 feet**
Transitional Surface	7:1 Slope to 150 feet above runway	7:1 Slope to 150 feet above runway
Approach Surface Width at End	1,250 feet	**2,000 feet**
Approach Surface Length	5,000 feet	5,000 feet
Approach Surface Slope	20:1	20:1
Horizontal Surface Elevation Horizontal Surface Radius	150 feet above airport elevation 5,000 feet	150 feet above airport elevation 5,000 feet
Conical Surface	20:1 for 4,000 feet	20:1 for 4,000 feet

The 2002 Airspace Plan depicts airspace surfaces based on "utility" visual approaches for Runway 16/34. As noted earlier, the existing airspace associated with Runway 16/34 supports the current nonprecision instrument approach with a visual final approach segment. The 2002 Airspace Plan obstruction table lists 8 items including power lines (2), trees (2), ground surface (3), and a business sign. The table indicates that all of the obstructions except the trees were "fixed" with "no action" recommended. It appears that "fixed" indicates the obstruction/locations were fixed and could not be modified. The two trees were recommended to be removed. Areas of terrain penetration are depicted in the conical surfaces, directly east and west of the runway.



SURFACE SLOPE KEY

- HORIZONTAL SURFACE
- 20:1
- 7:1
- 7:1
- VARIES (SEE "E" VALUE IN TABLE BELOW)
- 40:1 (PRECISION INSTRUMENT RUNWAY ONLY)

CIVIL AIRPORT IMAGINARY SURFACES

DIM.	ITEM	DIMENSIONAL STANDARDS (FEET)					
		VISUAL RUNWAY		NON-PRECISION INSTRUMENT RUNWAY			PRECISION INSTRUMENT RUNWAY
		UTILITY	LARGER THAN UTILITY	UTILITY	LARGER THAN UTILITY		
					X	Y	
A	WIDTH OF PRIMARY SURFACE AND APPROACH SURFACE WIDTH AT INNER END	250	500	500	500	1,000	1,000
B	RADIUS OF HORIZONTAL SURFACE	5,000	5,000	5,000	10,000	10,000	10,000
		VISUAL APPROACH		NON-PRECISION INSTRUMENT APPROACH			PRECISION INSTRUMENT APPROACH
		UTILITY	LARGER THAN UTILITY	UTILITY	LARGER THAN UTILITY		
					X	Y	
C	APPROACH SURFACE WIDTH AT END	1,250	1,500	2,000	3,500	4,000	16,000
D	APPROACH SURFACE LENGTH	5,000	5,000	5,000	10,000	10,000	*
E	APPROACH SLOPE	20:1	20:1	20:1	34:1	34:1	*

X - VISIBILITY MINIMUMS GREATER THAN 3/4 MILE
Y - VISIBILITY MINIMUMS AS LOW AS 3/4 MILE
* - PRECISION INSTRUMENT APPROACH SLOPE IS 50:1 FOR INNER 10,000 FEET AND 40:1 FOR AN ADDITIONAL 40,000 FEET

HEIGHT HAZARD AIRSPACE SURFACES

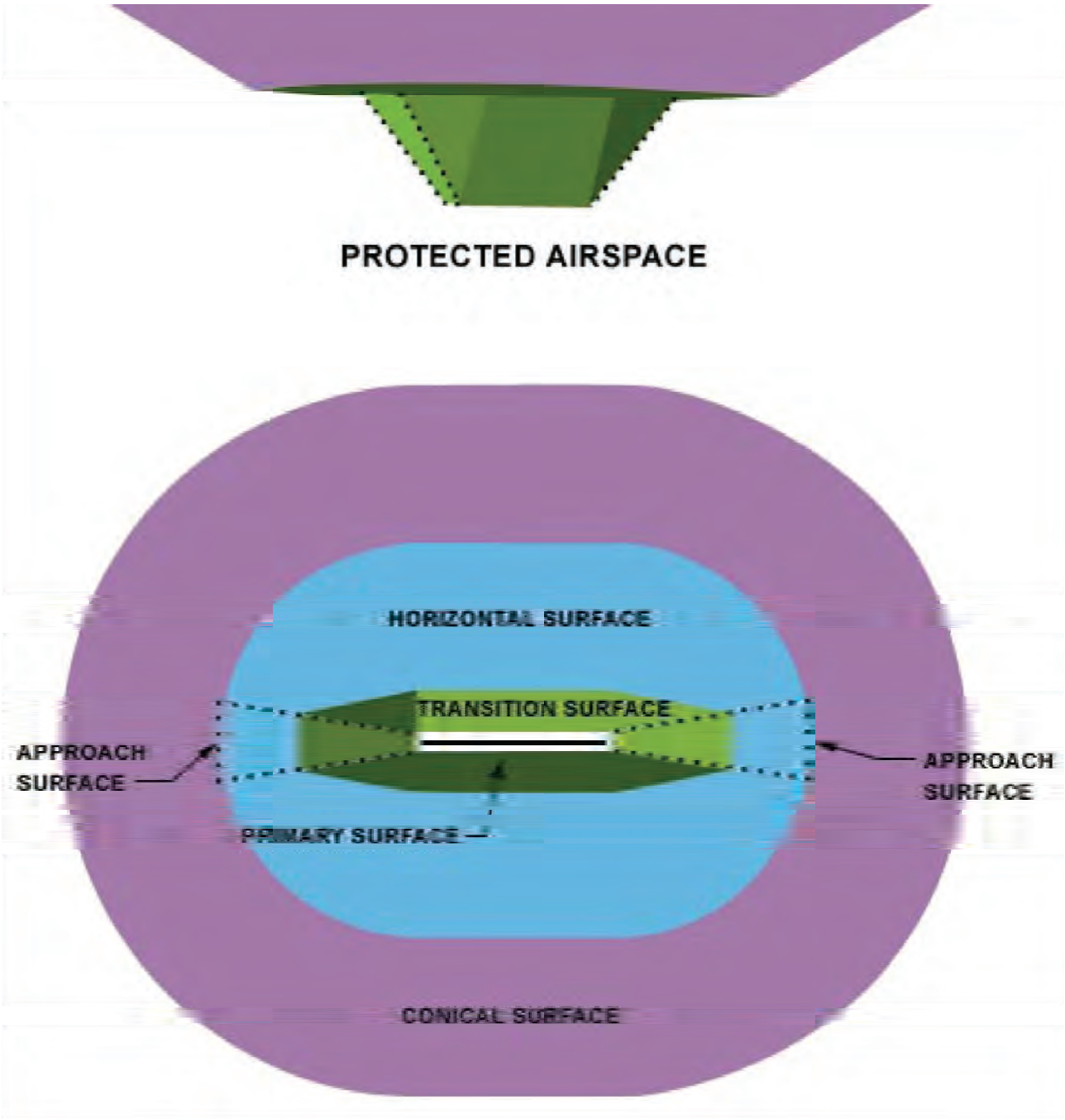


IMAGE SOURCE: WASHINGTON STATE DEPARTMENT OF TRANSPORTATION (AVIATION DIVISION).

A review of topographical mapping will be conducted to verify the obstruction clearance for all airspace surfaces associated with Auburn Municipal Airport as part of the drawing update. Updated obstruction data (where available) will be added to the updated airspace plan being prepared in the master plan update. Data gathered during future obstruction surveys should be added to the airspace plan drawing through periodic updates.

Approach Surfaces

Runway approach surfaces extend outward and upward from each end of the primary surface, along the extended runway centerline. As noted earlier, the dimensions and slope of approach surfaces are determined by the type of aircraft intended to use the runway and most demanding approach planned for the runway.

The 2002 Airspace Plan depicts ultimate 20:1 approach surfaces for Runway 16/34 (in plan view) based on the recommended (future) 3,953-foot runway length. The drawing's profile view depicts both the existing and ultimate FAR Part 77 approach surfaces and ultimate "visual obstruction clearance approach surfaces" for the runway. The approach surfaces are consistent with the runway category, approach capabilities, and approach visibility minimums. The approach surfaces extend 5,000 feet from the end of the runway primary surface.

In addition to the eight obstructions noted on the Airspace Plan, several close-in items are identified as existing or future approach surface obstructions on the Inner Approach Surface drawing. Two existing obstructions are noted: Runway 34 (parking lot – 5-foot penetration) and Runway 16 (building – 1.8-foot penetration). The drawing indicates that the electrical transmission lines located approximately 1,800 feet from the existing end of Runway 16 do not penetrate the current 20:1 FAR Part 77 approach surface. The current FAA 5010 Airport Record Form identifies an "East-West High Voltage Transmission Line, 80 feet above ground level, located 1,804 feet north of Runway 16 threshold at 20:1."

The ultimate obstruction data tables on the drawing identify 6 obstructions for Runway 16 and 4 obstructions for Runway 34. The obstructions include buildings (5), power lines (2), roadways (2) and a parking lot. The drawing indicates that for the future runway configuration, displaced thresholds and obstacle clearance surfaces will be required to provide unobstructed 20:1 surfaces for Runway 16 and 34 over the noted obstructions, except the parking lot (Rwy 34 end), which was identified "to be removed." The previously charted obstructions and any new building or obstruction data available will be reviewed and incorporated into the updated airport plan drawings for use in evaluating runway configuration options. No terrain penetrations are identified in the approach surfaces for Runway 16 or 34.

PRIMARY SURFACE

The primary surface is a rectangular plane of airspace, which rests on the runway (at centerline elevation) and extends 200 feet beyond the runway end. The primary surface should be free of any penetrations,

except items with locations fixed by function (i.e., VASI, runway or taxiway edge lights, etc.). The primary surface end connects to the inner portion of the runway approach surface.

The 2002 Airspace Plan depicts a 250-foot wide primary surface for Runway 16/34 that is consistent with the runway category, existing approach capabilities and approach visibility minimums. No obstructions to the primary surface were identified on the 2002 plan.

TRANSITIONAL SURFACE

The transitional surface is located at the outer edge of the primary surface, represented by a plane of airspace that rises perpendicularly at a slope of 7 to 1, until reaching an elevation 150 feet above runway elevation. This surface should be free of obstructions (i.e., parked aircraft, structures, trees, etc.). No building or parked aircraft penetrations were identified within the Runway 16/34 transitional surfaces on the 2002 Airspace Plan, although one item (business sign) was listed with a 3-foot penetration (no action recommended on plan).

HORIZONTAL SURFACE

The horizontal surface is a flat plane of airspace located 150 feet above runway elevation with its boundaries defined by the radii (5,000 feet for utility runways) that extend from each runway end. The outer points of the radii for each runway are connected to form an oval, which is defined as the horizontal surface.

The 2002 Airspace Plan depicted airport elevation at 63 feet above mean sea level (MSL) with a horizontal surface elevation of 213 feet above mean sea level (MSL). No terrain penetrations or other obstructions were identified within the horizontal surface on the 2002 Airspace Plan.

CONICAL SURFACE

The conical surface is an outer band of airspace, which abuts the horizontal surface. The conical surface begins at the elevation of the horizontal surface and extends outward 4,000 feet at a slope of 20:1. The top elevation of the conical surface for Runway 16/34 is 413feet MSL, 200 feet above the horizontal surface and 350 feet above airport elevation. Seven of the eight obstructions noted on the 2002 Airspace Plan were located in the conical surface, including ground surface, trees, and powerlines. Terrain penetrations were identified within the conical surface directly east and west of the runway (no action recommended on plan).

Airside Requirements

Airside facilities are those directly related to the arrival and departure and movement of aircraft:

- Runways
- Taxiways
- Airfield Instrumentation and Lighting

RUNWAYS

The adequacy of the existing runway system at Auburn Municipal Airport was analyzed from a number of perspectives including runway orientation, airfield capacity, runway length, and pavement strength.

Runway Orientation & Wind Coverage

The orientation of runways for takeoff and landing operations is primarily a function of wind velocity and direction, combined with the ability of aircraft to operate under adverse wind conditions. A runway's wind coverage is measured by an aircraft's ability to operate with a "direct" crosswind, which is defined as 90 degrees to the direction of travel. For runway planning purposes, the maximum direct crosswind for small aircraft is 12 miles per hour; larger general aviation aircraft are typically designed to accommodate a 15 mile per hour direct crosswind. Aircraft are able to operate safely in progressively higher wind speeds as the crosswind angle decreases and the wind direction turns more closely to the direction of flight. In addition, some aircraft are designed to safely operate with higher crosswind components. Ideally, an aircraft will take off and land directly into the wind or with light crosswind. The FAA recommends that primary runways accommodate at least 95 percent of local wind conditions; when this level of coverage is not provided, the FAA recommends development of a secondary (crosswind) runway.

The 2002 Airport Layout Plan indicates that Runway 16/34 has estimated wind coverage of 99.2 percent at 12 miles per hour. Local pilots indicate that the existing runway alignment is generally favorable with the local prevailing winds.

Runway Length

Runway length requirements are based primarily upon airport elevation, mean maximum daily temperature of the hottest month, runway gradient, and the critical aircraft type expected to use the runway. For general aviation airport runways used predominantly by small aircraft (maximum takeoff 12,500 pounds of less), the FAA recommends an evaluation based on a percentage of the small airplane fleet that is consistent with aircraft use. A common planning approach for general aviation runways accommodating a combination of single engine and multi-engine piston aircraft is to base future runway length planning on 95 or 100 percent of the small airplane fleet (aircraft 12,500 pounds and less), or for small airplanes with 10 or more seats.

The 2002 Airport Master Plan recognized the existing runway's ability to accommodate 95 percent of the small airplane fleet and suggested use of the 100 percent segment for long term planning based on FAA runway length planning criteria. It was noted that the length required to accommodate 100 percent of the small airplane fleet was 3,500 feet. The FAA indicates that use of the 100 percent of fleet standard is generally appropriate for airports primarily intended to serve communities located on the fringe of a metropolitan area or a relatively large population remote from a metropolitan area. [4]

However, the 2002 master plan also noted the City's desire to provide additional runway pavement for safety, particularly for accelerate-stop distances for multi-engine aircraft both in training and normal use. For these reasons, **the 2002 Airport Master Plan's recommended length for Runway 16/34 was 3,953 feet**. This dimension also reflected the limitations of the airport site, particularly the surface streets located at the north and south ends of the runway.

The existing and future design aircraft identified in the updated aviation activity forecasts (Chapter 3) is a multi-engine piston aircraft. The majority of these aircraft are included in Aircraft Approach Category B and Airplane Design Group I (ADG I). In addition to the typical range of general aviation activity, the potential exists for Auburn Municipal Airport to accommodate small package express aircraft, including a variety of ADG I and II turboprops. Several of these aircraft fall into the FAA defined category of "small airplanes with 10 or more seats." With this potential activity in mind, the use of this planning criteria appears to provide a reasonable upper range of runway capabilities for Auburn Municipal Airport that is also consistent with the previously-defined desire to provide additional runway pavement for safety purposes. The FAA runway length model indicates that 4,060 feet is required to accommodate small airplanes with 10 or more seats at Auburn Municipal Airport. **A runway length of approximately 4,000 feet (with displaced thresholds) can be accommodated within the limits of adjacent streets, which is comparable to the 2002 Airport Master Plan recommendation of 3,953 feet.**

A summary of FAA recommended runway lengths for planning based on the requirements of small aircraft is presented in **Table 4-5**. **Figure 4-9** depicts the existing length of Runway 16/34 and the length required to accommodate small airplanes with 10 or more seats.

4 FAA Advisory Circular (AC) 150-5325-4B, Runway Length Requirements for Airport Design

TABLE 4-5: FAA RECOMMENDED RUNWAY LENGTHS FOR PLANNING- (FROM FAA COMPUTER MODEL)

Runway Length Parameters for Auburn Municipal Airport • Airport Elevation: 63 feet MSL • Mean Max Temperature in Hottest Month: 78 F • Maximum Difference in Runway Centerline Elevation: 7 Feet • Wet and Slippery Runways • Existing Runway Length: 3,400'	
Small Airplanes with less than 10 seats	
➢ 75 percent of these airplanes	2,400 feet
➢ 95 percent of these airplanes	2,950 feet
➢ 100 percent of these airplanes	3,500 feet (corresponds to design aircraft)
➢ Small airplanes with 10 or more seats	4,060 feet (corresponds to typical accelerate-stop distances for piston twins and ADG II Reserve)

Accelerate-Stop Distance

For most multi-engine aircraft, pilots are trained that if an engine fails before attaining liftoff speed, the only proper action is to discontinue the takeoff. If the engine fails after liftoff with the landing gear still down, the takeoff should be discontinued if touch-down and roll-out on the remaining runway is still possible. Continuing a takeoff on one engine is only recommended when other options are not available since multi-engine piston aircraft typically lose 80 to 90 percent of their climb performance when operating on one engine.

The accelerate-stop distance is the distance required for an aircraft to accelerate to liftoff speed and, assuming failure of an engine at the instant liftoff speed is reached, throttle to idle, apply maximum braking and stop. Aircraft manufacturers assume that the pilot will recognize the engine failure within 3 seconds and act decisively. The accelerate-stop distance for a typical multi-engine piston aircraft (Beechcraft Baron 58P) was reviewed based on the conditions noted above for Auburn Municipal Airport to calculate runway length requirements. At maximum gross takeoff weight, the Baron 58P requires approximately 3,600 feet for the accelerate-stop distance on a dry runway surface with optimal pilot performance. This distance could be expected to increase by 10 to 15 percent (approximately 3,960 to 4,140 feet) on a wet runway. The manufacturer indicates that at 81 knots just before takeoff, upon engine failure, the aircraft will travel approximately 410 feet in the 3 seconds before the pilot cuts power on the good engine and begins to apply maximum braking. Although the accelerate-stop calculation is not reflected in the "normal" takeoff distances required for takeoff roll and climb to 50 feet, it reflects a valid margin of safety for pilots operating multi-engine aircraft on Runway 16/34 and warrants consideration in the master plan moving forward.

RUNWAY 3400' X 75' (EXISTING)

RUNWAY 4060' X 75' (SMALL AIRPLANES WITH 10 OR MORE SEATS)

NOTE:

1. THE INFORMATION DEPICTED IN THIS FIGURE IS FOR RUNWAY LENGTH ILLUSTRATION PURPOSES ONLY AND DOES NOT REFLECT A SPECIFIC RECOMMENDATION OR RUNWAY CONFIGURATION.

Runway Width

Runway 16/34 is 75 feet wide, which exceeds the ADG I standard of 60 feet and meets the ADG II (reserve) standard (75 feet).

AIRFIELD PAVEMENT

An updated airfield pavement maintenance and management study for Auburn Municipal Airport will be completed by WSDOT Aviation in 2013. The updated pavement plan, along with other engineering analyses was the primary decision making tools for the ongoing maintenance and replacement of airfield pavements. All airfield pavements require periodic crackfilling, vegetation removal and sealcoating to optimize useful life. For planning purposes, rehabilitation of asphalt pavements is typically assumed on a 15- to 25-year cycle, depending on use and pavement design. A prioritized list of pavement rehabilitation or reconstruction projects will be provided in the updated capital improvement program.

With effective maintenance, the parallel taxiway and runway should not require rehabilitation until the end of the current twenty-year planning period or beyond. As indicated in the Inventory Chapter (Table 2-7) various apron sections and hangar taxilanes were included in the "major rehabilitation" category, with some areas included in the "reconstruction" category based on the 2012 inspection and ratings. The predicted pavement conditions for the next ten years will be included in the 2013 document. Based on the recent ratings and normal wear, most of the existing apron and taxilane pavements can be expected to require at least rehabilitation, with some sections requiring reconstruction during the next twenty years. **Table 4-6** summarizes the most recent (2012) pavement ratings and the forecast ratings.

TABLE 4-6: SUMMARY OF AIRFIELD PAVEMENT CONDITION (PCI RATINGS)

PAVEMENT	2012 PCI RATING[1,2]	2020 PCI RATING[2]
Runway 16/34	81/76	67/60
Taxiway A (East Parallel Taxiway)	100	92
Exit Taxiways C, D, E, F	100/61	92/52
Exit Taxiway G	60	52
North Hangar Access Taxiway	75	65
South Access Taxiway (south of Rwy 34)	60	52
North Tiedown Apron (north of fuel)	65	54
Center Apron/Main Apron	45/76/29	34/65/22
South Tiedown Apron	71	60

North Hangar Taxilanes	75	65
ACHA Hangar Taxilanes	Not rated	N/R
South Hangar Taxilanes	45	34
Auburn Flight Service South FBO Taxilanes	Not rated	N/R

1. WSDOT Airport Pavement Management System, Applied Pavement Technology, 2012
2. The Pavement Condition Index (PCI) scale ranges from 0 to 100, with seven general condition categories ranging from "failed" to "excellent."

TAXIWAYS

Taxiways are constructed primarily to facilitate aircraft movements to and from the runway system. Some taxiways are necessary simply to provide access between apron and runways, while other taxiways become necessary as activity increases and safer and more efficient use of the airfield is needed. The existing taxiway system at Auburn Municipal Airport provides aircraft access to the runway and all landside facilities located on the east side of the runway. No existing taxiway access is provided on the west side of the runway.

Parallel Taxiway

The east parallel taxiway serving Runway 16/34 provides efficient access to the runway from the airport's landside facilities. The parallel taxiway has five 90-degree connecting exit taxiways which facilitate movement of aircraft between the runway and parallel taxiway. The parallel taxiway has four aircraft holding areas that allow efficient traffic flows. No major capacity or service related improvements are anticipated. The west parallel taxiway is 25 feet wide, which meets the ADG I taxiway width standard.

The 2002 Airport Layout Plan depicts additional taxiway improvements at both ends of the runway in conjunction with runway extension/displaced threshold projects. A future west parallel taxiway (1,700 feet x 25 feet) is also depicted with exit taxiway connections located at the existing Runway 34 end, the future Runway 34 end, and in line with Taxiway E on the east side of the runway. As noted earlier, the future west parallel taxiway is depicted with a 225-foot runway separation, which meets the ADG I standard, but is 15 feet less than the ADG II separation used on Taxiway A.

Taxilanes

The future development of new hangars or aircraft parking on the airport will require additional taxilane access. Access taxiways and taxilanes serving small hangar developments are 25 feet wide for ADG I aircraft with a 79-foot wide object free area. As noted earlier in this chapter, several existing hangar taxilanes do not meet FAA taxilane object free area clearing standards. While it may not be feasible to relocate existing hangars, new hangars should be configured to meet FAA standards.

The taxilanes located within aircraft parking aprons should be configured to provide the standard object free area clearances. Options for reconfiguring existing aprons to meet standards will be evaluated in the alternatives analysis. Apron reconfigurations are generally completed as part of a required pavement rehabilitation or reconstruction project.

Light airplane tiedown rows and adjacent taxilanes are typically designed to accommodate airplane design group (ADG) I aircraft; parking positions for larger multi-engine aircraft should be sized appropriately. The taxilane centerline to the nearest fixed/moveable object (parked aircraft) of 39.5 corresponds to the object free area dimensions for ADG I.

AIRFIELD INSTRUMENTATION, LIGHTING AND MARKING

Navigational Aids

Runway 16/34 currently supports a circling nonprecision GPS instrument approach (RNAV-GPS A). There are no ground based electronic navigational aids located on the airport. Any improvement to the current instrument approach (approach descent and visibility minimums) would also utilize satellite-based platforms rather than ground-based systems.

Instrument approaches currently being designed for general aviation airports typically use WAAS or LPV platforms, depending on the airfield capabilities and surrounding airspace. The FAA is currently implementing "NextGen" capabilities in the national airspace system that will eventually allow more efficient movement of aircraft between airports and provide more innovative instrument approach and departure routing and other capabilities.

It is anticipated that no on-site electronic navigational aids will be required during the current planning period.

Runway/Taxiway Lighting

The lighting systems associated with Runway 16/34 were installed new as part of the runway rehabilitation conducted in 2004. The lighting systems include medium intensity runway edge lighting (MIRL), runway end identifier lights (REIL), and visual approach slope indicators (VASI). The systems meet the standard for general aviation runways with visual or nonprecision instrument approaches. The parallel taxiways and exit taxiways are equipped with medium-intensity taxiway lighting (MITL).

Most lighting systems have a useful life of 20 to 25 years, depending on weather exposure and maintenance history. The visual approach slope indicator (VASI) units will likely require replacement with the current equivalent (precision approach path indicators - PAPI). The runway and taxiway edge lights, REILS, and the airport beacon should not require replacement until late in the 20-year planning or beyond.

Runway Markings

Runway 16/34 has basic (visual) markings, consistent with existing approach capabilities. The markings (threshold marking bars, runway end numbers, centerline stripe) are in excellent condition and were applied in the 2004 rehabilitation project. The runway exit taxiways have yellow aircraft hold line markings located 125 feet from runway centerline, which meets the runway OFA and OFZ clearing standard.

In the event the current instrument approach was to be replaced with a straight-in approach, the runway markings would need to be upgraded to non-precision instrument (NPI), which consists of threshold markings (6 vertical bars), runway end numbers, and runway aiming point markings, located 1,020 feet from each end of the runway. The FAA Flight Procedures Office is only permitted to design straight-in approaches for runways with NPI markings in place, so early coordination would be required if a straight-in approach is found to feasible and if the City decides to pursue that option.

Airfield Signage

The lighted airfield signage (location, mandatory, directional, destination, and distance remaining signs) are internally illuminated and were installed new during the runway and lighting rehabilitation projects.

Airfield Lighting

Airport management reports that the existing airport beacon operates normally.

The lighted wind cone on the west side of the runway is in good condition. Airports will often locate supplemental wind cones near runway ends to provide pilots with additional information about surface wind conditions.

ON FIELD WEATHER DATA

Auburn Municipal Airport does not currently have on-site weather observation. Aircraft conducting instrument approaches at the airport are required to use the SEATAC altimeter setting. Automated Weather Observation Systems (AWOS and ASOS) are located at five airports within 15 miles of Auburn Municipal Airport. It appears that existing weather data is adequate to support local instrument operations. However, adding onsite weather should be considered as the overall development and use of the airport evolves. The addition of on-site weather observation capabilities would support airport operations in both visual and instrument conditions. Onsite weather would also allow aircraft licensed under FAR Part 135 (air taxi/charter) to operate in IFR conditions.

Landside Facilities

For general aviation airports, landside facilities are generally defined as those that serve aircraft, passenger needs and their related functions. At Auburn Municipal Airport, landside facilities include aircraft

aprons, hangars, and fixed base operator (FBO) space and aircraft fueling facilities. The Airport Management Group (AMG), the City's contract airport manager, is also responsible for managing the City's aviation fuel storage and dispensing system. As noted in the Inventory Chapter, the Airport has several commercial tenants providing variety of aviation services.

The 2002 Airport Layout Plan does not depict specific development areas for additional commercial tenants. Future hangar development options will be developed in the alternatives analysis and will include space to accommodate commercial tenants in addition to aircraft storage. Options for providing additional aviation fuel storage may be considered for the west side of the runway, depending on its future development needs.

AIRCRAFT PARKING AND TIEDOWN APRON

Aircraft aprons provide parking for locally based aircraft that are not stored in hangars and for transient aircraft visiting the airport and ground operations such as aircraft fueling. At Auburn Municipal Airport, the four primary apron areas accommodate small airplane tiedowns for local and transient aircraft, and aircraft fueling. The Airport does not currently have a designated parking area for helicopter use, although helicopters are accommodated within existing tiedown aprons by airport management on an individual basis.

Larger aircraft parking is also accommodated on the apron (in small airplane tiedown rows), although there are no parking positions designed for larger aircraft. As noted earlier, larger aircraft parked in the small airplane tiedown rows typically extend well into the adjacent taxilanes, which reduces the available taxilane clearance. The addition of parking positions for twin-engine or other larger aircraft should be addressed in the apron alternatives evaluation.

As noted in the Inventory Chapter, the Airport has approximately 169 small airplane tiedowns located on four aprons, although not all tiedowns are marked or actively used. 35 of the tiedowns are located on leased apron areas at Auburn Flight Service. The existing apron configurations do not meet FAA taxilane object free area clearance standards for ADG I aircraft in several areas. Options for reconfiguring the aprons to meet standards will be included in the alternatives evaluation. It is noted that in order to meet FAA design standards, some reduction in the number of tiedown positions may be needed. Based on this possibility, future space calculations should not assume that 100 percent of existing tiedown capacity will be available to meet forecast demand. Given the relatively large number of unused tiedowns and the relative scarcity of developable land for new hangar construction, converting a portion of existing parking apron capacity to hangar development may also be considered in the alternatives analysis.

In order to address the uncertainty associated with predicting long term demand, aircraft apron reserve areas should be identified to preserve the airport's ability to accommodate user needs. A development reserve area equal to 50 to 100 percent of the net twenty year parking demand will provide a conservative planning guideline to accommodate unanticipated demand, changes in existing apron configurations, and

demand beyond the current planning period. The location and configuration of the development reserves will be addressed in the alternatives analysis.

Aircraft Parking Demand (Local and Itinerant)

For planning purposes, it is assumed that 80 percent of forecast based aircraft will be stored in hangars and 20 percent will use apron parking. Based on these assumptions, 66 light aircraft tiedowns will be required for locally-based aircraft by 2032. These estimates may prove to be overly optimistic in gauging apron parking demand for based aircraft as existing hangars (doors on the open-front T-hangars, etc.) are improved or additional hangar space is developed at the airport. However, this approach will ensure that adequate apron is preserved for long term use.

FAA **Advisory Circular 150/5300-13A** suggests a methodology by which itinerant parking requirements can be determined from knowledge of busy day operations. Future demand for itinerant parking spaces was estimated based on 20 percent of design day itinerant operations (20% of daily itinerant operations divided by two, to identify peak parking demand). The FAA planning criterion of 360 square yards per itinerant aircraft was applied to the number itinerant spaces to determine future itinerant ramp requirements. By 2032, itinerant aircraft parking requirements are estimated to be 31 aircraft parking positions. Based on the projected distribution of air traffic, the parking positions will be primarily small airplane tiedowns, but would also include parking positions for multi-engine aircraft and other business class aircraft (single-engine/multi-engine turboprops, very light jets, etc.), and parking for helicopters. **Table 4-7** summarizes projected aircraft parking requirements based on the updated aviation activity forecasts.

Aircraft Fueling Apron

The existing aircraft fueling area can accommodate two small aircraft on the apron located on the north and south sides of the fuel tanks. However, as noted earlier, the existing clearance between the fueling area and the adjacent taxilane to the east does not meet FAA taxilane OFA standards. Options for reconfiguring existing taxilanes or relocating the fueling apron will be addressed in the airport development alternatives. The analysis will also evaluate the space requirements to provide additional fuel grades, such as jet fuel or auto gasoline.

Helicopter Practice Pad

The Airport has a small unpaved pad located on the west side of the runway that accommodates helicopter flight training activities. The pad is located approximately 180 feet from runway centerline, which is outside the ADG I protected areas for the runway (runway safety area, object free area, and obstacle free zone). The pad functions as a parking area rather than a designated landing area.

AIRCRAFT HANGARS

Auburn Municipal Airport accommodates a wide variety of hangars including commercial hangars and hangars used primarily for aircraft storage. It is estimated that 80 percent of the airport's 274 based aircraft are stored in hangars, with the remaining aircraft parked on aircraft apron. For planning purposes, it is assumed that existing hangar space is committed and all additional (forecast) demand would need to be met through new construction. Improvements to the City's open-front T-hangars may affect demand for new construction, although given an uncertain timeframe for making improvements, it is prudent to plan for new construction and let the market forces determine future needs.

As indicated in the aviation activity forecasts, the number of based aircraft at Auburn Municipal Airport is projected to increase by 55 aircraft during the twenty year planning period. Based on a projected 80 percent hangar utilization level, additional long term demand for new hangar space is estimated to be 44 spaces. A planning standard of 1,500 square feet per based aircraft stored in hangars is used to project gross space requirements (44 aircraft = 66,000 square feet). The projected hangar requirements for aircraft storage at Auburn Municipal Airport are presented in **Table 4-7.**

TABLE 4-7: APRON AND HANGAR FACILITY REQUIREMENTS SUMMARY

ITEM	BASE YEAR (2012)	2017	2022	2027	2032
Based Aircraft Forecast	**274**	**280**	**291**	**308**	**329**
Aircraft Parking Apron ***(Note: capacities reflect current configuration of existing apron areas, actual capacity when reconfigured may be significantly different.)***					
Small Aircraft Tiedowns	169				
Total Apron Area *(includes taxilanes and unusable space required for hangars access)*	51,000 sy				
Projected Needs (*Gross Demand*) [1]					
Itinerant Single Engine Aircraft Tiedowns (@ 360 SY each)		17 spaces / 6,120 sy	18 spaces / 6,480 sy	19 spaces / 6,840 sy	22 spaces / 7,920 sy
Locally Based Tiedowns (@ 300 SY each)		56 spaces / 16,800 sy	58 spaces / 17,400 sy	62 spaces / 18,600 sy	66 spaces / 19,800 sy
Multi-Engine Aircraft Parking (@ 625 SY each)		4 spaces / 2,500 sy	5 spaces / 3,125 sy	5 spaces / 3,125 sy	5 spaces / 3,125 sy
Small Helicopter Parking Positions (@ 380 SY each)		3 spaces / 1,140 sy	3 spaces / 1,140 sy	4 spaces / 1,520 sy	4 spaces / 1,520 sy
Total Apron Needs		**80 spaces 26,560 SY**	**84 spaces 28,145 SY**	**90 spaces 30,085 SY**	**97 spaces 32,365 SY**
Aircraft Hangars ***(Existing Facilities)***					
Existing Hangar Spaces (est.)	253				

Projected Needs ***(Net Increase in Demand)*** [2]					
(New) Hangar Space Demand (@ 1,500 SF per space) *(Cumulative twenty year projected demand: 45 spaces / 67,500 SF)*		**+5 spaces / 7,500 sf**	**+9 spaces / 13,500 sf**	**+14 spaces / 21,000 sf**	**+17 spaces / 25,500 sf**

1. Aircraft parking demand levels identified for each forecast year represent forecast gross demand.
2. Hangar demand levels identified for each forecast year represent the net increase above current hangar capacity.

In addition to aircraft storage, additional demand for business related and commercial hangar needs should be anticipated. Specialized aviation service businesses such as engine & airframe repair, avionics, interior and paint shops generally prefer locations that provide convenient aircraft access. Highly successful aviation service businesses generally rely on both locally based aircraft and their ability to attract customers from outside the local area. While there is no specific formula to predict demand for general aviation service businesses at a particular airport, reserving several spaces for larger commercial hangars is recommended.

Individual aircraft owners needs vary and demand can be influenced by a wide range of factors beyond the control of an airport. In addition, the moderate forecast growth in based aircraft may be exceeded if conditions are favorable. For this reason, it is recommended that hangar development reserves be identified to address the uncertainty of hangar market conditions and demand factors. Conservative development reserves should be established to accommodate a combination of conventional hangars -and T-hangars, roughly equal to 50 to 100 percent of the twenty year forecast (net) demand. The location and configuration of the development reserves will be addressed in the alternatives analysis.

Surface Access and Vehicle Parking

EAST LANDSIDE AREA

The surface access to the east landside area of the Airport appears to be adequate. Automated vehicle gates are located adjacent to the hangar areas and aircraft aprons. As noted earlier, the hangar areas have minimal vehicle parking areas and vehicles often park on the taxilanes adjacent to hangars. Due to limited space adjacent to existing hangars, options for adding vehicle parking may be limited, but should be explored. Potential redevelopment or infill in the east landside area may require additional vehicle parking.

WEST LANDSIDE AREA

There is no existing surface access to the undeveloped area on west side of the runway. The 2002 Airport Layout Plan identifies future access to the area from the B Street to the northwest corner of the west development area. Other access options may be available from the south through adjacent property and 15th Street. The vehicle parking requirements for the west side of the runway will depend on the type of

use. Commercial development typically requires more vehicle parking capacity than aircraft storage. Options for providing functional vehicle parking in the west and east landside areas should be addressed in the alternatives evaluation. The City of Auburn parking code can provide guidance on parking allocations based on building square footage or another acceptable metric.

Support Facilities

AVIATION FUEL STORAGE

The city-owned aviation fuel storage (12,000 gallon Aviation Gasoline) and dispensing facilities appear to be adequate to accommodate current demand. As noted earlier, the existing clearance between the fueling area and the adjacent north-south apron taxilane does not meet FAA standards. Options for addressing the current configuration will be included in the evaluation of airport development alternatives. In addition, adequate space should be reserved to accommodate additional tanks that may be needed for jet fuel or automobile gasoline. The growth in manufacturing of small turbine aircraft, particularly single engine turboprops, very light jets, and turbine helicopters will increase demand for jet fuel for transient aircraft in addition to demand from locally-based turbine aircraft. It is also noted that several light airplane manufacturers are now offering diesel engines (using jet fuel) as an alternative to conventional AVGAS fueled piston engines.

The development of a secondary containment area for (future) mobile fuel truck parking should also be considered. Most mobile fuel trucks in use today have single wall tank construction and do not provide the secondary containment of double wall aboveground bulk storage tanks. It is anticipated that federal or state regulations will eventually require secondary containment for single wall tank mobile fuel trucks when unattended, such as for overnight parking when the trucks are not in service or otherwise monitored. Locating secondary containment areas for airport fuel trucks in close proximity to the bulk fuel storage areas may be the most efficient use of land in the terminal area.

AIRCRAFT WASH DOWN FACILITIES

The existing aircraft wash down facilities appear to be adequate.

AIRPORT UTILITIES

The existing utilities on the airport appear to be adequate both in capacity and service within the developed areas of the airport. Extensions of water, sanitary sewer and electrical service to serve future west landside developments would be required. All power lines located on the airfield should be buried. Expansion or upgrade of existing stormwater systems will be required as the impervious surface on the airport increases through development.

SECURITY

The airport has chain link fencing extending around the airport perimeter, with vehicle and pedestrian gates located adjacent to existing hangar and aircraft parking areas. Future landside development will require reconfigurations of existing fencing and additional controlled access gates.

Property Acquisition

The 2002 Airport Layout Plan depicts six separate parcels for acquisition. Five of the parcels are located near the south end of the runway. The parcels include the park & ride parking lot (2.7 acres), the grassy area immediately north of the park & ride lot (1.2 acres), a parcel near the southwest corner of the airport (2.75 acres), and two narrow strips of property (0.05 and 0.2 acres) for access or fencing. A 1.47 acre parcel located on the east side of the airport, immediately north of 26th Street was also identified for future acquisition. A review of current King County property records indicates that the larger parcels have not been acquired. A review of City property needs will be conducted to determine if these parcels should remain identified for future acquisition. Due to the fact that the east landside area is nearing full-build out and the costs of developing the west landside area will be significant, there may be other parcels adjacent to the airport's east side that could provide future opportunities for airport land expansion. This information will also be included the review of property needs.

West Landside Area

The 2002 Airport Layout Plan depicts future T-hangars with taxiway connections to the runway. As part of the master plan update, the development constraints and costs of developing the west parcel are being reviewed. The site has a considerable acreage consisting of wetlands and wetland buffers. Development that impacts these areas would require mitigation (on-site or off-site) that is highly regulated. The FAA generally discourages on-site wetland on airports due to concerns about potential increase in bird attraction. The cost of bringing the site up to buildable standards includes fill and grading, roadway access and extension of utility service. The City has indicated that the options for future development of this site will require sufficient revenue or other benefits to justify the costs of development/mitigation. This would suggest that commercial/industrial aviation-related development capable of generating revenue or employment may prove to be a highest and best use, compared to aircraft storage, which has more limited revenue streams. Options for developing the west parcel as a fully integrated part of the airport will be included the alternatives analysis

Facility Requirements Summary

The projected twenty year facility needs for Auburn Municipal Airport are summarized in **Table 4-8**. As noted in the table, maintaining existing pavements represents a significant, ongoing facility need. The updated forecasts of aviation activity anticipate moderate growth in activity that will result in similarly moderate airside and landside facility demands beyond existing capabilities.

The existing airfield facilities have the ability to accommodate a significant increase in activity, with targeted facility improvements. For the most part, the need for new or expanded facilities, such as aircraft hangars, will be market driven, although there will be significant front end investments required in preparation, utility extensions, road extensions, and taxiway/taxilane construction. The nonconforming items noted at the beginning of this chapter are relatively minor and can be addressed systematically during the current planning period to improve overall safety for all users.

TABLE 4-8: FACILITY REQUIREMENTS SUMMARY

ITEM	SHORT TERM	LONG TERM
Runway 16/34	• 600-foot Runway Extension / Reserve • Displaced Thresholds for Obstruction Clearance • Pavement Maintenance[1]	• ADG II Development Reserves (option) • Pavement Maintenance[1]
Taxiways and Taxilanes	• Pavement Maintenance[1] • Extend Taxiway A for Runway Extensions • Rehabilitate Hangar Taxilanes • Taxiways/Taxilanes West Landside Area • Modify Aircraft Hold Area (south of Taxiway C)	• Pavement Maintenance[1] • West Parallel Taxiway (partial length) • Taxiways/Taxilanes to New Hangar Areas • ADG II Development Reserves (option)
Aircraft Aprons	• Reconfigure Aircraft Parking Aprons (rehabilitate/reconstruct older sections) to meet FAA taxilane clearing standards • Business Aircraft Parking • Helicopter Parking • Pavement Maintenance[1]	• Pavement Maintenance[1] • Apron Development Reserves • Aircraft Fueling Area Reserve
Hangars	• Define development areas for T-hangars, conventional hangars, and commercial hangars based on forecast demand	• Hangar development reserves
Navigational Aids and Lighting	• Upgrade Instrument Approach	• Taxiway Edge Lighting (MITL) West Taxiways • PAPIs Rwy 16 & 34 • Supplemental Wind Cone
Fuel Storage	• Fueling Area (address taxilane clearances) • Define Reserve Area for additional fuel tanks/grades	• Identify Secondary Containment Area(s) for Fuel Truck Parking
FBO	• Identify FBO reserve(s) for commercial aviation tenants	• Same
Utilities	• Extend Service to New Development Areas	• Same

Roadways and Parking	• Extend/Improve Roads to New Development Areas • Add designated vehicle parking adjacent to hangars and apron areas.	• Same
Security	• Add Automated Gates for West landside area • Flood Lighting	• Same

[1] Vegetation control, crackfill, sealcoat, slurry seal, localized patching, joint rehabilitation, etc., as required.

AIRFIELD CAPACITY

Annual service volume (ASV) is a measure of estimated airport capacity and delay used for long-term planning. ASV, as defined in FAA Advisory Circular (AC) 150/5060-5, Airport Capacity and Delay, provides a reasonable estimate of an airport's operational capacity. The ratio between demand and capacity helps to define a timeline to address potential runway capacity constraints before they reach a critical point. If average delay becomes excessive (greater than 3 minutes per aircraft), significant congestion can occur on a regular basis, which significantly reduces the efficient movement of air traffic. ASV is calculated based on the runway and taxiway configuration, percent of VFR/IFR traffic, aircraft mix, lighting, instrumentation, the availability of terminal radar coverage and the level of air traffic control at an airport.

For long-term planning purposes, the FAA estimates ASV for a single runway with no air carrier traffic is approximately 230,000; hourly capacity is estimated to be 98 operations during visual flight rules (VFR) conditions and 59 operations during instrument flight rules (IFR) conditions. Although these estimates assume optimal conditions (air traffic control. etc.), they provide a reasonable basis for approximating existing and future capacity:

- *Existing Capacity: 93,136 Annual Operations / 230,000 ASV = 40.5% (demand/capacity ratio)*
- *Future Capacity: 128,565 Annual Operations/ 230,000 ASV = 55.9% (demand/capacity ratio)*

Based on these ratios, the average delay per aircraft would be expected to remain below three minutes through the planning period. The FAA recommends that airports proceed with planning to provide additional capacity when 60 percent of ASV is reached. As noted in the Forecast Chapter, the airfield has accommodated significantly higher traffic volumes in recent years when local flight school operations were active. In the future, exit taxiway enhancements (high speed exits, etc.) may be appropriate to reduce runway occupancy times and maintain adequate capacity.