WAUPACA MUNICIPAL AIRPORT

AIRPORT MASTER PLAN

Draft Final

DRAFT FINAL

AIRPORT MASTER PLAN

FOR

Waupaca Municipal Airport (PCZ)
City of Waupaca, Wisconsin

PREPARED BY

Coffman Associates
AIRPORT CONSULTANTS
a PAPE-DAWSON company

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Table of Contents

TABLE OF CONTENTS

INTRODUCTION

CHAPTER 1 – INVENTORY

CHAPTER 1 – INVENTORY (CONTINUED)

CHAPTER 2 – FORECASTS

CHAPTER 3 – FACILITY REQUIREMENTS

CHAPTER 4 – DEVELOPMENT ALTERNATIVES

CHAPTER 4 – DEVELOPMENT ALTERNATIVES (CONTINUED)

CHAPTER 5 – RECOMMENDED MASTER PLAN CONCEPT

CHAPTER 6 – CAPITAL IMPROVEMENT PLAN

EXHIBITS

Chapter 1 – Inventory

Chapter 2 – Forecasts

Chapter 3 – Facility Requirements

Chapter 4 – Development Alternatives

Chapter 5 – Development Alternatives

Chapter 6 – Capital Financial Plan

APPENDICES

Appendix A – Glossary of Terms

Introduction

WHAT IS A MASTER PLAN?

The Federal Aviation Administration (FAA) recommends that airports update their long-term planning documents every seven to 10 years, or as necessary to address local changes at the airport. The most recent plan for Waupaca Municipal Airport (PCZ) is the airport layout plan (ALP), which was approved in 2007. The City of Waupaca, the sponsor of the airport, received a grant from the Wisconsin Department of Transportation (WisDOT) Bureau of Aeronautics (BOA)[1] to update this airport master plan.

The city is responsible for funding capital improvements at the airport and obtaining FAA Airport Improvement Program (AIP) and WisDOT-BOA development grants. In addition, the city oversees facility enhancements and infrastructure development conducted by private entities at the airport. The master plan provides guidance for future development and justification for projects for which the airport may receive funding through an updated capital improvement program (CIP) by demonstrating the future investments required by the city, the FAA, and the BOA.

The airport master plan follows a systematic approach outlined by the FAA to identify airport needs in advance of the actual need for improvements. This is done to ensure the city can coordinate environmental reviews, project approvals, design, financing, and construction to minimize the negative effects of maintaining and operating inadequate or insufficient facilities. An important outcome of the master plan process is a recommended development plan, which reserves sufficient areas for future facility needs. Such planning will protect development areas and ensure they will be readily available when required to meet future needs. The intended outcome of this study is a detailed on-airport land use concept that outlines specific uses for all areas of airport property, including strategies for revenue enhancement.

The preparation of this study is evidence that the city recognizes the importance of the airport to the surrounding region, as well as the associated challenges inherent in providing for its unique operating and improvement needs. The cost of maintaining an airport is an investment that yields impressive benefits to the local community. With a sound and realistic master plan, the airport can maintain its role as an

[1] WisDOT participates in the State Block Grant Program, which administers federal grants from the AIP for the FAA.

important link to the regional, state, and national air transportation systems. Moreover, the plan will aid in supporting decisions for directing limited and valuable city resources for future airport development. Ultimately, the continued investments in the airport will allow the city to reap the economic benefits generated by historical investments.

AN AIRPORT MASTER PLAN IS…

- A comprehensive, long-range study of the airport, including all airside and landside components, that describes plans to meet FAA safety standards and future aviation demand.
- Required by the FAA to be conducted every 7-10 years to ensure plans are up to date and reflect current conditions and FAA regulations.
- Funded 90% by a BOA apportionment grant derived from FAA discretionary funds allocated to the BOA. The remaining 10% is split between the State of Wisconsin and the City of Waupaca.
- A local document that will ultimately be presented for approval from the City of Waupaca. The FAA approves only two elements of the master plan: the aviation demand forecasts and the airport layout plan (ALP) drawing set.
- An opportunity for airport stakeholders and the public to engage with airport staff on issues related to the airport, its current and future operations, and environmental and socioeconomic impacts. Two (3) public information workshops were conducted during the master plan process to facilitate this public outreach effort.

AN AIRPORT MASTER PLAN IS *NOT*…

- A guarantee that the airport will proceed with any planned projects. Master plans are guides that help airport staff plan for future development; however, the need/demand for certain projects might never materialize.
- A guarantee that the City of Waupaca, the BOA, or the FAA will fund any planned projects. Project funding is considered on a case-by-case basis and requires appropriate need and demand. Certain projects may require the completion of a benefit-cost analysis.
- A binding or static plan. Elements of the master plan may be updated to reflect changes in aviation activity at the airport, the economic conditions of the region, or the goals of the City of Waupaca.
- Environmental clearance for specific projects. The master plan includes an environmental overview, which identifies potential environmental sensitivities per *National Environmental Policy Act of 1969* (NEPA) guidelines. Most planned projects will require a separate environmental study prior to construction.

WHO IS PREPARING THE MASTER PLAN?

The City of Waupaca has contracted with Coffman Associates, Inc. to undertake this airport master plan. Coffman Associates is an airport planning and consulting firm that specializes in master planning and environmental studies. Coffman Associates will lead the planning team, with engineering support from Strand Associates.

The airport master plan is being prepared in accordance with FAA requirements, including the following:

- Advisory Circular (AC) 150/5070-6B, *Airport Design*
- AC 150/5070-6B, Change 2, *Airport Master Plans*
- AC 150/5300-13B, *Airport Design*, Change 1

The development of the master plan will include applicable FAA ACs, grant assurances, and the *Wisconsin Administrative Code* Chapter Trans 55 criteria. The plan will be closely coordinated with other planning studies relevant to the area and with aviation plans developed by the FAA and BOA. The plan will also be coordinated with the City of Waupaca, as well as other local and regional agencies, as appropriate.

GOALS AND OBJECTIVES

The primary goal of this master plan is to develop and maintain a financially feasible long-term development program that will satisfy the aviation demand of the region; be compatible with community development, other transportation modes, and the environment; and enhance employment and revenue for the local area. Accomplishing this goal requires an evaluation of the existing airport to decide what actions should be taken to maintain a safe, adequate, and reliable facility.

Specific objectives of the study include the following:

- Prepare initiation materials and conduct a planning advisory committee (PAC) kickoff meeting.
- Develop a project website to host and allow public access to various project materials.
- Inventory the airport facilities and existing land within the present boundaries of Waupaca Municipal Airport.
- Inventory air traffic and passenger data, including procedures, navigational aids, and operations.
- Inventory local plans, land uses, environmental plans, and different demographic data that can provide greater insight into the local area.
- Obtain tabulated wind data from the National Oceanic and Atmospheric Administration and the National Climatic Data Center to prepare an updated wind rose for the airport layout plan.
- Complete an environmental inventory to gather information regarding environmental sensitivities on and/or near airport property.
- Define based aircraft service areas to help determine local air services, based on the closest commercial service and general aviation airports.
- Prepare new based aircraft and annual operations forecasts for general aviation and military aircraft, as applicable.
- Prepare forecasts for operational activity information concerning regarding peak month, day, and hour activity for facility needs evaluations.
- Establish physical planning criteria and determine the airport's critical aircraft.
- Identify airfield facility criteria to help determine the adequacy of airside facilities.
- Identify general aviation criteria for evaluating the adequacy of various general aviation facilities for forecasted demands.
- Establish alternative development design issues.
- Evaluate potential airside alternatives.

- Evaluate potential general aviation alternatives.
- Develop a master plan concept.
- Analyze land use controls and plans for compatibility.
- Provide an environmental overview and recycling plan.
- Prepare airport development schedules and an opinion of probable construction costs (OPCC).
- Prepare a capital program and financial plan.
- Prepare the final master plan report.

BASELINE ASSUMPTIONS

A long-range planning study requires several baseline assumptions, which will be used throughout this analysis. The baseline assumptions for this study are as follows:

- Waupaca Municipal Airport will continue to operate as a local general aviation airport through the 20-year planning period.
- The airport will continue to accommodate general aviation tenants, as well as itinerant and/or local aircraft operations by air taxi, general aviation, and military operators.
- The aviation industry will develop through the planning period as projected by the FAA. (Specifics of projected changes in national aviation industries are described in Chapter Two.)
- The socioeconomic characteristics of the region will generally change as forecasted. (See Chapter Two).
- A federal and state airport improvement program will be in place through the planning period to assist in funding future capital development needs.

MASTER PLAN ELEMENTS AND PROCESS

The master plan includes eight elements that are intended to assist in the evaluation of future facility needs and provide the supporting rationale for their implementation.

Element 1 – Study Initiation and Organization includes the development of the scope of services and schedule, as well as the establishment of a PAC. Study materials are assembled in a workbook format. General background information is established, including an outline of the goals and objectives to be accomplished during the master plan. A project-specific website is also developed to host draft materials and allow for the receipt of comments.

Element 2 – Inventory of Existing Conditions focuses on collecting and assembling relevant data pertaining to the airport and the area it serves. Information on existing facilities and operations is collected. Local economic and demographic data are collected to define the local growth trends, and environmental information is gathered to identify potential environmental sensitivities that might affect future improvements. Planning studies that may have relevance to the master plan are also collected.

Element 3 – Forecasts examines the potential aviation demand at the airport. The analysis utilizes local socioeconomic information and national air transportation trends to quantify the levels of aviation activity that can reasonably be expected to occur at Waupaca Municipal Airport over a 20-year period. Existing and ultimate critical aircraft are also established to determine future planning design standards, based on AC 150/5000-17, *Critical Aircraft and Regular Use Determination*. The results of this effort are used to determine the types and sizes of facilities that will be required to meet the projected aviation demand at the airport through the planning period. This element is one of two elements that are submitted to the BOA for approval.

Element 4 – Airport Facility Requirements Analysis determines the available capacities of various facilities at the airport, whether they conform with FAA/BOA standards, and what facility updates or new facilities will be needed to comply with FAA/BOA requirements and/or the projected 20-year demand.

Element 5 – Airport Development Alternatives considers a variety of solutions to accommodate projected airside and landside facility needs through the long-term planning period. An analysis is completed to identify the strengths and weaknesses of each proposed development alternative, with the intention of determining a single direction for development.

Element 6 – Recommended Plan and Land Use Compatibility provides graphic and narrative descriptions of the recommended plan for the use, development, and operation of the airport. This plan forms the basis of the ALP drawing set. Existing zoning ordinances and other land use management documentation will be reviewed and summarized, and land use management techniques in the airport vicinity will be outlined. This element also includes the formulation of an environmental overview and recycling plan.

Element 7 – Financial Management and Development Program includes a 20-year capital improvement program (CIP), which is established to define the schedules, costs, and funding sources for the recommended development projects.

Element 8 – Final Reports and Approvals provides documents that depict the findings of the study effort and present the study and its recommendations to appropriate local organizations. The final document incorporates the revisions to previous working papers prepared under earlier elements into a usable master plan document.

COORDINATION AND OUTREACH

The Waupaca Municipal Airport master plan is of interest to many within the local community and region, including local citizens and businesses, community organizations, city officials, airport users/tenants, and aviation organizations. As a component of the regional, state, and national aviation systems, the airport is of importance to both state and federal agencies responsible for overseeing the air transportation system.

To assist in the development of the master plan, a PAC was established to act in an advisory role during the preparation of the study. Committee members are scheduled to meet four times at designated points during the study to review study materials and provide comments to help ensure the development of a realistic, viable plan.

Draft working paper materials will be prepared at various milestones in the planning process. The working paper process allows for timely input and review during each step in the master plan to ensure all issues are fully addressed as the recommended program develops.

Two open-house public information workshops will also be conducted as part of the study coordination and outreach efforts. Workshops are designed to allow all interested persons to become informed and provide input concerning the master plan process. Notices of meeting times and locations will be advertised through local media outlets and all draft reports, meeting notices, and materials will be made available to the public on the project website at **www.waupaca.airportstudy.net**.

Chapter 1

Inventory

The inventory of existing conditions is the initial step in the preparation of the Waupaca Municipal Airport (PCZ) master plan. The inventory will serve as an overview of the airport's physical and operational features, including facilities, users, and activity levels, as well as specific information related to the airspace, air traffic activity, and role of the airport. Finally, a summary of socioeconomic characteristics and review of existing environmental conditions on and adjacent to the airport are thoroughly detailed, which will provide further input into the study process.

Information provided in Chapter One serves as the baseline for the remainder of the master plan, which is compiled using a wide variety of resources, including applicable planning documents; on-site visits; interviews with airport staff, tenants, and users; aerial and ground photography; federal, state, and local publications; and project record drawings. Specific sources are listed below and environmental resources are detailed at the end of this chapter.

Inventory Source Documents:

- 2007 Waupaca Municipal Airport Layout Plan (ALP)
- City of Waupaca's airport website (https://cityofwaupaca.org/departments/airport/)
- Federal Aviation Administration (FAA) Form 5010, *Airport Master Record*, for PCZ

AIRPORT SETTING AND BACKGROUND

LOCALE

The City of Waupaca is located in Waupaca County in north-central Wisconsin, approximately 130 miles north of Milwaukee and 75 miles west of Green Bay. Waupaca serves as the county seat and has a population of 6,282, as of the 2020 Census. Locally, the city is situated along the banks of the Waupaca River. The area is known for its abundant forests and lakes. In this locale, residents and visitors enjoy diverse scenery, a rich history, and a thriving local economy. Major employment industries in the area include manufacturing, finance, agricultural sales, and automotive sales.

Waupaca Municipal Airport is located within the Waupaca city limits on the southeast edge of town, near Waupaca Eco Park. The airport encompasses approximately 385 acres and sits at an elevation of 840.2 feet above mean sea level (MSL). The surrounding major surface roadways include U.S. Route 10, which runs west/east on the south side of Waupaca, and Wisconsin Highway 22 (WIS 22), which borders the airport's west side and connects to Apple Tree Lane. From Apple Tree Lane, Commercial Drive and Runway Drive provide access to airport property. **Exhibit 1A** depicts the airport in its regional setting.

AIRPORT ADMINISTRATION

Waupaca Municipal Airport is owned and operated by the City of Waupaca. An airport manager provides day-to-day oversight of the airport and its maintenance. The airport is staffed via the fixed base operator (FBO), which acts as the airport manager Monday through Friday from 8:00 a.m. to 5:00 p.m.

CLIMATE

Climate and local weather conditions are important considerations in the master planning process, as they can significantly impact an airport's operations. For example, high surface temperatures and humidity increase runway length requirements, and runway orientation is dependent on predominant wind patterns for the area. Cloud cover percentages and frequency of other climatic conditions also determine the need for navigational aids and lighting.

Waupaca experiences a humid continental climate with four distinct seasons. Winters are severe, while summers are generally warm. The weather is generally humid and there is no dry season. **Exhibit 1B** displays weather patterns in the city. The highest average maximum temperature of 82 degrees Fahrenheit (°F) occurs in July, while January is the coldest month, with an average minimum temperature of 7.6°F. The average annual rainfall totals 33.8 inches and is most plentiful during the summer; June is the rainiest month, averaging 4.6 inches. The average annual snowfall totals 49.3 inches, with December averaging the most snow at 12.3 inches.

Table 1A indicates that visual meteorological conditions (VMC) occur 91.30 percent of the time at PCZ. When under VMC, pilots can operate using visual flight rules (VFR) and are responsible for maintaining proper separation from objects and other aircraft. Instrument meteorological conditions (IMC) account for all weather conditions less than VMC that still allow for aircraft to safely operate under instrument flight rules (IFR). Under IFR, pilots rely on instruments in aircraft to accomplish navigation. IMC occurs 5.73 percent of the time. Less than IMC, or poor visibility conditions (PVC), are present 2.97 percent of the time. These weather conditions are lower than instrument approach minimums, making the airport inaccessible to most air traffic. It should be noted that the data for Table 1A considers the percentage by duration (by minutes recorded), which means that the data were recorded by the number of minutes during which each type of weather condition was present.

TABLE 1A | Weather Conditions

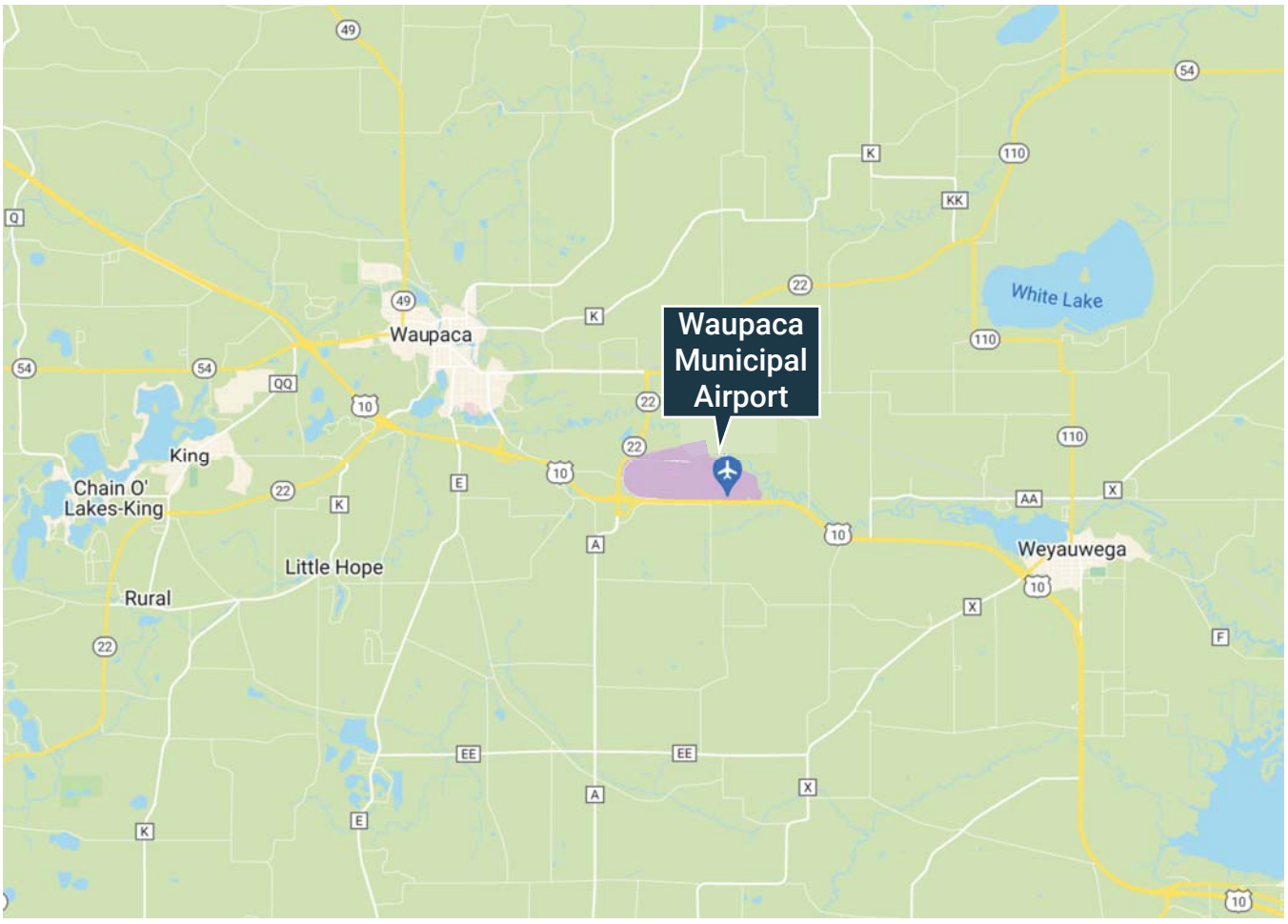
Conditions	Cloud Ceiling	Visibility	Percent of Total
VMC	≥ 1,000' AGL	≥ 3 statute miles	91.30%
IMC	≥ 500' AGL and < 1,000' AGL	≥ 1 to < 3 statute miles	5.73%
PVC	< 500' AGL	< 1 statute mile	2.97%

AGL = above ground level
IMC = instrument meteorological conditions
PVC = poor visibility conditions
VMC = visual meteorological conditions

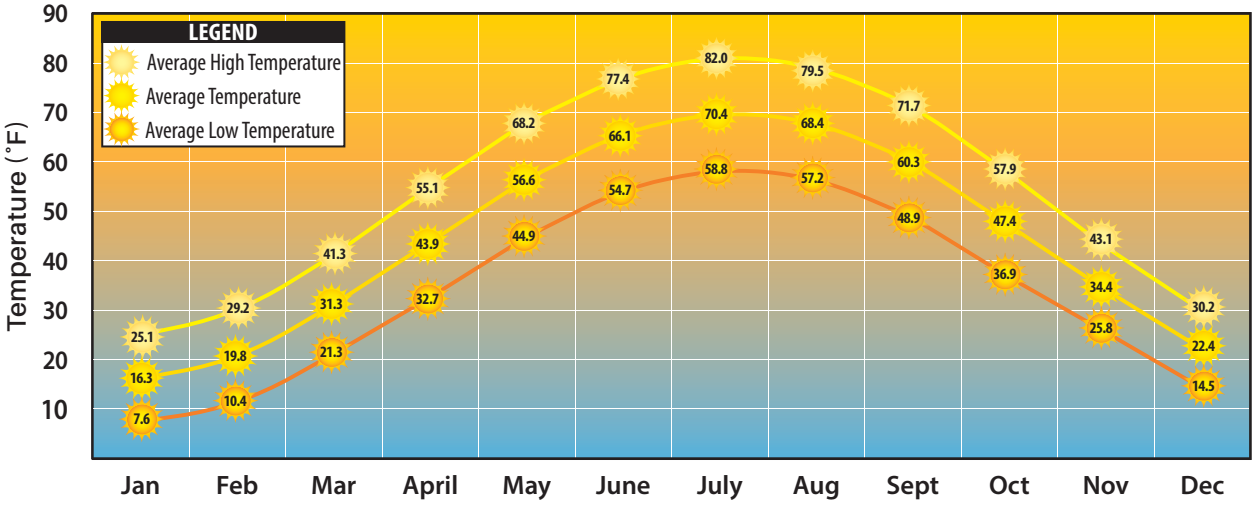
Station ID: Waupaca Municipal Airport, WI, U.S., observations from January 1, 2014, through December 31, 2023


WISCONSIN
Waupaca
MICHIGAN
IOWA
ILLINOIS
INDIANA
Chicago
Milwaukee
Madison
Green Bay
Indianapolis
REGIONAL MAP

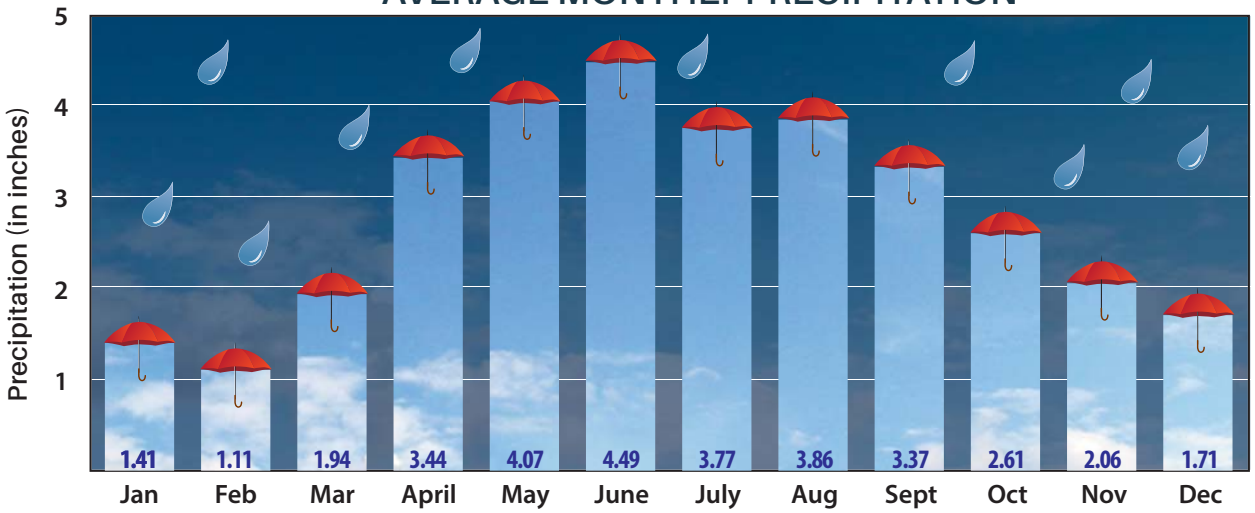

Marathon
Shawano
Waupaca
Outagamie
Waupaca
Portage
Adams
Waushara
Green Lake
Winnebago
Marquette
Fond du Lac
VICINITY MAP


Waupaca
Municipal
Airport
White Lake
Waupaca
King
Chain O'
Lakes-King
Little Hope
Rural
Weyauwega

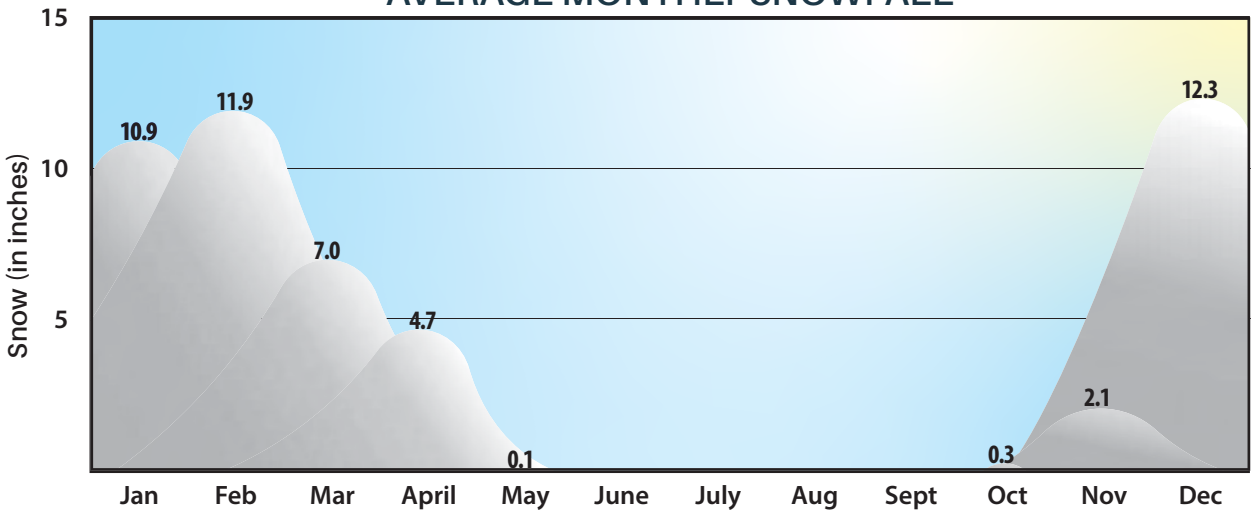
AVERAGE MONTHLY TEMPERATURE



AVERAGE MONTHLY PRECIPITATION



AVERAGE MONTHLY SNOWFALL



THE AIRPORT'S SYSTEM ROLE

Airport planning takes place at the local, state, and national levels, each of which has a different emphasis and purpose.

- **Local |** Waupaca Municipal Airport has an approved airport layout plan (ALP), which was last updated in 2007.
- **State |** Waupaca Municipal Airport is included within the *Wisconsin State Airport System Plan 2030*.
- **National |** Waupaca Municipal Airport is included in the *National Plan of Integrated Airport Systems* (NPIAS), which categorizes overall airport roles and responsibilities based on input from local and state planning efforts (i.e., master plans and state system plans).

LOCAL AIRPORT PLANNING

2007 Airport Layout Plan

The 2007 ALP provided a 20-year airport development vision. The primary recommendations included:

- Extending Runway 10-28 to 6,100 feet;
- Extending Taxiway A;
- Constructing a partial parallel taxiway to serve the north side of Runway 10-28;
- Implementing a localizer and approach lighting system to serve Runway 10-28; and
- Constructing additional landside facilities (aprons/taxilanes/hangars).

STATE AIRPORT PLANNING

The primary planning document for the State of Wisconsin is the *Wisconsin State Airport System Plan 2030* (SASP), which was adopted in 2015. The SASP provides an inventory and evaluation of all public-use airports in the state, with a focus on keeping Wisconsin's airports highly advanced, safe, and responsive to the public's needs. Waupaca Municipal Airport is classified as a medium general aviation (GA) airport within the SASP, which defines medium GA airports as ones that "support most single and multi-engine GA aircraft, including those aircraft commonly used by businesses [and] support regional and in-state air transportation needs."

FEDERAL AIRPORT PLANNING

Many of the nation's existing airports were either initially constructed by the federal government or their development and maintenance was partially funded through various federal grant-in-aid programs to local communities; therefore, the system of airports that exists today is mostly due to federal policy that promotes the development of civil aviation. As part of a continuing effort to develop a national airport system, U.S. Congress has maintained a national plan for the development and maintenance of airports.

The FAA maintains the *National Plan of Integrated Airport Systems* (NPIAS), which is a database of airports that are eligible for Airport Improvement Program (AIP) funding and are for public use. The NPIAS is published and used by the FAA in administering the AIP, which is the source of federal funds for airport improvement projects across the country. An airport must be included in the NPIAS to be eligible for federal funding assistance through the AIP.

The current plan is the NPIAS 2023–2027, which identifies 3,287 existing public-use airports and eight proposed nonprimary airports that are anticipated to open by 2027 and are deemed important to national air transportation. The plan estimates that approximately $62.4 billion in AIP-eligible airport projects will require financial assistance between 2023 and 2027, which is an increase of almost $19 billion from the cost identified in the previous NPIAS report.

The NPIAS categorizes airports by the types of activities they support, including commercial service, cargo service, reliever operations, and general aviation. Waupaca Municipal Airport is currently classified as a local GA airport in the NPIAS. These airports are critical components of the national GA system and account for 36 percent of all NPIAS airports. They are typically located near population centers and have moderate levels of activity. Local GA airports often accommodate flight training and emergency services and average approximately 35 based propeller-driven aircraft at their facilities.

AIRPORT FACILITIES AND SERVICES

There are three broad categories of facilities and services at the airport:

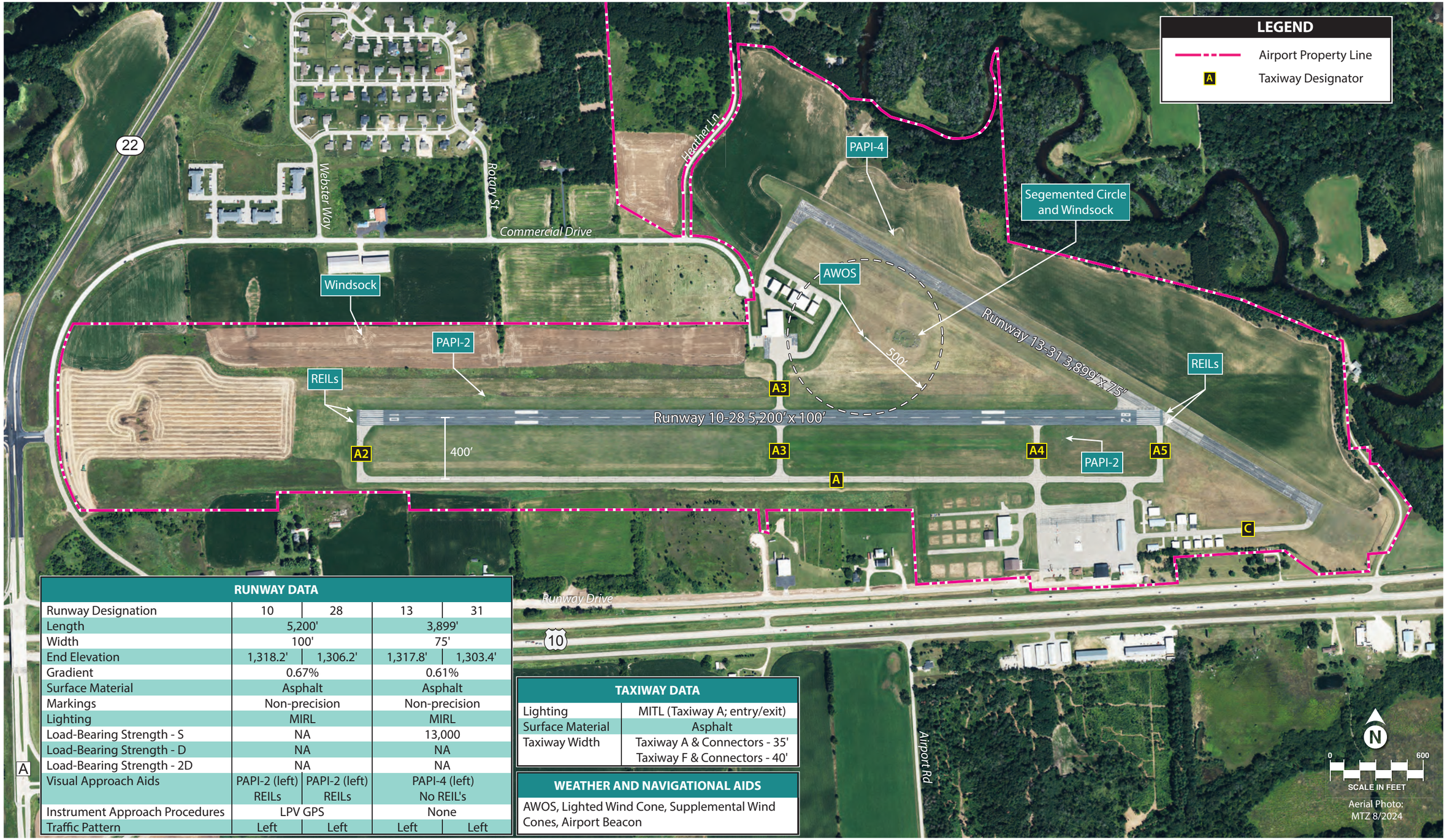
- **Airside facilities** are directly associated with aircraft operations and include runways, taxiways, lighting, markings, navigational aids, and weather reporting systems.
- **Landside facilities** are necessary to provide a safe transition from surface to air transportation and support aircraft parking, servicing, storage, maintenance, and operational safety.
- **Support facilities** serve as a critical link to provide the necessary efficiency to aircraft ground operations, such as fuel storage, airport maintenance, firefighting, and security.

AIRSIDE FACILITIES

Runways

As depicted on **Exhibit 1C**, Waupaca Municipal Airport has a dual runway system. The runways and their features are detailed as follows.

- *Runway 10-28* | Runway 10-28 is the airport's primary runway and measures 5,200 feet long by 100 feet wide. The runway is oriented east/west and is constructed of asphalt, which is reported to be in fair condition. Both runway ends are equipped with non-precision markings, which support the localizer performance with vertical guidance (LPV) global positioning system (GPS) approaches that are available to each runway end. Both ends of Runway 10-28 are also served by two-light precision approach path indicator (PAPI-2) systems on the left side of the runway. The runway generally slopes down from Runway 28 and ends at a longitudinal gradient of 0.67 percent.



RUNWAY DATA				
Runway Designation	10	28	13	31
Length	5,200'		3,899'	
Width	100'		75'	
End Elevation	1,318.2'	1,306.2'	1,317.8'	1,303.4'
Gradient	0.67%		0.61%	
Surface Material	Asphalt		Asphalt	
Markings	Non-precision		Non-precision	
Lighting	MIRL		MIRL	
Load-Bearing Strength - S	NA		13,000	
Load-Bearing Strength - D	NA		NA	
Load-Bearing Strength - 2D	NA		NA	
Visual Approach Aids	PAPI-2 (left) REILs	PAPI-2 (left) REILs	PAPI-4 (left) No REIL's	
Instrument Approach Procedures	LPV GPS		None	
Traffic Pattern	Left	Left	Left	Left

TAXIWAY DATA	
Lighting	MITL (Taxiway A; entry/exit)
Surface Material	Asphalt
Taxiway Width	Taxiway A & Connectors - 35' Taxiway F & Connectors - 40'

WEATHER AND NAVIGATIONAL AIDS
AWOS, Lighted Wind Cone, Supplemental Wind Cones, Airport Beacon

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- *Runway 13-31* | Runway 13-31 is oriented northwest/southeast and serves as the crosswind runway. It is 3,899 feet long by 75 feet wide and is constructed of asphalt that is reported to be in poor condition, with numerous cracks and vegetation in the pavement. Runway 13-31 has a weight-bearing capacity of 13,000 pounds for single wheel aircraft (S). It has basic markings and no instrument approach procedures. Runway 13 is served by a four-light PAPI (PAPI-4), while Runway 31 is served by a PAPI-2. Each PAPI system is located on the left side of the runway it serves. The longitudinal gradient is 0.61 percent, generally sloping downward from the Runway 31 end.

Taxiways

The taxiway system at Waupaca Municipal Airport is identified on **Exhibit 1C**. A full-length parallel taxiway, labeled as Taxiway A, serves Runway 10-28, extending from the Runway 10 threshold to the Runway 28 threshold. Four connector taxiways provide entry/exit points from Runway 10-28 to Taxiway A. Taxiway A, which is 40 feet wide, is separated from the Runway 10-28 centerline by 400 feet.

Another small taxiway connects to the end of Runway 31 from the terminal apron. This taxiway is approximately 35 feet wide and is labeled as Taxiway C.

Finally, a partial taxiway connects Runway 10-28 and Runway 3-31. This taxiway also leads to Red Door Hangar and several other hangars and is 40 feet wide.

Airfield Lighting

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

Airport Identification Lighting

The location of the airport at night is universally identified by a rotating beacon, which projects two beams of light, one white and one green, 180 degrees apart. The beacon operates from sunset to sunrise and is located on the east side of the airport property at the entrance to the public parking area.

Rotating Beacon

Pavement Edge Lighting

Pavement edge lighting defines the lateral limits of the pavement to ensure safe operations at night and/or during times of low visibility and helps maintain safe and efficient access to and from the runway and aircraft parking areas. Both runways are equipped with medium intensity runway lighting (MIRL). Each runway end is equipped with threshold lights, which emit green light outward from the runway and emit red light

toward the runway. The green lights indicate the landing threshold to arriving aircraft and red lights indicate the end of the runway to departing or landing aircraft. Only entrance/exit taxiways and signs at the airport are equipped with medium intensity taxiway lighting (MITL). Full-length taxiways at PCZ are not currently lighted.

Visual Approach Aids

Visual approach aids are installed at airports to assist pilots in determining the correct descent path to the runway end during landing. Runway 10-28 is equipped with a PAPI-2 system on each runway end. The PAPIs are installed on the left side of the runway and have been set at the standard 3.00-degree glide path. PAPIs have an effective visual range of three miles during the day and 20 miles at night. Runway 13 has a PAPI-4 system on the left side that is set at 4.00-degree glide path. Runway 31 is equipped with a PAPI-2 system set at 3.00 degrees.

Runway end identification lights (REILs) provide a visual identification of the runway end for landing aircraft. The REILs consist of two synchronized flashing lights that are located laterally on each side of the runway end, facing the approaching aircraft. These flashing lights can be seen during day or night for up to 20 miles, depending on visibility conditions. Runway 10-28 is equipped with REILs on both ends, while Runway 13-31 does not have REILs.

Taxiway A3 and Runway 10-28 Signage

Pilot-Controlled Lighting

During nighttime hours, pilots can use the pilot-controlled lighting (PCL) system to activate and dim the airfield lights and visual approach aids from their aircraft through a series of clicks of their radio transmitters, using the common traffic advisory frequency (CTAF) (122.8 megahertz [MHz]).

Airfield Signage and Markings

Airfield identification signs assist pilots in identifying runways, taxiway routes, holding positions, and critical areas. Waupaca Municipal Airport is equipped with lighted runway and taxiway designations and routing/directional signage.

Pavement markings aid the movement of aircraft along surfaces at the airport and identify closed or hazardous areas. The airport provides and maintains marking systems in accordance with FAA Advisory Circular (AC) 150/5340-1, *Standards for Airport Marking*. As mentioned previously, Runway 10-28 is equipped with non-precision markings that include the runway centerline, designation, threshold markings, and aiming points. Runway 13-31 also has non-precision markings.

All taxiways at the airport are marked with yellow centerline markings, holding position markings, and leadoff lines on normally used exits. Centerline markings assist pilots in maintaining proper clearance from pavement edges and objects near the taxiway edges. Aircraft holding positions are marked at each runway/taxiway intersection. All taxiways serving Runway 10-28 are marked with holding positions located 250 feet from the runway centerline. Holding positions serving each end of Runway 13-31 are located 125 and 180 feet from runway centerline, respectively.

Navigational Aids and Instrument Approach Procedures

Navigational aids are electronic devices that transmit radio frequencies that pilots in properly equipped aircraft can translate into point-to-point guidance and position information. In general, the very high omnidirectional range (VOR) provides azimuth readings to pilots of properly equipped aircraft by transmitting a radio signal at every degree to provide 360 individual navigational courses. Distance measuring equipment (DME) is frequently combined with a VOR facility (VOR/DME) to provide both distance and direction information to pilots. Military tactical air navigation aids (TACANs) and civil VORs are commonly combined to form VORTACs. A VORTAC provides distance and direction information to both civil and military pilots. The Waupaca area is served by two VOR/DME facilities. One is located at Wittman Regional Airport (OSH/Oshkosh), 28.7 nautical miles (nm) southeast of PCZ. The second is the Green Bay VORTAC, located 37.9 nm northeast.

A non-directional beacon (NDB) is a radio transmitter at a known location that is used as an aviation or marine navigational aid. The signal transmitted does not include inherent directional information, unlike other navigational aids (such as a VOR). NDB signals follow the curvature of the earth, so they can be received at much greater distances at lower altitudes, which is a major advantage over VOR. The Kooky NDB, located 27.7 nm to the northwest, is the closest NDB in the vicinity of Waupaca Municipal Airport. Another NDB location is in Pober, approximately 34 nm away. NDBs are generally being phased out of use by the FAA.

The global positioning system (GPS) is an additional navigational aid for pilots. GPS was initially developed by the United States Department of Defense for military navigation around the world. GPS differs from an NDB or VOR in that it does not require pilots to navigate using a specific facility and allows pilots to directly navigate to any airport in the country. GPS uses satellites placed in orbit around the earth to transmit electronic radio signals, which pilots of properly equipped aircraft use to determine altitude, speed, and other navigational information.

Instrument approach procedures assist pilots in locating and landing at an airport during low visibility and cloud ceiling conditions. They are categorized as either precision, approach with vertical guidance (APV), or non-precision. Precision instrument approach aids provide an exact course alignment and vertical descent path for an aircraft on final approach to a runway with a height above threshold (HATh)

lower than 250 feet and visibility lower than ¾-mile. APVs also provide course alignment and vertical guidance but have HAThs of 250 feet or more and visibility minimums of ¾-mile or greater. Non-precision instrument approaches provide only course alignment information with no vertical guidance.

Approach minimums are published for different aircraft categories and consist of a minimum decision altitude (DA) and required visibility. (Aircraft categories are described in greater detail in Chapter Two.) According to Title 14 Code of Federal Regulations (CFR) 91.175, a pilot must be able to make a safe landing and have the runway in sight, and the visibility requirement must be met. For a precision approach or approach with vertical guidance, the DA is the point at which the pilot must meet all three criteria for landing, otherwise they cannot land using the published instrument approach. For a non-precision approach, the minimum descent altitude (MDA) is a specified altitude at which the required visual reference must be made, or a missed approach must be initiated.

At Waupaca Municipal Airport, GPS provides for localizer performance with vertical guidance (LPV) via an area navigation (RNAV) GPS instrument approach to each end of Runway 10-28. **Table 1B** details the instrument approach procedures at Waupaca Municipal Airport.

TABLE 1B | Instrument Approach Procedures

	WEATHER MINIMUMS BY AIRCRAFT TYPE			
	Category A	Category B	Category C	Category D
RNAV (GPS) Runway 10				
LPV DA	1,090' / ¾-mile			
LNAV/VNAV DA	1,384' / 1⅛-mile			
LNAV MDA	1,380' / 1-mile		1,380' / 1½-mile	
Circling	1,380' / 1-mile	1,420' / 1-mile	1,420' / 1½-mile	1,500' / 2-mile
RNAV (GPS) Runway 28				
LPV MDA	1,260' / 1-mile		1260' / 1⅜-mile	
LNAV MDA	1,340' / 1-mile		1,340' / 1⅜-mile	
Circling	1,380' / 1-mile	1,420' / 1-mile	1,420' / 1½-mile	1,500' / 2-mile

xxx' / x-mile = decision altitude / visibility minimum
RNAV= area navigation
LNAV= lateral navigation
VNAV= vertical navigation
GPS= global positioning system
LPV= localizer performance with vertical guidance
DA= decision altitude
MDA= minimum descent altitude

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

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

Source: AirNav (https://www.airnav.com/airport/KPCZ)

WEATHER AND COMMUNICATION

Waupaca Municipal Airport is served by an automated weather observing system (AWOS-3). The system updates weather observations every minute, continuously reporting changes that can be accessed via radio frequency 118.625 MHz or by calling (920) 867-2407. The AWOS reports cloud ceiling, visibility, temperature, dew point, wind direction, wind speed, altimeter setting (barometric pressure), lightning detection, and density altitude (airfield elevation corrected for temperature) information. The AWOS is located near the middle of the airport property between Runways 10-28 and 13-31 and is adjacent to the northern taxiway.

Waupaca Municipal Airport also has a lighted wind cone and lighted wind tee, which are co-located approximately 270 feet east of the AWOS equipment, between Runway 3-31 and 10-28. The wind cone informs pilots of the wind direction and speed, while the wind tee indicates wind direction only.

Segmented Circle and Wind Cone

AWOS-3 Station

AREA AIRSPACE AND AIR TRAFFIC CONTROL

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

AIRSPACE STRUCTURE

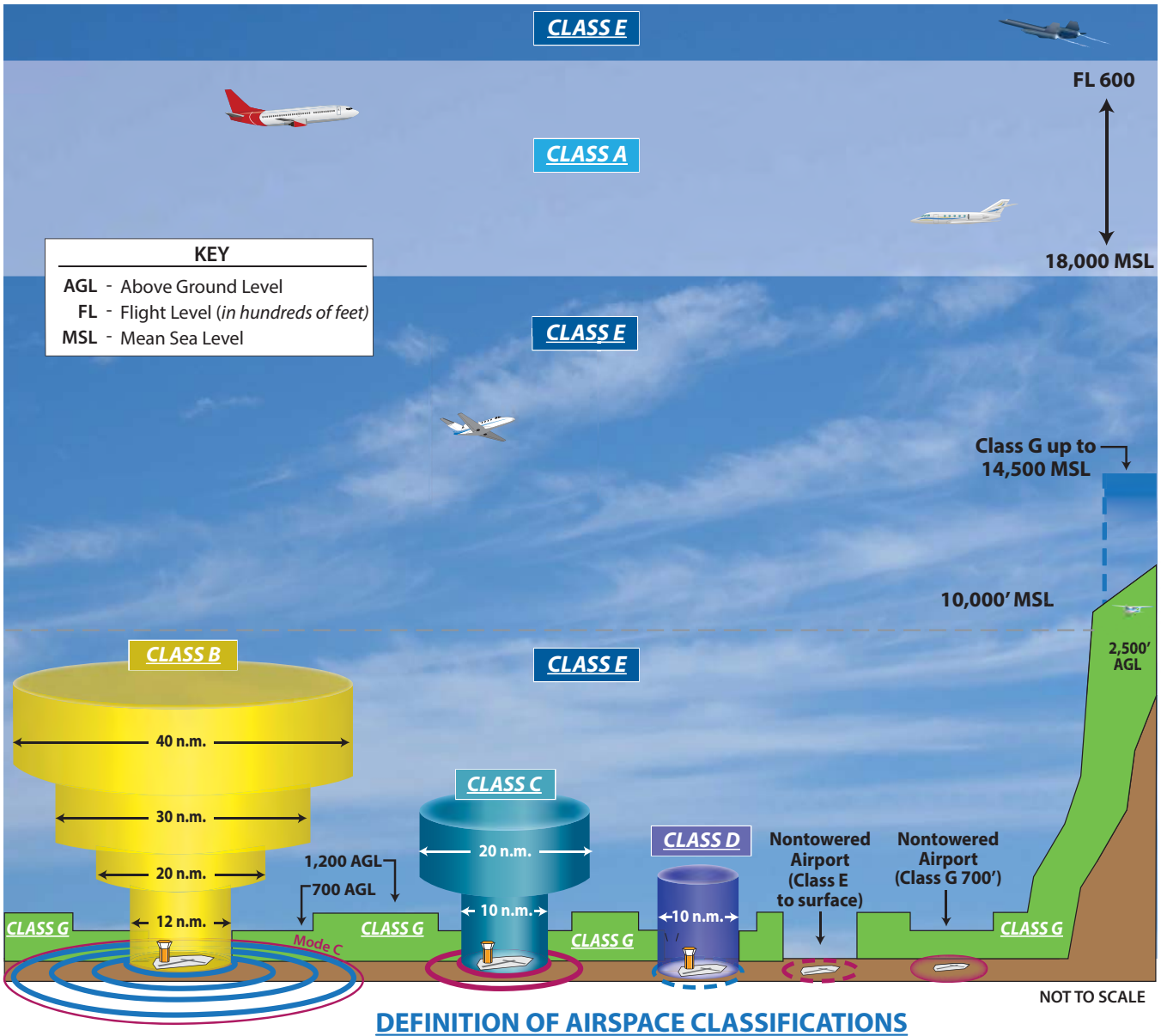
Airspace within the U.S. is broadly classified as either controlled or uncontrolled. The difference between controlled and uncontrolled airspace relates primarily to requirements for pilot qualifications, ground-to-air communications, navigation and air traffic services, and weather conditions. Six classes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

Class A Airspace

Class A airspace includes all airspace from 18,000 feet MSL to flight level (FL) 600 (approximately 60,000 feet MSL) over the contiguous 48 states and Alaska. This airspace is designated in 14 CFR Part 71.33 for positive control of aircraft. All aircraft must be on an IFR clearance to operate within Class A airspace.

Class B Airspace

Class B airspace has been designated around some of the country's major airports, such as Chicago O'Hare International Airport (ORD), to separate all aircraft within a specified radius of the primary airport. Each Class B airspace is specifically tailored for its primary airport. This airspace is the most restrictive



DEFINITION OF AIRSPACE CLASSIFICATIONS

CLASS A Think A - Altitude. Airspace above 18,000 feet MSL up to and including FL 600. Instrument Flight Rule (IFR) flights only, ADS-B 1090 ES transponder required, ATC clearance required.

CLASS B Think B - Busy. Multi-layered airspace from the surface up to 10,000 feet MSL surrounding the nation's busiest airports. ADS-B 1090 ES transponder required, ATC clearance required.

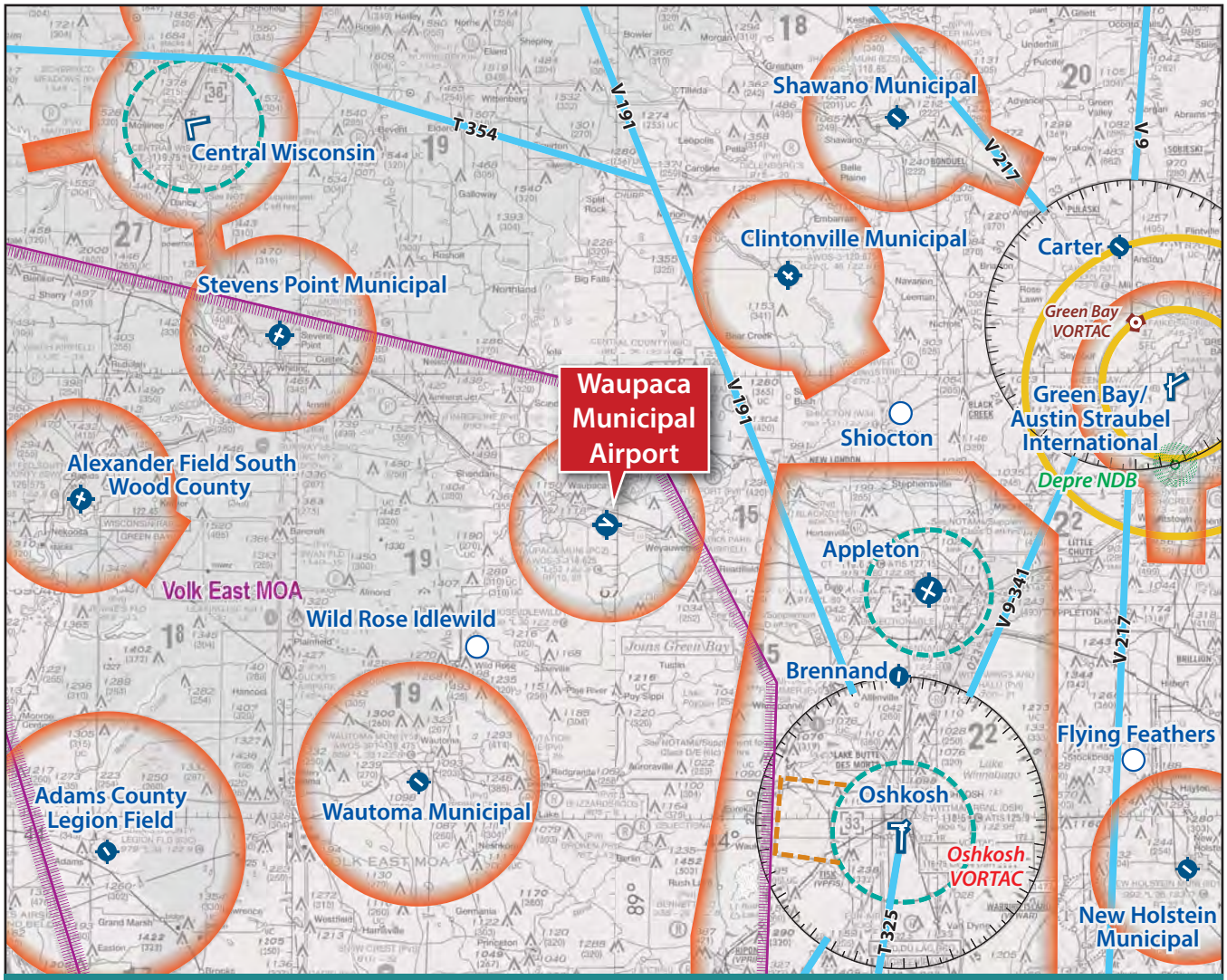
CLASS C Think C - Mode C. Mode C transponder required. ATC communication required. Generally airspace from the surface to 4,000 feet AGL surrounding towered airports with service by radar approach control.

CLASS D Think D - Dialogue. Pilot must establish dialogue with tower. Generally airspace from the surface to minimum 2,500 feet AGL surrounding towered airports.

CLASS E Think E - Everywhere. Controlled airspace that is not designated as any other Class of airspace.

CLASS G Think G - Ground. Uncontrolled airspace. From surface to a 1,200 AGL (in mountainous areas 2,500 AGL) Exceptions: near airports it lowers to 700' AGL; some airports have Class E to the surface. Visual Flight Rules (VFR) minimums apply.

Source: www.faa.gov/regulations_policies/handbooks_manuals/aviation/phak/media/15_phak_ch15.pdf



LEGEND

- Airport with other than hard-surfaced runway
- Airport with hard-surfaced runways 1,500' to 8,069' in length
- Airports with hard-surfaced runways greater than 8,069' or some multiple runways less than 8,069'
- Compass Rose
- Victor Airways
- Non-directional Radio Beacon (NDB)
- Military Operations Area (MOA)
- VORTAC
- Class B Airspace
- Class C Airspace
- Class D Airspace
- Class E (sfc) Airspace
- Class E Airspace with floor 700' above surface

NORTH

NOT TO SCALE

Source: Chicago and Green Bay Sectional Charts, US Department of Commerce, National Oceanic and Atmospheric Administration March 21, 2024

controlled airspace routinely encountered by pilots operating under VFR in an uncontrolled environment. To fly within Class B airspace, an aircraft must be equipped with special radio and navigation equipment and must obtain clearance from air traffic control.

A pilot flying within Class B airspace is required to have at least a private pilot certificate or be a student pilot who has met the requirements of Federal Aviation Regulation (FAR) Part 61.95, which requires special ground and flight training for Class B airspace. Aircraft are also required to utilize a Mode C transponder within a 30-nm range of the center of Class B airspace. A Mode C transponder allows the airport traffic control tower (ATCT) to track the location and altitude of the aircraft. Waupaca Municipal Airport is located approximately 148 nm from ORD's Class B airspace.

Class C Airspace

The FAA has established Class C airspace at approximately 120 airports around the country that have significant levels of IFR traffic. Class C airspace is designed to regulate the flow of uncontrolled traffic above, around, and below the arrival and departure airspace required for high-performance passenger-carrying aircraft at major airports. To fly inside Class C airspace, an aircraft must have a two-way radio and an encoding transponder and must have established communication with the air traffic control (ATC) facility. Aircraft may fly below the floor of the Class C airspace or above the Class C airspace ceiling without establishing communication with ATC. The nearest Class C airspace to Waupaca Municipal Airport surrounds Green Bay-Austin Straubel International Airport (GRB) in Green Bay, approximately 40 nm to the northeast.

Class D Airspace

Class D airspace is controlled airspace surrounding airports with ATCTs. Class D airspace typically constitutes a cylinder with a horizontal radius of four or five nm from the airport, extending from the surface up to a designated vertical limit, which is typically set at approximately 2,500 feet above the airport elevation. Aircraft operators planning to operate within Class D airspace are required to contact ATC prior to entering or departing the airspace and must maintain contact while within the controlled airspace to land or transverse the area. The nearest Class D airspace to PCZ includes Appleton International Airport (ATW), 22 nm to the southeast, and OSH, approximately 24 nm southeast of PCZ.

Class E Airspace

Class E airspace is controlled airspace designed to contain IFR operations near an airport and while aircraft are transitioning between the airport and en-route environments. Unless otherwise specified, Class E airspace terminates at the base of the overlying airspace. Only aircraft operating under IFR are required to be in contact with ATC when operating in Class E airspace. While aircraft conducting visual flights in Class E airspace are not required to be in radio communication with ATC facilities, visual flight can only be conducted if minimum visibility and cloud ceilings exist. It should be noted that Waupaca Municipal Airport is within Class E airspace.

Class G Airspace

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

While aircraft may technically operate within Class G airspace without any contact with ATC, it is unlikely that many aircraft will operate this low to the ground. Furthermore, federal regulations specify minimum altitudes for flights. FAR Part 91.119, *Minimum Safe Altitudes*, generally states that, except when necessary for takeoff or landing, pilots must not operate aircraft over any congested area of a city, town, or settlement, or over any open-air assembly of persons, at an altitude of 1,000 feet above the highest obstacle within a horizontal radius of 2,000 feet of the aircraft.

Over less congested areas, pilots must maintain an altitude of 500 feet above the surface, except over open water or sparsely populated areas. In those cases, aircraft may not be operated closer than 500 feet to any person, vessel, vehicle, or structure. Helicopters may be operated at less than the minimums prescribed above if the operation is conducted without hazard to persons or property on the surface. In addition, each person operating a helicopter shall comply with any routes or altitudes specifically prescribed for helicopters by the FAA.

Victor Airways

For aircraft arriving in or departing from the regional area using VOR facilities, a system of federal airways, referred to as Victor airways, has been established. Victor airways are corridors of airspace that are eight miles wide, extend upward from 1,200 feet AGL to 18,000 feet MSL, and extend between VOR navigational facilities. Victor airways near Waupaca Municipal Airport are identified on **Exhibit 1E**.

Alert Areas / Military Operations Areas (MOAs) and Military Training Routes (MTRs) / Restricted Areas

Alert areas, MOAs, MTRs, and restricted areas are depicted on aeronautical charts to inform nonparticipating pilots of any area that may contain a high volume of pilot training or military operations/activities, or an unusual type of aerial activity. Pilots should exercise caution near and within these areas. All activity within these areas, if granted by the controlling agency, should be conducted in accordance with regulations, without a waiver. Pilots of participating aircraft and pilots transitioning to the area are equally responsible for collision avoidance. PCZ is in the Volk East MOA. The time of use is intermittent and is communicated by Notice to Air Mission (NOTAM) at least four hours in advance. The Volk West MOA is also near PCZ. Its time of use is also intermittent and is communicated by NOTAM at least four hours in advance. The controlling agency for both MOAs is Minneapolis Center. A restricted area (R-6904A and B) used for live fire munitions training is located approximately 42 nm southwest of PCZ.

Wilderness Areas

When operating near designated wilderness areas, aircraft are required to maintain a minimum altitude of 2,000 feet above the surface of designated national park areas, which include wilderness areas and designated breeding grounds. FAA AC 91-36C defines the surface as the highest terrain within 2,000 feet laterally of the route of flight or the uppermost rim of a canyon or valley. Horicon National Wildlife Refuge is the nearest wilderness area and is located approximately 43 nm to the south of PCZ.

AIRSPACE CONTROL

The FAA has established 21 Air Route Traffic Control Centers (ARTCCs) throughout the continental U.S. to control aircraft operating under IFR within controlled airspace and while en route. An ARTCC assigns specific routes and altitudes along federal airways to maintain separation and orderly traffic flow. The Minneapolis Center ARTCC controls IFR airspace en route to and from Waupaca Municipal Airport at altitudes greater than 10,000 feet AGL.

Flight service stations (FSS) are air traffic facilities that provide pilot briefings, flight plan processing, in-flight radio communications, search and rescue (SAR) services, and assistance to lost aircraft and aircraft in emergency situations. FSS also relays ATC clearances, processes NOTAMs, and broadcasts aviation meteorological and aeronautical information. The Green Bay FSS is the nearest to PCZ.

LOCAL OPERATING PROCEDURES

The traffic pattern at the airport is maintained to provide the safest and most efficient use of the airspace. At Waupaca Municipal Airport, Runway 10-28 uses a left-hand traffic pattern, which means aircraft conduct left-hand turns within the traffic pattern when operating on the runway. Runway 13-31 also uses left-hand traffic patterns. The typical traffic pattern altitude is 500 feet AGL for rotorcraft, between 800 and 1,000 feet AGL for piston aircraft, and 1,500 feet AGL for turbine aircraft.

REGIONAL AIRPORTS

A review of other public-use airports with at least one paved runway within a 30-nm radius of Waupaca Municipal Airport was conducted to identify and distinguish the types of air service provided in the region. It is important to consider the capabilities and limitations of these airports when planning for future changes or improvements at the airport. **Exhibit 1F** provides basic-level information on the public-use airports within the vicinity of Waupaca Municipal Airport.

LANDSIDE FACILITIES

TERMINAL/AIRPORT OPERATIONS OFFICE

The terminal building at Waupaca Municipal Airport is located on the south side of the airport near the fuel depot. From the airside, it can be accessed via the terminal apron and Taxiways A and C. From the landside, it is accessible from Runway Drive. The terminal features a comfortable lobby, a pilots' lounge, a conference room, a kitchen, and several radios.

Terminal Building

68C

CENTRAL COUNTY AIRPORT

Distance from PCZ ..... 10 nm N
FAA Service Level ..... NA
Based Aircraft 20
Annual Operations..... 6,510
Longest Runway ..... 2,493′
Lowest Visiblity Minimum ..... Visual

WAUPACA MUNICIPAL AIRPORT

FAA Service Level
Local GA

Based Aircraft
49

Operations
20,160

PCZ

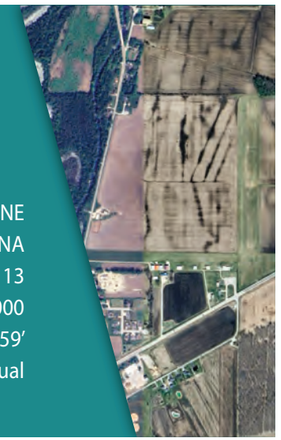
Longest Runway
5,200′

Lowest Visibility Minimum
¾-mile

W34

SCHIOCTON AIRPORT

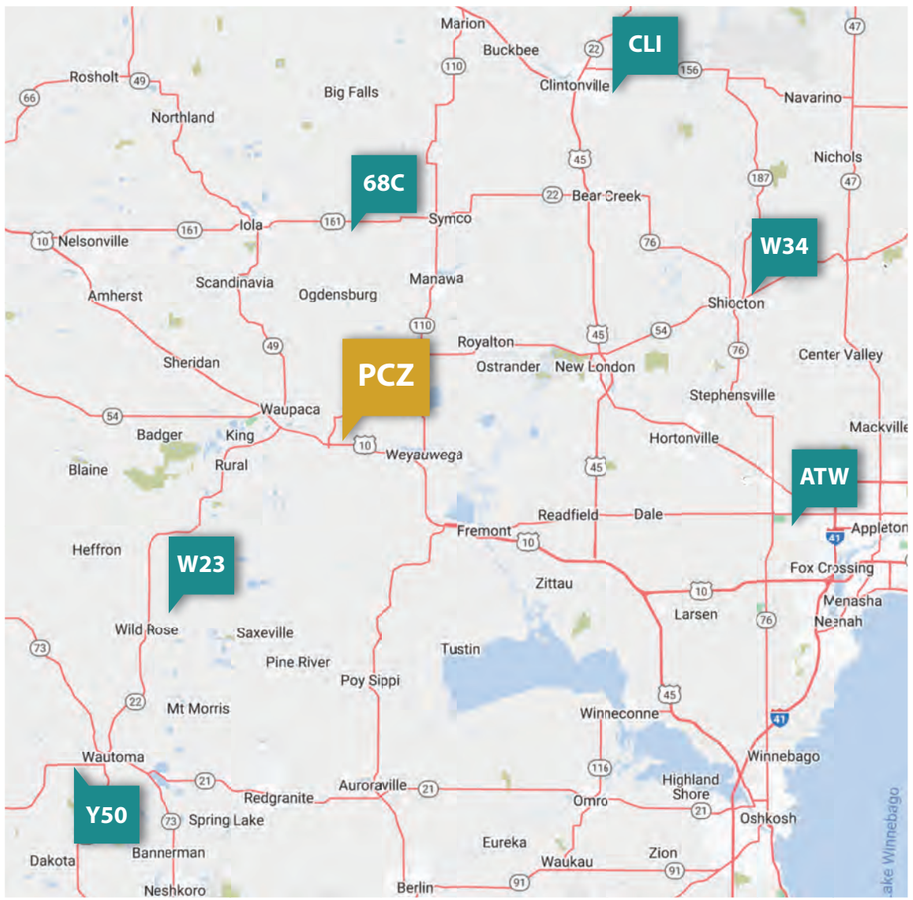
Distance from PCZ ..... 21 nm ENE
FAA Service Level ..... NA
Based Aircraft 13
Annual Operations..... 4,000
Longest Runway ..... 2,159′
Lowest Visiblity Minimum ..... Visual



W23

WILD ROSE IDLEWILD AIRPORT

Distance from PCZ ..... 12 nm SW
FAA Service Level ..... NA
Based Aircraft..... 11
Annual Operations..... 1,500
Longest Runway ..... 2,990′
Lowest Visiblity Minimum ..... Visual



Y50

WAUTOVMA MUNICIPAL AIRPORT

Distance from PCZ ..... 21.3 nm SW
FAA Service Level ..... Local GA
Based Aircraft..... 37
Annual Operations..... 12,400
Longest Runway ..... 3,330′
Lowest Visiblity Minimum 1-mile

CLI

CLINTONVILLE MUNICIPAL AIRPORT

Distance from PCZ ..... 21 nm NE
FAA Service Level ..... Local GA
Based Aircraft 18
Annual Operations..... 11,500
Longest Runway ..... 4,599′
Lowest Visiblity Minimum 1-mile

ATW

APPLETON INTERNATIONAL AIRPORT

Distance from PCZ ..... 22 nm ESE
FAA Service Level Primary Commercial Service
Based Aircraft 74
Annual Operations..... 40,877
Longest Runway ..... 8,003′
Lowest Visiblity Minimum ..... ½-mile

Sources: FAA Form 5010, Airport Master Record; airnav.com; FAA's Validated Based Aircraft Database

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FIXED BASE OPERATOR AND AVIATION BUSINESSES

A fixed base operator (FBO), KlattAero, is currently located on the south side of the airport and can be visited from the terminal apron and the south taxiway. The FBO provides aircraft maintenance services and daily on-site management, when open. Some of the services performed by the FBO include airport management, aviation fuel, aircraft parking, hangar usage, flight training, and some sales.

AIRCRAFT HANGAR FACILITIES

Existing hangar facilities at Waupaca Municipal Airport are primarily located on the southeast side of the airport, with the exception of several hangars located at midfield, as shown on **Exhibit 1G**. These aircraft storage facilities include T-hangars, which are designed to accommodate individual smaller aircraft, and executive box hangars, which can accommodate larger aircraft and typically range in size from 2,500 square feet (sf) to 10,000 sf. There are two conventional hangars at the airport, one of which is a maintenance hangar. Conventional hangars are typically greater than 10,000 sf in size and are used to store larger aircraft, including jets.

T-Hangar

Box Hangars

AIRCRAFT PARKING APRONS

There are two aircraft parking aprons at Waupaca Municipal Airport: the terminal apron and the north apron. The terminal/FBO apron is located on the south side of the airport and offers 23 marked parking positions for fixed-wing aircraft. The north apron is located on the north side of the airport and has six marked aircraft parking positions. The airport's fuel farm is located on the terminal apron. The total apron area in square yards (sy) at the airport is approximately 16,700 sy. Aircraft parking aprons are identified on **Exhibit 1G**.

VEHICLE PARKING

There is a public vehicle parking lot at Waupaca Municipal Airport. The parking lot is adjacent to the terminal building and contains 32 parking spaces plus two accessible parking spaces. Tenants of the box hangar and T-hangar facilities on the airport are authorized to pass through secured gates with their vehicles, so most of these facilities do not have separate vehicle parking areas.

SUPPORT FACILITIES

Firefighting Services

As a general aviation airport, Waupaca Municipal Airport is not required to maintain on-site aircraft rescue and firefighting (ARFF) equipment or services. Firefighting services are provided by the Waupaca Fire Department, which operates from a station located at 124 S Washington Street in Waupaca, approximately five miles northwest of the airport.

Fuel Storage

Fuel storage facilities at Waupaca Municipal Airport are located on the south side of the airport in the center of the terminal apron, as shown on **Exhibit 1G**. The fuel farm has two gas tanks for 100LL fuel and Jet A fuel. Each fuel tank has a capacity of 12,000 gallons.

Fuel Farm

Airport Maintenance Facilities

Waupaca has various maintenance equipment. The airport has a New Holland Tv6070 tractor, which is used for mowing and some snow removal, and a New Holland T8 tractor that was obtained in 2022 and is primarily used for snow removal. For all snow removal, the airport has tractor-mounted plows, blowers, a mounted broom, and a sprayer (for runway deicing fluid). A truck-mounted salt spreader is also available. For maintenance, the airport has a 2023 Hustler zero-turn lawn mower, a push mower, and a batwing-style mower.

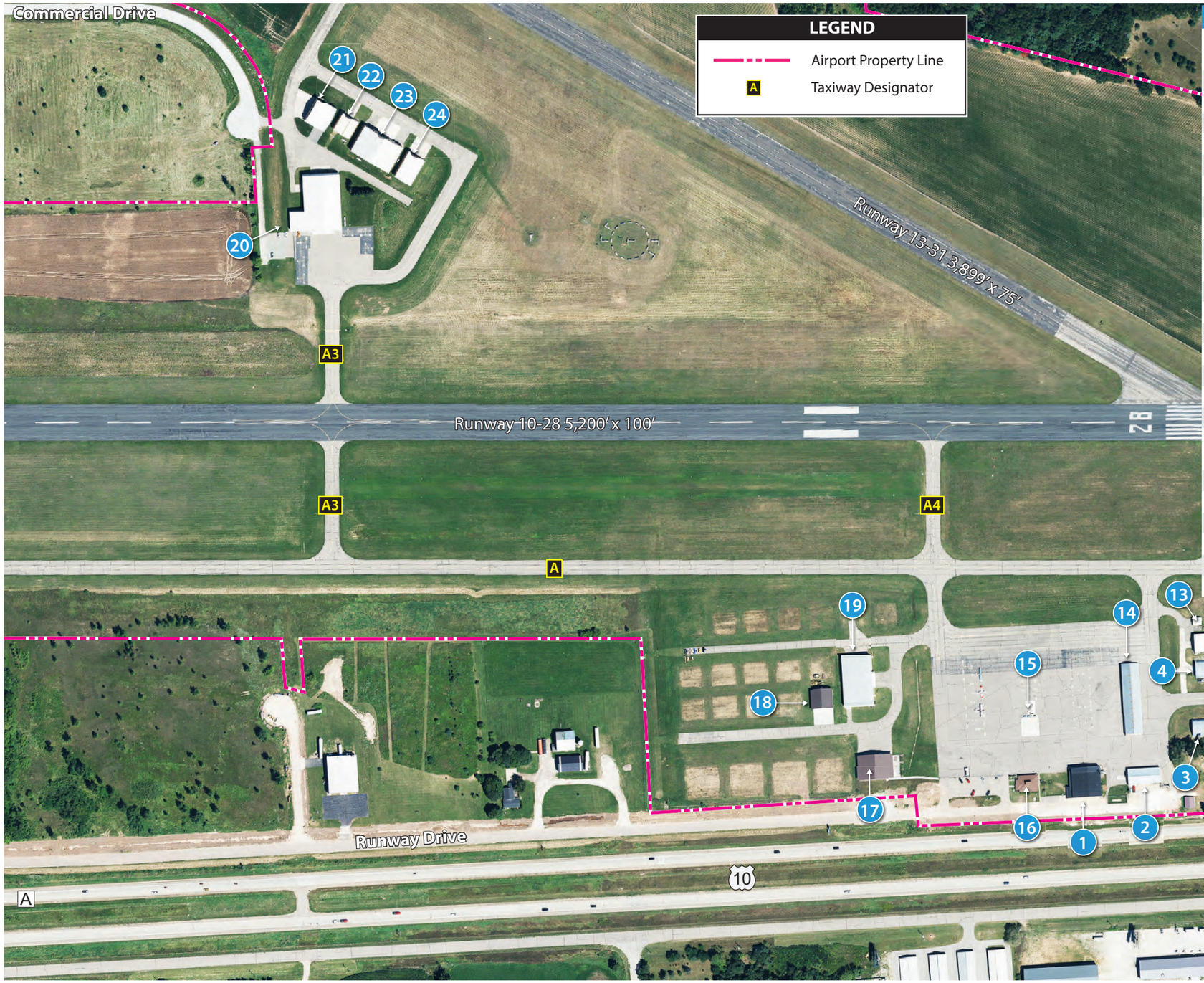
PERIMETER FENCING

Several different types of fencing surround Waupaca Municipal Airport. The airport has a roll-open gate near the terminal, and a coded gate and doors to the terminal building are available for pilots during after-hours operations of the terminal building.

Perimeter Fencing/Gate A

UTILITIES

The availability and capacities of the utilities serving the airport are factors in determining the development potential of the airport property, as well as the land immediately adjacent to the facility. Of primary concern in the inventory investigation is the availability of water, gas, sewer, and power sources. Utility providers are detailed as follows.



Bldg #	Building Type	Size (in square feet)
1	Executive Box Hangar/Waupaca Foundry Inc Hangar	7,000
2	Executive Box Hangar/KlattAero	3,900
3	Cylindrical Style Clear Span Hangar	3,200
4	Cylindrical Style Clear Span Hangar	5,500
5	Executive Box Hangar	3,700
6	Executive Box Hangar	4,000
7	Executive Box Hangar	3,000
8	Executive Box Hangar	2,000
9	Executive Box Hangar	2,200
10	Executive Box Hangar	2,200
11	Executive Box Hangar	2,500
12	Executive Box Hangar	2,300
13	Electrical Vault	NA
14	T-Hangar	9,800
15	Fuel Farm	NA
16	Terminal Building	2,600
17	Airport Maintenance/SRE Building	6,000
18	Executive Box Hangar	3,100
19	Conventional Hangar/Maintenance/ Celestial Kinetics Flight Academy	11,500
20	Conventional Hangar/Red Door Hangar	16,900
21	Executive Box Hangar	4,400
22	Executive Box Hangar	2,600
23	Executive Box Hangar	9,600
24	Executive Box Hangar	4,000
	Total	**112,000**

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Utility Providers

- We Energies provides electrical power and Wisconsin Public Service (WPS) provides natural gas.
- Waupaca Municipal Airport currently uses septic tanks but plans on changing to city sewer services.
- The City of Waupaca provides communications, including Wi-Fi and internet.
- GFL Environmental provides waste disposal service.

COMMUNITY PROFILE

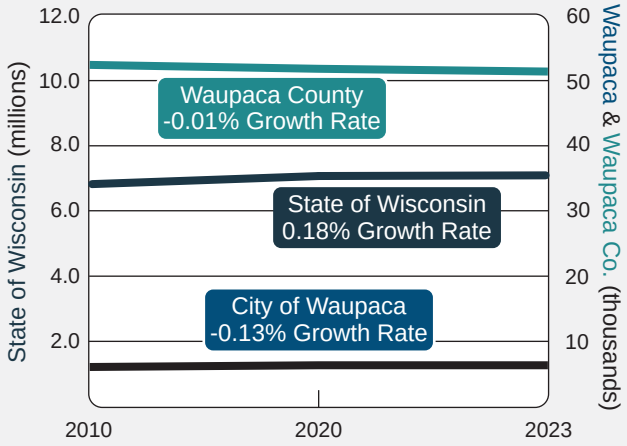
For an airport planning study, a profile of the local community that includes its socioeconomic characteristics is created and examined in order to understand the growth dynamics of the study area. The community profile for the City of Waupaca on **Exhibit 1H** is derived from several sources, including the city's comprehensive plan, Woods & Poole Economics, Inc., and the U.S. Census Bureau.

ENVIRONMENTAL INVENTORY

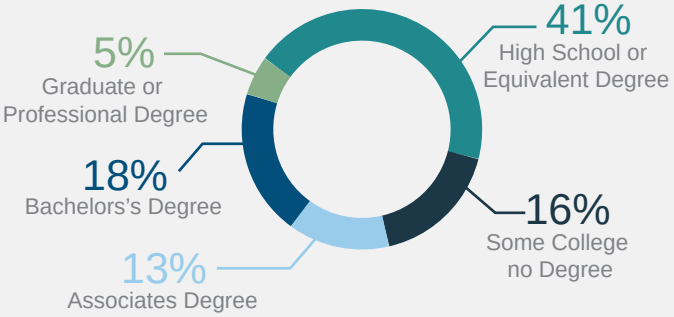
The purpose of the following environmental inventory is to identify potential environmental sensitivities that should be considered when planning future improvements at the airport. Research was performed for each of the 13 impact categories within FAA Order 1050.1G, *FAA National Environmental Policy Act Implementing Procedures* (§1.2(b)(1)). When considering the effects to the impact categories listed below, the FAA may examine the short- and long-term effects, beneficial and adverse effects, effects on public health and safety, economic effects, and the effects on the quality of life of American people.

i. Aviation Emissions and Air Quality
ii. Biological Resources (including fish, wildlife, and plants)
iii. Coastal Resources
iv. *Department of Transportation Act*, Section 303 (referred to as "Section 4(f)") and Land and Water Conservation Fund (referred to as "Section 6(f)")
v. Farmlands
vi. Hazardous Materials, Solid Waste, and Pollution Prevention
vii. Historical, Architectural, Archeological, and Cultural Resources
viii. Land Use
ix. Natural Resources and Energy Supply
x. Noise and Noise-Compatible Land Use
xi. Socioeconomic and Children's Health and Safety Risks
xii. Visual Effects (including light emissions)
xiii. Water Resources (including wetlands, floodplains, surface waters, groundwater, and wild and scenic rivers)

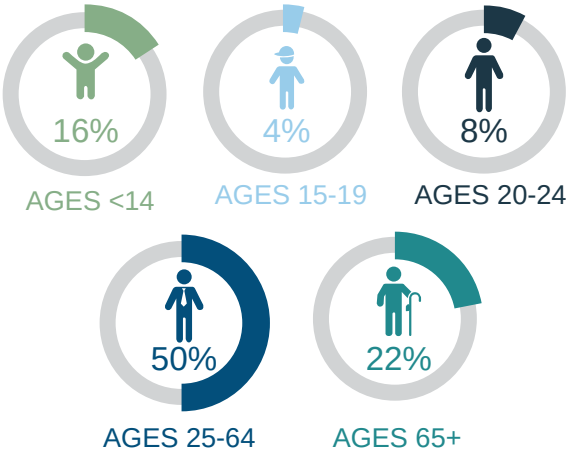
POPULATION



EDUCATION



POPULATION BY AGE



MAJOR EMPLOYERS

- First State Bank
- Premier Community Bank
- Walker Forge
- Waupaca Foundry
- Bank First
- Kolbe Windows & Doors

HOUSEHOLDS

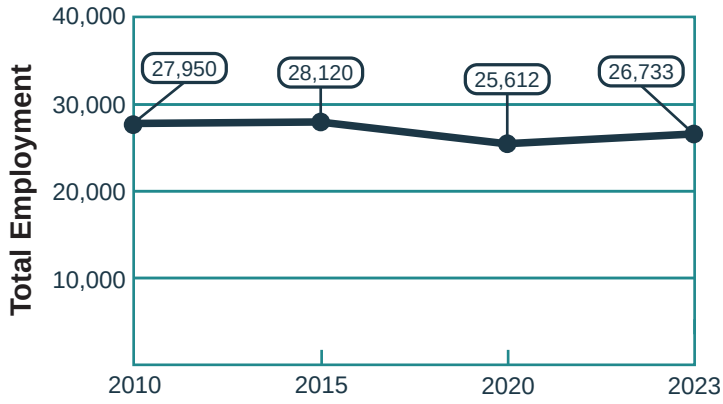
Median Household Income

Waupaca
$56,076

Median Value of Owner Occupied Housing Units (2018-2022)

$154,300

EMPLOYMENT TRENDS



Sources: Woods and Poole Economics Complete Economic and Demographic Data Source

AVIATION EMISSIONS AND AIR QUALITY

The concentration of various pollutants in the atmosphere defines the local air quality. The significance of a pollutant's concentration is determined by comparing it to the state and federal air quality standards. In 1971, the U.S. Environmental Protection Agency (EPA) established standards that specify the maximum permissible short- and long-term concentrations of various air contaminants. The National Ambient Air Quality Standards (NAAQS) consist of primary and secondary standards for criteria pollutants: ozone (O_3), carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), coarse particulate matter (PM_{10}), fine particulate matter ($PM_{2.5}$), and lead (Pb). Based on federal air quality standards, a specific geographic area can be classified as an attainment, maintenance, or nonattainment area for each pollutant. The threshold for nonattainment designation varies by pollutant.

Waupaca Municipal Airport (PCZ) is in Waupaca County, Wisconsin, which is in attainment for all federal criteria pollutants, as of May 31, 2024.[1]

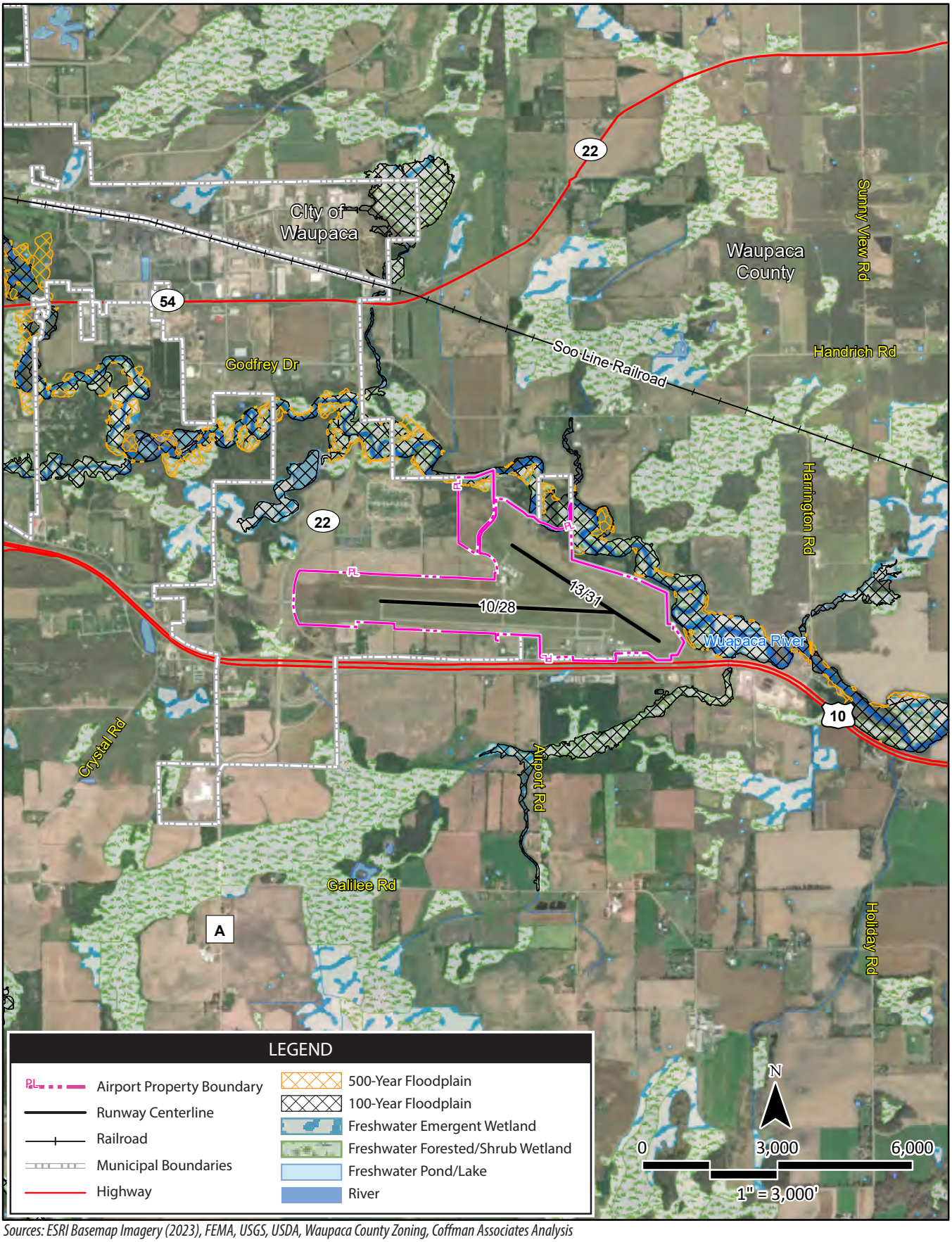
BIOLOGICAL RESOURCES

Biological resources include the various types of plants and animals that are present in an area. The term also applies to rivers, lakes, wetlands, forests, and other habitat types that support plants and animals. The airport is flat; elevations range from roughly 799 to 830 feet across the airport. Habitat on the airport includes ruderal vegetation and grasses, as well as trees located on the northern edge of the airport near Waupaca River and across from Runway Drive on the southern end of the airport. Adjacent to the north side of the airport lie wetlands that surround the Waupaca River (see **Exhibit 1J**).

The U.S. Fish and Wildlife Service (USFWS) is charged with overseeing the requirements contained within Section 7 of the *Endangered Species Act* (ESA). The ESA provides a framework to conserve and protect animal or plant species whose populations are threatened by human activities. The FAA and USFWS review projects to determine if a significant impact to protected species will result from the implementation of a proposed project. Significant impacts occur when a proposed action could jeopardize the continued existence of a protected species or would result in the destruction or adverse modification of federally designated critical habitat in the area. The USFWS Information for Planning and Consultation (IPaC) resource list describes species and habitats protected under the ESA within the vicinity of the airport (**Table 1C**).

The State of Wisconsin passed a state endangered species law in 1972. This law was established and defined in Wisconsin Administrative Code, Chapter NR 29.604. Through the Wisconsin Department of Natural Resources (DNR), the state outlined rules and regulations that identified which species were to be protected under the state's endangered species law.

[1] U.S. EPA, Green Book, Wisconsin Nonattainment/Maintenance Status for Each County by Year for All Criteria Pollutants (https://www3.epa.gov/airquality/greenbook/anayo_wi.html)



Sources: ESRI Basemap Imagery (2023), FEMA, USGS, USDA, Waupaca County Zoning, Coffman Associates Analysis

TABLE 1C | U.S. Fish and Wildlife Service List of Federally Endangered, Threatened, and Candidate Species to be Considered for Airport Development Actions

Common Name (*Scientific Name*)	Federal/State Status*	Habitat and Range	Potential for Occurrence
Mammals			
gray wolf (*Canis lupus*)	Federal Endangered	Gray wolves can inhabit a variety of ecosystems, including temperate forests, mountains, tundra, taiga, and grasslands.	**Unlikely to occur.** The airport does not contain suitable habitat for this species.
Birds			
whooping crane (*Grus americana*)	Federal Experimental	Whooping cranes reside in wetlands, marshes, mudflats, wet prairies, and fields.	**May occur.** The airport contains freshwater forested/shrub wetlands along its northern portion.
Clams			
salamander mussel (*Simpsonaias ambigua*)	Federal Proposed Endangered/ State Threatened	Salamander mussels inhabit water sources, such as rivers and streams, that contain areas of shelter (e.g., rocks or crevices).	**Unlikely to occur.** The airport does not contain water sources for salamander mussels to inhabit.
Insects			
Karner blue butterfly (*Lycaeides melissa samuelis*)	Federal Endangered	Karner blue butterflies require wild lupine plants (*lupinus perennis*) to lay eggs. This species can be found inhabiting oak savannas and pine barren ecosystems that range from western Wisconsin and eastward to the Atlantic seaboard.	**Unknown.** A biological survey is needed to determine the presence of this species.
monarch butterfly (*Danaus plexippus)*	Federal Proposed Threatened	The monarch butterfly is a migratory species that is found in a variety of habitats and requires milkweed (*Asclepias* spp.) for breeding. Migrating monarch butterflies often occur near water sources (e.g., rivers, creeks, riparian corridors, roadside ditches, and irrigated gardens).	**May occur.** The airport is surrounded by agricultural fields to the east that could provide a habitat for foraging.

***USFWS Status Definitions for Federally Listed Species**

Endangered = an animal or plant species in danger of extinction throughout all or a significant portion of its range

Threatened = an animal or plant species likely to become endangered within the foreseeable future throughout all or a significant portion of its range

Proposed Threatened = an animal or plant species that is likely to become endangered within the foreseeable future throughout all or a significant portion of its range and has been proposed to be listed as threatened; proposed threatened species are not protected by the take prohibitions of Section 9 of the ESA.

Proposed Endangered = an animal or plant species that is in danger of extinction throughout all or a significant portion of its range and has been proposed to be listed as endangered; proposed endangered species are not protected by the take prohibitions of Section 9 of the ESA

Proposed Experimental Population, Non-Essential = a population that is proposed or established within its historical range under Section 10(j) of the ESA to aid recovery of the species; a non-essential population is not necessary for the continued existence of a species

Sources: USFWS, IPaC (https://ipac.ecosphere.fws.gov/); USFWS Species (https://www.fws.gov/species); Wisconsin Department of Natural Resources (WI DNR), Natural Heritage Inventory (NHI) County Data (https://dnrx.wisconsin.gov/nhiportal/public/data/county)

Species identified for Waupaca County on the Wisconsin DNR's *Wisconsin Endangered and Threatened Species Laws and List* that are state-listed, but not federally listed, are provided as follows.

- Amphibians
    - Blanchard's cricket frog (*Acris blanchardi*) – state endangered

- Birds
    - black tern (Chlidonias niger) – state endangered
    - cerulean warbler (Setophaga cerulea) – state threatened
    - red-shouldered hawk (Buteo lineatus) – state threatened
    - yellow-crowned night heron (Nyctanassa violacea) – state threatened
- Clams
    - buckhorn (Tritogonia verrucosa) – state threatened
    - slippershell mussel (Alasmidonta viridis) – state threatened
    - snuffbox (Epioblasma triquetra) – state endangered
- Fish
    - pugnose shiner (Notropis anogenus) – state threatened
    - redfin shiner (Lythrurus umbratilis) – state threatened
    - river redhorse (Moxostoma carinatum) – state threatened
- Mammals
    - little brown bat (Myotis lucifugus) – state threatened
- Plants
    - brittle prickly-pear (Opuntia fragilis) – state threatened
    - handsome sedge (Carex formosa)- state threatened
    - long-beaked bald-rush (Rhynchospora scirpoides) – state threatened
    - marsh valerian (Valeriana uliginosa) – state threatened
    - ram's-head lady's-slipper (Cypripedium arietinum) – state threatened
    - square-stem spike-rush (Eleocharis quadrangulata) – state endangered
- Reptiles
    - wood turtle (*Glyptemys insculpta*) – state threatened

Section 3 of the ESA is used to protect critical habitat areas. Designated critical habitat areas are geographically defined and have been determined to be essential to the recovery of specific species. There are no critical habitats at or near the airport.

The federal *Migratory Bird Treaty Act* (MBTA) protects migratory birds and their eggs, nests, and feathers. Potential impacts to species protected under the MBTA are evaluated by the USFWS in consultation with other federal agencies. Habitat for migratory birds may occur if bushes or other ground nesting substrate is present. The typical breeding season for migratory birds that would be present in the area of PCZ is from August through December.

COASTAL RESOURCES

Federal activities that involve or affect coastal resources are governed by the *Coastal Barriers Resource Act*, the *Coastal Zone Management Act*, and Executive Order (E.O.) 13089, *Coral Reef Protection*.

The airport is not located within a coastal zone. The closest National Marine Sanctuary is Thunder Bay National Marine Sanctuary, located 250 miles from the airport.

DEPARTMENT OF TRANSPORTATION ACT, SECTION 4(F)

Section 4(f) of the *Department of Transportation Act*, which was recodified and renumbered as Section 303(c) of Title 49 United States Code, provides that the Secretary of Transportation will not approve any program or project that requires the use of any publicly or privately owned historic sites, public parks or recreation areas, or waterfowl and wildlife refuges of national, state, regional, or local importance, unless there is no feasible and prudent alternative to the use of such land and the project includes all possible planning to minimize harm resulting from the use.

There is one potential Section 4(f) resources within one mile of the airport:

- Waupaca Eco Park

Waupaca Eco Park is located 0.5 miles northwest of the airport at 2601 Runway Drive. This small county park includes playground equipment that is composed of natural materials (**Exhibit 1J**). The park connects to River Ridge Trail, which winds through Waupaca and contains trails for hiking and biking.

The nearest historic feature listed on the National Register of Historic Places (NRHP) is the Lake Historic District, which is bounded by South Washington Street, East Badger Street, Fifth Street, and Tioga Street and is over two miles away from the airport.[2]

The nearest waterfowl and wildlife refuge, wilderness area, and national recreation area are:

- Wildlife/Waterfowl Refuge – Fox River National Wildlife Refuge Park (50 miles from PCZ)
- Wilderness Area – Headwaters Wilderness (100 miles from PCZ)
- National Recreation Area – Mississippi National River and Recreation Area (185 miles from PCZ)

FARMLANDS

Under the *Farmland Protection Policy Act* (FPPA), federal agencies are directed to identify and consider the adverse effects of federal programs on the preservation of farmland, consider appropriate alternative actions that could lessen adverse effects, and ensure that such federal programs are (to the extent practicable) compatible with state or local government programs and policies to protect farmland.

[2] U.S. Department of the Interior, National Park Service, National Register of Historic Places (https://www.nps.gov/maps/full.html?mapId=7ad17cc9-b808-4ff8-a2f9-a99909164466)

The FPPA guidelines were developed by the U.S. Department of Agriculture (USDA) and apply to farmland classified as prime, unique, or of state or local importance, as determined by the appropriate government agency with concurrence by the Secretary of Agriculture.

The USDA Natural Resources Conservation Service (USDA-NRCS) Web Soil Survey shows the types of soils and their farmland classifications on and adjacent to the airport (**Exhibit 1J**). The airport is not located within a census-designated urbanized area and may be subject to the FPPA, as portions of the airport contain prime farmland.[3]

The airport contains four classifications of farmland: all areas are prime farmland, prime farmland if drained, farmland of statewide importance, and not prime farmland (**Table D**).

TABLE 1D | Farmland Classification – Summary Map Unit – Waupaca County, Wisconsin (WI135)

Web Soil Survey Symbol	Soil Type	Farmland Rating
BrmA	Brems loamy sand, 0 to 3 percent slopes	Not prime farmland
Mh	Meehan loamy sand, 0 to 3 percent slopes	Not prime farmland
MIA	Meehan loamy sand, loamy substratum, 0 to 3 percent slopes	Not prime farmland
PfBT	Plainfield loamy sand, till plain, 2 to 6 percent slopes	Not prime farmland
PfDT	Plainfield loamy sand, till plain, 12 to 30 percent slopes	Not prime farmland
PIB	Plainfield loamy sand, loamy substratum, 2 to 6 percent slopes	Not prime farmland
Rc	Roscommon mucky loamy sand, 0 to 2 percent slopes	Not prime farmland
RfA	Richford loamy sand, 0 to 2 percent slopes	Farmland of statewide importance
SyA	Symco loam, 0 to 3 percent slopes	Prime farmland if drained
TIB	Tilleda loam, 2 to 6 percent slopes	All areas are prime farmland
TIC2	Tilleda loam, 6 to 12 percent slopes	Farmland of statewide importance

Source: USDA-NRCS, Web Soil Survey (https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx)

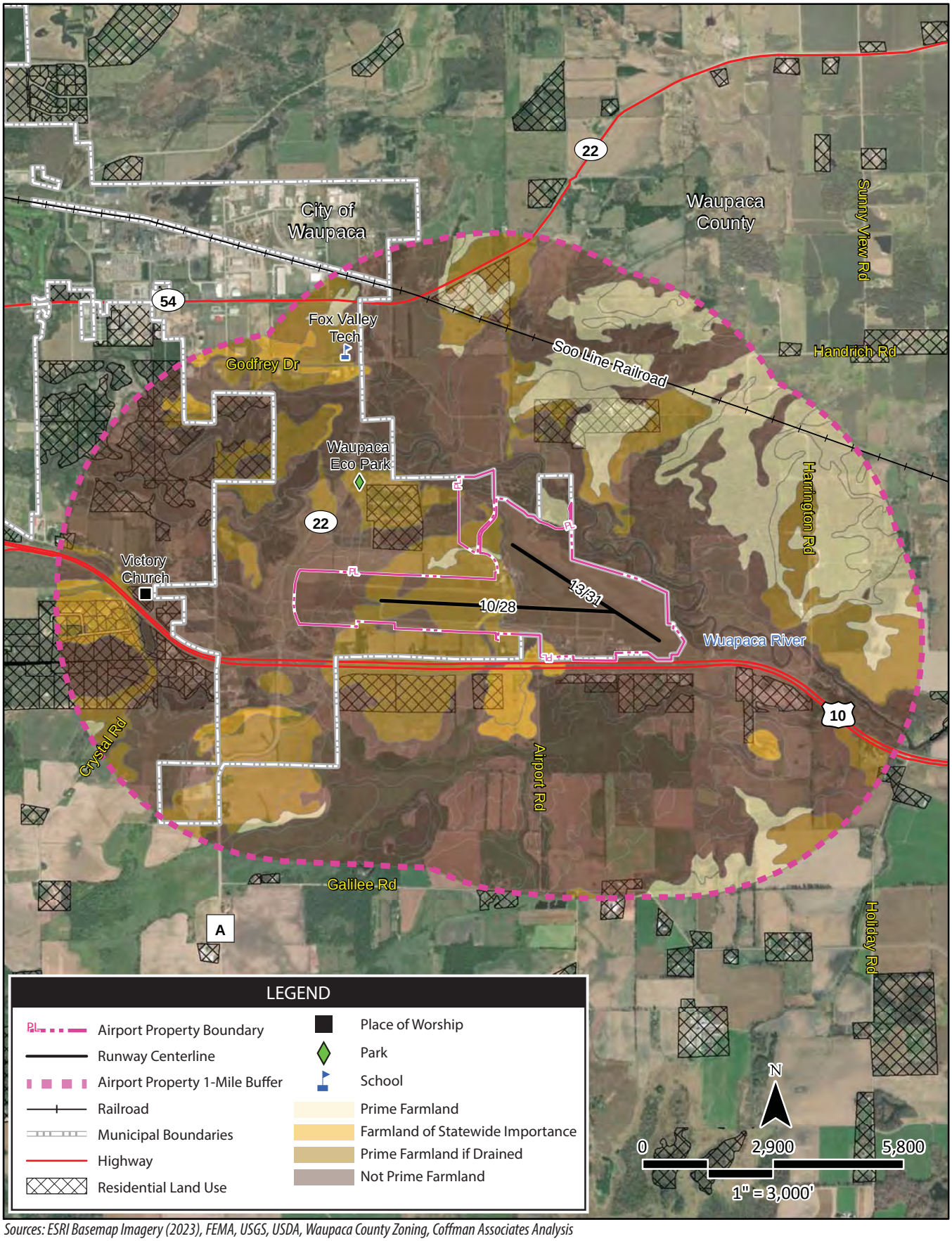
Exhibit 1K also shows the soil ratings for the area within one mile of the airport. This land contains soil categorized as prime farmland, prime farmland if drained, and not prime farmland.

HAZARDOUS MATERIALS, SOLID WASTE, AND POLLUTION PREVENTION

Federal, state, and local laws regulate hazardous materials use, storage, transportation, and disposal. These laws may extend to past and future landowners of properties that contain these materials. Disrupting sites that contain hazardous materials or contaminants may cause significant impacts to soil, surface water, groundwater, air quality, and the organisms using these resources.

The two statutes of most importance to airport projects are the *Resource Conservation Recovery Act* (RCRA), as amended by the *Federal Facilities Compliance Act of 1992*, and the *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA), as amended (also known as Superfund). The RCRA governs the generation, treatment, storage, and disposal of hazardous wastes. The CERCLA provides for the cleanup of any release of a hazardous substance that may endanger public health or the environment.

[3] U.S. EPA, EJScreen, Version 2.2, Boundaries, Urban Areas (https://ejscreen.epa.gov/mapper/)



Sources: ESRI Basemap Imagery (2023), FEMA, USGS, USDA, Waupaca County Zoning, Coffman Associates Analysis

These laws may extend to past and future landowners of properties that contain these materials. Locations identified as Superfund sites are listed on the National Priorities List (NPL). According to the U.S. EPA's EJScreen online tool, there are no Superfund or brownfield sites within one mile of PCZ.[4]

Based on Wisconsin's tank registration database, there are currently no leaking petroleum storage tanks present at the airport.[5]

The airport contains two underground aircraft fuel facilities that are owned by the City of Waupaca, and one city-owned fuel truck is located near the fuel farm. Spill prevention, control, and countermeasure (SPCC) plans are required for these facilities, per U.S. EPA regulations.

In Wisconsin, the Wisconsin DNR regulates the discharge of pollutants to waters of the state through the Wisconsin Pollutant Discharge Elimination System (WPDES) program. WPDES general permits are issued by the DNR for specific categories of industrial, municipal, and other wastewater discharges. Permits are issued for five-year terms.[6]

The closest solid waste landfill to the airport is the Waupaca County Processing and Transfer Facility, located roughly 7.3 miles north of the airport. This facility accepts a variety of residential, commercial, and industrial waste.[7]

HISTORICAL, ARCHITECTURAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

Determination of a project's environmental impact to historic and cultural resources is made under guidance in the *National Historic Preservation Act of 1966* (NHPA), as amended, the *Archaeological and Historic Preservation Act of 1974* (AHPA), the *Archaeological Resources Protection Act* (ARPA), and the *Native American Graves Protection and Repatriation Act of 1990* (NAGPRA). The *Antiquities Act of 1906*, the *Historic Sites Act of 1935*, and the *American Indian Religious Freedom Act of 1978* also protect historic, architectural, archaeological, and cultural resources. Impacts may occur when a proposed project causes an adverse effect on a resource that has been identified (or is identified after being unearthed during construction) as having historic, architectural, archaeological, or cultural significance.

From the information available at the time this report was prepared, no systematic airport-wide cultural surveys have been conducted. Much of the airport has been developed or disturbed by construction or agricultural practices; however, there is still a chance that intact cultural resources may be present on the ground surface or subsurface.

The airport was opened in August 1964, and buildings or structures of historic age (i.e., 50 years or older) may still be present within airport property; for example, based on a review of historic aerials, there may be historic-age structures along Runway Drive.[8]

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[4] U.S. EPA, EJScreen, Version 2.2, EJScreen Community Report (https://ejscreen.epa.gov/mapper/)
[5] Wisconsin Department of Natural Resources, Wisconsin Department of Agriculture, Trade and Consumer Protection (https://mydatcp.wi.gov/Home/ServiceDetails/4a171523-04c7-e611-80f6-0050568c4f26?Key=Services_Group)
[6] Wisconsin Department of Natural Resources, Wastewater (https://dnr.wisconsin.gov/topic/Wastewater/Permits.html)
[7] Waupaca County, Wisconsin, Waupaca County Processing Transfer Facility (https://www.waupacacounty-wi.gov/departments/solid_waste_and_recycling/ptf.php)
[8] Historic Aerials (https://www.historicaerials.com/viewer)

LAND USE

Land use regulations near airports are achieved through local government codes, city policies, and plans that include airport districts and planning areas. Regulations are used to avoid land use compatibility conflicts around airports.

The airport is a city-owned facility within the County of Waupaca. According to the City of Waupaca Zoning Districts Map, the airport is zoned as AG (Agricultural District).[9] Based on the city's Unified Development Code, an AG area is intended to preserve a low-density area that would accommodate livestock and agricultural uses and further provide for the allowance of commercial agriculture.

The airport is bounded by Highway 22 to the west and U.S. Route 10 to the south. North, east, and west of the airport lies the Waupaca River. The airport is currently surrounded by open undeveloped land, with scattered residential land uses to the northwest and commercial and industrial land uses to the south. West of the airport lies undeveloped land. General land uses within one mile of the airport, including those that could be sensitive to airport noise or other effects, are identified on **Exhibit 1K**.

According to the Future Land Use Map detailed in the *City of Waupaca Comprehensive Plan – Year 2030*, the airport is categorized as a Civic/Institutional land use.

The *City of Waupaca Comprehensive Plan – Year 2030* was adopted by the City of Waupaca in March 2021. Table 8 in the report, *Land Use Descriptions*, describes the intent for future growth within the transportation sector to promote connectivity within the city and minimize impact on neighborhoods and nearby street networks.[10]

NATURAL RESOURCES AND ENERGY SUPPLY

It is the policy of FAA Order 1053.1C, *Energy and Water Management Program for FAA Buildings and Facilities*, to encourage the development of facilities that exemplify the highest standards of design, including principles of sustainability.

The City of Waupaca Water Department is responsible for providing water service to the city's residents and businesses.[11]

NOISE AND NOISE-COMPATIBLE LAND USE

Federal land use compatibility guidelines are established under 14 CFR Part 150, *Airport Noise Compatibility Planning*. According to 14 CFR Part 150, residential land and schools are noise-sensitive land uses that are not considered compatible with a 65-decibel (dB) day-night average sound level (Ldn or DNL). Other noise-sensitive land uses (such as religious facilities, hospitals, or nursing homes), if located within a 65-dB

[9] City of Waupaca, Wisconsin, Home, Community and Economic Development, Maps (https://cityofwaupaca.org/community-economic-development/maps/)

[10] City of Waupaca Comprehensive Plan – Year 2030, Chapter 3, Land Use, Table 8, Land Use Descriptions (https://cityofwaupaca.org/wp-content/uploads/2023/05/City-of-Waupaca-Year-2030-Comprehensive-Plan.pdf)

[11] City of Waupaca, Wisconsin, Water Utility (https://cityofwaupaca.org/departments/water-utility/)

DNL contour, are generally compatible when an interior noise level reduction of 25 dB is incorporated into the design and construction of the structures. Special consideration should also be given to noise-sensitive areas within Section 4(f) properties where the land use compatibility guidelines in 14 CFR Part 150 do not account for the value, significance, and enjoyment of the area in question.[12]

The closest residential units are located along the southern boundary of the airport across from Runway Drive. The closest off-airport residential neighborhoods are located 0.10 miles north of the airport boundary, where single-family homes are located off Webster Way and Rotary Street. One school (Fox Valley Technical College) is located northwest of the airport at the intersection of Highway 22 and Godfrey Drive.

There are no hospitals or live-in medical care facilities within one mile of the airport.

SOCIOECONOMICS AND CHILDREN'S ENVIRONMENTAL HEALTH AND SAFETY RISKS

Socioeconomics

Socioeconomics is an umbrella term used to describe aspects of a project that are either social or economic in nature. A socioeconomic analysis evaluates how elements of the human environment (such as population, employment, housing, and public services) might be affected by the proposed action or alternative(s).

Children's Environmental Health and Safety

Per E.O. 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, federal agencies are directed to make it a high priority to identify and assess environmental health and safety risks that may disproportionately impact children. Such risks include those that are attributable to products or substances a child is likely to encounter or ingest (i.e., air, food, and water, including drinking water) or to which they may be exposed.

There is one park (Waupaca Eco Park) located within one mile of the airport and no other recreational facilities are located near the airport.

VISUAL EFFECTS

Visual effects deal broadly with the extent to which a proposed action or alternative(s) would either (1) produce light emissions that create an annoyance or interfere with activities; or (2) contrast with or detract from the visual resources and/or the visual character of the existing environment. Each jurisdiction will typically address outdoor lighting, scenic vistas, and scenic corridors in its zoning ordinances and general plan.

[12] Title 49 U.S. Code § 47141, Compatible Land Use Planning and Projects by State and Local Governments

Light Emissions

These impacts typically relate to the extent to which any light or glare results from a source that could create an annoyance for people or would interfere with normal activities.

Airfield lighting at the airport includes MIRL and MITL. Navigation lights include a rotating beacon, which emits flashes of white and green light, and PAPI-2 systems on Runways 10, 28, and 31. Runway 13 is equipped with a PAPI-4. (See Airfield Lighting earlier in this inventory chapter.) Landside outdoor lighting includes building and parking lot security lighting.

Land uses like residential neighborhoods are sensitive to light pollution. Single-family residential units are located within airport property across from Runway Drive. The closest off-airport residential neighborhood is located 0.10 miles north of the airport boundary off Webster Way and Young Drive. Dense clusters of mature trees screen the airfield from these homes; however, during the winter, when these trees shed their leaves, airfield lighting is visible to residences.

Visual Resources and Visual Character

Visual character refers to the overall visual makeup of the existing environment where a proposed action or its alternative(s) would be located. For example, areas near densely populated areas generally have a visual character that could be defined as urban, whereas less developed areas could have a visual character defined by the surrounding landscape features, such as open grass fields, forests, mountains, deserts, etc.

Visual resources include buildings, sites, traditional cultural properties, and other natural or human-made landscape features that are visually important or have unique characteristics. Visual resources may include structures or objects that obscure or block other landscape features. In addition, visual resources can include the cohesive collection of various individual visual resources that can be viewed at once or in concert from the area surrounding the site of the proposed action or alternative(s).

The airport is primarily surrounded by open undeveloped land, with pockets of residential and industrial land uses scattered within one mile of its borders. Visually, the airport is characterized by airport development, clusters of trees, and open fields. Views of the airport are not accessible from nearby roadways due to the vegetation surrounding the airport.

There are two national scenic byways and one All-American Road in Wisconsin.[13] None of these byways are located near the airport. There are no scenic corridors identified in the *City of Waupaca Comprehensive Plan – Year 2030,* the city's comprehensive plan, which was adopted in 2021.

[13] U.S. Department of Transportation, Federal Highways Administration, National Scenic Byways & All-American Roads (https://fhwaapps.fhwa.dot.gov/bywaysp/States/Show/WI), June 2024

WATER RESOURCES

Wetlands

The U.S. Army Corps of Engineers regulates the discharge of dredged and/or fill material into waters of the United States, including wetlands with a continuous surface connection to a traditional navigable water, under Section 404 of the *Clean Water Act* (CWA). Wetlands are defined in E.O. 11990, *Protection of Wetlands.* Wetlands can include swamps, marshes, bogs, sloughs, potholes, wet meadows, river overflows, mudflats, natural ponds, estuarine areas, tidal overflows, and shallow lakes and ponds with emergent vegetation. Wetlands exhibit three characteristics: the soil is inundated or saturated to the surface at some time during the growing season (hydrology), the soil has a population of plants that are able to tolerate various degrees of flooding or frequent saturation (hydrophytes), and the soil is saturated enough to develop anaerobic (absent of air or oxygen) conditions during the growing season (hydric).

The USFWS manages the National Wetlands Inventory (NWI), which identifies surface waters and wetlands in the nation at a macro level, based on aerial photography.[14] Several wetlands associated with the Waupaca River are located adjacent to the airport along its western/northwestern boundary (**Exhibit 1J**). While these wetlands are primarily located outside airport boundaries, a portion of the northern boundary of the airport traverses Waupaca River and includes freshwater emergent and freshwater forested shrub wetlands.

Waupaca River connects to a series of lakes, including Weyauwega Lake, Partridge Lake, Lake Poygan, Lake Winneconne, and others; therefore, the portion of the airport that traverses the Waupaca River might be considered a jurisdictional water under Section 404 of the CWA.

Floodplains

E.O. 11988, *Floodplain Management*, directs federal agencies to take action to reduce the risk of flood loss; minimize the impacts of floods on human safety, health, and welfare; and restore and preserve the natural and beneficial values served by the floodplains. U.S. Department of Transportation (DOT) Order 5650.2, *Floodplain Management and Protection*, implements the guidelines contained in E.O. 11988.

The Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Map (FIRM) panel numbers 55135C0459D and 55135C0458D (effective January 1, 2010) indicate that most of the airport is in Zone X, an area of minimal flood hazard; however, there are 100-year, and 500-year floodplains associated with the Waupaca River in the northernmost part of the airport (**Exhibit 1J**).[15]

Surface Waters

The CWA establishes water quality standards, controls discharge, develops waste treatment management plans and practices, prevents or minimizes the loss of wetlands, and regulates other issues concerning water quality. Water quality concerns related to airport development most often relate to the potential

[14] National Wetlands Inventory (https://fwsprimary.wim.usgs.gov/wetlands/apps/wetlands-mapper/)
[15] FEMA, Flood Map Service Center (https://msc.fema.gov/portal/search?AddressQuery=waupaca%20municipal%20airport)

for surface runoff and soil erosion, as well as the storage and handling of fuel, petroleum products, solvents, etc. Additionally, U.S. Congress has mandated the National Pollutant Discharge Elimination System (NPDES) under the CWA.

As previously discussed under *Hazardous Materials, Solid Waste, and Pollution Prevention*, the WPDES program has regulatory authority over discharges of pollutants to Wisconsin surface waters. The airport is in the Weyauwega Lake-Waupaca River Watershed.[16] There are six impaired waterbodies and nine waterbodies with unknown water conditions within this watershed. Four of the impaired waterbodies are located downstream of the airport and the remaining two are located upstream of the airport.

Groundwater

Groundwater is subsurface water that occupies the space between sand, clay, and rock formations. The term *aquifer* is used to describe the geologic layers that store or transmit groundwater, such as wells, springs, and other water sources. Examples of direct impacts to groundwater could include withdrawal of groundwater for operational purposes or reduction of infiltration or recharge area due to new impervious surfaces.

The U.S. EPA's Sole Source Aquifer (SSA) program was established under Section 1424(e) of the *Safe Drinking Water Act* (SDWA). Since 1977, the program has been used by communities to help prevent contamination of groundwater by federally funded projects and has increased public awareness of the vulnerability of groundwater resources. The SSA program is authorized by Section 1424(e) of the SDWA (Public Law 93-523, 42 U.S.C. 300 et. seq), which states:

> "*If the Administrator determines, on his own initiative or upon petition, that an area has an aquifer which is the sole or principal drinking water source for the area and which, if contaminated, would create a significant hazard to public health, he shall publish notice of that determination in the Federal Register*."[17]

According to the U.S. EPA's Sole Source Aquifer for Drinking Water website, no sole source aquifers are located within airport boundaries. The nearest sole source aquifer is the Mahomet SSA, which is located over 200 miles away from the airport.[18]

Wild and Scenic Rivers

The *National Wild and Scenic Rivers Act* was established to preserve certain rivers with outstanding natural, cultural, and recreational values in a free-flowing condition for the enjoyment of present and future generations.

[16] U.S. EPA, How's My Waterway (https://mywaterway.epa.gov/community/waupaca%20municipal%20airport/overview)
[17] U.S. EPA, Overview of the Drinking Water Sole Source Aquifer Program (https://www.epa.gov/dwssa/overview-drinking-water-sole-source-aquifer-program#Authority)
[18] U.S. EPA, Sole Source Aquifers (https://epa.maps.arcgis.com/apps/webappviewer/index.html?id=9ebb047ba3ec41ada1877155fe31356b)

The Nationwide Rivers Inventory is a list of over 3,400 rivers or river segments that appear to meet the minimum *National Wild and Scenic Rivers Act* eligibility requirements, based on their free-flowing status and resource values. The development of the Nationwide Rivers Inventory resulted from Section 5(d)(1) in the *National Wild and Scenic Rivers Act*, which directs federal agencies to consider potential wild and scenic rivers in the comprehensive planning process.

The closest designated National Wild and Scenic River identified is the Wolf River, which is located more than 40 miles from the airport.[19] The nearest Nationwide Rivers Inventory feature is the Waupaca River, which is adjacent to the northern portion of the airport.[20]

[19] U.S. Department of the Interior, National Park Service, National Wild and Scenic River System in the U.S. (https://nps.maps.arcgis.com/apps/MapJournal/index.html?appid=ba6debd907c7431ea765071e9502d5ac#)

[20] U.S. Department of the Interior, National Park Service, Nationwide Rivers Inventory (https://www.nps.gov/maps/full.html?mapId=8adbe798-0d7e-40fb-bd48-225513d64977)

Chapter 2

Forecasts

Chapter 2
Forecasts

The definition of demand that may reasonably be expected to occur during the useful life of an airport's key components (i.e., runways, taxiways, terminal buildings, etc.) is an important factor in facility planning. In airport master planning, defining demand involves projecting potential aviation activity for at least a 20-year timeframe. Aviation demand forecasting for Waupaca Municipal Airport (PCZ) will primarily consider based aircraft, aircraft operations, peak activity periods, and the airport's critical aircraft.

The Federal Aviation Administration (FAA) has oversight responsibility to review and approve aviation forecasts developed in conjunction with airport planning studies. The FAA reviews individual airport forecasts with the objective of comparing them to its *Terminal Area Forecasts* (TAF) and the *National Plan of Integrated Airport Systems* (NPIAS). Even though the TAF is updated annually, there has almost always been a disparity between the TAF and master planning forecasts in the past, primarily because the TAF forecasts are the result of a top-down model that does not consider local conditions or recent trends. While the TAF forecasts are a point of comparison for master plan forecasts, they serve other purposes, such as asset allocation by the FAA.

When reviewing an airport sponsor's forecast from a master plan, the FAA must ensure that the forecast is based on reasonable planning assumptions, uses current data, and is developed using appropriate forecasting methods. According to the FAA, forecasts should be:

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

The forecasting process for an airport master plan consists of a series of basic steps that vary in complexity depending on the issues to be addressed and the level of effort required. The steps include a review of previous forecasts, determination of data needs, identification of data sources, collection of data, selection of forecasting methods, preparation of the forecasts, and documentation and evaluation of the results.

FAA Advisory Circular (AC) 150/5070-6B, *Airport Master Plans*, outlines the following seven standard steps that are involved in the forecasting process.

1. **Identify Aviation Activity Measures**: Determine the level(s) and type(s) of aviation activities that are likely to impact facility needs. For general aviation, these typically include based aircraft and operations.

2. **Review Previous Airport Forecasts**: This review may include the FAA 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 forecasted data.

4. **Select Forecasting Methods**: Several appropriate methodologies and techniques are 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 Forecasting Methods and Evaluate Results**: Prepare the actual forecasts and evaluate them for reasonableness.

6. **Summarize and Document Results**: Provide supporting text and tables, as necessary.

7. **Compare Forecast Results with FAA's TAF**: Based aircraft and total operations are considered consistent with the TAF if they meet the following criteria:

    - The forecasts differ by less than 10 percent in the five-year forecast period and less than 15 percent in the 10-year forecast period.
    - The forecasts do not affect the timing or scale of an airport project.
    - The forecasts do not affect the role of the airport, as defined in the current version of FAA Order 5090.5, *Field Formulation of the National Plan of Integrated Airport Systems (NPIAS) and the Airports Capital Improvement Plan (ACIP)*.

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

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

The forecasts for this master plan will utilize a base year of 2024 with a long-range forecast out to 2044.

NATIONAL AVIATION TRENDS

Each year, the FAA updates and publishes a national aviation forecast. Included in this publication are forecasts for large air carriers, regional/commuter air carriers, general aviation, and FAA workload measures. The forecasts are prepared to meet the budget and planning needs of the FAA and provide information that can be used by state and local authorities, the aviation industry, and the general public. The current edition upon preparation of this chapter was *FAA Aerospace Forecast – Fiscal Years* (FY) *2024–2044* (published in April 2024). The FAA primarily uses the economic performance of the United States (U.S.) as an indicator of future aviation industry growth. Similar economic analyses are applied to the outlook for aviation growth in international markets. The following discussion is summarized from the *FAA Aerospace Forecast*.

The U.S. commercial air carrier industry experienced a decade of relative stability that extended from the end of the great recession in 2009 through the emergence of COVID-19 in 2020. During that period, U.S. airlines revamped their business models to minimize losses by lowering operating costs, eliminating unprofitable routes, and grounding older, less fuel-efficient aircraft. To increase operating revenues, carriers initiated new services that customers were willing to purchase and started charging separately for services that were historically bundled in the price of a ticket. The results of these efforts were impressive: 2019 marked the eleventh consecutive year of profitability for the U.S. airline industry.

The COVID-19 pandemic in 2020 effectively ended those boom years. Airline activity and profitability plummeting almost overnight; in response, airlines cut capacity and costs, and most were able to weather the storm. Some small regional carriers ceased operations as a result of the pandemic, but no mainline carriers did. Some segments of aviation were less impacted: cargo activity surged, boosted by consumer purchases, and general aviation generally maintained pre-pandemic levels of activity. In 2022, demand for leisure travel destinations surged domestically and in the Latin America region. By 2023, a wider array of accessible destinations opened, and travelers responded by seeking flights across the Atlantic and to some Pacific markets, while domestic and Latin America market activity remained consistent. As carriers worked to assess shifting passenger preferences and supply response, the overall level of demand was supportive of the industry's aggregate results. Consumer demand for experiences over goods continued to drive the demand for leisure trips and a willingness to pay higher fares that exceeded 2019 levels; the strong overall demand led to positive financial results. The top eight U.S. passenger carriers posted operating and net profits, proving strong success for the new business models air carriers have utilized while transitioning out of the pandemic years.

The business changes airlines implemented due to the pandemic will shape the industry long after recovery is complete. Airlines retired older, less fuel-efficient aircraft and encouraged voluntary employee separations. This has led to airlines seeking newer aircraft investments while meeting the current demand for the rebuilding of business and international travel, which has lagged behind leisure traffic during the recovery. Within the industry there is confidence that U.S. airlines can generate solid returns on capital and sustained profits; however, over the long term, aviation demand will be driven by economic activity as the growing U.S. and world economies provide the basis for aviation growth.

ECONOMIC ENVIRONMENT

According to the FAA forecast, the annual gross domestic product (GDP) of the U.S. is expected to increase by 1.7 percent over the next 20 years. U.S. carriers posted profits in 2023, and the FAA expects carriers to remain profitable over the next few years as demand rises, despite higher fares that offset the raised labor and fuel costs. As yields stabilize and carriers return to levels of capacity consistent with their fixed costs and shed excess debt, consistent profitability should continue. Over the long term, a competitive and profitable aviation industry, characterized by increasing demand for air travel, is anticipated, as well as slower airfare growth compared to overall inflation, reflective of the growing U.S. and global economies.

Prior to the COVID-19 pandemic, the U.S. economy was recovering from the most serious economic downturn and slow recovery since the Great Depression. Demand for aviation is fundamentally driven by economic activity; as economic growth picks up, so will growth in aviation activity. Overall, the FAA forecast calls for annual passenger growth over the next 20 years to average 2.5 percent. Oil prices surged to $93 per barrel in 2022, largely due to the Russian invasion of Ukraine, after averaging $55 per barrel over the five-year period from 2016 to 2021. Prices are forecasted to remain consistent over the next few years before slowly climbing to reach $107 per barrel by 2044.

FAA GENERAL AVIATION FORECASTS

The long-term outlook for general aviation (GA) is promising, as growth at the high end of the segment offsets continuing retirements at the traditional low end. The active general aviation fleet is forecasted to remain relatively stable between 2024 and 2044, increasing by just 0.4 percent. While steady growth in both GDP and corporate profits results in continued growth of the turbine and rotorcraft fleets, the largest segment of the fleet, fixed-wing piston aircraft, continues to shrink over the forecast period.

The FAA forecasts the fleet mix and hours flown for single-engine piston (SEP) aircraft; multi-engine piston (MEP) aircraft; turboprops; business jets; piston and turbine helicopters; and light sport, experimental, and other aircraft (e.g., gliders and balloons). The FAA forecasts active aircraft, not total aircraft; an active aircraft is one that is flown at least one hour during the year. From 2010 through 2013, the FAA undertook an effort to have all aircraft owners re-register their aircraft. This effort resulted in a decrease of 10.5 in the number of active general aviation aircraft, mostly in the piston category. **Table 2A** shows the primary general aviation demand indicators, as forecasted by the FAA.

TABLE 2A | FAA General Aviation Forecast

Demand Indicator	2024	2044	CAGR
General Aviation Fleet			
Total Fixed-Wing Piston	136,485	130,790	-0.2%
Total Fixed-Wing Turbine	27,905	41,580	2.0%
Total Helicopters	10,090	14,025	1.7%
Total Other (experimental, light sport, etc.)	31,100	37,810	1.0%
Total GA Fleet:	**210,105**	**228,975**	**0.4%**
General Aviation Operations			
Local	15,900,000	17,571,000	0.5%
Itinerant	15,125,000	16,569,000	0.5%
Total General Aviation Operations:	**31,026,000**	**34,140,000**	**0.5%**

CAGR = compound annual growth rate (2024–2044)

Source: FAA Aerospace Forecast – FY 2024–2044

General Aviation Fleet Mix

For 2024, the FAA estimates there are 136,485 piston-powered fixed-wing aircraft in the national fleet. That number is forecasted to decline by 0.2 percent by 2044, resulting in 130,790 aircraft. This includes a decline of 0.2 percent in SEP aircraft and a decline of 0.3 percent in MEP aircraft.

Total turbine aircraft are forecasted to grow at an annual rate of 2.0 percent through 2044. The FAA estimates there are 27,905 fixed-wing turbine-powered aircraft in the national fleet in 2024 and there will be 41,580 by 2044. Turboprops are forecasted to grow by 1.0 percent annually, while business jets are projected to grow by 2.6 percent annually through 2044.

Total helicopters are projected to grow by 1.7 percent annually in the forecast period. There are an estimated 10,090 total helicopters in the national fleet in 2024, and that number is expected to grow to a total of 14,025 by 2044. This includes annual growth rates of 0.8 percent for piston helicopters and 2.0 percent for turbine helicopters.

The FAA also forecasts experimental aircraft, light sport aircraft (LSA), and others. Combined, there are an estimated 31,100 other aircraft in 2024 that are forecasted to grow to 37,810 by 2044, for an annual growth rate of 1.0 percent.

General Aviation Operations

The FAA also forecasts total operations based on activity at control towers across the United States. Operations are categorized as air carrier, air taxi/commuter, general aviation, and military. While the fleet size remains relatively level, the number of general aviation operations at towered airports is projected to increase from 31.0 million in 2024 to 34.1 million in 2044, with an average increase of 0.5 percent per year as growth in turbine, rotorcraft, and experimental hours offsets a decline in fixed-wing piston hours. This includes an annual growth rate of 0.5 percent for local general aviation operations; itinerant operations will remain the same. **Exhibit 2A** presents the historical and forecasted U.S. active general aviation aircraft and operations.

General Aviation Aircraft Shipments and Revenue

On an annual basis, the General Aviation Manufacturers Association (GAMA) publishes an aviation industry outlook that documents past and current trends and provides an assessment of the future condition of the general aviation industry. **Table 2B** presents historical data related to general aviation aircraft shipments.

Worldwide shipments of general aviation airplanes increased in 2023, with a total of 3,050 units delivered around the globe, compared to 2,813 units in 2022: the third year in a row to experience an increase after the drop during 2020, when only 2,408 units were delivered. Worldwide general aviation billings were the highest in 2014. In 2022, an increase in new aircraft shipments generated more than $23 billion, compared to $22.7 billion in the previous year. North America continues to be the largest market for general aviation aircraft and leads in the manufacturing of piston, turboprop, and jet aircraft. The European region is the second largest market for piston-powered aircraft and is also the leader for turboprop deliveries. North America leads in business jet deliveries.

TABLE 2B | Annual General Aviation Airplane Shipments

Manufactured Worldwide and Factory Net Billings						
Year	Total	SEP	MEP	TP	J	Net Billings ($ million)
2003	2,686	1,825	71	272	518	9,998
2004	2,962	1,999	52	319	592	12,093
2005	3,590	2,326	139	375	750	15,156
2006	4,054	2,513	242	412	887	18,815
2007	4,277	2,417	258	465	1,137	21,837
2008	3,974	1,943	176	538	1,317	24,846
2009	2,283	893	70	446	874	19,474
2010	2,024	781	108	368	767	19,715
2011	2,120	761	137	526	696	19,042
2012	2,164	817	91	584	672	18,895
2013	2,353	908	122	645	678	23,450
2014	2,454	986	143	603	722	24,499
2015	2,331	946	110	557	718	24,129
2016	2,268	890	129	582	667	21,092
2017	2,324	936	149	563	676	20,197
2018	2,441	952	185	601	703	20,515
2019	2,658	1,111	213	525	809	23,515
2020	2,408	1,164	157	443	644	20,048
2021	2,646	1,261	148	527	710	21,603
2022	2,818	1,361	158	582	712	22,866
2023	3,050	1,508	174	638	730	23,377

J = jet
MEP = multi-engine piston
SEP = single-engine piston
TP = turboprop

Source: General Aviation Manufacturers Association (GAMA) 2023 Annual Report

Business Jets | Business jet deliveries increased from 712 units in 2022 to 730 units in 2023. The North American market accounted for 74.9 percent of business jet deliveries, which is a 7.3 percent increase in market share compared to 2022.

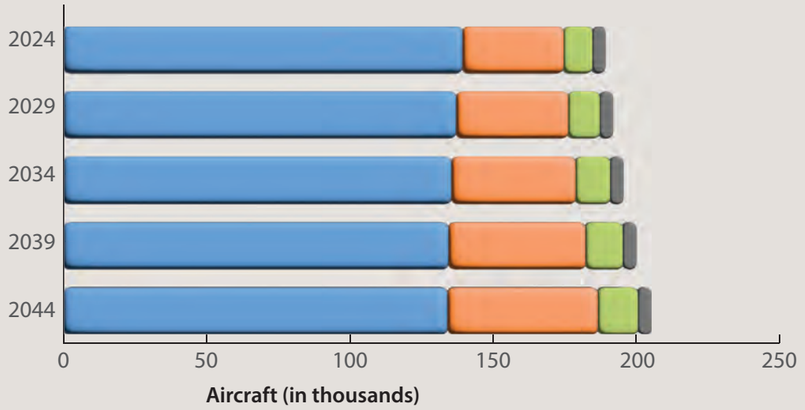
Turboprops | Turboprop shipments increased from 582 in 2022 to 638 in 2023. North America's market share of turboprop aircraft decreased by 2.1 percent in the last year. The European, Middle Eastern, and African market shares increased, while the market shares of the Asia-Pacific and Latin America regions decreased.

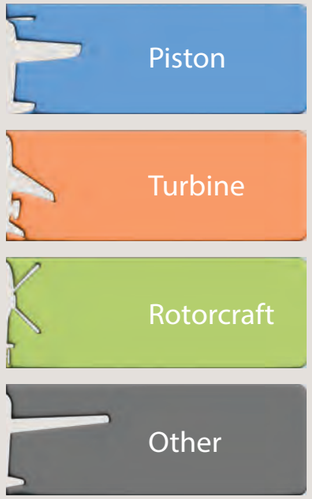
Pistons | In 2023, piston airplane shipments increased to 1,682 units from 1,519 units in the prior year. North America's market share of piston aircraft deliveries rose 7.2 percent from 2022. The European, Latin American, and Middle Eastern and African regions experienced positive rates in market shares during the past year, while the Asia-Pacific market experienced a decline.

U.S. PILOT POPULATION

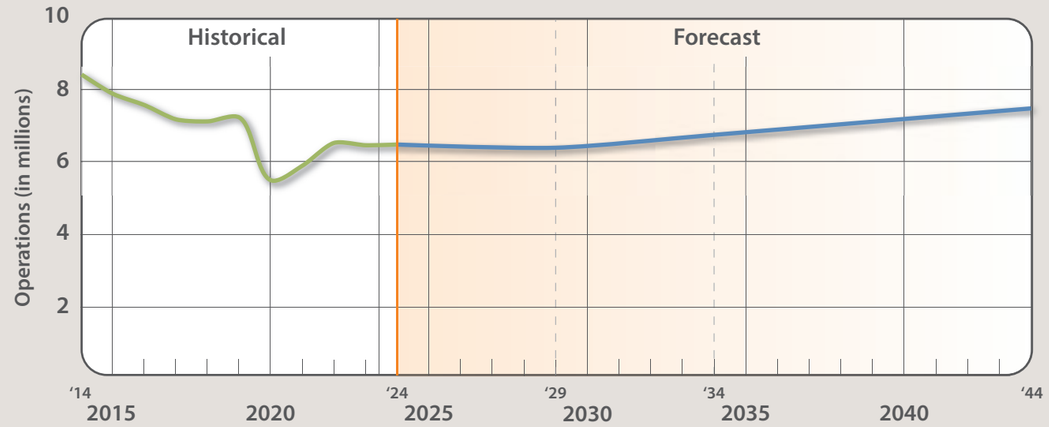
There were 490,470 active pilots certificated by the FAA at the end of 2023, with 500,406 active pilots projected in 2024. All pilot categories, except recreational-only certificates, are expected to continue to increase for the forecast length. Excluding student pilots, the number of active pilots is projected to

U.S. Active General Aviation Aircraft

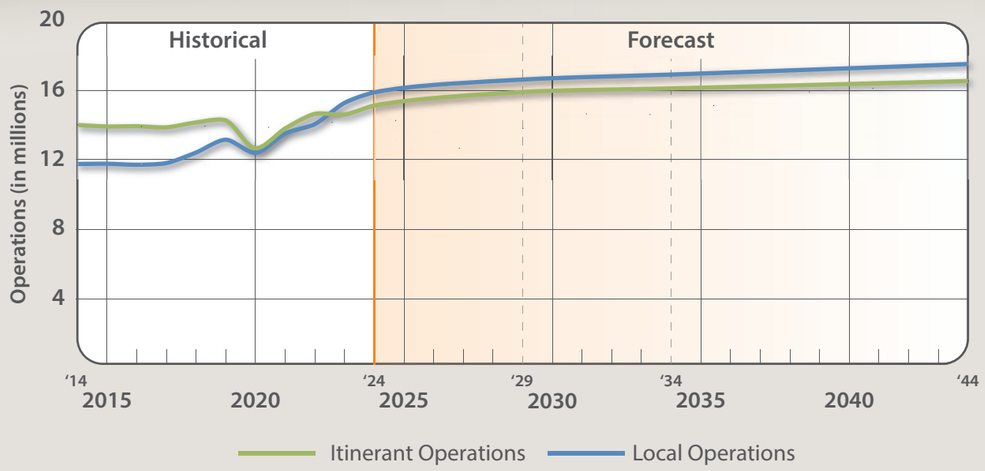




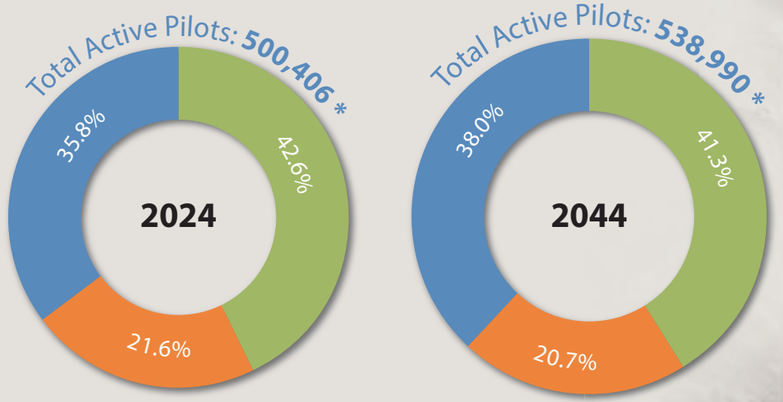
U.S. Air Taxi Operations



U.S. General Aviation Operations



Active Pilots By Certificate



*Excludes Student Pilot Certificates

Source: FAA Aerospace Forecasts FY2024-2044

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increase by about 38,584 (up 0.4 percent annually) between 2024 and 2044. The airline transport pilot (ATP) category is forecasted to increase by 25,800 (up 0.7 percent annually). Sport pilots are predicted to increase by 2.4 percent, commercial pilots will remain steady over the forecast period, and private pilot certificates are projected to decrease at an average annual rate of 0.1 percent through 2044. The FAA has currently suspended the student pilot forecast.

RISKS TO THE FORECAST

While the FAA is confident that its forecasts for aviation demand and activity can be reached, the FAA forecasts are dependent on several factors, including the strength of the global economy, security (including the threat of international terrorism), and oil prices. Higher oil prices could lead to further shifts in consumer spending away from aviation, dampening a recovery in air transport demand. The COVID-19 pandemic introduced a new risk, and although the industry has rebounded, the threat of future global health emergencies and potential economic fallout remains.

AIRPORT SERVICE AREA

The initial step in determining the aviation demand for an airport is to define its generalized service area in geographic terms for various segments of aviation. The service area is determined primarily by evaluating the locations of competing airports and their capabilities, services, and relative attraction and convenience. In determining the aviation demand for an airport, it is necessary to identify the role of the airport, as well as the specific areas of aviation demand the airport is intended to serve. Waupaca Municipal Airport is classified as a Local General Aviation (GA) airport within the NPIAS, which means its primary role is to provide the community with access to local and regional markets. Within the 2030 *Wisconsin State Aviation System Plan* (SASP), the airport is classified as a medium GA Community airport, which means its role is to accommodate most single- and multi-engine GA aircraft and support regional and intrastate air transportation needs. General aviation, which includes all segments of the aviation industry except commercial air carriers and the military, is the largest component of the national aviation system and includes activities such as pilot training, recreational flying, and the use of sophisticated turboprop and jet aircraft for business and corporate use.

The service area for an airport is a geographic region from which an airport can be expected to attract the largest share of its activity. The definition of the service area can be used to identify other factors, such as socioeconomic and demographic trends, that influence aviation demand at an airport. Aviation demand will be impacted by the proximity of competing airports, the surface transportation network, and the strength of general aviation services provided by the airport and competing airports.

As in any business enterprise, the more attractive the facility is in terms of service and capabilities, the more competitive it will be in the market. If an airport's attractiveness increases in relation to nearby airports, so will the size of its service area. If facilities and services are adequate and/or competitive, some level of aviation activity might be attracted to an airport from more distant locales.

As a Local GA airport, Waupaca Municipal Airport's service area is driven by aircraft owners/operators and where they choose to base their aircraft. The primary consideration of aircraft owners/operators when choosing where to base their aircraft is convenience (i.e., easy access and proximity to the airport).

As a general rule, an airport's service area can extend up to and beyond 30 miles. The proximity and level of general aviation services are a defining factor when describing the general aviation service area. Descriptions of nearby airports were previously provided in Chapter One, as presented on Exhibit 1F, although only the six closest airports were shown on the exhibit. There are nine public-use airports within 30 nautical miles (nm) of Waupaca Municipal Airport:

- Central County Airport (68C)
- Wild Rose Idlewild Airport (W23)
- Clintonville Municipal Airport (CLI)
- Shiocton Airport (W34)
- Wautoma Municipal Airport (Y50)
- Appleton International Airport (ATW)
- Brennand Airport (79C)
- Stevens Point Municipal Airport (STE)
- Wittmann Regional Airport (OSH)

Five of these nine other airports are included in the NPIAS: CLI, Y50, ATW, STE, and OSH. **Table 2C** depicts some of the characteristics of these airports that are included in the NPIAS.

TABLE 2C | Regional NPIAS Airports Within 30 Nautical Miles – Waupaca Municipal Airport

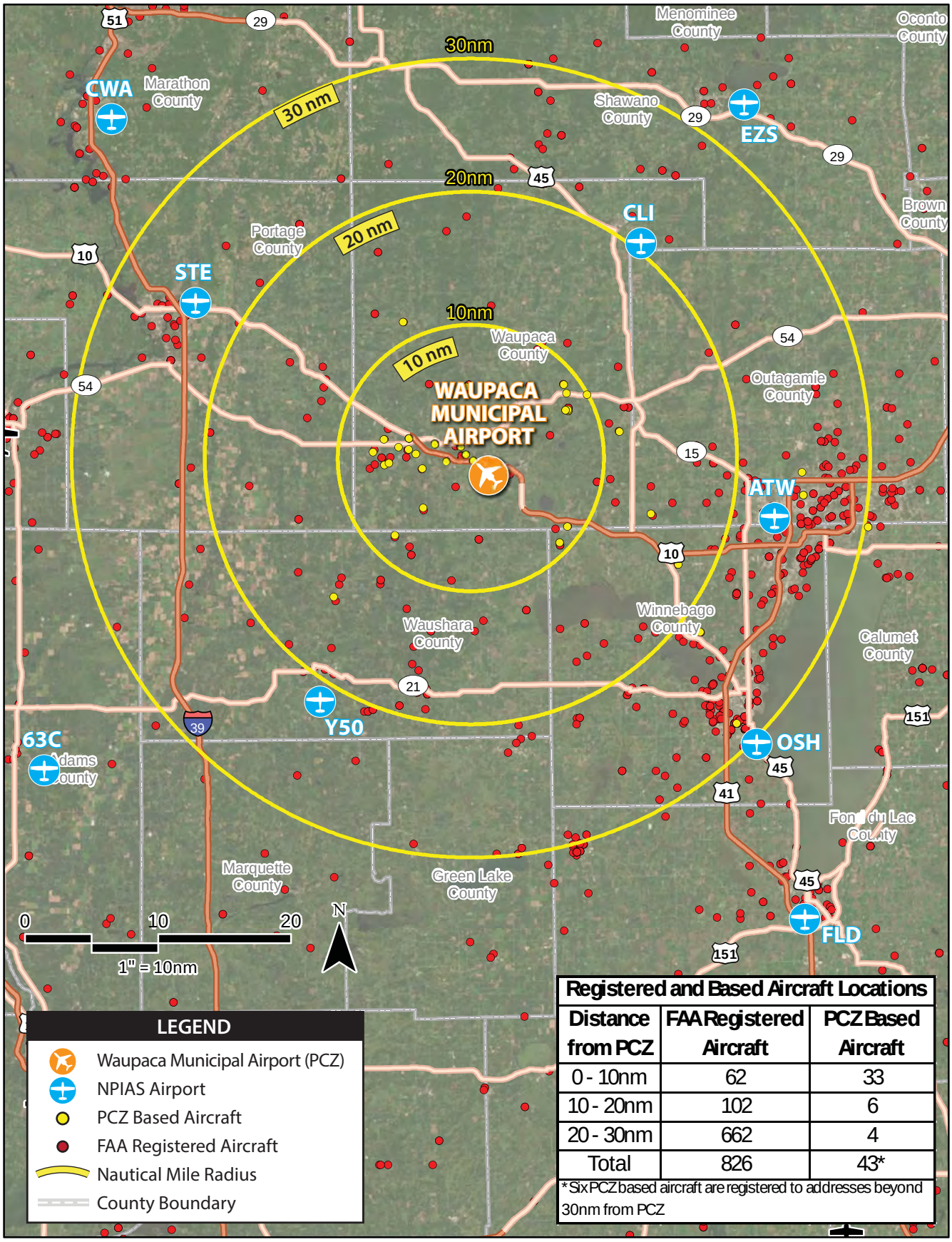
Airport	nm/Direction from 57C[1]	FAA Service Level[2]	Towered[1]	Based Aircraft[3]	2023 Annual Operations[4]	Longest Runway[1]	Visibility Minimum[1]
Waupaca Municipal Airport	**–**	**GA**	**No**	**49[5]**	**20,160**	**5,200'**	**3/4-mile**
Clintonville Municipal Airport	20.9 nm NE	GA	No	18	11,500	4,599'	1-mile
Wautoma Municipal Airport	21.3 nm SW	GA	No	37	12,400	2,334'	1-mile
Appleton International Airport	22.0 nm ESE	Commercial	Yes	74	40,877	8,003'	1/2-mile
Stevens Point Municipal Airport	25.3 nm WNW	GA	No	35	36,750	6,028'	3/4-mile
Oshkosh Wittman Regional Airport	28.9 nm SE	GA	Yes	168	80,102	8,002'	3/4-mile

GA= general aviation
nm= nautical miles

Sources: [1]Airnav.com; [2]FAA NPIAS; [3]BasedAircraft.com; [4]ADIP; [5]57C Based Aircraft Airport Records

When discussing the general aviation service area, two primary demand segments must be addressed. The first component is the airport's ability to attract based aircraft. Under this component, the most effective method of defining the airport's service area is by examining the number of registered aircraft owners in proximity to the airport. As previously mentioned, aircraft owners typically choose to base at airport near their homes or businesses. Based on the current registered aircraft data (presented on **Exhibit 2B**), there are 826 registered aircraft within 30 nm of Waupaca Municipal Airport. Of these aircraft, 49 (or approximately six percent) are based at PCZ. Having 826 aircraft within 30 nm is unusually high, relative to most communities, and indicates a chance for PCZ to attract aircraft from the large pool nearby.

The second demand segment to consider is itinerant aircraft operations. In most instances, pilots will opt to utilize airports nearer their intended destinations; however, this is also dependent on the airport's capabilities in accommodating aircraft operators. As a result, airports that offer better services and facilities are more likely to attract itinerant operators in the region.



LEGEND

- Waupaca Municipal Airport (PCZ)
- NPIAS Airport
- PCZ Based Aircraft
- FAA Registered Aircraft
- Nautical Mile Radius
- County Boundary

Registered and Based Aircraft Locations

Distance from PCZ	FAA Registered Aircraft	PCZ Based Aircraft
0 - 10nm	62	33
10 - 20nm	102	6
20 - 30nm	662	4
Total	826	43*

*Six PCZ based aircraft are registered to addresses beyond 30nm from PCZ

With several competing airports in the region, Waupaca Municipal Airport's primary service area is defined by its convenience to its users and its ability to compete for based aircraft. There are several airports near Waupaca, all of which differ widely in terms of capacity/services/ or whatever their primary differentiators are. As previously outlined, five of the nine other airports within 30 nm of Waupaca are identified within the NPIAS and are thus supported by federal/state grant improvement funding sources. Appleton International Airport and Wittman Regional (Oshkosh) Airport have two runways that are at least 8,000 feet long. Steven's Point has one runway that is at least 6,000 feet long. Compared to the five nearby airports that are also included in the NPIAS, Waupaca has the fourth longest runway. Appleton International Airport and Wittman Regional Airport airports that are included in the NPIAS are served by airport traffic control towers (ATCTs).

Each airport experiences a varying range of annual operations by different demand segments; the highest annual operational count is reported at Wittman Regional Airport (80,102 operations). Wittman Regional Airport is commonly known as "Oshkosh" and is the host of one of the world's largest annual airshow events. Clintonville Municipal Airport experiences approximately 11,500 annual operations, which is the lowest operations count of the five nearest NPIAS airports. Waupaca Municipal Airport currently experiences approximately 20,160 annual operations, according to the FAA TAF.

Waupaca Municipal Airport offers several amenities that create a desirable environment for based aircraft owners and itinerant operators. The airport is currently served by instrument approach minimums down to ¾-mile, fixed base operator (FBO) services, and dual asphalt runways. As shown on **Exhibit 2B**, PCZ currently draws the majority of its based aircraft from Waupaca County. The airport is quite capable of meeting the needs of nearby aircraft users and general aviation demand segments. For these reasons, Waupaca County will be considered the primary service area for Waupaca Municipal Airport in this planning effort, with secondary service areas extending into adjacent counties. It should be noted that over 800 aircraft registrations extend into other counties near and including Waupaca County. It is probable that registered aircraft within Waupaca County will continue to comprise the majority of based aircraft at Waupaca Municipal Airport and the pattern will continue for adjacent counties and their respective airports. For example, registered aircraft owners within Winnebago County and Outagamie County will likely base their aircraft at nearby airports, such as Wittman Regional Airport (Oshkosh) and Appleton International Airport. As a result, the service area to the east and southeast of Waupaca Municipal Airport (near the 20-30 nm radius) will remain limited, due to the locations of the more prominent airports in the region that are listed above.

FORECASTING APPROACH

The development of aviation forecasts proceeds through both analytical and judgmental processes. A series of mathematical relationships is tested to establish statistical logic and rationale for projected growth; however, the judgment of the forecast analyst, based on professional experience, knowledge of the aviation industry, and assessment of the local situation, is important in the final determination of the preferred forecast. The most reliable approach to estimating aviation demand is through the utilization of more than one analytical technique. Methodologies frequently considered include trendline/time-series projections, correlation/regression analysis, and market share analysis. The forecast analyst may elect not to use certain techniques, depending on the reasonableness of the forecasts produced using other techniques.

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

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

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

Market share analysis involves a historical review of the airport activity as a percentage, or share, of a larger regional, state, or national aviation market. A historical market share trend is determined, providing an expected market share for the future. These shares are then multiplied by the forecasts of the larger geographical area to produce a market share projection. This method has the same limitations as trendline projections but can provide a useful check on the validity of other forecasting techniques.

Forecasts will age, and the farther a forecast is from its base year, the less reliable it may become, particularly due to changing local and national conditions; nevertheless, the FAA requires that a 20-year forecast be developed for long-range airport planning. Facility and financial planning efforts usually require at least a 10-year view because it often takes more than five years to complete a major facility development program; however, it is important to use forecasts that do not overestimate revenue-generating capabilities or understate demand for facilities needed to meet public (user) needs.

A wide range of factors is known to influence the aviation industry and can have significant impacts on the extent and nature of aviation activity in both the local and national markets. Historically, the nature and trend of the national economy has had a direct impact on the level of aviation activity. Recessionary periods have been closely followed by declines in aviation activity; nevertheless, trends emerge over time and provide the basis for airport planning.

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

- Based aircraft
- Based aircraft fleet mix
- General aviation operations
- Air taxi and military operations
- Operational peaks

EXISTING FORECASTS

Consideration is given to any forecasts of aviation demand for the airport that have been completed in the recent past. For Waupaca Municipal Airport, the previous forecasts reviewed are those in the FAA TAF and the 2030 SASP. The SASP used a base year of 2010, and it should be noted that activity characteristics from the SASP are extremely dated for a planning study based in 2024; thus, the SASP will be consulted only for historical purposes.

FAA TERMINAL AREA FORECAST

The FAA publishes the TAF for each airport included in the NPIAS on an annual basis. The TAF is a generalized forecast of airport activity that is used by the FAA primarily for internal planning purposes. It is available to airports and consultants to use as a baseline projection and is an important point of comparison when developing local forecasts. The current TAF was published in January 2024 and is based on the federal fiscal year (October-September).

As presented in **Table 2C**, the TAF projects general aviation activity at PCZ to remain static over the next 20 years, which is the common practice by the FAA for airports that are not served by ATCTs. Because there is currently no commercial service activity at Waupaca Municipal Airport, the TAF does not reflect any existing and/or forecasted air carrier operations; however, the TAF reflects 150 air taxi operations over the forecast period. Operations are projected to be dominated by local and itinerant GA operations, which are estimated to account for 99 percent of the total aircraft operations over the planning period. Military operations are projected to account for less than one percent of total operations, with 10 operations projected for each of the plan years. Based aircraft are also projected to remain flat at 43 aircraft over the next 20 years, which is another common FAA forecasting practice for non-towered general aviation airports. As previously noted, even though the TAF is generic and presents no real forecasted growth, the FAA will compare the new forecasts developed for this master plan to the TAF.

TABLE 2C | 2024 FAA Terminal Area Forecast – Waupaca Municipal Airport

	2024	2028	2033	2044	CAGR 2024–2044
ANNUAL OPERATIONS					
Itinerant					
Air Carrier	0	0	0	0	0.0%
Air Taxi	150	150	150	150	0.0%
General Aviation	10,000	10,000	10,000	10,000	0.0%
Military	10	10	10	10	10
Total Itinerant:	**10,160**	**10,160**	**10,160**	**10,160**	**0.0%**
Local					
General Aviation	10,000	10,000	10,000	10,000	0.0%
Military	0	0	0	0	0.0%
Total Local:	**10,000**	**10,000**	**9,000**	**9,000**	**0.0%**
Total Operations:	**20,160**	**20,160**	**20,160**	**20,160**	**0.0%**
BASED AIRCRAFT					
Based Aircraft:	**43**	**43**	**43**	**43**	**0.0%**

Source: FAA Terminal Area Forecast (TAF), January 2024

PREVIOUS FORECASTS

Forecasts of aviation activity at Waupaca Municipal Airport were previously prepared within older, less currently relevant documents, including the 2030 SASP. **Table 2D** summarizes the forecasts of operations and based aircraft at Waupaca Municipal Airport that were prepared for the SASP.

TABLE 2D | SASP Operations and Based Aircraft

Year	Total Operations	Based Aircraft
2010	20,160	34
2015	20,460	35
2020	20,820	35
2030	22,390	38

The SASP, which used a base year of 2010, forecasted total operations to grow from 20,160 in 2010 to 22,390 by 2030 and based aircraft to increase slightly from 34 in 2010 to 38 by 2030. In terms of based aircraft, PCZ has exceeded these projections and has 49 validated based aircraft, as of the time this chapter was prepared (June 2024). Based on recent activity trends at Waupaca Municipal Airport and in the region, along with the time that has passed since the preparation of these previous forecasts, it is necessary to develop new forecasts utilizing the most current information available.

GENERAL AVIATION FORECASTS

The following forecast analysis examines each aviation demand category expected at Waupaca Municipal Airport over the next 20 years. Each segment is examined individually and then collectively to provide an understanding of the overall aviation activity at the airport through 2044. Forecasts for airport activities include the following:

- Service area registered aircraft
- Based aircraft
- Based aircraft fleet mix
- General aviation operations (local and itinerant)
- Air taxi and military operations
- Peaking conditions
- Critical aircraft

The remainder of this chapter examines historical trends regarding these areas of general aviation and project future demand for these segments of general aviation activity at the airport. These forecasts will become the basis for planning future facilities (both airside and landside) once they are approved by the FAA.

REGISTERED AIRCRAFT FORECASTS

The most basic indicator of general aviation demand at an airport is the total number of aircraft based at the facility; however, before a projection of based aircraft can be developed, it is important to ascertain the number, or pool, of aircraft in the market area from which PCZ based aircraft will be generated.

The methodology for identifying the market pool is to examine and forecast registered aircraft in the airport's service area. As previously stated, the generalized PCZ service area extends out to approximately 30 nm and includes over 800 registered aircraft; however, for the purposes of this master plan, the primary

service area for PCZ includes the entirety of Waupaca County, from which the airport draws the majority of its based aircraft. This does not preclude the possibility for aircraft registered in other surrounding counties to base at PCZ.

Table 2E presents the historical registered aircraft for Waupaca County for 2003 through 2024. These figures are derived from the FAA aircraft registration database, which categorizes aircraft registrations by county based on the zip codes of the aircraft owners. Although this information generally provides a correlation to based aircraft, it is not uncommon for some aircraft to be registered in the county but be based at airports outside the county, or vice versa.

TABLE 2E | Historical Registered Aircraft – Waupaca County

Year	Single-Engine Piston	Multi-Engine Piston	Turboprop	Jet	Helicopter	Other[1]	Total
2003	104	2	4	1	1	1	113
2004	107	2	4	1	1	1	116
2005	105	2	3	1	1	1	113
2006	108	4	2	1	2	1	118
2007	117	3	0	1	3	7	131
2008	117	2	1	1	4	7	132
2009	104	2	0	1	3	7	117
2010	103	4	0	1	4	7	119
2011	102	4	0	1	3	6	116
2012	107	5	0	1	3	6	122
2013	93	3	0	1	3	5	105
2014	97	3	0	1	3	6	110
2015	94	3	0	1	2	6	106
2016	92	3	0	1	2	8	106
2017	86	2	0	1	2	10	101
2018	85	4	0	1	1	10	101
2019	83	4	0	1	0	9	97
2020	86	4	0	1	0	8	99
2021	80	3	0	1	0	6	90
2022	78	3	0	1	0	6	88
2023	80	3	0	1	0	9	93
2024	84	4	1	1	0	5	95

[1]The Other aircraft category includes aircraft such as gliders, electric aircraft, balloons, dirigibles, and unmanned aerial vehicles (UAV)
[2]As of July 26, 2024

Source: FAA Aircraft Registration Database

The registered aircraft in the service area show a somewhat declining trend over the last several years. The historical high was recorded in 2008 with 132 registered aircraft. The FAA required aircraft owners to re-register their aircraft during the following years (starting in 2010), which likely accounts for the notable decrease from 122 registered aircraft in 2012 to 105 in 2013. Since then, registered aircraft in Waupaca County generally dropped until 2022. The most recent count for 2024 shows 95 reported registrations in the county.

Although there are no recently prepared forecasts for Waupaca County regarding registered aircraft, one was prepared for this study using market share, ratio, and historical growth rate projection methods. Several regression forecasts were considered, as well, including single- and multi-variable regressions

examining the correlation of registered aircraft correlation with the service area population, employment, income, and gross regional product, and with U.S. active general aviation aircraft. **Table 2F** details the results of this analysis.

The regression that produced the best correlation was the time series regression, which produced an r^2 value of 0.83. Because none of the registered and based aircraft regressions produced a correlation value of 0.90 or higher, the regression forecasts have been excluded from consideration.

TABLE 2F | Regression Analysis

Independent Variable	r^2
Year	0.83
Population	0.64
Employment	0.52
Income	0.74
Gross Regional Product	0.09
U.S. Active Aircraft	0.07

Source: Coffman Associates analysis

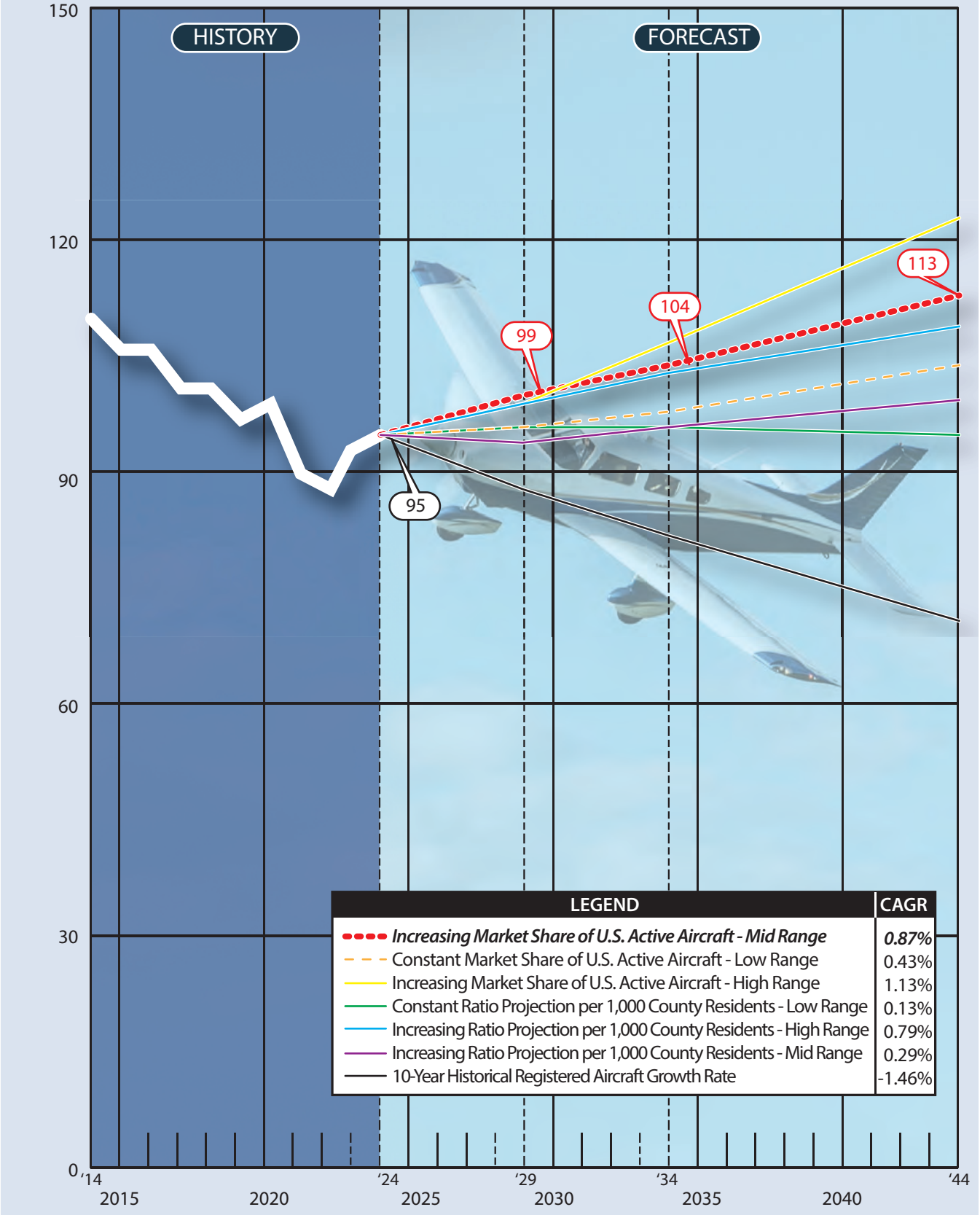
Table 2G and **Exhibit 2C** present several other projections of registered aircraft for the service area, with a goal of presenting a planning envelope that shows a range of projections based on historical trends. The first set of forecasts is based on market share, which considers the relationship between registered aircraft located in Waupaca County and active aircraft within the United States. The next set of projections is based on a ratio of the number of aircraft per 1,000 county residents. Lastly, a projection based on the 10-year historical growth rate was also prepared.

TABLE 2G | Registered Aircraft Projections – Waupaca County

Year	Service Area Registrations	U.S. Active Aircraft	Market Share of U.S. Aircraft	Service Area Population	Aircraft per 1,000 Residents
2014	110	204,408	0.0538%	52,385	2.10
2015	106	210,031	0.0505%	52,248	2.03
2016	106	211,794	0.0500%	51,977	2.04
2017	101	211,757	0.0477%	51,897	1.95
2018	101	211,749	0.0477%	51,953	1.94
2019	97	210,981	0.0460%	51,877	1.87
2020	99	204,140	0.0485%	51,791	1.91
2021	90	209,194	0.0430%	51,992	1.73
2022	88	209,140	0.0421%	51,488	1.71
2023	93	209,095	0.0445%	51,568	1.80
2024	95	210,105	0.0452%	51,642	1.84
Constant Market Share of U.S. Active Aircraft – Low Range (CAGR 0.43%)					
2029	96	213,370	0.0452%	51,933	1.86
2034	98	217,685	0.0452%	52,063	1.89
2044	104	228,975	0.0452%	51,836	2.00
Increasing Market Share of U.S. Active Aircraft – High Range (CAGR 1.31%)					
2029	99	213,370	0.0465%	51,933	1.91
2034	106	217,685	0.0486%	52,063	2.03
2044	123	228,975	0.0538%	51,836	2.38
Increasing Market Share of U.S. Active Aircraft – Mid Range (CAGR 0.87%) – SELECTED FORECAST					
2029	99	213,370	0.0465%	51,933	1.91
2034	104	217,685	0.0476%	52,063	1.99
2044	113	228,975	0.0493%	51,836	2.18
Constant Ratio Projection per 1,000 County Residents – Low Range (CAGR 0.13%)					
2029	96	213,370	0.0448%	51,933	1.84
2034	96	217,685	0.0440%	52,063	1.84
2044	95	228,975	0.0416%	51,836	1.84

(Continues)

Registered Aircraft Forecasts



Sources: 1. FAA Aircraft Registration Database, 2. FAA Aerospace Forecast - Fiscal Years 2024-2044, 3. Woods & Poole 2024

TABLE 2G | Registered Aircraft Projections – Waupaca County (continued)

Year	Service Area Registrations	U.S. Active Aircraft	Market Share of U.S. Aircraft	Service Area Population	Aircraft per 1,000 Residents
Increasing Ratio Projection per 1,000 County Residents – High Range (CAGR 0.79%)					
2029	99	213,370	0.0464%	51,933	1.90
2034	103	217,685	0.0471%	52,063	1.97
2044	109	228,975	0.0475%	51,836	2.10
Increasing Ratio Projection per 1,000 County Residents – Mid Range (CAGR 0.29%)					
2029	94	213,370	0.0443%	51,933	1.82
2034	96	217,685	0.0439%	52,063	1.83
2044	99	228,975	0.0431%	51,836	1.90
10-Year Historical Registered Aircraft Growth Rate (CAGR -1.46%)					
2029	88	213,370	0.0414%	51,933	1.70
2034	82	217,685	0.0377%	52,063	1.58
2044	71	228,975	0.0309%	51,836	1.37

Sources: FAA Aircraft Registration Database; FAA Aerospace Forecast, FY 2024–2044; Woods & Poole, 2024; Coffman Associates analysis

Market Share Projections

- *Constant Market Share* | This forecast maintains the 2024 market share of county residents per registered aircraft (0.0452 percent) throughout the planning period. The result is only slight growth in registrations in the short and intermediate terms, with the addition of one aircraft, followed by the addition of two aircraft by the long term. This projection yields 104 registered aircraft by 2044, increasing at a compound annual growth rate (CAGR) of 0.43 percent.

- *Increasing Market Share* | Two increasing market share projections were also considered. The first evaluated a high-range market share forecast based on a return to the county's record high market share of 0.0538 percent, which occurred in 2014. This scenario output a CAGR of 1.31 percent and 123 registered aircraft in the county by 2044. A mid-range scenario based on the median CAGR between the constant and high-range scenarios was also considered, which increased the market share to 0.0493 percent, resulting in 113 registered aircraft in Waupaca County by the end of the planning period. This projection has a CAGR of 0.87 percent.

Ratio Projections

- *Constant Ratio* | In 2024, there were 1.84 registered aircraft per 1,000 county residents. Carrying this ratio forward through the plan years results in no change to the number of registrations in the county, with 94 aircraft projected by the end of the planning years.

- *Increasing Ratio* | Mid- and high-range increases were also projected. The mid-range projection was based on the historical average ratio and resulted in 99 registered aircraft by 2044, which equates to a CAGR of 0.29 percent. The high-range projection, which is based on a return to the historical high ratio of 2.10, results in 109 aircraft by 2044, for a CAGR of 0.79 percent.

Simple Growth Rate Projection

The historical growth rate was also examined. Over the last 10 years, Waupaca County aircraft registrations have generally declined at a rate of -1.46 percent. If this trend is applied to the forecast years, a reduction in county aircraft registrations would follow, from 95 aircraft in the base year to 71 by the end of the planning period.

Selected Forecast

Each of these forecasts offers a projection of what aircraft registrations in the service area could look like over the next 20 years. The projection based on the regression analysis included in **Table 2F** and the growth rate forecast provide the low-end projections, and the high-range increasing ratio forecast comprises the top end of the planning envelope. Even though county registrations have generally declined and the service area population is expected to remain stagnant, it is not unreasonable to expect some level of growth in aircraft registrations over the next 20 years. This is predicated on the anticipated growth in the national fleet of active aircraft, as well as the slow increase in registrations over the past three years. It is believed that the mid-range increasing market share of U.S. active aircraft is considered the most reasonable registered aircraft forecast. At a CAGR of 0.87 percent, this forecast shows slow but steady growth in aircraft registrations in Waupaca County, with the addition of four aircraft by 2029, five more by 2034, and nine more by 2044, for a total of 113 registered aircraft in the service area in 2044. Although the population is projected to decline slightly in the future, gross regional product for Waupaca County is forecasted to grow at 1.00 percent CAGR over the long-term planning horizon. As such, it is reasonable to expect some level of registered aircraft growth in the future.

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

BASED AIRCRAFT FORECAST

Determining the number of based aircraft at an airport can be a challenging task. Aircraft storage can be somewhat transient in nature; aircraft owners can and do move their aircraft. Some aircraft owners may store their aircraft at an airport for only part of the year. For many years, the FAA did not require airports to report their based aircraft counts and did not validate based aircraft at airports; however, this has changed in recent years, and now the FAA mandates that airports report their based aircraft levels. These counts are recorded in the National Based Aircraft Inventory program and are maintained and validated by the FAA to ensure accuracy.

According to the FAA's database, Waupaca Municipal Airport has 49 based aircraft. This count was most recently confirmed in June 2024. As such, 49 aircraft will serve as the base year count for forecasting purposes.

Like the registered aircraft forecasts, several projections have been made for based aircraft at Waupaca Municipal Airport, including market share, ratio, and growth rate forecasts. The market share is based on the airport's percentage of based aircraft, as compared to registered aircraft in the service area, while

the ratio projection is based on the number of based aircraft per 1,000 county residents. The growth rate projection considers the FAA's TAF projection for the State of Wisconsin. The results of these analyses are detailed in **Table 2H** and depicted graphically in **Exhibit 2D**. It should be noted that no historically-based aircraft data were available; as such, an assumptive analysis was made, based on the experience of the forecast preparer and knowledge of regional and national based aircraft trends. The overarching assumption is that PCZ will experience some level of growth in based aircraft over the planning period, for the following reasons:

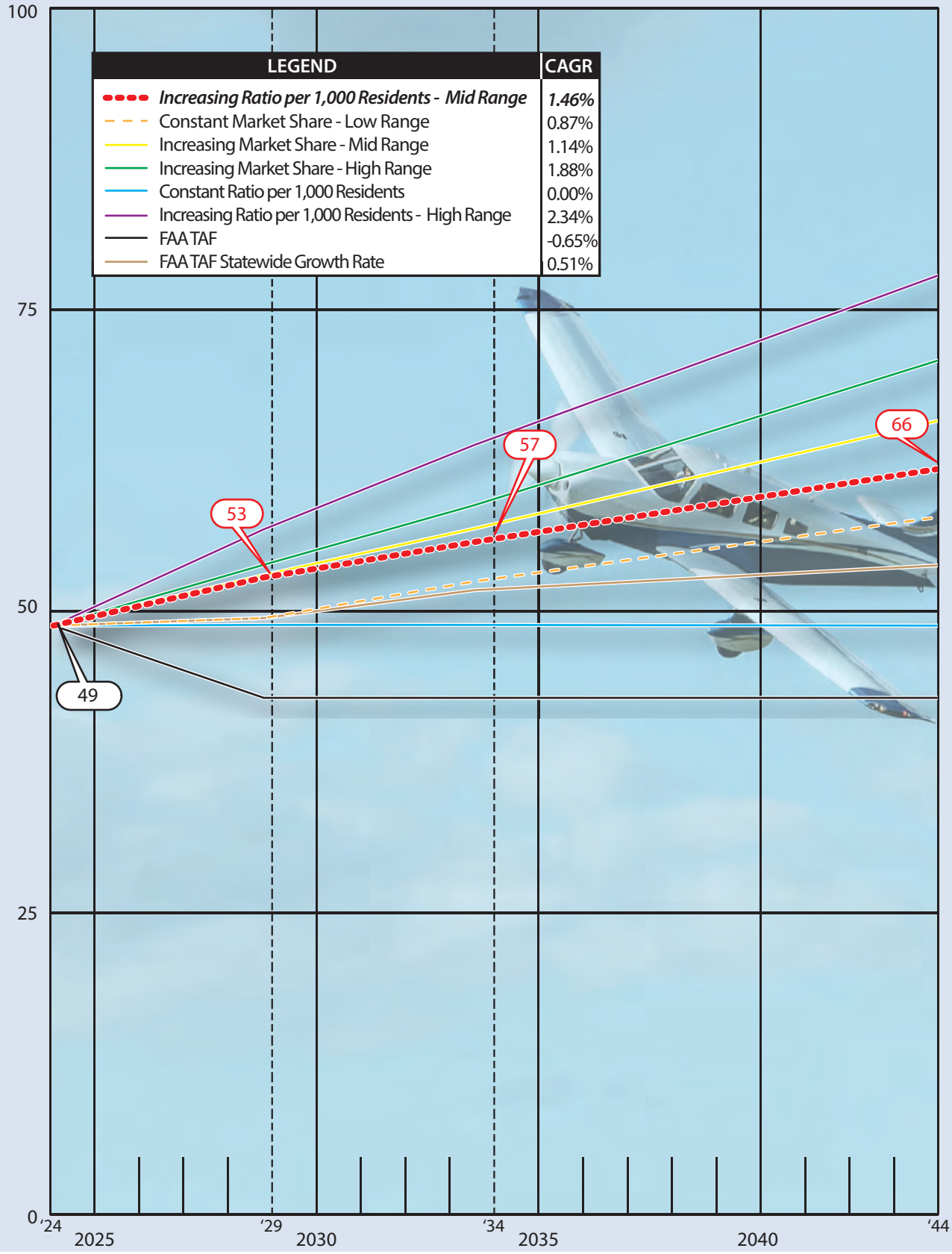
1. The projected growth reflects national and state estimates for increased aircraft ownership, as noted in the FAA TAF.

2. There is existing demand for aircraft storage space at PCZ.

TABLE 2H | Based Aircraft Forecasts for Waupaca Municipal Airport

Year	PCZ Based Aircraft	Service Area Registrations	Market Share	Service Area Population	Aircraft per 1,000 Residents
2024	49	95	51.6%	51,568	0.95
Constant Market Share – Low Range (CAGR 0.87%)					
2029	51	99	51.6%	51,888	0.99
2034	53	104	51.6%	52,051	1.03
2044	58	113	51.6%	51,873	1.12
Increasing Market Share – Mid Range (CAGR 1.46%) – SELECTED FORECAST					
2029	53	99	53.2%	51,888	1.02
2034	57	104	54.8%	52,051	1.09
2044	66	113	58.0%	51,873	1.26
Increasing Market Share – High Range (CAGR 1.88%)					
2029	54	99	54.4%	51,888	1.04
2034	59	104	57.3%	52,051	1.14
2044	71	113	63.0%	51,873	1.37
Constant Ratio per 1,000 Residents (CAGR 0.00%)					
2029	49	99	49.7%	51,888	0.95
2034	49	104	47.8%	52,051	0.95
2044	49	113	43.6%	51,873	0.95
Increasing Ratio per 1,000 Residents – Mid Range (CAGR 1.20%)					
2029	53	99	53.0%	51,888	1.01
2034	56	104	54.0%	52,051	1.08
2044	62	113	55.1%	51,873	1.20
Increasing Ratio per 1,000 Residents – High Range (CAGR 2.34%)					
2029	56	99	56.9%	51,888	1.09
2034	64	104	61.6%	52,051	1.23
2044	78	113	68.8%	51,873	1.50
FAA TAF (CAGR -0.65%)					
2029	43	99	43.3%	51,888	0.83
2034	43	104	41.5%	52,051	0.83
2044	43	113	38.1%	51,873	0.83
FAA TAF Statewide Growth Rate (CAGR 0.51%)					
2029	50	99	50.7%	51,888	0.97
2034	52	104	49.8%	52,051	0.99
2044	54	113	48.0%	51,873	1.05

Sources: Based aircraft records; 2024 FAA TAF; Woods & Poole CEDDS, 2023; Coffman Associates analysis



Sources: basedaircraft.com; 2024 FAA TAF; Woods & Poole CEDDS 2024

Market Share Projections

- *Constant Market Share* | In 2024, the airport had 49 based aircraft, which equates to 51.6 percent of the market share of registered aircraft in Waupaca County. Carrying this percentage throughout the plan years results in a small increase in based aircraft, reflective of a 0.87 percent CAGR. This projection yielded 58 based aircraft by 2044.

- *Increasing Market Share* | Two increasing market share forecasts were also evaluated. The mid-range scenario considered a 58 percent market share by 2044 and resulted in an increase in based aircraft to 66, or a 1.46 percent CAGR, by the end of the planning period. The high-range market share forecast evaluated a stronger growth scenario that considered Waupaca Municipal Airport holding 63.0 percent of the market share by the end of the planning period. This resulted in 71 based aircraft by 2044, for a CAGR of 1.88 percent.

Ratio Projections

- *Constant Ratio* | In 2024, the ratio of based aircraft per 1,000 county residents stood at 0.95. Maintaining this at a constant through 2044 resulted in no growth in based aircraft, due to the stagnant nature of the county population projections. Under this scenario, the airport would remain at 49 based aircraft over the planning period.

- *Increasing Ratio* | Mid- and high-range growth scenarios were also evaluated. The mid-range scenario is based on a slow-growing ratio of 1.20 based aircraft per 1,000 residents by 2044. Applying this figure to the end of the planning period results in 62 based aircraft at the airport by 2044 at a CAGR of 1.20 percent. The high-range scenario considers more aggressive growth, with 1.50 based aircraft per 1,000 residents by the end of the planning period. Applying this ratio produces 78 based aircraft by 2044.

As a point of comparison, the FAA TAF projections for based aircraft at Waupaca Municipal Airport are also included. The TAF shows no growth in based aircraft, with the count flatlined at 43 throughout the planning period; this results in a negative CAGR when considering the actual count of based aircraft in 2024. The TAF for the State of Wisconsin was also examined and the statewide growth rate for based aircraft (0.51 percent) was applied. This resulted in 54 based aircraft at Waupaca Municipal Airport by the end of the planning period.

Selected Forecast

The forecasts produce a planning envelope ranging from 49 to 78 based aircraft on the airport by 2044. With favorable trends in aircraft ownership both locally and nationally, as well as clear demand for hangar space and approximately 20 shovel-ready sites for hangar development, it is reasonable to assume a more robust growth rate for based aircraft at PCZ; therefore, the increasing market share mid-range forecast was selected as the preferred projection. With a CAGR of 1.46 percent, this forecast shows an increase of 17 based aircraft by the end of the planning period, for a total of 66 aircraft based at PCZ by 2044.

Based Aircraft Fleet Mix Forecast

It is important to understand the current and projected based aircraft fleet mix at an airport, which will ensure the planning of proper facilities in the future. The forecasted mix of based aircraft was determined by comparing existing and forecasted U.S. general aviation fleet trends to the fleet mix at the airport. The national trend in general aviation is toward a greater percentage of larger, more sophisticated aircraft as part of the national fleet. Waupaca Municipal Airport is capable of accommodating all types of general aviation aircraft, from small piston-powered aircraft up to small- and mid-size business jet aircraft.

As indicated in **Table 2J**, single-engine piston aircraft presently represent the majority of the fleet mix at the airport, comprising 88 percent of the aircraft based at PCZ. The remaining percentages account for 12 percent of multi-engine piston and jet aircraft.

TABLE 2J | Total Based Aircraft Fleet Mix

	EXISTING		FORECAST					
Aircraft Type	2024	%	2029	%	2034	%	2044	%
Single-Engine Piston	43	88%	46	87%	48	84%	54	82%
Multi-Engine Piston	4	8%	3	–	2	–	1	–
Turboprop	0	0%	2	–	3	–	4	–
Jet	2	4%	2	4%	3	5%	4	6%
Helicopter	0	0%	0	0%	1	2%	2	3%
Totals	49	100%	53	100%	57	100%	66	100%

Source: Airport records; Coffman Associates analysis

The FAA predicts that piston-powered aircraft will decline in numbers nationwide and aircraft ownership trends will shift to the more sophisticated turboprops and jets; however, it is anticipated that piston aircraft will continue to comprise the majority of the fleet mix at Waupaca Municipal Airport, with slower growth in turbine aircraft. The table details the based aircraft fleet mix projections for the airport over the next 20 years. Single-engine pistons are projected to increase from the 43 currently based at the airport to 54 by 2044. The multi-engine piston category is expected to decrease to one by the end of the planning period, in line with national trends, as no new aircraft of this type have been produced for some time.

Four turboprops, two jets, and two helicopters are anticipated to be added to the fleet mix by 2044. The "other" category, which includes experimental, ultralight, and unmanned aerial system (UAS) aircraft, is expected to remain at zero and is not shown in the table.

OPERATIONS FORECASTS

Operations at Waupaca Municipal Airport are classified as either general aviation, air taxi, or military. General aviation operations include a wide range of activities, from recreational use and flight training to business and corporate uses. Air taxi operations are those conducted by aircraft operating under Title 14 Code of Federal Regulations (CFR) Part 135, otherwise known as for-hire or on-demand activity. Military operations include operations conducted by various branches of the U.S. military.

Aircraft operations are further classified as local and itinerant. A local operation is a takeoff or landing performed by an aircraft that operates within sight of an airport or executes simulated approaches or touch-and-go operations at an airport. Local operations are generally characterized by training activity.

Itinerant operations are those performed by aircraft with a specific origin or destination away from an airport. Typically, itinerant operations increase with business and commercial use because business aircraft are used primarily to transport passengers from one location to another.

Because Waupaca Municipal Airport is not equipped with an ATCT, precise operational (takeoff and landing) counts are not available. Sources for estimated operational activity at the airport include the FAA Form 5010 Airport Master Record, the FAA TAF, and the 2030 SASP. The 2024 FAA TAF indicates a total of 20,160 operations in 2024, as does Form 5010 for the 12-month period ending June 13, 2024. In both estimates, there is an even split of local and itinerant operations, with each category comprising 49.6 percent of the total operations count. Air taxi and military operations are each estimated at 0.7 percent of the total. On a more local level, the SASP provides an estimate of 20,160 total operations, with a base year of 2010. The SASP does not categorize operations as local or itinerant.

Additional calculations to estimate annual operations were also conducted for comparison purposes. The first, Equation 15 in the FAA's *Model for Estimating General Aviation Operations at Non-Towered Airports Using Towered and Non-Towered Airport Data* factors in regional population and based aircraft data to develop a baseline operational count. When these data were input, the result was 18,014 annual operations, as shown in **Table 2K**.

TABLE 2K | FAA Model for Operations Estimates

Inputs		
Population within 25nm		212,535
Population within 100 nm		4,604,908
BA		49
BA at Airports within 100 nm		2,564
Equation 15		
Constant	775	
241 (BA)	+	11,809
0.14 (BA^2)	-	336
31,478 (% in 100 miles)	+	602
5,557 (VITFSnum)	+	0
0.001 (Pop100)	+	4,605
3,736 (WACAORAK)	-	0
12,121 (Pop25/100)	+	559
Estimate of Total Operations:	**18,014**	

BA = based aircraft
VITFSnum = # of FAR 141 pilot schools on airport
WACAORAK = 1 if WA, CA, OR, or AK; 0 otherwise

Source: GRA, Inc., Equation 15, Model for Estimating General Aviation Operations at Non-towered Airports Using Towered and Non-towered Airport Data, 2001

The second calculation multiplies validated based aircraft by an estimated number of operations per based aircraft (OPBA), as outlined in Airport Cooperative Research Program (ACRP) Report 129, *Evaluating Methods for Counting Aircraft Operations at Non-Towered Airports*. In FAA Order 5090.5, the FAA recommends using a multiplier of 350 OPBA for local GA airports. This resulted in an estimated 17,150 total annual operations.

Lastly, the FAA's Traffic Flow Management System Counts (TFMSC) database was examined to assist in determining total annual operations at PCZ. The TFMSC database captures an operation when a pilot files a flight plan and/or when a flight is detected by the National Airspace System, usually via radar. It includes documentation of commercial traffic (air carrier and air taxi), general aviation, and military aircraft. Due to certain factors (such as incomplete flight plans, limited radar coverage, and visual flight rules operations), TFMSC data do not account for all aircraft activity at an airport by a given aircraft type. The TFMSC database reports 390 operations occurring at PCZ during 2023 and offers a limited dataset.

In summary, the following are estimates of annual operations, as derived from various sources:

- FAA Form 5010 – 20,160 annual operations
- 2024 FAA TAF – 20,160 annual operations
- 2030 SASP – 20,160 (2010 base year estimate)

- FAA Equation 15 – 18,014 annual operations
- OPBA with 350 multiplier – 17,150 annual operations
- TFMSC – 390 operations (2024)

Based on activity levels in the region and at similar airports, the FAA Equation 15 estimation of 18,014 annual operations is considered to be the most in line with actual operations.

General Aviation Operations Forecast

Market Share Projections

Table 2L presents three market share forecasts for local and itinerant GA operations, based on the airport's current market share of total U.S. itinerant GA operations. In 2024, the airport held a 0.060 percent market share of national itinerant operations and 0.057 percent of the market share for local operations. The first forecast carries this figure forward as a constant through the planning period, resulting in 9,870 itinerant operations and 9,950 local operations by 2044, for CAGRs of 0.46 percent and 0.50 percent, respectively. As growth in both itinerant and local operations is expected to occur nationally, two increasing market share forecasts were also developed. The first considers a slower growth scenario with an increase to 11,100 itinerant operations and 11,600 local operations by 2044. This produced CAGRs of 1.05 percent and 1.27 percent, respectively. A faster growth scenario evaluated market shares at 0.075 percent for both itinerant and local operations. This resulted in 12,430 itinerant operations at a CAGR of 1.62 percent and 13,180 local operations at a CAGR of 1.92 percent by 2044.

TABLE 2L | Operations Forecasts – Market Share

Year	PCZ GA Itinerant	U.S. GA Itinerant	Market %	PCZ GA Local	U.S. GA Local	Market %
2024	9,007	15,125,333	0.060%	9,007	15,900,404	0.057%
Constant Market Share – Low Range						
2029	9,480	15,923,540	0.060%	9,430	16,655,425	0.557%
2034	9,610	16,133,058	0.060%	9,600	16,950,476	0.057%
2044	9,870	16,568,634	0.060%	9,950	17,570,920	0.0557%
CAGR	**0.46%**	–	–	**0.50%**	–	–
Increasing Market Share – Mid Range – SELECTED FORECAST						
2029	9,780	15,923,540	0.061%	9,820	16,655,425	0.059%
2034	10,210	16,133,058	0.063%	10,390	16,950,476	0.061%
2044	11,100	16,568,634	0.067%	11,600	17,570,920	0.066%
CAGR	**1.05%**	–	–	**1.27%**	–	–
Increasing Market Share – High Range						
2029	10,100	15,923,540	0.068%	10,200	16,655,425	0.061%
2034	10,850	16,133,058	0.071%	11,160	16,960,476	0.066%
2044	12,430	16,568,634	0.075%	13,180	17,570,920	0.075%
CAGR	**1.62%**	–	–	**1.92%**	–	–

Sources: FAA Aerospace Forecast, FY 2024–2044; Coffman Associates analysis

Other Projections

Lastly, projections presented in the FAA TAF were considered, along with the Wisconsin TAF growth rate; the TAF projections were included primarily for comparison purposes. The FAA TAF estimates both itinerant and local operations at Waupaca Municipal Airport to remain flatlined at 10,000 over the course of the planning period. The Wisconsin TAF growth rate for local operations is estimated at 0.51 percent, which results in 9,970 local operations in 2044 when applied to the base year count.

Exhibit 2E presents graphs of the itinerant and local GA operations projections, while **Table 2M** summarizes each forecast. In terms of itinerant operations, the forecasts present a planning envelope ranging from 9,240 (Wisconsin TAF growth rate forecast) to 10,100 itinerant operations (high-range market share forecast). Local operations show a very similar scenario, ranging from 9,240 (Wisconsin TAF growth rate) to 10,200 (high-range market share forecast) local operations. With growth in itinerant and local operations anticipated both nationally and regionally, it is reasonable to assume a moderate increase in this type of traffic over the next 20 years. As such, the mid-range increasing market share forecast is the selected projection for each operational category. For itinerant operations, this is reflective of a 1.05 percent CAGR, or 11,100 operations by the end of the planning period; for local operations, the result is 11,600 operations at a CAGR of 1.27 percent. Overall, this represents a somewhat conservative, yet realistic, growth scenario. Combined, these forecasts illustrate growth from an estimated 18,014 total GA operations in 2024 to 22,700 total operations by 2044: an increase of 4,686 operations.

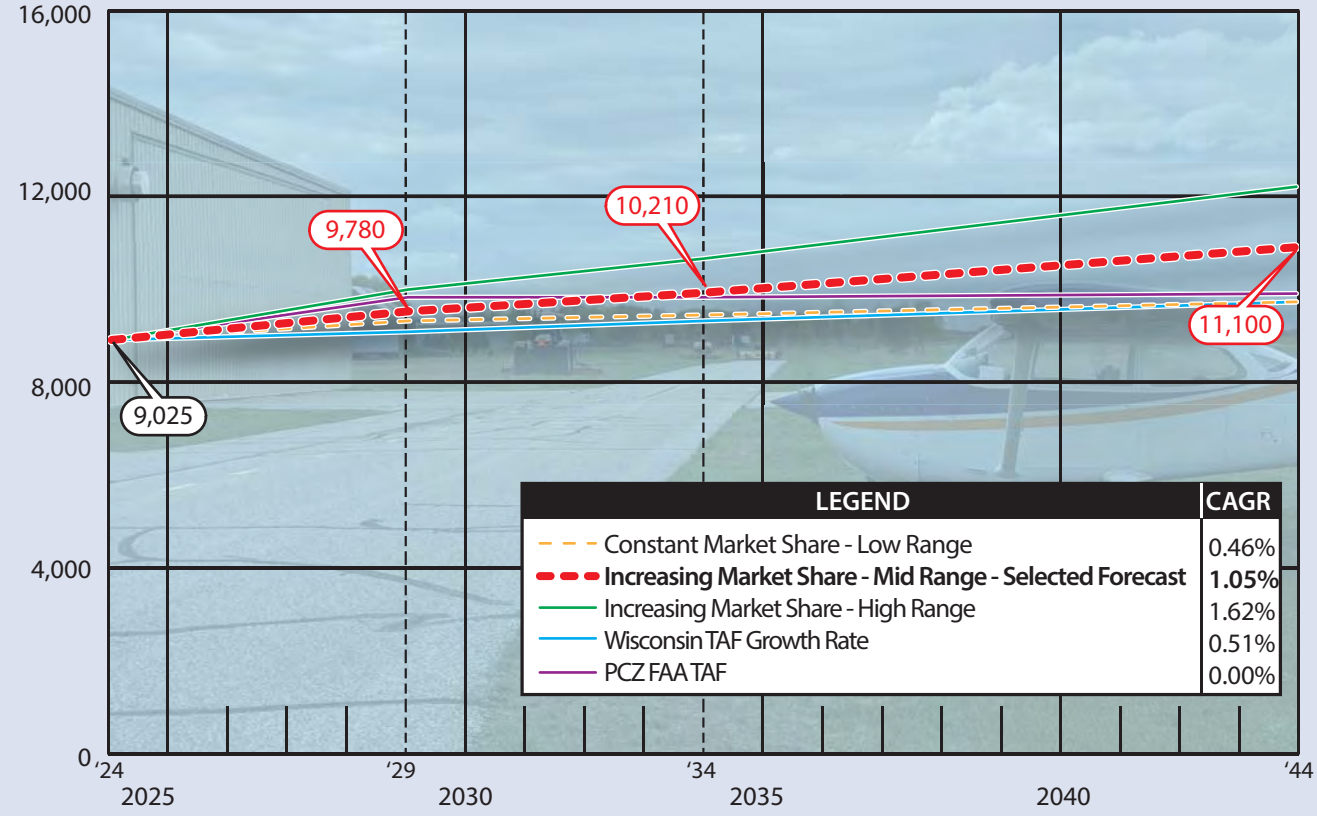
TABLE 2M | PCZ Operations Forecast Summary

Projections	2029	2034	2044	CAGR
Itinerant GA				
Constant Market– Low Range	9,480	9,610	9,870	0.46%
Increasing Market – Mid Range	**9,780**	**10,210**	**11,100**	**1.05%**
Increasing Market – High Range	10,100	10,850	12,430	1.62%
Wisconsin TAF Growth Rate	9,240	9,480	9,970	0.51%
PCZ FAA TAF	10,000	10,000	10,000	0.00%
Local GA				
Constant Market – Low Range	9,430	9,600	9,950	0.50%
Increasing Market – Mid Range	**9,820**	**10,390**	**11,600**	**1.27%**
Increasing Market – High Range	10,200	11,160	13,180	1.92%
Wisconsin TAF Growth Rate	9,240	9,480	9,970	0.51%
PCZ FAA TAF	10,000	10,000	10,000	0.00%

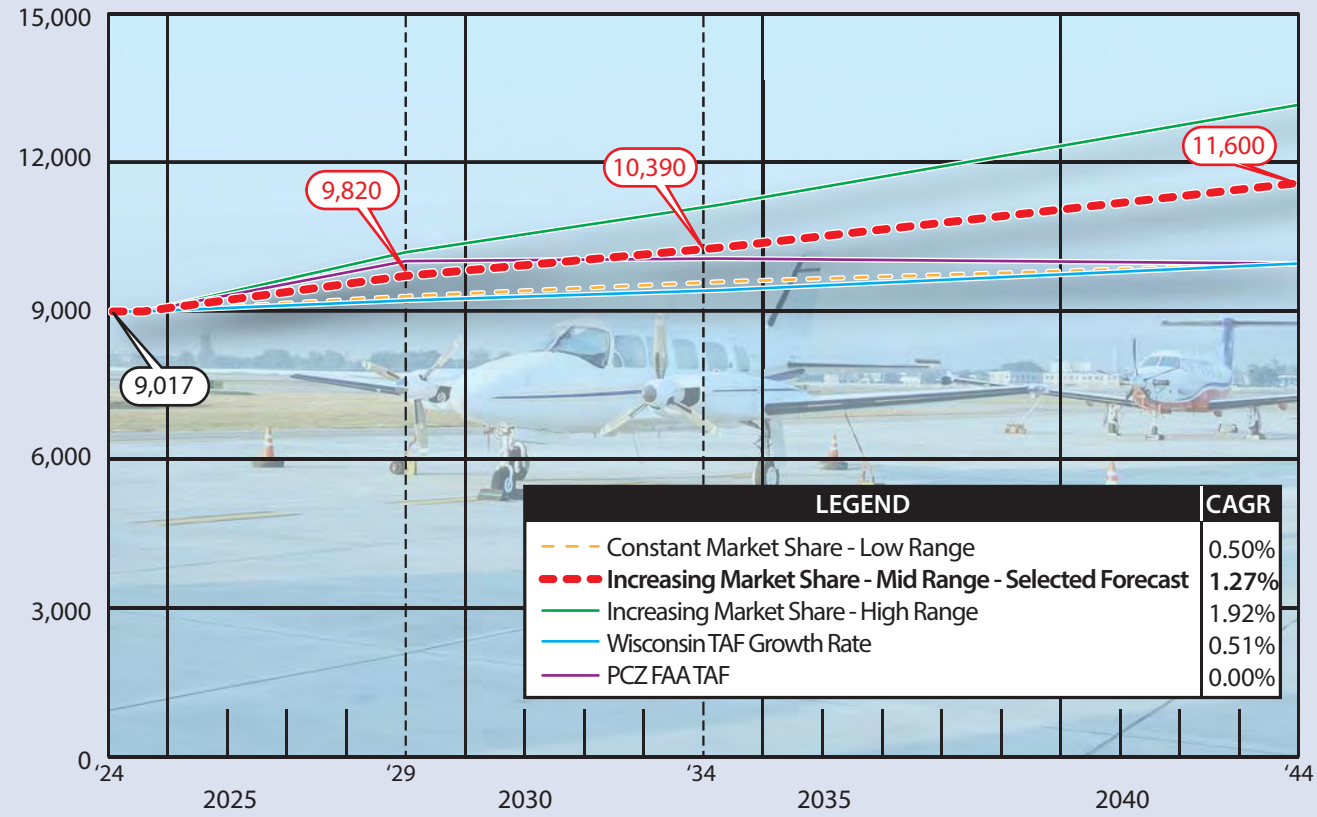
Air Taxi Operations Forecast

The air taxi category, which is a subset of the itinerant operations category, is comprised of operations that are conducted by aircraft operating under 14 CFR Part 135. Part 135 operations are for-hire or on-demand and include charter and commuter flights, air ambulance operations, or fractional ownership aircraft operations. The FAA projects a 0.7 percent CAGR increase in air taxi operations between 2024 and 2044. The primary reasons for this increase are the technological advancements of the electric vertical takeoff and landing aircraft (eVTOL) and the continued national growth in the business jet segment of the air taxi category.

Itinerant GA Forecasts



Local GA Forecasts



The FAA TAF and Form 5010 both report 150 air taxi operations. AirportIQ, a private party vendor that tracks Part 135 operations, was consulted to determine a more accurate air taxi operational count. Over the last 10 years, air taxi operations (as reported by AirportIQ at PCZ) have fluctuated to some degree, but overall have remained low, as shown in **Table 2N**.

TABLE 2N | Historical and Projected Air Taxi Operations

Year	Air Taxi Operations
2014	12
2015	12
2016	28
2017	8
2018	6
2019	8
2020	8
2021	8
2022	8
2023	16
2024	18
Air Taxi Operations Forecast	
2029	25
2034	35
2044	70

Source: AirportIQ

These operations are generally tabulated based on flight plans filed under instrument flight rules (IFR). These operations generally depart and arrive fully under IFR, while some operators depart under visual flight rules (VFR) and then file IFR flight plans in the air after departure, or cancel IFR flight plans en route prior to landing. Either condition would likely remove such an operation from the AirportIQ dataset. For this reason, and due to the generally low number of this type of operation, a growth rate projection utilizing the FAA national air taxi operational growth rate of 0.7 percent has been carried forward for each of the plan years. This forecast yields a total of 70 air taxi operations by 2044 and a CAGR of 0.7 percent.

Military Operations Forecast

Military aircraft can and do utilize civilian airports across the country, including Waupaca Municipal Airport; however, it is inherently difficult to project future military operations due to their national security nature and the fact that military missions can change without notice, so it is typical for the FAA to use a flat-line number for military operations. For this planning study, military operations at Waupaca Municipal Airport are projected to stay constant at 10 itinerant operations through the plan years and will likely constitute helicopter activity.

Peak Period Forecasts

Peaking characteristics play an important role in determining airport capacity and facility requirements. Because Waupaca Municipal Airport does not have an airport traffic control tower, the generalized peaking characteristics of other non-towered general aviation airports have been used for the purposes of this study. The peaking periods used to develop the capacity analysis and facility requirements are described below.

- Peak month – the calendar month in which traffic activity is the highest
- Design day – the average day in the peak month, derived by dividing the peak month by the number of days in the month
- Design hour – the average hour within the design day
- Busy day – the busiest day of a typical week in the peak month

For the purposes of this study, the peak month for total operations was estimated at 10 percent of the annual operations. By 2044, the estimated peak month is projected to reach 2,286 operations. The design day is estimated by dividing the peak month by the number of days in the month (31), and the busy day is calculated at 1.25 times the design day. The design hour is then calculated at 15 percent of the design day. These projections are included in **Table 2P**.

TABLE 2P | Peak Period Forecasts – Waupaca Municipal Airport

	2024	2029	2034	2044
Annual	18,042	19,635	20,645	22,780
Peak Month	1,804	1,964	2,065	2,278
Design Day	58	63	67	73
Design Hour	9	10	10	11
Busy Day	73	79	82	89

Source: Coffman Associates analysis

FORECAST SUMMARY

This chapter has outlined the various activity levels that might reasonably be anticipated over the planning period. **Exhibit 2F** presents a summary of the aviation forecasts prepared in this chapter. The base year for these forecasts is 2024, with a 20-year planning horizon to 2044. The primary aviation demand indicators are based aircraft and operations. Based aircraft at Waupaca Municipal Airport are forecasted to increase from 49 in 2024 to 66 by 2044 (1.50 percent CAGR). Total operations are forecasted to increase from 18,042 in 2024 to 22,800 by 2044 (1.20 percent CAGR).

Projections of aviation demand will be influenced by unforeseen factors and events in the future; therefore, it is not reasonable to assume that future demand will follow the exact projection line, but forecasts of aviation demand tend to fall within the planning envelope over time. The forecasts developed for this master planning effort are considered reasonable for planning purposes. The need for additional facilities will be based on these forecasts; however, if demand does not materialize as projected, implementation of facility construction can be slower. Likewise, if demand exceeds these forecasts, the airport may accelerate construction of new facilities.

FORECAST COMPARISON TO THE FAA TAF

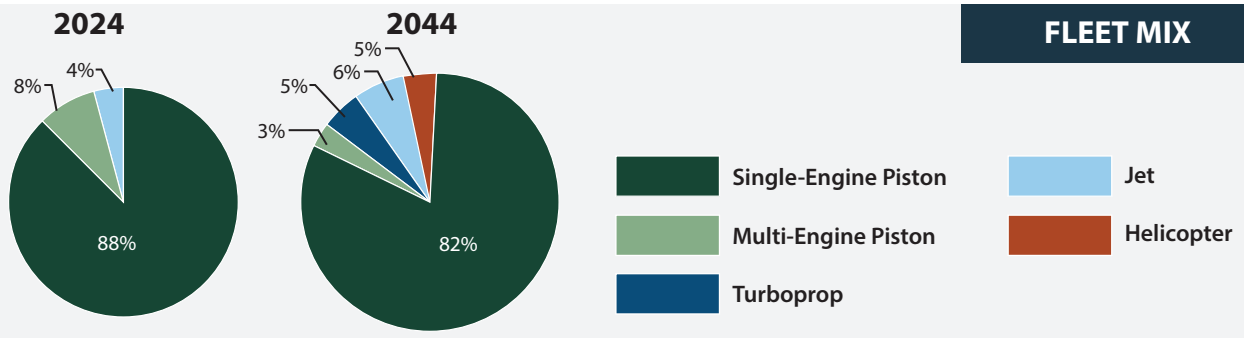
Historically, forecasts have been submitted to the FAA for evaluation and comparison to the TAF. The FAA has preferred that forecasts differ by less than 10 percent in the five-year period and less than 15 percent in the 10-year period. Where the forecasts differ, supporting documentation was necessary to justify the difference.

Table 2Q presents a summary of the selected forecasts and a comparison to the FAA TAF. The direct comparison between the master plan forecasts and the TAF is presented at the bottom of the table. The operations forecast is within the TAF tolerance for both the five-year and 10-year periods.

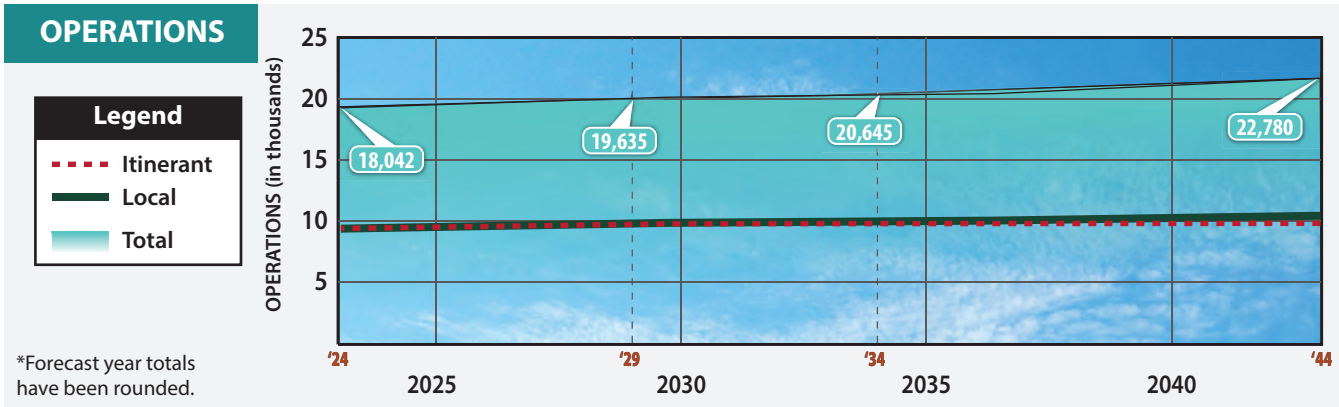
In terms of based aircraft, the master plan forecast is outside the TAF tolerance for both the five- and 10-year periods. This is due primarily to the TAF count being well below the current FAA-validated based aircraft count for the base year, as well as the FAA TAF flatlined growth projection for based aircraft over the next 20 years.

	Base Year	Forecast		
	2024	2029	2034	2044
OPERATIONS				
Itinerant				
Air Carrier	0	0	0	0
Air Taxi	18	25	35	70
General Aviation, Itinerant	9,007	9,780	10,210	11,100
Total Itinerant	***9,025***	***9,805***	***10,245***	***11,170***
Local				
General Aviation, Local	9,007	9,820	10,390	11,600
Military, Local	10	10	10	10
Total Local	***9,017***	***9,830***	***10,400***	***11,610***
TOTAL OPERATIONS	**18,042**	**19,635**	**20,645**	**22,780**
PEAKING				
Total Annual Operations	18,042	19,635	20,645	22,780
Peak Month	1,804	1,964	2,065	2,278
Design Day	58	63	67	73
Design Hour	9	10	10	11
Busy Day	73	79	82	89
BASED AIRCRAFT				
Single-Engine	43	46	48	54
Multi-Engine	4	4	3	3
Turboprop	0	1	2	3
Jet	2	2	3	4
Helicopter	0	0	1	2
TOTAL PCZ BASED AIRCRAFT	**49**	**53**	**57**	**66**

FLEET MIX



OPERATIONS



*Forecast year totals have been rounded.

TABLE 2Q | Comparison of Master Plan Forecasts to FAA TAF

	2024	2029	2034	2044	CAGR
Total Operations					
Master Plan Forecast	18,042	19,635	20,645	22,780	1.20%
TAF	20,160	20,160	20,160	20,160	0.0%
% Difference:	**11.1%**	**2.6%**	**2.4%**	**12.2%**	**–**
Based Aircraft					
Master Plan Forecast	49	53	57	66	1.46%
TAF	43	43	43	43	0.0%
% Difference:	**13.0%**	**20.8%**	**28.0%**	**42.2%**	**–**

AIRCRAFT/AIRPORT/RUNWAY CLASSIFICATION

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

AIRCRAFT CLASSIFICATION

The selection of appropriate FAA design standards for the development and location of airport facilities is based primarily on the characteristics of the aircraft that currently use or are expected to use at an airport. The critical aircraft is used to define the design parameters for an airport. The critical aircraft may be a single aircraft type or a composite aircraft that represents a collection of aircraft with similar characteristics. The critical aircraft is classified by three parameters: aircraft approach category (AAC), airplane design group (ADG), and taxiway design group (TDG). FAA AC 150/5300-13B, *Airport Design*, describes the following airplane classification systems, the parameters of which are presented on **Exhibit 2G**.

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

The AAC generally refers to the approach speed of an aircraft in landing configuration. The higher the approach speed, the more restrictive the applicable design standards are. The AAC is depicted by a letter (A through E) and relates to aircraft approach speed (operational characteristics). The AAC generally applies to runways and runway-related facilities, such as runway width, runway safety area (RSA), runway object free area (ROFA), runway protection zone (RPZ), and separation standards.

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

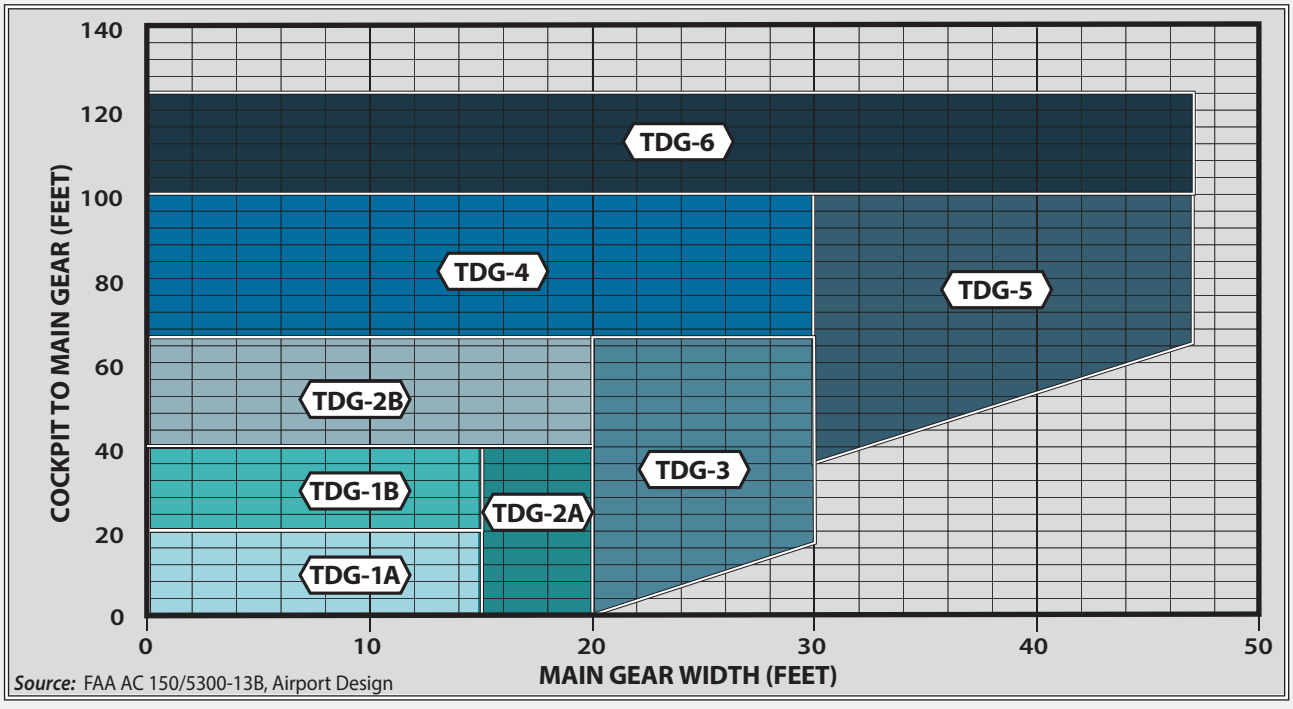
AIRCRAFT APPROACH CATEGORY (AAC)	
Category	**Approach Speed**
A	Less than 91 knots
B	91 knots or more but less than 121 knots
C	121 knots or more but less than 141 knots
D	141 knots or more but less than 166 knots
E	166 knots or more

AIRPLANE DESIGN GROUP (ADG)		
Group #	**Tail Height (ft)**	**Wingspan (ft)**
I	<20	<49
II	20≤30	49≤79
III	30≤45	79≤118
IV	45≤60	118≤171
V	60≤66	171≤214
VI	66≤80	214≤262

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

***RVR**: Runway Visual Range

TAXIWAY DESIGN GROUP (TDG)



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

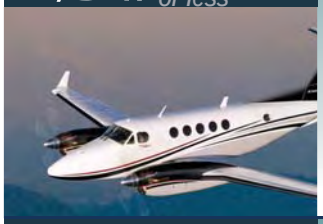
A-I

Aircraft	TDG
• Beech Baron 55	1A
• **Beech Bonanza**	**1A**
• Cessna 150, 172	1A
• Eclipse 500	1A
• Piper Archer, Seneca	1A

B-I

• **Beech Baron 58**	**1A**
• Beech King Air 90	1A
• Cessna 421	1A
• Cessna Citation CJ1 (525)	1A
• Cessna Citation 1(500)	2
• Embraer Phenom 100	1B

A/B-II *12,500 lbs. or less*



• **Beech Super King Air 200**	**2**
• Cessna 441 Conquest	1A
• Cessna Citation CJ2 (525A)	2
• Pilatus PC-12	1A

B-II *over 12,500 lbs.*

• Beech Super King Air 350	2
• Cessna Citation CJ3(525B), Bravo (550), V (560)	2
• **Cessna Citation CJ4 (525C)**	**1B**
• Cessna Citation Latitude/Longitude	1B
• Embraer Phenom 300	1B
• Falcon 10, 20, 50	1B
• Falcon 900, 2000	2
• Hawker 800, 800XP, 850XP, 4000	1B
• Pilatus PC-24	1B

A/B-III

• Bombardier Dash 8	3
• **Bombardier Global 5000**, 6000, 7000, 8000	**2**
• Falcon 6X, 7X, 8X	2

Note: Aircraft pictured is identified in bold type.

C/D-I

Aircraft	TDG
• **Lear** 25, 31, 45, 55, **60**	**1B**
• Learjet 35, 36 (D-I)	1B

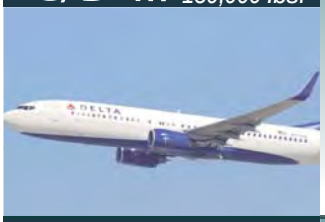
C/D-II

• Challenger 600/604/ 800/850	1B
• Cessna Citation VII, X+	1B
• Embraer Legacy 450/500	1B
• **Gulfstream IV**, 350, 450 (D-II)	**2**
• Gulfstream G200/G280	1B
• Lear 70, 75	1B

C/D-III *less than 150,000 lbs.*

• Gulfstream V	2
• **Gulfstream** G500, 550, 600, **650 (D-III)**	**2**

C/D-III *over 150,000 lbs.*



• Airbus A319-100, 200	3
• **Boeing 737 -800**, 900, BBJ2 (D-III)	**3**
• MD-83, 88 (D-III)	4

C/D-IV

• Airbus A300-100, 200, 600	5
• Boeing 757-200	4
• **Boeing 767**-300, **400**	**5**
• MD-11	6

D-V

• Airbus A330-200, 300	5
• Airbus A340-500, 600	6
• Boeing 747-100 - 400	5
• Boeing 777-300	6
• **Boeing 787-8**, 9	**5**

Taxiway Design Group (TDG) | The TDG is a classification of airplanes based on outer-to-outer main gear width (MGW) and cockpit to main gear (CMG) distance. The TDG relates to the undercarriage dimensions of the critical aircraft. The TDG is classified by an alphanumeric system: 1A, 1B, 2A, 2B, 3, 4, 5, 6, and 7. The taxiway design elements determined by the application of the TDG include the taxiway width, taxiway edge safety margin, taxiway shoulder width, taxiway fillet dimensions, and (in some cases) separation distance between parallel taxiways/taxilanes. Other taxiway elements – such as the taxiway safety area (TSA), taxiway/taxilane object free area (TOFA), taxiway/taxilane separation to parallel taxiway/taxilanes or fixed or movable objects, and taxiway/taxilane wingtip clearances – are determined solely based on the wingspan (ADG) of the critical aircraft that utilizes those surfaces. It is appropriate for taxiways to be planned and built to different TDG standards, based on expected use.

The second page of **Exhibit 2G** summarizes the classifications of the most common aircraft in operation today. Generally, recreational and business piston and turboprop aircraft will fall in AAC A and B, and ADG I and II. Business jets typically fall in AAC B and C, while the larger commercial aircraft will fall in AAC C and D.

AIRPORT AND RUNWAY CLASSIFICATIONS

Along with the previously defined aircraft classifications, airport and runway classifications are used to determine the appropriate FAA design standards to which airfield facilities should be designed and built.

Runway Design Code (RDC) | The RDC is a code that signifies the design standards to which the runway is to be built. The RDC is based on planned development and has no operational component.

The AAC, ADG, and runway visual range (RVR) are combined to form the RDC of a runway. The RDC provides the information needed to determine certain applicable design standards. The first component, depicted by a letter, is the AAC and relates to aircraft approach speed (operational characteristics). The second component, depicted by a Roman numeral, is the ADG and relates to either the aircraft wingspan or tail height (physical characteristics), whichever is most restrictive. The third component relates to the available instrument approach visibility minimums, expressed by RVR values in feet of 1,200 (⅛-mile), 1,600 (¼-mile), 2,400 (½-mile), 4,000 (¾-mile), and 5,000 (1-mile). The RVR values approximate standard visibility minimums for instrument approaches to the runways. The third component is labeled “VIS” for runways that are designed for visual approach use only.

Approach Reference Code (APRC) | The APRC is a code that signifies the current operational capabilities of a runway and associated parallel taxiway with regard to landing operations. Like the RDC, the APRC is composed of the AAC, ADG, and RVR. The APRC describes the current operational capabilities of a runway under particular meteorological conditions in which no special operating procedures are necessary, whereas the RDC is based on planned development and has no operational component. The APRC for a runway is established based on the minimum runway-to-taxiway centerline separation.

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

Airport Reference Code (ARC) | The ARC is an airport designation that signifies the airport's highest RDC minus the third (visibility) component of the RDC. The ARC is used for planning and design only and does not limit the aircraft that may be able to operate safely at an airport. The current airport layout plan (ALP) for Waupaca Municipal Airport identifies the existing ARC as C-II.

CRITICAL AIRCRAFT

The selection of appropriate FAA design standards for the development and location of airport facilities is based primarily on the characteristics of the aircraft that currently use or are expected to use an airport. The critical aircraft is used to define the design parameters for an airport. The critical aircraft may be a single aircraft or a composite aircraft that represents a collection of aircraft classified by the three parameters: AAC, ADG, and TDG.

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

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

According to FAA AC 150/5300-13B, *Airport Design*, "airport designs based only aircraft currently using the airport can severely limit the airport's ability to accommodate future operations of more demanding aircraft. Conversely, it is not practical or economical to base airport design on aircraft that will not realistically use the airport." Selection of the current and future critical aircraft must be realistic in nature and supported by current data and realistic projections.

LOCAL AIRPORT DATA

Waupaca Municipal Airport provided local airport data regarding the traffic counts over the last two years. The data analyzed included the numbers of passengers, operations, jet/turbo aircraft, piston aircraft, based aircraft, and transient aircraft at PCZ, as well as the numbers of total aircraft that used Runways 10-28 and 13-31. **Table 2R** summarizes the local data provided by Waupaca Municipal Airport.

The data in **Table 2R** represent local data that Waupaca Municipal Airport has collected over the last two full years. The last table contains data for January through June 2024. Multiple categories of data are provided, including the numbers of passengers, operations, different types of aircraft (jet/turboprop piston), and based aircraft, as well as the usage that both runways experience. Within each category, all total numbers from 2022 through 2023 have shown an increase. It should be noted that Runway 10-28 receives much more usage than Runway 13-31. The number of jet and turboprop aircraft are the biggest driver for what the critical aircraft could be. The next section will discuss critical aircraft at the airport.

TABLE 2R | Waupaca Local Data

Month	Passengers	Operations	Jet/Turbo	Piston	Based	Transient	Runway 13-31	Runway 10-28
2022								
January	134	226	7	94	30	63	40	64
February	147	281	3	92	55	40	22	80
March	164	288	6	93	39	60	22	90
April	161	266	7	102	34	76	7	103
May	172	349	11	107	106	93	54	175
June	372	675	21	185	55	151	89	539
July	565	668	25	291	71	262	34	325
August	399	1030	14	234	97	152	57	344
September	381	438	29	153	95	105	14	172
October	356	454	21	175	102	103	48	141
November	350	376	18	129	75	69	14	133
December	210	85	10	84	49	31	16	85
Total	**3,411**	**5,136**	**172**	**1,739**	**808**	**1,205**	**417**	**2,251**
2023								
January	98	112	7	37	26	18	8	38
February	326	446	11	150	67	78	27	145
March	301	519	7	166	80	95	24	148
April	351	530	22	152	79	91	38	137
May	544	507	30	261	138	150	56	241
June	521	647	13	265	111	166	20	259
July	742	845	32	358	131	258	51	350
August	553	775	15	288	122	165	19	291
September	425	622	47	217	123	106	56	176
October	514	574	22	203	117	107	38	193
November	485	515	16	231	109	135	21	228
December	394	633	15	203	91	128	71	190
Total	**5,254**	**6,725**	**237**	**2,531**	**1,194**	**1,497**	**429**	**2,396**
2024*								
January	222	353	5	103	59	49	13	96
February	499	753	5	262	119	150	27	247
March	503	678	13	251	122	141	29	246
April	405	479	16	185	105	82	22	183
May	527	673	12	288	138	161	24	278
June	500	552	11	252	130	129	38	225
Total	**2,656**	**3,488**	**62**	**1,341**	**673**	**712**	**153**	**1,275**

*January through June 2024

AIRPORT CRITICAL AIRCRAFT

Three elements are used for classifying the airport critical aircraft: AAC, ADG, and TDG. The AAC and ADG are examined first, followed by the TDG.

As discussed, the FAA's TFMSC database captures certain operations (i.e., those for which a flight plan is filed and those detected by radar). While the TFMSC data do not account for all aircraft activity at an airport by a given aircraft type, the TFMSC provides an accurate reflection of IFR activity. Operators of high-performance aircraft, such as turboprops and jets, tend to file flight plans at a high rate.

Exhibit 2H presents the TFMSC operational mix at the airport for turbine aircraft operations over the last 10 years. As the exhibit shows, there has been limited reporting of activity by turboprops and business jets, and no single aircraft or family of aircraft has conducted 500 or more operations at the airport over the last 10 years. In 2023, the greatest number of operations in any single design family was 306 by aircraft in the B-II category. The Citation XLS conducted 194 out of the 306 total operations for B-II aircraft, or approximately 63 percent in 2023: the most operations of any aircraft in the B-II category.

According to the TFMSC data, operations conducted by AAC/ADG B-II aircraft have consistently exceeded or neared the threshold of 500 annual operations over the past 10 years; therefore, the existing critical aircraft for Waupaca Municipal Airport is determined to fall within ARC B-II, with the Citation XLS serving as the representative aircraft. The ultimate critical aircraft category has been determined as C-II. This is consistent with the current ALP and reflects existing and forecasted national trends of more frequent operations by larger and faster business jets within the fleet mix. It should be noted that single-engine pistons will likely continue to lead in terms of operations at the airport over the planning period, with some turboprop and jet operations.

Airport Critical Aircraft Summary

While previous planning determined the existing and ultimate critical aircraft to be within the C-II category, more specific information has become available regarding the types of aircraft that most frequently operate at Waupaca Municipal Airport (i.e., the TFMSC). Based on these recent data, the current AAC is identified as B and the current ADG is II. Over the last 10 years, the most active B-II airplane at Waupaca Municipal Airport has been the Citation XLS; therefore, the current critical aircraft for Waupaca Municipal Airport is classified as B-II, represented by the Citation XLS. C-II aircraft, such as the Bombardier and Falcon aircraft families, also currently operate at the airport. As the national fleet mix evolves to include more turboprop and jet aircraft, these aircraft families are likely to operate more frequently at PCZ in the coming years; as such, the ultimate critical aircraft is planned to be represented by the Bombardier Challenger 300 within the C-II category.

RUNWAY DESIGN CODE

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

Runway 10-28 | As the primary runway, Runway 10-28 should be designed to accommodate the overall airport design aircraft. Runway 10-28 is 5,200 feet long by 100 feet wide and has non-precision instrument approaches, with visibility minimums as low as ¾-mile serving Runway 10 and as low as one-mile serving Runway 28. It has been established that the current critical aircraft falls within ARC B-II; therefore, when factoring in the RVR, the existing RDC for Runway 10-28 is B-II-4000, while the ultimate RDC is classified as C-II-4000.

Runway 13-31 | Runway 13-31 is the airport's crosswind runway. It measures 3,899 feet long by 75 wide and does not currently offer instrument approach capability. Presently, the RDC for Runway 13-31 is classified as B-II-VIS (visual approach capability only), as indicated on the current ALP. This runway is

ARC	Aircraft	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
A-I	Cirrus Vision Jet	0	0	0	4	16	18	4	10	34	38
	Kodiak Quest	0	0	0	0	2	0	0	2	0	0
	Lancair Evolution/Legacy	0	0	2	2	0	2	0	0	0	0
	Piper Malibu/Meridian	4	0	0	0	2	4	0	2	0	0
	Socata TBM 7/850/900	6	2	0	0	4	6	6	14	8	2
	Total	10	2	2	6	24	30	10	28	42	40
A-II	Cessna Caravan	0	4	0	0	0	2	0	2	0	0
	Pilatus PC-12	2	2	2	4	2	0	0	6	8	6
	Total	2	6	2	4	2	2	0	8	8	6
B-I	Beechjet 400	2	2	0	2	2	4	4	0	0	0
	Cessna 425 Corsair	0	0	0	0	0	0	0	0	2	0
	Challenger 300	0	0	0	0	0	0	0	2	0	0
	Citation CJ1	4	4	0	0	2	2	24	8	10	4
	Citation I/SP	44	20	52	6	0	0	0	2	4	2
	Citation M2	0	0	0	0	0	2	0	0	4	0
	Citation Mustang	2	4	0	0	2	2	2	4	6	2
	Eclipse 400/500	2	0	0	0	0	0	0	14	2	4
	Learjet 31	0	0	0	0	0	0	0	4	0	0
	Mitsubishi MU-2	2	0	0	0	0	0	0	0	0	0
	Piper Cheyenne	2	4	6	0	0	4	0	0	0	0
	Premier 1	0	0	2	0	0	0	0	0	0	0
	Total	58	34	60	8	6	14	30	34	28	12
B-II	Cessna Conquest	0	0	6	2	2	0	2	4	0	2
	Citation CJ2/CJ3/CJ4	2	4	0	2	2	0	2	0	6	10
	Citation II/SP/Latitude	2	0	2	2	2	4	0	8	12	0
	Citation V/Sovereign	236	256	284	196	248	226	126	144	146	72
	Citation XLS	304	196	154	218	176	198	202	170	182	194
	King Air 200/300/350	16	6	14	14	20	0	10	8	18	10
	King Air 90/100	26	30	24	18	32	86	78	64	42	14
	King Air F90	0	0	0	0	0	0	0	0	2	0
	No Data	24	12	0	0	0	0	0	0	0	0
	Phenom 300	0	0	6	4	0	2	2	6	2	4
	Pilatus PC-24	0	0	0	0	0	0	0	0	2	0
	Total	610	504	490	456	482	516	422	404	412	306
C-I	Learjet 35/36	0	4	0	2	0	0	0	0	0	0
	Learjet 40 Series	0	4	0	0	0	0	0	0	0	0
	Westwind II	0	2	0	0	6	0	0	2	0	0
	Total	0	10	0	2	6	0	0	2	0	0
C-II	Challenger 300	0	0	0	0	0	0	0	0	4	0
	Challenger 600/604	0	2	4	0	0	0	0	0	6	0
	Citation III/VI	0	2	0	2	0	0	0	0	0	0
	Citation X	2	0	0	0	0	0	0	0	0	0
	Embraer ERJ-135/140/145	2	2	0	0	0	0	0	0	0	0
	Falcon 20/50	22	12	0	0	0	0	0	0	0	0
	Falcon 2000	0	0	0	0	0	0	0	0	0	2
	Falcon 900	0	0	0	0	0	0	0	0	2	0
	Gulfstream 100/150	0	0	0	0	0	0	2	0	0	2
	Hawker 800 (Formerly Bae-125-800)	2	2	2	2	2	0	0	0	0	0
	Learjet 70 Series	0	0	0	2	0	0	0	0	0	0
	No Data	0	0	26	16	2	20	16	24	22	22
	Total	0	4	6	8	6	6	10	12	12	34
C-III	Boeing 737 (200 thru 700 series)	2	0	0	0	0	0	0	0	0	0
	Total	2	0	0	0	0	0	0	0	0	0
D-I	T-38 Talon	2	0	0	0	0	0	0	0	0	0
	Total	2	0	0	0	0	0	0	0	0	0
D-II	Bombardier CRJ 100/200/700	2	0	0	0	0	0	0	0	0	0
	Total	2	0	0	0	0	0	0	0	0	0
D-III	Bombardier CRJ 900/1000	2	0	0	0	0	0	0	0	0	0
	Total	2	0	0	0	0	0	0	0	0	0

AIRPORT REFERENCE CODE (ARC) SUMMARY

ARC CODE	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
A-I	10	2	2	6	24	30	10	28	42	40
A-II	2	6	2	4	2	2	0	8	8	6
B-I	58	34	60	8	6	14	30	34	28	12
B-II	610	504	490	456	482	516	422	404	412	306
C-I	0	10	0	2	6	0	0	2	0	0
C-II	28	20	32	22	4	20	18	24	34	26
C-III	2	0	0	0	0	0	0	0	0	0
D-I	2	0	0	0	0	0	0	0	0	0
D-II	2	0	0	0	0	0	0	0	0	0
D-III	2	0	0	0	0	0	0	0	0	0
Total	**716**	**576**	**586**	**498**	**524**	**582**	**480**	**500**	**524**	**390**

Approach Category

AC	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
A	12	8	4	10	26	32	10	36	50	46
B	668	538	550	464	488	530	452	438	440	318
C	30	30	32	24	10	20	18	26	34	26
D	6	0	0	0	0	0	0	0	0	0
Total	**716**	**576**	**586**	**498**	**524**	**582**	**480**	**500**	**524**	**390**

Design Group

DG	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
I	70	46	62	16	36	44	40	64	70	52
II	642	530	524	482	488	538	440	436	454	338
III	4	0	0	0	0	0	0	0	0	0
Total	**716**	**576**	**586**	**498**	**524**	**582**	**480**	**500**	**524**	**390**

Source: TFMSC 2014-2023. Data normalized annually.

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designed to meet the minimum requirements for AAC B aircraft that utilize the airport; however, as part of this master plan, the continued eligibility of this runway will be examined based on the FAA's wind coverage requirements for crosswind components up to 10.5 knots (to be discussed in the next chapter).

APPROACH AND DEPARTURE REFERENCE CODES

The approach and departure reference codes (APRC and DPRC) describe the current operational capabilities of each runway and the adjacent parallel taxiways, where no special operating procedures are necessary. Essentially, the APRC and DPRC describe the current conditions at an airport in runway classification terms when considering the parallel taxiway.

AIRPORT AND RUNWAY CLASSIFICATION SUMMARY

Table 2S summarizes the current and future airport and runway classifications. The existing critical aircraft is now defined by those aircraft in ARC B-II, with a transition to ARC C-II by the end of the planning period or beyond.

TABLE 2S | Airport and Runway Classifications

	Runway 10-28		Runway 13-31
	Existing	Ultimate	Existing & Ultimate
Airport Reference Code (ARC)	B-II	C-II	B-I(S)
Airport Critical Aircraft	B-II-2A	C-II-2A	TBD
Critical Aircraft (Typ.)	Citation XLS	Challenger 300	–
Runway Design Code (RDC)	B-II-4000	C-II-4000	–
Approach Reference Code (APRC)	D/IV/4000 & D/V/4000		–
Departure Reference Code (DPRC)	D/IV & D/V		–
Taxiway Design Group (TDG)	2A		TBD
*Eligibility for Runway 13-31 will be further examined in the Facility Requirements chapter			

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

SUMMARY

This chapter has outlined the various activity levels that might reasonably be anticipated over the planning period, as well as the critical aircraft for the airport. Total based aircraft are forecasted to grow from 49 in 2024 to 66 by 2044. Operations are forecasted to grow from an estimated 18,042 in 2024 to 22,780 by 2044. The projected growth is driven by the FAA's positive outlook for general activity nationwide, as well as generally positive outlooks for the region.

The critical aircraft for the airport was determined by examining the FAA's TFMSC database of flight plans. The current critical aircraft is described as B-II, with the Citation XLS serving as the representative aircraft. The ultimate critical aircraft is planned to transition to the C-II family, represented by the Bombardier Challenger 300.

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

Chapter 3

Facility Requirements

Chapter 3
Facility Requirements

Proper airport planning requires the translation of forecast aviation demand into the specific types and quantities of facilities that can adequately serve the identified demand. This chapter will analyze the existing capacities of facilities at Waupaca Municipal Airport (PCZ). The existing capacities will then be compared to the forecast activity levels prepared in Chapter Two to determine the adequacy of the existing facilities and identify whether deficiencies currently exist or may be expected to materialize in the future. This chapter presents the following elements:

- Planning horizon activity levels
- Airfield capacity
- Airport physical planning criteria
- Airside and landside facility requirements

This exercise is intended to identify the adequacy of existing airport facilities, outline what new facilities may be needed, and determine when new facilities may be needed to accommodate forecasted demand. Once the facility needs have been identified, various alternatives for providing these facilities will be detailed for both the airside and the landside. Each alternative will be evaluated to determine the most feasible, cost-effective, and efficient means for implementation.

The facility requirements for Waupaca Municipal Airport were evaluated using guidance contained in several Federal Aviation Administration (FAA) publications, including the following:

- FAA Advisory Circular (AC) 150/5300-13B, *Airport Design*, Change 1
- AC 150/5060-5, *Airport Capacity and Delay*
- AC 150/5325-4B, *Runway Length Requirements for Airport Design*
- Federal Aviation Regulation (FAR) Part 77, *Objects Affecting Navigable Airspace*
- FAA Order 5090.5, *Formulation of the National Plan of Integrated Airport Systems* (*NPIAS) and the Airports Capital Improvement Plan (ACIP)*

DEMAND-BASED PLANNING HORIZONS

An updated set of aviation demand forecasts for Waupaca Municipal Airport was established and detailed in Chapter Two. These activity forecasts include annual aircraft operations, based aircraft, aircraft fleet mix, and peaking characteristics. With this information, specific components of the airfield and landside system can be evaluated to determine their capacity to accommodate future demand.

Cost-effective, efficient, and orderly development of an airport should be based more on actual demand at an airport than on a time-based forecast figure. To develop a master plan that is demand-based, rather than time-based, a series of planning horizon milestones has been established that takes into consideration the reasonable range of aviation demand projections. The planning horizons are the short term (years 1–5), the intermediate term (years 6–10), and the long term (years 11–20).

It is important to consider that the actual activity at the airport may be higher or lower than what the annualized forecast portrays. By planning according to activity milestones, the resultant plan can accommodate unexpected shifts or changes in the area's aviation demand by allowing airport management the flexibility to make decisions and develop facilities based on need generated by actual demand levels, rather than dates in time. The demand-based schedule provides flexibility in development, as development schedules can be slowed or expedited according to demand at any given time over the planning period. The resultant plan provides airport officials with a financially responsible and needs-based program. **Table 3A** presents the short-term, intermediate-term, and long-term planning horizon milestones for each aircraft activity level forecasted in Chapter Two.

TABLE 3A | Aviation Demand Planning Horizons

	Base Year (2024)	Short Term (1–5 Years)	Intermediate Term (6–10 Years)	Long Term (11–20 Years)
BASED AIRCRAFT				
Single-Engine	43	46	48	54
Multi-Engine	4	4	3	3
Turboprop	0	1	2	3
Jet	2	2	3	4
Helicopter	0	0	1	2
TOTAL BASED AIRCRAFT:	**49**	**53**	**57**	**66**
ANNUAL OPERATIONS				
Itinerant				
Air Carrier	0	0	0	0
Air Taxi	18	25	35	70
General Aviation	9,007	9,780	10,210	11,100
Total Itinerant:	**9,025**	**9,805**	**10,245**	**11,170**
Local				
General Aviation	9,007	9,820	10,390	11,600
Local Military	10	10	10	10
Total Local	**9,017**	**9,830**	**10,400**	**11,610**
TOTAL ANNUAL OPERATIONS:	**18,042**	**19,635**	**20,645**	**22,780**

Source: Coffman Associates analysis

AIRFIELD CAPACITY

An airfield's capacity is expressed in terms of its annual service volume (ASV). ASV is a reasonable estimate of the maximum number of aircraft operations that can be accommodated in a year without incurring significant delay factors. As aircraft operations near or surpass the ASV, delay factors increase.

PCZ's ASV was examined using FAA AC 150/5060-5, *Airport Capacity and Delay*. Several factors were evaluated to calculate the airport's ASV, including the following:

- Runway configuration
- Runway use
- Exit taxiways
- Weather conditions
- Aircraft mix
- Percent arrivals
- Touch-and-go activity
- Peak period operations

Each factor represents an airfield or operational element that can contribute to delay. When these elements are examined together, the ASV at Waupaca Municipal Airport is approximately 230,000 annual operations. The ASV does not indicate a point of absolute gridlock but does represent a point at which delay for each operation increases exponentially and capacity becomes constrained.

Current operational estimates for PCZ represent approximately eight percent of the airfield's ASV. By the end of the long-term planning period, total annual operations are expected to represent approximately 10 percent of the airfield's ASV. FAA guidance recommends that improvements for airfield capacity purposes should begin to be considered once operations reach 60 to 75 percent of the ASV. At the 80 percent level, planned improvements should be made. Because existing and forecasted operations remain well below these levels, no significant capacity improvements are planned; however, other options to improve airfield efficiency, such as taxiway geometry improvements, will still be considered.

AIRSIDE FACILITY REQUIREMENTS

Airside facilities include those facilities related to the arrival, departure, and ground movement of aircraft. Airside facility requirements are based primarily on the runway design code (RDC) for each runway. Analysis in Chapter Two identified the existing RDC for Runway 10-28 as B-II-4000 and the ultimate RDC as C-II-4000. For Runway 13-31, the existing and ultimate RDC is B-I(S)-VIS.

RUNWAYS

Runway conditions, such as orientation, length, width, and pavement strength, were analyzed at Waupaca Municipal Airport. From this information, requirements for runway improvements were determined for the airport.

Runway Orientation

Key considerations in the runway configuration of an airport involve the orientation for wind coverage and the operational capacity of the runway system. FAA AC 150/5300-13B, *Airport Design*, Change 1, recommends that a crosswind runway be made available when the primary runway orientation provides less than 95 percent crosswind component coverage for an aircraft design group. **Table 3B** details the allowable crosswind component for each RDC.

TABLE 3B | Allowable Crosswind Component by RDC

RDC	Allowable Crosswind Component
A-I and B-I (includes small aircraft)	10.5 knots
A-II and B-II	13 knots
A-III and B-III	16 knots
C-I through D-III	16 knots
A-IV and B-IV	20 knots
C-IV through C-VI	20 knots
D-IV through D-VI	20 knots
E-I through E-VI	20 knots

Source: FAA AC 150/5300-13B, Airport Design, Change 1

Exhibit 3A presents the generalized, FAA-accepted all-weather and instrument flight rules (IFR) wind roses for the airport. The previous 10 years of wind data[1] were obtained from the on-airport automated weather observation station (AWOS) and have been analyzed to identify the wind coverage provided by the existing runway orientations. At Waupaca Municipal Airport, the orientation of Runway 10-28 provides 97.21 percent coverage for the 10.5-knot component and greater than 98 percent coverage for 13-, 16-, and 20-knot components in all weather conditions. Runway 13-31 provides 96.49 percent coverage for the 10.5 knot component and greater than 98 percent coverage for the 13-, 16-, and 20-knot components. Combined, the runways provide 98.31 percent coverage in all other weather conditions. In IFR conditions, the individual and combined runways provide greater than 97.00 percent coverage for each crosswind component. **It should be noted that the calculations described above exclude gusting conditions, which the FAA does not consider when determining runway orientation. Gusting conditions, specifically wind gust velocities, affect what runway a pilot chooses to use; however, the FAA does not support using gusts to determine crosswind runway eligibility or justification.**

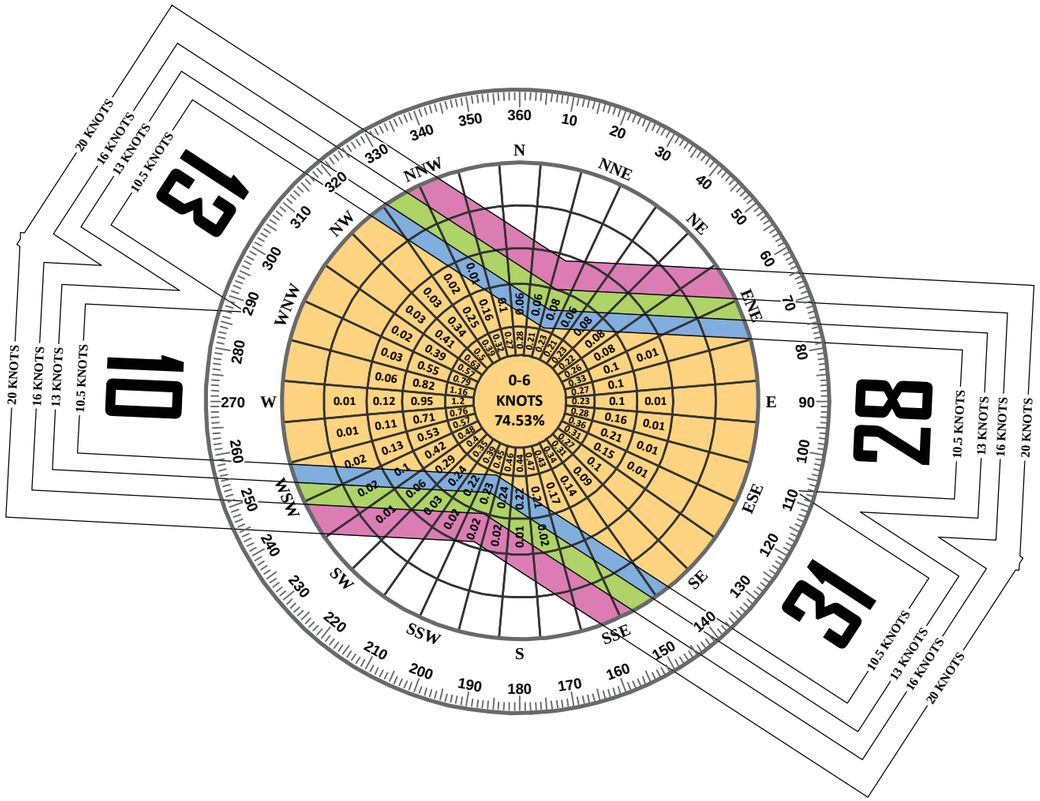
Summary

Runway 10-28 is currently classified as a B-II runway with forecasted potential to become a C-II runway when operations dictate (i.e., when at least 500 annual operations by aircraft within the C-II family are documented). Runway 13-31 is classified as a B-I(S) runway in the existing and ultimate conditions. As detailed in **Table 3B**, the allowable crosswind component for a B-II runway is 13 knots and 10.5 knots for B-I(S) runways; however, given that the crosswind component for Runway 10-28 is greater than 95 percent at 10.5 knots, Runway 13-31 is currently ineligible for federal funding assistance through the Wisconsin Department of Transportation (WisDOT) Bureau of Aeronautics (BOA). As such, funding to maintain Runway 13-31 will remain the responsibility of the City of Waupaca. Should local demands dictate, it is prudent to continue to maintain the current crosswind runway designed to meet A/B-I(S) aircraft operations at Waupaca Municipal Airport. Alternative considerations (to be discussed in the next chapter) will explore options for the ultimate disposition of Runway 13-31.

[1] NOAA, National Climatic Data Center, Asheville, North Carolina, for Waupaca Municipal Airport, Waupaca, WI

ALL-WEATHER WIND COVERAGE

Runways	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 10-28	97.21%	98.68%	99.79%	99.97%
Runway 13-31	96.49%	98.25%	99.57%	99.91%
All Runways	98.31%	99.32%	99.90%	99.99%

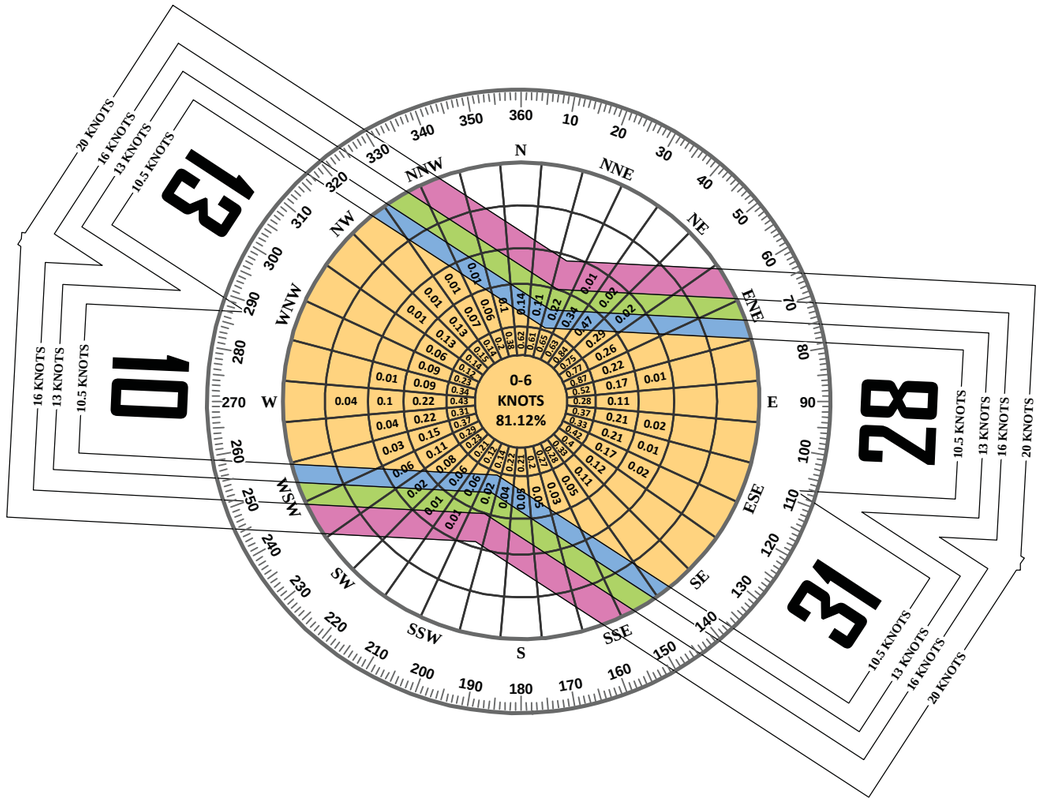


SOURCE:
NOAA National Climatic Center
Asheville, North Carolina
Waupaca Municipal Airport
Waupaca, WI

OBSERVATIONS:
252,706 All Weather Observations
Jan. 1, 2014 - Dec, 31 2023

IFR WIND COVERAGE

Runways	10.5 Knots	13 Knots	16 Knots	20 Knots
Runway 10-28	98.12%	99.20%	99.91%	99.99%
Runway 13-31	97.20%	98.55%	99.75%	99.97%
All Runways	98.58%	99.50%	99.96%	99.99%



SOURCE:
NOAA National Climatic Center
Asheville, North Carolina
Waupaca Municipal Airport
Waupaca, WI

OBSERVATIONS:
24,062 IFR Observations
Jan. 1, 2014 - Dec, 31 2023

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Runway Designations

A runway's designation is based on its magnetic headings, which are determined by the magnetic declination for the area. The runway has a true heading of 093°/273°. Adjusting for the magnetic declination, the current magnetic heading of Runway 10-28 is 094°/274°. The true heading of Runway 13-31 is 123°/303° and its magnetic heading is 124°/304°. The runway designations will not need to change for the next 10 years.

Runway Length

AC 150/5325-4B, *Runway Length Requirements for Airport Design*, provides guidance for determining runway length needs. The determination of runway length requirements for the airport is based on five primary factors:

- Mean maximum temperature of the hottest month
- Airport elevation
- Runway gradient
- Critical aircraft type expected to use the runway
- Stage length of the longest nonstop destination (specific to larger aircraft)

The mean maximum daily temperature of the hottest month for Waupaca Municipal Airport is 82 degrees Fahrenheit (°F), which occurs in July. The airport elevation is 840.2 feet mean sea level (MSL). Runway 10-28 has a longitudinal gradient of 0.67 percent, while Runway 13-31 has a gradient of 0.61 percent. Both conform to FAA design standards for the gradient.

Airplanes operate on a wide variety of available runway lengths. Many factors govern the sustainability of runway lengths for aircraft, such as elevation, temperature, wind, aircraft weight, wing flap settings, runway condition (wet or dry), runway gradient, vicinity airspace obstructions, and any special operating procedures. Airport operators can pursue policies that maximize the sustainability of the runway length. Policies such as area zoning and height and hazard restrictions can protect an airport's runway length. Airport ownership (fee simple easement) of land leading to the runway ends reduces the possibility of natural growth or human-made obstructions. Planning for runways should include an evaluation of the aircraft types expected to use the airport now and in the future. Future planning should be realistic, supported by the FAA-approved forecasts, and based on the critical aircraft (or family of aircraft).

General Aviation Aircraft

Most operations occurring at Waupaca Municipal Airport are conducted using smaller general aviation (GA) aircraft that weigh less than 12,500 pounds. Following guidance from AC 150/ 5325-4B, to accommodate 95 percent of these small aircraft with fewer than 10 passenger seats, a runway length of 3,300 feet is recommended. For 100 percent of these small aircraft, a runway length of 3,900 feet is recommended. For small aircraft with 10 or more passenger seats, a runway length of 4,200 feet is recommended.

The airport is also utilized by aircraft that weigh more than 12,500 pounds, including small-sized to medium-sized business jet aircraft. Runway length requirements for business jets that weigh less than 60,000 pounds have also been calculated. These calculations take into consideration the runway gradient and landing length requirements for contaminated (wet) runways. Business jets tend to need greater runway length when landing on wet surfaces because of their increased approach speeds. AC 150/5325-4B stipulates that runway length determination for business jets must consider a grouping of airplanes with similar operating characteristics. The AC provides two separate family groupings of airplanes, each of which is based on its representative percentage of aircraft in the national fleet. The first grouping is those business jets that comprise 75 percent of the national fleet, and the second grouping is those that comprise 100 percent of the national fleet. **Table 3C** presents a partial list of common aircraft in each aircraft grouping. A third grouping considers business jets that weigh more than 60,000 pounds. Runway length determination for these aircraft must be based on the performance characteristics of the individual aircraft.

TABLE 3C | Business Jet Categories for Runway Length Determination

Aircraft	MTOW (lbs.)
75 Percent of the National Fleet	
Lear 35	20,350
Lear 45	20,500
Cessna 550	14,100
Cessna 560XL	20,000
Cessna 650 (VII)	22,000
IAI Westwind	23,500
Beechjet 400	15,800
Falcon 50	18,500
75-100 Percent of the National Fleet	
Lear 55	21,500
Lear 60	23,500
Hawker 800XP	28,000
Hawker 1000	31,000
Cessna 650 (III/IV)	22,000
Cessna 750 (X)	36,100
Challenger 604	47,600
IAI Astra	23,500
Greater than 60,000 Pounds	
Gulfstream II	65,500
Gulfstream IV	73,200
Gulfstream V	90,500
Global Express	98,000
Gulfstream 650	99,600

MTOW = maximum takeoff weight

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

Table 3D presents the results of the runway length analysis for business jets that was developed following the guidance provided in AC 150/5325-4B. To accommodate 75 percent of the business jet fleet at 60 percent useful load, a runway length of 5,400 feet is recommended. This length is derived from a raw length of 4,695 feet, which is adjusted (as recommended) for runway gradient and consideration of landing length needs on a contaminated (wet and slippery) runway. To accommodate 100 percent of the business jet fleet at 60 percent useful load, 5,700 feet is the recommended runway length.

TABLE 3D | Runway Length Requirements

Fleet Mix Category	TAKEOFF LENGTHS		LANDING LENGTHS	Final Runway Length
	Raw Runway Length from FAA AC	Runway Length with Gradient Adjustment (+348')	Wet Surface Landing Length for Jets (+15%)*	
75% of Fleet at 60% Useful Load	4,695	5,043	5,399	5,400
100% of Fleet at 60% Useful Load	5,349	5,697	5,500	5,700
75% of Fleet at 90% Useful Load	6,258	6,606	7,000	7,000
100% of Fleet at 90% Useful Load	7,937	8,285	7,000	8,300

*Max. 5,500' for 60% useful load and max. 7,000' for 90% useful load in wet condition

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

Utilization of the 90 percent category for runway length determination is generally not considered by the FAA unless there is a demonstrated need at an airport, such as documented activity by a business jet operator that flies out frequently with heavy loads. To accommodate 75 percent of the business jet fleet at 90 percent useful load, a runway length of 7,000 feet is recommended. To accommodate 100 percent of business jets at 90 percent useful load, a runway length of 8,300 feet is recommended.

Another method to determine runway length requirements for aircraft at Waupaca Municipal Airport is to examine aircraft flight planning manuals under conditions specific to the airport. Several aircraft were analyzed for takeoff length requirements at a design temperature of 82.0°F and a field elevation of 840.2 feet MSL with a 0.67 percent runway grade. **Table 3E** provides a detailed runway length analysis for some of the most common turbine aircraft in the national fleet. These data were obtained from Ultranav software, which computes operational parameters for specific aircraft based on flight manual data. The analysis includes the maximum takeoff weight (MTOW) allowable and the percent useful load from 60 percent to 100 percent.

TABLE 3E | Business Aircraft Takeoff Length Requirements – Runway 10-28

		TAKEOFF LENGTH REQUIREMENTS (feet)				
		Useful Load				
Aircraft Name	MTOW	60%	70%	80%	90%	100%
Pilatus PC-12	9,921	2,070	2,237	2,412	2,595	2,786
Citation I/SP	11,850	2,791	3,028	3,279	3,545	3,826
Citation CJ3	13,870	2,999	3,163	3,337	3,634	3,920
King Air 350	15,000	3,343	3,479	3,616	3,857	4,223
Citation Mustang	8,645	2,952	3,174	3,446	3,863	4,320
Citation (525A) CJ2	12,375	3,225	3,459	3,733	4,020	4,326
Citation Sovereign	30,300	3,743	3,768	3,832	4,075	4,376
Citation 560 XLS	20,200	3,396	3,661	3,944	4,219	4,547
Citation (525) CJ1	10,600	3,477	4,030	4,736	5,551	6,374
Challenger 300	38,850	4,537	4,971	5,420	5,881	6,369
Gulfstream 100	24,650	4,697	5,199	5,751	6,302	6,850
Gulfstream 150	26,100	4,897	5,199	5,751	6,302	6,850
Falcon 2000	35,800	4,726	5,261	5,960	6,770	7,627

Note: Green cell values are less than or equal to the length of the primary runway at Waupaca Municipal Airport; orange cell values are greater than the length of the primary runway at Waupaca Municipal Airport.
MTOW = maximum takeoff weight

Source: Ultranav software

All of the aircraft analyzed are capable of departing at MTOW on the existing runway length during hot weather with useful loads at 60 percent, and the majority can operate with loads up to 70 percent. Beyond that, the fleet mix analyzed becomes more weight-restricted or (in some cases) unable to take off at loads exceeding 80 percent.

The Challenger 300 has a MTOW of 38,850. As the ultimate critical aircraft for Runway 10-28, its takeoff field length is 6,369 feet at 100 percent useful load. It is possible that extensions to Runway 10-28 may be required for this aircraft to be able to take off at 100 percent load.

Table 3F presents the runway length required for landing under three operational categories: Title 14 Code of Federal Regulations (CFR) Part 25, CFR Part 135, and CFR Part 91k. CFR Part 25 operations are those conducted by individuals or companies that own their aircraft. CFR Part 135 applies to all for-hire charter

operations, including most fractional ownership operations. CFR Part 91k includes operations in fractional ownership that utilize their own aircraft under the direction of pilots specifically assigned to said aircraft. Part 91k and Part 135 rules regarding landing operations require operators to land at a destination airport within 60 percent of the effective runway length. An additional rule allows operators to land within 80 percent of the effective runway length if the operator has an approved destination airport analysis in the airport's program operating manual. The landing length analysis accounts for both scenarios.

TABLE 3F | Business Aircraft Landing Length Requirements – Runway 10-28

		LANDING LENGTH REQUIREMENTS (feet)					
		Dry Runway Condition			Wet Runway Condition		
Aircraft Name	MLW	Part 25	80% Rule	60% Rule	Part 25	80% Rule	60% Rule
Pilatus PC-12	9,921	2,347	2,934	3,912	No Data	No Data	No Data
Citation I/SP	11,850	2,436	3,045	4,060	2,801	3,501	4,668
Falcon 2000	35,800	3,178	3,973	5,297	3,655	4,569	6,092
Citation Mustang	8,645	2,807	3,509	4,678	3,961	4,951	6,602
Challenger 300	33,750	2,648	5,076	4,413	8,460	3,310	6,345
Citation Sovereign	30,300	3,195	3,994	5,325	4,142	5,178	6,903
Citation (525) CJ1	10,600	3,255	4,069	5,425	4,433	5,541	7,388
Citation CJ3	13,870	3,351	4,189	5,585	4,573	5,716	7,622
Gulfstream 150	26,100	3,304	4,130	5,507	4,903	6,129	8,172
Citation (525A) CJ2	12,375	3,538	4,423	5,897	5,095	6,369	8,492
Citation 560 XLS	20,200	3,700	4,625	6,167	5,897	7,371	9,828
Gulfstream 100	24,650	3,375	4,219	5,625	6,191	7,739	10,318

Note: Green cell values are less than or equal to the length of the primary runway at Waupaca Municipal Airport; orange cell values are greater than the length of the primary runway at Waupaca Municipal Airport.
MLW = maximum landing weight
N/A = not applicable; some turboprop aircraft landing lengths are not adjusted for wet runway conditions

Source: Ultranav software

The landing length analysis shows that, of the aircraft analyzed, all Part 25 and Part 91k operations can land on the available runway length at Waupaca Municipal Airport during dry runway conditions; however, fewer than half of the aircraft analyzed can conduct operations if operating under Part 135 during dry conditions. During wet (or contaminated) runway conditions, most of the analyzed aircraft can land when operating under Part 25, approximately half are able to operate under Part 91k, and very few are able to operate under Part 135.

Runway Length Summary

Many factors were considered when determining appropriate runway length for safe and efficient operations of aircraft at Waupaca Municipal Airport. The airport should strive to accommodate business jets and turboprop aircraft to the greatest extent possible, as demand dictates. Primary Runway 10-28 is currently 5,200 feet long and (as detailed in the previous tables) can accommodate many of the common business jets operating at Waupaca Municipal Airport under moderate loading conditions.

Justification for any runway extension to meet the needs of turbine aircraft would require regular use (500 annual itinerant operations) by a representative aircraft or family of aircraft, which is the minimum threshold required to obtain FAA grant funding assistance. While the primary runway at PCZ currently

exceeds the recommended length for all small aircraft, the runway length recommendation per FAA AC 150/5325-4B is 5,400 feet to accommodate at least 75 percent of the business jet fleet at 60 percent useful load. Moreover, roughly half of the turbine aircraft currently using and anticipated to use the runway at Waupaca Municipal Airport are unable to operate when taking on useful loads of 80 percent and greater, according to Ultranav calculations. As such, runway extension options should be considered. The current critical aircraft (Citation XLS) and the future critical aircraft (Challenger 300) can operate under certain conditions. The Citation XLS is able to take off at 100 percent useful load on the current runway length, while the Challenger 300 requires a minimum runway length of 6,369 feet. Alternatives (to be discussed in the next chapter) will analyze multiple options for a future potential runway extension.

Runway 13-31 is currently 3,899 feet long. As previously detailed, guidance from AC 150/ 5325-4B recommends a length of 3,300 feet to accommodate 95 percent of small aircraft with fewer than 10 passenger seats, while a length of 3,900 feet is required to accommodate 100 percent of small aircraft with fewer than 10 passenger seats. Alternative considerations to be presented in the next chapter will examine options for Runway 13-31, depending on the ultimate disposition of the runway, given its funding eligibility.

Runway Width

Runway width design standards are primarily based on the critical aircraft but can also be influenced by the visibility minimums of published instrument approach procedures. For primary Runway 10-28, existing RDC B-II-4000 design requires a runway width of 75 feet ultimate RDC C-II-4000 requires a runway width of 100 feet. The existing width of Runway 10-28 is 100 feet, which should be maintained. Runway 13-31 is currently 75 feet wide, which exceeds the B-I(S)-VIS standard of 60 feet. If Runway 13-31 is to remain operational in the future, it should be maintained at 60 feet wide.

Pavement Strength

An important feature of airfield pavement is its ability to withstand repeated use by aircraft of varying weights. The current airport layout plan (ALP), which was approved in 2007, lists the strength rating for Runway 10-28 as 30,000 pounds for single wheel aircraft (S). Currently, there is no published runway strength rating for dual wheel aircraft (D). Runway 13-31 is reported to have a pavement strength of 13,000 pounds S.

The strength rating of a runway does not preclude aircraft that weigh more than the published strength rating from using the runway. All federally obligated airports must remain open to the public, and it is typically up to the pilot of an aircraft to determine if a runway can safely support the aircraft. An airport sponsor cannot restrict an aircraft from using the runway simply because its weight exceeds the published strength rating; however, the airport sponsor has an obligation to properly maintain and protect the useful life of the runway (typically for 20 years).

The strength rating of a runway can change over time. Regular usage by heavier aircraft can decrease the strength rating, while periodic runway resurfacing can increase the strength rating. The current runway strength rating on each runway is adequate to accommodate the aircraft that currently and are

anticipated to operate at the airport. The ultimate critical aircraft, represented by the C-II-2A Challenger 300, can weigh over 38,000 pounds D; therefore, the pavement strength rating for Runway 10-28 should be maintained at 30,000 pounds S and increased to 60,000 pounds D in the ultimate condition. If Runway 13-31 is to be maintained, a runway strength rating of 12,500 pounds should be considered to accommodate B-I(S) aircraft.

Runway Line-of-Sight and Gradient

The FAA has instituted various line-of-sight requirements to facilitate coordination among aircraft and between aircraft and vehicles that are operating on active runways. This allows departing and arriving aircraft to verify the locations and actions of other aircraft and vehicles on the ground that could create a conflict.

Line-of-sight standards for an individual runway are based on a parallel taxiway is available. When a partial parallel taxiway is available, any point five feet above the runway centerline must be mutually visible with any other point five feet above the runway centerline. Both runways at PCZ meet the line-of-sight standard.

The surface gradient of a runway affects aircraft performance and pilot perception. The surface gradient is the maximum allowable slope for a runway. For runways designated for approach categories A and B, the maximum longitudinal grade is 2.0 percent. Runway 10-28 has a longitudinal grade of 0.67 percent, while Runway 13-31 has a longitudinal grade of 0.61 percent. Both runways meet the gradient standard.

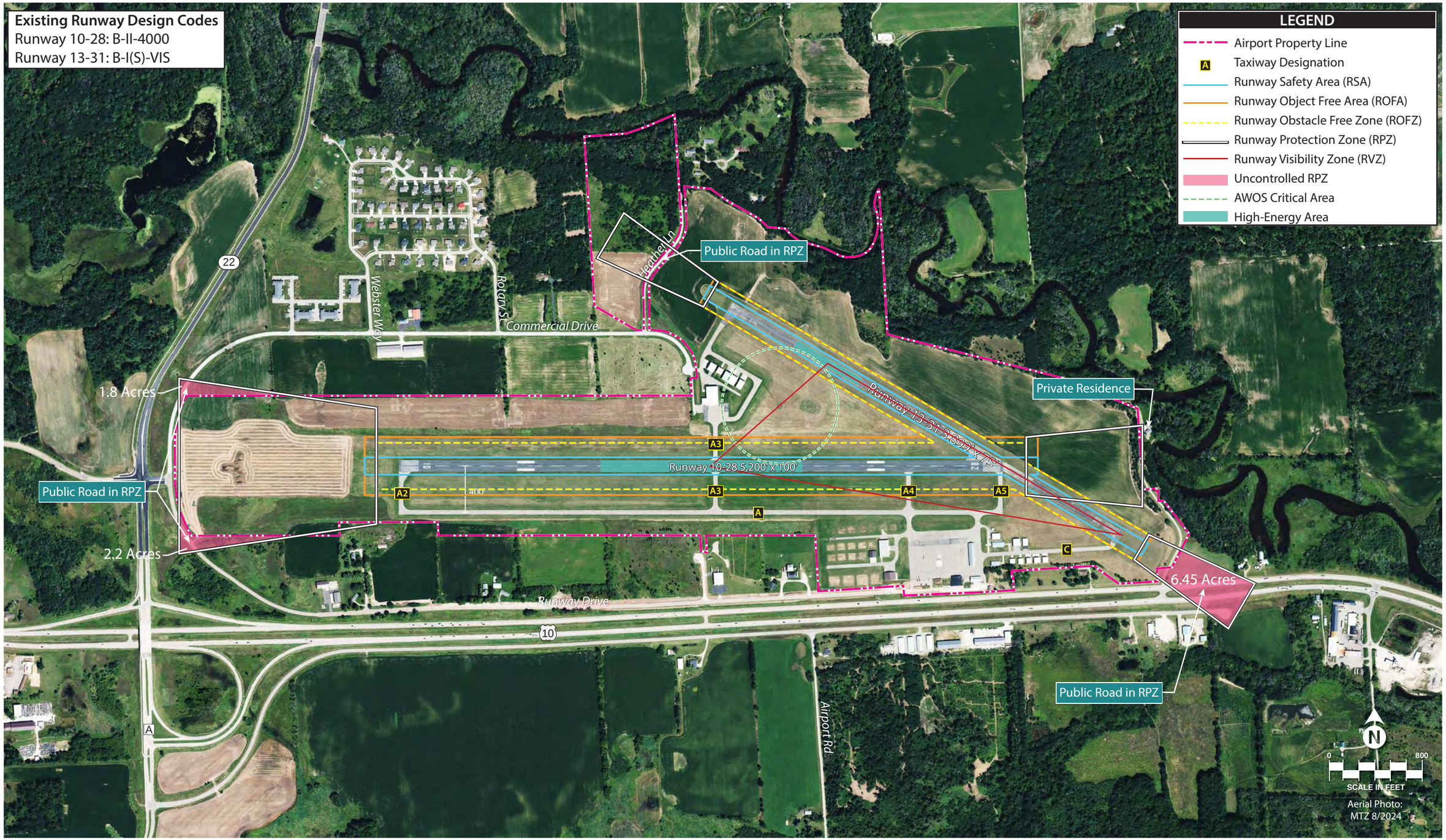
SAFETY AREA DESIGN STANDARDS

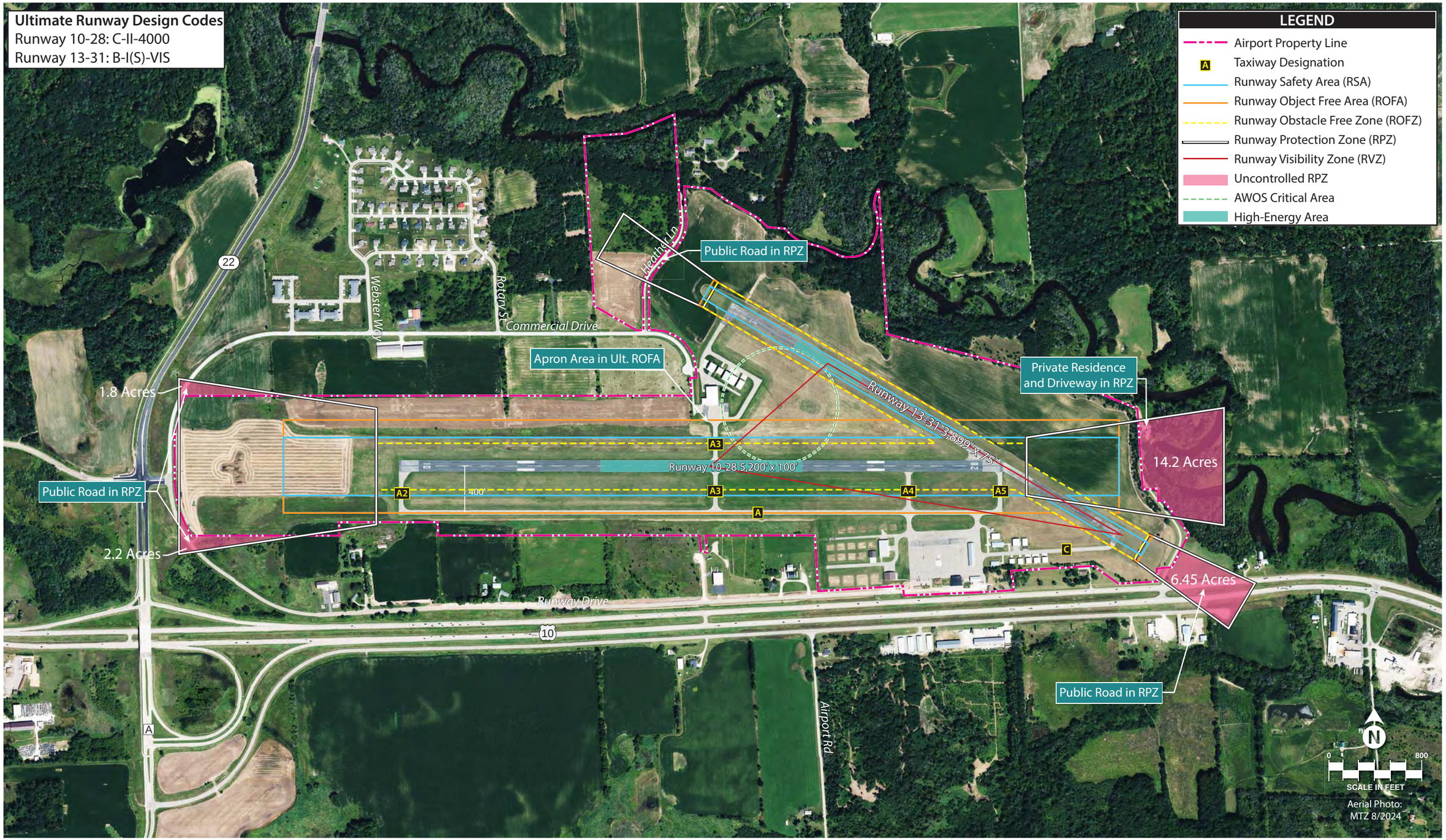
The FAA has established several imaginary surfaces to protect aircraft operational areas and keep them free from obstructions. These include the runway safety area (RSA), runway object free area (ROFA), runway obstacle free zone (ROFZ), and runway protection zone (RPZ).

The entire RSA, ROFA, and ROFZ must be under the direct ownership of the airport sponsor to ensure these areas remain free of obstacles and can be readily accessed by maintenance and emergency personnel. RPZs should also be under airport ownership. An alternative to outright ownership of the RPZ is the purchase of aviation easements (acquiring control of designated airspace within the RPZ) or having sufficient land use control measures in place that ensure the RPZ remains free of incompatible development. The various airport safety areas and their dimensions, as sourced from FAA AC 150/5300-13B, *Airport Design*, Change 1, are presented graphically on **Exhibit 3B**.

Runway Safety Area

The RSA is defined in FAA AC 150/5300-13B, *Airport Design*, Change 1, as a “defined area surrounding the runway consisting of a prepared surface suitable for reducing the risk of damage to aircraft in the event of undershoot, overshoot, or excursion from the runway.” The RSA is centered on the runway and dimensioned in accordance with the approach speed of the critical aircraft using the runway. The FAA requires the RSA to be cleared and graded, drained by grading or storm sewers, capable of accommodating the critical aircraft and fire and rescue vehicles, and free of obstacles that are not fixed by navigational purpose, such as runway edge lights or approach lights.


Existing Runway Design Codes
Runway 10-28: B-II-4000
Runway 13-31: B-I(S)-VIS
LEGEND
Airport Property Line
Taxiway Designation
Runway Safety Area (RSA)
Runway Object Free Area (ROFA)
Runway Obstacle Free Zone (ROFZ)
Runway Protection Zone (RPZ)
Runway Visibility Zone (RVZ)
Uncontrolled RPZ
AWOS Critical Area
High-Energy Area
Public Road in RPZ
Heather Ln
Webster Way
Rotary St
Commercial Drive
22
1.8 Acres
Private Residence
Runway 13-31 3,899' x 75'
A3
Runway 10-28 5,200' x 100'
A2
400'
A3
A4
A5
A
C
Public Road in RPZ
2.2 Acres
6.45 Acres
Runway Drive
10
A
Airport Rd.
N
0
800
SCALE IN FEET
Aerial Photo:
MTZ 8/2024


Ultimate Runway Design Codes
Runway 10-28: C-II-4000
Runway 13-31: B-I(S)-VIS
LEGEND
Airport Property Line
Taxiway Designation
Runway Safety Area (RSA)
Runway Object Free Area (ROFA)
Runway Obstacle Free Zone (ROFZ)
Runway Protection Zone (RPZ)
Runway Visibility Zone (RVZ)
Uncontrolled RPZ
AWOS Critical Area
High-Energy Area
Public Road in RPZ
Heather Ln
Apron Area in Ult. ROFA
Private Residence and Driveway in RPZ
Runway 13-31 3,899' x 75'
1.8 Acres
14.2 Acres
Runway 10-28 5,200' x 100'
400'
Public Road in RPZ
2.2 Acres
6.45 Acres
Public Road in RPZ
Webster Way
Rotary St
Commercial Drive
Runway Drive
Airport Rd.
22
10
A
A2
A3
A4
A5
B
C
0
800
SCALE IN FEET
N
Aerial Photo:
MTZ 8/2024

The FAA places high significance on maintaining adequate RSAs at all airports. The FAA established the *Runway Safety Area Program* under Order 5200.8 (effective October 1, 1999). The Order states: "The objective of the Runway Safety Area Program is that all RSAs at federally obligated airports…shall conform to the standards contained in AC 150/5300-13B Change 1, *Airport Design*, to the extent practicable." Each Regional Airports Division of the FAA is obligated to collect and maintain data on the RSAs for all runways and perform airport inspections.

As shown on **Exhibit 3B**, for existing RDC B-II-4000 design standards on primary Runway 10-28, the FAA calls for the RSA to be 150 feet wide and extend 300 feet beyond the runway ends. In the ultimate RDC C-II-4000 environment, the dimensions of the Runway 10-28 RSA increase to 500 feet wide and extend 1,000 feet beyond the end of the runway. For crosswind Runway 13-31 in both the existing and ultimate runway conditions, the RSA dimensions are 120 wide and extend 240 feet beyond the runway ends. For both runways, at the dimensions detailed above, the RSA is fully contained within airport property and free of obstructions under existing and ultimate conditions.

Overlapping Runway Safety Areas and Elevated Risk

Runway configurations that result in a runway threshold being located in close proximity to another runway or runway threshold create an elevated risk for runway incursions and wrong surface events. A wrong surface event occurs when an aircraft lands or departs, or tries to land or depart, on the wrong runway or on a taxiway. The causal factors for such events are broad. As they relate to airport design, airfield pavement geometries may contribute to wrong surface events.

The current configuration of Runway 10-28 and 13-31 is subject to elevated risk, as the Runway 10 threshold is situated on Runway 13-31. This configuration does not provide sufficient physical space for designing entrance taxiways or associated markings and signage, thus increasing the potential for a runway incursion, pilot confusion, and loss of situational awareness. Alternatives presented in the next chapter will examine potential solutions to alleviate risks associated with the intersecting runways.

Runway Object Free Area

The ROFA is "a clear area limited to equipment necessary for air and ground navigation and provides wingtip protection in the event of an aircraft excursion from the runway." It is a two-dimensional ground area surrounding a runway, taxiways, and taxilanes that is clear of objects, except objects with locations that are fixed by function (e.g., airfield lighting). The ROFA does not have to be graded and level like the RSA; instead, the primary requirement for the ROFA is that no object in the ROFA penetrates the lateral elevation of the RSA. The ROFA is centered on the runway, extending out in accordance with the critical aircraft utilizing the runway.

The ROFA design standards associated with primary Runway 10-28 for existing RDC B-II-4000 are 500 feet wide and extend 300 feet beyond the runway end. These dimensions increase to 800 feet wide and extend 1,000 feet beyond the end of the runway in the ultimate C-II-4000 environment. For crosswind Runway 13-31, the ROFA dimensions are 250 feet wide and extend 240 feet beyond the end of the runway in the existing and ultimate conditions. The ROFAs associated with each runway in the existing

and ultimate scenarios are fully contained on airport property, with the exception of a small portion of apron area encompassed within the ultimate Runway 10-28 ROFA on the north side of the runway. Alternative considerations in the next chapter will examine options to fix this condition.

Obstacle Free Zone

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

For all runways serving aircraft over 12,500 pounds, the ROFZ is 400 feet wide, centered on the runway, and extends 200 feet beyond the runway ends. This standard applies to primary Runway 10-28 at Waupaca Municipal Airport. For runways serving small aircraft under 12,500 pounds but with approach speeds greater than or equal to 50 knots, the ROFZ is 250 feet wide, centered on the runway, and extends 200 feet beyond the runway ends, which are the dimensions of the ROFZ serving Runway 13-31 under the existing and ultimate condition. Under the current evaluation with available data, there are no ROFZ obstructions at the airport.

Runway Protection Zone

An RPZ is a trapezoidal area centered on the extended runway centerline beginning 200 feet from the end of the runway. This safety area is established to protect the end of the runway from airspace penetrations and incompatible land uses. The RPZ dimensions are based on the established RDC and the approach visibility minimums serving the runway. While the RPZ is intended to be clear of incompatible objects or land uses, some uses are permitted with conditions and other land uses are prohibited. According to AC 150/5300-13B, Change 1, the following land uses are permissible within the RPZ:

- Farming that meets the minimum buffer requirements;
- Irrigation channels, as long as they do not attract birds;
- Airport service roads, as long as they are not public roads and are directly controlled by the airport operator;
- Underground facilities, as long as they meet other design criteria, such as RSA requirements, as applicable;
- Unstaffed navigational aids (NAVAIDs) and facilities, such as those required for airport facilities that are fixed by function regarding the RPZ; and
- Aboveground fuel tanks associated with backup generators for unstaffed NAVAIDS.

In September 2022, the FAA published AC 150/5190-4B, *Airport Land Use Compatibility Planning*, which states that airport owner control over RPZs is preferred. Airport owner control over RPZs may be achieved through:

- Ownership of the RPZ property in fee simple;
- Possessing sufficient interest in the RPZ property through easements, deed restrictions, etc.;
- Possessing sufficient land use control authority to regulate land use in the jurisdiction that contains the RPZ;
- Possessing and exercising the power of eminent domain over the property; or
- Possessing and exercising permitting authority over proponents of development within the RPZ (e.g., where the sponsor is a state).

AC 150/5190-4B further states that "control is preferably exercised through acquisition of sufficient property interest and includes clearing RPZ areas (and keeping them clear) of objects and activities that would impact the safety of people and property on the ground." The FAA recognizes that land ownership, environmental, geographical, and other considerations can complicate land use compatibility within RPZs; regardless, airport sponsors must comply with FAA grant assurances, including (but not limited to) Grant Assurance 21, *Compatible Land Use*. Sponsors are expected to take appropriate measures to "protect against, remove, or mitigate land uses that introduce incompatible development within RPZs." For proposed projects that would shift an RPZ into an area with existing incompatible land uses, such as a runway extension or the construction of a new runway, the sponsor is expected to have or secure sufficient control of the RPZ, ideally through fee simple ownership. Where existing incompatible land uses are present, the FAA expects sponsors to "seek all possible opportunities to eliminate, reduce, or mitigate existing incompatible land uses" through acquisition, land exchanges, right-of-first refusal to purchase, agreement with property owners on land uses, easements, or other such measures. These efforts should be revisited during master plan or ALP updates, and periodically thereafter, and should be documented to demonstrate compliance with FAA grant assurances. If new or proposed incompatible land uses impact an RPZ, the FAA expects the airport to take the above actions to control the property within the RPZ and adopt a strong public stance opposing the incompatible land uses.

For new incompatible land uses that result from a sponsor-proposed action (e.g., an airfield project like a runway extension, a change in the critical aircraft that increases the RPZ dimension, or lower minimums that increase the RPZ dimension), the airport sponsor is expected to conduct an alternatives evaluation. The intent of the alternative's evaluation is to "proactively identify a full range of alternatives and prepare a sufficient evaluation to be able to draw a conclusion about what is 'appropriate and reasonable.'" For incompatible development off-airport, the sponsor should coordinate with the Airports District Office (ADO) as soon as the sponsor learns of the development, and the alternatives evaluation should be conducted within 30 days of the sponsor's first awareness of the development within the RPZ. The following items are typically necessary in an alternative's evaluation:

- Sponsor's statement of the purpose and need of the proposed action (airport project, land use change, or development)
- Identification of any other interested parties and proponents

- Identification of any federal, state, and/or local transportation agencies involved
- Analysis of sponsor control of the land within the RPZ
- Summary of all alternatives considered, including:
    - Alternatives that preclude introducing the incompatible land use within the RPZ (e.g., zoning action, purchase, and design alternatives, such as implementation of declared distances, displaced thresholds, runway shift or shortening, raising minimums, etc.)
    - Alternatives that minimize the impact of the land use in the RPZ (e.g., rerouting a new roadway through less of the RPZ, etc.)
    - Alternatives that mitigate risk to people and property on the ground (e.g., tunnelling, depressing and/or protecting a roadway through the RPZ, implementing operational measures to mitigate any risks, etc.)
- Narrative discussion and exhibits or figures depicting the alternative
- Rough order of magnitude cost estimates associated with each alternative, regardless of potential funding sources
- Practicability assessment based on the feasibility of the alternative in terms of constructability, cost, operational impacts, and other factors

Once the alternatives evaluation has been submitted to the ADO, the FAA will determine whether the sponsor has made an adequate effort to pursue and consider appropriate and reasonable alternatives.

The FAA will not approve or disapprove the airport sponsor's preferred alternative; rather, the FAA will evaluate whether an acceptable level of alternatives analysis has been completed before the sponsor makes the decision to allow or disallow the proposed land use within the RPZ.

In summary, the RPZ guidance published in September 2022 shifts the responsibility of protecting the RPZ to the airport sponsor. The airport sponsor is expected to take action to control the RPZ or demonstrate that appropriate actions have been taken. The decision to permit or disallow existing or new incompatible land uses within an RPZ is ultimately up to the airport sponsor, with the understanding that the sponsor still has grant assurance obligations, and the FAA retains the authority to review and approve or disapprove portions of the ALP that would adversely impact the safety of people and property within the RPZ.

RPZs are further designated as approach and departure RPZs. The approach RPZ is a function of the aircraft approach category (AAC) and approach visibility minimums associated with the approach runway end. The departure RPZ is a function of the AAC, and departure procedures associated with the runway. For a particular runway end, the more stringent RPZ requirements (usually associated with the approach RPZ) will govern the property interests and clearing requirements the airport sponsor should pursue.

Under existing conditions, the RPZ serving Runway 10 is 1,000 feet wide at the inner portion, 1,510 feet wide at the outer portion, and 1,700 feet long, while the existing RPZ serving Runway 28 is 500 wide feet at the inner portion, 700 feet wide at the outer portion, and 1,000 feet long. Under ultimate RDC C-II-4000 conditions, the RPZ serving Runway 10 remains the same size, while the RPZ serving Runway 28 increases in size to a dimension of 500 feet wide at the inner portion, 1,010 feet wide at the outer portion, and 1,700 feet long. It should be noted that the size difference for the RPZ serving Runway 10-28 is a result of differing approach minimums serving each runway end; Runway 10 is served by a ¾-mile instrument approach minimum, while Runway 28 is served by a one-mile instrument approach minimum. The existing and ultimate RPZs serving Runway 13-31 under RDC B-I(S)-VIS are 250 feet at the inner portion, 450 feet at the outer portion, and 1,000 feet long.

As shown on **Exhibit 3B**, for the existing RPZs associated with Runway 10-28 under existing B-II-4000 design conditions, the RPZ serving Runway 10 extends beyond airport property to the west and encompasses approximately 2.2 and 1.8 acres of uncontrolled property (4.0 total acres) in the outer corners of the RPZ, as well as portions of Runway Drive. The existing RPZ serving Runway 28 is contained within airport property; however, a private residence and driveway exist immediately east of airport property and just beyond the Runway 28 RPZ. Under ultimate RDC C-II-4000 conditions, the RPZ serving Runway 28 expands in size, encompassing approximately 14.2 acres of uncontrolled property, as well as the private residence and driveway located immediately east of airport property. Under both the existing and ultimate conditions, the RPZs serving Runway 13-31 are traversed by Heather Lane and Highway 10, respectively. In addition, the RPZ serving Runway 31 extends beyond airport property to the south, encompassing approximately 6.5 acres of uncontrolled property.

Under the ultimate condition, several public roadways pass through the RPZs associated with Runways 10, 13, and 31. Additionally, the RPZ serving Runway 28 extends to the east, encompassing a private residence and driveway; this is considered incompatible land use. Considerations for potential mitigation options will be further explored in the next chapter.

SEPARATION STANDARDS

Several other standards are related to separation distances from runways and taxiways. Each is designed to enhance the safety of the airfield.

Runway/Taxiway Separation

The design standard for the separation between runways and parallel taxiways is a function of the critical aircraft and the instrument approach visibility minimum. The separation standard for primary Runway 10-28 in the existing RDC B-II-4000 condition is 240 feet from the runway centerline to the parallel taxiway centerline. In the ultimate C-II-4000 environment, the separation standard increases to 300 feet. Parallel Taxiway A is currently separated from the runway by 400 feet and should be maintained in its current location. For crosswind Runway 13-31, the runway-to-taxiway separation standard in both the existing and ultimate RDC B-I(S)-VIS conditions is 150 feet. Runway 13-31 is not currently served by a parallel taxiway. It should be noted that there is a taxilane serving the north hangars that is parallel to Runway 13-31 and is separated by approximately 430 feet from the runway centerline.

Hold Line Position Separation

Hold line position markings are placed on taxiways leading to runways. When instructed, pilots are to stop short of the holding position marking line. The existing and ultimate design standards for Runway 10-28 call for holding positions to be separated from the runway centerline by 200 feet (existing) and 250 feet (ultimate). The existing and ultimate design standards for Runway 13-31 call for holding positions to be separated from the runway centerline by 125 feet.

At Waupaca Municipal Airport, each hold line position marking serving primary Runway 10-28 is situated 250 feet from the runway centerline and should be maintained. The holding positions serving Runway 13-31 are situated at 125 and 170 feet from the runway centerline, respectively, and meet existing and ultimate B-I(S) design standards; however, it should be noted that Taxiway C is acutely angled to the runway as it connects to the Runway 31 threshold, which means the hold position is not angled at 90 degrees to Runway 13-31. The alternatives in the next chapter will consider options to orient all hold positions at 90 degrees perpendicular to their respective runways.

Aircraft Parking Area Separation

According to FAA AC 150/5300-13B, Change 1, aircraft parking positions should be located to ensure that aircraft components (wings, tail, and fuselage) do not:

1. Conflict with the object free area for the adjacent runway or taxiways:

    a. Runway object free area (ROFA)
    b. Taxiway object free area (TOFA)
    c. Taxilane object free area (TLOFA)

or

2. Violate any of the following aeronautical surfaces and areas:

    a. Runway approach or departure surface
    b. Runway visibility zone (RVZ)
    c. Runway obstacle free zone (ROFZ)
    d. Navigational aid equipment critical areas

Existing aircraft parking positions at Waupaca Municipal Airport are located on each aircraft parking apron. In their existing locations, each marked aircraft parking position at PCZ is clear of the safety areas, as well as the aeronautical surfaces and areas detailed above. In the ultimate condition, a portion of the northern apron is in the C-II ROFA, which needs to be kept clear. The alternatives analysis in the next chapter will examine potential solutions to this issue.

TAXIWAYS

The design standards associated with taxiways are determined by the taxiway design group (TDG) or the ADG of the airport's critical aircraft. As determined previously, the applicable ADG for primary Runway 10-28 is ADG II in the existing and ultimate conditions, while the ADG for Runway 13-31 has been identified as ADG I in the existing and ultimate conditions. **Table 3G** presents the various taxiway design

standards related to ADG I and ADG II. The table also shows the taxiway design standards related to TDG. The TDG standards are based on the main gear width (MGW) and cockpit to main gear (CMG) distance of the critical aircraft expected to use those taxiways. Different taxiway and taxilane pavements can and should be planned to the most appropriate TDG design standards, based on usage.

The current design for all taxiways at PCZ is TDG 2A, which dictates a width of 35 feet. Taxiway A and its associated connectors are currently 40 feet wide, while Taxiway C is 35 feet wide. While the 40-foot width provides an added safety margin for aircraft operating at the airport, the BOA may elect not to fund regular pavement maintenance for the portions of taxiway pavement that exceed the standard. If the airport chooses to maintain the taxiways at their current widths, the costs may need to come from a local funding source, rather than federal or state grant monies. Certain portions of the landside area that are utilized exclusively by small aircraft should adhere to TDG 1A/1B standards.

TABLE 3G | Taxiway Dimensions and Standards

STANDARDS BASED ON WINGSPAN	ADG I	ADG II
Taxiway and Taxilane Protection		
Taxiway Safety Area Width (TSA)	49'	79'
Taxiway Object Free Area Width (TOFA)	89'	124'
Taxilane Object Free Area Width (TLOFA)	79'	110'
Taxiway and Taxilane Separation		
Taxiway Centerline to Parallel Taxiway Centerline	70'	101.5'
Taxiway Centerline to Fixed or Moveable Object	44.5'	62'
Taxilane Centerline to Parallel Taxilane Centerline	64'	94.5'
Taxilane Centerline to Fixed or Moveable Object	39.5'	55'
Wingtip Clearance		
Taxiway Wingtip Clearance	20'	22.5'
Taxilane Wingtip Clearance	15'	15.5'
STANDARDS BASED ON TDG	**TDG 1A/B**	**TDG 2A/B**
Taxiway Width Standard	25'	35'
Taxiway Edge Safety Margin	5'	7.5'
Taxiway Shoulder Width	10'	15'
Note: All dimensions are in feet. ADG = airplane design group TDG = taxiway design group		

Source: FAA AC 150/5300-13B, Airport Design, Change 1

Exhibit 3C shows the TOFA for Taxiway A, which is 124 feet wide and clear of obstructions, and should be maintained as such.

Exhibit 3C – Taxiway A TOFA

Taxiway and Taxilane Design Considerations

FAA AC 150/5300-13B, *Airport Design*, Change 1, provides guidance on recommended taxiway and taxilane layouts to enhance safety by avoiding runway incursions. A runway incursion is defined as "any occurrence at an airport involving the incorrect presence of an aircraft, vehicle, or person on the protected area of a surface designated for the landing and takeoff of aircraft."

The following is a list of the FAA's taxiway design guidelines and the basic rationale behind each recommendation included in the current AC, as well as previous FAA safety and design recommendations.

1. *Taxiing Method*: Taxiways are designed for cockpit-over-centerline taxiing with pavement that is wide enough to allow a certain amount of wander. On turns, sufficient pavement should be provided to maintain the edge safety margin from the landing gear. When constructing new taxiways, existing intersections should be upgraded to eliminate judgmental oversteering, which is when a pilot must intentionally steer the cockpit outside the marked centerline to ensure the aircraft remains on the taxiway pavement.

2. *Curve Design*: Taxiways should be designed so the nose gear steering angle is no more than 50 degrees, which is the generally accepted value to prevent excessive tire scrubbing.

3. *Three-Path Concept*: To maintain pilot situational awareness, taxiway intersections should provide a pilot with a maximum of three choices of travel. Ideally, these are right, left, and a continuation straight ahead.

4. *Channelized Taxiing*: To support visibility of airfield signage, taxiway intersections should be designed to meet standard taxiway width and fillet geometry.

5. *Designated Hot Spots and Runway Incursion Mitigation (RIM) Locations*: A hot spot is a location on the airfield with elevated risk of collisions or runway incursions. Mitigation measures should be prioritized for areas the FAA designates as hot spots or RIM locations.

6. *Intersection Angles*: Turns should be designed to be 90 degrees, wherever possible. For acute-angle intersections, standard angles of 30, 45, 60, 120, 135, and 150 degrees are preferred.

7. *Runway Incursions*: Taxiways should be designed to reduce the probability of runway incursions.

    - *Increase Pilot Situational Awareness*: A pilot who knows where he/she is on the airport is less likely to enter a runway improperly. Complexity leads to confusion. Keep taxiway systems simple by using the three-path concept.

    - *Avoid Wide Expanses of Pavement*: Wide pavements require placement of signs far from a pilot's eye. This is especially critical at runway entrance points. Where a wide expanse of pavement is necessary, avoid direct access to a runway.

    - *Limit Runway Crossings*: The taxiway layout can reduce the opportunity for human error. The benefits are twofold: through a simple reduction in the number of occurrences and a reduction in air traffic controller workload.

    - *Avoid High-Energy Intersections*: These are intersections in the middle thirds of runways. By limiting runway crossings to the first and last thirds of a runway, the portion of the runway where a pilot can least maneuver to avoid a collision is kept clear.

    - *Increase Visibility*: Right-angle intersections between both taxiways and runways provide the best visibility. Acute-angle runway exits provide greater efficiency in runway usage but should not be used as runway entrance or crossing points. A right-angle turn at the end of a parallel taxiway is a clear indication of approaching a runway.

- *Avoid Dual-Purpose Pavements*: Runways used as taxiways and taxiways used as runways can lead to confusion. A runway should always be clearly identified as a runway, and only a runway.

- *Direct Access*: Taxiways should not be designed to lead directly from an apron to a runway. Such configurations can lead to confusion when a pilot typically expects to encounter a parallel taxiway.

- *Hot Spots*: Confusing intersections near runways are more likely to contribute to runway incursions. These intersections must be redesigned when the associated runway is subject to reconstruction or rehabilitation. Other hot spots should be corrected as soon as practicable.

8. *Runway/Taxiway Intersections*:

   - *Right Angle*: Right-angle intersections are the standard for all runway/taxiway intersections, except where there is a need for an acute-angled exit. Right-angle taxiways provide the best visual perspective to a pilot approaching an intersection with the runway to observe aircraft in both the left and right directions. They also provide optimal orientation of the runway holding position signs, so the signage is visible to pilots.

   - *Acute Angle*: Acute angles should not be larger than 45 degrees from the runway centerline. A 30-degree taxiway layout should be reserved for high-speed exits. The use of multiple intersecting taxiways with acute angles creates pilot confusion and improper positioning of taxiway signage. The construction of high-speed exits is typically only justified for runways with regular use by jet aircraft in approach categories C and above.

   - *Large Expanses of Pavement*: A taxiway must never coincide with the intersection of two runways. Taxiway configurations with multiple taxiway and runway intersections in a single area create large expanses of pavement, which make it difficult to provide proper signage, marking, and lighting.

9. *Taxiway/Runway/Apron Incursion Prevention*: Apron locations that allow direct access into a runway should be avoided. Increase pilot situational awareness by designing taxiways in a manner that forces pilots to consciously make turns. Taxiways that originate from aprons and form straight lines across runways at mid-span should be avoided.

   - *Wide Throat Taxiways*: Wide throat taxiway entrances should be avoided. Such large expanses of pavement may cause pilot confusion and make lighting and marking more difficult.

   - *Direct Access from Apron to a Runway*: Avoid taxiway connectors that cross over a parallel taxiway and directly onto a runway. Consider a staggered taxiway layout or a no-taxi island that forces pilots to make a conscious decision to turn.

   - *Apron to Parallel Taxiway End*: Avoid direct connection from an apron to a parallel taxiway at the end of a runway.

The taxiway system at Waupaca Municipal Airport generally provides for the efficient movement of aircraft, and there are no FAA-designated hot spots at the airport; however, there is direct access from both aprons at the airport, as shown on **Exhibit 3D**. It should be noted that there are geometry issues, including the acute-angle Taxiway C connection to Runway 31, direct access provided by Taxiways A3 and A4, and Taxiway A3 crossing through the high-energy area (the middle third) of Runway 10-28. Potential solutions to correct these issues will be examined in the alternatives chapter. Analysis in the next chapter will also consider improvements that could be implemented on the airfield to minimize runway incursion potential, improve efficiency, and conform to FAA standards for taxiway design.

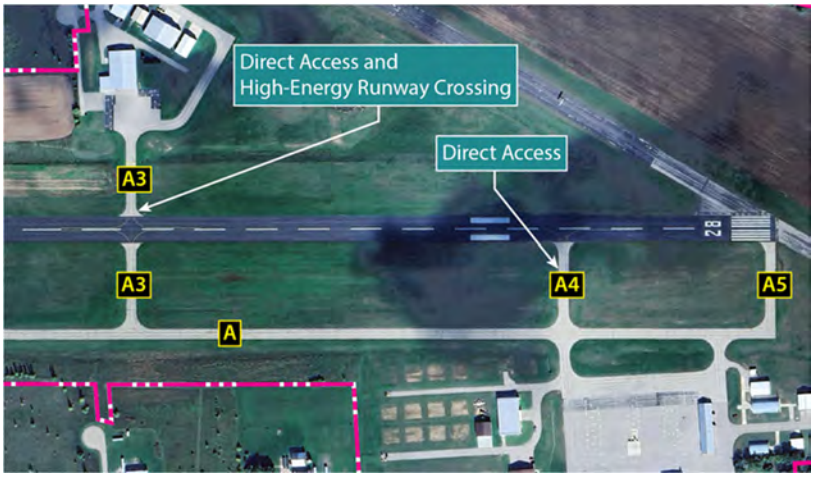


Exhibit 3D – Non-Standard Taxiway Geometry

Taxilane Design Considerations

Taxilanes are distinguished from taxiways in that they do not provide direct access to or from the runway system. Taxilanes typically provide access to hangar areas and can be planned to varying design standards, depending on the type(s) of aircraft that utilize the taxilane, as described previously.

NAVIGATIONAL AND APPROACH AIDS

Navigational aids are devices that provide pilots with guidance and position information when utilizing the runway system. Electronic and visual guidance to arriving aircraft enhance the safety and capacity of the airfield. Such facilities are vital to the success of an airport and provide additional safety to pilots and passengers using the air transportation system. While instrument approach aids are especially helpful during poor weather, they are often used by pilots conducting flight training and operating larger aircraft when visibility is good.

Instrument Approach Aids

Waupaca Municipal Airport has two published instrument approaches. A localizer performance with vertical guidance (LPV) via an area navigation (RNAV) GPS instrument approach is available to each end of Runway 10-28. The Runway 10 approach has visibility minimums down to ¾-mile for categories A, B, C, and D aircraft, while Runway 28 has a one-mile approach.

Crosswind Runway 13-31 is currently a visual runway with no published instrument approach procedures and is planned to remain as such in the ultimate condition; however, for planning purposes, the alternatives will consider the possible implementation of an instrument approach procedure with visibility

minimums not lower than one-mile if there is local interest. This would not alter the size of the existing RPZs associated with Runway 13-31, but any costs associated with an ultimate approach will likely be ineligible for funding assistance due to the current crosswind coverage of Runway 10-28.

Visual Approach Aids

In most instances, the landing phase of any flight must be conducted in visual conditions. Electronic visual approach aids are commonly used at airports to provide pilots with visual guidance information during landings on the runway. Both ends of primary Runway 10-28 are currently equipped with a two-box precision approach path indicator (PAPI-2) system. As more turbine aircraft begin to operate at the airport, consideration should be given to upgrading the PAPI-2 to a PAPI-4 (four-box system) on each runway end.

Runway end identification lights (REILs) are flashing lights located at the runway threshold end that facilitate rapid identification of the runway end at night and during poor visibility conditions. REILs provide pilots with the ability to identify the runway thresholds and distinguish the runway end lighting from the other lighting on the airport and in the approach areas. The FAA indicates that REILs should be considered for all lighted runway ends not planned for more sophisticated approach lighting systems. Both ends of primary Runway 10-28 are equipped with REILs, which should be maintained.

Crosswind Runway 13-31 is equipped with differing PAPI systems. Runway 13 is served by a PAPI-4 (four-box system) while Runway 31 is equipped with a PAPI-2. Runway 13-31 is not currently served by REILs. Pending the future disposition of Runway 13-31, consideration should be given to maintaining the current PAPI systems and installing REILs at each runway end.

Weather Reporting Aids

Waupaca Municipal Airport has a lighted wind cone and wind tee, which are centrally located between the two runways. These provide information to pilots regarding wind speed and direction and should be maintained through the planning period. A segmented circle is often co-located with an airport's primary wind cone. The segmented circle is a system of visual indicators designed to provide traffic pattern information to pilots.

The airport is also equipped with an automated weather observation station (AWOS), which provides weather observations 24 hours per day. The system updates weather observations every minute, continuously reporting significant weather changes as they occur in real time. This information is transmitted via a designated radio frequency at regular intervals. FAA siting criteria indicate that the AWOS should be located between 1,000 and 3,000 feet from the runway threshold and between 500 to 1,000 feet perpendicular to the runway centerline. The AWOS also has a 500-foot radius critical area that must be kept free of obstructions that could interfere with its sensors. The AWOS at Waupaca Municipal Airport should be maintained in its current location through the planning period.

AIRFIELD LIGHTING, MARKING, AND SIGNAGE

Several lighting and pavement marking aids serve pilots using the airport. These aids assist pilots in locating the airport and runway at night or in poor visibility conditions. They also serve aircraft navigating the airport environment on the ground when transitioning to/from aircraft parking areas to the runway.

Airport Identification Lighting

Waupaca Municipal Airport's rotating beacon is located on the south side of the airport property by the entrance to the public parking area. The beacon should be maintained during the planning period.

Runway and Taxiway Lighting

Both runways are equipped with a medium intensity runway lighting (MIRL) system, which is adequate and should be maintained. It should be noted that only taxiway entrances are lighted. Planning should consider the implementation of medium intensity taxiway lighting (MITL) on all taxiways and the expansion of both MIRL and MITL systems if/when new pavements are constructed.

Airfield Signs

Airfield identification signs assist pilots in identifying their locations on the airfield and directing them to their desired locations. Lighted signs are installed on the runway and taxiway systems on the airfield. The signage system includes lighted runway and taxiway designations and routing/directional signage. All signs should be maintained through the planning period.

It should be noted that many airports are transitioning to light-emitting diode (LED) systems. LEDs have many advantages, including lower energy consumption, longer lifespan, increased durability, reduced size, greater reliability, and faster switching. While a larger initial investment is required up front, the energy savings and reduced maintenance costs outweigh any additional costs over time.

Pavement Markings

Runway markings are typically designed to the type of instrument approach available on the runway. FAA AC 150/5340-1K, *Standards for Airport Markings*, provides guidance necessary to design airport markings. Runways 10-28 and 13-31 are both equipped with non-precision markings. These runway markings should be maintained through the long-term planning horizon on Runway 10-28. Pending the future disposition of Runway 13-31, the current non-precision markings could be maintained if a GPS approach is considered. If Runway 13-31 is maintained as a visual runway, it could be marked with basic markings.

A summary of the airside facilities at Waupaca Municipal Airport is presented on **Exhibit 3E**.

	EXISTING	ULTIMATE	EXISTING	ULTIMATE
	10-28	10-28	13-31	13-31*
Runways				
Runway Design Code (RDC)	B-II-4000	C-II-4000	B-I(S)-VIS	B-I(S)-VIS
Dimensions	5,200' x 100'	Consider extension; maintain width	3,899' x 75'	Maintain
Pavement Strength	30,000 lbs (S)	Maintain/consider 60,000 lbs (D)	13,000 lbs (S)	Maintain
Safety Areas				
RSA	Standard RSA	Maintain	Standard RSA	Maintain
ROFA	Standard ROFA	Maintain	Standard ROFA	Maintain
ROFZ	Standard ROFZ	Maintain	Standard ROFZ	Maintain
RPZ	Extend beyond airport property; include roadways	Consider mitigation	Extend beyond airport property; include roadways	Consider mitigation
Taxiways				
Design Group	2A	Maintain	1A	Maintain
Parallel Taxiway	Taxiway A (parallel)	Maintain	NA	Maintain
Parallel Taxiway Separation from Runway	400'	Maintain	NA	Maintain
Widths	40' (Taxiway A and connectors)	Maintain	35' (Taxiway C and connectors)	Maintain if feasible
Holding Position Separation	250'	Maintain	125', 170'	Consider geometry upgrades
Notable Conditions	None	Maintain	Numerous cracks and vegetation in pavement	Consider corrective measures
Navigational and Weather Aids				
Instrument Approaches	LPV GPS (10, 28)	Maintain	Visual only	Maintain
Weather Aids	AWOS, wind cones, rotating beacon, segmented circle	Maintain equipment		
Approach Aids	PAPI-2 & REILS on both runway ends maintain REILs	Consider upgrade to PAPI-4	PAPI-2 / PAPI-4 and REILs	Maintain/consider REILs
Lighting and Marking				
Runway Lighting	MIRL	Maintain	MIRL	Maintain
Runway Marking	Non-precision	Maintain	Published as NPI	Consider Basic
Taxiway Lighting	MITL (Taxiway A) Entrance Only	Consider MITL along Taxiway A	No lighting on Taxiway C	Install MITL on Taxiway C

**Pending Ultimate Disposition of Runway 13-31 Due to Lack of Funding Eligibility.*

KEY

AWOS - Automated Weather Observing System
MIRL - Medium Intensity Runway Lighting
D - Dual Wheel Loading
MITL - Medium Intensity Taxiway Lighting
NPI - Non-Precision Instrument
PAPI - Precision Approach Path Indicator
RDC - Runway Design Code
REIL - Runway End Identification Lights
ROFA - Runway Object Free Area
ROFZ - Runway Obstacle Free Zone
RPZ - Runway Protection Zone
RSA - Runway Safety Area
S - Single Wheel
TDG - Taxiway Design Group

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LANDSIDE FACILITY REQUIREMENTS

Landside facilities are those necessary for the handling of aircraft and passengers while on the ground. These facilities provide the essential interface between the air and ground transportation modes. The capacity of the various components of each element was examined in relation to projected demand to identify future landside facility needs. For Waupaca Municipal Airport, this includes components for general aviation needs, such as the following:

- General aviation terminal facilities and auto parking
- Aircraft storage hangars
- Aircraft parking aprons
- Airport support facilities

Projections made for aircraft storage hangars, aircraft parking aprons, and marked parking positions are based on the number of aircraft currently based and forecast to base on the airport property over the 20-year planning horizon. Terminal facilities, auto parking, and other airport support facilities are based on the annual number of operations projected to occur over the planning period.

In addition to landside facility requirements, potential non-aeronautical land uses will be evaluated in subsequent chapters. These are portions of airport property that are suitable for non-aviation purposes and can generate revenue for the airport, such as agriculture or industrial uses. While airport property is generally subject to Airport Improvement Program (AIP) grant assurances, an airport can request a release from aeronautical federal obligations for certain areas of property that are not necessary for aviation uses. These requests are facilitated under the *FAA Reauthorization Act of 2018*, Section 163, which governs the FAA's authority over non-aeronautical development.

GENERAL AVIATION TERMINAL SERVICES

The general aviation terminal facilities at an airport often provide corporate officials and visitors with their first impressions of the community. General aviation terminal facilities at an airport can provide space for passenger waiting, a pilots' lounge, flight planning, concessions, management, storage, and many other needs. This space is not necessarily limited to a single, separate terminal building, but can include space offered by fixed base operators (FBOs) and other specialty operators for these functions and services. At Waupaca Municipal Airport, general aviation terminal services are provided in the terminal building, which includes a lobby, a pilots' lounge, a conference room, a kitchen, and restrooms.

The methodology used in estimating general aviation terminal facility needs was based on the number of airport users expected to utilize general aviation facilities during the design hour. This methodology is a general airport planning practice and is not considered exacting, as each airport terminal serves unique functions. The space requirements for terminal building facilities were based on providing 125 square feet (sf) per design hour itinerant passenger. A multiplier of 2.0 in the short term, increasing to 3.0 in the long term, was also applied to terminal facility needs to better determine the number of passengers associated with each itinerant aircraft operation. This increasing multiplier indicates an expected increase in larger aircraft operations through the long term. These operations typically support larger turboprop and jet aircraft, which can accommodate an increasing passenger load factor. Such is the case at Waupaca Municipal Airport, where an increasing number of turbine operations are anticipated.

Table 3H outlines the space requirements for general aviation terminal services at Waupaca Municipal Airport through the long-term planning period. The amount of space currently offered in the terminal building is approximately 2,600 sf. As shown in the table, additional terminal space is needed over the long-term planning period.

TABLE 3H | General Aviation Terminal Area Facilities

	Currently Available	Short-Term Need	Intermediate-Term Need	Long-Term Need
Terminal Building (sf)	2,600	2,400	3,100	4,100
General Aviation Design Hour Passengers	–	10	10	11
Passenger Multiplier	–	2.0	2.5	3.0
Visitor/Tenant Vehicle Parking	35	35	42	53

Source: Coffman Associates analysis

General aviation vehicle parking demands have also been determined for the airport. Space determinations for passengers were based on an evaluation of existing airport use, as well as standards set forth to help calculate projected terminal facility needs. There are currently 35 marked individual vehicle spaces provided at the airport. Most based aircraft owners park near their hangars. As shown in the table, additional vehicle parking could be needed over the planned period. In the next chapter, proposed hangar facility layouts will include dedicated vehicle parking for tenants.

AIRCRAFT HANGARS

Utilization of hangar space varies as a function of local climate, security, and owner preference. The trend in general aviation aircraft is toward more sophisticated (and consequently, more expensive) aircraft; therefore, many aircraft owners prefer enclosed hangar space, as opposed to outside tiedowns.

The demand for aircraft storage hangars is dependent on the number and type(s) of aircraft expected to be based at the airport in the future. For planning purposes, it is necessary to estimate hangar requirements based on forecast operational activity; however, hangar development should be based on actual demand trends and financial investment conditions.

While most aircraft owners prefer enclosed aircraft storage, some will still use outdoor tiedown spaces, usually due to lack of available hangar space, high hangar rental rates, or operational needs; therefore, enclosed hangar facilities do not necessarily need to be planned for each based aircraft.

Hangar types vary greatly in size and function. T-hangars, box hangars, and shade hangars are popular with aircraft owners who need to store individual private aircraft. These hangars often provide individual spaces within a larger structure or in standalone portable buildings. There is approximately 112,500 sf of total hangar storage space at the airport. For determining future aircraft storage needs, a planning standard of 1,200 sf per aircraft is utilized for this type of hangar.

Executive box hangars are open-space facilities with no interior supporting structures. These hangars can vary in size from 1,500 and 2,500 sf to nearly 10,000 sf. They are typically able to house single-engine, multi-engine, turboprop, and jet aircraft, as well as helicopters. For future planning, standards of 3,000 sf per turboprop, 5,000 sf per jet, and 1,500 sf per helicopter are utilized for executive box hangars. There is approximately 71,200 sf of space for executive box hangars at PCZ.

Conventional hangars are large open-space facilities with no supporting interior structures. These hangars provide for bulk aircraft storage and are often utilized by airport businesses, such as FBOs or aircraft maintenance operators. Conventional hangars are generally larger than executive box hangars and can range in size from 10,000 sf to more than 20,000 sf. Portions of conventional hangars are often utilized for non-aircraft storage needs, such as maintenance or office space. There are two conventional hangars at Waupaca Municipal Airport, which total 28,400 sf. For planning purposes, the same aircraft sizing standards utilized for executive hangars are also utilized for conventional hangars.

Requirements for maintenance/service hangar area have also been calculated. There is one maintenance/service provider at the airport, which operates out of an executive hangar that is approximately 12,000 sf in size. To determine service hangar needs, a planning standard of 125 sf per based aircraft has been calculated and was found to be 8,300 sf over the long-term planning period.

Future hangar requirements for the airport are summarized in **Table 3J**. While most based aircraft owners prefer enclosed hangar space, it is assumed that some will use tiedowns on the apron. The analysis shows that future hangar requirements indicate a potential need for over 55,000 sf of new hangar storage capacity throughout the long-term planning period. This includes a mixture of hangar types, with the largest need projected in the executive/conventional hangar category. Due to the projected increase in based aircraft, the existing demand for hangar space, annual general aviation operations, and hangar storage needs, facility planning will consider additional hangars at the airport. It is expected that the aircraft storage hangar requirements will continue to be met through a combination of hangar types.

TABLE 3J | Aircraft Hangar Requirements

	Currently Available	Short-Term Need	Intermediate-Term Need	Long-Term Need	Difference
Total Based Aircraft	49	53	57	66	+17
Hangar Area Requirements					
T-Hangar Area (sf)	9,800	24,200	26,500	39,100	+29,300
Executive Box/Conventional Hangar Area (sf)	88,100	94,100	108,400	117,900	+29,800
Service Hangar Area (sf)	12,000	6,600	7,100	8,300	+2,400
Total Hangar Area (sf):	**109,900**	**124,900**	**142,000**	**165,300**	**+55,400**

Source: Coffman Associates analysis

It should be noted that hangar requirements are general in nature and are based on aviation demand forecasts. The actual need for hangar space will further depend on the usage within the hangars. For example, some hangars may be utilized entirely for non-aircraft storage, such as maintenance, but they have an aircraft storage capacity from a planning standpoint; therefore, the needs of an individual user may differ from the calculated space necessary.

AIRCRAFT PARKING APRONS

The aircraft parking apron is an expanse of paved area intended for aircraft parking and circulation. Typically, a main apron is centrally located near the airside entry point, such as the terminal building or FBO facility. Ideally, the main apron is large enough to accommodate transient airport users, as well as

a portion of locally based aircraft. Smaller aprons are often available adjacent to FBO or specialty aviation service operator (SASO) hangars and at other locations around the airport. The apron layout at Waupaca Municipal Airport generally follows this pattern, with an apron adjacent to both the terminal and the FBO facility (KlattAero). A second apron, located on the north side of the airport by Red Door Hangar, provides additional dedicated aircraft parking space.

To determine future apron needs, the FAA-recommended planning criterion[2] of 800 square yards (sy) was used for single- and multi-engine itinerant aircraft, while a planning criterion of 1,600 sy was used to determine the area for transient turboprop and jet aircraft. A parking apron should also provide space for locally based aircraft that require temporary tiedown storage. Locally based tiedowns are typically utilized by smaller single-engine aircraft; thus, a planning standard of 650 sy per position is utilized.

The total apron parking requirements are presented in **Table 3K**. The existing apron pavement area at Waupaca Municipal Airport encompasses approximately 16,700 sy of space, divided between the two apron areas. Approximately 16,700 sy of this space is used exclusively for aircraft parking. Using the planning standards described above and factoring in assumptions regarding operational and based aircraft growth, additional apron space is projected to be needed; an additional 9,900 sy of aircraft parking apron pavement is estimated to be needed over the next 20 years.

Currently, 29 marked parking positions are available for based and itinerant aircraft at the airport. There is no helicopter parking. As shown in the table, additional aircraft parking is projected to be needed, beginning in the short term, including dedicated parking for helicopters and small corporate jets.

TABLE 3K | Aircraft Parking Apron Requirements

	Available	Short Term	Intermediate Term	Long Term
Aircraft Parking Positions				
Based/Local GA Aircraft	–	3	3	3
Transient GA Aircraft	–	20	21	23
Corporate Jet Aircraft	–	1	2	3
Helicopter	–	1	1	2
Total Parking Positions	29	25	27	31
Total Apron Area	**16,700**	**20,000**	**22,500**	**26,600**

Source: Coffman Associates analysis

SUPPORT FACILITIES

Various other landside facilities that play a supporting role in overall airport operations have also been identified. These support facilities include the following:

- Aviation fuel storage
- Perimeter fencing and gates

[2] Refer to Advisory Circular (AC) 150/5300-13B, Airport Design, Change 1, Appendix E

Aviation Fuel Storage

The airport's fuel storage tanks are located on the terminal apron. There is one 12,000-gallon tank for 100LL Avgas fuel and one 12,000-gallon tank for Jet A fuel. Generally, a fuel tank should be of adequate capacity to accept a full refueling tanker (approximately 8,000 gallons) while maintaining a reasonable level of fuel in the storage tank. Future aircraft demand experienced by the airport will determine the need for additional fuel storage capacity. It is important that airport personnel work with the fuel service provider and other specialty aviation operators to plan for adequate fuel storage capacity through the long-term planning period. Because the current fuel storage capacity can accommodate a full refueling tanker, it is recommended that the airport maintain the fuel storage capacity for 100LL and Jet A fuels at 12,000 gallons each. This allows the fuel service provider to maintain a reasonable level of fuel for customers while accepting a full refueling tanker load of fuel, which would ultimately prevent the need to completely drain a fuel tank prior to receiving another load of fuel.

Maintenance and Snow Removal Equipment (SRE) Facility

Maintenance equipment at PCZ includes a New Holland TV6070 tractor that is used for mowing and some snow removal. The airport also has a New Holland T8 tractor, which is used for snow removal and was acquired in 2022, and a 2023 Hustler zero-turn lawn mower that is used for mowing. Other snow implements include a tractor-mounted plow, blower, broom, and sprayer, and a runway deicing fluid foundry is provided. A truck-mounted salt spreader is also available. A dedicated airport maintenance and SRE facility is currently located adjacent to the west side of the main aircraft apron and should be maintained through the planning horizon.

Perimeter Fencing and Gates

Perimeter fencing is used at airports primarily to secure the aircraft operational area. The physical barrier of perimeter fencing:

- Gives notice of the legal boundary of the outermost limits of the facility or security-sensitive areas;
- Assists in controlling and screening authorized entries into a secured area by deterring entry elsewhere along the boundary;
- Supports surveillance, detection, assessment, and other security functions by providing a zone for installing intrusion detection equipment and closed-circuit television (CCTV);
- Deters casual intruders from penetrating the aircraft operations areas on the airport;
- Creates a psychological deterrent;
- Demonstrates a corporate concern for facilities; and
- Limits inadvertent access to the aircraft operations area by wildlife.

Waupaca Municipal Airport has limited fencing. A roll-open gate near the terminal allows access to the airport. There is a coded gate to the hangars for pilots, and the doors to the terminal building are also coded for after-hours use. All fencing, gates, and coded doors should be maintained through the planning period and should be regularly inspected to ensure they are functioning properly and are undamaged. Long-term planning will consider the implementation of a perimeter fence that fully surrounds the airport.

A summary of the overall general aviation landside facilities is presented on **Exhibit 3F**.

SUMMARY

This chapter has outlined the safety design standards and facilities required to meet the potential aviation demand projected at Waupaca Municipal Airport for the next 20 years. To provide a more flexible master plan, the yearly forecasts from Chapter Two have been converted to planning horizon levels. The short term roughly corresponds to a five-year time period, the intermediate term is approximately 10 years, and the long term is 20 years. By utilizing planning horizons, airport management can focus on demand indicators for initiating projects and grant requests, rather than on specific dates in the future.

In Chapter Four, potential improvements to the airside and landside systems will be examined through a series of airport development alternatives. Most of the alternatives discussion will focus on those capital improvements that would be eligible for federal and state grant funds. Other projects of local concern will also be presented. Ultimately, an overall airport development plan that presents a vision beyond the 20-year scope of this master plan will be developed for Waupaca Municipal Airport.

Aircraft Storage Hangars

	Available	Short Term	Intermediate Term	Long Term
Aircraft to be Hangared	43	46	48	54
T-Hangar Area (sf)	9,800	24,200	26,500	39,100
Executive/Conventional Hangar Area (sf)	88,100	94,100	108,400	117,900
Service/Maintenance Area (sf)	12,000	6,600	7,100	8,300
Total Hangar Storage Area (sf)	**109,900**	**124,900**	**142,000**	**165,300**

Aircraft Parking Apron

	Available	Short Term	Intermediate Term	Long Term
Aircraft Parking Positions	18	24	27	32
Total Public Apron Area (sy)	16,700	20,000	22,500	26,600

General Aviation Terminal Facilities and Parking

	Available	Short Term	Intermediate Term	Long Term
Terminal Building Space (sf)	2,600	2,400	3,100	4,100
Total GA Parking Spaces	35	35	42	18

Fuel Storage Requirements

	Available		Short Term	Intermediate Term	Long Term
	Capacity	**# of Tanks**			
Jet A	12,000	1	Maintain		
AvGas	12,000	1	Maintain		

Chapter 4

Development Alternatives

Chapter 4
Development Alternatives

The aviation facilities required to satisfy airside and landside demand through the 20-year planning period of the master plan were identified in the previous chapter. Several Federal Aviation Administration (FAA) and Wisconsin Department of Transportation (WisDOT) Bureau of Aeronautics (BOA) development standards that apply to airfield design were also discussed. The next step in the planning process is to evaluate appropriate staging for these facilities while meeting applicable federal and local design standards. The purpose of this chapter is to formulate and examine a range of realistic development alternatives that address the short-term, intermediate-term, and long-term planning horizon levels. Because there are multiple possibilities and combinations, it is necessary to focus on the opportunities that have the greatest potential for success. Each alternative provides a different approach to meeting existing and future facility needs. The alternatives considered in this chapter are presented in graphic form for ease of understanding, evaluation, and discussion.

Some airports become constrained due to limited availability of vacant and/or underutilized land, while others may be constrained due to adjacent existing and/or approved land use development or other human-made or geographical features. These conditions must be carefully considered and understood to organize a functionally successful layout of the new and improved facilities at Waupaca Municipal Airport (PCZ). Taking a long-term approach to facility planning now will provide an effective insurance policy for the City of Waupaca, ensuring the airport's long-term viability for safe and functional aviation operations while supporting compatible and sustainable economic growth.

The primary goal of this planning process is to develop a feasible plan to meet the projected needs driven by market demand over the next 20 years. The resulting master plan and capital financial plan should be developed in a manner consistent with the future goals and objectives of the City of Waupaca and airport stakeholders, including users of the airport and the local community and region, all of which have a vested interest in the successful development and operation of PCZ.

The goal of this chapter is to develop an underlying rationale that supports the final recommended concept. Through this planning process, an evaluation of the highest and best uses of airport property will be made, while also considering local development goals, efficiency, physical and environmental factors, capacity, and appropriate safety design standards.

The alternatives presented in this chapter have been formulated as potential solutions to meet the overall program objectives for the airport in a balanced manner. Through coordination with the City of Waupaca, the planning advisory committee (PAC), and the public, an alternative (or combination of alternatives) will be refined and modified as necessary into a recommended development concept in Chapter Five; therefore, the planning considerations and alternatives presented in this chapter serve as the starting points in a recommended development concept to attain the airport's desired future.

PLANNING OBJECTIVES

A set of basic planning objectives has been established to guide the alternative development process. The goal of this master planning update effort is to produce a development plan for the airport that addresses forecasted aviation demand and meets FAA and/or BOA design standards to the greatest degree possible. As the owner and operator of PCZ, the City of Waupaca provides the overall guidance for the operation and development of the airport. It is of primary importance that PCZ is marketed, developed, and operated for the benefit of the community and its users. The following basic planning principles and objectives will be utilized as general guidelines during this planning effort:

- Develop a safe, attractive, and efficient aviation facility in accordance with applicable federal, state, and local regulations
- Preserve and protect public and private investments in existing airport facilities
- Provide a means for the airport to grow, as dictated by demand
- Establish a plan to ensure the long-term viability of the airport and promote compatible land uses surrounding the airport
- Develop a facility that is responsive to the changing needs of all aviation users
- Reflect and support the long-term planning efforts that are currently applicable to the region
- Develop a facility with a focus on self-sufficiency in both operational and developmental cost recovery
- Ensure future development is environmentally compatible

NO-ACTION/NON-DEVELOPMENT ALTERNATIVES

The City of Waupaca is charged with managing the airport for the economic betterment of the community and region. In some studies, alternatives may include a no-action option; however, for PCZ, a no-action alternative would effectively reduce the quality of services being provided to the public, affect the aviation facility's ability to meet FAA design standards, and impact the region's ability to support aviation needs. The ramifications of a no-action alternative extend into impacts on the economic well-being of the region. If facilities are not maintained and improved so the airport can provide a pleasant experience for visitors and business travelers, or if delays become unacceptable, activity and business may shift elsewhere.

The no-action alternative is also inconsistent with the primary long-term goal of the FAA and the BOA, which is to enhance local and interstate commerce. Additionally, the acceptance and use of state and federal grants carries the obligation of grant assurances, which require the City of Waupaca to maintain and allow for the improvement of PCZ as needed to serve local and regional demand. Other significant considerations are previous investments and outstanding contractual agreements with all airport tenants and users. Discontinuing active management and development of the airport would require the city to breach these obligations and could result in associated legal actions; therefore, a no-action alternative is not considered further in this master plan.

This study does not consider the relocation of services to another airport or the development of a new airport site. The development of a new facility like PCZ is a complex and expensive option. A new site would require greater land area, duplication of investment in facilities, installation of supporting infrastructure that is already available at the existing site, and greater potential for negative impacts to natural, biological, and cultural resources.

The purpose of this study is to examine aviation needs at PCZ over the course of the next 20 years. As such, this master plan examines the needs of the existing airport and will present a program of necessary capital improvement projects to cover the scope of the plan. The airport is a lucrative business, transportation utility, and economic asset for the region. PCZ can accommodate existing and future demand and should be developed accordingly to support the interests of the residents and local businesses that rely upon it. Ultimately, the final decision to pursue development rests with the City of Waupaca, the FAA, and the WisDOT BOA on an individual project basis. The following analysis presents airside and landside development alternatives that consider an array of facility demands, including safety, capacity, access, and efficiency.

REVIEW OF PREVIOUS AIRPORT PLANS

Although the airport has not historically undergone an official master planning process, it has an airport layout plan (ALP) drawing set, which was completed in 2005 and fully approved in 2007. The ALP is shown on **Exhibit 4A**. The ALP provides information regarding existing and ultimate conditions at PCZ, including the following:

- Airport data related to airport category, airport reference code (ARC), elevation, wind conditions, temperature, and navigational aids located at the airport
- Runway data related to the critical design aircraft, safety areas, markings, lighting, and visual and navigational aids associated with the runway and taxiway system

Additionally, the drawing graphically depicts the following airside and landside recommendations based on previous airport planning efforts:

- Extension of Taxiway A and Runway 10-28 to an ultimate length of 6,100 feet
- Maintenance of Runway 13-31
- Construction of a partial parallel taxiway serving the north side of Runway 10-28
- Implementation of ground-based navigational systems and approach aids
- Construction of landside facilities (aprons/taxilanes/hangars) on the south side of Runway 10-28

The analysis presented in this chapter revisits the recommendations presented on the ALP. Since the completion of the last ALP, the FAA has made modifications to design standards, as outlined in the previous chapter. As such, some of the previous plan's elements are carried over to this master plan and others are changed or removed from further consideration.

AIRSIDE ALTERNATIVES

As previously detailed, the development alternatives are categorized into two functional areas: airside and landside. Airside considerations relate to runways, taxiways, navigational aids, lighting and marking aids, etc., and require the commitment of an extensive land area to meet the physical layout of the airport and the required airfield safety standards. The design of the airfield also defines minimum setback distances from the runway and object clearance standards. These criteria are established first to ensure the fundamental operational needs of the airport are met. Landside considerations include hangars, aircraft parking aprons, and terminal services, as well as the potential utilization of property to provide revenue support for the airport and benefit the economic development and well-being of the surrounding area.

Exhibit 4B presents the airside and landside alternative considerations that are specifically addressed in this analysis. These initial concepts stem from the findings of the aviation demand forecasts and facility requirements evaluations, as well as input from the PAC, the City of Waupaca, and the public.

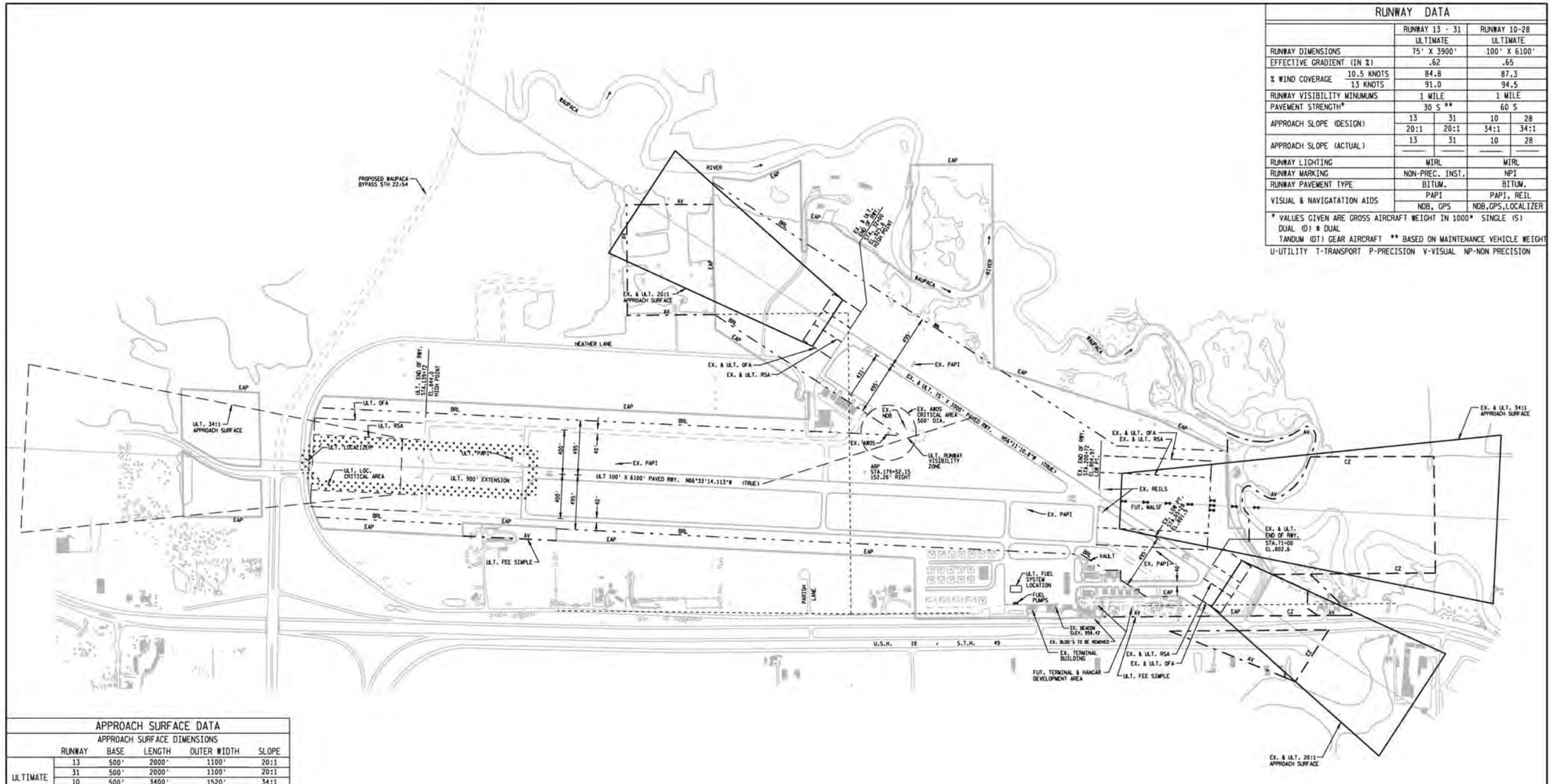
The remainder of this chapter describes various development alternatives for airside and landside facilities. Although each airfield component is treated separately in this chapter, the final master plan will integrate all these individual requirements so they complement one another.

AIRSIDE CONSIDERATIONS

This section identifies and evaluates various airside development factors at PCZ to meet the requirements set forth in Chapter Three. By nature, airside facilities are the focal point of an airport facility. Because of their primary role and the fact that they physically dominate airport land use, airfield facility needs often serve as the most critical factor in the determination of viable development options.

AIRPORT DESIGN CRITERIA

Applicable standards for airport design are outlined in FAA Advisory Circular (AC) 150/5300-13B, *Airport Design,* Change 1. The design of airfield facilities is primarily based on the physical and operational characteristics of the aircraft that use the airport. As discussed in Chapter Two, a runway design code (RDC) is applied to each runway at an airport to identify the appropriate design standards for the runway and its associated taxiway system. The RDC relates to the maximum size and top speed of aircraft that regularly operate at the airport and is comprised of the aircraft approach category (AAC), the airplane design group (ADG), and the approach visibility minimums expressed in runway visual range (RVR) values. The FAA has historically defined regular use as at least 500 annual operations at the airport. While this standard can sometimes be represented by one specific make and model of aircraft, most of the runway's RDC values are represented by several different aircraft that, collectively, operate frequently at the airport.



RUNWAY DATA		RUNWAY 13 - 31		RUNWAY 10-28	
		ULTIMATE		ULTIMATE	
RUNWAY DIMENSIONS		75' X 3900'		100' X 6100'	
EFFECTIVE GRADIENT (IN %)		.62		.65	
% WIND COVERAGE	10.5 KNOTS	84.8		87.3	
	13 KNOTS	91.0		94.5	
RUNWAY VISIBILITY MINUMUMS		1 MILE		1 MILE	
PAVEMENT STRENGTH*		30 S **		60 S	
APPROACH SLOPE (DESIGN)		13	31	10	28
		20:1	20:1	34:1	34:1
APPROACH SLOPE (ACTUAL)		13	31	10	28
		___	___	___	___
RUNWAY LIGHTING		MIRL		MIRL	
RUNWAY MARKING		NON-PREC. INST.		NPI	
RUNWAY PAVEMENT TYPE		BITUM.		BITUM.	
VISUAL & NAVIGATATION AIDS		PAPI		PAPI, REIL	
		NDB, GPS		NDB,GPS,LOCALIZER	

* VALUES GIVEN ARE GROSS AIRCRAFT WEIGHT IN 1000* SINGLE (S) DUAL (D) & DUAL TANDUM (DT) GEAR AIRCRAFT ** BASED ON MAINTENANCE VEHICLE WEIGHT
U-UTILITY T-TRANSPORT P-PRECISION V-VISUAL NP-NON PRECISION

APPROACH SURFACE DATA					
APPROACH SURFACE DIMENSIONS					
	RUNWAY	BASE	LENGTH	OUTER WIDTH	SLOPE
ULTIMATE	13	500'	2000'	1100'	20:1
	31	500'	2000'	1100'	20:1
	10	500'	3400'	1520'	34:1
	28	500'	3400'	1520'	34:1

RUNWAY SAFETY AREA (RSA)		
ULTIMATE RUNWAY SAFETY AREA DIMENSIONS		
RUNWAY	WIDTH	LENGTH BEYOND RUNWAY END
13	150'	300'
31	150'	300'
10	500'	1000'
28	500'	1000'

RUNWAY OBJECT FREE AREA (OFA)		
ULTIMATE RUNWAY OBJECT FREE AREA DIMENSIONS		
RUNWAY	WIDTH	LENGTH BEYOND RUNWAY END
13	500'	300'
31	500'	300'
10	800'	1000'
28	800'	1000'

RUNWAY END COORDINATES (NAD 83)		
ULTIMATE		
13	44°20'11.989"	89°01'18.086"
31	44°19'50.559"	89°00'33.519"
10	44°20'00.644"	89°02'10.771"
28	44°19'57.032"	89°00'46.998"

-LEGEND-

EAP — EX. AIRPORT PROPERTY LINE
ULT — ULT. AIRPORT PROPERTY LINE
CZE — EX. CLEAR ZONE EASEMENT LINE
AVE — EX. AVEGATION EASEMENT LINE
BRL — BUILDING RESTRICTION LINE

VAR. 2°05'W
N
DEC. 17, 2002
0 500' 1000 FEET
SCALE

SHEET 3 REVISIONS			
DESCRIPTION OF REVISIONS	DATE:	FIRM OR AGENCY NAME	DRAWN BY:

ULTIMATE AIRPORT LAYOUT PLAN

WAUPACA MUNICIPAL AIRPORT
WAUPACA, WISCONSIN

PREPARED BY:
WISCONSIN DEPARTMENT OF TRANSPORTATION
BUREAU OF AERONAUTICS

DATE: 6-30-05	DRAWN BY: KJS
SCALE: 1"=500'	SHEET 3 OF 11

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AIRSIDE CONSIDERATIONS

- Evaluate improvements necessary to meet the appropriate existing and ultimate Federal Aviation Administration (FAA) design standards.
- Examine a potential runway extension on Runway 10-28 and consider options for ultimate disposition of Runway 13-31.
- Analyze options to mitigate incompatible land uses within the runway protection zones (RPZs).
- Consider increased runway pavement strength on Runway 10-28 to 60,000 lbs (D).
- Evaluate the potential for improved instrument approach minimums serving Runway 28.
- Evaluate the taxiway system in meeting airfield safety, design, and geometry standards.
- Upgrade airport signage to include runway distance remaining signs and upgrade visual approach aids.

LANDSIDE CONSIDERATIONS

- Determine efficient land uses that allow the airport to meet the needs of aviation users and promote non-aviation uses where possible.
- Identify locations for hangar development and additional aircraft apron area to meet projected demand.
- Consider options for expanded or additional general aviation terminal facilities.
- Evaluate options to construct support facilities such as perimeter fencing, access gates and potential for a dedicated airport maintenance and snow removal equipment (SRE) building.
- Examine options for vehicle parking access while best segregating aircraft and vehicle traffic on airport movement areas.

As a local general aviation airport in the FAA's *National Plan of Integrated Airport Systems* (NPIAS), PCZ should be capable of safely accommodating the needs of recreational, instructional, and public safety uses, as well as charter and military aviation uses on a more limited basis. Analysis in Chapter Two indicated that the RDC for Runway 10-28 is currently B-II-4000, while the RDC for Runway 13-31 is B-I(S)-VIS. The airfield should continue to be planned with the most demanding piston- and turbine-powered aircraft that utilize the airport in mind and should account for a potential increase in business jet activity to the greatest extent possible, as demand dictates. As such, alternatives associated with runway length and the possibility of improved instrument approach visibility minimums are considered. Design considerations for Runway 10-28 are presented under B-II-4000 standards, as well as ultimate RDC C-II-4000 standards, while considerations for Runway 13-31 are presented under RDC B-I(S)-VIS standards. The ultimate disposition of Runway 13-31 is also evaluated in this chapter. Wind analysis conducted in Chapter Three indicated that Runway 10-28 meets 95 percent wind coverage at 10.5 knots, which is above the design criteria to justify funding eligibility for a crosswind runway; therefore, all future costs associated with maintaining Runway 13-31 will likely be the responsibility of the airport sponsor.

OBJECTS AFFECTING NAVIGABLE AIRSPACE – TITLE 14 CFR PART 77

Title 14 Code of Federal Regulations (CFR) Part 77 establishes standards for determining obstructions in navigable airspace and sets forth requirements for the construction and alteration of structures (e.g., buildings, towers, etc.). This federal regulation provides for studies of obstructions to determine their effects on the safe and efficient use of airspace, public hearings regarding these obstructions, and the creation of antenna or wind farm areas. It also establishes methods for identifying surfaces that must be free from penetration by obstructions (including buildings, cranes, cell towers, etc.) in the vicinity of an airport. This regulation is predominately focused on airspace-related issues. Implementation and enforcement of the elements contained in this regulation are a cooperative effort between the FAA and individual state aviation agencies or individual airports. The imaginary surfaces defined in 14 CFR Part 77 include the primary surface, transitional surface, approach surface, horizontal surface, and conical surface. As part of the PCZ airport master plan, a detailed obstruction analysis is being conducted for inclusion in the ALP drawing set. The ALP is the culmination of the airport master plan and depicts the ultimate layout for the airport over the next 20 years or more.

BUILDING RESTRICTION LINE

The building restriction line (BRL) identifies suitable building area locations on the existing and proposed airport property. The BRL encompasses the runway protection zones (RPZs), the runway object free area (ROFA), navigational aid critical areas, areas required for terminal instrument procedures, and other areas necessary for meeting airport line-of-sight criteria.

Two primary factors contribute to the determination of the BRL: the type of runway (utility or other-than-utility) and the capability of the instrument approaches. Utility runways serve aircraft that weigh under 12,500 pounds, while other-than-utility runways serve large aircraft that weigh over 12,500 pounds. Under the ultimate condition, Runway 10-28 is an other-than-utility non-precision instrument runway with visibility minimums not lower than ¾-mile and Runway 13-31 is a utility runway with visual approaches.

The BRL is the product of 14 CFR Part 77 transitional surface clearance requirements. These requirements stipulate that no object be located in the primary surface, which is defined as 1,000 feet wide for other-than-utility runways with instrument approach minimums as low as ¾-mile, and 250 feet wide for utility runways with visual approaches. From the primary surface, the transitional surface extends outward at a slope of one vertical foot to every seven horizontal feet. For Runway 10-28, the 25-foot BRL is based on a 1,000-foot-wide primary surface (500 feet on either side of the runway) set at 675 feet from the runway centerline. For Runway 13-31, the 25-foot BRL is based on a 250-foot-wide primary surface (125 feet on either side of the runway) set at 300 feet from the runway centerline. The BRL at PCZ is depicted for all landside development alternatives to be considered.

RUNWAY LENGTH

The runway length analysis in the previous chapter concluded that the existing length of Runway 10-28 (5,200 feet) is capable of safely accommodating up to 100 percent of small aircraft (less than 12,500 pounds) with 10 or more passenger seats; 4,200 feet of runway length is recommended.

The analysis concluded that Runway 10-28's current length of 5,200 feet is adequate for many business jet and turboprop aircraft for takeoffs at up to 60-70 percent useful load. Of the aircraft analyzed, some are able to operate at 90 or 100 percent useful load, while others become weight-restricted. During hot summer periods, some business jet and turboprop aircraft must depart from PCZ with restricted payloads (less fuel/freight; fewer passengers), which can limit nonstop destination distances. Furthermore, when considering wet runway conditions, the landing length requirements of several business jets analyzed in Chapter Three exceed the current runway length. Of the aircraft analyzed, only the Pilatus PC-12 and Cessna Citation I/SP can conduct landing operations during wet runway conditions while operating under the 60 percent rule.

The facility requirements concluded that additional length on the primary runway may become necessary in the future, depending on how the business jet aircraft fleet mix changes and grows. For these reasons, the following alternatives consider extension options for the runway so the airport is prepared in the future if demand for an extension materializes. At a minimum, planning for runway extensions allows the City of Waupaca to develop land use and zoning policies that limit the potential for encroaching developments that would restrict future airport expansion. As discussed in Chapter Three, a runway length of 7,000 feet can accommodate 75 percent of the business jet fleet operating at 90 percent useful load. Additionally, a runway of this length could accommodate the Challenger 300 for takeoff operations at 100 percent useful load under design day conditions and landing operations to a contaminated runway under the 80 percent rule. As such, analysis in this chapter examines the potential impacts of an extension to Runway 10-28 to approximately 7,000 feet while considering the appropriate safety design standards.

Given that Runway 13-31 is designed to accommodate B-I(S) aircraft only, the existing runway length (3,899 feet) is planned to be maintained under the condition that the City of Waupaca decides to preserve the runway.

OVERLAPPING RUNWAY SAFETY AREAS AND ELEVATED RISK

As discussed in Chapter Three, the current configuration of Runway 10-28 and 13-31 is subject to elevated risk, as the Runway 10 threshold is situated on Runway 13-31. This configuration does not provide sufficient physical space for the runway safety areas, entrance/exit taxiways, or associated markings and signage, thus increasing the potential for runway incursions, pilot confusion, and loss of situational awareness. The following alternatives examine potential solutions to alleviate risks associated with the intersecting runways.

TAXIWAY CONFIGURATION

The taxiway system at PCZ primarily meets the recommended design and geometry standards set forth by the FAA; however, the following existing non-standard taxiway geometry conditions need to be addressed:

- The midfield Taxiway A3 crosses within the high-energy area of Runway 10-28.
- Taxiway A3 provides direct access as it connects the northern apron to Runway 10-28.
- Taxiway A4 provides direct access as it extends from the main apron area to Runway 10-28.
- Taxiway C is acutely angled to the Runway 31 threshold.

These conditions are addressed in the following airside alternatives because they introduce various hazards and can lead to pilots inadvertently taxiing onto the runway, causing runway incursions and other potentially dangerous airfield safety concerns.

ANCILLARY IMPROVEMENTS

Runway Strength

An important feature of airfield pavement is its ability to withstand repeated use by aircraft. The strength rating of a runway does not preclude aircraft that weigh more than the published strength rating from using the runway. Runway strength is based on design parameters that support a high volume of aircraft at or below the published weight and allow the pavement to survive its intended useful life. The current pavement strength for Runway 10-28 is reported as 30,000 pounds single wheel loading (S). Given the number of turboprop and jet aircraft that currently operate and are forecasted to operate at PCZ, future planning should consider maintaining the existing Runway 10-28 pavement strength rating of 30,000 pounds S and increasing to 60,000 pounds dual wheel loading (D). If the City of Waupaca decides to maintain Runway 13-31 in its current disposition, its existing pavement strength of 13,000 S should be maintained.

Visual Approach Aids

Runways 10 and 28 are currently equipped with two-box precision approach path indicator (PAPI-2) systems. Generally, four-box precision approach path indicators (PAPI-4s) are recommended for runways that are used by jet and turboprop aircraft; therefore, consideration should be given to upgrading the PAPI-2 systems to PAPI-4 systems.

Improved Instrument Approach Minimums

The instrument approach capabilities at an airport are an important consideration that directly impacts the utility of the airport; lower visibility minimums increase the utility of an airport. From an economic development standpoint, it is important to achieve the lowest possible visibility minimums. The best possible approach minimums will prevent aircraft from having to divert to another airport, which can create additional operating costs and time delays for aircraft operators and on-airport businesses. Runway 10 is currently served by ¾-mile instrument approach minimums and Runway 28 is served by one-mile instrument approach minimums. The following alternatives consider impacts associated with enhanced instrument approach minimums of ¾-mile serving the Runway 28 end.

Airfield Signage

Airfield identification signs are lighted signs installed on the runway and taxiway system on the airfield. These signs assist pilots in identifying their locations on the airfield and directing them to their desired locations. The signage system includes runway and taxiway designation, holding position, routing/ directional, and runway exit signs. All existing signs at PCZ should be maintained through the planning period. At present, there are no distance remaining signs serving PCZ; at a minimum, consideration should be given to the addition of distance remaining signage on Runway 10-28. Airfield signage should be expanded or upgraded as airfield improvements are made.

AIRSIDE ALTERNATIVES

Four airfield alternatives have been prepared to address the airfield components outlined in the previous section. The following alternatives have been analyzed under existing RDC B-II-4000 design criteria as an interim scenario, as well as ultimate C-II-4000 design criteria for Runway 10-28. The details of each alternative are described along with each alternative's associated advantages and disadvantages. **It should be noted that all airside alternatives that involve changes to existing runway ends are pending survey analysis. Any selected alternative may need to be adjusted, depending on the survey results.**

INTERIM AIRSIDE ALTERNATIVE 1

As depicted on **Exhibit 4C**, Airside Alternative 1 considers improvements to the airfield to increase the current runway length while meeting critical safety area design standards for existing RDC B-II-4000 on Runway 10-28 and maintaining the existing instrument approach minimums. In addition, this alternative explores options to mitigate the increased risk associated with the current intersection of Runways 10-28 and 13-31, address direct access from each apron area to Runway 10-28, realign the Taxiway A3 midfield connector to eliminate a runway crossing through the high-energy area, and realign the acute-angled Taxiway C as it connects to Runway 31. This alternative maintains Runway 13-31 in its existing condition.

Runway 10-28

A 900-foot extension to Runway 10-28 results in a length of 6,100 feet, which would satisfy the ultimate critical aircraft (Bombardier Challenger 300) requirements for takeoff operations at 90 percent useful load. This length would also increase the runway's overall utility for other business jets and turboprop aircraft.

As such, this alternative considers a 900-foot runway extension to the east and the necessary improvements to maintain existing RDC B-II-4000 design standards. By extending the runway in this manner, the RPZ serving Runway 28 would extend beyond the existing airport property boundary and would need to be controlled through avigation easement or fee simple acquisition; however, a runway extension to the east would shift the RPZ serving Runway 28 over a private residence, which is considered an incompatible land use. To meet RDC B-II-4000 design standards, consideration is given to the implementation of a threshold displacement on Runway 28, as well as declared distances to mitigate safety area deficiencies for the ultimate RPZ beyond the east end of the runway, which includes a private residence.

Declared distances are used to define the effective runway length for landing and takeoff when a standard RSA/ROFA cannot be achieved or an RPZ needs to be relocated. The four declared distances are as follows:

- Takeoff run available (TORA) – the runway length declared available and suitable for the ground run of an aircraft taking off (factors in the positioning of the departure RPZ)
- Takeoff distance available (TODA) – the TORA plus the length of any remaining runway or clearway beyond the far end of the TORA; the full length of the TODA may need to be reduced because of obstacles in the departure area
- Accelerate-stop distance available (ASDA) – the runway plus stopway length declared available and suitable for the acceleration and deceleration of an aircraft aborting a takeoff (factors in the RSA/ROFA length beyond the runway end)
- Landing distance available (LDA) – the runway length declared available and suitable for landing an aircraft (factors in the RSA/ROFA length beyond the runway end and positioning of the approach RPZ)

The declared distances pertaining to the RSA and ROFA are the ASDA and LDA, while the TORA and LDA relate to the RPZs. The runway extension and declared distances presented in Alternative 1 reduce the LDA for Runway 28. The TORA for Runway 10 is also reduced due to incompatibilities beyond the runway end. The application of declared distances maintains the Runway 28 RPZ in its existing location, which minimizes impacts to off-airport property while allowing for a Runway 10-28 extension to the east and through the intersection of Runway 13-31. This configuration also allows for the extension of Taxiway A to the east, which could be routed across the Runway 31 threshold and ultimately to the extended Runway 28. The resulting declared distances for this alternative are presented in **Table 4A**.

TABLE 4A | Airside Alternative 1 – Declared Distances

Runway 10-28 Declared Distances	10	28
Takeoff Run Available (TORA)	5,200'	6,100'
Takeoff Distance Available (TODA)	6,000'	6,100'
Accelerate-Stop Distance Available (ASDA)	6,000'	6,100'
Landing Distance Available (LDA)	6,000'	5,200'

Source: Coffman Associates analysis

Existing Runway Design Codes
Runway 10-28: B-II-4000
Runway 13-31: B-I(S)-VIS

DEFINITIONS

TODA - Takeoff Distance Available
TORA - Takeoff Run Available
ASDA - Accelerate/Stop Distance Available
LDA - Landing Distance Available

DECLARED DISTANCES

	Runway 10	Runway 28
TORA	5,200′	6,100′
TODA	6,000′	6,100′
ASDA	6,000′	6,100′
LDA	6,000′	5,200′

LEGEND

- Airport Property Line
- Existing Taxiway Designation
- Ultimate Taxiway Desigmation
- Runway Safety Area (RSA)
- Runway Object Free Area (ROFA)
- Runway Obstacle Free Zone (ROFZ)
- Runway Protection Zone (RPZ)
- Property to be Acquired
- AWOS Critical Area
- High-Energy Area
- Ultimate Airfield Pavement
- Remove Pavement

**Acreage is approximate and intended for planning uses only*

Public Road in RPZ
Heather Ln
Webster Way
Rotary St
Commercial Drive
22
1.8 Acres
900′ Runway Extension/ Displaced Threshold
Private Residence
Runway 13-31 (3,899′ x 75′)
B
B1
B2
B3
B4
240′
Ultimate Runway 10-28 (6,100′ x 100′)
A1
A2
A3
A4
A5
400′
A
C
240′
2.2 Acres
Public Road in RPZ
Runway Drive
10
6.45 Acres
200′ Holding line
Public Road in RPZ
Airport Rd.
A
N
0
800
SCALE IN FEET
Aerial Photo: MTZ 8/2024

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The proposed improvements to the runway would involve several connected projects and other airfield improvements, including the following:

- Extension of Taxiway A
- Extension of medium intensity runway lighting (MIRL) and taxiway lighting (MITL)
- Acquisition of approximately 1.8 and 2.2 acres of uncontrolled property within the existing and ultimate Runway 10 RPZ
- Mitigation of overgrown vegetation and gradient incompatibilities within the RSA, ROFA, and ROFZ associated with the eastern runway extension

Further analysis will be required at the time of construction of a runway extension.

Taxiway Geometry Improvements

To mitigate the existing (and unsafe) direct access from the northern and southern aircraft apron areas to Runway 10-28, this alternative considers the removal and relocation of the southern apron connector at the A4 Taxiway and construction of partial parallel Taxiway B with a 240-foot runway-to-taxiway centerline separation on the north side of Runway 10-28. Ultimately, this would allow for the removal and relocation of the existing taxiway, which currently provides direct access from the northern apron area to Runway 10-28, as well as elimination of a runway crossing through the high-energy area of Runway 10-28 at existing Taxiway A3.

Additionally, this alternative considers the extension of Taxiway A to the southeast to connect with Taxiway C. Taxiway A5 is also proposed to be removed and relocated to the east to serve the extended runway. The existing Taxiway C could then be reoriented so the holding position serving the Runway 31 end is positioned 200 feet from the runway centerline and 90 degrees perpendicular to the runway as Taxiway C connects to Runway 31.

INTERIM AIRSIDE ALTERNATIVE 2

As depicted on **Exhibit 4D**, Airside Alternative 2 considers improvements to the airfield to increase the current runway length while meeting critical safety area design standards for RDC B-II-4000 on Runway 10-28 and maintaining the existing instrument approach minimums. This alternative also explores options to mitigate the existing direct access and eliminate the existing crossing through the high-energy area of Runway 10-28. In addition, this alternative addresses the increased risk of the existing intersection of Runway 10-28 and Runway 13-31 by relocating Runway 13-31 and redesignating it as a turf runway.

Runway 10-28

A 500-foot extension on the west end of Runway 10-28 results in a length of 5,700 feet, which would allow the ultimate critical aircraft to take off above 80 percent maximum takeoff weight (MTOW) during the hottest periods of the summer and would satisfy runway length requirements to accommodate 100 percent of the business jet fleet at 60 percent useful load. Primary impacts associated with a runway

extension of 500 feet on the Runway 10 end would include shifting the RPZ that serves Runway 10 farther west, beyond the existing airport property boundary; the Runway 10 RPZ would encompass approximately 16.4 acres of uncontrolled property and would be completely traversed by Runway Drive and Highway 22. The existing RPZ serving Runway 28 will remain in its existing location. The proposed improvements to the runway would involve numerous connected projects, including the following:

- Extension of Taxiway A
- Extension of MIRL and MITL
- Relocation of the runway end identifier lights (REILs) and PAPI system serving Runway 10
- Acquisition (fee simple/easement) of approximately 16.4 acres of uncontrolled property within the ultimate Runway 10 RPZ
- Potential relocation of public roadways
- Mitigation of potential gradient incompatibilities associated with the RSA, ROFA, and ROFZ

Further analysis will be required at the time of construction of a runway extension.

Runway 13-31

Airside Alternative 2 considers relocating Runway 13-31 to the northeast and converting it to a turf runway. Based on the current wind coverage of Runway 10-28 (97.21 percent at 10.5 knots), a paved crosswind runway is no longer justified and would be prioritized very low for federal funding assistance. Given these circumstances, a turf runway option is explored for Runway 13-31 if local demand warrants. Due to the nature of aircraft (and pilots) that typically operate on turf, the runway length could be shortened to 2,500 feet and shifted to the northeast to alleviate current risks associated with the existing intersecting runway configuration. The proposed improvements to the runway involve several connected projects, including the following:

- Closure of existing paved Runway 13-31
- Implementation of turf runway edge markers
- Mitigation of overgrown vegetation and gradient incompatibilities associated with the RSA, ROFA, and ROFZ

Taxiway Geometry Improvements

This alternative considers the construction of full-length parallel Taxiway B serving the north side of Runway 10-28 with a runway-to-taxiway centerline separation of 240 feet. Ultimately, this configuration would allow for the removal and relocation of the existing taxiway connection that provides direct access from the north apron area and would eliminate the runway crossing through the Runway 10-28 high-energy

Existing Runway Design Codes
Runway 10-28: B-II-4000
Runway 13-31: B-I(S)-VIS

LEGEND
- Airport Property Line
- Existing Taxiway Designation
- Ultimate Taxiway Desigmation
- Runway Safety Area (RSA)
- Runway Object Free Area (ROFA)
- Runway Obstacle Free Zone (ROFZ)
- Runway Protection Zone (RPZ)
- Property to be Acquired
- AWOS Critical Area
- High-Energy Area
- Ultimate Airfield Pavement
- Remove Pavement

**Acreage is approximate and intended for planning uses only*

Public Road in RPZ
Heather Ln
Ultimate Turf Runway 13-31 2,500' x 75'
Private Residence
22
Webster Way
Rotary St
Commercial Drive
500' Runway extension
16.4 Acres
B
B1
B2
240'
B3
B4
B5
Ultimate Runway 10-28 5,700' x 100'
A1
A2
400'
A3
A4
A5
A
C
Potentially Relocate Public Roads in RPZ
Runway Drive
10
No-Taxi Island
Airport Rd.
N
0
800
SCALE IN FEET
Aerial Photo: MTZ 8/2024

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area at Taxiway A3. This alternative also considers the implementation of a no-taxi island on the southern apron area to prevent direct access provided from the apron to Runway 10-28 via Taxiway A4. Finally, Taxiway A could be extended to the east to provide more convenient access to Taxiway C and the existing landside development.

ULTIMATE AIRSIDE ALTERNATIVE 3

As shown on **Exhibit 4E**, Ultimate Airside Alternative 3 also considers improvements to the airfield to maximize the runway length while meeting critical safety area design standards for ultimate RDC C-II-4000 on Runway 10-28 and limiting off-airport impacts. This alternative also explores the potential for enhanced instrument approach visibility minimums serving Runway 28. Additional taxiway layouts were examined to create more efficient traffic flow while mitigating identified taxiway geometry deficiencies. Runway 13-31 is maintained in its existing condition under this scenario.

Runway 10-28

A 900-foot extension to the west and a 1,000-foot extension to the east of Runway 10-28 results in a length of 7,100 feet, which would satisfy the ultimate critical aircraft requirement for takeoff operations at 100 percent useful load, as well as landing operations under 14 CFR Part 25 and the 80 percent rule with a wet or contaminated runway. This length would also increase the runway's overall utility for other business jets and turboprop aircraft. As such, this alternative considers the aforementioned runway extension and the necessary improvements to meet ultimate RDC C-II-4000 design standards. By extending the runway in this manner, the RPZ serving Runway 10 extends beyond the airport property boundary to the west and encompass multiple roadways, while the RSA, ROFA, and RPZ serving Runway 28 extend beyond the existing airport property boundary to the east and encompass an existing residence and private property. The ultimate RSA and ROFA would need to be acquired in fee, while the RPZs could be acquired through avigation easement or fee simple acquisition. To meet ultimate RDC C-II-4000 design standards and limit impacts to off-airport property, consideration is given to the implementation of a threshold displacement on each end of Runway 10-28, as well as declared distances to mitigate safety area deficiencies for the ultimate RPZ beyond the west end of the runway and the ultimate RSA, ROFA, and RPZ beyond the east end of the runway.

As previously discussed, the declared distances pertaining to the RSA and ROFA are the ASDA and LDA, while the TORA and LDA relate to the RPZs. The runway extension and declared distances presented in Alternative 3 reduce the LDA and TORA for Runways 10 and 28. The application of declared distances minimizes impacts to off-airport property. The resulting declared distances for this alternative are presented in **Table 4B**.

TABLE 4B | Airside Alternative 3 – Declared Distances

Runway 10-28 Declared Distances	10	28
Takeoff Run Available (TORA)	6,100'	6,200'
Takeoff Distance Available (TODA)	7,100'	7,100'
Accelerate-Stop Distance Available (ASDA)	7,100'	7,100'
Landing Distance Available (LDA)	5,200'	6,100'

Source: Coffman Associates analysis

The proposed improvements to the runway would involve several connected projects and other airfield improvements, including the following:

- Extension of Taxiway A
- Extension of MIRL and MITL
- Acquisition (fee simple/easement) of approximately 1.8 and 2.2 acres of uncontrolled property within the ultimate Runway 10 RPZ
- Acquisition (fee simple/easement) of approximately 14.2 acres (one-mile instrument approach minimums) or 19.9 acres (¾-mile instrument approach minimums) of uncontrolled property within the ultimate Runway 28 RPZ
- Potential relocation of a private residence
- Mitigation of overgrown vegetation and gradient incompatibilities associated with the RSA, ROFA, and ROFZ

Further analysis will be required at the time of construction of a runway extension.

Taxiway Geometry Improvements

To mitigate the existing (and unsafe) direct access from the northern and southern aircraft apron areas to Runway 10-28, this alternative considers the removal and relocation of the southern apron connector at the A4 Taxiway and construction of partial parallel Taxiway B with a 400-foot runway-to-taxiway centerline separation on the north side of Runway 10-28. Ultimately, this allows for the removal and relocation of the existing taxiway that provides direct access from the northern apron area to Runway 10-28 and eliminates a runway crossing through the high-energy-area of Runway 10-28 at existing Taxiway A3.

Additionally, this alternative considers the extension of Taxiway A to the east; Taxiway A5 is also proposed to be removed and relocated to the east to serve the extended Runway 28 end. The existing Taxiway C could also be reoriented so the holding position serving the Runway 31 end is positioned 200 feet from the runway centerline and 90 degrees perpendicular to the runway as Taxiway C connects to Runway 31.

ULTIMATE AIRSIDE ALTERNATIVE 4

Ultimate Airside Alternative 4, shown on **Exhibit 4F**, examines potential options to meet critical safety area design standards for RDC C-II-4000 while maximizing the usable runway length on Runway 10-28. A runway extension to an ultimate length of 6,100 feet is considered, which would accommodate the ultimate critical aircraft for takeoff above 90 percent useful load. This runway length also satisfies FAA requirements to accommodate 100 percent of the business jet fleet at 60 percent useful load. Additionally, this alternative examines options to create more efficient traffic flow while mitigating identified taxiway geometry deficiencies. Due to the current funding challenges and the increased safety risks associated with Runway 13-31, this scenario considers the eventual closure of the runway.

Ultimate Runway Design Codes
Runway 10-28: C-II-4000
Runway 13-31: B-I(S)-VIS

DEFINITIONS
TODA - Takeoff Distance Available
TORA - Takeoff Run Available
ASDA - Accelerate/Stop Distance Available
LDA - Landing Distance Available

DECLARED DISTANCES	Runway 10	Runway 28
TORA	6,100′	6,200′
TODA	6,100′	7,100′
ASDA	6,100′	7,100′
LDA	5,200′	6,100′

LEGEND
- Airport Property Line
- Existing Taxiway Designation
- Ultimate Taxiway Desigmation
- Runway Safety Area (RSA)
- Runway Object Free Area (ROFA)
- Runway Obstacle Free Zone (ROFZ)
- Runway Protection Zone (RPZ)
- Runway Visibility Zone (RVZ)
- Property to be Acquired
- AWOS Critical Area
- High-Energy Area
- Ultimate Airfield Pavement
- Remove Pavement

**Acreage is approximate and intended for planning uses only*

Public Road in RPZ
1,000′ Runway Extension and Displaced Threshold
Potentially Relocate Private Residence and Driveway in RPZ
900′ Runway Extension and Displaced Threshold
Apron Area in Ult. ROFA
1.8 Acres*
1-Mile RPZ (Acquire 14.2 Acres*)
¾-Mile RPZ (Acquire 19.9 Acres*)
2.2 Acres*
6.45 Acres*
Remove/Relocate Connector
Public Road in RPZ
Runway 10-28 (7,100′ x 100′)
Runway 13-31 3,899′ x 75′
Heather Ln
Webster Way
Rotary St
Commercial Drive
Runway Drive
Airport Rd
22
10
400′
SCALE IN FEET 0 800
Aerial Photo: MTZ 8/2024

Ultimate Runway Design Codes
Runway 10-28: C-II-4000
Runway 13-31: To be Removed

LEGEND

- Airport Property Line
- Existing Taxiway Designation
- Ultimate Taxiway Desigmation
- Runway Safety Area (RSA)
- Runway Object Free Area (ROFA)
- Runway Obstacle Free Zone (ROFZ)
- Runway Protection Zone (RPZ)
- Property to be Acquired
- AWOS Critical Area
- High-Energy Area
- Ultimate Airfield Pavement
- Remove Pavement

**Acreage is approximate and intended for planning uses only*

Potentially Relocate Public Roads in RPZ

900' Runway Extension

Apron Area in Ult. ROFA

Potentially Relocate Private Residence and Driveway in RPZ

1-Mile RPZ (Acquire 14.2 Acres*)

18.3 Acres*

Runway 13-31 (to be removed)

Ultimate Runway 10-28 (6,100' x 100')

400'

¾-Mile RPZ (Acquire 19.9 Acres*)

Remove/Relocate Connector

Webster Way

Rotary St

Commercial Drive

Heather Ln

Runway Drive

Airport Rd

22

10

A

B

B1

B2

B3

B5

A1

A2

A3

A4

A5

C

N

0 800

SCALE IN FEET

Aerial Photo: MTZ 8/2024

Runway 10-28

This alternative considers extending the runway 900 feet to the west, which results in a total runway length of 6,100 feet. Primary impacts associated with a runway extension of 900 feet on the Runway 10 end include shifting the RPZ serving Runway 10 farther west, beyond the existing airport property boundary; the Runway 10 RPZ would encompass approximately 18.3 acres of uncontrolled property and would be completely traversed by Runway Drive and Highway 22. The ultimate RSA, ROFA, ROFZ remain on airport property. The ultimate RPZ serving Runway 28 remains in its existing location; however, it varies in size based on the ultimate instrument approach minimums serving Runway 28. The proposed improvements to the runway involve numerous connected projects, including the following:

- Extension of Taxiway A
- Relocation of the REILs and PAPI systems serving Runway 10-28
- Extension of MIRL and MITL
- Acquisition (fee simple/easement) of approximately 18.3 acres of uncontrolled property within the ultimate Runway 10 RPZ
- Acquisition (fee simple/easement) of approximately 14.2 acres (one-mile instrument approach minimums) or 19.9 acres (¾-mile instrument approach minimums) of uncontrolled property within the ultimate Runway 28 RPZ
- Potential relocation of public roadways
- Potential relocation of a private residence
- Mitigation of overgrown vegetation and gradient incompatibilities associated with the RSA, ROFA, and ROFZ

Further analysis will be required at the time of construction of a runway extension.

Taxiway Geometry Improvements

To mitigate the existing (and unsafe) direct access from the northern and southern aircraft apron areas to Runway 10-28, this alternative considers the removal and relocation of the southern apron connector at the A4 Taxiway and construction of full-length parallel Taxiway B with a 400-foot runway-to-taxiway centerline separation on the north side of Runway 10-28. Ultimately, this would allow for the removal and relocation of the existing taxiway connection that provides direct access from the north apron area, which would also eliminate the runway crossing through the Runway 10-28 high-energy-area at Taxiway A3. Finally, Taxiway A could be extended to the east to provide more convenient access to Taxiway C and the existing landside development.

AIRSIDE SUMMARY

This section has addressed four planning alternatives (two interim and two ultimate) for the airside facilities at PCZ. The primary issues to consider on the airfield include addressing non-standard airfield geometry and increasing operational utility at the airport. It is important that the PAC, the City of Waupaca, and the public offer feedback so the best combination of these alternatives is selected. Following discussion and review with these entities, a preferred recommended airside development concept will be drafted and presented in the next chapter.

LANDSIDE PLANNING CONSIDERATIONS

Generally, landside issues are related to the facilities necessary or desired for the safe and efficient parking and storage of aircraft, the movement of pilots and passengers to and from aircraft, airport support, and overall revenue support functions. Landside planning considerations (summarized previously on **Exhibit 4B**) focus on strategies that follow a philosophy of separating activity levels. To maximize airport efficiency, it is important to place facilities intended to serve similar functions near one another. The best approach to landside facility planning is to treat the development like that of a community, for which land use planning is the guide. For an airport, land use in the terminal area should generally be dictated by aviation activity levels. Due to the amount of potentially developable land available at PCZ, some consideration is also given to non-aviation uses that can provide additional revenue support to the airport and bolster economic development for the City of Waupaca.

Landside planning issues include facility-locating strategies that follow a philosophy of separating activity levels; therefore, it is important to plan for an appropriate mix of smaller T-hangars, executive hangars, and larger conventional hangars at PCZ.

The orderly development of the airport terminal area, which includes the areas parallel to the runway and along the flight line, can be the most critical (and often the most difficult) development to control on an airport. A development approach of “taking the path of least resistance” can have a significant effect on the long-term viability of an airport. Allowing development to occur without regard to a functional plan can result in a haphazard array of buildings and small ramp areas, which will eventually preclude the most efficient use of the limited and highly valuable space adjacent to the flight line.

The alternatives presented are not the only options for development. In some cases, a portion of one alternative could be intermixed with another, and some alternative development concepts could be replaced with others. The final recommended plan only serves as a guide for the airport to aid in its strategic planning of available properties. Airport operators often change their plans to meet the needs of specific users. The goal in analyzing landside development alternatives is to define a schematic approach to accommodate appropriate future development so the airport property can be maximized.

REVENUE SUPPORT LAND USES

If the amount of land on airport property exceeds the space needed for forecasted aviation demand, consideration could be given for PCZ to utilize portions of its property for indirect or non-aviation purposes, which could include commercial, industrial, or manufacturing development.

It should be noted that the airport does not have the approval to use undeveloped property for non-aviation purposes at this time; specific approval from the FAA will be required to utilize undeveloped airfield property for non-aviation uses. This planning document does not confirm any regulatory approval for non-aviation uses, even if these uses are ultimately included in the master plan and on the ALP. A separate request justifying the use of airport property for non-aviation uses will be required for FAA approval; however, the information contained in this document can be a source for developing that justification.

An environmental determination will also be required. While FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*, states that the release of an airport sponsor from federal obligations is normally categorically excluded and would not typically require an environmental assessment (EA), the issuance of a categorical exclusion is not an automatic action; the FAA must determine that no extraordinary circumstances exist at the airport. Extraordinary circumstances would include a potentially significant environmental impact to any environmental resources governed by federal law. An EA may be required by the FAA if extraordinary circumstances are identified at PCZ. The following generalized land use conditions outline topical subject areas that could present themselves on the airport.

ON-AIRPORT LAND USE OBLIGATIONS

The airport has accepted grants for capital improvements from the FAA in the past; as such, the City of Waupaca (airport sponsor) has agreed to certain grant assurances. Grant assurances related to land use guarantee that airport property will be reserved for aeronautical purposes. If the airport sponsor wishes to sell (release) airport land or lease airport land for a non-aeronautical purpose (land use change), the airport sponsor must petition the FAA for approval. The ALP and the airport property map must then be updated to reflect the sale or land use change of the identified property.

Release of Airport Property

A release of airport property would entail the sale of land that is not needed for aeronautical purposes currently or in the future. The following documentation is required to be submitted to the FAA for consideration of a land release:

1. What is requested?
2. What agreement(s) with the United States is/are involved?
3. Why is the release, modification, reformation, or amendment being requested?
4. What facts and circumstances justify the request?
5. What requirements of state or local law or ordinance should be provided for in the language of an FAA-issued document if the request is consented to or granted?
6. What property or facilities are involved?
7. How was the property acquired or obtained by the airport owner?
8. What is the present condition and what present use is made of any property or facilities involved?

9. What use or disposition will be made of the property or facilities?

10. What is the appraised fair market value of the property or facilities, and what appraisals or other types of evidence are required to establish fair market value?

11. What proceeds are expected from the use or disposition of the property, and what will be done with any net revenues derived?

12. What is the relative advantage or benefit to the airport from the sale or other disposition, compared to retention for rental income?

Each request should have a scaled drawing attached that shows all airport property and facilities that are currently obligated for airport purposes by agreements with the United States. Other exhibits that support or justify the request (such as maps, photographs, plans, and appraisal reports) should be attached as appropriate. No areas of Waupaca Municipal Airport property are currently planned for release from obligation and/or sale.

Land Use Change

A land use change permits land to be leased for non-aeronautical purposes; it does not authorize the sale of airport land. Leasing airport land to produce revenue via non-aeronautical uses allows the land to earn revenue for the airport and serve the interests of civil aviation by making the airport as self-sustaining as possible. Airport sponsors may petition for a land use change for the following purposes:

- So that land not needed for aeronautical purposes can be leased to earn revenue from non-aviation uses; this is land that is clearly surplus to the airport's aviation needs

- So that land that cannot be used for aeronautical purposes can be leased to earn revenue from non-aviation uses; this is land that cannot be used by aircraft, or where barriers or topography prevent an aviation use

- So that land not presently needed for aeronautical purposes can be rented on a temporary basis to earn revenue from non-aviation uses

A land use change will not be approved by the FAA if the land has a present or future airport or aviation purpose (clear aeronautical use); however, if land is not needed for aeronautical purposes until a long-term condition is met, a land use change may be justified and granted for a short-term or intermediate-term use. Ordinarily, land on or in proximity to the flight line and airport operations area is needed for aeronautical purposes and should not be used or planned for non-aviation purposes. The proceeds derived from the land use change must be used exclusively for the benefit of the airport. They may not be used for a non-airport purpose and cannot be diverted to the airport sponsor's general fund or for general economic development unrelated to the airport.

Generally, a land use change of airport property will be reviewed on a case-by-case basis at the time the change is necessary; however, the airport land use drawing, which is included as part of the ALP set, shows areas that are likely eligible for release from obligation.

AVIATION ACTIVITY LEVELS

The aviation development areas should be divided into high-activity, medium-activity, and low-activity levels at the airport. The high-activity area should be planned and developed to provide aviation services on the airport. Examples of high-activity areas are the airport terminal, administration building, and adjoining aircraft parking apron, which provides tiedown locations and circulation for aircraft. Large conventional hangars that are used for fixed base operators (FBOs), corporate aviation departments, or storing a large number of aircraft are also considered high-activity use areas. The best location for high-activity areas is along the flight line near mid-airfield for ease of access to all areas on the airfield. All major utility infrastructure would need to be provided to these areas.

The medium-activity use category defines the next level of airport use and primarily includes smaller corporate aircraft, the owners of which may desire private executive hangar storage on the airport. The best location for medium-activity use is off the immediate flight line but still readily accessible to aircraft, including corporate jets. Due to an airport's layout and other existing conditions, if this area is planned to be located along the flight line, it is best to keep it out of the mid-airfield area of the airport to avoid causing congestion with transient aircraft utilizing the airport. Parking and utilities (such as water and sewer) should also be provided in this area.

The low-activity use category defines the area for storage of smaller single- and multi-engine aircraft. Low-activity users are personal or small business aircraft owners that prefer individual space in linear box hangars or T-hangars. Low-activity areas should be located in less conspicuous areas. This use category requires electricity but generally does not require high-volume water or sewer utilities.

In addition to the functional compatibility of the aviation development areas, the proposed development concept should provide a first-class appearance for PCZ. The airport serves as a vital link to the entire region for both business and recreational visitors. Consideration to building and landscape design, construction, and maintenance should be given high priority in all public areas, as the airport may serve as a visitor's first impression of the community.

To allow for maximum development of the airport while continuing to meet mandated safety design standards, it is crucial to devise an airport layout plan that allows for the orderly development of airport facilities. An airport will typically reserve property adjacent to the runway system exclusively for aviation-related activity, which allows for the location of taxiways, aprons, and hangars.

HANGAR DEVELOPMENT

Analysis in Chapter Three indicated that the airport should plan for the construction of additional aircraft hangars over the next 20 years. Hangar development can occur in a variety of sizes that correspond with several different intended uses.

Commercial general aviation activities are essential to providing the necessary services on an airport, which include privately owned businesses involved with (but not limited to) aircraft rental and flight training, aircraft charters, aircraft maintenance, line service, skydiving, and aircraft fueling. These types of operations are commonly referred to as fixed base operators (FBOs) or specialized aviation service operators (SASOs).

The facilities associated with such businesses are often large, conventional-type hangars that hold several aircraft. High levels of activity often characterize these operations, along with a need for apron space for the storage and circulation of aircraft. These facilities are best placed along ample apron frontage with unobstructed visibility from the runway system for transient aircraft. Utility services and vehicle parking areas are necessary support uses for these types of facilities.

Aircraft hangars used for the storage of smaller aircraft primarily include T-hangars, shade hangars, and/or linear box hangars. Because storage hangars often experience lower levels of activity, these types of facilities can be located away from the primary apron areas in more remote locations on the airport. Limited utility services are needed for these areas.

Other types of hangar development can include executive hangars to accommodate either individual large aircraft or multiple small aircraft. These types of hangars are typically used by corporations with company-owned aircraft or by an individual or group of individuals with multiple aircraft. These hangar areas normally require all utilities, as well as segregated roadway access.

Table 4C summarizes the aircraft hangar types and the corresponding sizes and aviation uses typically associated with each facility. Approximately 109,900 square feet of hangar space (including maintenance area) is currently provided on airport property, comprised of a combination of the previously discussed hangar types.

TABLE 4C | Aircraft Hangar Types

Hangar Type	Typical Size	Aviation Uses
Conventional	Clear span hangars greater than 10,000 square feet	FBOs, SASOs, and other commercial aviation activities resulting in high-activity uses
Executive	Clear span hangars less than 10,000 square feet	SASOs, corporate flight departments, and private aircraft storage resulting in medium- to high-activity uses
T-Hangar/Linear Box	Individual storage spaces that offer 1,200 - 1,500 square feet	Private aircraft storage resulting in low-activity uses

FBO = fixed base operator
SASO = specialized aviation service operator

Currently, the primary areas that are ideal for potential general aviation-related development include the main terminal area along the primary aircraft apron. Development could be continued along the main aircraft apron area on the south side of Runway 10-28 and on the west side of Runway 13-31 near each runway end. Given the development potential for these portions of existing airport property, the following alternatives detail development options for the areas identified.

LANDSIDE ALTERNATIVES

This section describes a series of landside alternatives as they relate to the previously detailed considerations. These alternatives focus on current hangar developments and generalized land use. A generalized land use concept is beneficial because it allows flexibility in site development, which enables it to meet the needs of clients without predetermined layout constraints. Variations of future hangar developments are also presented to help visualize how these facilities could be integrated into the airport campus or complex.

Three alternatives have been prepared for the landside development area. The existing airport property located near the primary apron area is developed; however, there is still potential for additional infill and future development. The potential for new development is primarily located on the north and south sides of Runway 10-28 and along the west side of Runway 13-31 near each runway end. The alternatives provide potential development plans aimed at meeting the needs of general aviation through the long-term planning period and beyond.

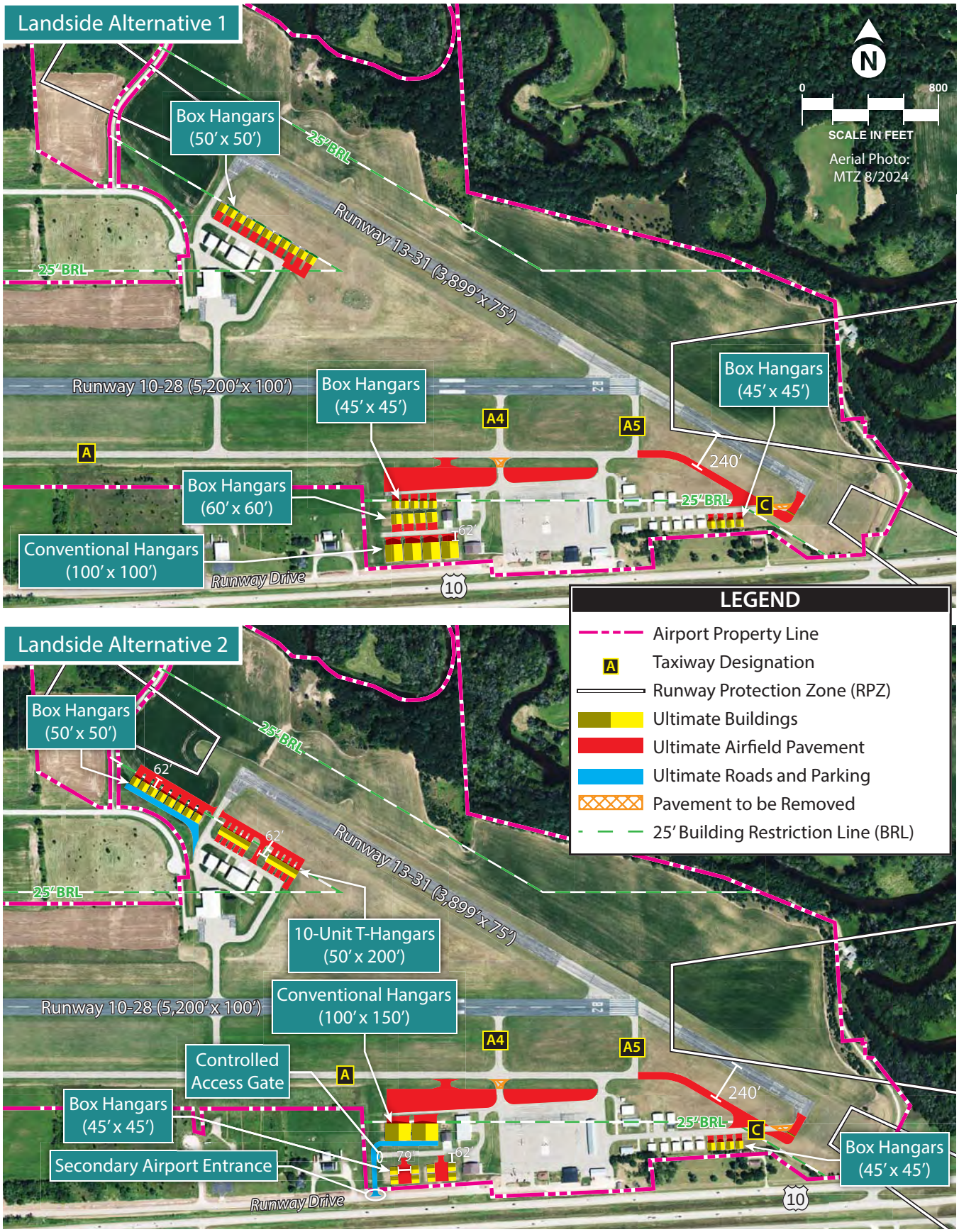
The alternatives presented are not the only reasonable options for development. In some cases, a portion of one alternative could be intermixed with another, and some development concepts could be replaced with others. The overall intent of this exercise is to outline basic development concepts to spur collaboration for a final recommended plan. Even then, the final recommended plan only serves as a guide to aid the City of Waupaca in the strategic planning of airport property. Airport operators often change their plans to meet the needs of specific users. The goal in analyzing landside development alternatives is to bring future development into focus so that airport property can be maximized and aviation activity can be protected.

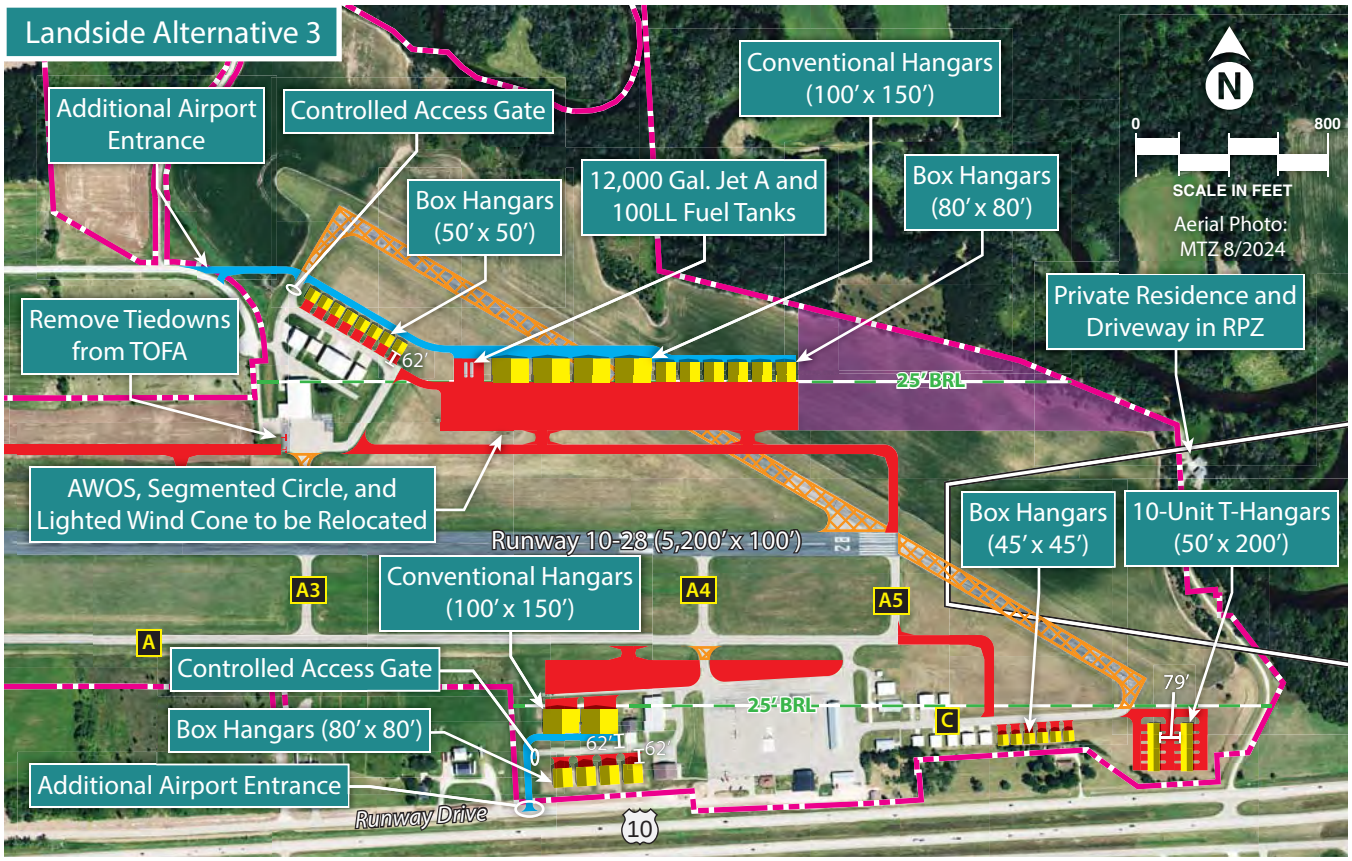
The existing airport landside infrastructure is located on the north and south sides of the airfield, along the north and south sides of Runway 10-28. Automobile access is provided on the south side of the airfield via Runway Drive and existing vehicle parking is provided in various locations near the hangar facilities close to the airport entrance. A secondary entrance provided via Commercial Drive allows access to the existing hangar development on the north side of Runway 10-28. The existing level of airside and landside access makes these areas of airport property ideal locations for continued airport development. The alternatives analysis presented on **Exhibit 4G** examines the potential options for continued landside development of PCZ.

LANDSIDE DEVELOPMENT ALTERNATIVE 1

Alternative 1, shown on **Exhibit 4G**, presents a potential layout that primarily carries forward a similar development to what is proposed on the current ALP. On the south side of the development area, nine 45- by 45-foot executive box hangars, four 60- by 60-foot executive box hangars, and four 100- by 100-foot conventional hangars are proposed. These hangars would continue the existing development trend on the south side of Runway 10-28 to maximize hangar development potential on the south side of the airfield. Airside access to these hangars could be provided via the existing taxilane structure. Additionally, Taxiway A is extended to the southeast to connect with existing Taxiway C, which would ultimately alleviate congestion for aircraft transitioning from Taxiway C to parallel Taxiway A. This alternative also considers an additional 13,600 square yards (sy) of apron area, along with potential taxiway geometry enhancements, as previously discussed.

Within existing hangar development, there is minimal opportunity for infill with additional hangar development, so further development is considered on the north side of Runway 10-28, west of Runway 13-31. The proposed development in this area considers the construction of 11 50- by 50-foot executive box hangars. Each proposed hangar development is served by an aircraft apron.


Landside Alternative 1
N
0
800
SCALE IN FEET
Aerial Photo:
MTZ 8/2024
Box Hangars
(50' x 50')
25' BRL
Runway 13-31 (3,899' x 75')
25' BRL
Runway 10-28 (5,200' x 100')
Box Hangars
(45' x 45')
A4
A5
Box Hangars
(45' x 45')
A
Box Hangars
(60' x 60')
240'
25' BRL
C
62'
Conventional Hangars
(100' x 100')
Runway Drive
10
LEGEND
Airport Property Line
A Taxiway Designation
Runway Protection Zone (RPZ)
Ultimate Buildings
Ultimate Airfield Pavement
Ultimate Roads and Parking
Pavement to be Removed
25' Building Restriction Line (BRL)
Landside Alternative 2
Box Hangars
(50' x 50')
25' BRL
62'
62'
Runway 13-31 (3,899' x 75')
25' BRL
10-Unit T-Hangars
(50' x 200')
Runway 10-28 (5,200' x 100')
Conventional Hangars
(100' x 150')
A4
A5
Controlled
Access Gate
A
240'
Box Hangars
(45' x 45')
25' BRL
C
Secondary Airport Entrance
79'
62'
Box Hangars
(45' x 45')
Runway Drive
10



LEGEND

- Airport Property Line
- A — Taxiway Designation
- Runway Protection Zone (RPZ)
- Ultimate Buildings
- Ultimate Airfield Pavement
- Ultimate Roads and Parking
- Pavement to be Removed
- 25' Building Restriction Line (BRL)
- Aviation Development Reserve

LANDSIDE DEVELOPMENT ALTERNATIVE 2

As depicted on **Exhibit 4G**, Landside Development Alternative 2 emphasizes additional development of large conventional and executive hangars and T-hangars on the north and south sides of Runway 10-28, as well as on existing developable airport property along the west side of Runway 13-31.

Beginning on the south side of Runway 10-28, the proposed development includes two 100- by 150-foot conventional hangars and 12 45- by 45-foot executive box hangars. Automobile access to the proposed conventional hangars could be provided by a secondary airport entrance from Runway Drive. Additionally, a controlled access gate is proposed for enhanced safety and security prior to entering the active aircraft operations area. Similar to the previous alternative, Taxiway A is extended to the southeast to connect with existing Taxiway C to alleviate congestion for aircraft transitioning from Taxiway C to parallel Taxiway A. This alternative also considers an additional 13,600 sy of apron area, along with potential taxiway geometry enhancements, as discussed in the Airside Alternatives section.

Options to continue development on the north side of Runway 10-28 are also considered. The proposed development directly adjacent to existing hangars and continuing north along Runway 13-31 includes two 10-unit T-hangars and eight 50- by 50-foot executive box hangars. Supporting aircraft apron areas are considered for the proposed executive box hangars, as well as automobile parking and access.

LANDSIDE DEVELOPMENT ALTERNATIVE 3

The third and final alternative option, presented on **Exhibit 4G**, explores a landside development scenario under ultimate C-II-4000 design standards and considers the potential closure of Runway 13-31, which would ultimately allow for significant landside development if demand warrants.

On the south side of Runway 10-28, the proposed development includes two 100- by 150-foot conventional hangars, four 80- by 80-foot executive box hangars, six 45- by 45-foot executive box hangars, and two 10-unit T-hangars. Automobile access to the proposed conventional hangars could be provided by a secondary airport entrance from Runway Drive. Additionally, a controlled access gate is proposed for enhanced safety and security prior to entering the active aircraft operations area. Similar to the previous alternative, Taxiway A is extended to the southeast to connect with existing Taxiway C to alleviate congestion for aircraft transitioning from Taxiway C to parallel Taxiway A. This alternative also considers an additional 13,600 sy of apron area, along with potential taxiway geometry enhancements, as discussed in the *Airside Alternatives* section.

This alternative continues development on the north side of Runway 10-28 with the addition of eight 50- by 50-foot executive box hangars, four 100- by 150-foot conventional hangars, and six 80- by 80-foot executive box hangars. The east side of the proposed hangars could be reserved for future development if demand dictates. Additional 12,000-gallon 100LL and Jet A fuel tanks are also considered for the north side development area, as well as a 29,700-sy aircraft apron area. The proposed fuel tanks could be situated with a self-service credit card reader or used to service fuel trucks for full-service fueling. Each proposed hangar development is served by automobile parking and access. An additional airport access point is considered on the north side of the airfield and vehicle access to the airfield operations area could be limited through a controlled gate.

LANDSIDE SUMMARY

The landside alternatives presented in this section are intended to accommodate an array of aviation activities that either currently occur or could be expected to occur at PCZ in the next 20 years. There is existing demand for new facilities at PCZ; with a changing fleet mix of aircraft that includes more sophisticated airframes, this document will help the City of Waupaca refine its approach to developing its property in an organized and thoughtful way. Each of the three development options considers a long-term vision that would extend beyond the 20-year scope of this master plan, in some cases; nevertheless, it is beneficial to provide a long-term vision to ensure the airport will adequately serve the City of Waupaca community for years to come.

SUMMARY

This chapter is intended to present an analysis of various options that may be considered for specific airport elements. The need for alternatives is typically generated by projections of aviation demand growth and/or the need to resolve non-standard airport conditions. FAA design standards are frequently updated with the intent of improving the safety and efficiency of aircraft movement on and around airports, which can lead to certain pavement geometries currently being classified as non-standard when they previously met FAA design standards.

Several development alternatives related to both the airside and the landside facilities have been presented. For the airside, the major considerations involve correcting non-standard taxiway conditions and extending the length and/or upgrading the RDC of Runway 10-28. For the landside, the alternatives presented include the previously planned hangar development and propose additional aviation development near the terminal area and on the north and south sides of Runway 10-28. As the airport's fleet mix transitions to include more jets and turboprops, it will be important to clearly delineate development areas for facilities to accommodate those aircraft; segregating jet and turboprop traffic from small aircraft operators contributes to operational safety and creates a more organized and efficient airport.

The next step in the master plan process is to arrive at a recommended development concept. Participation of the PAC and the public will be important to the determination of the ultimate concept. Additional consultation with the FAA and WisDOT BOA may also be required to ensure improvements are satisfactorily delineated and presented. Once a final development plan is identified, a 20-year airport capital improvement program will be presented, including a list of projects prioritized according to aviation demand and/or necessity. Finally, a financial analysis will be presented to identify potential funding sources and quantify the approximate contribution needed from the City of Waupaca to implement each project. In this manner, the City of Waupaca can adequately program matching funding in its five-year capital improvement plan.

Chapter 5

Recommended Master Plan Concept

The preparation of this airport master plan has included technical efforts in the previous chapters that were intended to establish the role of Waupaca Municipal Airport (PCZ), forecast potential aviation demand, establish airside and landside facility needs, and evaluate options for improving the airport to meet those facility needs. The planning process has included the development of draft working papers, which have been presented to the planning advisory committee (PAC). The PAC is comprised of stakeholders/constituents with investments or interests in the airport and surrounding area. This diverse group has provided extremely valuable input for the master plan. Additionally, a series of public information workshops was conducted as part of this planning process to provide interested members of the community with an opportunity to be involved in and educated about the study.

The alternatives that outlined future growth and development scenarios in Chapter Four have been refined into a recommended development concept for the master plan, which is presented in this chapter. An overview of environmental conditions that must be considered when development projects are undertaken is provided later in this chapter.

One of the objectives of the master plan is to allow decision-makers the ability to accelerate or slow development goals based on actual demand. If demand slows, development of the airport beyond routine safety and maintenance projects could be minimized. If aviation demand accelerates, development could be expedited. Any plan can account for limited development, but the lack of a plan for accelerated growth can be challenging; therefore, to ensure flexibility in planning and development to respond to unforeseen needs, the master plan concept considers balanced development potential for PCZ.

MASTER PLAN DEVELOPMENT CONCEPT

PCZ is classified as a local general aviation airport within the Federal Aviation Administration's (FAA) *National Plan of Integrated Airport Systems* (NPIAS). Most of the airport's operations can be attributed to general aviation activities, including business aviation and some air taxi and charter operations that occur at the airport. NPIAS airports are considered important to the national aviation system and are eligible for development grant funding from the FAA. At the state level, the Wisconsin Department of Transportation (WisDOT) Bureau of Aeronautics (BOA) classifies PCZ as a medium general aviation (GA) airport.

The airport's classifications are not anticipated to change because of the recommendations in this master plan, which fully supports the continued and necessary development of the airport to serve a local general aviation role within the NPIAS.

The master plan concept, as shown on **Exhibit 5A**, presents the recommended configuration for PCZ, which preserves and enhances the role of the facility while meeting FAA design and safety standards (to the extent practicable). The concept provides for anticipated facility needs over the next 20 years and establishes a vision and direction for meeting facility needs beyond the 20-year planning period of this study. A phased program to achieve the master plan concept is presented in Chapter Six. When assessing development needs, this chapter separates the airport into airside and landside functional areas. The following sections describe the master plan concept in detail.

AIRSIDE DEVELOPMENT CONCEPT

The airside plan generally considers improvements related to the runway and taxiway system and often requires the greatest commitment of land area to meet the physical layout of an airport. Operational activity at PCZ is anticipated to grow beyond the 20-year planning horizon of this master plan and the airport is projected to continue to serve the full range of general and business aviation operations, in addition to limited air taxi and charter activities. The principal airfield recommendations should always focus first on safety and security. Of key importance is to ensure proposed airfield improvements are designed to meet all appropriate FAA airport design standards. Recommendations are then designed to improve the operational efficiency, circulation, and capability of the airfield. The major airside issues addressed in the master plan concept include the following:

- Upgrade to ultimate runway design code (RDC) C-II standards on Runway 10-28 (should demand dictate) and convert Runway 13-31 to RDC A-I(S) design standards as a turf runway
- Consider raising the instrument approach minimums on Runway 10 from ¾-mile to one-mile to minimize potential obstructions to the transitional surface and maximize developable land
- Consider a runway extension of Runway 10-28 to an ultimate length of 6,200 feet to better accommodate turboprop and business jet operators, pending further justification and coordination with the WisDOT BOA and FAA
- Implement declared distances and address safety area deficiencies on Runway 10-28, primarily including land acquisition, vegetation obstructions associated with upgrading Runway 10-28 to ultimate RDC C-II standards, and safety area incompatibilities introduced by the runway extension
- Consider maintaining the pavement strength on Runway 10-28 at 30,000 pounds single wheel loading (S) and increasing to 60,000 pounds dual wheel loading (D)
- Consider taxiway geometry enhancements to meet FAA taxiway design standards
- Enhance visual approach aids serving Runway 10-28 with the installation of four-box precision approach path indicator (PAPI-4) systems and runway distance remaining signage

Ultimate Runway Design Codes
Runway 10-28: C-II-5000
Runway 13-31 (Turf): A-I-VIS

DEFINITIONS

TODA - Takeoff Distance Available
TORA - Takeoff Run Available
ASDA - Accelerate-Stop Distance Available
LDA - Landing Distance Available

DECLARED DISTANCES

	Runway 10	Runway 28
TORA	5,200′	6,200′
TODA	5,200′	6,200′
ASDA	5,200′	6,200′
LDA	5,200′	5,200′

LEGEND

- Airport Property Line
- Avigation Easement
- Clear Zone Easement
- Existing Taxiway Designation
- Ultimate Taxiway Designation
- Runway Safety Area (RSA)
- Runway Object Free Area (ROFA)
- Runway Obstacle Free Zone (ROFZ)
- Runway Protection Zone (RPZ)
- Runway Visibility Zone (RVZ)
- Property to be Acquired
- Potential Non-Aeronautical Land Use
- Aviation Development Reserve
- AWOS Critical Area
- High-Energy Area
- Ultimate Airfield Pavement
- Ultimate Buildings
- Ultimate Roads and Parking
- Remove Pavement
- 25′ Building Restriction Line (BRL)
- 35′ Building Restriction Line (BRL)

*Acreage is approximate and intended for planning uses only

INSET 1 1″ = 300′

Runway 13-31
55′
62′
Box Hangars (50′ x 50′)
10-Unit T-Hangars (50′ x 200′)
25′BRL

Heather Ln
Webster Way
Rotary St
Commercial Drive
22
1
Runway 13-31 (Turf) 2,125 x 75′
1,000′ Runway Extension and Displaced Threshold
3
35′BRL
PAPI-4
Parcels Planned for Airpark Development
9.7 Acres*
25′BRL
9.8 Acres*
6.9 Acres*
0.1 Acres*
A
B
B1
B2
B3
A3
C
C1
C2
300′
Runway 10-28 (6,200′ x 100′)
400′
A2
A1
A4
A5
A6
1-Mile RPZ (Acquire 13.7 Acres*)
Relocate Private Residence and Driveway in RPZ
2
4
Runway Drive
10
PAPI-4
Terminal Area/Overflow Parking

INSET 2
1″ = 300′
25′BRL
9-Unit T-Hangar (210′x54′)
79′
Box Hangars (60′x60′)
Box Hangars (70′x90′)
Controlled Access Gate

INSET 3
1″ = 300′
12,000-Gal. 100LL and Jet A Fuel Tanks
Conventional Hangars (100′x100′)
Conventional Hangar (200′x100′)
Box Hangars (60′x60′)

Airport Rd.

INSET 4
35′BRL
Box Hangars (50′ x 50′)
Conventional Hangar (200′x100′)
Conventional Hangars (100′x100′)

N
0
800
SCALE IN FEET
Aerial Photo: MTZ 8/2024

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RUNWAY DIMENSIONAL STANDARDS

The FAA has established design criteria to define the physical dimensions of the runways and taxiways, as well as the imaginary surfaces surrounding them, which protect the safe operation of aircraft at airports. These design standards also define the criteria for the placement of landside facilities.

As discussed in previous chapters, the design criteria primarily center on an airport's critical design aircraft. The critical design aircraft is the most demanding aircraft or family of aircraft that currently conducts (or is projected to conduct) 500 or more operations (takeoffs or landings) per year at an airport. Factors included in airport design are an aircraft's wingspan, approach speed, and tail height and the instrument approach visibility minimums for each runway. The FAA has established the RDC to relate these design aircraft factors to airfield design standards.

Analysis in Chapters Two and Three concluded that the existing RDC for Runway 10-28 is B-II. At a length of 5,200 feet, Runway 10-28 can accommodate most general aviation activities, including small business jets, as well as air taxi and charter activity. Future planning considers numerous upgrades to the runway (to be discussed), as well as upgrading to an ultimate RDC of C-II for Runway 10-28.

The existing crosswind runway, Runway 13-31, is 3,899 feet long and is designed to accommodate lightweight single-engine aircraft. The existing Runway 13-31 is designed to RDC B-I(S); however, the current configuration of Runway 10-28 and 13-31 is subject to elevated risk, as the Runway 10 threshold is situated on the Runway 13-31 centerline. This configuration does not provide sufficient physical space for the runway safety areas, entrance/exit taxiways, or associated markings and signage, thus increasing the potential for runway incursions, pilot confusion, and loss of situational awareness. The ultimate runway configuration mitigates this risk by shortening Runway 13-31 and converting it to a turf surface, adhering to RDC A-I(S) design standards.

Table 5A provides a summary of the RDCs for each runway based on the development concept. In addition to the physical and operational components of an aircraft, the RDC also considers the instrument approach capabilities of a runway, expressed in runway visual range (RVR) values. For Runway 10-28, the existing RVR value of 4000 indicates instrument approach visibility minimums lower than one mile but not less than ¾ mile. Under ultimate conditions, an RVR value of 5000 is considered, which indicates instrument approach visibility minimums not lower than one mile. The approaches serving Runway 13-31 are planned to remain visual only and are represented by the RVR designation "VIS."

TABLE 5A | Runway Design Standards

	Runway 10-28 (Existing)	Runway 10-28 (Ultimate)	Runway 13-31 (Existing/Ultimate)
Runway Design Code	B-II-4000	C-II-5000	B-I(S)-VIS / A-I(S)-VIS
Visibility Minimums	¾-mile	1-mile	Visual
RUNWAY DESIGN			
Runway Width	75	100	60
Blast Pad Length x Width	150 x 95	150 x 120	60 x 80
RUNWAY SEPARATION			
Runway Centerline to:			
Hold Line Position	200	250	125
Parallel Taxiway	240	300	150
Aircraft Parking Apron	250	400	125

(Continues)

TABLE 5A | Runway Design Standards (continued)

	Runway 10-28 (Existing)	Runway 10-28 (Ultimate)	Runway 13-31 (Existing/Ultimate)
RUNWAY PROTECTION			
Runway Safety Area			
Width	150	500	120
Length Beyond Departure End	300	1,000	240
Length Prior to Threshold	300	1,000	240
Runway Object Free Area			
Width	500	800	250
Length Beyond Departure End	300	1,000	240
Length Prior to Threshold	300	1,000	240
Runway Obstacle Free Zone			
Width	400	400	250
Length Beyond Runway End	200	200	200
Approach Runway Protection Zone			
Runway End	10 / 28	10 / 28	13 / 31
Inner Width	1,000 / 500	500	250
Outer Width	1,510 / 700	1,010	450
Length	1,700 / 1,000	1,700	1,000
Acres	48.98 / 13.77	29.47	8.04
Departure Runway Protection Zone			
Inner Width	500	500	250
Outer Width	700	1,010	450
Length	1,000	1,700	1,000
Acres	13.77	29.47	8.04

Note: All dimensions are in feet unless otherwise noted.

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

RUNWAY 10-28

Runway 10-28 is 5,200 feet long, 100 feet wide, served by instrument approach visibility minimums not lower than ¾-mile, and oriented in an east-west manner. The existing runway width should be maintained through the long-term planning horizon. The runway's existing pavement strength is 30,000 pounds single wheel loading (S). There is currently no strength rating for dual wheel loading (D) aircraft; however, because the future critical aircraft has a maximum takeoff weight (MTOW) greater than 30,000 pounds and the number of turboprops and jets utilizing the airport is forecasted to increase, the master plan will consider maintaining the pavement strength rating of 30,000 pounds S and increasing to 60,000 pounds D.

Based on the results of the runway analysis presented in Chapter Three, the length and width of the runway are adequate to accommodate most of the aircraft operating at the airport and the runway is capable of handling 100 percent of small airplanes with more than 10 passenger seats, as well as the existing critical aircraft (Citation XLS), at 100 percent useful load for takeoff; however, additional runway length could benefit operators of larger and faster business jets and turboprops in the future by allowing aircraft to depart with more fuel, which would enable longer stage lengths and increased usable payload. Additional runway length would also improve landing situations for the existing critical aircraft, as well as other business jets and turboprops operating under Part 91k or Part 135, especially during wet or contaminated runway conditions. As such, the recommended plan includes an extension of ultimate Runway 10-28 by 1,000 feet to the east to a planned length of 6,200 feet, as well as the implementation of declared distances (to be discussed).

The existing runway safety area (RSA), runway object free area (ROFA), and runway obstacle free zone (ROFZ) serving Runway 10-28 are free of obstructions or incompatibilities. Under existing conditions, the runway protection zone (RPZ) serving Runway 10 extends beyond the airport property boundary to the west, encompassing approximately 2.2 and 1.8 acres of uncontrolled property (4.0 acres total) in the outer corners of the RPZ, as well as portions of Runway Drive. The existing RPZ serving Runway 28 is contained within airport property; however, a private residence and driveway exist immediately east of airport property and just beyond the Runway 28 RPZ. It should be noted that the size difference for the existing RPZs serving the Runway 10-28 is a result of differing approach minimums serving each runway end; Runway 10 is currently served by a ¾-mile instrument approach minimum, while Runway 28 is served by a one-mile instrument approach minimum. In addition, public roadways are generally considered incompatible uses within an RPZ; however, the FAA often considers existing roads to be grandfathered, so no corrective action is necessary in the current condition. Any change to the runway environment that alters the size or position of the RPZ may negate the grandfathered condition.

As shown on **Exhibit 5A**, the ultimate RSA and ROFA associated with future RDC C-II-5000 conditions increase in size and position in relation to the runway, while the ROFZ is maintained at the same width of 400 feet and extends 200 feet beyond each runway end. Upon upgrading to C-II design standards and implementing one-mile instrument approach minimums serving Runway 10, the RPZs serving each end of Runway 10-28 will change in dimension to 500 feet at the inner portion, 1,010 feet at the outer portion, and 1,700 feet long. At the current runway length of 5,200 feet, the RDC C-II-5000 design standards for the RSA, ROFA, and ROFZ are currently met, with the exception of terrain clearing and grading. Furthermore, the ultimate RPZ serving Runway 10 will decrease in size, thereby reducing the total uncontrolled property within the RPZ to approximately 0.1 acres and will reduce impacts to Runway Drive.

If sufficient demand dictates the construction of the planned runway extension to the east, the safety areas that correspond to the Runway 28 end will also extend. The expanded RSA, ROFA, and ROFZ would extend beyond airport property to the east and encompass private property, an existing residence, the Waupaca River, and established wetlands. Upon the extension of Runway 10-28 and its upgrade to ultimate RDC C-II-5000 standards, the ultimate RSA, ROFA, and ROFZ must be cleared of all obstructing vegetation and graded accordingly, and approximately 13.7 acres within the unowned portion of the Runway 28 RPZ should be acquired (in fee). It should be noted that the ultimate Runway 28 RPZ is partially owned in clear zone; avigation easements and the design standard shift to C-II would necessitate the relocation of the existing residence within the Runway 28 RPZ, but these actions should not be taken unless (or until) the airport can justify an upgrade to C-II design standards and runway extension.

To meet ultimate RDC C-II-5000 design standards and limit impacts to off-airport property, consideration is given to the implementation of a threshold displacement on Runway 28, as well as declared distances to mitigate safety area deficiencies for the ultimate RSA, ROFA, ROFZ, and RPZ beyond the east end of the runway.

As discussed in Chapter Four, the declared distances pertaining to the RSA and ROFA are the accelerate-stop distance available (ASDA) and landing distance available (LDA), while the takeoff run available (TORA) and LDA relate to the RPZs. The takeoff distance available (TODA) is associated with the departure surface and cannot be longer than the TORA. The runway extension and declared distances presented on the development concept reduce the TORA, TODA, ASDA, and LDA and for Runway 10 and the LDA for Runway 28. The application of declared distances minimizes impacts to off-airport property and are presented in **Table 5B** and **Figure 5A**.

TABLE 5B | Declared Distances

Runway 10-28 Declared Distances	10	28
Takeoff Run Available (TORA)	5,200'	6,200'
Takeoff Distance Available (TODA)	5,200'	6,200'
Accelerate-Stop Distance Available (ASDA)	5,200'	6,200'
Landing Distance Available (LDA)	5,200'	6,200'

Source: Coffman Associates analysis

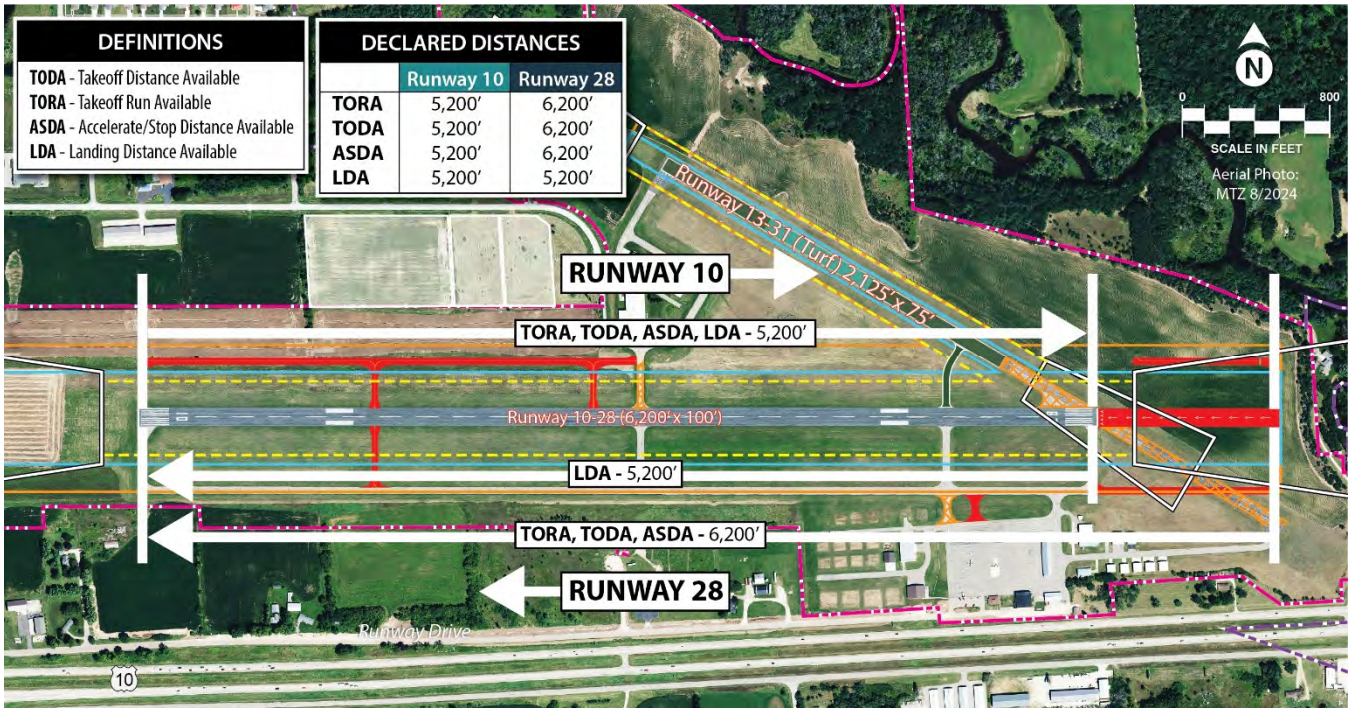


Figure 5A – Runway 10-28 Declared Distances

Airport management and the City of Waupaca should continue to monitor activity within the existing and proposed safety areas and RPZs serving Runway 10-28 and maintain them free of incompatible land uses, to the extent practicable. Continued coordination with WisDOT BOA and FAA officials will be important when implementing any projects that could require changes to the existing RPZs at PCZ.

RUNWAY 13-31

Runway 13-31 is currently 3,899 feet long and 75 feet wide, oriented in a northwest-southeast manner, with visual approaches. Given that Runway 13-31 is currently reported in poor condition, its load-bearing strength capacity is unknown; however, the runway is generally capable of accommodating small aircraft that weigh less than 12,500 pounds. In its current condition, the RSA, ROFA, and ROFZ are in compliance with FAA design standards for RDC B-I(S)-VIS. The RPZ serving Runway 13 is currently traversed by Heather Lane, while the RPZ serving Runway 31 extends beyond airport property to the southeast, encompassing approximately 6.5 acres, and is traversed by Highway 10.

Runway 13-31 has historically been designed as the crosswind runway serving small aircraft that utilize PCZ, as high crosswind conditions impact them more; however, wind analysis conducted in Chapter Three indicated that Runway 10-28 meets 95 percent wind coverage at 10.5 knots, which is above the design criteria to justify funding eligibility for a crosswind runway. As identified in Chapter Three, the current configuration of Runway 10-28 and 13-31 is subject to elevated risk, as the Runway 10 threshold is situated on Runway 13-31. This configuration does not provide sufficient physical space for designing entrance taxiways or associated markings and signage and thus increases the potential for a runway incursion, pilot confusion, and loss of situational awareness. Alternatives presented in the previous chapter examined multiple potential solutions to alleviate risks associated with the intersecting runways.

Given that the current configuration of Runways 10-28 and 13-31 is subject to elevated risk, Runway 10-28 meets the 95 percent wind coverage requirements, and the Runway 13-31 pavement is currently in poor condition, the development concept considers shortening Runway 13-31 to 2,125 feet and converting the runway to a turf surface. At this length, Runway 13-31 would be completely decoupled from Runway 10-28 and would remain clear of the RSA serving Runway 10-28 in the ultimate condition.

In the ultimate condition, turf Runway 13-31 is 2,125 feet long and 75 feet wide, oriented in a northwest-southeast manner, with visual approaches. Given that Runway 13-31 will be unpaved, its load-bearing strength capacity is unknown; however, the runway is generally capable of accommodating small aircraft that weigh less than 12,500 pounds. As such, the ultimate Runway 13-31 is designed to RDC A-I(S)-VIS.

Under ultimate RDC A-I(S)-VIS standards, the RSA, ROFA, and ROFZ serving Runway 13-31 should be maintained clear of obstructions and graded according to FAA standards. As presented on **Exhibit 5A**, the existing/ultimate RPZ serving the Runway 13 end remains in its current location on airport property and is traversed by Heather Lane. The ultimate Runway 31 RPZ will shift to the northwest to correspond with the proposed Runway 31 end and remains on airport property. Airport management and the City of Waupaca should continue to monitor activity within the existing and proposed safety areas and RPZs serving Runway 13-31 and maintain them free of incompatible land uses, to the extent practicable. Continued coordination with WisDOT BOA and FAA officials will be important when implementing any projects that could require changes to the existing RPZs at PCZ.

INSTRUMENT APPROACHES

As previously discussed, PCZ has two published instrument approaches. A localizer performance with vertical guidance (LPV) via an area navigation (RNAV) GPS instrument approach is available to each end of Runway 10-28. The Runway 10 approach has visibility minimums down to ¾ mile for categories A, B, C, and D aircraft, while Runway 28 has a one-mile approach.

Chapter Four discussed the maintenance and potential enhancement of the instrument approaches serving each runway end. Currently, the ¾-mile instrument approach capabilities serving Runway 10 require the width of the Part 77 primary surface to be 1,000 feet wide, which influences the placement of the Part 77 transitional surface and building restriction line (to be discussed). The existing ¾-mile instrument approach capability and associated clearing requirements significantly limit the land currently available for hangar development. Through coordination with airport management, a priority has been placed on future potential landside development. As such, the instrument approach minimums of not lower than one mile will serve each end of Runway 10-28 in the ultimate condition. Similarly, the approaches to Runway 13-31 are maintained as visual only in the ultimate condition.

BUILDING RESTRICTION LINE

Although achieving the lowest instrument approach visibility minimums is advantageous for airport operations, multiple safety area requirements are tied to the minimums associated with a runway's instrument approach procedure(s). As a result, impacts to the airport environment imposed by the ultimate instrument approach visibility minimums must be addressed. The runway type and capability of the instrument approach minimums contribute to the determination of the building restriction line (BRL), which is a product of Title 14 Code of Federal Regulations (CFR) Part 77 primary and transitional surface clearance requirements and identifies suitable building locations on the airport.

Because the existing and ultimate strength rating for Runway 10-28 is over 12,500 pounds, the runway is classified as an *other-than-utility* runway under Part 77. Runway 13-31 is classified as a *utility* runway, as it is designed to accommodate aircraft under 12,500 pounds. The width of the primary surface for other-than-utility visual and non-precision instrument runways with minimums less than or equal to ¾ statute mile is 1,000 feet (500 feet to each side of the runway centerline), which is the condition for Runway 10-28. The width of the primary surface serving utility runways with visual-only approaches is 250 feet (125 feet to each side of the runway centerline), which is the condition for Runway 13-31.

As shown on the recommended concept for long-term planning at PCZ, instrument approach minimums of not lower than one mile will serve each end of Runway 10-28 in the ultimate condition and Runway 13-31 is planned to remain a utility runway with visual approaches. As such, the primary surface serving Runway 10-28 will be reduced to 500 feet wide and maintained at 250 feet wide for Runway 13-31. The transitional surface extends out and up from the edge of the primary surface at a ratio of seven feet laterally for every one-foot increase. Based on these criteria and using a planned building height, the BRL or obstructions to the BRL can be determined. **Exhibit 5A** presents the ultimate BRL separation at 425 feet from the runway centerline for Runway 10-28 and 300 feet from the runway centerline for Runway 13-31, based on the approach capabilities of each runway and the selected allowable structure height of 25 feet.

As shown on the master plan concept, no structures are currently located or planned within the ultimate 25-foot BRL.

VISUAL APPROACH AIDS

Future planning considers various enhancements to visual approach aids serving the runway system at PCZ, as depicted on **Exhibit 5A**. Runways 10 and 28 are currently served by two-box precision approach path indicator (PAPI-2) systems, Runway 13 is served by a four-box precision approach path indicator (PAPI-4) system, and Runway 31 is served by a PAPI-2. Ultimately, PAPI-4s are planned to serve Runways 10 and 28 to further enhance the use of each runway, as well as overall airfield safety, by providing pilots with improved visual approach guidance information during landing phases of flight. When Runway 13-31 is shortened and converted to turf, the existing PAPI systems serving the runway should be removed.

Runways 10 and 28 are also served by runway end identifier lights (REILs), which are flashing lights located at a runway threshold end that facilitate rapid identification of the runway end at night and during poor visibility conditions. REILs provide pilots with the ability to identify the runway thresholds and distinguish the runway end lighting from other lighting on the airport and in the approach areas. As such, the existing REILs are planned to be maintained through the planning horizon.

WEATHER REPORTING AIDS AND COMMUNICATION

At present, PCZ is served by an automated weather observation system (AWOS), which provides weather observations 24 hours per day. The system updates weather observations every minute, continuously reporting significant weather changes as they occur. This information is then transmitted at regular intervals (usually once per hour). Aircraft in the vicinity can receive the information if their radios are tuned to the correct frequency (118.625 megahertz [MHz]). The AWOS is surrounded by an FAA-defined critical area with a radius of 500 feet. Although buildings and objects are permissible within this area, they must not obstruct the operation of the AWOS sensors. As such, the ultimate development concept maintains the existing location of the AWOS and critical area, as depicted on **Exhibit 5A**.

PCZ is also served by a segmented circle, lighted wind cone, and wind tee, which are centrally located between the two runways. These facilities provide information to pilots regarding wind speed and direction, and the segmented circle is a system of visual indicators designed to provide traffic pattern information to pilots. These facilities should all be maintained through the long-term planning horizon.

TAXIWAY DESIGN, MARKING, AND SIGNAGE

While no significant airfield capacity improvements should be necessary during the planning period, the development concept considers improving the taxiway system through the implementation of additional taxiway connectors and extended taxiways. Taxiways A, C, and associated connectors are planned to maintain taxiway design group (TDG) 2A standards at a taxiway width of 35 feet. Taxiway A and its associated connectors are currently 40 feet wide, while Taxiway C is 35 feet wide. While the 40-foot width provides an added safety margin for aircraft operating at the airport, the BOA may elect not to fund regular pavement maintenance for the portions of taxiway pavement that exceed the standard. If the airport chooses to maintain the taxiways at their current widths, the costs may need to come from a local funding source, rather than federal or state grant monies. Certain portions of the landside area that are utilized exclusively by small aircraft should adhere to TDG 1A/1B standards. In addition, it is recommended that taxiway fillets be upgraded to the current taxiway fillet geometry standards on an as-needed basis or when taxiway rehabilitation projects are scheduled to occur.

At present, the taxiway system serving PCZ is adequate for meeting current and future air traffic demand, and the existing airfield taxiway geometry is largely consistent with the current taxiway design standards established in FAA Advisory Circular (AC) 150/5300-13B, *Airport Design*; however, existing Taxiways A3 and A4 provide direct access from an aircraft apron area, Taxiway A3 crosses through the high-energy area of Runway 10-28, and Taxiway C is acutely angled to Runway 13-31, all of which are non-standard conditions. Under future conditions, the northern portion of existing Taxiway A3 is planned to be removed and relocated in a manner that eliminates the existing direct access and high-energy crossing. Additionally, the southern portion of Taxiway A4 is planned to be removed and realigned to eliminate direct access from the apron area to Runway 10-28. Finally, Runway 13-31 is planned to be shortened and converted to turf, thereby eliminating the acute-angle Taxiway C connection. Given the ultimate disposition of Runway 13-31, the existing Taxiway C is planned to serve as a taxilane in the future.

The recommended development concept also considers the potential for partial parallel Taxiways B and C serving the north side of Runway 10-28, on the east and west sides of Runway 13-31. Both of the proposed taxiways serving the north side of Runway 10-28 would allow for enhanced access to proposed landside development (to be discussed). The proposed partial parallel taxiways serving Runway 10-28 would maintain a runway-to-taxiway centerline separation of 300 feet, which is in accordance with ultimate C-II-5000 design standards.

As discussed in Chapter Three, holding position markings are placed on taxiways that lead to runways to indicate where pilots should stop and hold prior to entering an active runway. Currently, the holding position markings serving Runway 10-28 are situated at least 250 feet from the runway centerline and meet the ultimate FAA design standard for RDC C-II-5000 runways. As future development takes place, design standards for RDC C-II-5000 should continue to be met. The holding positions serving Runway 13-31 are respectively situated at 125 and 170 feet from the runway centerline and meet existing B-I(S)-VIS and ultimate A-I(S)-VIS design standards. In the future, holding positions serving Runway 13-31 should continue to be positioned at least 125 feet from the runway centerline.

LANDSIDE DEVELOPMENT CONCEPT

The primary goals of landside facility planning are to provide adequate space to meet reasonably anticipated aviation needs while optimizing operational efficiency and land use. Achieving these goals yields a development scheme that segregates functional uses and maximizes the airport's revenue potential. Chapters Three and Four identified several opportunities to improve the existing landside facilities to better accommodate future aviation demand. This section specifies the recommended improvements pertaining to landside facilities. Landside facilities can include terminal buildings, hangars, aircraft parking aprons, and aviation support services, as well as the utilization of remaining airport property to provide revenue support and benefit the economic well-being of the regional area. Also important is identification of the overall land use classification of airport property to preserve the aviation purpose of the facility well into the future. **Exhibit 5A** presents the planned landside development for PCZ.

As a local general aviation airport, most of the landside development proposed within the master plan concept will accommodate the general aviation owners and operators at PCZ, as well as current and future service providers. At present, general aviation landside facilities are located on the north and south sides of Runway 10-28 and include 21 separate hangar facilities that provide approximately 109,900 square feet (sf) of hangar capacity, as well as approximately 16,700 total square yards (sy) of aircraft apron space.

Multiple layouts of potential landside facilities were presented in Chapter Four, including hangar development, aircraft apron layouts, and the placement of aviation support services. The master plan concept provides a compilation of proposed landside facilities that attempts to maximize potential aviation development space on the airfield. New development is primarily planned near existing facilities to take advantage of existing infrastructure availability and reduce future development costs; however, long-term landside development also considers new development locations that could help meet forecasted demands.

The major landside issues addressed in the master plan concept include the following objectives:

- Designate areas that can accommodate aviation development potential near the existing terminal area, continue development south of Runway 10-28 on the east and west sides of the apron area, and identify development areas located north of Runway 10-28 on the east and west sides of Runway 13-31.
- Provide hangar options that could accommodate specialty aviation service operators (SASOs) or additional general aviation terminal facilities.
- Provide an additional location for Jet A and 100LL fuel storage capacity.
- Designate areas for additional automobile parking and new airport access extending from Runway Drive, Highway 10, and Heather Lane.

AIRCRAFT STORAGE HANGARS AND FUTURE AVIATION DEVELOPMENT

Analysis in Chapter Three indicated that over 55,000 sf of aircraft storage hangar capacity may be needed to meet potential aviation demand through the long-term planning period. Recommended hangar development is proposed in the form of T-hangars, executive box hangars, and conventional hangars, although future demand will ultimately dictate the size(s) and type(s) of hangar facilities that could be built. Ultimately, the master plan concept seeks to maximize hangar development potential along the flight line and contiguous to existing hangar development while identifying locations on existing airport property for future development. If continued demand for aircraft hangar storage materializes, the development concept also identifies an area on the northeast side of the airfield that could accommodate significant hangar development. The proposed landside development areas to be discussed are categorized into two separate development areas: the southern development area and the northern development area. The southern development area is comprised of the existing terminal area and hangar development on the south side of Runway 10-28. The northern development area is located on the north side of Runway 10-28, on the east and west sides of Runway 13-31.

Southern Development Area

As presented on **Exhibit 5A**, the development concept considers significant aviation-related improvements and near the existing airport terminal area, which is located on the east and west sides of the main aircraft apron. Existing automobile parking and access are provided on the west side of the terminal area and on the south side of the Klatt Aero fixed base operator (FBO), which is accessible via Runway Drive.

Surrounding the terminal area, there is opportunity for infill with hangar development on the east and west sides of the apron area. The City of Waupaca and PCZ are currently in the process of designing and constructing a nine-unit T-hangar on the west side of the apron area. In addition, multiple lots that have previously been planned for 60-foot by 60-foot box hangars have been claimed by private developers and are in various stages of design and construction. As such, the development concept considers extensive hangar development on the west side of the apron area. Hangar development in this location

includes the construction of a nine-unit T-hangar (currently being designed), 16 60-foot by 60-foot box hangars, and one 70-foot by 90-foot box hangar. Each proposed hangar is served by apron frontage and taxilane access to the main aircraft apron area. Automobile parking and access to the proposed hangars could be provided via a new airport access point and controlled access gate stemming from Runway Drive. Furthermore, additional terminal area parking is proposed immediately east of the Klatt Aero FBO building.

The recommended development concept continues development on the east side of the main aircraft apron area and proposes 12 50-foot by 50-foot box hangars, two 100-foot by 100-foot conventional hangars, and one 200-foot by 100-foot conventional hangar. The proposed conventional hangars are supported by an additional 10,600 sy of apron area and can be accessed from the airside via Taxiway A or the existing Taxiway C, which is ultimately planned to serve as a taxilane. Supporting vehicle parking is also proposed on the south side of the conventional hangars and automobile access could be provided via Highway 10. These hangars would continue the existing development trends on the south side of Runway 10-28, maximizing hangar development potential on the south side of the airfield.

Northern Development Area

As previously mentioned, the recommended master plan concept presents areas located on existing airport property that would be suited for future aviation development if demand warrants. Multiple development layouts were explored through the alternatives process. The northern development area consists of proposed development located on the east and west sides of Runway 13-31. These development areas are ideal because they would provide airside access via exiting Taxiway A3 (ultimate Taxiway B3) and the proposed partial parallel Taxiways B and C serving the north side of Runway 10-28, while landside access could be provided from Commercial Drive and Heather Lane (pending further justification). **Exhibit 5A** presents the recommended master plan concept as it relates to the northern development area.

On the northwest side of the airfield, the recommended development concept considers continued hangar development near the Commercial Drive airport entrance road. Proposed development considers the construction of one 10-unit T-hangar and eight 50-foot by 50-foot box hangars. The hangar development could be accessed from the airside via Taxiway A3 (ultimate Taxiway B3) or the Runway 13 taxiway connector and would be supported by an additional taxilane. The proposed box hangars are also served by additional automobile parking and access. Furthermore, if sufficient demand warrants, approximately 9.7 acres of property could be reserved for future aviation development along the proposed partial parallel Taxiway B.

At present, the proposed development on the northeast side of the airfield is somewhat isolated from the existing taxiway/taxilane access points on the airfield. As such, the recommended master plan concept considers the addition of partial parallel Taxiway C to serve the northeast side of Runway 10-28 and connecting taxiways to provide airside access to the proposed development area. Proposed hangar development in this location includes four 60-foot by 60-foot box hangars, two 100-foot by 100-foot conventional hangars, and one 200-foot by 100-foot conventional hangar. The proposed hangars are supported by 10,600 sy of apron area, as well as 12,000-gallon 100LL and Jet A fuel storage tanks. The proposed fuel tanks could be situated with a self-service credit card reader or used to service fuel trucks for full-service fueling. Each proposed hangar is served by automobile parking and access. An additional airport access point is considered on the north side of the airfield via Heather Lane.

SUPPORT FACILITIES

As mentioned in Chapter Three, support facilities are integral to the operation of the airport; however, these facilities are not categorized as airside or landside facilities. The facility requirements analysis identified several improvements that will ultimately contribute to the airport's ability to accommodate the forecasted aviation activity levels.

- **Aviation Fuel Storage |** Jet A and 100LL fuel are currently stored in 12,000-gallon underground storage tanks adjacent to the aircraft apron (12,000 gallons each). Fuel is dispensed via a self-serve system that is co-located with the tanks. Analysis in Chapter Three indicated the current Jet A and 100LL fuel storage capacity is adequate to meet the 14-day supply criterion through the long-term planning horizon but could be increased if significant demand materializes. As such, an additional fuel farm with 12,000-gallon storage capacity for 100LL fuel and 12,000-gallon storage capacity for Jet A fuel is proposed on the northeast side of Runway 10-28; however, the need for additional fuel storage capacity will be determined by the airport sponsor and the fuel service provider.

- **Airport Utilities |** At this time, any significant landside development could be limited by the existing utility infrastructure (or lack thereof), particularly in the southeastern and northeastern development areas. Minimum water flow requirements for sprinkler and firefighting purposes may vary depending on the type(s) of hangars and facilities built and the water storage and pumping capabilities they require. All future development should consider enhancements to utility infrastructure, which could include increased water storage and pumping capacity, sewer improvements, and improved electrical and natural gas capabilities. In addition to utilities, the airport should also evaluate the existing drainage system prior to any significant landside development to ensure it will adequately support development.

ENVIRONMENTAL OVERVIEW

An analysis of potential environmental impacts associated with proposed airport projects is an essential consideration in the airport master plan process. The primary purpose of this discussion is to review the recommended development concept (**Exhibit 5A**) and the airport's capital program to determine whether projects identified in the airport plan could, individually or collectively, significantly impact existing environmental resources. Information contained in this section was obtained from previous studies, official internet websites, and analysis by the consultant. This section provides an overview of potential impacts to existing resources that could result from the implementation of the planned improvements outlined on the recommended development concept.

If the FAA retains approval authority over a project, the project is typically subject to the *National Environmental Policy Act* (NEPA). For projects not categorically excluded under FAA 1050.1G, *FAA National Environmental Policy Act Implementing Procedures*, compliance with NEPA is generally satisfied through the preparation of environmental assessment (EA). In instances where significant environmental impacts are expected, an environmental impact statement (EIS) may be required.

The *FAA Reauthorization Act of 2024* introduced a variety of updated and new environmental guidelines. The primary environmental-related updates are outlined in two sections: Section 743 and Section 783.

- Section 743 details the FAA's authority to regulate uses of airport property for projects on land acquired without federal assistance and outlines limitations imposed on non-aeronautical review. Section 743 also states that a notice of intent for proposed projects outside FAA jurisdiction should be submitted by an airport sponsor to the FAA.

- Section 783 outlines the airport capacity enhancement projects, terminal development projects, and general aviation airport improvement projects that will be subject to coordinated and expedited environmental review requirements.

The following portion of the master plan is not designed to satisfy NEPA requirements for a specific development project, but it provides a preliminary review of environmental issues that may need to be considered in more detail within the environmental review processes. It is important to note that the FAA is ultimately responsible for determining the level of environmental documentation required for airport actions.

Table 5C summarizes potential environmental concerns associated with implementation of the ultimate recommended development concept for PCZ. Analysis under NEPA requires federal agencies to prepare a "detailed statement" for proposed "major federal actions significantly affecting the quality of the human environment" (as amended by the *Fiscal Responsibility Act of 2023* [FRA], Public Law 118-5). This statement must include the following:

1. The reasonably foreseeable environmental effects of the proposed agency action

2. The reasonably foreseeable adverse environmental effects that cannot be avoided

3. A reasonable range of alternatives to the proposed agency action, including an analysis of any negative environmental impacts of not implementing the proposed agency action, in the case of a no-action alternative, that are technically and economically feasible and meet the purpose and need of the proposal

4. The relationship between local short-term uses of the human environment and the maintenance and enhancement of long-term productivity

5. Any irreversible and irretrievable commitments of resources that would be involved in the proposed action

TABLE 5C | Summary of Potential Environmental Concerns

AVIATION EMISSIONS AND AIR QUALITY	
FAA Order 1050.1G, *Significance Threshold/ Factors to Consider*	***The action would cause pollutant concentrations to exceed one or more of the National Ambient Air Quality Standards (NAAQS), as established by the United States (U.S.) Environmental Protection Agency (EPA) under the Clean Air Act, for any of the time periods analyzed, or to increase the frequency or severity of any such existing violations.***
Potential Environmental Concerns	**Potential Impact.** An increase in operations could occur over the 20+ year period outlined in the aviation demand forecasts as part of this airport master plan that would likely result in additional emissions; however, Waupaca County is in attainment for all federal criteria pollutants. For construction or operational emissions, project-specific qualitative or quantitative emissions inventories under NEPA may be required, depending on the type of environmental review needed for specific projects defined on the development concept plan.
BIOLOGICAL RESOURCES (INCLUDING FISH, WILDLIFE, AND PLANTS)	
FAA Order 1050.1G, *Significance Threshold/ Factors to Consider*	***The U.S. Fish and Wildlife Service (USFWS) or the National Marine Fisheries Service (NMFS) determines that the action would be likely to jeopardize the continued existence of a federally listed threatened or endangered species or would result in the destruction or adverse modification of federally designated critical habitat.*** ***The FAA has not established a significance threshold for non-listed species; however, factors to consider include whether an action would have the potential for:*** • ***Long-term or permanent loss of unlisted plant or wildlife species;*** • ***Adverse impacts to special status species or their habitats;*** • ***Substantial loss, reduction, degradation, disturbance, or fragmentation of native species' habitats or populations; or*** • ***Adverse impacts on a species' reproductive rates, non-natural mortality, or ability to sustain the minimum population levels required for population maintenance.***
Potential Environmental Concerns	<u>Federally Protected Species</u> **Potential Impact.** According to the USFWS *Information for Planning and Consultation* (IPaC) report, there is potential for five endangered, proposed endangered, proposed threatened, and nonessential experimental species at PCZ: • gray wolf (endangered) • whooping crane (nonessential experimental) • salamander mussel (federal proposed endangered/state threatened) • Karner blue butterfly (endangered) • monarch butterfly (proposed threatened) Based on a review of aerial imagery, PCZ appears to contain freshwater forested/shrub wetlands along the northern portion of the airport. Furthermore, there are agricultural fields east of the airport that could be used for foraging habitat. A biological resources evaluation may be needed to ensure no suitable habitat for federally protected species is located within the proposed development footprint for projects identified on **Exhibit 5A**. <u>Designated Critical Habitat</u> **No Impact**. There is no designated critical habitat within airport boundaries. *(Continues)*

TABLE 5C | Summary of Potential Environmental Concerns (continued)

Potential Environmental Concerns (continued)	Non-Listed Species **Potential Impact.** Non-listed species of concern include those protected by the *Migratory Bird Treaty Act (MBTA)* and the *Bald and Golden Eagle Protection Ac*t. Bird species protected by the MBTA could be adversely affected if construction occurs during the nesting and breeding seasons (December 31–August 31). Pre-construction surveys of vegetated areas at the airport are recommended for projects that involve ground-clearing projects unless such projects are outside the nesting and breeding seasons. *Source: USFWS, IPaC report (https://ipac.ecosphere.fws.gov/location/index), accessed September 2025*
COASTAL RESOURCES	
FAA Order 1050.1G, *Significance Threshold/ Factors to Consider*	***The FAA has not established a significance threshold for Coastal Resources. Factors to consider include whether an action would have the potential to:*** • ***Be inconsistent with the relevant state coastal zone management plan(s);*** • ***Impact a coastal barrier resources system unit;*** • ***Pose an impact on coral reef ecosystems;*** • ***Cause an unacceptable risk to human safety or property; or*** • ***Cause adverse impacts on the coastal environment that cannot be satisfactorily mitigated.***
Potential Environmental Concerns	**No Impact.** As mentioned in Chapter One, the airport is not located within a coastal zone; therefore, airport development depicted on **Exhibit 5A** would not impact coastal resources.
***DEPARTMENT OF TRANSPORTATION ACT*, SECTION 4(f)** (NOW CODIFIED IN 49 UNITED STATES CODE [U.S.C.] § 303)	
FAA Order 1050.1G, *Significance Threshold/ Factors to Consider*	***The action involves more than a minimal physical use of a Section 4(f) resource or constitutes a "constructive use" based on an FAA determination that the aviation project would substantially impair the Section 4(f) resource. Resources that are protected by Section 4(f) are publicly owned land from a public park, recreation area, or wildlife and waterfowl refuge of national, state, or local significance, and publicly or privately owned land from a historic site of national, state, or local significance. Substantial impairment occurs when the activities, features, or attributes of the resource that contribute to its significance or enjoyment are substantially diminished.***
Potential Environmental Concerns	**No Impact.** There is one Section 4(f) resource within one mile of the airport: Echo Park. The recommended development concept proposes new airport development within existing airport property and would not physically or constructively use this resource.
FARMLANDS	

FAA Order 1050.1G, *Significance Threshold/ Factors to Consider*	***The total combined score on Form AD-1006, Farmland Conversion Impact Rating, ranges between 200 and 260. Form AD-1006 is used by the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) to assess impacts under the Farmland Protection Policy Act (FPPA).***
	
	The FPPA applies when airport activities meet the following conditions:
	
	• ***Federal funds are involved;***
	• ***The action involves the potential for the irreversible conversion of important farmlands to non-agricultural uses (important farmlands include pastureland, cropland, and forest considered to be prime, unique, or statewide or locally important land); or***
	• ***None of the exemptions to the FPPA apply. These exemptions include:***
	  ○ ***Land that is not considered "farmland" under FPPA, such as land that is already developed or already irreversibly converted (these instances include when land is designated as an urban area by the U.S. Census Bureau or the existing footprint includes rights-of-way)***
	  ○ ***Land that is already committed to urban development***
	  ○ ***Land that is committed to water storage***
	  ○ ***Construction of non-farm structures necessary to support farming operations***
	  ○ ***Construction/land development for national defense purposes.***

(Continues)

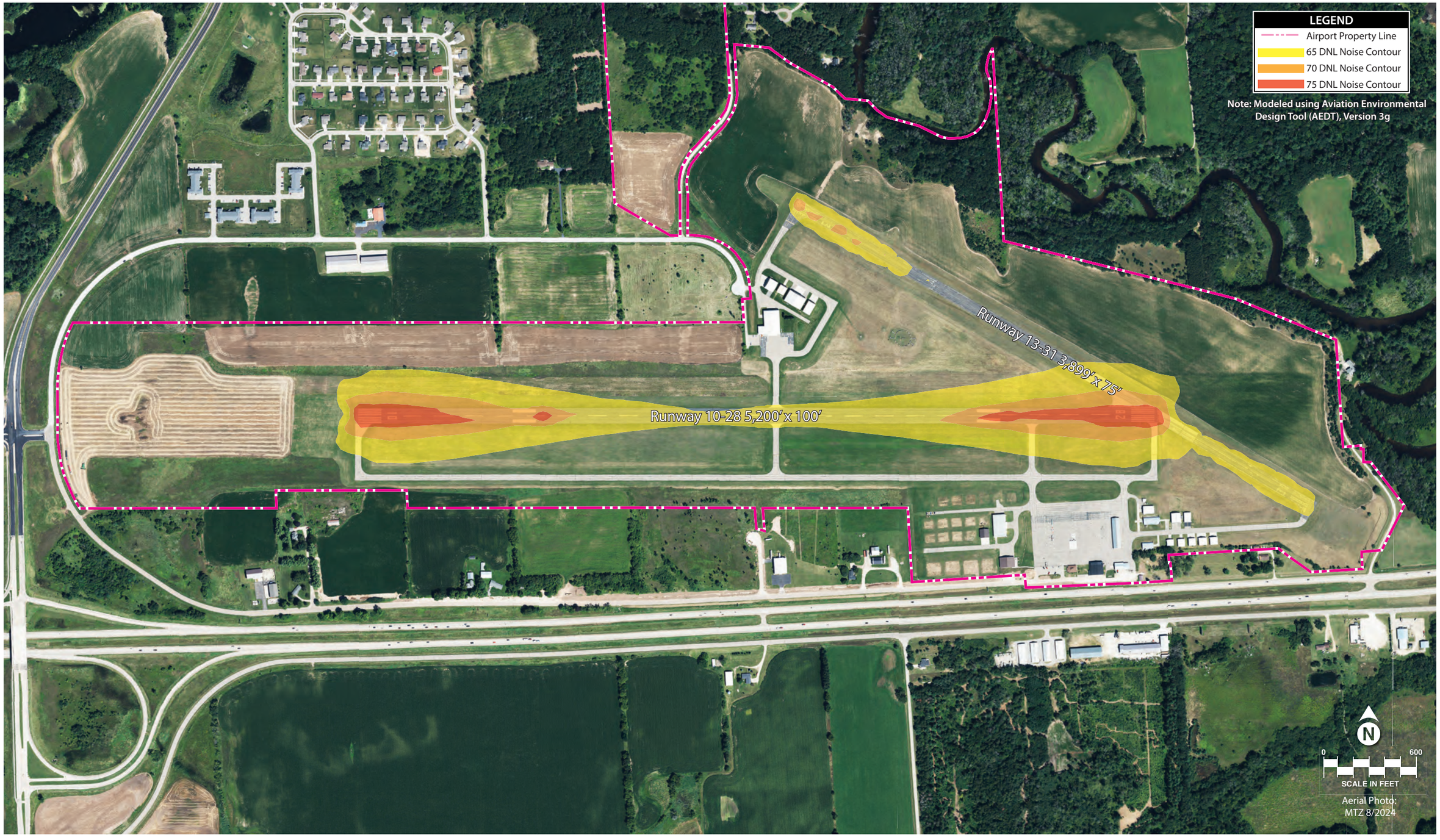
TABLE 5C | Summary of Potential Environmental Concerns (continued)

Potential Environmental Concerns	**Potential Impact.** According to the USDA-NRCS Web Soil Survey, portions of the airport include prime farmland and may be subject to the FPPA (**Exhibit 1J**). The recommended development concept proposes the construction of Taxiways B and A2, and a 9.7-acre aviation reserve in areas with farmable soils; therefore, prior to the construction of these projects, coordination may be required with the USDA to assess potential impacts to these soils. *Source: USDA-NRCS (https://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx), accessed September 2025*
HAZARDOUS MATERIALS, SOLID WASTE, AND POLLUTION PREVENTION	
FAA Order 1050.1G, *Significance Threshold/ Factors to Consider*	***The FAA has not established a significance threshold for Hazardous Materials, Solid Waste, and Pollution Prevention; however, factors to consider include whether an action would have the potential to:*** • ***Violate applicable federal, state, tribal, or local laws or regulations regarding hazardous materials and/or solid waste management;*** • ***Involve a contaminated site;*** • ***Produce an appreciably different quantity or type of hazardous waste;*** • ***Generate an appreciably different quantity or type of solid waste or use a different method of collection or disposal and/or would exceed local capacity;*** • ***Use a different method of waste collection, treatment, storage, or disposal that, as an action, would adversely impact the site, surroundings, or affected community, and/or would exceed state, tribal, or local capacity; or*** • ***Adversely affect human health and the environment.***
Potential Environmental Concerns	**No Impact.** There are no identified brownfields or Superfund sites within a one-mile buffer of the airport. Due to existing regulatory environmental management requirements regarding hazardous materials and water and stormwater management, no impacts related to ultimate airport development are anticipated. Furthermore, no long-term impacts related to solid waste disposal are expected based on the projects outlined on **Exhibit 5A**. Solid waste, such as the pavement proposed to be removed from the airfield, will be properly disposed of in local landfills. The proposed 12,000-gallon 100LL and Jet A fuel tanks in the eastern area of the airport would be subject to a spill prevention, control, and countermeasure (SPCC) plan required for these facilities.
HISTORICAL, ARCHITECTURAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES	
FAA Order 1050.1G, *Significance Threshold/ Factors to Consider*	***The FAA has not established a significance threshold for Historical, Architectural, Archaeological, and Cultural Resources. Factors to consider include whether an action would result in a finding of adverse effect through the Section 106 process; however, an adverse effect finding does not automatically trigger the preparation of an EIS (i.e., a significant impact).***
Potential Environmental Concerns	**Potential Impact.** There are no listed National Register of Historic Places (NRHP) sites on or near PCZ. As mentioned in Chapter One of the master plan, no systematic airport-wide cultural surveys have been conducted on airport property, and while much of the airport has been developed or disturbed by construction, there is still a potential that intact cultural resources may be present on the ground surface or subsurface. If previously undocumented buried cultural resources are identified during ground-disturbing activities for future airport development, all work must immediately cease within 30 meters (100 feet) until a qualified archaeologist has documented the discovery and evaluated its eligibility for the NRHP, as appropriate. Work must not resume in the area without the approval of the FAA.
LAND USE	
FAA Order 1050.1G, *Significance Threshold/ Factors to Consider*	***The FAA has not established a significance threshold for Land Use and there are no specific independent factors to consider. The determination that significant impacts exist is normally dependent on the significance of other impacts.***

(Continues)

TABLE 5C | Summary of Potential Environmental Concerns (continued)

Potential Environmental Concerns	**Potential Impact.** Property to be acquired within the Runway 28 RPZ is depicted on **Exhibit 5A**. This is recommended to allow the airport to have control over what land uses may be permitted within the airport's RPZ. This parcel of land is currently occupied by a private residence and would require the relocation of this land use. All other proposed projects on **Exhibit 5A** would occur within the existing airport boundaries and would not directly affect off-airport land uses.
NATURAL RESOURCES AND ENERGY SUPPLY	
FAA Order 1050.1G, *Significance Threshold/ Factors to Consider*	***The FAA has not established a significance threshold for Natural Resources and Energy Supply; however, factors to consider include whether the action would have the potential to cause demand to exceed available or future supplies of these resources or adversely impact extant federal, tribal, state, or local resource planning already in place.***
Potential Environmental Concerns	**No Impact.** Planned development projects at the airport could increase demands on energy utilities, water supplies and treatment, and other natural resources during construction; however, significant long-term impacts are not anticipated. Should long-term impacts be a concern, coordination with local service providers is recommended.
NOISE AND NOISE-COMPATIBLE LAND USE	
FAA Order 1050.1G, *Significance Threshold/ Factors to Consider*	***The significance threshold applies to all civil aviation activities, including aircraft and airports; unmanned aerial systems (UAS) and hubs, advanced air mobility (AAM) and vertiports, and commercial space vehicles and launch and reentry sites.*** ***The action would result in noise exposure from impulsive noise sources (e.g., sonic booms) that meet or exceed 60 CDNL: equivalent to day-night average sound level (DNL) 65 dBA (A-weighted decibels).*** ***The action would increase noise by a DNL of 1.5 decibels (dB) or more for a noise-sensitive area that is exposed to noise at or above the 65-dB DNL noise exposure level, or that will be exposed at or above the 65-dB DNL level due to a 1.5-dB DNL or greater increase, when compared to the no-action alternative for the same timeframe.*** ***Another factor to consider is that special consideration should be given to the evaluation of the significance of noise impacts on noise-sensitive areas within Section 4(f) properties where the land use compatibility guidelines in Title 14 CFR Part 150 are not relevant to the value, significance, and enjoyment of the area in question.***
Potential Environmental Concerns	**No Impact**. There are no hospitals or live-in medical facilities within one mile of the airport. The closest residences are situated along the southern boundary of the airport across from Runway Drive. Other nearby residential areas are located to the north of PCZ, including single-family homes off Webster Way and Rotary Street. The closest school is situated northwest of the airport at the intersection of Highway 22 and Godfrey Drive. Based on the noise contours prepared for this study (**Exhibits 5B** and **5C**), the 65-dB DNL would remain within airport boundaries in the existing (2024) and future (2044) conditions and would not impact nearby noise-sensitive land uses. Furthermore, the ultimate development at the airport is not expected to change the overall noise environment more than the 1.5-dB threshold; however, this should be confirmed prior to the extension of ultimate Runway 10-28.
SOCIOECONOMICS AND CHILDREN'S ENVIRONMENTAL HEALTH AND SAFETY RISKS	
Socioeconomics	
FAA Order 1050.1G, *Significance Threshold/ Factors to Consider*	***The FAA has not established a significance threshold for Socioeconomics; however, factors to consider include whether an action would have the potential to:*** • ***Disrupt or divide the physical arrangement of an established community;*** • ***Cause extensive relocation when sufficient replacement housing is unavailable;*** *(Continues)*


LEGEND
Airport Property Line
65 DNL Noise Contour
70 DNL Noise Contour
75 DNL Noise Contour
Note: Modeled using Aviation Environmental Design Tool (AEDT), Version 3g
Runway 13-31 3,899' x 75'
Runway 10-28 5,200' x 100'
N
0
600
SCALE IN FEET
Aerial Photo:
MTZ 8/2024

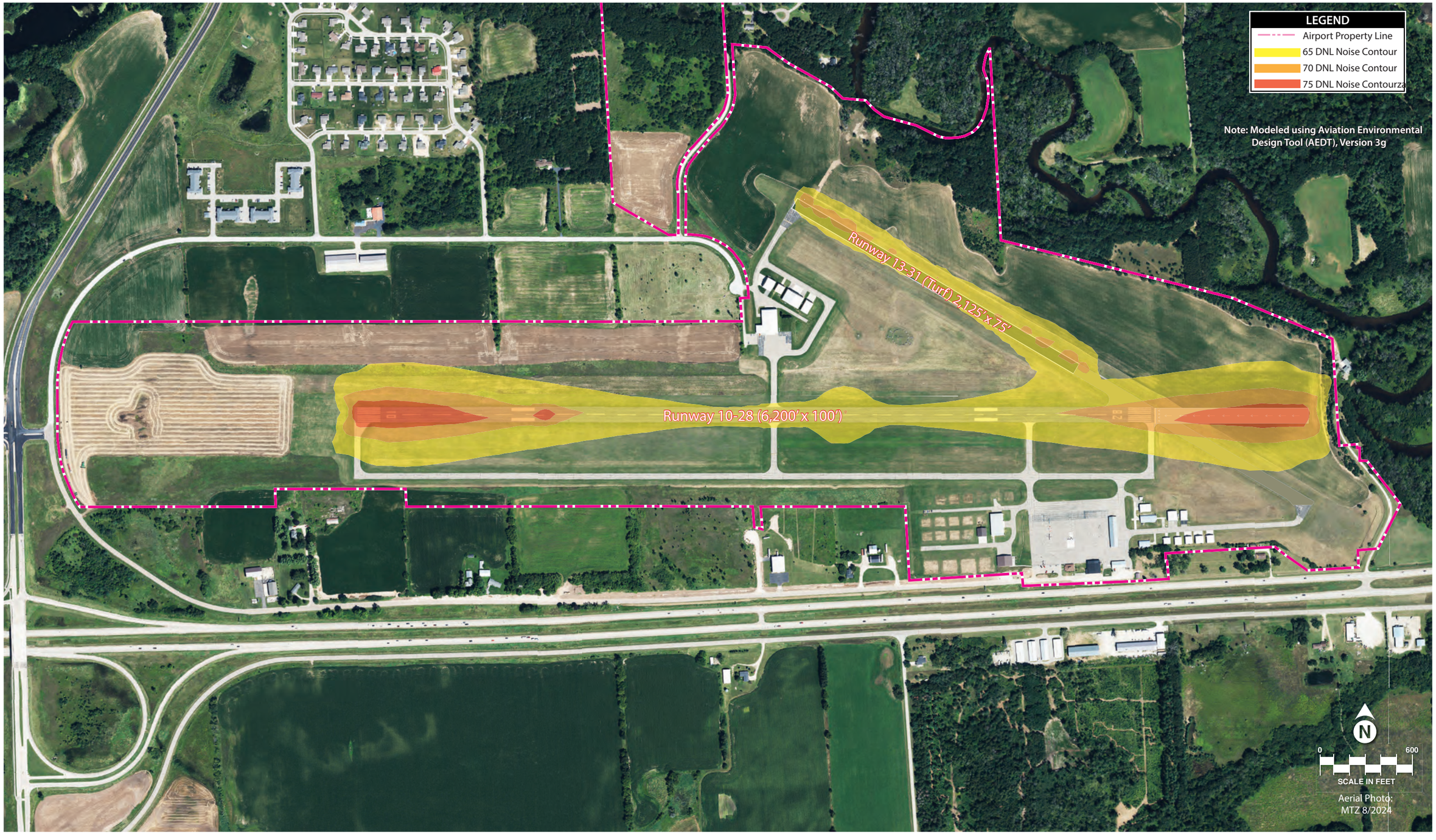

LEGEND
Airport Property Line
65 DNL Noise Contour
70 DNL Noise Contour
75 DNL Noise Contourza
Note: Modeled using Aviation Environmental Design Tool (AEDT), Version 3g
Runway 13-31 (Turf) 2,125' x 75'
Runway 10-28 (6,200' x 100')
N
0
600
SCALE IN FEET
Aerial Photo:
MTZ 8/2024

TABLE 5C | Summary of Potential Environmental Concerns (continued)

FAA Order 1050.1G, *Significance Threshold/ Factors to Consider* (continued)	• ***Cause extensive relocation of community businesses that would cause severe economic hardship for affected communities;*** • ***Disrupt local traffic patterns and substantially reduce the levels of service of roads serving the airport and its surrounding communities; or*** • ***Produce a substantial change in the community tax base.***
Potential Environmental Concerns	**Potential Impact.** The proposed development depicted on **Exhibit 5A** could encourage economic growth in Waupaca County. This growth could include new construction jobs, new jobs for the airport and other commercial uses, new housing, and increases to the local tax base. **Exhibit 5A** depicts hangar development on the northwestern, eastern, and southern areas of the airport. No long-term traffic impacts are anticipated as a result of this development, as hangars are typically low traffic generators. Additionally, the acquisition of the property within the Runway 28 RPZ would result in the relocation of a single-unit residence and may be subject to the *Uniform Relocation Assistance and Real Property Acquisitions Act*.
Children's Health and Safety Risks	
FAA Order 1050.1G, *Significance Threshold/ Factors to Consider*	***The FAA has not established a significance threshold for Children's Environmental Health and Safety Risks; however, factors to consider include whether an action would have the potential to lead to a disproportionate health or safety risk to children.***
Potential Environmental Concerns	**No Impact**. No disproportionately high or adverse impacts are anticipated to affect children living near the airport because of the proposed ultimate development. The airport is in an access-controlled facility and children will not be granted access to the airfield or landside facilities without adult supervision. All construction areas should be controlled to prevent unauthorized access, as well.
VISUAL EFFECTS	
Light Emissions	
FAA Order 1050.1G, *Significance Threshold/ Factors to Consider*	***The FAA has not established a significance threshold for Light Emissions; however, a factor to consider is the degree to which an action would have the potential to:*** • ***Create annoyance or interfere with normal activities from light emissions; or*** • ***Affect the nature of the visual character of the area due to light emissions, including the importance, uniqueness, and aesthetic value of the affected visual resources.***
Potential Environmental Concerns	**No Impact.** The proposed recommended development would include the conversion of Runway 13-31 to a turf runway. When Runway 13-31 is shortened and converted to turf, the existing PAPI systems should be removed. Proposed lighting upgrades to Runway 10-28 include the installation of PAPI-4s on Runways 10 and 28. These light fixtures would be installed at ground level and would not be seen from nearby roadways. Construction of the proposed 1,000-foot runway extension for Runway 10-28 may require nighttime construction. Night lighting during construction phases within the runway environment is typically directed downward to the construction work area to prevent lighting spilling outside the airport boundaries. Other ultimate projects, such as the proposed hangars, would include new light fixtures that would be illuminated during the operation of the new facilities. Building security lights would be directed downward and would not create glare issues for users on nearby roadways. Similarly, if buildings are constructed in the reserves slated for aeronautical and non-aeronautical development, lights installed for building security would be directed downward to minimize the potential for glare issues.

(Continues)

TABLE 5C | Summary of Potential Environmental Concerns (continued)

Visual Resources/Visual Character	
FAA Order 1050.1G, *Significance Threshold/ Factors to Consider*	***The FAA has not established a significance threshold for Visual Resources/Visual Character; however, a factor to consider is the extent to which an action would have the potential to:*** • ***Affect the nature of the visual character of the area, including the importance, uniqueness, and aesthetic value of the affected visual resources;*** • ***Contrast with the visual resources and/or visual character in the study area; and*** • ***Block or obstruct the views of the visual resources, including whether these resources would still be viewable from other locations.***
Potential Environmental Concerns	**No Impact**. There are no national scenic byways, state scenic byways, or scenic corridors near PCZ. Furthermore, views of the airport are not readily accessible due to the flat topography of the airport environs. *Sources: U.S. Department of Transportation, Federal Highways Administration, National Scenic Byways & All-American Roads (https://fhwaapps.fhwa.dot.gov/bywaysp/States/Show/WI), accessed September 2025; City of Waupaca Comprehensive Plan – Year 2030*
WATER RESOURCES	
Wetlands	
FAA Order 1050.1G, *Significance Threshold/ Factors to Consider*	***The action would:*** 1. ***Adversely affect a wetland's function to protect the quality or quantity of municipal water supplies, including surface waters and sole source and other aquifers;*** 2. ***Substantially alter the hydrology needed to sustain the affected wetland system's values and functions or those of a wetland to which it is connected;*** 3. ***Substantially reduce the affected wetland's ability to retain floodwaters or storm runoff, thereby threatening public health, safety, or welfare (the term welfare includes cultural, recreational, and scientific resources or property important to the public);*** 4. ***Adversely affect the maintenance of natural systems that support wildlife and fish habitat or economically important timber, food, or fiber resources of the affected or surrounding wetlands;*** 5. ***Promote the development of secondary activities or services that would cause the circumstances listed above to occur; or*** 6. ***Be inconsistent with applicable state wetland strategies.***
Potential Environmental Concerns	**No Impact.** Based on the National Wetlands Inventory (NWI), there are freshwater forested/ shrub wetlands in the northernmost portion of PCZ associated with the Waupaca River. Freshwater forested/shrub wetlands have also been identified to the west of the airport. It is important to note that this information is based on aerial photography interpretation based on images from 2007. To determine if wetlands are present, a field survey and/or wetland delineation may be required. According to the location of wetlands shown on the NWI aerial photography, there are no wetlands located in areas shown for potential airport development, as depicted on **Exhibit 5A**. *Source: USFWS, National Wetlands Inventory (https://fwsprimary.wim.usgs.gov/wetlands/apps/wetlands-mapper/), accessed September 2025*
Floodplains	
FAA Order 1050.1G, *Significance Threshold/ Factors to Consider*	***The action would cause notable adverse impacts on natural and beneficial floodplain values. Natural and beneficial floodplain values are defined in Paragraph 4.k of U.S. Department of Transportation (DOT) Order 5650.2, Floodplain Management and Protection.***

(Continues)

TABLE 5C | Summary of Potential Environmental Concerns (continued)

Potential Environmental Concerns	**No Impact.** Based on the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM), the majority of PCZ is located in Zone X (unshaded), an area of minimal flood hazard; however, a portion of the airport in the northernmost boundary is located in 100-year and 500-year floodplains associated with the Waupaca River (**Exhibit 1J**). Projects delineated on the recommended development concept would remain outside the 100-year and 500-year floodplains at PCZ. *Source: U.S. FEMA, FEMA Flood Map Service (https://msc.fema.gov/portal/search?AddressQuery=waupaca%20airport), accessed September 2025*
Surface Waters	
FAA Order 1050.1G, *Significance Threshold/ Factors to Consider*	***The action would:*** ***1. Exceed water quality standards established by federal, state, local, and tribal regulatory agencies; or*** ***2. Contaminate public drinking water supply such that public health may be adversely affected.*** ***Factors to consider are when a project would have the potential to:*** • ***Adversely affect natural and beneficial water resource values to a degree that substantially diminishes or destroys such values;*** • ***Adversely affect surface waters such that the beneficial uses and values of such waters are appreciably diminished or can no longer be maintained and such impairment cannot be avoided or satisfactorily mitigated; or*** • ***Present difficulties based on water quality impacts when obtaining a permit or authorization.***
Potential Environmental Concerns	**Potential Impact.** The proposed development depicted on **Exhibit 5A** would increase impervious surfaces at PCZ with the construction of additional hangars, roads and parking, and ultimate runway, taxiway, and apron pavements. A National Pollutant Discharge Elimination System (NPDES) general construction permit will be required for all projects that involve ground disturbance over one acre. Improvements outlined on **Exhibit 5A** will require revisions to the SWPPP to address operational and structural sources, best management practices (BMPs), and sediment and erosion control. FAA AC 150/5370-10H, *Standards for Specifying Construction of Airports*, Item C-102, *Temporary Air and Water Pollution, Soil Erosion, and Siltation Control* should also be implemented during construction projects at the airport.
Groundwater	
FAA Order 1050.1G, *Significance Threshold/ Factors to Consider*	***The action would:*** ***1. Exceed groundwater quality standards established by federal, state, local, and tribal regulatory agencies; or*** ***2. Contaminate an aquifer used for public water supply such that public health may be adversely affected.*** ***Factors to consider are when a project would have the potential to:*** • ***Adversely affect natural and beneficial groundwater values to a degree that substantially diminishes or destroys such values;*** • ***Adversely affect groundwater quantities such that the beneficial uses and values of such groundwater are appreciably diminished or can no longer be maintained and such impairment cannot be avoided or satisfactorily mitigated; or*** • ***Present difficulties based on water quality impacts when obtaining a permit or authorization.***

(Continues)

TABLE 5C | Summary of Potential Environmental Concerns (continued)

Potential Environmental Concerns	**No Impact**. Based on the NEPAssist website, there are no U.S. Geological Survey (USGS) groundwater wells at the airport. According to the USGS National Water Information System Mapper, the airport is not an area with reported groundwater scarcity. Furthermore, the closest sole source aquifer is the Mahomet Sole Source Aquifer, which is located over 200 miles from the airport. *Sources: U.S. EPA, NEPAssist Tool (https://nepassisttool.epa.gov/nepassist/nepamap.aspx), accessed September 2025; U.S. EPA, Sole Source Aquifers (https://epa.maps.arcgis.com/apps/webappviewer/index.html?id=9ebb047ba3ec41ada1877155fe31356b), accessed September 2025*
Wild and Scenic Rivers	
FAA Order 1050.1G, *Significance Threshold/ Factors to Consider*	***The FAA has not established a significance threshold for Wild and Scenic Rivers. Factors to consider are when an action would have an adverse impact on the values for which a river was designated (or considered for designation) through:*** • ***Destroying or altering a river's free-flowing nature;*** • ***A direct and adverse effect on the values for which a river was designated (or is under study for designation);*** • ***Introducing a visual, audible, or another type of intrusion that is out of character with the river or would alter outstanding features of the river's setting;*** • ***Causing the river's water quality to deteriorate;*** • ***Allowing the transfer or sale of property interests without restrictions needed to protect the river or the river corridor; or*** • ***Any of the above impacts preventing a river on the Nationwide Rivers Inventory (NRI) or a Section 5(d) river that is not included in the NRI from being included in the Wild and Scenic River System or causing a downgrade in its classification (e.g., from wild to recreational).***
Potential Environmental Concerns	**No Impact.** As discussed in Chapter One, PCZ is not located near a listed river on the National Wild and Scenic Rivers list. The closest river segment identified on the Nationwide Rivers Inventory is the Waupaca River, which is adjacent to the northern portion of PCZ. Based on the proposed recommended development concept, there is no proposed development near the Waupaca River; therefore, the projects delineated on the master plan concept would not have adverse effects on these rivers' outstanding remarkable values (i.e., scenery, geology, fish, wildlife, and history). *Sources: National Wild and Scenic River System (https://rivers.gov/), accessed September 2025; National Park Service, Nationwide Rivers Inventory (https://www.nps.gov/subjects/rivers/nationwide-rivers-inventory.htm), accessed September 2025*

OFF-AIRPORT LAND USE COMPATIBILITY

Land use planning around Waupaca Municipal Airport occurs through regulatory and non-regulatory means. The primary regulatory tools for directing land uses are the city and county zoning ordinances, which limit the types, sizes, and densities of land uses in various locations surrounding the airport. Examples of land use types addressed through regulatory tools include residential, commercial, industrial, and agricultural. Zoning regulations may include airport hazard zoning ordinances or overlays, which are intended to restrict unsafe development surrounding airports.

Non-regulatory land use control is accomplished through the comprehensive or future land use planning process. Comprehensive plan documents can be adopted for multiple jurisdictions, for a single municipality, or for specific areas within a city. In most states, including Wisconsin, zoning ordinances are required to be created in accordance with each jurisdiction's comprehensive plan.

It is important to note the distinction between primary land use concepts used in evaluating development within the airport environs and existing land use, comprehensive plan, and zoning land use. Existing land use refers to property improvements as they ***exist today***, according to city records.

Zoning identifies the type of land use ***permitted*** on a given piece of property, according to the city zoning ordinances and maps. Local governments are required to regulate the subdivision of all lands within their corporate limits. Zoning ordinances should be consistent with the general plan, where one has been prepared. In some cases, the land use prescribed in the zoning ordinance or depicted in the general plan may differ from the existing land use.

The comprehensive plan land use map identifies the ***projected or future*** land use, according to the goals and policies of the locally adopted comprehensive plan. This document guides future development within the city planning area and provides the basis for zoning designations.

The following sections describe the applicable land use policies for the area within the vicinity of the airport. Specifically, these sections pertain to the lands within the 65-decibel day-night average sound level metric (DNL) contours and the FAA Title 14 CFR Part 77 approach surface restricted to one mile from the runway ends.

EXISTING LAND USE

As discussed in Chapter One, Waupaca Municipal Airport is located within the municipal boundary of Waupaca, Wisconsin. The airport property boundary aligns with the southeast limits of the municipality and the airport is surrounded by unincorporated Waupaca County to the south and east. Portions of all four approach surfaces, extended out to one mile, fall within unincorporated Waupaca County land use jurisdiction.

Due to the airport's proximity to Interstate 10 (I-10), portions of the approach surfaces to Runway 10 and Runway 31 include highway rights-of-way. Wisconsin State Highway 22 (WIS 22) is also adjacent to airport property to the west and bisects land within the approach surfaces to Runway 13 and Runway 10.

East and west of the airport along I-10, land uses include existing commercial uses and one place of worship to the west. There are residential uses to the north of the airport and south of the Waupaca River, including an existing residential subdivision and multifamily apartment complex. Land near the river to the north of the airport is largely undeveloped, while land to the south is used for agricultural purposes. Land in unincorporated Waupaca County east of the airport is largely vacant with some commercial and residential uses present on large lots.

ZONING

Zoning regulations are used in conjunction with subdivision regulations and are essential tools for achieving the goals and policies outlined in the comprehensive plans of each city and county. These regulations divide land into districts, or zones, and regulate land use activities in those districts. Zoning regulations also specify permitted uses, the intensity and density of each use, and the bulk sizes of each building. Traditional zoning ordinances separate land into four basic uses: residential, commercial (including office), industrial, and agricultural.

The current Chapter 17 of the Code of Ordinances for the City of Waupaca (also referred to as the City of Waupaca's Zoning Ordinance) was adopted in 2020 by the City of Waupaca under authority granted to it by the State of Wisconsin.[1] The current Waupaca County Zoning Ordinance for unincorporated Waupaca County (Chapter 34 of the Waupaca County General Code of Ordinances) was comprehensively amended and adopted by the Waupaca County Board of Supervisors on May 18, 2010, under separate authority granted to it by the State of Wisconsin.[2]

Exhibit 5D depicts the PCZ approach surfaces out to one mile overlayed on the official zoning maps for the City of Waupaca, WI, and unincorporated Waupaca County. As shown on the exhibit, the following zoning districts are present within the PCZ approach surfaces clipped to one mile: industrial, residential, commercial, single-family, planned unit development, agriculture, private recreation and forestry, and resource conservation.

Table 5D summarizes the type of land use allowed in each zoning district, as well as the maximum density or maximum lot coverage, maximum allowable height, and overall minimum lot size, where applicable.

TABLE 5D | Zoning Classifications Within the Ultimate Approach Surfaces Out to 1-Mile

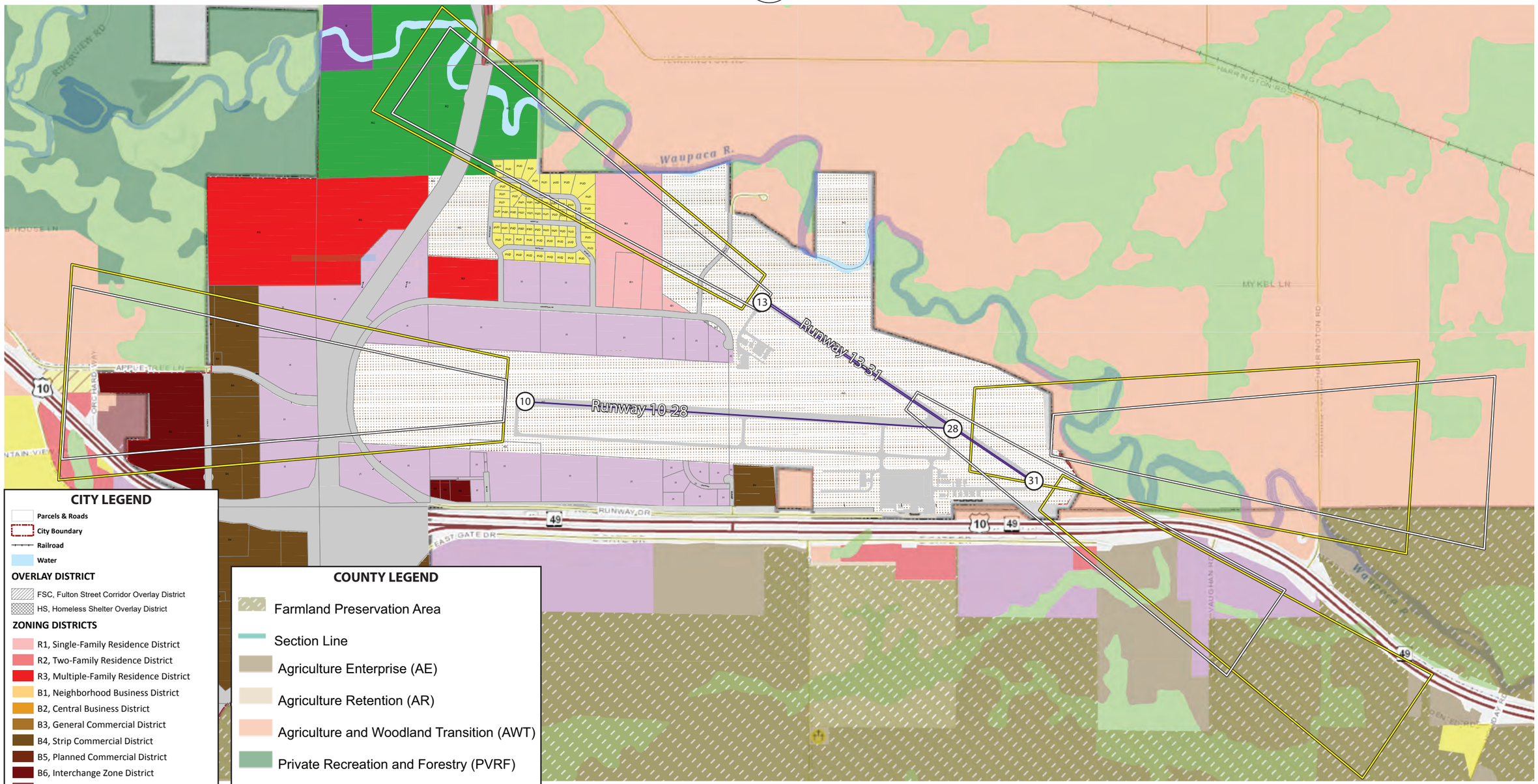
City of Waupaca, WI Zoning Classifications	Residential Allowed?	Residential Density	Minimum Area	Maximum Building Height
Light Industrial (I1)	Yes[1]	Varies	20,000 square feet	55 feet
Strip Commercial (B4)	Yes[2]	Varies	None	35 feet
Single-Family Residence (R1)	Yes	1 unit per lot	5,000 square feet	35 feet
Planned Unit Development (PUD)	Yes	Varies	Varies	Varies
Resource Conservation (RC)	No	N/A	None	None
Unincorporated Waupaca County, WI Zoning Classification	**Residential Allowed?**	**Residential Density**	**Minimum Area**	**Maximum Building Height**
Agriculture and Woodland Transition (AWT)	Yes	1 unit per 2 acres	1 acre	35 feet
Private Recreation and Forestry (PVRF)	Yes	1 unit per 10 acres	1 acre	35 feet
Resource Protection (RP)	No	N/A – No buildings or structures permitted.		
Rural Commercial – Neighborhood (RC-N)	No	N/A	None	60 feet
Rural Industrial – General (RI-G)	No	N/A	10,000 square feet	60 feet
Agriculture Enterprise (AE)	Yes	1 unit per 40 acres	1 acre	35 feet

[1] A Conditional Use Permit is required for residential uses.
[2] Multi-family and duplex are the only permitted residential uses.

Sources: City of Waupaca Zoning Ordinance, 2020; Waupaca County Zoning Ordinance, 2010; Coffman Associates analysis

Additionally, Wisconsin Statute §114.136 gives public airport owners the authority to enforce height limitations on structures within three miles of their airports. Airport-specific height limitations are established in the Municipal Code of Waupaca, Wisconsin, §17.209, *Height Limitations in Airport Vicinity*.[3] The ordinance enforces height limitations for new structures and the replacement, substantial alteration, or reconstruction of nonconforming structures in the airport height zones depicted on the city's *Height Limitation Zoning Map* (dated January 14, 2004). The ordinance does not apply to objects that are less than 35 feet in height above ground level at the object site.

[1] Wisconsin Statute §62.23, 87.30, ll4.l26 and l45.02 (as amended)
[2] Wisconsin Statute §59.69, 59.694, and 87.30 and Chapter 91 (and amendments thereto).
[3] Municipal Code of Waupaca, WI, §17.209, Height Limitations in Airport Vicinity (as amended) (https://library.municode.com/wi/waupaca/codes/code_of_ordinances?nodeId=CH17ZOCOREREOR09-20_17.200GEPR_17.209HELIAIVI), accessed October 2025



CITY LEGEND

- Parcels & Roads
- City Boundary
- Railroad
- Water

OVERLAY DISTRICT

- FSC, Fulton Street Corridor Overlay District
- HS, Homeless Shelter Overlay District

ZONING DISTRICTS

- R1, Single-Family Residence District
- R2, Two-Family Residence District
- R3, Multiple-Family Residence District
- B1, Neighborhood Business District
- B2, Central Business District
- B3, General Commercial District
- B4, Strip Commercial District
- B5, Planned Commercial District
- B6, Interchange Zone District
- B7, Riverfront District
- PUL, Public Facility and Utility Lands District
- PUD, Planned Unit Development District
- I1, Light Industrial District
- I2, Heavy Industrial District
- AG, Agricultural District
- RC, Resource Conservation District
- Q, Quarrying District

COUNTY LEGEND

- Farmland Preservation Area
- Section Line
- Agriculture Enterprise (AE)
- Agriculture Retention (AR)
- Agriculture and Woodland Transition (AWT)
- Private Recreation and Forestry (PVRF)
- Resource Protection (RP)
- Rural Commercial-Neighborhood (RC-N)
- Rural Industrial-General (RI-G)
- Rural Residential (RR)

APPROACH SURFACES LEGEND

- Existing Part 77 Approach Surfaces
- Future Part 77 Approach Surfaces
- Runway Centerline

Source: City of Waupaca, WI, Zoning Districts Map (amended February 2025); Waupaca County, WI, GIS Data Viewer – Zoning Viewer (accessed October 2025); Coffman Associates analysis

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Waupaca County, WI, has not adopted an airport overlay district to regulate the height of structures in relationship to the Part 77 surfaces of PCZ; however, any amendments to the official zoning map for Waupaca County unincorporated areas within the airport affected area require notification of the airport owner in accordance with Wisconsin Statutes §62.23(6) (am).[4]

SUBDIVISION REGULATIONS

Subdivision regulations are legal devices employed to administer the process of dividing land into two or more lots, parcels, or sites for the building and location, design, and installation of supporting infrastructure. The subdivision regulations are one of two instruments commonly employed to carry out the goals and policies outlined in the comprehensive plan. The development standards for subdivision design and improvement in the City of Waupaca are codified within Chapter 495, *Subdivision of Land*, of the city's zoning and development code.[5] Subdivision regulations for unincorporated Waupaca County, WI, are contained within Chapter 37, *Subdivision Ordinance*, of the county's code of ordinances.[6]

Subdivision regulations can be used to specify requirements for airport-compatible land development by requiring developers to plat and develop land to minimize noise impacts or reduce noise exposure to new development. Subdivision regulations can also be used to protect the airport proprietor from litigation for noise impacts at a later date. The most common requirement is the dedication of a noise or avigation easement to the airport sponsor by the land developer as a condition of the development approval. Easements typically authorize overflights of property with noise levels attendant to such operations.

BUILDING CODE

Building codes are established to provide minimum standards to safeguard life, limb, health, and public welfare by regulating and controlling the design, construction, quality of materials, use and occupancy, location, and maintenance of all buildings and structures. Building codes may be required to provide sound insulation in new residential, office, and institutional buildings when warranted by existing or potential high aircraft noise levels.

For residential properties, the building codes for the City of Waupaca and unincorporated Waupaca County are comprised of the State of Wisconsin's *Uniform Dwelling Code* (UDC), as amended by each jurisdiction. The UDC generally does not include noise attenuation requirements in the building code. Jurisdictions can pass additional regulations in their building codes for additional building requirements, such as reacting to unique threats of regional natural disasters. This helps ensure structures are built accordingly from the beginning of construction, as such features can be expensive and difficult to change

[4] Waupaca County, WI, Zoning Ordinance, Chapter 34, §14-5, Duties of the Planning and Zoning Committee (https://www.waupacacounty-wi.gov/Zoning%20Ordinance%20Ch%2034%20(2025).pdf?t=20250630083406411), accessed October2025.

[5] Municipal Code of Waupaca, WI, Chapter 18, Subdivision and Platting (https://library.municode.com/wi/waupaca/codes/code_of_ordinances?nodeId=CH18SUPLREREOR09-162016), accessed October 2025

[6] Waupaca County, WI, Code of Ordinances, Chapter 37, Subdivision Ordinance (https://www.waupacacounty-wi.gov/Planning%20&%20Zoning/Ordinances/Subdivision%20Ordinance%20ch%2037.pdf?t=20240722160226961), accessed October 2025

later in the process. For new construction near an airport, incorporating noise attenuation can be especially important. Noise attenuation measures can include increased thickness of windows or sound-absorbing building materials.

FUTURE LAND USE PLANS

The future land use plan is a general policy document used by a government agency to identify and describe the community's characteristics, articulate goals and policies, and explore alternative plans for future growth. These aspects are used to produce zoning ordinances and subdivision regulations to carry out the plan's goals. A municipality will often incorporate goals and policies for its airports in its future land use plan, which is typically separate from an airport master plan. Generally, the future land use plan guides local decision-makers through complications they may face during the development process or maintenance issues. Current planning documents of this type for the land near PCZ are the *City of Waupaca – Year 2030 Comprehensive Plan*, which was adopted in March 2021, and the *Waupaca County Year 2030 Comprehensive Plan*, which was adopted September 18, 2007.

CITY OF WAUPACA – YEAR 2030 COMPREHENSIVE PLAN

The *City of Waupaca – Year 2030 Comprehensive Plan* identifies future land uses on its Future Land Use Map (FLUM). Airport property is included in the plan as Civic/Institutional, and the comprehensive plan's Community Facilities analysis notes that, while current airport facilities are adequate, additional hangars are desired and the airport's terminal building may require improvements within the next 10 to 25 years (p. 78). The Future Land Use Map depicts land to the north designated as Neighborhood Mixed Use and Industrial and land to the south designated as Commercial and Community Mixed Use. The comprehensive plan also indicates that additional restrictions govern development within the airport zone (p. 43); Policy 2D states that "*the City's transportation network Official Map should clearly show easements and other development constraints associated with the City's airport*" (p. 51).

The airport is part of a larger planned area referred to as Eastgate. According to the comprehensive plan, "*the area is currently planned a mix of public institutional, planned retail commercial, and mixed-use commercial residential. The Future Land Use Map (CLUM) now shows this area as a mix of conservation, low and medium density residential, and community mixed use. Development constraints north of US HWY 10 include the airport and large wetland complexes. It may be a challenge to cost effectively develop portions of this area as a result. To the south of US HWY 10, the FLUM identifies areas for more intensive commercial uses as well as medium density residential across from the Waupaca County Highway Department*" (p. 47).

WAUPACA COUNTY YEAR 2030 COMPREHENSIVE PLAN

Chapter IX, *Land Use Element*, of the *Multi-Jurisdictional Comprehensive Plan Update for Waupaca County* classifies the future land use of PCZ in the transportation, communication, and utility category. Although the plan document does not outline policies and programs specific to the county's airports, the land use categories depicted on the land use map near Waupaca Municipal Airport are described in detail. Additionally, regional and local airports are identified as economic strengths of the county.

Exhibit 5E depicts the comprehensive plan land use designations within the airport's existing and ultimate Part 77 approach surfaces out to one mile. Airport property is currently designated as civic/institutional. Future land uses within the approach surfaces out to one mile include residential, agriculture, industrial, commercial, and conservation land uses. **Table 5E** presents the runway approach location where each land use is planned, as well as the purpose of each land use designation as stated in the comprehensive plan.

TABLE 5E | Future Land Use Designations Within the Ultimate Approach Surfaces Out to One Mile

CITY OF WAUPACA, WI
Civic/Institutional
Location: Airport Property & Runways 28, 10, 31 & 13 *Description:* All of the land designated as civic/institutional and within the approach surfaces is on airport property.
Low-Density Residential
Location: Runways 10 & 13 *Description:* One- to two-family detached and attached residential units are allowed, including single family homes and duplexes. Some lower-density "missing middle" housing types may be allowed under special circumstances, where compatible with the character of the existing neighborhood. Accessory dwelling units are allowed by right. The intent is to support existing lower-density neighborhoods while allowing for a modest increase in additional housing units where there is sufficient market demand. This designation should enable more individuals to age in place or establish multi-generational households.
Medium-Density Residential
Location: Runway 10 *Description:* Single-family and small- to medium-sized multi-family developments are allowed. In established neighborhoods, this designation may include a broad range of "missing middle" housing types, such as duplexes, triplexes, townhouses and smaller scale multi-unit apartment buildings. The intent is to provide opportunities for residents to age in place without having to leave their neighborhoods; support creation of new workforce housing; and provide a broader range of housing types to meet consumer demand.
Parks and Conservation
Location: Runways 10 & 13 *Description:* Parks and trails, natural areas, storm water management areas, conservation areas, cemeteries, and other open spaces are allowed. This designation may include low-density residential development on private lands. The intent is to preserve and restore natural resources while enhancing community connectivity.
Community Mixed Use
Location: Runway 10 *Description:* More intensive or larger-scale commercial or medium-density residential development is allowed, which may include institutional, light industrial, or civic uses. The intent is to support existing uses, as well as larger future redevelopment and adaptive reuse opportunities.
Commercial
Location: Runway 10 *Description:* Largely commercial uses, including lodging, restaurants, retail, office, and personal and professional services, are allowed. This designation may have more automobile traffic and is typically located on higher-traffic corridors. The intent is to provide areas suitable for a mix of commercial uses, including office uses. This designation includes areas less conducive to residential development.
UNINCORPORATED WAUPACA COUNTY, WI
Low-Density/Rural Residential
Location: Runways 10 & 13 *Description:* Rural Residential (RR) and Sewered Residential (SR) have been mapped to recognize existing and planned concentrations of residential development. Residential will be the primary use in these areas.

(Continues)

TABLE 5E | Future Land Use Designations Within the Ultimate Approach Surfaces Out to One Mile (continued)

UNINCORPORATED WAUPACA COUNTY, WI (continued)
Agriculture
Location: Runways 28 & 31 *Description:* Agriculture Retention (AR) has been mapped in areas where the long-term viability of the agricultural industry and supporting land base are of highest priority. AR has been mapped throughout the county and there is at least one occurrence in almost every town. The long-term viability of agriculture will be preserved in these areas by limiting residential development to moderately low overall densities, establishing minimum and maximum lot sizes that reduce residential land consumption, and encouraging the use of tools like site planning and conservation land division design.
Resource Protection
Location: Runways 28 & 31 *Description:* Resource Protection (RP) has been mapped in areas where communities have set priorities relative to the protection of natural resources. A wide variety of approaches were used in locally defining the mapping of RP, but every town has included, at a minimum, the general locations of regulatory wetlands (five acres and larger) and floodplains. This designation is a common thread that ties together all of the town plans and provides linkages throughout the county-wide map of preferred land use. In some towns, RP includes other features beyond wetlands and floodplains, such as buffers around waterways, buffers around wetlands, areas of exposed bedrock, etc.
Commercial
Location: Runway 28 *Description:* Rural Commercial/Industrial (RCI) has been mapped in areas where existing and planned concentrations of commercial, light industrial, or mixed-use development are found. RCI is primarily planned along major highway corridors but is also found in some isolated locations in recognition of existing businesses or industrial facilities.

Sources: City of Waupaca – Year 2030 Comprehensive Plan, adopted March 2021; Waupaca County Year 2030 Comprehensive Plan, adopted September 18, 2007; Coffman Associates analysis

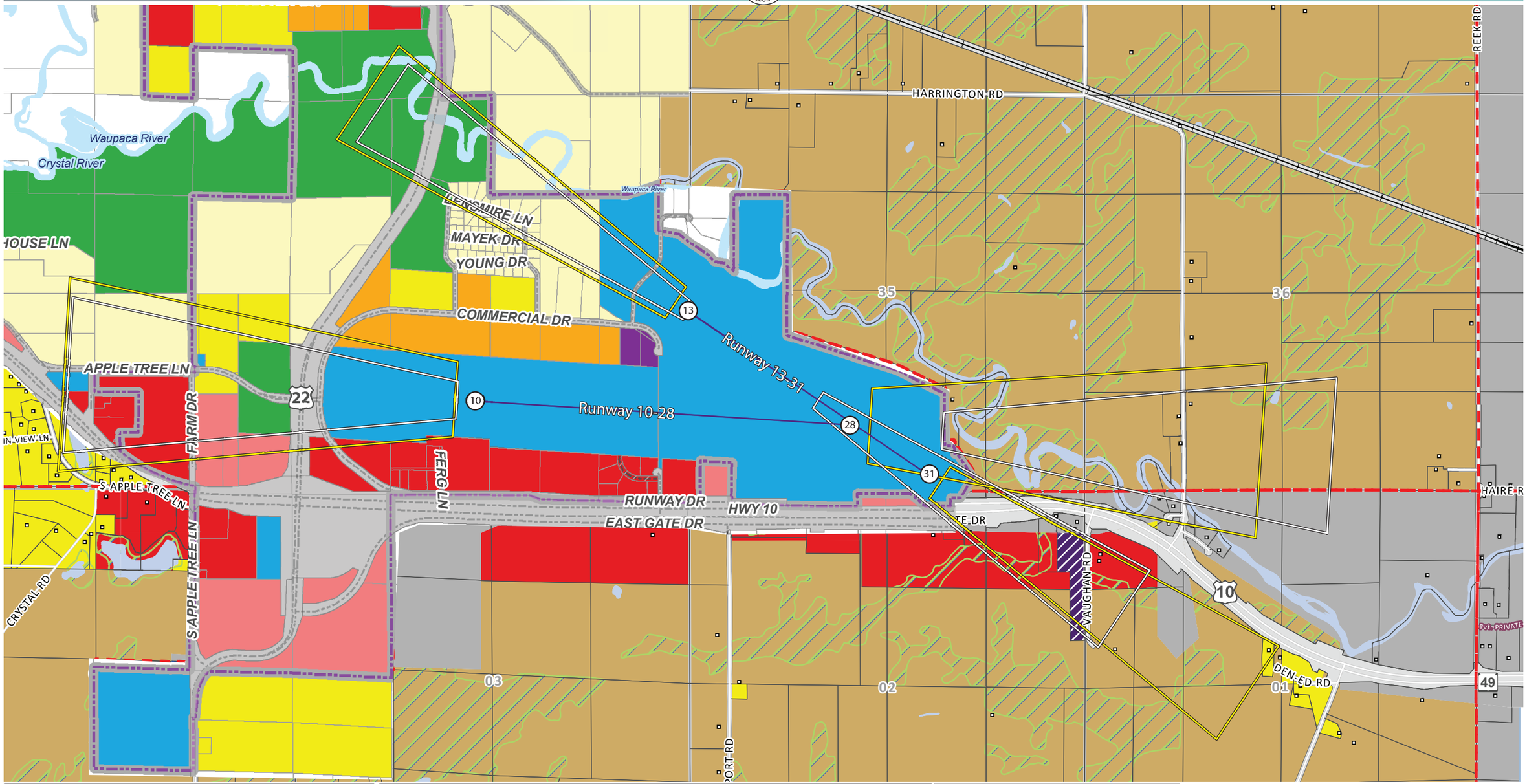
NON-COMPATIBLE DEVELOPMENT ANALYSIS

In addition to evaluating areas with the potential for non-compatible development based on zoning and future land use plans, the airport's noise exposure contours have been evaluated in comparison with the recommended height restrictions within the Part 77 approach surfaces out to one mile. This was accomplished by evaluating city-adopted land use plans and zoning designations for the parcels encompassed by the noise contours to determine if noise-sensitive land uses could be developed in those areas. Noise contours and height restrictions within the Part 77 approach surface area are addressed as follows.

NOISE EXPOSURE CONTOURS

The standard methodology for analyzing noise conditions at airports involves the use of a computer simulation model. The purpose of the noise model is to produce noise exposure contours that are overlain on a map of the airport and vicinity to graphically represent aircraft noise conditions. When compared to land use, zoning, and general plan maps, the noise exposure contours may be used to identify areas that are currently, or have the potential to be, exposed to aircraft noise.

To achieve an accurate representation of an airport's noise conditions, the noise model uses a combination of industry-standard information and user-supplied inputs specific to the airport. The software provides noise characteristics, standard flight profiles, and manufacturer-supplied flight procedures for aircraft that commonly operate at PCZ. Because each aircraft has different design and



County Legend

Preferred Land Use Classifications

- Agriculture
- Commercial
- Neighborhood Mixed Use
- Industrial
- Public Institutional
- Residential

Overlays

- Farmland Preservation Area
- Resource Protection Area

Base Map Features

- Addressed Structure
- Municipal Boundaries
- Railroad
- Road
- Private Road
- Parcel Line
- Road ROW
- Private Road ROW
- Section Line
- Water Area

City Legend

Future Land Use

- Agriculture
- Civic/Institutional
- Commercial
- Community Mixed Use
- Downtown Mixed Use
- Industrial
- Low-Density Residential
- Medium-Density Residential
- Neighborhood Mixed Use
- Parks and Conservation
- Transportation and Utilities
- 1.5 Mile Extraterritorial Boundary
- City of Waupaca Municipal Boundary

Approach Surfaces Legend

- Existing Part 77 Approach Surfaces
- Future Part 77 Approach Surfaces
- Runway Centerline

N

0 0.5

SCALE IN MILES

Source: City of Waupaca 2030 Comprehensive Plan Future Land Use Map (2021); Waupaca County Year 2030 Comprehensive Plan (2007); Coffman Associates analysis

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operating characteristics (number and type of engines, weight, and thrust levels), each aircraft emits different noise levels. The most common way to spatially represent the noise levels emitted by an aircraft is a noise exposure contour. Airport-specific information is also used in modeling inputs, including runway configuration, flight paths, aircraft fleet mix, runway use distribution, local terrain and elevation, average temperature, and numbers of daytime and nighttime operations.

Based on assumptions provided by the user, the noise model calculates average 24-hour aircraft sound exposure within a grid covering the airport and surrounding areas. The grid values represent the DNL at each intersection point on the grid and signify a noise level for those geographic locations. To create noise contours, an isoline similar to those on a topographic map is drawn connecting points of the same DNL noise value. In the same way that a topographic contour represents areas of equal elevation, the noise contour identifies areas of equal noise exposure.

DNL is the metric currently accepted by the FAA, U.S. EPA, and Department of Housing and Urban Development (HUD) as an appropriate measure of cumulative noise exposure. These three agencies have each identified the 65 DNL noise contour as the threshold of incompatibility.

The guidelines summarized in Table 1 of 14 CFR Part 150 indicate that all land uses are acceptable in areas below 65 DNL.[7] At or above the 65 DNL threshold, residential uses (including RV parks and campgrounds), educational and religious facilities, health and childcare facilities, and outdoor sport, recreation, and park facilities are all incompatible. Educational, healthcare, and religious facilities are also generally considered to be incompatible with noise exposure above 65 DNL. As with residential development, a community can make a policy decision that these uses are acceptable with appropriate sound attenuation measures. Hospitals and nursing homes, places of worship, auditoriums, and concert halls are structures that are generally compatible if measures to achieve noise level reduction are incorporated into the design and construction of such structures. Outdoor music shells and amphitheaters are not compatible and should be prohibited within the 65 DNL noise contour. Additionally, agricultural uses and livestock farming are generally considered compatible except for related residential components of these uses, which should incorporate sound attenuation measures.

As part of this master plan, noise exposure contours were prepared for PCZ for a baseline condition (2024) and a long-range condition (2044). The resulting contours are shown on **Exhibits 5B** and **5C**.

HEIGHT RESTRICTIONS

To analyze the potential for non-compatible development of land off airport property, zoning was evaluated within the Part 77 approach surface area out to one mile from the end of the runways. Table 5D notes the maximum height limit for zoning of the underlying permitted land uses, which range from 35 to 60 feet where maximum heights are stipulated. Additional height restrictions are placed on the approach surfaces by the City of Waupaca by municipal ordinance, as previously discussed.

[7] Title 14 CFR Part 150 (https://www.ecfr.gov/current/title-14/chapter-I/subchapter-I/part-150)

RECOMMENDATIONS

Based on the information presented in the previous sections and the non-compatible development analysis, the following recommendations are provided to maintain airport land use compatibility in the vicinity of PCZ. These recommendations are in accordance with the recently published FAA AC 150/5190-4B, which identifies compatible land use development tools, resources, and techniques to protect surrounding communities from adverse effects associated with airport operations.[8]

- **Add Airport Height Restriction Overlay Zoning Map |** The airport height restriction overlay zoning ordinance adopted by the City of Waupaca could be reviewed and updated to reflect the existing and ultimate conditions for PCZ. The current airport hazard zoning ordinance references the Part 77 surfaces for the airport, which may change over time as the Part 77 airspace drawing for the airport is updated. The hazard zoning maps for each jurisdiction could also be updated and included on the official zoning map for the City of Waupaca.

- **Encourage Surrounding Cities to Adopt Airport Hazard Area Zoning Ordinance & Maps |** Waupaca County, WI, does not currently enforce zoning ordinances for the safety of land uses surrounding PCZ in unincorporated Waupaca County. Due to the proximity of PCZ to vacant land in the county, there is potential for land development that could create hazards to flight or to persons and property on the ground. It is recommended that surrounding jurisdictions adopt airport hazard zoning ordinances consistent with the City of Waupaca *Airport Height Restriction Overlay Zoning Ordinance & Maps*.

- **Implement Use of the FAA Obstruction Evaluation/Airport Airspace Analysis (OE/AAA) Tool |** The city and county airport hazard zoning ordinances and/or building permit application process could be modified so that airport hazards are identified through an FAA 7460-1 airspace analysis. The FAA notice criteria tool allows users (airport sponsor, developer, and local municipality) to input location and dimensional information about a proposed development to determine if they are required to file notice with the FAA. If a notice is required, the proponent will be required to submit FAA Form 7460-1, *Notice of Construction or Alteration*, to the FAA for review as a local project review standard pursuant to each jurisdiction's existing airport hazard ordinance.

- **Consult FAA Advisory Circular for Wildlife Hazard Review |** Certain land uses that attract birds and other wildlife hazards should not be permitted on or near the airport, according to FAA AC 15/5200-33C.[9] Land uses that increase the potential for bird strikes could be addressed more specifically in the airport hazard overlay district zoning regulations.

- **Modify Special Exceptions/Conditional Uses |** In its most recent circular, the FAA advises that if a community located near an airport, allows some land use control through conditional uses, that community should ensure such uses do not create a hazard for the community, the airport, or the user of the subject property. The cities could modify the change of zone requirements and/or conditional use requirements within the airport's vicinity to have a designation that triggers extraordinary review of these exceptions because of a property's location near an airport.

[8] FAA, Advisory Circular 150/5190-4B, Airport Land Use Compatibility Planning, September 16, 2022
[9] FAA, Advisory Circular 150/5200-33C, Hazardous Wildlife Attractants on or near Airports, February 21, 2020

- **Adopt Fair Disclosure Requirements for Real Estate Transactions within the Vicinity of PCZ |** Fair disclosure regulations in real estate transactions are intended to ensure prospective buyers of property are informed that the property is or will be exposed to potentially disruptive aircraft noise or overflights. It is not uncommon, around even the busiest airports, for newcomers to report having bought property without having been informed about airport noise levels. At the most formal level, fair disclosure can be implemented through a city or county ordinance that requires a deed notice for property within the vicinity based on an existing boundary, such as the Part 77 horizontal imaginary surface. The following is an example of deed notice language that would notify the property owner of the proximity of an airport and expectations for living in the vicinity of the airport:

  The subject property is within the vicinity of Waupaca Municipal Airport, located at 2601 Runway Drive, Waupaca, WI 54981. Properties within this area are routinely subject to overflights by aircraft using this public-use airport and, as a result, residents may experience inconvenience, annoyance, or discomfort arising from the noise of such operations. Residents should also be aware that the current volume of aircraft activity may increase in response to the population and economic growth within the Waupaca Municipal Airport vicinity. Any subsequent deed conveying this parcel, or subdivisions thereof, shall contain a statement in substantially this form.

- **Increase Airport and FAA Participation in Local and Regional Planning |** The authority to develop, implement, and enforce land use programs and decisions rests predominantly with local governments; therefore, it is recommended that airport operators be involved in the preparation of city, county, and regional comprehensive plans so they can advocate for airport interests and provide their specialized expertise to the planning team. Airport coordination with local governments ensures they are routinely provided with information about proposed development activity in the airport environs, which allows the airport operators the opportunity to review and comment on those proposals. This coordination would include engagement with all jurisdictions in the airport vicinity.

AIRPORT RECYCLING, REUSE, AND WASTE REDUCTION

The primary objective of this section is to provide the City of Waupaca and its airport administration with recommendations for future improvements and processes that promote sustainable principles in addressing airport operations and aviation demand. By making sustainability a priority in the planning process and identifying best management practices, the airport can become a more environmentally friendly economic hub.

REGULATORY GUIDELINES

FAA Modernization and Reform Act of 2012

The *FAA Modernization and Reform Act of 2012* (FMRA), which amended Title 49 United States Code (USC), included several changes to the Airport Improvement Program (AIP). Two of these changes are related to recycling, reuse, and waste reduction at airports.

- Section 132(b) of the FMRA expanded the definition of airport planning to include "developing a plan for recycling and minimizing the generation of airport solid waste, consistent with applicable state and local recycling laws, including cost of a waste audit."

- Section 133 of the FMRA added a provision requiring any airport that has or plans to prepare an ALP narrative report and receives AIP funding for an eligible project to ensure the new or updated master plan addresses issues related to solid waste recycling at the airport, including the following:

    - The feasibility of solid waste recycling at the airport
    - Minimizing the generation of solid waste at the airport
    - Operation and maintenance requirements
    - A review of waste management contracts
    - The potential for cost savings or generation of income

State of Wisconsin Solid Waste Management

In the State of Wisconsin, Wisconsin's Department of Natural Resources (DNR) aids in managing solid waste with local governments, private industries, and other organizations to minimize waste and encourage reuse and recycling.[10]

Wisconsin also has a strong history of recycling and composting, and as a result, Wisconsin has a comprehensive set of laws that ban the disposal and incineration of certain materials in local landfills (**Exhibit 5F**). Wisconsin also has a database that tracks statewide collection areas for recyclables and compostable items, known as *The Wisconsin Recycling Markets Directory.*

SOLID WASTE

Typically, airport sponsors have purview over waste-handling services in facilities they own and operate, such as the airport-owned hangars and maintenance facilities. Tenants of airport-owned buildings/ hangars or tenants that own their own facilities are usually responsible for coordinating their own waste-handling services. While the focus of this plan is airport-operated facilities, the airport should work to incorporate facility-wide strategies that create consistency in waste disposal mechanisms.

For airports, waste can generally be divided into eight categories:[11]

1. **Municipal Solid Waste** (MSW) is more commonly known as trash or garbage and consists of everyday items that are used and then discarded, such as product packaging.

2. **Construction and Demolition Waste** (C&D) is considered non-hazardous trash resulting from land clearing, excavation, demolition, renovation, or repair of structures, roads, and utilities, including concrete, wood, metals, drywall, carpet, plastic, pipe, cardboard, and salvaged building components. C&D is also generally labelled as MSW.

[10] Wisconsin Department of Natural Resources, Solid Waste Management in Wisconsin (https://dnr.wisconsin.gov/topic/Waste/Solid.html)
[11] FAA, Recycling, Reuse, and Waste Reduction at Airports, April 24, 2013

Wisconsin Recycles

The following items are banned from landfills and incinerators statewide and should be reused, recycled, or composted.

Containers

- #1 and #2 plastic bottles and jars
- Aluminum containers
- Bi-metal cans
- Glass containers
- Steel (tin) cans

Paper and Cardboard

- Corrugated cardboard
- Magazines, catalogs, and other materials on similar paper
- Newspaper and newsprint materials
- Office paper

Yard Materials

- Grass clippings
- Debris and brush under 6" in diameter
- Leaves

Vehicle Items

- Lead-acid vehicle batteries
- Tires *
- Used oil filters
- Waste oils *

*These items may be burned in a solid waste treatment facililty with energy recovery.

Appliances

- Air conditioners
- Boilers
- Clothes dryers
- Clothes washers
- Dehumidifiers
- Dishwashers
- Freezers
- Furnaces
- Microwaves
- Ovens
- Refrigerators
- Stoves
- Water heaters

Electronics

- Cell phones
- Computers – desktop, laptop, netbook, tablet
- Computer monitors
- Computer keyboards and mice
- Computer scanners
- Computer speakers
- Desktop printers (including those that fax and scan)
- DVD players, VCRs, DVRs, and all other video players
- External hard drives
- Fax machines
- Flash drives/USBs
- Other items that plug into a computer
- Televisions

Source: Wisconsin Department of Natural Resources, Recycling, What to Recycle in Wisconsin, (https://dnr.wisconsin.gov/topic/Recycling/Banned.html)

Why ban items from the landfill and incinerator?

The items on this list are made of materials that can be reused in new products. Some also have toxic components that we do not want in our groundwater, air, or soil. Recycling and composting allow landfills to last longer, provide markets with valuable reusable materials, create jobs, and prevent pollution.

Why not ban more materials?

Corrugated cardboard is banned, while waxed cardboard is not. Some things with plugs, like computers, are banned, while others, like toasters, are not. Why? Current bans cover some of the most easily reusable or most toxic materials on the market today. Eventually, more items may be added to this list as new recycling markets develop or the types of materials we throw away change.

Some communities go above and beyond what is required by state law. Check with your local government or recycling service provider to find out what additional materials are accepted for recycling in your area. For more information about Wisconsin's recycling program, search "recycle" at dnr.wi.gov. Wisconsin's recycling requirements apply to everyone in the state at all residences and places of work or play.

Wisconsin Department of Natural Resources
Bureau of Waste and Materials Management
P.O. Box 7921, Madison, WI 53707 • (608) 266-2111
DNRWasteMaterials@wisconsin.gov

PUB-WA-1574 2012 Printed on Recycled Paper

3. **Green Waste** is a form of MSW yard waste that consists of tree, shrub, and grass clippings, leaves, weeds, small branches, seeds, and pods.

4. **Food Waste** includes unconsumed food products or waste generated and discarded during food preparation and is also considered MSW.

5. **Deplaned Waste** is waste removed from passenger aircraft. Deplaned waste includes bottles, cans, mixed paper (newspapers, napkins, paper towels), plastic cups, service ware, food waste, and food-soiled paper/packaging.

6. **Lavatory Waste** is a special waste that is emptied through a hose and pumped into a lavatory service vehicle. The waste is then transported to a triturator[12] facility for pretreatment prior to discharge in the sanitary sewage system. Chemicals in lavatory waste can present environmental and human health risks if mishandled; therefore, caution must be taken to ensure lavatory waste is not released to the public sanitary sewage system prior to pretreatment.

7. **Spill Clean and Remediation Wastes** are also special wastes and are generated during cleanup of spills and/or the remediation of contamination from several types of sites on an airport.

8. **Hazardous Wastes** are governed by the *Resource Conservation and Recovery Act* (RCRA), as well as regulations for certain hazardous waste, known as universal waste, described in Title 40 CFR Part 237, *The Universal Waste Rule*. Common sources of aviation hazardous waste are included below:

    - Solvents
    - Caustic part washes
    - Heavy metal paint waste and paint chips
    - Wastewater sludges from metal etching and electroplating
    - Unused explosives and monomers
    - Waste fuels and other ignitable products
    - Unusable water conditioning chemicals
    - Nickel cadmium batteries
    - Waste pesticides

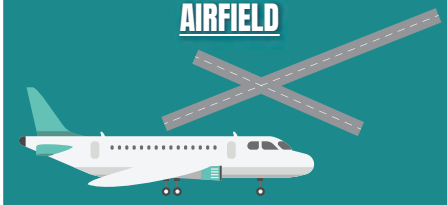
As shown on **Exhibit 5G**, there are multiple areas where the airport potentially contributes to the waste stream, including the terminal building, on-airport tenants (FBOs/SASOs, etc.), hangars, airfields, aircraft ground support equipment, and airport construction projects. To create a comprehensive waste reduction and recycling plan for the airport, all potential inputs must be considered.

EXISTING SERVICES

The airport manages its solid waste through a dumpster located adjacent to the terminal on the northeast corner of the parking lot; this dumpster is routinely emptied and is available for airport use. Currently, tenants at the airport are responsible for managing their own waste and PCZ has no program for recycling.

[12] A triturator facility turns lavatory waste into fine particulates for further processing.

AIRPORT WASTE STREAMS

AIRPORT AREA	POTENTIAL INPUTS	POTENTIAL OUTPUTS
	Restaurants Shops Passengers Employees	Food Waste, Paper, Plastic, Aluminum Cans, Trash, Grease & Oil, Green Waste, Deplaned Waste
	Employees	Food Waste, Paper, Plastic, Aluminum Cans, Trash
	Aircraft Operations	Runway Rubber, Green Waste
	Aircraft Ground Support Equipment (GSE)	Vehicle Waste, Plastic, Wastewater, Hazmat
	Construction Re-Construction Demolition	Reused Concrete, Reused Asphalt, Vehicle Waste, Soils, Building Materials, Wood, General Waste

Source: Recycling, Reuse, and Waste Reduction at Airports, FAA (April 24, 2013)

SOLID WASTE MANAGEMENT SYSTEM

Airports generally utilize either a centralized or decentralized waste management system. The differences between the two methods are described below and summarized on **Exhibit 5H**.

- **Centralized Waste Management System |** With a centralized waste management system, the airport provides receptacles for the collection of waste, recyclable materials, or compostable materials and contracts for their removal by a single local provider.[13] The centralized waste management system allows for more participation from airport tenants, who may not be incentivized to recycle on their own, and can reduce the overall cost of service for all involved. A centralized strategy can be inefficient for some airports, as it requires more effort and oversight on the part of airport management; however, the centralized system is advantageous in that it has fewer working components involved in the overall management of the solid waste and recycling efforts. It also allows greater control by the airport sponsor over the type, placement, and maintenance of dumpsters, thereby saving space and eliminating the need for tenants to have individual containers.

- **Decentralized Waste Management System |** Under a decentralized waste management system, the airport provides waste containers and contracts for the hauling of waste materials in the airport-operated spaces only; however, airport tenants (such as FBOs, retail shops, and others) manage the waste from their leased spaces with separate contracts, billing, and hauling schedules. A decentralized waste management system can increase the number of receptacles on airport property and the number of trips by a waste collection service provider, should tenants' and the airport's collection schedules differ.

Solid Waste and Recycling Goals

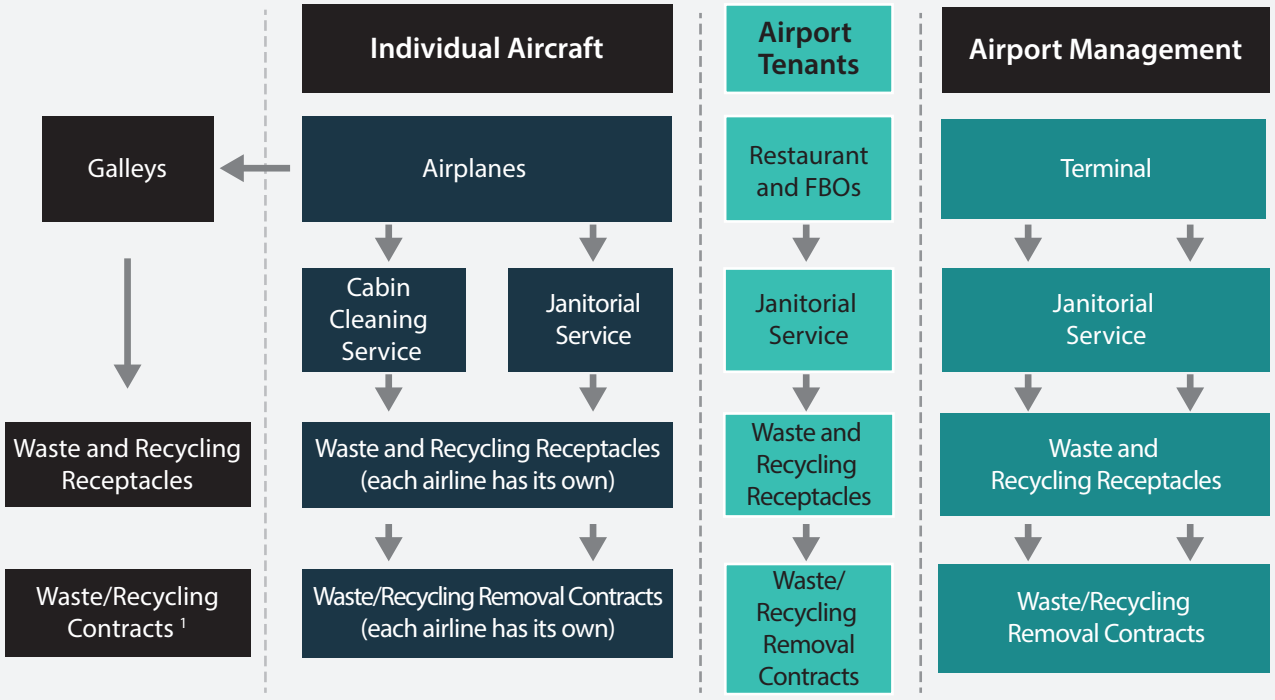
The following recommendations are made to maximize waste reduction and introduce recycling efforts at the airport.

Goal 1: Reduce the Amount of Solid Waste Generated

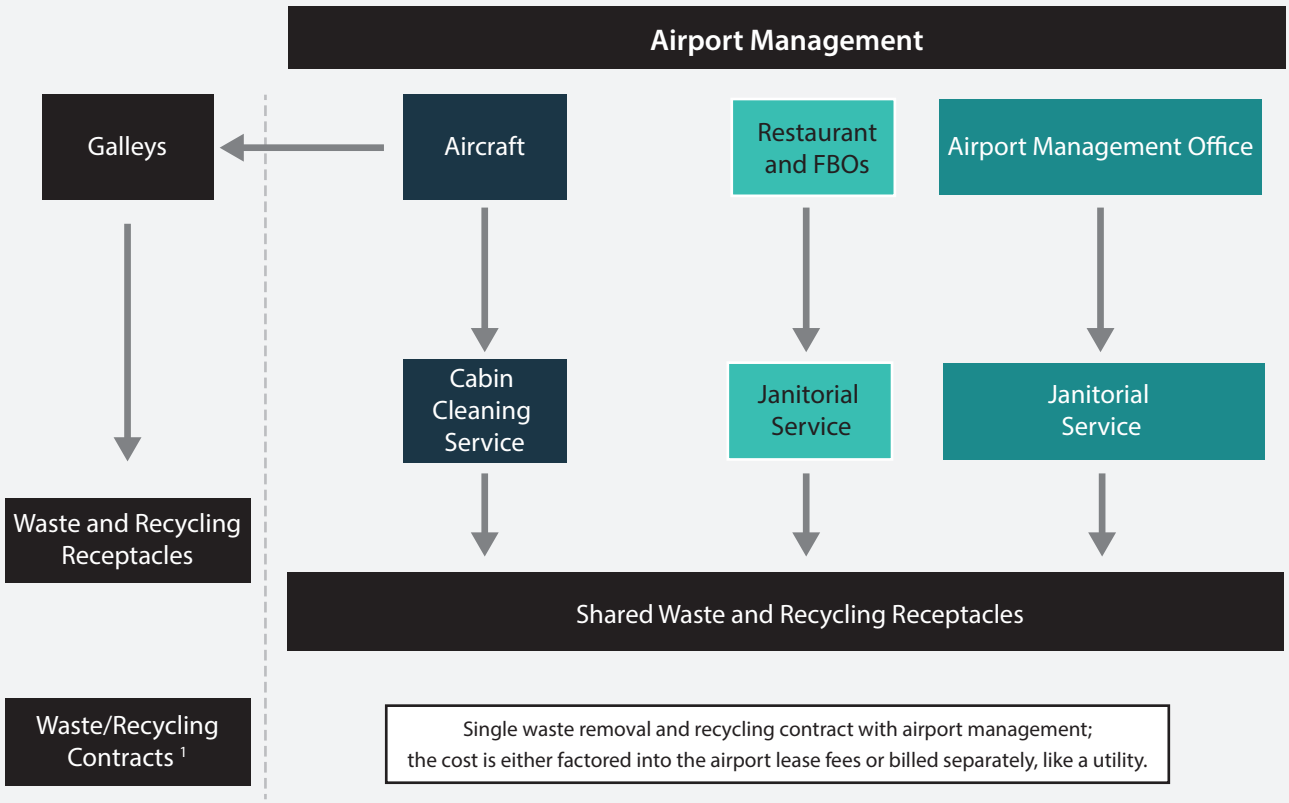
- Create a centralized waste management system at the airport. Currently, PCZ participates in a decentralized waste management system. Airport tenants are responsible for overseeing their own waste management. Airport staff could consider engaging tenants to create a centralized waste management system at PCZ to streamline waste management efforts at the airport.
    - Considerations:
        - Any lease agreements that are up for renewal should be reviewed/revised to include language that would require tenants to enact recycling practices.
        - Implementation of incentives for tenants to either enhance existing recycling practices or join the airport's recycling program should be considered.

[13] National Academies of Sciences, Engineering, and Medicine, Airport Cooperative Research Program, Synthesis 92, Airport Waste Management and Recycling Practices, 2018

Components of a Decentralized Airport Waste Management System



Components of a Centralized Airport Waste Management System



[1] Galleys usually manage their own waste even if an airport relies on a centralized system.

Source: Natural Resources Defense Council, Trash Landings: How Airlines and Airports Can Clean Up Their Recycling Programs, December 2006

- Assign the responsibility of waste management to a dedicated individual or group. Having one person or a group of people oversee and manage solid waste at the airport would create efficient and cost-saving solid waste management solutions. People dedicated to this operational aspect of the airport would gain familiarity with waste processes and could help identify areas of improvement and cost-saving measures.

- Provide education for airport employees. To minimize waste within the airport, it is crucial to inform airport employees and provide them with a thorough education on waste management at both individual and group levels. As part of the onboarding process, new employees should be given the tools needed to achieve a thorough understanding of the airport's solid waste goals.

- Audit the current waste management system. The continuation of an effective program requires accurate data on current waste rates. An airport can gain insight into its waste stream in several ways, such as requesting weights from the hauler, tracking the volume, or reviewing the bills; however, managing the waste system starts with a waste audit, which is an analysis of the types of waste produced. A waste audit is the most comprehensive and intensive way to assess waste stream composition, opportunities for waste reduction, and capture of recyclables and should include the following actions:

    - Examination of records

        - Evaluate waste hauling and disposal records and contracts
        - Examine supply and equipment invoices
        - Identify other waste management costs (commodity rebates, container costs, etc.)
        - Track waste from the point of origin
        - Establish a baseline for metrics

    - Facility walk-through conducted by the airport

    - Gather qualitative waste information to determine major waste components and waste-gathering practices

- Create a tracking and reporting system. Tracking solid waste generated will allow the airport to identify areas where a significant amount of waste is generated, which will help the airport estimate annual waste volumes. Understanding the cyclical nature of waste generation will allow the airport to estimate costs and identify areas of improvement.

Goal 2: Create a Recycling Management Plan at PCZ

- Introduce a recycling program at the airport. To guarantee the airport reduces the amount of waste hauled to the landfill, materials that cannot be reused or avoided should be recycled, if possible. The city should review internal procedures to ensure there are no unacceptable items contaminating recycling containers or recyclables thrown in the trash.

- Reduce waste through controlled purchasing practices and the consumption of nonessential products. The airport can control the amount of waste generated by prioritizing the purchase of items or supplies that are reusable, recyclable, compostable, or made from recycled materials.

- Provide tenant education. It is crucial to encourage participation to ensure buy-in of any future recycling efforts that may be undertaken at PCZ. To ensure recycling is part of the airport's everyday business, airport administration should provide training and education to support personnel, tenants, and others that conduct business at the airport. In-person meetings with airport tenants could be held to create mutual understanding of the airport's solid waste and recycling goals and how tenants play a vital role in the airport's overall success.

Goal 3: Establish Construction and Demolition Goals

- Implement construction waste requirements in contracts for construction projects. Construction contracts should highlight ways to repurpose and reuse materials/salvage and explain how recyclable materials are defined in the construction process. Additionally, these contracts should establish standards and specifications in the procurement process and contracting when starting a new construction project at PCZ. Other action items to consider when drafting a contract for a construction project include preparing a construction waste management (CWM) plan, assigning a waste management coordinator, and tracking and reporting requirements under the CWM plan.

- Create a CWM plan. The airport and its contractors should adopt a CWM plan when applicable. A typical CWM plan should encompass goals and strategies to manage a project's C&D waste. A CWM plan should also identify the types and quantities by weight for any proposed demolition, site-clearing, and/or construction waste that may be generated by the project. Other items to include in a CWM plan include the following:

    - Complete a materials handling estimate worksheet for all applicable project waste streams.
    - Identify where recyclable materials storage and collection points will be situated.
    - Create a plan to communicate recycling goals with employees and subcontractors.
    - Create a waste reduction work plan to identify what materials can be salvaged or recycled, how waste is disposed of, and the method for collecting and transporting waste streams.

  At the end of each project, as part of the CWM plan, documentation that includes tracking, reporting, and invoicing should also be submitted to demonstrate which CWM plan goals were met.

The construction waste management plan should consider the following construction and demolition debris for recycling or reuse:	
Earth, soil, dirt	Sand
Concrete reclaimed asphalt pavement	Wood
Bricks/masonry (cinder blocks, mortar, etc.)	Gypsum drywall
Rock, stone, gravel	Plastics
Ferrous metal (iron, steel, etc.)	Plaster
Nonferrous metal (aluminum, copper, etc.)	Paint
Roofing shingles and other roof materials	Plumbing fixtures and piping
Cardboard, paper, packaging	Land-clearing debris
Non-asbestos insulation	

SUMMARY

This chapter was prepared to help the airport sponsor make decisions on the future growth and development of PCZ by narratively and graphically describing the development concept. The plan represents an airfield facility that fulfills aviation needs for the airport while conforming to safety and design standards, to the extent practicable. It also provides a guide for a landside complex that can be developed as demand dictates.

Flexibility will be crucial to future development at the airport, as activity may not occur as predicted. The development concept provides airport stakeholders with a general guide that, if followed, can maintain the airport's long-term viability and allow the airport to continue to provide general aviation services for the region. The next chapter of this master plan will consider strategies for funding the recommended improvements and will provide a reasonable schedule for undertaking the projects over the next 20 years and beyond, based on safety and demand.

Chapter 6

Capital Financial Plan

Chapter 6
Capital Financial Plan

The master plan concept presented in Chapter Five outlined airside and landside improvements for Waupaca Municipal Airport (PCZ) that provide the City of Waupaca with a plan to preserve and develop the airport to meet future aviation demands. Using the recommended master plan concept as a guide, this chapter provides descriptions and overall cost estimates for the projects identified in the capital improvement program (CIP) and development schedule. The program has been evaluated from a variety of perspectives and represents a comparative analysis of basic budget factors, demand, and priority assignments.

The presentation of the capital improvement program is organized into two sections. In the first section, the airport's CIP and associated cost estimates are presented in narrative and graphic form. The CIP has been developed following Federal Aviation Administration (FAA) guidelines for master plans and primarily identifies projects that are likely eligible for FAA and Wisconsin Department of Transportation (WisDOT) Bureau of Aeronautics (BOA) grant funding. The second section identifies and discusses capital improvement funding sources at the federal, state, and local levels. Because Wisconsin is a block grant state, the BOA is responsible for distributing FAA state apportionment and discretionary grant funds to general aviation (GA) airports, as well as its own state funding program. As such, the BOA serves as both the state and federal agency for grants at PCZ.

The recommended concept and specific needs and improvements for the airport have been established; therefore, the next step is to determine a realistic schedule for project implementation and the associated costs for the plan.

The capital improvement program considers the interrelationships among the projects to determine an appropriate sequence of development while remaining within reasonable fiscal constraints.

The CIP is programmed by planning horizons and has been developed to cover the short-term (1–5 years), intermediate-term (6–10 years), and long-term (11–20 years) planning horizons. By using planning horizons instead of specific years, the City of Waupaca will have greater flexibility to adjust capital needs as demand dictates. **Table 6A** summarizes the key aviation demand milestones projected at PCZ for each planning horizon.

TABLE 6A | Planning Horizon Activity Levels

	Base Year (2024)	Short Term (1-5 Years)	Intermediate Term (6-10 Years)	Long Term (11-20 Years)
BASED AIRCRAFT				
Single-Engine	43	46	48	54
Multi-Engine	4	4	3	3
Turboprop	0	1	2	3
Jet	2	2	3	4
Helicopter	0	0	1	2
TOTAL BASED AIRCRAFT:	**49**	**53**	**57**	**66**
ANNUAL OPERATIONS				
Itinerant				
Air Carrier	0	0	0	0
Air Taxi	18	25	35	70
General Aviation	9,007	9,780	10,210	11,100
Total Itinerant:	**9,025**	**9,805**	**10,245**	**11,170**
Local				
General Aviation	9,007	9,820	10,390	11,600
Local Military	10	10	10	10
Total Local:	**9,017**	**9,830**	**10,400**	**11,610**
TOTAL ANNUAL OPERATIONS:	**18,042**	**19,635**	**20,645**	**22,780**

Source: Coffman Associates analysis

A key aspect of this planning document is the use of demand-based planning milestones. The short-term planning horizon contains the items of highest need and/or priority, some of which have been previously defined by airport management and existing CIP schedules. As short-term horizon activity levels are reached, the intermediate term can be planned for based on the next activity milestones. Likewise, the long-term activity milestones can be planned for when the intermediate milestones are reached.

Many development items included in the recommended concept will need to follow these demand indicators. For example, the plan includes utility infrastructure expansion and site preparation for the construction of new landside facilities to support aircraft activity. Demand for new based aircraft will be a primary indicator for these projects. If based aircraft growth occurs as projected, additional hangars should be constructed to meet the demand. If growth slows or does not occur as forecasted, some projects may be delayed. As a result, capital expenditures are planned to be made on an as-needed basis, which will lead to more responsible use of capital assets. Some development items do not depend on demand, such as airfield improvements to meet FAA design standards. These projects need to be programmed in a timely manner, regardless of changes in demand indicators, and should be monitored regularly by airport management.

At PCZ, some hangars are owned and managed by the airport sponsor and leased to individual tenants, while others are privately owned and managed on land leased from the airport sponsor. Because of economic realities, many airports rely on private developers to construct new hangars. In some cases, private developers can keep construction costs lower, which lowers the monthly lease rates necessary to amortize a loan. **The CIP for PCZ assumes development for many landside facilities will primarily be constructed privately through ground lease agreements with the sponsor**. This assumption does not preclude the possibility of the airport sponsor constructing new hangars. Furthermore, the airport sponsor may decide to provide the site preparation projects necessary to facilitate hangar construction,

such as grading and utility installation. Ultimately, the City of Waupaca will determine whether to self-fund landside facility development or rely on private developers based on demand and the specific needs of potential developers.

Because a master plan is a conceptual document, implementation of the capital projects should only be undertaken after further refinement of their design and costs through architectural and/or engineering analysis. Moreover, some projects may require additional infrastructure improvements (e.g., drainage, extension of utilities, etc.) that may increase the estimated project cost or timeline for completion.

Once a list of necessary projects was identified and refined, project-specific cost estimates were prepared. These estimates include design, construction, administration, and contingency costs that may arise for each project. **Capital costs presented here should be viewed only as order-of-magnitude estimates that are subject to further refinement during any engineering and/or architectural design**; nevertheless, they are considered sufficient for planning purposes. Cost estimates for each development project in the CIP are based on present-day construction, design, and administration costs. Adjustments will need to be applied over time to account for inflation and changes in construction and capital equipment costs. Cost estimates for all projects are in current (2025) dollars.

Exhibit 6A presents the proposed 20-year CIP for PCZ with a beginning year of 2026, as projects from that year are not yet complete. Most of the projects identified are eligible for federal and/or state grant funding but may not meet the eligibility funding threshold due to low priority rating. Projects that may not fully meet funding eligibility requirements are otherwise noted on **Exhibit 6A**. The point of the analysis is to identify possible funding opportunities, which should be decided on a project-by-project basis.

BOA-funded projects utilize FAA block grant funds and are eligible for up to 90 percent of the total project cost. The remaining share (10 percent) must be funded locally by the airport sponsor; however, it should be noted that the State of Wisconsin maintains its own aviation funding program, which will match up to 50 percent of the airport or local share of all eligible items contained in BOA-funded projects.

The FAA Reauthorization Act of 2024 (enacted May 16, 2024) authorized the FAA's Airport Improvement Program (AIP) at $4.0 billion for fiscal years (FY) 2025 through 2028. Section 708 of this act increases the federal share of allowable AIP-funded project costs at nonhub and nonprimary airports to 95 percent for FY 2025 and FY 2026. After FY 2026, the federal share will revert to 90 percent for AIP-funded projects; as such, state and local funding responsibility will be 2.5 percent for AIP projects during FY 2025 and FY 2026.

The BOA uses the FAA priority ranking system to help objectively evaluate potential airport projects. Projects are weighted toward safety, infrastructure preservation, standards, and capacity enhancement.

The BOA will participate in the highest-priority projects before considering lower-priority projects, even if a lower-priority project is considered a more urgent need by the local sponsor; nevertheless, such projects should remain a priority for the airport and funding support should continue to be requested in subsequent years.

The most important feature of the CIP is that future projects for which the airport may request BOA funding are included on the list. On a biennial basis, the CIP is updated and reviewed with the BOA. Projects on the CIP will be moved up and down depending on priority and funding availability. Periodically, new projects will arise that can be added to the CIP and presented to the BOA.

Some projects identified in the CIP will require environmental documentation. The level of required documentation for each project must be determined in consultation with the FAA and BOA. There are three major levels of environmental review to be considered under the National Environmental Policy Act (NEPA): categorical exclusion (CatEx), environmental assessment (EA), and environmental impact statement (EIS). Each level requires more time to complete and more detailed information. Guidance on what level of documentation is required for a specific project is outlined in FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*. The environmental overview presented in Chapter Five addresses NEPA and provides an evaluation of various environmental categories for PCZ.

The following sections describe the projects identified for the airport over the next 20 years in greater detail. The projects are grouped based on a detailed evaluation of existing and projected demand, safety, rehabilitation needs, and local priority. While the CIP identifies the priority ranking of the projects, the list should be evaluated and revised on a regular basis. It is also important to note that projects are listed separately for purposes of evaluation in this study, but certain projects could be combined with other projects during the time of construction/implementation.

SHORT-TERM PROGRAM (1–5 YEARS)

The short-term projects are anticipated to be needed during the first five years of the 20-year CIP. The projects listed are subject to change based on federal and state funding priorities. Projects relating to safety and maintenance generally have the highest priority. The short-term program presents 16 projects for the planning period between 2026 and 2030, as presented on **Exhibits 6A** and **6B**.

FY 2026 PROJECTS

Project #1: Construct Taxilane D – Phase 2 (Construction)

Description: This project is the construction of Taxilane D to provide airside access to the planned T-hangar development.

Cost Estimate: $300,000.00

Funding Eligibility: FAA/BOA – 95 percent[1] / State Match – 2.5 percent / Airport/Local – 2.5 percent

Project #2: Construct Service Road – Phase 2 (Construction)

Description: This project is the construction of an additional airport access road to provide automobile access to the planned T-hangar development via Runway Drive.

Cost Estimate: $100,000.00

Funding Eligibility: FAA/BOA – 95 percent[1] / State Match – 2.5 percent / Airport/Local – 2.5 percent

[1] The FAA Reauthorization Act of 2024 sets AIP funding at general aviation airports to 95 percent for FY 2025 and FY 2026.

Project #	Project	Estimated Cost	Federal Share	State / BOA Share	Airport Sponsor/ Local Share
	SHORT TERM (1-5 Years)				
	FY2026				
1	Construct Taxilane D - Phase 2 (Construction)	$300,000	$285,000	$7,500	$7,500
2	Construct Service Road - Phase 2 (Construction)	$100,000	$95,000	$2,500	$2,500
3	Install Perimeter Fencing not Required by CFR Part 1542 (Power Gate for Southwest Hangar Service Road) - Phase 2 (Construction)	$130,000	$123,500	$3,250	$3,250
4	Construct Aircraft Hangar (T-Hangar) - Phase 2 (Construction)	$1,300,000	$550,000		$750,000
5	Conduct Airport Master Plan - Phase 2 (Exhibit A and ALP Update)	$99,000	$89,100	$4,950	$4,950
6	Design and Construct Pump Station, Water and Sanitary Sewer Extension	$250,000	$-	$-	$250,000
	FY2027				
7	Convert Runway 13-31 to Turf and Shorten to 2,125' x 75' - Phase 1 (Design)	$75,000	$67,500	$3,750	$3,750
	FY2028				
8	Convert Runway 13-31 to Turf and Shorten to 2,125' x 75' - Phase 2 (Construction)	$685,000	$616,500	$34,250	$34,250
	FY2029				
9	Reconstruct Runway 10-28 Lighting (Including Connectors A2 and A3) - Phase 1 (Design)	$80,000	$72,000	$4,000	$4,000
10	Install Runway Vertical/Visual Guidance System (Runway 10-28 PAPIs & REILs) - Phase 1 (Design)	$20,000	$18,000	$1,000	$1,000
11	Reconstruct Airfield Guidance Signs (Runway 10-28) - Phase 1 (Design)	$8,000	$7,200	$400	$400
12	Replace Airport Lighting Vault (Equipment for Runway 10-28) - Phase 1 (Design)	$8,000	$7,200	$400	$400
	FY2030				
13	Reconstruct Runway 10-28 Lighting (Including Connectors A2 and A3) - Phase 2 (Construction)	$800,000	$720,000	$40,000	$40,000
14	Install Runway Vertical/Visual Guidance System (Runway 10-28 PAPIs & REILs) - Phase 2 (Construction	$100,000	$90,000	$5,000	$5,000
15	Reconstruct Airfield Guidance Signs (Runway 10-28) - Phase 2 (Construction)	$75,000	$67,500	$3,750	$3,750
16	Replace Airport Lighting Vault (Equipment for Runway 10-28) - Phase 2 (Construction)	$75,000	$67,500	$3,750	$3,750
	Short-Term CIP Subtotal	**$4,105,000**	**$2,876,000**	**$114,500**	**$1,114,500**
	INTERMEDIATE TERM (6-10 Years)				
17	Reconstruct Taxiway A (Including Connectors A1 and A4), Reconstruct Lighting and Guidance Signs, and Replace Airport Lighting Vault (Equipment for Taxiway A - Phase 1 (Design)	$250,000	$225,000	$12,500	$12,500
18	Reconstruct Taxiway A (Including Connectors A1 and A4), Reconstruct Lighting and Guidance Signs, and Replace Airport Lighting Vault (Equipment for Taxiway A - Phase 2 (Construct)	$3,350,000	$3,015,000	$167,500	$167,500
19	Remove and Relocate Northern Taxiway A3 Connector and Southern A4 Connector to Eliminate Direct Access to Runway 10-28 (Design and Construct)	$440,000	$396,000	$22,000	$22,000
20	Construct Terminal Area Overflow Parking (Design and Construct)	$370,000	$333,000	$18,500	$18,500
21	Construct Ultimate Taxiway A2 and Airport Maintenance / SRE Access Road (Design and Construct)	$600,000	$540,000	$30,000	$30,000
22	Construct Ultimate Partial Parallel Taxiway B, Lighting, and Signage - Phase 1 (Design)	$400,000	$360,000	$20,000	$20,000
23	Construct Ultimate Partial Parallel Taxiway B, Lighting, and Signage - Phase 2 (Construction)	$3,200,000	$2,880,000	$160,000	$160,000
24	Routine Airport Pavement Maintenance	$500,000	$450,000	$25,000	$25,000
25	Construct Taxilane Access to the Proposed Box Hangars and T-Hangar North of Runway 10-28 (Design and Construct)	$860,000	$774,000	$43,000	$43,000
	Intermediate -Term CIP Subtotal	**$9,970,000**	**$8,973,000**	**$498,500**	**$498,500**
	LONG TERM (11-20 Years and Beyond)				
26	Environmental Assessment (Land Acquisition and Runway 10-28 Extension)	$250,000	$225,000	$12,500	$12,500
27	Acquire Approximately 13.7 Acres within the Ultimate RPZ Serving Runway 28 and Relocate Private Residence	$700,000	$630,000	$35,000	$35,000
28	Construct 1,000-Foot Runway 10-28 and Taxiway A Extension, Increase Pavement Strength to 30.0 S / 60.0 D - Phase 1 (Design)	$320,000	$288,000	$16,000	$16,000
29	Construct 1,000-Foot Runway 10-28 and Taxiway A Extension, Increase Pavement Strength to 30.0 S / 60.0 D - Phase 2 (Construction)	$3,500,000	$3,150,000	$175,000	$175,000
30	Upgrade PAPI-2s to PAPI-4s Serving Runway 10-28 and Install Distance Remaining Signage	$120,000	$108,000	$6,000	$6,000
31	Routine Airport Pavement Maintenance	$500,000	$450,000	$25,000	$25,000
32	Construct Taxiway Access and Apron Area (Southeast Development Area - Including Lighting) - Phase 1 (Design)	$150,000	$135,000	$7,500	$7,500
33	Construct Taxiway Access and Apron Area (Southeast Development Area - Including Lighting) - Phase 2 (Construction)	$1,500,000	$1,350,000	$75,000	$75,000
34	Construct Taxiway C, Taxilane Access, and Apron Area (North of Runway 10-28 Including Lighting) - Phase 1 (Design)	$300,000	$270,000	$15,000	$15,000
35	Construct Taxiway C, Taxilane Access, and Apron Area (North of Runway 10-28 Including Lighting) - Phase 2 (Construction)	$2,900,000	$2,610,000	$145,000	$145,000
36	Construct Secondary Northern Airport Entrance Road Extending from Heather Lane (Design and Construct)	$1,100,000	$990,000	$55,000	$55,000
37	Construct 12,000-Gallon 100LL and Jet A Fuel Storage Tanks (Design and Construct)	$1,100,000	$990,000	$55,000	$55,000
	Long-Term CIP Subtotal	**$12,440,000**	**$11,196,000**	**$622,000**	**$622,000**
	CAPITAL IMPROVEMENT PROGRAM TOTAL	**$26,515,000**	**$23,045,000**	**$1,235,000**	**$2,235,000**

Short-Term Projects (1-5 Years)		
2026	1	Construct Taxilane D - Phase 2 (Construction)
2026	2	Construct Service Road - Phase 2 (Construction)
2026	3	Install Perimeter Fencing not Required by CFR part 1542 (Power Gate for Southwest Hangar Service Road) - Phase 2 (Construction) NP
2026	4	Construct Aircraft Hangar (T-Hangar) - Phase 2 (Construction)
2026	5	Conduct Airport Master Plan - Phase 2 (Exhibit A and ALP Update) NP
2026	6	Design and Construct Pump Station, Water and Sanitary Sewer Extension NP
2027	7	Convert Runway 13-31 to Turf and Shorten to 2,125' x 75' - Phase 1 (Design) NP
2028	8	Convert Runway 13-31 to Turf and Shorten to 2,125' x 75' - Phase 2 (Construction)
2029	9	Reconstruct Runway 10-28 Lighting (Including Connectors A2 and A3) - Phase 1 (Design) NP
2029	10	Install Runway Vertical/Visual Guidance System (Runway 10-28 PAPIs & REILs) - Phase 1 (Design) NP
2029	11	Reconstruct Airfield Guidance Signs (Runway 10-28) - Phase 1 (Design) NP
2029	12	Replace Airport Lighting Vault (Equipment for Runway 10-28) - Phase 1 (Design) NP
2030	13	Reconstruct Runway 10-28 Lighting (Including Connectors A2 and A3) - Phase 2 (Construction) NP
2030	14	Install Runway Vertical/Visual Guidance System (Runway 10-28 PAPIs & REILs) - Phase 2 (Construction) NP
2030	15	Reconstruct Airfield Guidance Signs (Runway 10-28) - Phase 2 (Construction) NP
2030	16	Replace Airport Lighting Vault (Equipment for Runway 10-28) - Phase 2 (Construction) NP

Intermediate-Term Projects (6-10 Years)	
17	Reconstruct Taxiway A (Including Connectors A1 and A4), Reconstruct Lighting and Guidance Signs, and Replace Airport Lighting Vault (Equipment for Taxiway A - Phase 1 (Design) NP
18	Reconstruct Taxiway A (Including Connectors A1 and A4), Reconstruct Lighting and Guidance Signs, and Replace Airport Lighting Vault (Equipment for Taxiway A - Phase 2 (Construct)
19	Remove and Relocate Northern Taxiway A3 Connector and Southern A4 Connector to Eliminate Direct Access to Runway 10-28 (Design and Construct)
20	Construct Terminal Area Overflow Parking (Design and Construct)
21	Construct Ultimate Taxiway A2 and Airport Maintenance / SRE Access Road (Design and Construct)
22	Construct Ultimate Partial Parallel Taxiway B, Lighting, and Signage - Phase 1 (Design) NP
23	Construct Ultimate Partial Parallel Taxiway B, Lighting, and Signage - Phase 2 (Construction)
24	Routine Airport Pavement Maintenance NP
25	Construct Taxilane Access to the Proposed Box Hangars and T-Hangar North of Runway 10-28 (Design and Construct)

Long-Term Projects(11-20 Years and Beyond)	
26	Environmental Assessment (Land Acquisition and Runway 10-28 Extension) NP
27	Acquire Approximately 13.7 Acres within the Ultimate RPZ Serving Runway 28 and Relocate Private Residence
28	Construct 1,000-Foot Runway 10-28 and Taxiway A Extension, Increase Pavement Strength to 30.0 S / 60.0 D - Phase 1 (Design) NP
29	Construct 1,000-Foot Runway 10-28 and Taxiway A Extension, Increase Pavement Strength to 30.0 S / 60.0 D - Phase 2 (Construction)
30	Upgrade PAPI-2s to PAPI-4s Serving Runway 10-28 and Install Distance Remaining Signage
31	Routine Airport Pavement Maintenance NP
32	Construct Taxiway Access and Apron Area (Southeast Development Area - Including Lighting) - Phase 1 (Design) NP
33	Construct Taxiway Access and Apron Area (Southeast Development Area - Including Lighting) - Phase 2 (Construction)
34	Construct Taxiway C, Taxilane Access, and Apron Area (North of Runway 10-28 Including Lighting) - Phase 1 (Design) NP
35	Construct Taxiway C, Taxilane Access, and Apron Area (North of Runway 10-28 Including Lighting) - Phase 2 (Construction)
36	Construct Secondary Northern Airport Entrance Road Extending from Heather Lane (Design and Construct)
37	Construct 12,000-Gallon 100LL and Jet A Fuel Storage Tanks (Design and Construct)

LEGEND

- Airport Property Line
- Avigation Easement
- Clear Zone Easement
- Runway Protection Zone
- Pavement to be Removed
- Short- Term Projects
- Intermediate-Term Projects
- Long-Term Projects
- NP — Not Pictured

*Acreage is approximate and intended for planning uses only.

N

0 800

SCALE IN FEET

Aerial Photo: MTZ 8/2024

Heather Ln

Commercial Drive

Runway 13-31 (Turf) 2,125' x 75'

Runway 10-28 (6,200' x 100')

0.1 Acres*

INSET 1 1" = 300'

INSET 2 1" = 300'

INSET 3 1" = 300'

INSET 4

Project #3: Install Perimeter Fencing not Required by CFR Part 1542 (Power Gate for Southwest Hangar Service Road) – Phase 2 (Construction)

Description: This project is the construction of perimeter fencing and an access gate serving the airport access road constructed as part of Project #2.

Cost Estimate: $130,000.00

Funding Eligibility: FAA/BOA – 95 percent[1] / State Match – 2.5 percent / Airport/Local – 2.5 percent

Project #4: Construct Aircraft Hangar (T-Hangar) – Phase 2 (Construction)

Description: This project is for the construction of a nine-unit T-hangar located west of the main aircraft apron area. It should be noted that non-primary entitlement funding could be banked and utilized for this project in an effort to ease the local funding burden. The remaining balance is slated to be funded through the *Bipartisan Infrastructure Law* (to be discussed).

Cost Estimate: $1,300,000.00

Funding Eligibility: FAA/BOA – 42 percent / State Match – 0 percent / Airport/Local – 58 percent

Project #5: Conduct Airport Master Plan – Phase 2 (Exhibit A and ALP Update)

Description: This project is for the completion of an updated Exhibit A property map and airport layout plan (ALP) drawing set as part of ongoing airport planning.

Cost Estimate: $99,000.00

Funding Eligibility: FAA/BOA – 95 percent[1] / State Match – 2.5 percent / Airport/Local – 2.5 percent

Project #6: Design and Construct Pump Station, Water and Sanitary Sewer Extension

Description: Should the airport experience continued demand for additional amenities in hangar development areas, this project is for the construction of a pump station, water, and sanitary sewer mains on the west side of the main aircraft apron area.

Cost Estimate: $250,000.00

Funding Eligibility: FAA/BOA – 0 percent / State Match – 0 percent / Airport/Local – 100 percent

FY 2027 PROJECTS

Project #7: Convert Runway 13-31 to Turf and Shorten to 2,125' x 75' – Phase 1 (Design)

Description: Given that the current configuration of Runways 10-28 and 13-31 is subject to elevated risk, Runway 10-28 meets the 95 percent wind coverage requirements, and the Runway 13-31 pavement is currently in poor condition, the development concept considers shortening Runway 13-31 to 2,125 feet and converting the runway to a turf surface. As such, this project is the design phase for shortening and converting Runway 13-31 to turf.

Cost Estimate: $75,000.00

Funding Eligibility: FAA/BOA – 90 percent / State Match – 5 percent / Airport/Local – 5 percent

FY 2028 PROJECTS

Project #8: Convert Runway 13-31 to Turf and Shorten to 2,125' x 75' – Phase 2 (Construction)

Description: This project is the construction phase for shortening and converting Runway 13-31 to turf.

Cost Estimate: $685,000.00

Funding Eligibility: FAA/BOA – 90 percent / State Match – 5 percent / Airport/Local – 5 percent

FY 2029 PROJECTS

Project #9: Reconstruct Runway 10-28 Lighting (Including Connectors A2 and A3) – Phase 1 (Design)

Description: This project is the design phase for the reconstruction of lighting systems serving Runway 10-28 as well as Taxiway Connectors A2 and A3, as part of routine maintenance.

Cost Estimate: $80,000.00

Funding Eligibility: FAA/BOA – 90 percent / State Match – 5 percent / Airport/Local – 5 percent

Project #10: Install Runway Vertical/Visual Guidance System (Runway 10-28 PAPIs and REILs) – Phase 1 (Design)

Description: This project is the design phase for reconstruction of the two-box precision approach path indicators (PAPI-2s) and runway end identifier lights (REILs) serving Runway 10-28, as part of routine maintenance.

Cost Estimate: $20,000.00

Funding Eligibility: FAA/BOA – 90 percent / State Match – 5 percent / Airport/Local – 5 percent

Project #11: Reconstruct Airfield Guidance Signs (Runway 10-28) – Phase 1 (Design)

Description: This project is the design phase for reconstruction of the airfield guidance signage system serving Runway 10-28, as part of routine maintenance.

Cost Estimate: $8,000.00

Funding Eligibility: FAA/BOA – 90 percent / State Match – 5 percent / Airport/Local – 5 percent

Project #12: Reconstruct Airport Lighting Vault (Equipment Vault for Runway 10-28) – Phase 1 (Design)

Description: This project is the design phase for reconstruction of the airport lighting equipment vault serving Runway 10-28, as part of routine maintenance.

Cost Estimate: $8,000.00

Funding Eligibility: FAA/BOA – 90 percent / State Match – 5 percent / Airport/Local – 5 percent

FY 2030 PROJECTS

Project #13: Reconstruct Runway 10-28 Lighting (Including Connectors A2 and A3) – Phase 2 (Construction)

Description: This project is the construction phase for the reconstruction of lighting systems serving Runway 10-28 as well as Taxiway Connectors A2 and A3, as part of routine maintenance.

Cost Estimate: $800,000.00

Funding Eligibility: FAA/BOA – 90 percent / State Match – 5 percent / Airport/Local – 5 percent

Project #14: Install Runway Vertical/Visual Guidance System (Runway 10-28 PAPIs and REILs) – Phase 2 (Construction)

Description: This project is the construction phase for reconstruction of the two-box precision approach path indicators (PAPI-2s) and runway end identifier lights (REILs) serving Runway 10-28, as part of routine maintenance.

Cost Estimate: $100,000.00

Funding Eligibility: FAA/BOA – 90 percent / State Match – 5 percent / Airport/Local – 5 percent

Project #15: Reconstruct Airfield Guidance Signs (Runway 10-28) – Phase 2 (Construction)

Description: This project is the construction phase for reconstruction of the airfield guidance signage system serving Runway 10-28, as part of routine maintenance.

Cost Estimate: $75,000.00

Funding Eligibility: FAA/BOA – 90 percent / State Match – 5 percent / Airport/Local – 5 percent

Project #16: Reconstruct Airport Lighting Vault (Equipment Vault for Runway 10-28) – Phase 2 (Construction)

Description: This project is the construction phase for reconstruction of the airport lighting equipment vault serving Runway 10-28, as part of routine maintenance.

Cost Estimate: $75,000.00

Funding Eligibility: FAA/BOA – 90 percent / State Match – 5 percent / Airport/Local – 5 percent

SHORT-TERM PROGRAM SUMMARY

The short-term CIP is detailed on **Exhibit 6A** and includes projects that enhance the overall safety, efficiency, and maintenance of the airfield while implementing landside improvements. The total investment necessary for the short-term CIP is approximately $4.1 million. Of the total short-term program, approximately $2.9 million is eligible for federal or BOA funding assistance, while the state match program is eligible for approximately $114,500, and the airport (or local) share is approximately $1.1 million.

INTERMEDIATE-TERM PROGRAM (6–10 YEARS)

The intermediate-term projects are generally anticipated to be necessary between 2031 and 2035. These projects are not tied to specific years of implementation; instead, they have been prioritized so airport management has the flexibility to determine when they need to be pursued based on current conditions.

It is not unusual for certain projects to be delayed or advanced based on changing conditions, such as funding availability or changes in the aviation industry. The intermediate-term planning horizon includes nine projects, as listed on **Exhibit 6A** and depicted on **Exhibit 6B**. This section includes a description of each project.

Project #17: Reconstruct Taxiway A (Including Connectors A1 and A4), Lighting and Guidance Signs, and Replace Airport Lighting Vault (Equipment for Taxiway A) – Phase 1 (Design)

Description: As part of routine maintenance, this project is to design the reconstruction of Taxiway A as well as Connectors A1 and A4. This project also includes design efforts to reconstruct the lighting, guidance signs, and lighting equipment vault serving Taxiway A.

Cost Estimate: $250,000.00

Funding Eligibility: FAA/BOA – 90 percent / State Match – 5 percent / Airport/Local – 5 percent

Project #18: Reconstruct Taxiway A (Including Connectors A1 and A4), Lighting and Guidance Signs, and Replace Airport Lighting Vault (Equipment for Taxiway A) – Phase 2 (Construction)

Description: As part of routine maintenance, this project is reconstruction of Taxiway A as well as Connectors A1 and A4. This project also includes efforts to reconstruct the lighting, guidance signs, and lighting equipment vault serving Taxiway A.

Cost Estimate: $3,350,000.00

Funding Eligibility: FAA/BOA – 90 percent / State Match – 5 percent / Airport/Local – 5 percent

Project #19: Remove and Relocate Northern Taxiway A3 Connector and Southern A4 Connector to Eliminate Direct Access to Runway 10-28 (Design and Construct)

Description: This project is for the elimination of existing direct access through removal and relocation of the northern Taxiway A3 and southern Taxiway A4 connectors.

Cost Estimate: $440,000.00

Funding Eligibility: FAA/BOA – 90 percent / State Match – 5 percent / Airport/Local – 5 percent

Project #20: Construct Terminal Area Overflow Parking (Design and Construct)

Description: This project is for the construction of approximately 26,500 sf of public automobile parking to better serve automobile parking needs surrounding the terminal area.

Cost Estimate: $370,000.00

Funding Eligibility: FAA/BOA – 90 percent / State Match – 5 percent / Airport/Local – 5 percent

Project #21: Construct Ultimate Taxiway A2 and Airport Maintenance/Snow Removal Equipment (SRE) Access Road (Design and Construct)

Description: This project is for the design and construction of an additional taxiway connector (ultimate Taxiway A2) serving Runway 10-28. Also included in this project is the extension of an airport maintenance and SRE access road from Taxilane E to provide increased access from the main aircraft apron area to the airport maintenance building, which is located on the west side of the main aircraft apron.

Cost Estimate: $600,000.00

Funding Eligibility: FAA/BOA – 90 percent / State Match – 5 percent / Airport/Local – 5 percent

Project #22: Construct Ultimate Partial Parallel Taxiway B, Lighting, and Signage – Phase 1 (Design)

Description: This project is for the design of partial parallel Taxiway B to extend west to the Runway 10 threshold to provide better airside access to planned hangar development on the north side of the airfield. Included in this project is the design for lighting and signage systems serving the ultimate Taxiway B.

Cost Estimate: $400,000.00

Funding Eligibility: FAA/BOA – 90 percent / State Match – 5 percent / Airport/Local – 5 percent

Project #23: Construct Ultimate Parallel Taxiway B, Lighting, and Signage – Phase 2 (Construction)

Description: This project is for the construction of partial parallel Taxiway B to extend west to the Runway 10 threshold to provide better airside access to planned hangar development on the north side of the airfield. Included in this project is the construction of lighting and signage systems serving the ultimate Taxiway B.

Cost Estimate: $3,200,000.00

Funding Eligibility: FAA/BOA – 90 percent / State Match – 5 percent / Airport/Local – 5 percent

Project #24: Routine Airport Pavement Maintenance

Description: As part of routine airport maintenance, this project has been included to ensure the airport maintains existing infrastructure and a safe operating environment. At this time, taxiway fillets can be upgraded to current FAA taxiway fillet geometry standards.

Cost Estimate: $500,000.00

Funding Eligibility: FAA/BOA – 90 percent / State Match – 5 percent / Airport/Local – 5 percent

Project #25: Construct Taxilane Access to the Proposed Box Hangars and T-Hangar North of Runway 10-28 (Design and Construct)

Description: This project is the design and construction of the northern taxilane near the Runway 13 threshold to provide airside access to planned hangar development. It should be noted that hangar development and vehicle access roads/parking in this area are assumed to be funded through private or local funding mechanisms and are not included in the cost estimate. Ultimate hangar layouts may vary from what is depicted on the development concept.

Cost Estimate: $860,000.00

Funding Eligibility: FAA/BOA – 90 percent / State Match – 5 percent / Airport/Local – 5 percent

INTERMEDIATE-TERM PROGRAM SUMMARY

The total costs associated with the intermediate-term program are estimated at $10.0 million. Of this total, approximately $9.0 million could be eligible for federal or BOA funding, while the state match program could be eligible for $498,500, and the airport (or local) share is projected at approximately $498,500.

LONG-TERM PROGRAM (10–20 YEARS AND BEYOND)

The long-term planning horizon considers 12 projects for the final 10-year period (and beyond) that are mainly demand-driven. These projects and their associated costs are listed on **Exhibit 6A** and presented on **Exhibit 6B**.

Project #26: Environmental Assessment (Land Acquisition and Runway 10-28 Extension)

Description: This project is for the environmental documentation required for the runway extension and associated property acquisition prior to extending Runway 10-28.

Cost Estimate: $250,000.00

Funding Eligibility: FAA/BOA – 90 percent / State Match – 5 percent / Airport/Local – 5 percent

Project #27: Acquire Approximately 13.7 Acres Within the RPZ Serving Runway 28 and Relocate Private Residence

Description: This project is for the acquisition of approximately 13.7 acres of property within the existing ultimate Runway 28 RPZ. It should be noted that the ultimate Runway 28 RPZ is partially owned in clear zone and avigation easements and the design standard shift to C-II would necessitate the relocation of the existing residence within the Runway 28 RPZ; however, these actions should not be taken unless (or until) the airport can justify an upgrade to C-II design standards and runway extension.

Cost Estimate: $700,000.00

Funding Eligibility: FAA/BOA – 90 percent / State Match – 5 percent / Airport/Local – 5 percent

Project #28: Construct 1,000-foot Runway 10-28 and Taxiway A Extension, Increase Pavement Strength to 30.0 S / 60.0 D – Phase 1 (Design)

Description: This project is for the engineering and design required before physical construction can take place prior to extending Runway 10-28 and Taxiway A. At the time of the runway extension, the pavement strength rating should also be increased to accommodate dual wheel configured aircraft with a maximum takeoff weight of 60,000 pounds.

Cost Estimate: $320,000.00

Funding Eligibility: FAA/BOA – 90 percent / State Match – 5 percent / Airport/Local – 5 percent

Project #29: Construct 1,000-foot Runway 10-28 and Taxiway A Extension, Increase Pavement Strength to 30.0 S / 60.0 D – Phase 2 (Construction)

Description: As discussed in Chapter Five, additional runway length could benefit larger and faster business jet and turboprop operators by making the airport more accessible during hot summer months, providing the opportunity for aircraft to depart with more fuel, and allowing for longer stage lengths and an increase in usable payload. As such, this project is for the extension of Taxiway A and Runway 10-28 to an ultimate length of 6,200 feet. At the time of the runway extension, the pavement strength rating should also be increased to accommodate dual wheel configured aircraft with a maximum takeoff weight of 60,000 pounds.

Cost Estimate: $3,500,000.00

Funding Eligibility: FAA/BOA – 90 percent / State Match – 5 percent / Airport/Local – 5 percent

Project #30: Upgrade Two-Light Precision Approach Path Indicators (PAPI-2s) to PAPI-4s Serving Runway 10-28 and Install Distance Remaining Signage

Description: This project is for the implementation of PAPI-4s and runway distance remaining signage to enhance the use of the runway and overall airfield safety.

Cost Estimate: $120,000.00

Funding Eligibility: FAA/BOA – 90 percent / State Match – 5 percent / Airport/Local – 5 percent

Project #31: Routine Airport Pavement Maintenance

Description: As part of routine airport maintenance, this project has been included to ensure the airport maintains existing infrastructure and a safe operating environment. At this time, taxiway fillets can be upgraded to current FAA taxiway fillet geometry standards.

Cost Estimate: $500,000.00

Funding Eligibility: FAA/BOA – 90 percent / State Match – 5 percent / Airport/Local – 5 percent

Project #32: Construct Taxiway Access and Apron Area (Southeast Development Area – Including Lighting) – Phase 1 (Design)

Description: This project is for the design of approximately 10,600 square yards (sy) of apron area and taxiway access, extending from Taxiway A located on the southeast side of the Runway 28 threshold, providing airside access to planned hangar development. It should be noted that hangar development and vehicle access roads/parking in this area are assumed to be funded through private or local funding mechanisms and are not included in the cost estimate. Ultimate hangar layouts may vary from what is depicted on the development concept.

Cost Estimate: $150,000.00

Funding Eligibility: FAA/BOA – 90 percent / State Match – 5 percent / Airport/Local – 5 percent

Project #33: Construct Taxiway Access and Apron Area (Southeast Development Area – Including Lighting) – Phase 2 (Construction)

Description: This project is for the construction of approximately 10,600 sy of apron area and taxiway access, extending from Taxiway A located on the southeast side of the Runway 28 threshold, providing airside access to planned hangar development. It should be noted that hangar development and vehicle access roads/parking in this area are assumed to be funded through private or local funding mechanisms and are not included in the cost estimate. Ultimate hangar layouts may vary from what is depicted on the development concept.

Cost Estimate: $1,500,000.00

Funding Eligibility: FAA/BOA – 90 percent / State Match – 5 percent / Airport/Local – 5 percent

Project #34: Construct Taxiway C, Taxilane Access, and Apron Area (North of Runway 10-28 – Including Lighting) – Phase 1 (Design)

Description: Should the airport experience continued demand for hangars, this project is for the design of partial parallel Taxiway C, taxilane network, and approximately 10,600 sy of apron area that would provide access to new hangar development areas on the northeast side of the airfield. It should be noted that hangar development and vehicle access roads/parking in this area are assumed to be funded through private or local funding mechanisms and are not included in the cost estimate. Ultimate hangar layouts may vary from what is depicted on the development concept.

Cost Estimate: $300,000.00

Funding Eligibility: FAA/BOA – 90 percent / State Match – 5 percent / Airport/Local – 5 percent

Project #35: Construct Taxiway C, Taxilane Access, and Apron Area (North of Runway 10-28 – Including Lighting) – Phase 2 (Construction)

Description: Should the airport experience continued demand for hangars, this project is for the construction of partial parallel Taxiway C, taxilane network, and approximately 10,600 sy of apron area that would provide access to new hangar development areas on the northeast side of the airfield. It should be noted that hangar development and vehicle access roads/parking in this area are assumed to be funded through private or local funding mechanisms and are not included in the cost estimate. Ultimate hangar layouts may vary from what is depicted on the development concept.

Cost Estimate: $2,900,000.00

Funding Eligibility: FAA/BOA – 90 percent / State Match – 5 percent / Airport/Local – 5 percent

Project #36: Construct Secondary Northern Airport Entrance Road Extending from Heather Lane (Design and Construct)

Description: This project is the design and construction of an additional airport access road extending from Heather Lane to provide automobile access to the planned hangar development located on the northeast side of the airfield.

Cost Estimate: $1,100,000.00

Funding Eligibility: FAA/BOA – 90 percent / State Match – 5 percent / Airport/Local – 5 percent

Project #37: Construct 12,000 Gallon 100LL and Jet A Fuel Storage Tanks (Design and Construct)

Description: Because the northeast landside development area is removed from the terminal area, this project considers the implementation of two 12,000-gallon aboveground fuel tanks to provide 100LL and Jet A fuel storage capability. The proposed fuel tanks could be situated with a self-service credit card reader or used to service fuel trucks for full-service fueling.

Cost Estimate: $1,100,000.00

Funding Eligibility: FAA/BOA – 90 percent / State Match – 5 percent / Airport/Local – 5 percent

LONG-TERM PROGRAM SUMMARY

The total investment necessary for the long-term CIP is approximately $12.4 million. Roughly $11.2 million could be eligible for federal or BOA assistance; approximately $622,000 is eligible for the state match program; and the airport/local share of the long-term projects are estimated at $622,000. As previously noted, eligibility and actual funding of individual projects will be determined year-to-year and on a case-by-case basis.

CAPITAL IMPROVEMENT PROGRAM SUMMARY

The CIP is intended as a road map of improvements to help guide the City of Waupaca and the BOA. As presented, the plan will help accommodate increased demand at PCZ over the next 20 years and beyond. The sequence of projects may change due to availability of funds or changing priorities based on the annual review by airport management, the airport sponsor, and the BOA; nevertheless, the CIP is a comprehensive list of capital projects the airport should consider in the next 20 years and beyond.

The total CIP proposed represents approximately $26.5 million in airport development needs. Of this total, nearly $23.1 million could be eligible for federal or BOA funding assistance. The state match program could be eligible for nearly $1.2 million. The local funding estimate for the proposed CIP is estimated to be a minimum of $2.2 million, which could increase if individual projects are not offered federal grants.

CAPITAL IMPROVEMENT FUNDING SOURCES

The four different sources of funds generally used to finance airport development include the following:

- Airport cash flow
- Revenue and general obligation bonds
- Federal/state/local grants
- Passenger facility charges (reserved for commercial service airports)

Access to these sources of financing varies widely among airports. Some large airports maintain substantial cash reserves, while smaller commercial service and general aviation airports often require subsidies from local governments to fund operating expenses and finance modest improvements.

Financing for capital improvements at PCZ will not rely solely on the financial resources of the airport sponsor. Capital improvement funding is available through various grant-in-aid programs on the federal and state levels. Historically, the airport has received both federal and state grants. While more funds could be available some years, the CIP has been developed with project phasing to remain realistic and within the range of anticipated grant assistance. The following discussion outlines key sources of funding potentially available for capital improvements at the airport.

FEDERAL GRANTS

Through federal legislation over the years, various grant-in-aid programs have been established to develop and maintain the system of public-use airports across the United States. The purposes of this system and its federally based funding are to maintain national defense and promote interstate commerce. As previously noted, the *FAA Reauthorization Act of 2024* authorized the FAA's AIP at $4.0 billion for fiscal years 2025 through 2028. Section 708 of this law increases the federal share of allowable AIP-funded project costs at nonhub and nonprimary airports to 95 percent for FY 2025 and FY 2026. After FY 2026, the federal share will revert to 90 percent for AIP-funded projects.

The source for AIP funds is the Aviation Trust Fund. The Aviation Trust Fund was established in 1970 and provides funding for aviation capital investment programs (aviation development, facilities and equipment, and research and development). The Aviation Trust Fund also finances the operation of the FAA. It is funded by user fees, including taxes on airline tickets, aviation fuel, and various aircraft parts.

Several projects identified in the CIP are eligible for FAA funding through the AIP, which provides entitlement funds to airports based (in part) on annual enplaned passengers and pounds of landed cargo weight. Additional AIP funds that are designated as discretionary may also be used for eligible projects based on the FAA's national priority system. Although the AIP has been reauthorized several times and the funding formulas have been periodically revised to reflect changing national priorities, the program has remained essentially the same. Public use airports that serve civil aviation, like PCZ, may receive AIP funding for eligible projects, as described in the FAA's *Airport Improvement Program Handbook*. The airport must fund the costs of the remaining projects using a combination of other funding sources, which are discussed in the following sections.

Funding for AIP-eligible projects is undertaken through a cost-sharing arrangement in which the FAA/BOA typically provides up to 90 percent of the cost and the remaining share is split evenly between the BOA and the airport sponsor (five percent each). In exchange for this level of funding, the airport sponsor is required to meet various grant assurances, including maintenance of each improvement for its useful life (usually 20 years).

Another source for federal grants is the *Infrastructure Investment and Jobs Act*, which is also known as the *Bipartisan Infrastructure Law* (BIL). The BIL was signed into law in 2022 and plans for $25 billion to be invested into U.S. airports over a five-year period. BIL funds are sourced from the U.S. Treasury General Fund and are split into three funding buckets:

- Airport Infrastructure Grants (AIG) – $15 billion
- Airport Terminal Program (ATP) – $5 billion
- Air traffic control facilities and equipment – $5 billion

Under the BIL, PCZ will receive $137,000 in allocated AIG funding in FY 2025[2]. This money can be used for the repair and maintenance of existing infrastructure or the construction of new facilities (e.g., airfield pavement, navigational aids, lighting, terminal building, etc.). ATP and air traffic control facility grants can be used for multimodal terminal development and the relocation, reconstruction, repair, or improvement of an airport traffic control tower. The federal share for AIG funds is the same as an AIP grant (90 percent with a 10 percent local match), while the federal share for ATP grants is 95 percent for nonprimary airports. The grant assurances that apply to AIP grants also apply to BIL grants. BIL and AIP grants cannot be combined into a single grant.

Apportionment (Entitlement) Funds

The AIP provides funding for eligible projects at airports through an apportionment (entitlement) program. Nonprimary airports that are included in the *National Plan of Integrated Airport Systems* (NPIAS), such as PCZ, receive a guaranteed minimum level of up to $150,000 each year in nonprimary entitlement (NPE) funds. These funds can be carried over and combined for up to four years, thereby allowing for the completion of a more expensive project.

The FAA also provides a state apportionment based on a federal formula that considers land area and population. For the State of Wisconsin, the BOA distributes these funds for projects at various airports throughout the state.

Small Airport Fund

If a large-hub or medium-hub commercial service airport chooses to institute a passenger facility charge (PFC), which is a fee of up to $4.50 per airline ticket for funding of capital improvement projects, the airport's apportionment is reduced. A portion of the reduced apportionment goes to the small airport fund, which is reserved for small-hub primary commercial service airports, nonhub commercial service airports, reliever airports, and general aviation airports. As a general aviation airport, PCZ is eligible for funds from this source.

Discretionary Funds

Airports may face major projects that will require funds that total more than the airport's annual entitlements; thus, additional funds from discretionary apportionments under the AIP become desirable. The primary feature of discretionary funds is that they are distributed on a priority basis. The priorities are established by the FAA with a code system under which projects are ranked by purpose. Projects that ensure airport safety and security are ranked as the most important priorities, followed by projects that maintain current infrastructure development, mitigate noise and other environmental impacts, meet design standards, and increase system capacity.

It is important to note that competition for discretionary funding is not limited to airports within the State of Wisconsin or those within the FAA Great Lakes Region. The funds are distributed to all airports in the country and, as such, are more difficult to obtain; high-priority projects often fare favorably, while lower-priority projects may not receive discretionary grants.

[2] FAA, Bipartisan Infrastructure Law, Airport Infrastructure Grants (AIG) (https://www.faa.gov/bil/airport-infrastructure)

FAA Facilities and Equipment (F&E) Program

The Airway Facilities Division of the FAA administers the Facilities and Equipment (F&E) Program, which provides funding for the installation and maintenance of various navigational aids and equipment of the National Airspace System. Under the F&E Program, funding is provided for FAA airport traffic control towers, en-route navigational aids, on-airport navigational aids, and approach lighting systems.

While the F&E Program still installs and maintains some navigational aids, on-airport facilities at general aviation airports have not been a priority; therefore, airports often request funding assistance for navigational aids through the AIP and maintain the equipment on their own[3].

STATE FUNDING PROGRAMS

The State of Wisconsin participates in the federal State Block Grant Program. Under this program, the FAA annually distributes general aviation state apportionment and discretionary funds to the WisDOT BOA, which distributes grants to airports within the state. In compliance with the BOA's legislative mandate that it "apply for, receive, and disburse" federal funds for general aviation airports, the BOA acts as the agent of the local airport sponsor. Although these grants are distributed by the BOA, they contain all federal obligations.

All publicly owned airports and federally designated privately owned reliever airports are eligible for state financial aid; however, the state's designation of airport classification in the state aviation system plan (SASP) determines the extent to which an airport can be developed with these funds. Development beyond these guidelines may not be eligible for funding, depending on the justification of need for the specific development. This determination is made on a case-by-case basis. State financial aid is available through the BOA and is provided by the issuance of a finding approved by the governor. Appropriation of funds depends on individual airport needs and BOA priorities. For projects that receive federal financial aid, the airport owner and BOA equally share the non-federal costs.

For projects that do not involve federal financial aid, the state normally pays 80 percent of the cost of eligible airside and landside development and 50 percent of some planning projects. The state's contribution toward the cost of eligible buildings is limited to $1.25 million. The state cannot participate in the cost of hangars. In addition, the State of Wisconsin provides a five percent funding match for airport projects that are federally funded. The five percent state funding match covers a portion of the 10 percent local match, which leaves the airport sponsor responsible for the remaining five percent of the project cost. This state-funded portion of the local match greatly increases the affordability of projects for many airport sponsors throughout the State of Wisconsin.

Advance Land Acquisition Loan Program

The Advance Land Acquisition Loan Program was created to lend state funds to the owners of public-use airports included in the SASP. These funds are used for purchasing land essential for airport development and approach protection.

[3] Guidance on the eligibility of a project for federal AIP grant funding can be found in FAA Order 5100.38D, Airport Improvement Program Handbook, Change 1, effective February 26, 2019.

It is BOA policy that all land needed for airport development projects seeking state or federal aid be purchased prior to funding approval. The program is available to airport owners to assist them in meeting this requirement and also assists airport owners with purchasing properties when they come up for sale and the airport owner has not budgeted for the purchase. The program operates as a revolving fund wherein loan repayments are made available for future loans. Acquisition of land before receipt of federal financial aid allows construction to begin at the earliest possible date and minimizes the need for funding amendments caused by land cost overruns.

In addition to property acquisition costs, other costs associated with the project are eligible for loans through this program, including the following:

- Feasibility studies
- Land surveys
- Airport layout plan updates
- Environmental studies (including agricultural impact statements)
- Project plans and specifications
- Other incidental expenses of acquisition (such as appraisals, relocation plans, hazardous materials surveys, and closing costs)
- Legal services associated with land acquisition

These loans are available for up to 80 percent of eligible costs, for a maximum term of five years, with simple interest payable annually at the rate of four percent on the unpaid balance. The airport owner must provide 20 percent of the estimated eligible project costs up front.

Funding Flow

For land loan projects, the airport owner's share of the project is used to begin the preliminary work. The funds for the preliminary work are then applied to the airport owner's share of the land loan and, ultimately, the state or federal aid project. This procedure allows work to begin on a project before state or federal airport development funds are available. As previously stated, funds for preliminary work are also applied to the airport owner's share. In some cases, a third party (i.e., a private corporation or individual) may donate funds toward the airport owner's share. The airport owner must commit its share of the project funds before state and federal funds can be secured. An airport owner may include one or several listed items in a request for financial aid. Funding consideration is given for each work item listed and work that will enhance safety or keep the airport operational is prioritized.

Five-Year Airport Improvement Program

Although a work item may be eligible for funding, its eligibility does not guarantee funding, or funding on the airport's stated schedule. The BOA always receives more funding requests than it can cover. The state and federal priority systems help the BOA make decisions regarding what work to include in the Five-Year Airport Improvement Program, as well as the schedule of work included. The Five-Year Airport Improvement Program is the BOA's tool for scheduling individual airport projects that are eligible for federal and state assistance. Projects with the highest priority will be included in the program for early consideration. The first two years of the program's five-year schedule primarily include projects

that have been formally petitioned by an airport owner. Many of the projects included in the last three years of the program are tentative; the program is dynamic and changes due to fluctuating funding levels at federal, state, and local levels of government.

LOCAL FUNDING

After consideration has been given to grants, the balance of project costs must be funded through local resources. A goal for any airport is to generate enough revenue to cover all operating and capital expenditures, if possible. Several local financing options are available to consider when funding future development at airports, including airport revenues, issuance of various bond types, leasehold financing, customer facility charge (CFC) implementation, pursuit of non-aviation development potential, and collection of money from special events. These strategies could be used to fund the local matching share or complete a project if grant funding cannot be arranged. This section includes brief descriptions of the most common local funding options.

Airport Revenues

An airport's daily operations are conducted through the collection of various rates and charges. These airport revenues are generated specifically by airport operations and there are restrictions on the use of revenues collected by the airport. All receipts (excluding bond proceeds or related grants and interest) are irrevocably pledged to the punctual payment of operating and maintenance expenses, payment of debt service for as long as bonds remain outstanding, or additions or improvements to airport facilities.

All airports should establish standard base rates for various leases. All lease rates should be set to adjust to a standard index, such as the consumer price index (CPI), to ensure fair and equitable rates continue to be charged in the future. Many factors impact what the standard lease rate should be for a particular facility or ground parcel. For example, ground leases for aviation-related facilities should have different lease rates than non-aviation leases. When an airport owns hangars, a separate facility lease rate should be charged. The lease rate for any individual parcel or hangar may vary due to availability of utilities, condition, location, and other factors; nevertheless, standard lease rates should fall within an acceptable range.

Bonding

Bonding is a common method to finance large capital projects at airports. A bond is an instrument of indebtedness of the bond issuer to the bond holders; a bond is a form of loan or "IOU." While bond terms are negotiable, the bond issuer is typically obligated to pay the bond holder interest at regular intervals and/or repay the principal at a later date.

Leasehold/Third-Party Financing

Leasehold or third-party financing refers to a developer or tenant financing improvements under a long-term ground lease. The advantage of this arrangement is that it relieves the airport of the responsibility of raising capital funds for the improvement. For example, a hangar developer might consider constructing hangars and charging fair market lease rates while paying the airport sponsor for a ground lease. A fuel farm can be undertaken in the same manner; under such an arrangement, the developer of the facility would pay the airport a fuel flowage fee.

Many airports use third-party funding when planned improvements will primarily be used by a private business or other organization because such projects are not ordinarily eligible for federal funding. Projects of this kind typically include hangars, fixed base operator facilities, fuel storage, exclusive aircraft parking aprons, industrial aviation-use facilities, non-aviation office/commercial/industrial developments, and other similar projects. Private development proposals are considered on a case-by-case basis. Airport funds for infrastructure, preliminary site work, and site access are often required to facilitate privately developed projects on airport property.

Customer Facility Charge (CFC)

A CFC is the imposition of an additional fee charged to customers for the use of certain facilities. The most common example is when an airport constructs a consolidated rental car facility and imposes a fee for each rental car contract; that fee is then used by the airport to pay down the debt incurred from building the facility. A landing fee is another example, wherein operators of aircraft pay the airport a set amount for use of the airfield; a landing fee can often be waived with the purchase of aviation fuel, which offers another revenue source for the airport.

Non-Aeronautical Development

In addition to generating revenue from traditional aviation sources, airports with excess land can permit compatible non-aeronautical development. Generally, an airport will extend a long-term lease for land that is not anticipated to be needed for aviation purposes in the future. The developer will then pay the monthly lease rate and construct and use the compatible facility. Although the recommended development concept does not include non-aeronautical development, the City of Waupaca should not preclude non-aeronautical development opportunities, if presented. It should be noted that any future non-aviation development must be reviewed and approved by both the FAA and BOA.

Special Events

Another common revenue-generating option is permitted use of airport property for temporary or single events. Pancake “fly-ins” and airshows are two popular examples of special events. Airports can also permit portions of their facilities to be used for non-aviation special events, such as car shows or video production of commercials. This type of revenue generation must be approved by the FAA.

Airport Rates and Fees Information

Each year, the BOA completes a survey of public-use airports in Wisconsin to gauge the rates, charges, and related activities for state airports. Per Wisconsin Administrative Code, Chapter Trans 55, airports are required to submit responses as a condition of receiving state funding. The survey offers a comparative tool to help airports gauge financial practices and needs. Of the 96 SASP airports, 92 airports provided responses to the survey. (Complete rates and charges survey data can be found on the BOA’s website at https://wisconsindot.gov/av-pubs.) PCZ qualifies as a medium general aviation airport; summary averages and/or detailed information for specific rates/fees are included in **Table 6B**.

TABLE 6B | BOA Rates and Charges Survey Results (2024) – Medium GA Airports	
100LL Fuel – Available at 100% of Responding Medium GA Airports	
100LL Price on 12/31/2024	$5.26
Gallons of 100LL Sold	21,500
Jet A Fuel – Available at 74% of Responding Medium GA Airports	
Jet A Price on 12/31/2024	$4.77
Gallons of Jet A Sold	45,000
Landing Fees – Charged at 15% of Responding Medium GA Airports	
Tiedown Fees – Charged at 32% of Responding Medium GA Airports	
Daily Tiedown Rate for a Cessna 172	$9
Daily Tiedown Rate for a Beechcraft King Air	$42
Daily Tiedown Rate for a Hawker 800	$72
Rented T-Hangars – Available at 51% of Responding Medium GA Airports	
Non-Heated, T-Hangar – Monthly Rate for a Cessna 172	$176
Heated, T-Hangar – Monthly Rate for a Cessna 172	$256
Community Hangars – Available at 45% of Responding Medium GA Airports	
Non-Heated, Community Hangar – Daily Rate for a Cessna 172	$35
Non-Heated, Community Hangar – Monthly Rate for a Cessna 172	$233
Heated, Community Hangar – Daily Rate for a Cessna 172	$61
Heated, Community Hangar – Monthly Rate for a Cessna 172	$697
Ground Leases – Available at 99% of Responding Medium GA Airports	
Private Hangar Rate	$0.11 per square foot
Corporate Hangar Rate	$0.16 per square foot
Commercial Hangar Rate	$0.37 per square foot
Financial Self-Sustainability – 79% of Responding Medium GA Airports Required Local Subsidy	
Local Tax Levy Subsidy	$101,000

MASTER PLAN IMPLEMENTATION

To implement the master plan recommendations, it is key to recognize that planning is a continuous process and does not end with approval of this document. The airport should implement measures that allow it to track various demand indicators, such as based aircraft, hangar demand, and operations. The issues on which this master plan is based will remain valid for a number of years. The primary goal is for PCZ to best serve the air transportation needs of the region while achieving economic self-sufficiency. The CIP and phasing program presented will change over time. An effort has been made to identify and prioritize all major capital projects that would require federal or state grant funding; nevertheless, the airport and the BOA should review the five-year CIP on an annual basis.

The primary value of this study is that it keeps the issues and objectives at the forefront of the minds of decision-makers. In addition to adjustments in aviation demand, decisions regarding when to undertake any projects or improvements recommended in this master plan will impact how long the plan remains valid. The format of this plan reduces the need for formal and costly updates by simply adjusting the timing of project implementation. Updates can be performed by airport management, thereby improving the effectiveness of the master plan; nevertheless, airports are typically encouraged to update their master plans every seven to 10 years, or sooner if significant changes occur in the interim.

In summary, the planning process requires the City of Waupaca to constantly monitor the progress of the airport. The information obtained from continually monitoring activity will provide the data necessary to determine if the development schedule should be accelerated or decelerated.

Appendix A

Glossary of Terms

GLOSSARY OF TERMS

A

Above Ground Level: The elevation of a point or surface above the ground.

Accelerate-Stop Distance Available (ASDA): See declared distances.

Advisory Circular: External publications issued by the FAA consisting of non-regulatory material providing for the recommendations relative to a policy, guidance and information relative to a specific aviation subject.

Air Carrier: An operator which: (1) performs at least five round trips per week between two or more points and publishes flight schedules which specify the times, days of the week, and places between which such flights are performed; or (2) transports mail by air pursuant to a current contract with the U.S. Postal Service. Certified in accordance with Federal Aviation Regulation (FAR) Parts 121 and 127.

Air Route Traffic Control Center (ARTCC): A facility established to provide air traffic control service to aircraft operating on an IFR flight plan within controlled airspace and principally during the enroute phase of flight.

Air Taxi: An air carrier certificated in accordance with FAR Part 121 and FAR Part 135 and authorized to provide, on demand, public transportation of persons and property by aircraft. Generally operates small aircraft "for hire" for specific trips.

Air Traffic Control: A service operated by an appropriate organization for the purpose of providing for the safe, orderly, and expeditious flow of air traffic.

Air Traffic Control System Command Center: A facility operated by the FAA which is responsible for the central flow control, the central altitude reservation system, the airport reservation position system, and the air traffic service contingency command for the air traffic control system.

Air Traffic Hub: A categorization of commercial service airports or group of commercial service airports in a metropolitan or urban area based upon the proportion of annual national enplanements existing at the airport or airports. The categories are large hub, medium hub, small hub, or non-hub. It forms the basis for the apportionment of entitlement funds.

Air Transport Association Of America: An organization consisting of the principal U.S. airlines that represents the interests of the airline industry on major aviation issues before federal, state, and local government bodies. It promotes air transportation safety by coordinating industry and governmental safety programs and it serves as a focal point for industry efforts to standardize practices and enhance the efficiency of the air transportation system.

Aircraft: A device that is used or intended to be used for flight in the air.

Aircraft Approach Category: A grouping of aircraft based on 1.3 times the stall speed in their landing configuration at their maximum certificated landing weight. The categories are as follows:

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

Aircraft Operation: The landing, takeoff, or touch-and-go procedure by an aircraft on a runway at an airport.

Aircraft Operations Area (AOA): A restricted and secure area on the airport property designed to protect all aspects related to aircraft operations.

Aircraft Owners And Pilots Association: A private organization serving the interests and needs of general aviation pilots and aircraft owners.

Aircraft Rescue And Fire Fighting: A facility located at an airport that provides emergency vehicles, extinguishing agents, and personnel responsible for minimizing the impacts of an aircraft accident or incident.

Airfield: The portion of an airport which contains the facilities necessary for the operation of aircraft.

Airline Hub: An airport at which an airline concentrates a significant portion of its activity and which often has a significant amount of connecting traffic.

Airplane Design Group (ADG): A grouping of aircraft based upon wingspan. The groups are as follows:

- **Group I:** Up to but not including 49 feet.
- **Group II:** 49 feet up to but not including 79 feet.
- **Group III:** 79 feet up to but not including 118 feet.
- **Group IV:** 118 feet up to but not including 171 feet.
- **Group V:** 171 feet up to but not including 214 feet.
- **Group VI:** 214 feet or greater.

Airport Authority: A quasi-governmental public organization responsible for setting the policies governing the management and operation of an airport or system of airports under its jurisdiction.

Airport Beacon: A navigational aid located at an airport which displays a rotating light beam to identify whether an airport is lighted.

Airport Beacon

Airport Capital Improvement Plan: The planning program used by the Federal Aviation Administration to identify, prioritize, and distribute funds for airport development and the needs of the National Airspace System to meet specified national goals and objectives.

Airport Elevation: The highest point on the runway system at an airport expressed in feet above mean sea level (MSL).

Airport Improvement Program: A program authorized by the Airport and Airway Improvement Act of 1982 that provides funding for airport planning and development.

Airport Layout Drawing (ALD): The drawing of the airport showing the layout of existing and proposed airport facilities.

Airport Layout Plan (ALP): A scaled drawing of the existing and planned land and facilities necessary for the operation and development of the airport.

Airport Layout Plan Drawing Set: A set of technical drawings depicting the current and future airport conditions. The individual sheets comprising the set can vary with the complexities of the airport, but the FAA-required drawings include the Airport Layout Plan (sometimes referred to as the Airport Layout Drawing (ALD), the Airport Airspace Drawing, and the Inner Portion of the Approach Surface Drawing, On-Airport Land Use Drawing, and Property Map.

Airport Master Plan: A local planning document that serves as a guide for the long-term development of an airport.

Airport Movement Area Safety System: A system that provides automated alerts and warnings of potential runway incursions or other hazardous aircraft movement events.

Airport Obstruction Chart: A scaled drawing depicting the Federal Aviation Regulation (FAR) Part 77 surfaces, a representation of objects that penetrate these surfaces, runway, taxiway, and ramp areas, navigational aids, buildings, roads and other detail in the vicinity of an airport.

Airport Reference Code (ARC): A coding system used to relate airport design criteria to the operational (Aircraft Approach Category) to the physical characteristics (Airplane Design Group) of the airplanes intended to operate at the airport.

Airport Reference Point (ARP): The latitude and longitude of the approximate center of the airport.

Airport Sponsor: The entity that is legally responsible for the management and operation of an airport, including the fulfillment of the requirements of laws and regulations related thereto.

Airport Surface Detection Equipment: A radar system that provides air traffic controllers with a visual representation of the movement of aircraft and other vehicles on the ground on the airfield at an airport.

Airport Surveillance Radar: The primary radar located at an airport or in an air traffic control terminal area that receives a signal at an antenna and transmits the signal to air traffic control display equipment defining the location of aircraft in the air. The signal provides only the azimuth and range of aircraft from the location of the antenna.

Airport Traffic Control Tower (ATCT): A central operations facility in the terminal air traffic control system, consisting of a tower, including an associated instrument flight rule (IFR) room if radar equipped, using air/ground communications and/or radar, visual signaling and other devices to provide safe and expeditious movement of terminal air traffic.

Airside: The portion of an airport that contains the facilities necessary for the operation of aircraft.

Airspace: The volume of space above the surface of the ground that is provided for the operation of aircraft.

Alert Area: See special-use airspace.

Altitude: The vertical distance measured in feet above mean sea level.

Annual Instrument Approach (AIA): An approach to an airport with the intent to land by an aircraft in accordance with an IFR flight plan when visibility is less than three miles and/or when the ceiling is at or below the minimum initial approach altitude.

Approach Lighting System (ALS): An airport lighting facility which provides visual guidance to landing aircraft by radiating light beams by which the pilot aligns the aircraft with the extended centerline of the runway on final approach and landing.


Approach Lighting System

Approach Minimums: The altitude below which an aircraft may not descend while on an IFR approach unless the pilot has the runway in sight.

Approach Surface: An imaginary obstruction limiting surface defined in FAR Part 77 which is longitudinally centered on an extended runway centerline and extends outward and upward from the primary surface at each end of a runway at a designated slope and distance based upon the type of available or planned approach by aircraft to a runway.

Apron: A specified portion of the airfield used for passenger, cargo or freight loading and unloading, aircraft parking, and the refueling, maintenance and servicing of aircraft.

Area Navigation: The air navigation procedure that provides the capability to establish and maintain a flight path on an arbitrary course that remains within the coverage area of navigational sources being used.

Automated Terminal Information Service (ATIS): The continuous broadcast of recorded non-control information at towered airports. Information typically includes wind speed, direction, and runway in use.

Automated Surface Observation System (ASOS): A reporting system that provides frequent airport ground surface weather observation data through digitized voice broadcasts and printed reports.

Automated Weather Observation System (AWOS): Equipment used to automatically record weather conditions (i.e., cloud height, visibility, wind speed and direction, temperature, dew point, etc.)

Automatic Dependent Surveillance–Broadcast (ADS–B): An advanced surveillance technology that combines an aircraft's positioning source, aircraft avionics, and a ground infrastructure to create an accurate surveillance interface between aircraft and ATC.

Automatic Direction Finder (ADF): An aircraft radio navigation system which senses and indicates the direction to a non-directional radio beacon (NDB) ground transmitter.

Avigation Easement: A contractual right or a property interest in land over which a right of unobstructed flight in the airspace is established.

Azimuth: Horizontal direction expressed as the angular distance between true north and the direction of a fixed point (as the observer's heading).

B

Base Leg: A flight path at right angles to the landing runway off its approach end. The base leg normally extends from the downwind leg to the intersection of the extended runway centerline. See "traffic pattern."

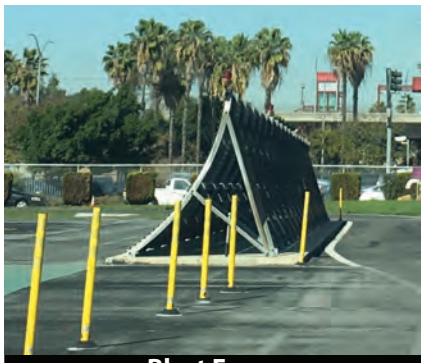
Based Aircraft: The general aviation aircraft that use a specific airport as a home base.

Bearing: The horizontal direction to or from any point, usually measured clockwise from true north or magnetic north.

Blast Fence: A barrier used to divert or dissipate jet blast or propeller wash.

Blast Pad: A prepared surface adjacent to the end of a runway for the purpose of eliminating the erosion of the ground surface by the wind forces produced by airplanes at the initiation of takeoff operations.

Building Restriction Line (BRL): A line which identifies suitable building area locations on the airport.



Blast Fence

C

Capital Improvement Plan: The planning program used by the Federal Aviation Administration to identify, prioritize, and distribute Airport Improvement Program funds for airport development and the needs of the National Airspace System to meet specified national goals and objectives.

Cargo Service Airport: An airport served by aircraft providing air transportation of property only, including mail, with an annual aggregate landed weight of at least 100,000,000 pounds.

Ceiling: The height above the ground surface to the location of the lowest layer of clouds which is reported as either broken or overcast.

Circling Approach: A maneuver initiated by the pilot to align the aircraft with the runway for landing when flying a predetermined circling instrument approach under IFR.

Class A Airspace: See Controlled Airspace.

Class B Airspace: See Controlled Airspace.

Class C Airspace: See Controlled Airspace.

Class D Airspace: See Controlled Airspace.

Class E Airspace: See Controlled Airspace.

Class G Airspace: See Controlled Airspace.

Clear Zone: See Runway Protection Zone.

Commercial Service Airport: A public airport providing scheduled passenger service that enplanes at least 2,500 annual passengers.

Common Traffic Advisory Frequency (CTAF): A radio frequency identified in the appropriate aeronautical chart which is designated for the purpose of transmitting airport advisory information and procedures while operating to or from an uncontrolled airport.

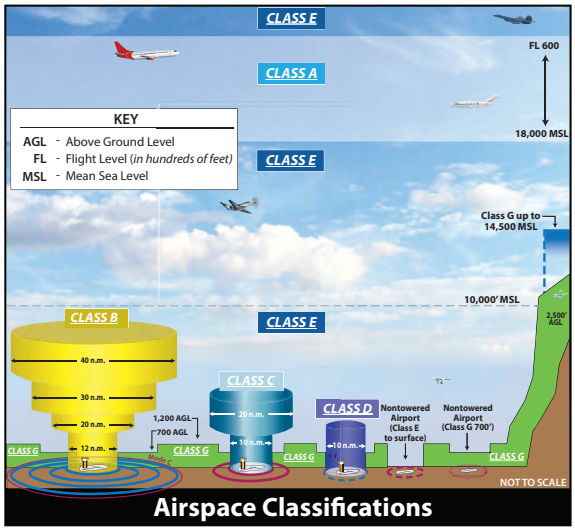
Compass Locator (LOM): A low power, low/medium frequency radio-beacon installed in conjunction with the instrument landing system at one or two of the marker sites.

Conical Surface: An imaginary obstruction- limiting surface defined in FAR Part 77 that extends from the edge of the horizontal surface outward and upward at a slope of 20 to 1 for a horizontal distance of 4,000 feet.

Controlled Airport: An airport that has an operating airport traffic control tower.

Controlled Airspace: Airspace of defined dimensions within which air traffic control services are provided to instrument flight rules (IFR) and visual flight rules (VFR) flights in accordance with the airspace classification. Controlled airspace in the United States is designated as follows:

CLASS A: Generally, the airspace from 18,000 feet mean sea level (MSL) up to but not including flight level FL600. All persons must operate their aircraft under IFR.



CLASS B: Generally, the airspace from the surface to 10,000 feet MSL surrounding the nation's busiest airports. The configuration of Class B airspace is unique to each airport, but typically consists of two or more layers of air space and is designed to contain all published instrument approach procedures to the airport. An air traffic control clearance is required for all aircraft to operate in the area.

CLASS C: Generally, the airspace from the surface to 4,000 feet above the airport elevation (charted as MSL) surrounding those airports that have an operational control tower and radar approach control and are served by a qualifying number of IFR operations or passenger enplanements. Although individually tailored for each airport, Class C airspace typically consists of a surface area with a five nautical mile (nm) radius and an outer area with a 10 nautical mile radius that extends from 1,200 feet to 4,000 feet above the airport elevation. Two-way radio communication is required for all aircraft.

CLASS D: Generally, that airspace from the surface to 2,500 feet above the airport elevation (charted as MSL) surrounding those airports that have an operational control tower. Class D airspace is individually tailored and configured to encompass published instrument approach procedure. Unless otherwise authorized, all persons must establish two-way radio communication.

CLASS E: Generally, controlled airspace that is not classified as Class A, B, C, or D. Class E airspace extends upward from either the surface or a designated altitude to the overlying or adjacent controlled airspace. When designated as a surface area, the airspace will be configured to contain all instrument procedures. Class E airspace encompasses all Victor Airways. Only aircraft following instrument flight rules are required to establish two-way radio communication with air traffic control.

CLASS G: Generally, that airspace not classified as Class A, B, C, D, or E. Class G airspace is uncontrolled for all aircraft. Class G airspace extends from the surface to the overlying Class E airspace.

Controlled Firing Area: See special-use airspace.

Crosswind: A wind that is not parallel to a runway centerline or to the intended flight path of an aircraft.

Crosswind Component: The component of wind that is at a right angle to the runway centerline or the intended flight path of an aircraft.

Crosswind Leg: A flight path at right angles to the landing runway off its upwind end. See "traffic pattern."

D

Decibel: A unit of noise representing a level relative to a reference of a sound pressure 20 micro newtons per square meter.

Decision Height/Decision Altitude: The height above the end of the runway surface at which a decision must be made by a pilot during the ILS or Precision Approach Radar approach to either continue the approach or to execute a missed approach.

Declared Distances: The distances declared available for the airplane's takeoff runway, takeoff distance, accelerate-stop distance, and landing distance requirements. The distances are:

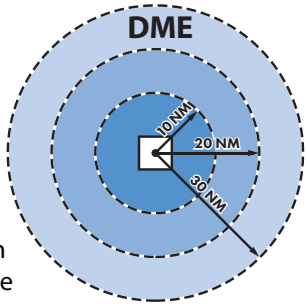
- **Takeoff Run Available (TORA):** The runway length declared available and suitable for the ground run of an airplane taking off.
- **Takeoff Distance Available (TODA):** The TORA plus the length of any remaining runway and/or clear way beyond the far end of the TORA.
- **Accelerate-stop Distance Available (ASDA):** The runway plus stopway length declared available for the acceleration and deceleration of an aircraft aborting a takeoff.
- **Landing Distance Available (LDA):** The runway length declared available and suitable for landing.

Department Of Transportation: The cabinet level federal government organization consisting of modal operating agencies, such as the Federal Aviation Administration, which was established to promote the coordination of federal transportation programs and to act as a focal point for research and development efforts in transportation.

Discretionary Funds: Federal grant funds that may be appropriated to an airport based upon designation by the Secretary of Transportation or Congress to meet a specified national priority such as enhancing capacity, safety, and security, or mitigating noise.

Displaced Threshold: A threshold that is located at a point on the runway other than the designated beginning of the runway.

Distance Measuring Equipment (DME): Equipment (airborne and ground) used to measure, in nautical miles, the slant range distance of an aircraft from the DME navigational aid.



DNL: The 24-hour average sound level, in decibels, obtained after the addition of ten decibels to sound levels for the periods between 10 p.m. and 7 a.m. as averaged over a span of one year. It is the FAA standard metric for determining the cumulative exposure of individuals to noise.

Downwind Leg: A flight path parallel to the landing runway in the direction opposite to landing. The downwind leg normally extends between the crosswind leg and the base leg. Also see "traffic pattern."

E

Easement: The legal right of one party to use a portion of the total rights in real estate owned by another party. This may include the right of passage over, on, or below the property; certain air rights above the property, including view rights; and the rights to any

specified form of development or activity, as well as any other legal rights in the property that may be specified in the easement document.

Elevation: The vertical distance measured in feet above mean sea level.

Enplaned Passengers: The total number of revenue passengers boarding aircraft, including originating, stop-over, and transfer passengers, in scheduled and nonscheduled services.

Enplanement: The boarding of a passenger, cargo, freight, or mail on an aircraft at an airport.

Entitlement: Federal funds for which a commercial service airport may be eligible based upon its annual passenger enplanements.

Environmental Assessment (EA): An environmental analysis performed pursuant to the National Environmental Policy Act to determine whether an action would significantly affect the environment and thus require a more detailed environmental impact statement.

Environmental Audit: An assessment of the current status of a party's compliance with applicable environmental requirements of a party's environmental compliance policies, practices, and controls.

Environmental Impact Statement (EIS): A document required of federal agencies by the National Environmental Policy Act for major projects or legislative proposals affecting the environment. It is a tool for decision-making describing the positive and negative effects of a proposed action and citing alternative actions.

Essential Air Service: A federal program which guarantees air carrier service to selected small cities by providing subsidies as needed to prevent these cities from such service.

F

Federal Aviation Regulations: The general and permanent rules established by the executive departments and agencies of the Federal Government for aviation, which are published in the Federal Register. These are the aviation subset of the Code of Federal Regulations.

Federal Inspection Services: The provision of customs and immigration services including passport inspection, inspection of baggage, the collection of duties on certain imported items, and the inspections for agricultural products, illegal drugs, or other restricted items.

Final Approach: A flight path in the direction of landing along the extended runway centerline. The final approach normally extends from the base leg to the runway. See "traffic pattern."

Final Approach and Takeoff Area (FATO): A defined area over which the final phase of the helicopter approach to a hover, or a landing is completed and from which the takeoff is initiated.

Final Approach Fix: The designated point at which the final approach segment for an aircraft landing on a runway begins for a non-precision approach.

Finding Of No Significant Impact (FONSI): A public document prepared by a Federal agency that presents the rationale why a proposed action will not have a significant effect on the environment and for which an environmental impact statement will not be prepared.

Fixed Base Operator (FBO): A provider of services to users of an airport. Such services include, but are not limited to, hangaring, fueling, flight training, repair, and maintenance.

Flight Level: A measure of altitude used by aircraft flying above 18,000 feet. Flight levels are indicated by three digits representing the pressure altitude in hundreds of feet. An airplane flying at flight level 360 is flying at a pressure altitude of 36,000 feet. This is expressed as FL 360.

Flight Service Station (FSS): An operations facility in the national flight advisory system which utilizes data interchange facilities for the collection and dissemination of Notices to Airmen, weather, and administrative data and which provides preflight and in-flight advisory services to pilots through air and ground based communication facilities.

Frangible Navaid: A navigational aid which retains its structural integrity and stiffness up to a designated maximum load, but on impact from a greater load, breaks, distorts, or yields in such a manner as to present the minimum hazard to aircraft.

G

General Aviation: That portion of civil aviation which encompasses all facets of aviation except air carriers holding a certificate of convenience and necessity, and large aircraft commercial operators.

General Aviation Airport: An airport that provides air service to only general aviation.

Glideslope (GS): Provides vertical guidance for aircraft during approach and landing. The glideslope consists of the following:

- Electronic components emitting signals which provide vertical guidance by reference to airborne instruments during instrument approaches such as ILS; or
- Visual ground aids, such as PAPI, which provide vertical guidance for VFR approach or for the visual portion of an instrument approach and landing.

Global Positioning System (GPS): A system of satellites used as reference points to enable navigators equipped with GPS receivers to determine their latitude, longitude, and altitude.

Ground Access: The transportation system on and around the airport that provides access to and from the airport by ground transportation vehicles for passengers, employees, cargo, freight, and airport services.

Ground Based Augmentation System (GBAS): A program that augments the existing GPS system by providing corrections to aircraft in the vicinity of an airport in order to improve the accuracy of these aircrafts' GPS navigational position

H

Helipad: A designated area for the takeoff, landing, and parking of helicopters.

High Intensity Runway Lights (HIRL): The highest classification in terms of intensity or brightness for lights designated for use in delineating the sides of a runway.

High-speed Exit Taxiway: An acute-angled exit taxiway forming a 30 degree angle with the runway centerline, designed to allow an aircraft to exit a runway without having to decelerate to typical taxi speed.

Horizontal Surface: An imaginary obstruction-limiting surface defined in FAR Part 77 that is specified as a portion of a horizontal plane surrounding a runway located 150 feet above the established airport elevation. The specific horizontal dimensions of this surface are **a** function of the types of approaches existing or planned for the runway.

Hot Spot: A location on an airport movement area with a history of potential risk of collision or runway incursion, and where heightened attention by pilots and drivers is necessary.

I

Initial Approach Fix: The designated point at which the initial approach segment begins for an instrument approach to a runway.

Instrument Approach Procedure: A series of predetermined maneuvers for the orderly transfer of an aircraft under instrument flight conditions from the beginning of the initial approach to a landing, or to a point from which a landing may be made visually.

Instrument Flight Rules (IFR): Procedures for the conduct of flight in weather conditions below Visual Flight Rules weather minimums. The term IFR is often also used to define weather conditions **and the type of flight plan under which an aircraft is operating.**

Instrument Landing System (ILS): A precision instrument approach system which normally consists of the following electronic components and visual aids:

1. Localizer
2. Glide Slope
3. Outer Marker
4. Middle Marker
5. Approach Lights

Instrument Meteorological Conditions: Meteorological conditions expressed in terms of specific visibility and ceiling conditions that are less than the minimums specified for visual meteorological conditions.

Itinerant Operations: Operations by aircraft that are arriving from outside the traffic pattern or departing the airport traffic pattern.

K

Knots: A unit of speed length used in navigation that is equivalent to the number of nautical miles traveled in one hour.

L

Landside: The portion of an airport that provides the facilities necessary for the processing of passengers, cargo, freight, and ground transportation vehicles.

Landing Distance Available (LDA): See declared distances.

Large Airplane: An airplane that has a maximum certified takeoff weight in excess of 12,500 pounds.

Local Operations: Aircraft operations performed by aircraft that operate in the local traffic pattern or within sight of the airport, that are known to be departing for or arriving from flights in local practice areas within a prescribed distance from the airport, or that execute simulated instrument approaches at the airport. Typically, this includes touch and-go training operations.

Localizer: The component of an ILS which provides course guidance to the runway.

Localizer Type Directional Aid (LDA): A facility of comparable utility and accuracy to a localizer but is not part of a complete ILS and is not aligned with the runway.

Localizer

Low Intensity Runway Lights: The lowest classification in terms of intensity or brightness for lights designated for use in delineating the sides of a runway.

M

Medium Intensity Runway Lights: The middle classification in terms of intensity or brightness for lights designated for use in delineating the sides of a runway.

Military Operations: Aircraft operations that are performed in military aircraft.

Military Operations Area (MOA): See special-use airspace

Military Training Route: An air route depicted on aeronautical charts for the conduct of military flight training at speeds above 250 knots.

Missed Approach Course (MAC): The flight route to be followed if, after an instrument approach, a landing is not affected, and occurring normally:

- When the aircraft has descended to the decision height and has not established visual contact; or
- When directed by air traffic control to pull up or to go around again.

Movement Area: The runways, taxiways, and other areas of an airport which are utilized for taxiing/hover taxiing, air taxiing, takeoff, and landing of aircraft, exclusive of loading ramps and parking areas. At those airports with a tower, air traffic control clearance is required for entry onto the movement area.

N

National Airspace System (NAS): The network of air traffic control facilities, air traffic control areas, and navigational facilities through the U.S.

National Plan Of Integrated Airport Systems (NPIAS): The national airport system plan developed by the Secretary of Transportation on a biannual basis for the development of public use airports to meet national air transportation needs.

National Transportation Safety Board: A federal government organization established to investigate and determine the probable cause of transportation accidents, to recommend equipment and procedures to enhance transportation safety, and to review on appeal the suspension or revocation of any certificates or licenses issued by the Secretary of Transportation.

Nautical Mile: A unit of length used in navigation which is equivalent to the distance spanned by one minute of arc in latitude, that is, 1,852 meters or 6,076 feet. It is equivalent to approximately 1.15 statute mile.

Navaid: A term used to describe any electrical or visual air navigational aids, lights, signs, and associated supporting equipment (i.e., PAPI, VASI, ILS, etc.)

Navigational Aid: A facility used as, available for use as, or designed for use as an aid to air navigation.

Noise Contour: A continuous line on a map of the airport vicinity connecting all points of the same noise exposure level.

Non-directional Beacon (NDB): A beacon transmitting non-directional signals whereby the pilot of an aircraft equipped with direction finding equipment can determine their bearing to and from the radio beacon and home on, or track to, the station. When the radio beacon is installed in conjunction with the Instrument Landing System marker, it is normally called a Compass Locator.


NDB

Non-precision Approach Procedure: A standard instrument approach procedure in which no electronic glide slope is provided, such as VOR, TACAN, NDB, or LOC.

Notice To Air Missions (NOTAM): A notice containing information concerning the establishment, condition, or change in any component of or hazard in the National Airspace System, the timely knowledge of which is considered essential to personnel concerned with flight operations.

O

Object Free Area (OFA): An area on the ground centered on a runway, taxiway, or taxilane centerline provided to enhance the safety of aircraft operations by having the area free of objects, except for objects that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes.

Obstacle Free Zone (OFZ): The airspace below 150 feet above the established airport elevation and along the runway and extended runway centerline that is required to be kept clear of all objects, except for frangible visual NAVAIDs that need to be located in the OFZ because of their function, in order to provide clearance for aircraft landing or taking off from the runway, and for missed approaches.

Operation: The take-off, landing, or touch-and-go procedure by an aircraft on a runway at an airport.

Outer Marker (OM): An ILS navigation facility in the terminal area navigation system located four to seven miles from the runway edge on the extended centerline, indicating to the pilot that he/she is passing over the facility and can begin final approach.

P

Pilot-controlled Lighting: Runway lighting systems at an airport that are controlled by activating the microphone of a pilot on a specified radio frequency.

Precision Approach: A standard instrument approach procedure which provides runway alignment and glide slope (descent) information. It is categorized as follows:

- **CATEGORY I (CAT I):** A precision approach which provides for approaches with a decision height of not less than 200 feet and visibility not less than 1/2 mile or Runway Visual Range (RVR) 2400 (RVR 1800) with operative touchdown zone and runway centerline lights.
- **CATEGORY II (CAT II):** A precision approach which provides for approaches with a decision height of not less than 100 feet and visibility not less than 1200 feet RVR.
- **CATEGORY III (CAT III):** A precision approach which provides for approaches with minimal less than Category II.

Precision Approach Path Indicator (PAPI): A lighting system providing visual approach slope guidance to aircraft during a landing approach. A PAPI normally consists of four light units but an abbreviated system of two lights is acceptable for some categories of aircraft.


Precision Approach Path Indicator

Precision Approach Radar: A radar facility in the terminal air traffic control system used to detect and display with a high degree of accuracy the direction, range, and elevation of an aircraft on the final approach to a runway.

Precision Object Free Zone (POFZ): An area centered on the extended runway centerline, beginning at the runway threshold and extending behind the runway threshold that is 200 feet long by 800 feet wide. The POFZ is a clearing standard which requires the POFZ to be kept clear of above ground objects protruding above the runway safety area edge elevation (except for frangible NAVAIDS). The POFA is only in effect when the approach includes vertical guidance, the reported ceiling is below 250 feet, and an aircraft is on final approach within two miles of the runway threshold.

Primary Airport: A commercial service airport that enplanes at least 10,000 annual passengers.

Primary Surface: An imaginary obstruction limiting surface defined in FAR Part 77 that is specified as a rectangular surface longitudinally centered about a runway. The specific dimensions of this surface are a function of the types of approaches existing or planned for the runway.

Prohibited Area: See special-use airspace.

PVC: Poor visibility and ceiling. Used in determining Annual Service Volume. PVC conditions exist when the cloud ceiling is less than 500 feet and visibility is less than one mile.

R

Radial: A navigational signal generated by a Very High Frequency Omni-directional Range or VORTAC station that is measured as an azimuth from the station.

Regression Analysis: A statistical technique that seeks to identify and quantify the relationships between factors associated with a forecast.

Remote Communications Outlet (RCO): An unstaffed transmitter receiver/facility remotely controlled by air traffic personnel. RCOs serve flight service stations (FSSs). RCOs were established to provide ground-to-ground communications between air traffic control specialists and pilots at satellite airports for delivering enroute clearances, issuing departure authorizations, and acknowledging instrument flight rules cancellations or departure/landing times.

Remote Transmitter/receiver (RTR): See remote communications outlet. RTRs serve ARTCCs.

Remotely Piloted Unmanned Aircraft System (RPAS): A set of configurable elements consisting of a remotely-piloted aircraft, its associated remote pilot station(s), the required command and control links and any other system elements as may be required, at any point during flight operation.

Reliever Airport: An airport to serve general aviation aircraft which might otherwise use a congested air-carrier served airport.

Restricted Area: See special-use airspace.

RNAV: Area navigation - airborne equipment which permits flights over determined tracks within prescribed accuracy tolerances without the need to overfly ground-based navigation facilities. Used enroute and for approaches to an airport.

Runway: A defined rectangular area on an airport prepared for aircraft landing and takeoff. Runways are normally numbered in relation to their magnetic direction, rounded off to the nearest 10 degrees. For example, a runway with a magnetic heading of 180 would be designated Runway 18. The runway heading on the opposite end of the runway is 180 degrees from that runway end. For example, the opposite runway heading for Runway 18 would be Runway 36 (magnetic heading of 360). Aircraft can takeoff or land from either end of a runway, depending upon wind direction.

Runway Alignment Indicator Light (RAIL): A series of high intensity sequentially flashing lights installed on the extended centerline of the runway usually in conjunction with an approach lighting system.

Runway Design Code: A code signifying the FAA design standards to which the runway is to be built.

Runway End Identification Lighting (REIL): Two synchronized flashing lights, one on each side of the runway threshold, which provide rapid and positive identification of the approach end of a particular runway.

REIL

Runway Gradient: The average slope, measured in percent, between the two ends of a runway.

Runway Protection Zone (RPZ): An area off the runway end to enhance the protection of people and property on the ground. The RPZ is trapezoidal in shape. Its dimensions are determined by the aircraft approach speed and runway approach type and minimal.

Runway Reference Code: A code signifying the current operational capabilities of a runway and taxiway.

Runway Safety Area (RSA): A defined surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway.

Runway Visibility Zone (RVZ): An area on the airport to be kept clear of permanent objects so that there is an unobstructed line of sight from any point five feet above the runway centerline to any point five feet above an intersecting runway centerline.

Runway Visual Range (RVR): An instrumentally derived value, in feet, representing the horizontal distance a pilot can see down the runway from the runway end.

S

Scope: The document that identifies and defines the tasks, emphasis, and level of effort associated with a project or study.

Segmented Circle: A system of visual indicators designed to provide traffic pattern information at airports without operating control towers, often co-located with a wind cone.

Shoulder: An area adjacent to the edge of paved runways, taxiways, or aprons providing a transition between the pavement and the adjacent surface; support for aircraft running off the pavement; enhanced drainage; and blast protection. The shoulder Does Not Necessarily Need To Be Paved.

Slant-range Distance: The straight line distance between an aircraft and a point on the ground.

Small Aircraft: An aircraft that has a maximum certified takeoff weight of up to 12,500 pounds.

Special-use Airspace: Airspace of defined dimensions identified by a surface area wherein activities must be confined because of their nature and/or wherein limitations may be imposed upon aircraft operations that are not a part of those activities. Special-use airspace classifications include:

- **ALERT AREA:** Airspace which may contain a high volume of pilot training activities or an unusual type of aerial activity, neither of which is hazardous to aircraft.
- **CONTROLLED FIRING AREA:** Airspace wherein activities are conducted under conditions so controlled as to eliminate hazards to nonparticipating aircraft and to ensure the safety of persons or property on the ground.
- **MILITARY OPERATIONS AREA (MOA):** Designated airspace with defined vertical and lateral dimensions established outside Class A airspace to separate/segregate certain military activities from instrument flight rule (IFR) traffic and to identify for visual flight rule (VFR) traffic where these activities are conducted.
- **PROHIBITED AREA:** Designated airspace within which the flight of aircraft is prohibited.
- **RESTRICTED AREA:** Airspace designated under Federal Aviation Regulation (FAR) 73, within which the flight of aircraft, while not wholly prohibited, is subject to restriction. Most restricted areas are designated joint use. When not in use by the using agency, IFR/VFR operations can be authorized by the controlling air traffic control facility.
- **WARNING AREA:** Airspace which may contain hazards to nonparticipating aircraft.

Standard Instrument Departure (SID): A preplanned coded air traffic control IFR departure routing, preprinted for pilot use in graphic and textual form only.

Standard Instrument Departure Procedures: A published standard flight procedure to be utilized following takeoff to provide a transition between the airport and the terminal area or enroute airspace.

Standard Terminal Arrival Route (STAR): A preplanned coded air traffic control IFR arrival routing, preprinted for pilot use in graphic and textual or textual form only.

Stop-and-go: A procedure wherein an aircraft will land, make a complete stop on the runway, and then commence a takeoff from that point. A stop-and-go is recorded as two operations: one operation for the landing and one operation for the takeoff.

Stopway: An area beyond the end of a takeoff runway that is designed to support an aircraft during an aborted takeoff without causing structural damage to the aircraft. It is not to be used for takeoff, landing, or taxiing by aircraft.

Straight-in Landing/approach: A landing made on a runway aligned within 30 degrees of the final approach course following completion of an instrument approach.

T

Tactical Air Navigation (TACAN):
An ultrahigh frequency electronic air navigation system which provides suitably equipped aircraft a continuous indication of bearing and distance to the TACAN **station.**

Takeoff Runway Available (TORA):
See declared distances.

Takeoff Distance Available (TODA):
See declared distances.

Taxilane: A taxiway designed for low speed and precise taxiing. Taxilanes are usually, but not always, located outside the movement area and provide access to from taxiways to aircraft parking positions and other terminal areas.

Taxiway: A defined path established for the taxiing of aircraft from one part of an airport to another.

Taxiway Design Group: A classification of airplanes based on outer to outer Main Gear Width (MGW) and Cockpit to Main Gear (CMG) distance.

Taxiway Safety Area (TSA): A defined surface alongside the taxiway prepared or suitable for reducing the risk of damage to an airplane unintentionally departing the taxiway.

Terminal Instrument Procedures: Published flight procedures for conducting instrument approaches to runways under instrument meteorological conditions.

Terminal Radar Approach Control:
An element of the air traffic control system responsible for monitoring the enroute and terminal segment of air traffic in the airspace surrounding airports with moderate to high levels of air traffic.

Tetrahedron: A device used as a landing direction indicator. The small end of the tetrahedron points in the direction of landing.


Tetrahedron

Threshold: The beginning of that portion of the runway available for landing. In some instances, the threshold may be displaced.

Touch-and-go: An operation by an aircraft that lands and departs on a runway without stopping or exiting the runway. A touch-and-go is recorded as two operations: one operation for the landing and one operation for the takeoff.

Touchdown: The point at which a landing aircraft makes contact with the runway surface.

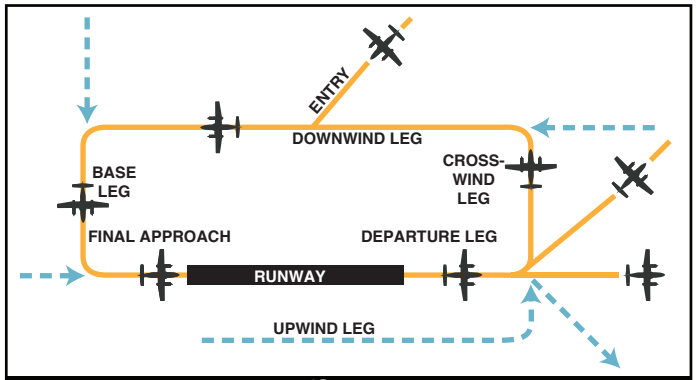
Touchdown and Lift-off Area (TLOF):
A load bearing, generally paved area, normally centered in the FATO, on which a helicopter lands or takes off.

Touchdown Zone (TDZ): The first 3,000 feet of the runway beginning at the threshold.

Touchdown Zone Elevation (TDZE):
The highest elevation in the touchdown zone.

Touchdown Zone Lighting: Two rows of transverse light bars located symmetrically about the runway centerline normally at 100-foot intervals. The basic system extends 3,000 feet along the runway.

Traffic Pattern: The traffic flow that is prescribed for aircraft landing at or taking off from an airport. The components of a typical traffic pattern are the upwind leg, crosswind leg, downwind leg, base leg, and final approach.



Traffic Pattern

U

Uncontrolled Airport: An airport without an airport traffic control tower at which the control of Visual Flight Rules traffic is not exercised.

Uncontrolled Airspace: Airspace within which aircraft are not subject to air traffic control.

Universal Communication (UNICOM): A non-government communication facility which may provide airport information at certain airports. Locations and frequencies of UNICOMs are shown on aeronautical charts and publications.

Unmanned Aircraft System (UAS): An unmanned aircraft and the equipment necessary for the safe and efficient operation of that aircraft. An unmanned aircraft is a component of a UAS. It is defined by statute as an aircraft that is operated without the possibility of direct human intervention from within or on the aircraft (Public Law 112-95, Section 331(8)).

Upwind Leg: A flight path parallel to the landing runway in the direction of landing. See "traffic pattern."

V

Vector: A heading issued to an aircraft to provide navigational guidance by radar.

Very High Frequency Omni-directional Range (VOR): A ground-based electronic navigation aid transmitting very high frequency navigation signals, 360 degrees in azimuth, oriented from magnetic north. Used as the basis for navigation in the national airspace system. The VOR periodically identifies itself by Morse Code and may have an additional voice identification feature.

Very High Frequency Omni-directional Range/Tactical Air Navigation (VORTAC): A navigation aid providing VOR azimuth, TACAN azimuth, and TACAN distance-measuring equipment (DME) at one site.

Victor Airway: A system of established routes that run along specified VOR radials, from one VOR station to another.

Visual Approach: An approach wherein an aircraft on an IFR flight plan, operating in VFR conditions under the control of an air traffic control facility and having an air traffic control authorization, may proceed to the airport of destination in VFR conditions.

Visual Approach Slope Indicator (VASI): An airport lighting facility providing vertical visual approach slope guidance to aircraft during approach to landing. The VASI is now obsolete and is being replaced with the PAPI.

Visual Flight Rules (VFR): Rules that govern the procedures for conducting flight under visual conditions. The term VFR is also used in the United States to indicate weather conditions that are equal to or greater than minimum VFR requirements. In addition, it is used by pilots and controllers to indicate type of flight plan.

Visual Meteorological Conditions: Meteorological conditions expressed in terms of specific visibility and ceiling conditions which are equal to or greater than the threshold values for instrument meteorological conditions.

Visual Runway: A runway without an existing or planned instrument approach.

VOR: See "Very High Frequency Omni-directional Range."

VORTAC: See "Very High Frequency Omni-directional Range/Tactical Air Navigation."

W

Warning Area: See special-use airspace.

Wide Area Augmentation System: An enhancement of the Global Positioning System that includes integrity broadcasts, differential corrections, and additional ranging signals for the purpose of providing the accuracy, integrity, availability, and continuity required to support all phases of flight.

Windsock/Wind Cone: A visual aid that indicates the prevailing wind direction and intensity at a particular location.

Windsock/Wind Cone

Abbreviations

AAM: advanced air mobility

AC: advisory circular

ACIP: airport capital improvement program

ADF: automatic direction finder

ADG: airplane design group

ADS-B: automatic dependent surveillance-broadcast

AFSS: automated flight service station

AGL: above ground level

AIA: annual instrument approach

AIP: Airport Improvement Program

AIR-21: Wendell H. Ford Aviation Investment and Reform Act for the 21st Century

ALS: approach lighting system

ALSF-1: standard 2,400-foot high intensity approach lighting system with sequenced flashers (CAT I configuration)

ALSF-2: standard 2,400-foot high intensity approach lighting system with sequenced flashers (CAT II configuration)

AOA: Aircraft Operation Area

APRC: approach reference code

APV: instrument approach procedure with vertical guidance

ARC: airport reference code

ARFF: aircraft rescue and fire fighting

ARP: airport reference point

ARTCC: air route traffic control center

ASDA: accelerate-stop distance available

ASR: airport surveillance radar

ASOS: automated surface observation station

ASV: annual service volume

ATC: airport traffic control

ATCT: airport traffic control tower

ATIS: automated terminal information service

AVGAS: aviation gasoline - typically 100 low lead (100LL)

AWOS: automated weather observation station

BRL: building restriction line

CFR: Code of Federal Regulation

CIP: capital improvement program

DME: distance measuring equipment

DNL: day-night noise level

DPRC: departure reference code

DWL: runway weight bearing capacity of aircraft with dual-wheel type landing gear

DTWL: runway weight bearing capacity of aircraft with dual-tandem type landing gear

eVTOL: electric vertical takeoff and landing aircraft

FAA: Federal Aviation Administration

FAR: Federal Aviation Regulation

FBO: fixed base operator

FY: fiscal year

GA: general aviation

GPS: global positioning system

GS: glide slope

HIRL: high intensity runway edge lighting

IFR: instrument flight rules (FAR Part 91)

ILS: instrument landing system

IM: inner marker

LDA: localizer type directional aid

LDA: landing distance available

LIRL: low intensity runway edge lighting

LMM: compass locator at middle marker

LNAV: lateral navigation

LOC: localizer

LOM: compass locator at outer marker

LP: localizer performance

LPV: localizer performance with vertical guidance

MALS: medium intensity approach lighting system

MALSR: MALS with runway alignment indicator lights

MALSF: MALS with sequenced flashers

MIRL: medium intensity runway edge lighting

MITL: medium intensity taxiway edge lighting

MLS: microwave landing system

MM: middle marker

MOA: military operations area

MSL: mean sea level

MTOW: maximum takeoff weight

NAVAID: navigational aid

NDB: non-directional radio beacon

NEPA: National Environmental Policy Act

NM: nautical mile (6,076.1 feet)

NPDES: National Pollutant Discharge Elimination System

NPIAS: National Plan of Integrated Airport Systems

NPRM: notice of proposed rule making

ODALS: omni-directional approach lighting system

OFA: object free area

OFZ: obstacle free zone

OM: outer marker

PAPI: precision approach path indicator

PFC: porous friction course

PFC: passenger facility charge

PCI: pavement condition index

PCL: pilot-controlled lighting

PIW: public information workshop

POFZ: precision object free zone

PVC: poor visibility and ceiling

RCO: remote communications outlet

RDC: runway design code

REIL: runway end identification lighting

RNAV: area navigation

RPAS: remotely piloted aircraft system

RPZ: runway protection zone

RSA: runway safety area

RTR: remote transmitter/receiver

RVR: runway visibility range

RVZ: runway visibility zone

SALS: short approach lighting system

SASP: state aviation system plan

SEL: sound exposure level

SID: standard instrument departure

SM: statute mile (5,280 feet)

SRE: snow removal equipment

SSALF: simplified short approach lighting system with runway alignment indicator lights

STAR: standard terminal arrival route

SWL: runway weight bearing capacity for aircraft with single-wheel tandem type landing gear

TACAN: tactical air navigational aid

TAF: Federal Aviation Administration (FAA) Terminal Area Forecast

TDG: taxiway design group

TLOF: Touchdown and lift-off

TDZ: touchdown zone

TDZE: touchdown zone elevation

TODA: takeoff distance available

TORA: takeoff runway available

TRACON: terminal radar approach control

UAS: unmanned aircraft system

VASI: visual approach slope indicator

VFR: visual flight rules (FAR Part 91)

VHF: very high frequency

VOR: very high frequency omni-directional range

VORTAC: very high frequency omni-directional range/tactical air navigation

WAAS: wide area augmentation system

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