Narrative Report
Airport Master Plan – Phase 1
Portage Municipal Airport (C47)
Mael Field • Portage, Wisconsin

July 2021 • Final Report

FAA AIP #3-55-0066-05

PREPARED FOR:

PORTAGE WISCONSIN

Bureau of Aeronautics WISCONSIN DEPARTMENT OF TRANSPORTATION

PREPARED BY:

TKDA

CITY OF PORTAGE RESOLUTION

RESOLUTION RELATIVE TO AIRPORT MASTER PLAN AND AIRPORT LAYOUT PLAN

WHEREAS, the City of Portage undertook an Airport Master Plan study to address non-standard conditions and actions needed to achieve compliance at the current airport; and to determine the viability of the existing airport site to meet the safety standards and the community's aviation need; and

WHEREAS, the Airport Master Plan will provide the City with a framework for future airport development based upon aviation demand, facility needs, and the City's goals and vision; and

WHEREAS, an Airport Layout Plan is a requirement to receive State and Federal funding for improvements; and

WHEREAS, the Airport Commission has reviewed the Airport Master Plan and Airport Layout Plan and has recommended to the Common Council approval.

NOW, THEREFORE BE IT HEREBY RESOLVED by the Common Council of the City of Portage, that the Airport Master Plan and Airport Layout Plan are hereby approved and a copy of this Resolution be forwarded to the Bureau of Aeronautics.

Dated this 22nd day of July, 2021.

Rick Dodd, Mayor

Marie A. Moe, WCPC, MMC, City Clerk

Resolution requested by:
Airport Commission

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EXECUTIVE SUMMARY

PORTAGE MUNICIPAL AIRPORT

AIRPORT MASTER PLAN – PHASE 1

TKDA

EXECUTIVE SUMMARY

STUDY BACKGROUND

The Airport Master Plan (AMP) study for the Portage Municipal Airport (FAA ID: C47) is developed to provide the Airport Sponsor (City of Portage) with a framework for future airport development at the existing airport site based upon aviation demand, facility needs, and the Sponsor's goals and vision. The last comprehensive AMP study was completed in 2011 and did not fully document non-standard conditions and actions needed to achieve compliance. A key driving factor to the completion of this AMP is to determine the viability of the existing airport site to meet the safety standards and the community's aviation needs. This study will enable the City of Portage to make an informed decision on future investments at the airport.

AIRPORT FACILITY

C47 is located in Columbia County and on the north edge of the City of Portage corporate limits. The airport is located adjacent to residential, industrial and commercial development and is surrounded by roads including Airport Road, Silver Lake Drive, County Highway CX and Interstate 39. C47 is part of the National Plan of Integrated Airport Systems (NPIAS), and is classified as a Local General Aviation airport by the Federal Aviation Administration (FAA). C47 features two paved runways – Runway 18-36 (3,768' x 60') and crosswind Runway 4-22 (2,510' x 40'). The airport also has visual navigational aids, a terminal/main hangar building, aircraft parking apron, AVGAS fuel facility, and several aircraft storage hangar buildings.

AIRPORT ACTIVITY

C47 sees a variety of aviation usage by recreational/flight training, including occasional use by business aviation and military operators. The airport has 25 based aircraft and over 3,500 annual operations, or about 9 takeoffs and landings per day. The airport is forecast to have nominal growth in based aircraft and operations through the year 2038. Growth in aviation activity including new based aircraft and larger business aviation aircraft is constrained by the size of the facilities. The constrained forecast of aviation activity at C47 is summarized in the table below.

Critical Design Aircraft
Beechcraft Baron G58
FAA AAC-B, ADG-I

C47 Aviation Activity Forecasts

Forecast Parameter	Forecast Year				Annual Growth
	2018	2023	2028	2038	
Based Aircraft	25	26	26	28	0.49%
Total Operations	3,700	3,826	3,960	4,255	0.70%

The critical design aircraft is the most demanding aircraft or grouping of aircraft with similar characteristics to regularly use the airport. Based on information collected from airport users, the existing and future critical design aircraft is expected to remain a small twin-engine piston aircraft throughout the planning period.

FACILITY NEEDS & RECOMMENDED DEVELOPMENT

C47 has several deficiencies to minimum FAA and state airport design standards, including objects in close proximity to the runways and numerous airspace obstructions to the runway approaches. Facility needs were identified to meet aeronautical demands. Major needs include:

- Correct existing FAA airport design standard deficiencies for both runways
- Mitigate airspace obstructions to all runway approaches to meet FAA standards
- Maintain a runway length of at least 3,300 feet with instrument approaches, if possible
- Rehabilitate or reconstruct airport pavements to extend their useful life
- Upgrade primary runway lighting and navigational aids
- Reconfigure taxiway and aircraft parking area geometry to meet current standards
- Provide additional aircraft storage hangar development areas to meet future needs
- Replace terminal building and fuel facility with new infrastructure

Anticipated long-term facility needs include a runway length of 3,800 feet or 5,500 feet to accommodate larger aircraft up to business jets.

Several development alternatives were analyzed to determine the on-airport and off-airport impacts of accommodate facility needs at the existing airport site. The analyzed concluded:

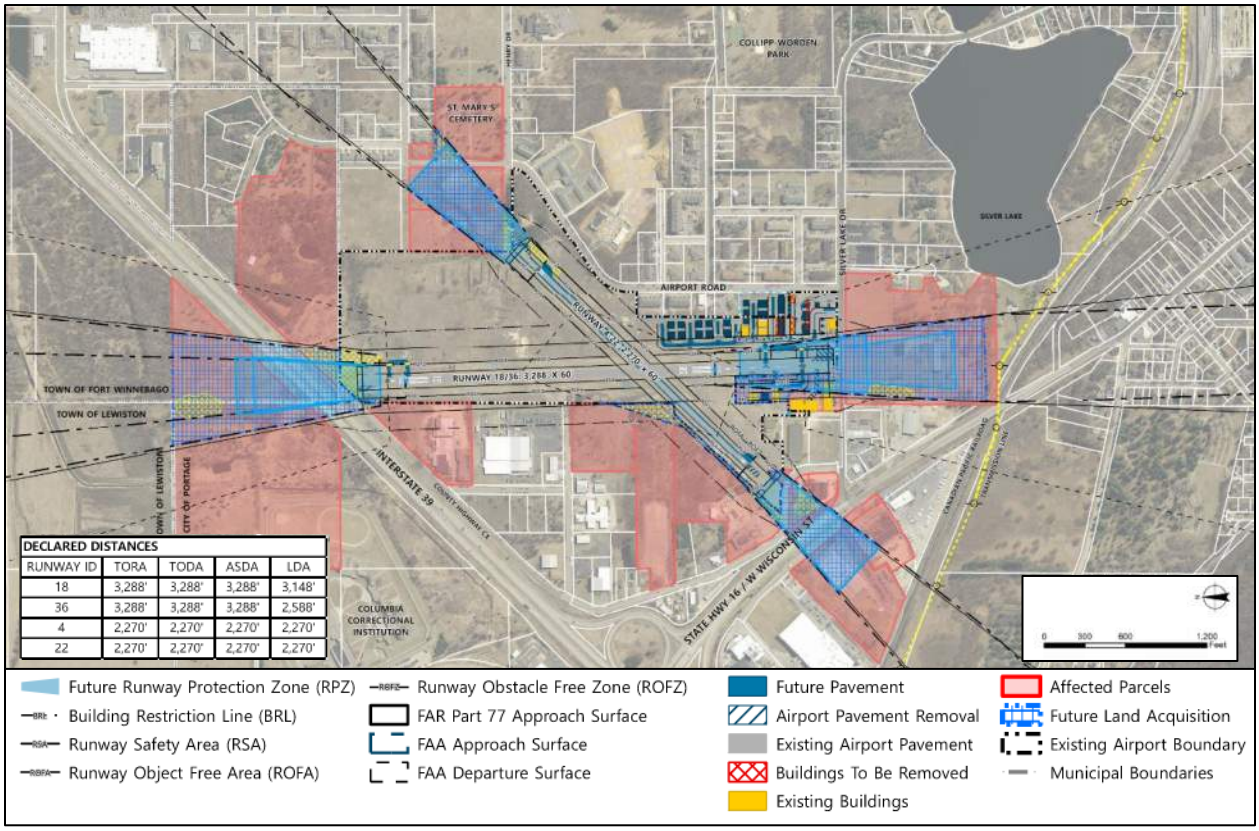
- The impacts and costs of building a 3,800-foot or 5,500-foot runway at the existing airport site are not feasible and warrant exploring a replacement airport site.

- ✈ Constructing a 3,300-foot runway to meet design standards on an existing or new runway alignment resulted in significant impacts and costs to the Sponsor.
- ✈ Improving the existing airport site to meet basic safety and compliance standards best satisfies aeronautical needs while considering potential operational, socioeconomic, environmental, and fiscal impacts in the short-term - is not a long-term solution to meet unconstrained future demand
- ✈ Exploring a replacement airport site is recommended considering the cost and impacts of improving the existing airport to meet the community's long-term aviation needs.

The recommended airport development for the existing airport site provides the Sponsor with a plan to address the highest priority safety items and maintain existing infrastructure, yet plan for future development if the airport remains at the existing site. It results in relocating runway ends/thresholds to meet critical safety standards. Runway 18-36 is reduced to 3,288 feet in length and Runway 4-22 is reduced to 2,270 feet in length with displaced thresholds established. Other recommended development includes reconfiguring critical taxiway/apron pavement geometry, acquiring land, and removing obstructions. The plan also maximizes available expandability options if the existing airport site remains.

In January 2021, the Portage Common Council approved seeking a replacement airport site and making priority safety improvements to the existing airport site until a new site is commissioned.

C47 Long-Term Development Plan



IMPLEMENTATION & FINANCIAL PLAN

Recommended projects are identified in the airport's implementation plan. These are sequenced based on priority actions, scheduled maintenance, available funding and demand triggers to provide the airport sponsor with a realistic implementation plan. The actual accomplishment of the projects may change based upon federal funding obligations, Sponsor priorities, regulatory justification, on available funding (federal, state and local).

The airport development plan within the next 10 years includes the following major preservation and safety/standards projects:

- Update Airport Layout Plan (ALP) for interim improvements to existing airport site
- Conduct airport feasibility study for a replacement airport site
- Relocate Runway 18-36 & 4-22 ends/thresholds and lighting
- Construct taxiway to new Runway 36 end, relocate aircraft parking and fuel facility
- Reconstruct taxilane pavements in poor condition
- Reconstruct Runway 18-36 and replace lighting when it is due for major work
- Reconstruct primary access taxiway
- Reconstruct aircraft parking apron pavement
- Reconstruct and widen Runway 4-22

The preferred airport development plan for the next 10 years provides the basis for the airport to update the Capital Improvement Plan (CIP).

The proposed 10-year financial plan identifies over $8.6 million in airport improvements at C47 with a net local share of over $660,000, or 7.6% of the total. Federal and state grants are projected to cover the remainder of the project cost share through the year 2030. The Sponsor should maximize on-airport revenue generating opportunities and work with agency partners to secure federal, State, and other funding to the extent possible.

C47 Project Financial Plan

Planning Period	Total Cost	FAA Share	State Share	Local Share
Short-Term (0-5 Years)	$2,651,668	$1,470,751	$895,583	$285,333
Mid-Term (6-10 Years)	$6,000,000	$4,950,000	$675,000	$375,000
TOTAL	**$8,651,668**	**$6,420,751**	**$1,570,583**	**$660,333**

PUBLIC & AGENCY INVOLVEMENT

Key stakeholders associated with or that may be affected by C47 airport development were asked to participate to provide input in the airport planning process before decisions were made. Input received influenced the direction of the study's conclusions. Various public and agency engagement tools were used to share information and collect feedback, including:

- Technical Advisory Committee (TAC) meetings (4)
- Open house meetings and/or public information meetings (3)
- Project update newsletters (3)
- Project website with video summaries after each TAC meeting (4)
- Wisconsin Bureau of Aeronautics and FAA coordination meetings/teleconferences

The Portage Common Council adopted the airport master plan study on July 22, 2021.

CHAPTER ONE

INTRODUCTION

PORTAGE MUNICIPAL AIRPORT

AIRPORT MASTER PLAN – PHASE 1

TKDA

INTRODUCTION

OVERVIEW

A master plan provides the airport owner and regulatory agencies a guidebook for future airport improvements by identifying existing and future demand, facility requirement needs, development initiatives, environmental and land use requirements, as well as funding and financial planning recommendations. A master plan also incorporates the latest federal and state regulatory requirements to support airport safety, efficiency and compatibility. To summarize, it is an effective written and graphical representation of ultimate airport development.

The goal of the Airport Master Plan for the Portage Municipal Airport (FAA identifier: C47) is to provide the City of Portage with a cost effective framework of future airport development at the existing airport site. Major considerations include meeting federal safety standards while satisfying aviation demand and minimizing environmental and socioeconomic impacts.

TKDA was hired by the City of Portage to complete the technical elements of the study. Financial grant assistance for this project was provided by the Federal Aviation Administration (FAA), Wisconsin Department of Transportation, Bureau of Aeronautics (WBOA), and the City of Portage.

MASTER PLAN PROCESS

Master Plans provide a step-by-step outline for each airport to address its key issues. FAA defines the master planning process in FAA Advisory Circular (AC) 150/5070-6B, *Airport Master Plans*. Plans allow for the airport to adapt to actual demand-driven needs. A graphical illustration of a typical master plan process is provided in **Exhibit 1-1**.

Public and aviation agency involvement is interwoven to each and every step of the process. This coordination effort provides the airport owner with valuable feedback to consider the needs of these key stakeholders when developing future airport plans.

Exhibit 1-1
Typical Airport Master Plan Process

Source: FAA Advisory Circular 150/5070-6B, Change 2, Airport Master Plans

Phase 1 of the Airport Master Plan for the Portage Municipal Airport consists of the following elements as identified by FAA:

- Pre-Planning – Airport development concerns are identified and planning objectives prepared to address these issues. The type of study and overall level of detail is formulated.
- Inventory of Existing Conditions – Develop an overview of airport setting, airside facilities, airspace/navigational aids, landside and support facilities, environmental overview, surrounding land use and socioeconomic conditions.
- Forecast of Aviation Demand – Estimate current and projected future airport activity for general aviation including the design aircraft using established forecasting methods. Forecasts are approved by the FAA.
- Facility Requirements – Compare the existing facilities with the future demand and identify the facility requirements to satisfy the aviation safety, capacity and compatibility needs.
- Alternatives Development and Evaluation – Identify and evaluate options to meet facility needs considering both on-airport and off-airport factors consistent with the study goals. Select a preferred alternative.
- Environmental Overview – Provide an overview of anticipated environmental impacts of the proposed development plans.
- Facilities Implementation Plan and Financial Feasibility Analysis – Prepare a comprehensive plan for implementation of the preferred alternative including project triggers, sequencing, and cost estimates. Identify available funding sources to execute the plan.

- Stakeholder and Public Involvement – Prepare and execute a plan to engage important airport stakeholders and the general public throughout the study to gather their input and consider their concerns.

The airport owner will at a later time complete this step in Phase 2 of the study:

- Airport Layout Plan – Document the existing and planned airport facilities through an Airport Layout Plan drawing set, including collection of aeronautical survey data, approved by the airport sponsor, state and FAA.

Study Need

The Wisconsin Bureau of Aeronautics has been working with the City of Portage to identify the next steps to meet the needs and goals of the Portage Municipal Airport. The airport has several existing deficiencies to FAA airport design standards. Previous studies did not fully document non-standard conditions and actions needed to achieve compliance. An updated airport master plan study is needed to document non-standard conditions, review the viability of the existing airport site to meet facility requirements, and allow the City of Portage to make an informed decision on future investment in the airport. An updated Airport Master Plan will allow the City to determine aeronautical demand, and formulate an updated plan for the existing airport site while incorporating airport design, operational, socioeconomic, environmental, zoning and land use considerations.

This new master plan replaces the previous master planning documentation completed in 2011. It will document all non-standard conditions, review the viability of the existing airport site to meet facility requirements and allow the airport sponsor to make an informed decision on future investment in the airport. Although the Master Plan does not guarantee development will occur, it does ensure the City of Portage will have an action plan to determine the direction of the airport.

Planning Considerations

Airport planning considerations are items that should be evaluated because they have the potential to affect the airport facility in the long-term. The planning considerations for the C47 master plan study include:

- The airport needs to determine if existing and forecasted aeronautical needs can be accommodate at the existing airport site. The airport should study airport facility options to meet aeronautical needs on the existing airport site.
- Airport has several deficiencies to FAA airport design standards. The airport should identify all deficiencies to FAA airport design standards and provide options to meet standards.
- Determine the recommended runway length and configuration to meet local user needs.
- Because of the constrained environment, the airport needs to balance airport needs with operational, environmental and fiscal impacts.
- The airport owner needs a realistic action plan for existing airport site to secure funding to meet airport safety and capacity needs.

- Existing runway approaches are obstructed. The airport needs to identify on-airport and off-airport airspace obstructions and prepare action plan to meet safety standards.
- There are structures within the existing FAA Runway Protection Zones. The airport should evaluate surrounding land use compatibility and identify options to achieve compliance.
- The terminal/hangar area is constrained by the airfield, surrounding roads and non-aviation development. The airport should identify general aviation and support facility needs.

Study elements to address the major planning considerations for this Master Plan are shown in **Figure 1-1**.

STUDY OBJECTIVES

Based on the airport planning considerations, the airport sponsor's planning objectives for this airport master plan study include:

- Identify aviation demand and facility requirements local to the Portage Area,
- Document deficiencies to FAA airport design standards for the existing airport configuration,
- Review the feasibility of achieving compliance with facility requirements, including evaluation options and costs,
- Develop a decision-making document to allow the airport sponsor to determine the future of the airport,
- Develop consensus with local stakeholders on understanding key airport planning issues,
- Obtain FAA and WBOA feedback to understand the opportunities and challenges of potentiation decision on the airport, and
- Establish the framework for future studies and actions to meet facility requirements.

PUBLIC INVOLVEMENT PROGRAM

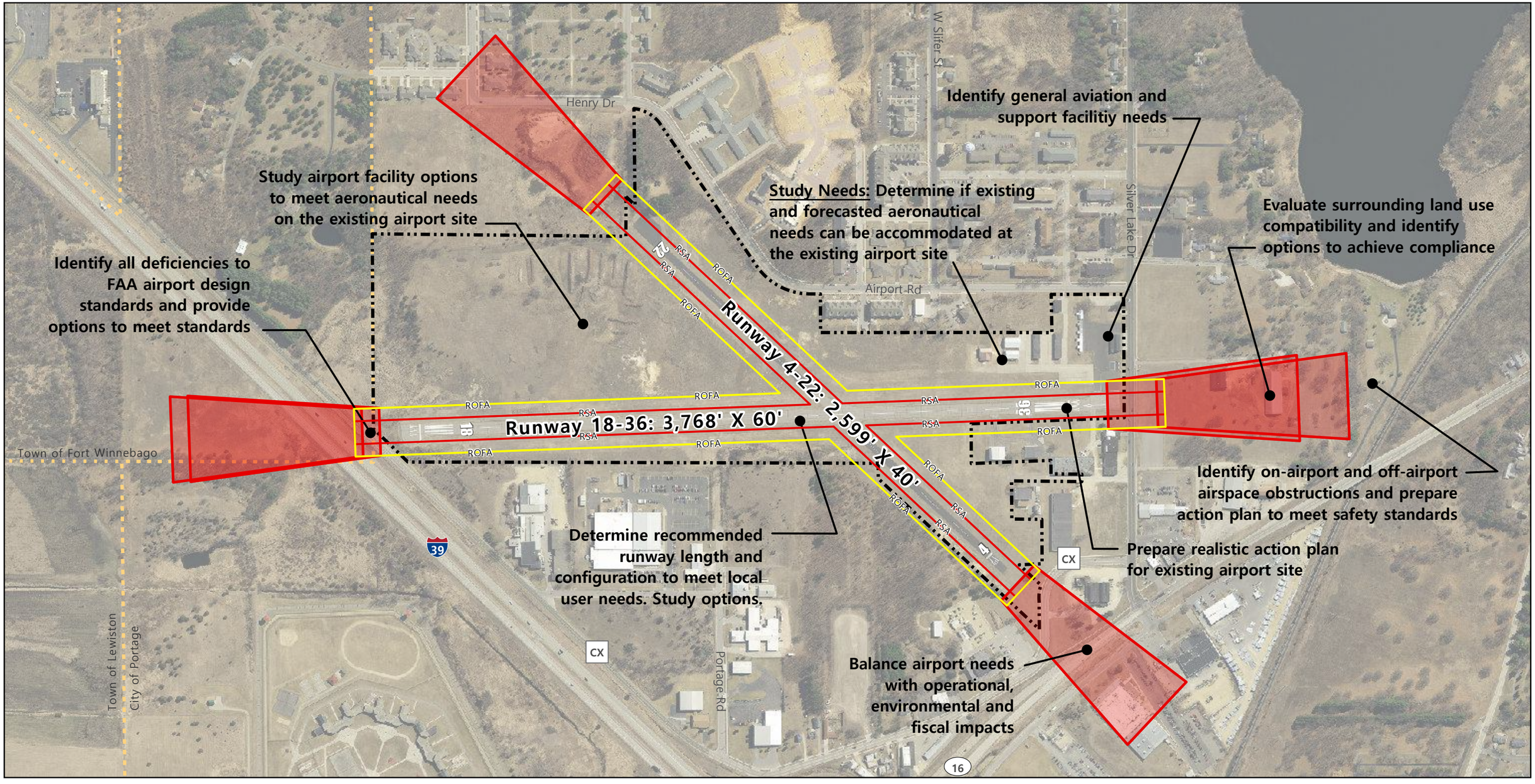
Key stakeholders associated with or that may be affected by C47 airport development were asked to participate to provide input in the airport planning process before decisions were made. Documentation is located in **Appendix A**. The following tools were used.

Technical Advisory Committee

The formation of the Technical Advisory Committee (TAC) was critical for the development of a master plan which meets the needs and demands of its users. The Portage Airport Master Plan TAC included representatives from City staff, Airport Commission, airport management, airport tenants, community businesses, and City Council. The TAC met four times throughout the planning process at key point in the study to provide insight and input into the proposed airport development plans. The TAC meeting dates were February 13, 2019, May 15, 2019, November 13, 2019, and October 28, 2020.

PORTAGE MUNICIPAL AIRPORT

Figure 1-1: Planning Considerations Map



Engineering
Architecture
Planning

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tkda.com

Data source: Columbia County Land Information Department http://opendata-cclid.opendata.arcgis.com/

Public Informational Meetings

Throughout this planning process the public at-large was given an opportunity to provide feedback on the study elements. Two public informational meetings were held to present information to interested members of the public to seek input at the study kickoff (November 14, 2018) and draft alternatives (September 29, 2020). The focus of the meetings was to inform the public and media of the study process, major findings to date, and to gather data from the local businesses that use the airport/general aviation. Members of the public were encouraged to provide input regarding airport development and any concerns they may have regarding airport operations. Public comments are located in **Appendix A**.

In addition, a focused public information meeting for business users was held in November 2018 to seek input from business users to help determine aviation demand.

A public information meeting to review the airport master plan findings was held prior to the Common Council meeting on January 28, 2021. The master plan preferred alternative was adopted by the Common Council on January 28, 2021. The Common Council adopted the airport master plan study on July 22, 2021.

Other Tools

In addition the public involvement meetings, other tools utilized include:

- Project Website: A project website (www.portageairportplan.tkda.com) was established to provide a project overview, post project comments, post meeting information, provide project links and contacts, and collect feedback from the public. Video summaries were developed as posted after each TAC meeting to provide an overview of the content presented.
- Project Newsletters: Three newsletters were developed at strategic points in the study to summarize key information for the public. Newsletters were posted to the project website.

STUDY DOCUMENTATION

The Master Plan Update documentation was divided into chapters of information to document airport planning data, analysis, findings, and recommendation of the study. The following sections are included in the narrative report:

- Executive Summary
- Chapter 1 – Introduction
- Chapter 2 – Airport Inventory
- Chapter 3 – Aviation Demand Forecasts
- Chapter 4 – Facility Requirements
- Chapter 5 – Alternatives Analysis
- Chapter 6 – Implementation Plans

The following appendices provide supporting documentation for this study:

- Appendix A – Public Involvement

- Appendix B – Airport User Survey
- Appendix C – Airport Business User Survey
- Appendix D – Airport Property Documentation
- Appendix E – FAA Design Standard Deficiencies
- Appendix F – Alternatives Cost Estimates

REGULATORY GUIDELINES

This master plan study is prepared in accordance with the most recent FAA Advisory Circulars including but not limited to AC 150/5070-6B *Airport Master Plans*, AC 150/5300-13A *Airport Design*, Orders, Standard Operating Procedures (SOPs) as well as State of Wisconsin rules and regulations. In addition, city, county, regional, state, and national planning and environmental guidelines are incorporated into the Master Planning effort to provide the sponsor and resource agencies with a comprehensive review of future airport development. These guidelines were used to identify recommended airside and landside projects tailored to C47's size, setting, environmental conditions and aeronautical needs.

DISCLAIMER

The preparation of this document was supported in part with financial assistance through the Airport Improvement Program from the Federal Aviation Administration (AIP Grant Number 3-55-0066-05) as provided under Title 49 USC § 47104. The contents do not necessarily reflect the official views or policy of the FAA or Wisconsin Bureau of Aeronautics. Acceptance of this report by the FAA or Wisconsin Bureau of Aeronautics does not in any way constitute a commitment on the part of the United States to participate in any development depicted therein, nor does it indicate that the proposed development is environmentally acceptable in accordance with appropriate public laws.

CONCLUSION

This Airport Master Plan study will serve as a guide to decision makers, users, and the general public relative to realistic and achievable development that is in line with both airport and community objectives. The document will provide the City of Portage with a guide for airport development at the existing airport site based upon current and anticipated conditions. This document, analysis and subsequent Airport Layout Plan are essential to allow an airport sponsor to compete for and receive federal and/or state assistance for airport improvements.

CHAPTER TWO

AIRPORT INVENTORY

PORTAGE MUNICIPAL AIRPORT

AIRPORT MASTER PLAN – PHASE 1

TKDA

AIRPORT INVENTORY

INTRODUCTION

The Inventory chapter of the Airport Master Plan for the Portage Municipal Airport (C47) provides the baseline framework to evaluate the airport facility. The facility inventory provides a review of the existing social and built environment to formulate profiles of the community and airport. The environmental inventory provides data to identify key environmental constraints and planning considerations that may affect airport development.

The inventory data collection will be used to compare the existing conditions to the airport needs determined in future sections of the plan. This will lead to a plan created for the future development of the airport. Background information and data is gathered from various sources and compiled into this chapter.

AIRPORT BACKGROUND

Location & Access

Portage is located in south-central Wisconsin along the Wisconsin River in Columbia County. The city is roughly 42 miles north of Madison and 105 miles west northwest of Milwaukee. The city is located along Interstate 39, and a few miles north of the intersection of Interstates 90/94. The city is also served by U.S. Highway 51, as well as and State Highways 16 and 33. Portage is located 45 minutes from Madison and 20 minutes from Wisconsin Dells. The city is also located along several railroad lines.

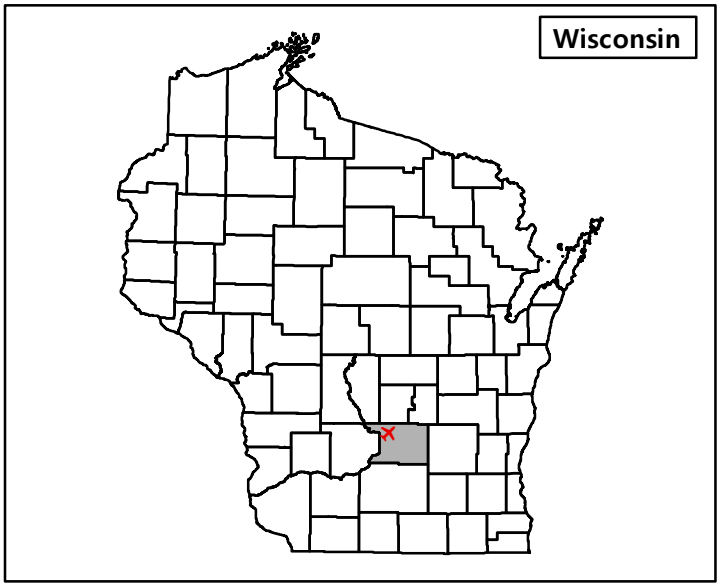
C47 is located 3 miles northwest of the central business district of Portage with city limits. The airport is accessible from State Highway 16 via Silver Lake Drive and Airport Road. The published Airport Reference Point (ARP), which is located at the geometric center of all the usable runways is N 43° 33’ 37.100” latitude and W 89° 28’ 58.300” longitude.

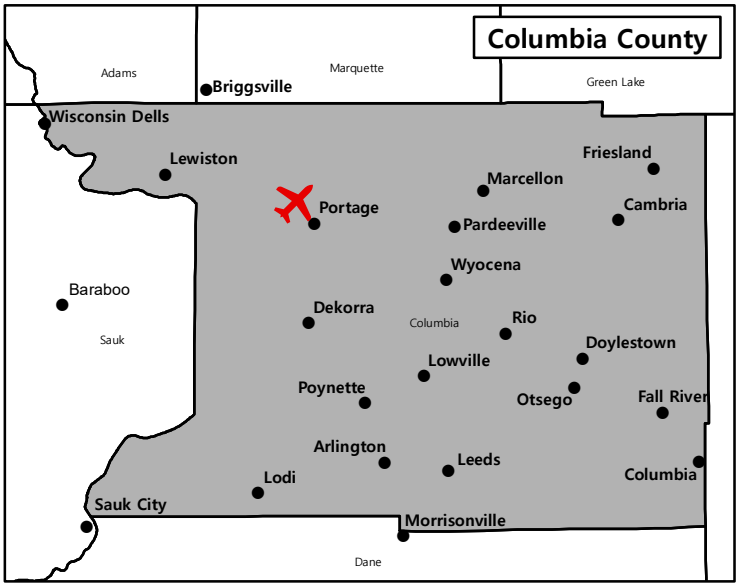
Setting

Portage is located in the Wisconsin River Valley between the Fox and Wisconsin Rivers. A mix of agricultural, forested and recreational land uses surround the community. C47 is within a generally urban environment surrounded by industrial, commercial, residential land uses, with some open space and wetlands to the north. Surrounding roadways include Interstate 39, County Highway CX, Silver Lake Drive, and Airport Road. The airport elevation is 824 feet above mean sea level (MSL).

PORTAGE MUNICIPAL AIRPORT

Figure 2-1: Airport Location





Portage Municipal Airport
Airport Boundary
City/Township Boundaries
Columbia County
County Boundaries
Freshwater Pond
Lake
Riverine

0 600 1,200 2,400 Feet

N

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Data Source: Columbia County Land Information Department, National Wetlands Inventory, FAA

Community & Socioeconomic Profile

Portage has an estimated population of 10,473 (2017) compared to 57,248 in all of Columbia County according to the U.S. Census Bureau. The city is 45 minutes north of the state capital in Madison. Portage is within the Madison Metropolitan Statistical Area (MSA) as defined by the U.S. Office of Management and Budget. Portage, which was previously the Winnebago settlement, received its name from the establishment of Fort Winnebago and was officially incorporated as Portage City in 1854. Portage is the county seat of Columbia County.

Portage is a regional center of commerce for Columbia County. Based on total employment, the County's economy is driven by agriculture, manufacturing, retail trade, and federal state/local government industries, each employing over 2,000 people in the County. The largest manufacturing employers include PendaForm Corporation (manufacturer of truck accessories), AMPI (cheese packaging), and Cardinal FG (glass manufacturer). Portage is home to the Columbia Correctional Institution. Madison Area Technical College has a campus in Portage.

Airport Ownership & Management

C47 is a city-owned public use airport with a contract Airport Manager. The Portage Airport Commission oversees all affairs in the management and operations of the airport including preparation of the annual operating budget. The city is responsible for the maintenance of the airport including snow removal and grass-cutting. The airport manager is responsible for on-site management (28 hours per week), fueling and airport lease/rent management. The Portage Common Council has ultimate decision authority regarding the airport. The city also works in conjunction with the Wisconsin Bureau of Aeronautics (WBOA) on all matters regarding airport development.

Airport Financials

The City of Portage is responsible for supporting the maintenance, operations and capital improvements at C47. The city tracks airport revenues and expenses as a separate 'Municipal Airport' account as part of the city's General Fund.

The airport manager's contract allows fuel and hangar lease revenue to be collected by the airport manager. A total of 5% of on-airport lease revenue and $0.05 per gallon of fuel sold is returned to the City of Portage. This amount totals about $1,500 annually. In 2017, approximately 11,000 gallons of fuel were sold. Monthly lease revenue totals nearly $1,800 when all hangars are occupied.

The city incurred an average of $31,319 in annual expenses between 2015 and 2017 for C47. The airport manager receives compensation for airport maintenance and consulting services. Average airport expense shares over 5% include:

- Other Professional Services (50.7%)
- Electricity & Gas (15.6%)
- Grounds Repair/Maintenance Supplies (15.4%)
- Buildings/Grounds (8.4%)

The city has an expense budget of about $40,000 for the municipal airport in 2019.

Capital improvements are funded through the local airport budget or directly by the city's General Fund. Some improvements receive state aid grants from the Wisconsin Bureau of Aeronautics.

Airport History

The Portage Municipal Airport, originally Mael Field, was activated in October 1941 according to FAA records. The airport was established in 1944 with two turf runways and an airport hangar that exists today (Main Hangar). Robert Mael established an aircraft manufacturing business at the airport. The Airport was first leased to the city from Robert Mael eventually purchased by the City of Portage in 1961. Airport ownership has since remained with the city. Today, the airport has two paved runways that follow the original airport runway alignments.

There have been several events over the years that have affected the airport's current configuration.

- 1944: Airport terminal constructed
- 1960s: Runway 4-22 (3,000' x 40') and Runway 17-35 (3,000' x 40') paved
- 1960s: Evidence of a 370-foot extension to Runway 17-35
- 1960s: Construction of several on-site hangars that remain today
- 1969: Friends of the airport installed Runway 17-35 edge lighting
- 1971: EAA hangar constructed
- Unknown: Runway 17-35 extended by 400-feet to the north with a turnaround
- 1996: Runway 17-35 reconstructed
- 2000s: Runway 4-22 shortened by +/- 500 feet when County Highway CX realigned
- 2010s: Runway 17-35 renamed Runway 18-36

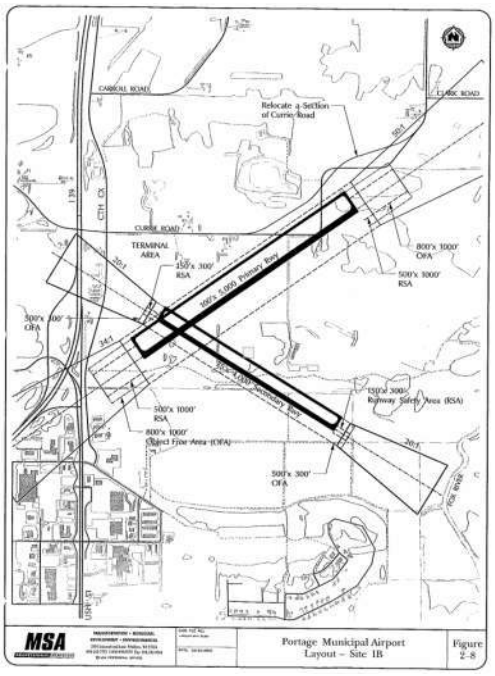
Previous Studies

The City of Portage has undertaken several studies to help determine the future of the airport. There has been discussion about moving the airport for nearly the past 50 years. Previous studies undertaken at the airport failed to provide the city with a comprehensive master plan to implement. Community development has encroached upon the airport. C47 today has several incompatible land uses and does not meet FAA airport design standards.

Below is a brief summary of previous studies conducted at Portage:

- 1972 – Airport Site Selection Study
- 1992 – Airport Site Selection Study
- 1994 – Runway Feasibility Study

New Portage Airport Site 1B (2005)



- 2002 – Airport Feasibility Study (Phase 1)
- 2003 – Airport Feasibility Study (Phase 2)
- 2007 – Environmental Assessment for new Airport
- 2011 – Airport Master Plan Update

The 1972 study recommended moving the airport but no action was completed. In 1992, the site selection study evaluated nine (9) alternate airport sites but all were rejected due to environmental and political factors. Expanding the airport current airport site with a 4,400-foot runway was rejected in 1994 because of required commercial property acquisition. With a nearby landfill closed, the city purchased the Evans farm for a potential new airport site north of Portage. The 2002 airport feasibility study determined the Evans farm site was feasible with a primary runway of 5,000 feet. The 1992 site selection study was updated in 2003 and found the Evans farm site to be the preferred site. The final environmental assessment was then prepared in 2007. New airport development did not proceed because of the establishment of new federal easement lands in the area. A 2011 master plan for the existing airport site reviewed several concepts but never offered the city with a conclusive path forward on how the airport could meet the community's aviation needs at the existing site.

The city is in need of a new plan that studies the feasibility of the existing site, identifies FAA safety standard deficiencies and provides the city with an action plan that guides future development at the airport while ensuring safety standards are met. This Airport Master Plan aims to provide the City of Portage with a document that meets these goals.

Airport Role & Design

Federal

Portage Municipal Airport is a public-use General Aviation (GA) Airport, meaning it accommodates general aviation activities other than scheduled air transportation operations. GA airports cover a large range of activities while providing essential aeronautical functions including flight training, aircraft maintenance, emergency response, business aviation and other economic activities.

There are currently 5,099 public-use airports in the United States. Of these, 3,321 existing and 7 proposed airports are considered important to the national air transportation system by the Federal Aviation Administration (FAA), and are eligible to receive federal grants for airport improvements. These airports are part of the FAA's National Plan of Integrated Airport Systems (NPIAS). FAA further defines the roles of airports into primary (380) and non-primary (2,941). Non-primary airports are categorized into one of four service levels, as displayed in **Exhibit 2-1**. Airports that do not meet these criteria are unclassified.

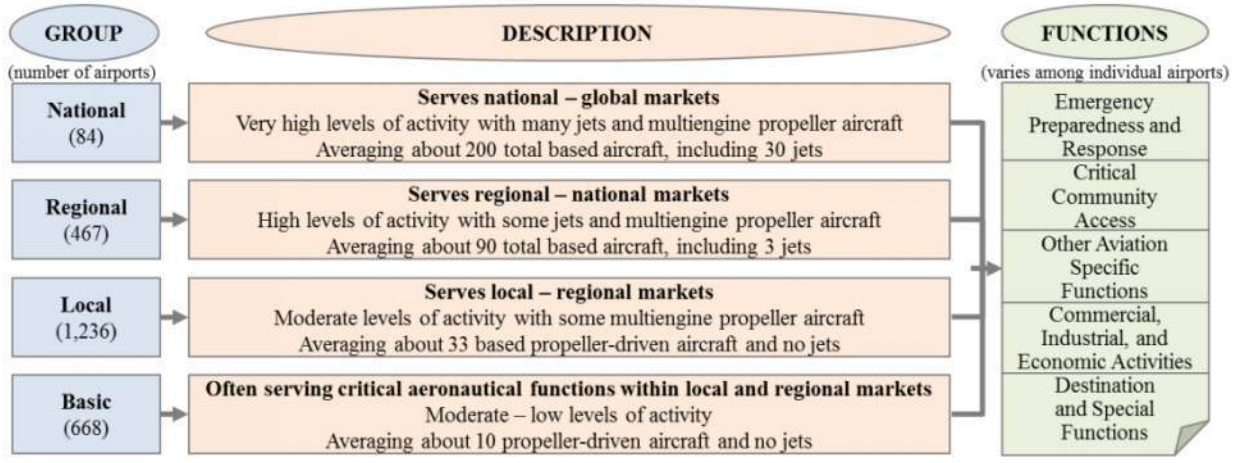
The NPIAS currently classifies C47 as a non-primary Local general aviation airport. Local airports serve local to regional markets, with moderate levels of activity with some multi-engine propeller aircraft.

Based upon the existing Capital Improvement Plan (CIP) submitted by the City of Portage and Wisconsin Bureau of Aeronautics to the U.S. Department of Transportation, an estimated

development cost of $12,350,000 of the $34.8 billion in airport development needs over the next five years (2019-2023) will be required to support identified facility needs at C47.

The FAA's Airport Reference Code (ARC) identifies a design category based on aircraft wingspan, tail height and approach speed for aircraft types that regularly use the airport. C47 is generally designed to accommodate ARC B-I aircraft. This design accommodates up to light twin-engine aircraft such as the Beechcraft Baron.

Exhibit 2-1
General Aviation Airport Categories



Source: FAA General Aviation Asset Study (2012)

State

Wisconsin's State Airport System Plan (SASP) categorizes airports into four classifications. Commercial Service Airports, Large, Medium and Small GA Airports. Portage is classified as a Medium General Aviation Airport in the SASP. The SASP last completed in 2010 identifies a minimum service level for each airport classification. The nearest GA airport with a runway length of 5,000 feet or greater is the Baraboo-Wisconsin Dells Airport, located 13 nautical miles to the west in Baraboo. The SASP estimates $13,979,100 in airport development from 2018-2022 to support identified facility needs at Portage.

Airport Service Area

The Airport Service Area (ASA) defines the geographic area that serves the basic public aviation needs. The core C47 service area provides service to populations where Portage is the closest NPIAS airport, as defined by drive time. This area is within 20 minutes to the north, 32 minutes to the east, 19 minutes to the south and 15 minutes to the west. Geographically this covers most of Columbia County, and large portions of Marquette, Adams, and Sauk Counties. The basic Portage service zone includes areas within a 30-minute drive time of Portage. The airport service area and surrounding airports are shown in **Figure 2-2**.

Airport Activity

GA accounts for the vast majority of the airport activity at C47. Flights are for business, personal and recreational uses. The FAA national based aircraft inventory (basedaircraft.com) shows there are 25 validated single-engine aircraft currently based at C47 as of May 2017. The FAA Terminal Area Forecast (TAF) estimates 4,750 annual operations (takeoffs and landings) performed at C47, or 13 per day on average. The busiest period at C47 coincides with the annual EAA Air Venture in Oshkosh in July. According to the airport manager, C47 may see as many as 200 visiting airplanes during this time.

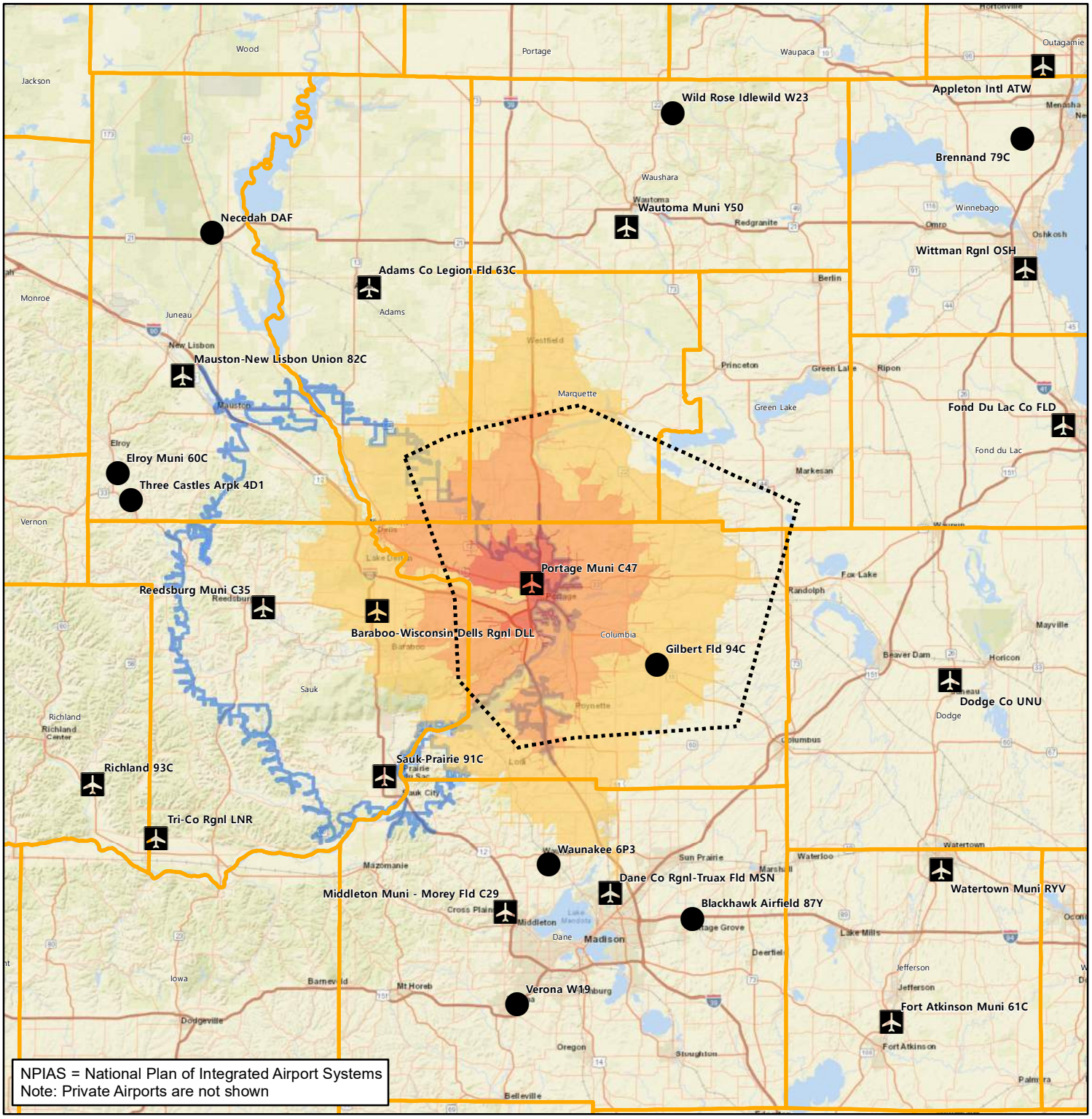
An airport user survey was completed in December 2018 to help identify user needs and activity trends. A total of 1,927 annual flight operations are estimated in the next five years from the 62 respondents. 11 of the 25 based aircraft (44%) responded to the survey. A summary of the responses is available in **Appendix B**.

In addition, a business user survey was completed in November 2018 to help identify the business needs for GA in Portage. A summary of the responses is available in **Appendix C**. The business survey identified five (5) local businesses that use GA to support their business. The Baraboo-Wisconsin Dells Airport is primarily used due to the short runway length at C47. Two (2) GA users identified a demand for 720 annual flight operations of business jet aircraft in year 2022.

More information on C47 airport activity is in the Aviation Demand Forecasts chapter of this study.

PORTAGE MUNICIPAL AIRPORT

Figure 2-2: Airport Service Area



Non-NPIAS, Public Use Airports

NPIAS Airports

Service Zone (Estimated)

County Boundaries

DLL Drive Time (30 Min)

Portage Drive Times (Minutes)

0-10

10-20

20-30

0 5 10 20 Miles

N

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TKDA

Data Sources: FAA, WI DNR

METEOROLOGICAL DATA

Weather conditions are a significant factor in the design and development of airport facilities. Local wind data was collected for the last 10 years from the Baraboo-Wisconsin Dells Airport (DLL). DLL is the closest airport weather station to C47. This data was obtained from the National Climatic Data Center (NCDC) under the control of the National Oceanic Atmospheric Administration (NOAA). Precipitation and temperature was gathered from NOAA from Portage[1].

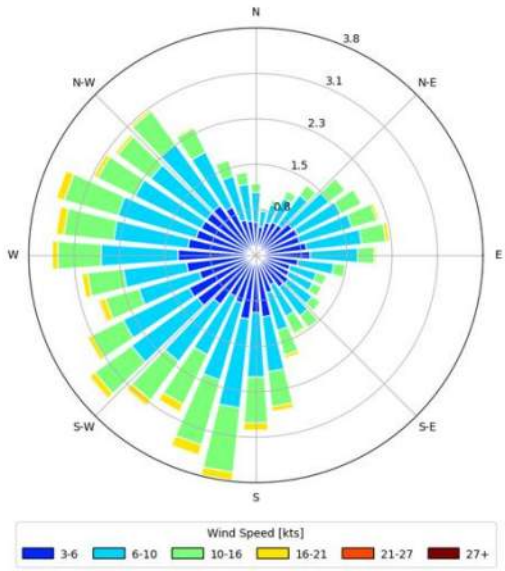
Climate

South-central Wisconsin's climate is typically continental. The area experiences warm, humid summers and cold winters with four distinct seasons.

Precipitation

Precipitation affects the takeoff and landing performance of aircraft. The average annual precipitation from 1981-2010 is 36.1 inches, including average annual snowfall of 38.4 inches. Total precipitation is distributed throughout all seasons with peak precipitation from May through July with over 3 inches per month on average. December through February are the peak months for snowfall averaging with 9.6 inches each.

DLL Wind Trends



Source: Iowa Environmental Mesonet

Temperature

Temperature also affects the performance of aircraft including runway length requirements for aircraft takeoff and/or landing. Warm temperatures reduce air density requiring longer runway length for takeoff. During the 10-year record period, 2009 through 2018, the mean high temperature for the hottest month at Portage was 82.8°F (28.2°C). Portage averages 8.1 days per year of temperatures over 90°F.

Wind

Aircraft takeoff and land into the wind. Therefore, accurate transmittal and recording of wind direction, speed and crosswind components are critical to the safe aircraft operations as well as future airfield development. Wind provides additional lift to an aircraft in a headwind, a tailwind can reduce lift increasing the risk of an aircraft stall, and crosswinds can push aircraft off course, especially smaller and lighter aircraft. Therefore, runways are typically aligned based upon the orientation of the prevailing winds.

[1] Station #USC00476718

Wind data was gathered for DLL for a period of 10 years, 2008 to 2017, using DLL Automated Weather Observation Station (AWOS) recorded data. The prevailing wind directions at DLL are from the south and west.

Runway wind coverage is the percent of time the crosswind component is below an acceptable velocity. For planning purposes, FAA has defined the maximum crosswind component for small aircraft as 12 miles per hour (10.5 knots), increasing to 15-miles per hour (13 knots) for larger aircraft with a runway design code of A-II or B-II. The desired coverage for the primary runway is typically 95% for the record period. If wind coverage for the primary runway is not 95%, a crosswind runway may be needed. A crosswind runway provides additional wind coverage and flexibility of use by smaller and lighter aircraft.

All-weather wind coverage evaluates the past 10 years to determine runway wind with 10.5 and 13.0-knot crosswind components. **Table 2-1** shows the results.

Table 2-1
All-Weather Wind Coverage

Runway	Crosswind Component	
	10.5 knots	13.0 knots
Runway Design Code (RDC)	*A-I, B-I*	*A-II, B-II*
Runway 18-36	93.44%	96.53%
Runway 4-22	94.45%	97.28%
Combined	97.21%	99.00%

Source: DLL AWOS (2008-2017) from National Climatic Data Center; FAA AGIS Wind Analysis Tool

Wind coverage evaluation during Instrument Flight Rules (IMC) determines the ideal alignment for an instrument approach to an airport's runway. Pilots can fly with visual reference to the ground and other aircraft during most weather conditions. This is known as Visual Meteorological Conditions (VMC). Pilots are required to reference flight instruments and be on an Instrument Flight Rules (IFR) flight plan when the cloud ceiling is less than 1,000 feet above the ground or the flight visibility is less than 3 statute miles. These conditions are known as IMC.

IMC wind coverage calculations for the past 10 years determine runway wind coverage with 10.5 and 13.0-knot crosswind components on both runways. **Table 2-2** shows the results**.**

Table 2-2
IMC Wind Coverage

Runway	Crosswind Component	
	10.5 knots	13.0 knots
Runway Design Code (RDC)	*A-I, B-I*	*A-II, B-II*
Runway 18-36	93.43%	96.59%
Runway 4-22	95.63%	97.94%
Combined	98.11%	99.40%

Source: DLL AWOS (2008-2017) from National Climatic Data Center; FAA AGIS Wind Analysis Tool

Cloud Ceiling & Visibility

An IFR flight plan is required for aircraft to operate when conditions are IMC. IFR procedures are used when a pilot primarily operates their aircraft using instruments inside the aircraft only and data provided by GPS or ground-based electronic navigational aids. Visual navigational aids provide supplemental guidance. Landings are accomplished using published instrument approach procedures.

Using local data obtained from the DLL AWOS, airport conditions in IMC occurred a total of 11.70% of the total observations. Current weather minimums are a 488-foot cloud ceiling and 1-statue mile flight visibility to allow for an instrument approach. Due to AWOS reporting limited to 100-foot cloud ceiling intervals, this equates to a 500-foot reported cloud ceiling. Conditions below current published minimums occurred during 4.59% of the observations.

Table 2-3 summarizes the meteorological analysis based on available reported hourly data.

Table 2-3
Meteorological Analysis

Weather Condition	Percentage	Days per Year	Hours per Year
Visual (VMC)	88.30%	322.3	7,735
Usable Instrument (IMC)*	7.11%	25.9	622
Below Minimums (IMC)*	4.59%	16.8	403
Total	***100.0%***	***365.0***	***8,760***

Source: DLL AWOS (2008-2017) from National Climatic Data Center (Hourly); TKDA Analysis (2018)
**500-foot cloud ceiling and 1-mile visibility*

AIRFIELD FACILITIES

Airfield facilities are those that are necessary for aircraft surface movement, such as runways, taxiways, aprons, and associated lighting, marking and signage systems. A map depicting existing airport airside components is included in **Figure 2-3**. Information on design codes is contained in the Facility Requirements chapter.

Land

The City of Portage owns approximately 98.16 acres of property for use as the Portage Municipal Airport. Much of what exists today as airport property was purchased by the City in 1961 from Robert Mael via warranty deed. An update of the Exhibit 'A'/Airport Property Map occurred in 2017 with the documentation located in **Appendix D**. See the On-Airport Land Use section of this chapter for further discussion on non-aeronautical land uses within airport property.

Runways

Runways are one of the most important infrastructure components of an airport, facilitating the takeoff and landing of aircraft. C47 has two paved runways available for use.

Runway 18-36

Runway 18-36 is the paved primary runway currently 3,768 feet long and 60 feet wide. The runway was constructed in the 1960s and was extended by 500 feet to its current length when it was reconstructed in 1996. This north-south runway is oriented 177.83°/357.83° true bearing. The difference between runway end elevations is 10.6 feet, producing a gradient of 0.28%. Runway 18 has a 92-foot displaced threshold to the landing point, and Runway 36 has a 260-foot displaced landing threshold. There is additional pavement on the Runway 18 end to aid in aircraft turnaround movements.

The runway is designed to FAA Runway Design Code (RDC) B-I, small aircraft design standards. Design approach visibility minimums are as low as 1 mile on the Runway 18 end, and visual/circling on the Runway 36 end. Runway 18-36 does not have a parallel taxiway and as such, the Approach Reference Code (APRC) and Departure Reference Code (DPRC) separation standards are not applicable. Runway 18 end accommodates non-precision GPS instrument approach with visibility minimums of 1 mile.

The runway pavement surface is asphalt with no surface friction improvements. Although the runway does not have a published pavement strength in the FAA Airport Master Record, the pavement is generally designed to accommodate regular use of up to 12,500 pound aircraft in a single wheel main landing gear configuration. The 1996 pavement reconstruction plans show 3-inches of new asphalt on a gravel base course (depth varies), on top of 3” of existing asphalt serving as the existing subgrade.

Runway 18-36 has several FAA airport design standard deficiencies. The runway also does not meet the desired Facility and Service Attributes (FSA) from the Wisconsin SASP for a Medium General Aviation Airport. These deficiencies are identified in the Facility Requirements chapter.

Runway 4-22

Runway 4-22 is a secondary runway at C47. This runway was constructed in 1948 and is currently 2,559 feet long and 40 feet wide. This northeast-southwest runway is oriented 43.04°/223.05° true bearing. The gradient of Runway 4-22 is 0.32% resulting from an 8.3-foot elevation difference between Runway 4 and 22 ends. Runway 4-22 does not have any displaced thresholds but additional pavement is located on each end as a remnant of old pavement, or to aid in aircraft turnaround movements. There are existing deficiencies to FAA airport design standards.

The runway is designed to meet FAA Runway Design Code (RDC) B-I, small aircraft design standards with visual-only approaches. The runway is available for visual and circling approaches only. Because Runway 4-22 does not have a parallel taxiway, APRC and DPRCs are not applicable. Runway 4-22 is closed from November 15th to April 15th and is not plowed during winter months.

Taxiways & Taxilanes

Taxiways are provided to permit the safe and expeditious movement of aircraft to and from the runway and other airfield facilities. Taxilanes are designed for low speed and precise taxiing. Locations are shown in **Figure 2-3** with details in **Figure 2-7**. There are existing deficiencies to FAA airport design standards.

There is no parallel taxiway at C47. There are three (3) taxiways connecting to Runway 18-36 from off-airport aeronautical hangars. The apron directly connects with the Runway 36 end.

C47 is served by a single taxilane providing access to the hangars and aircraft parking areas located north of the main apron. This taxilane is 40-feet wide and located 200-feet from the Runway 18-36 centerline. Pavements between hangars are not designated as taxilanes. There are no taxilanes designated within the apron area and adjacent hangars.

Apron

The apron serves the loading, unloading and parking needs for general aviation passengers and pilots. Fueling and short/long-term parking also take place on an apron. There are two (2) public aircraft parking aprons at C47. The locations are identified in **Figure 2-7**.

The main apron is located to the east of the Runway 36 end adjacent to the main hangar. This area provides space for itinerant aircraft parking, fueling and maneuvering. The apron is approximately 5,600 square yards in size east of the runway holding position parking, and consists of an asphalt surface. The last major pavement rehabilitation work was in 1982 according to State records. The paved aircraft parking apron is located north of the main apron. This pavement is approximately 1,300 square yards in size, of an asphalt surface, and the last major rehabilitation work was in 2001. There are six (6) striped aircraft tie-downs for ADG-I aircraft parking with positions as close as 125 feet east of the Runway 18-36 centerline. There are also five (5) additional aircraft parking positions in turf north of the aircraft parking apron, and two (2) east of the apron marked by tires.

Pavement Condition

Airport pavements are basic infrastructure components at airports. Airfield pavements need to be maintained in a safe and operable condition for aircraft operations. The State evaluates pavement condition and rates pavements on a 0 to 100 scale known as the Pavement Condition Index (PCI) rating. Pavement evaluation includes runway, taxiway, and apron pavement. A summary of the October 2015 PCI rating for the runway and selected other airfield pavements is in **Figure 2-4**.

Runway 18-36 has a PCI of 73 and will benefit from preventative maintenance actions. The last major rehabilitation work was in 1996 (reconstruction & extension). Distresses include medium alligator cracking, low longitudinal and transverse cracking, and medium weathering. Runway 4-22 has a PCI of 56 and is on the threshold of requiring major rehabilitation. State records show the last major rehabilitation was in 1948 with its original construction. Distresses include medium alligator cracking and low block cracking. The apron and taxilanes have a PCI ranging from 61 (aircraft parking apron) to 4 (taxilane) and most pavements will benefit from reconstruction. Overall, C47 has an area weighted estimated 2018 pavement condition of 54 PCI.

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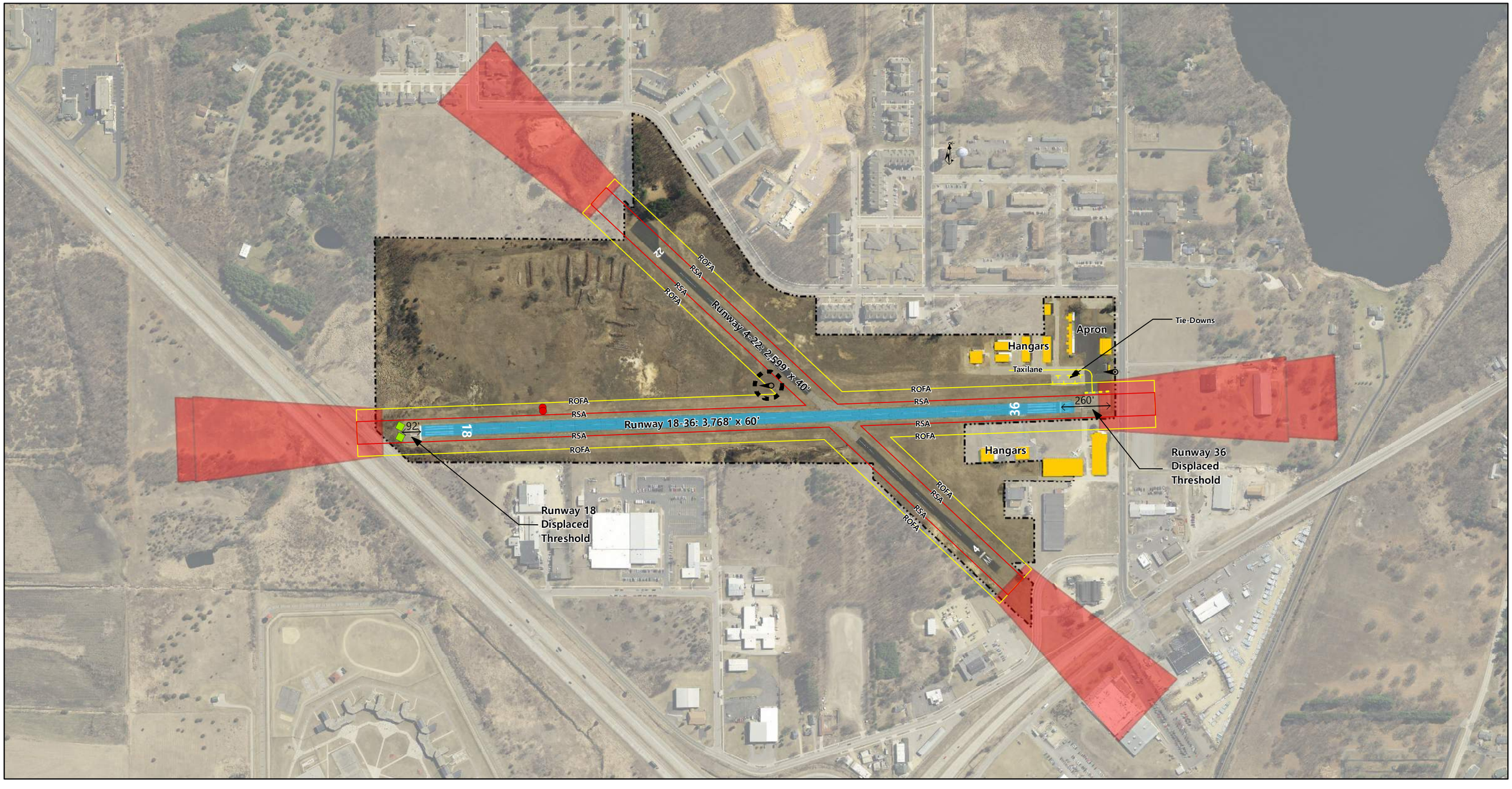
Figure 2-3: Airfield Facilities



Airport Beacon
Wind Cone
Runway End Identifier Lights
Precision Approach Path Indicators
Runway Hold Position
Runway Safety Area
Runway Object Free Area
Medium Intensity Runway Edge Lights
Approach Runway Protection Zone
Aeronautical Building
Airport Boundary
Segmented Circle

N

0 250 500 1,000 Feet

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TKDA
Engineering
Architecture
Planning
444 Cedar Street, Suite 1500
Saint Paul, MN 55101
651.292.4400
tkda.com

Data source: Columbia County Land Information Department

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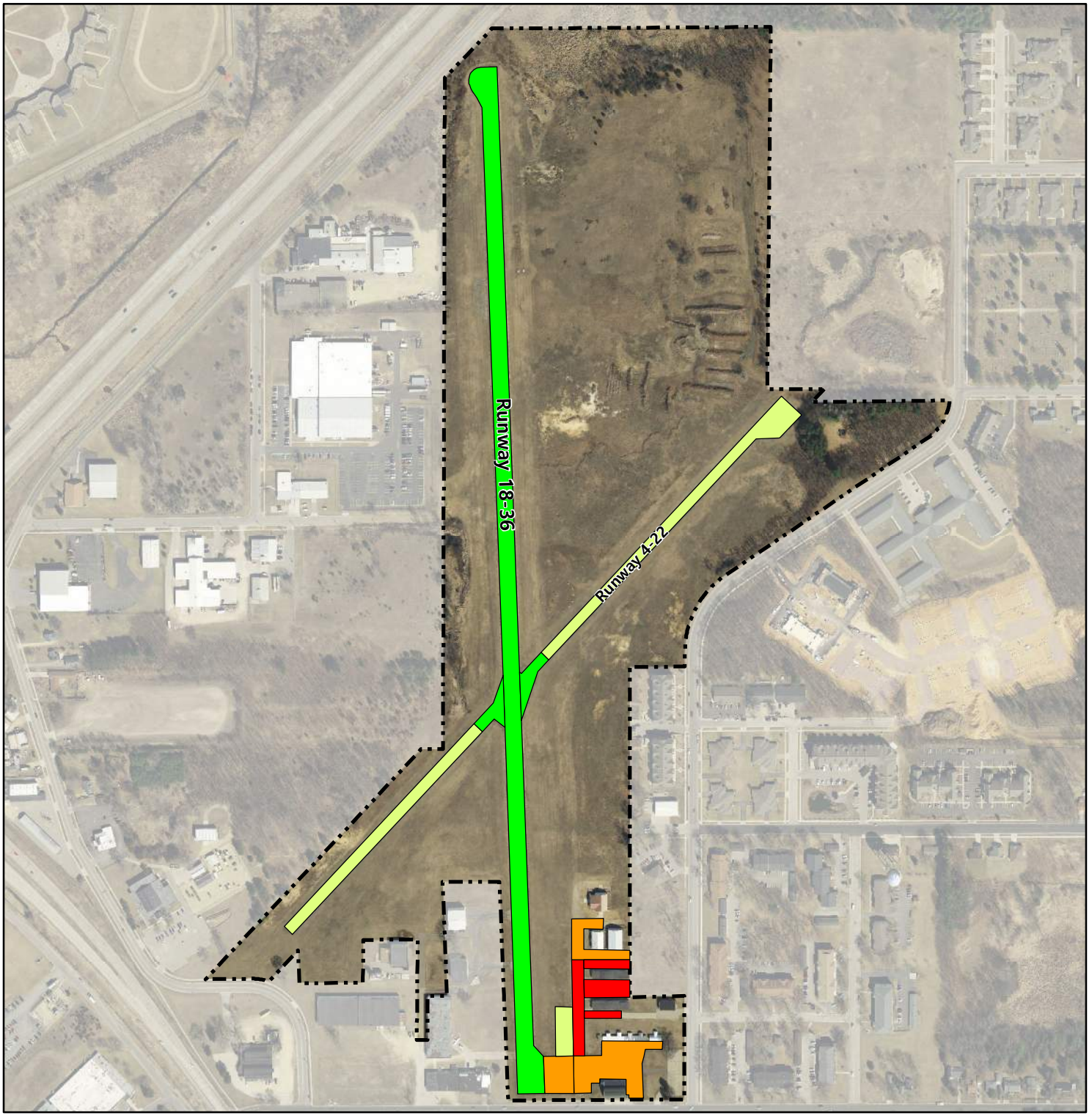
Figure 2-4: Pavement Condition



Pavement Condition Index

85-100	Preventative Maintenance	
70-85		
55-70	Major Rehabilitation	
40-55		
25-40	Reconstruction	
0-25		

Airport Boundary

0 200 400 800 Feet

N

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tkda.com

TKDA

Data Source: Columbia County Land Information Department, Applied Pavement Technology, Inc.

Deficiencies to FAA Design Standards

FAA AC 150/5300-13A, *Airport Design* details the geometric design standards for the safe and efficient operation of airports nationwide. There are several deficiencies to FAA and State standards at C47. All existing C47 design standard deficiencies will be analyzed and detailed in the facility requirements chapter. Significant existing FAA airport design standard deficiencies include:

- **FAA Approach Surface Obstructions**
  - *Approach surfaces are designed to protect the use of the runway in both visual and instrument meteorological conditions, is trapezoidal in shape, and extends outward and upward from the runway along the centerline at a specific slope.*
  - Runway 36 approach is obstructed by trees and a transmission line.
  - Runway 18 approach is obstructed by trees and vehicles on roadways.
  - Runway 4 approach is obstructed by trees and vehicles on roadways.
  - Runway 22 approach is obstructed by trees and vehicles on roadways.
- **Runway Safety Area (RSA)**
  - *A defined surface surrounding the runway prepared or suitable for reducing the risk of damage to aircraft in the event of an undershoot, overshoot, or excursion from the runway.*
  - County Highway CX is within the Runway 18 RSA.
  - Runway 18 RSA does not meet gradient requirements beyond runway end.
  - Silver Lake Drive is within the Runway 36 RSA.
  - A field road is within the Runway 22 RSA.
  - Trees and other vegetation is within the Runway 18, 4 and 22 RSAs.
- **Obstacle Free Zone (OFZ)**
  - *OFZ is the three-dimensional airspace along the runway and extended runway centerline that is required to be clear of obstacles for protection for aircraft landing and taking off from the runway and for missed approaches.*
  - Vehicles on County Highway CX are within the Runway 18 end OFZ.
  - Vehicles on Silver Lake Drive are within the Runway 36 end OFZ.
  - A field road is within the Runway 22 OFZ.
  - Parked aircraft are within the Runway 18-36 OFZ.
  - Aircraft holding at Runway 18-36 apron hold position are within the OFZ.
  - The windcone and segmented circle is within the Runway 4-22 OFZ.
  - Trees and other vegetation is within the Runway 18-36 and 4-22 OFZs.
- **Runway Protection Zone (RPZ)**
  - *RPZ is a trapezoidal area at ground level prior to the landing threshold or beyond the runway departure end to enhance the safety and protection of people and property on the ground. Residences and places of public assembly are generally prohibited from the RPZ, however further evaluation of land uses is required by FAA.*
  - Runway 36 RPZs contain two (2) storage structures.
  - Runway 4 RPZ contains a large portion of an industrial structure.
  - Runway 22 contains all or a portion of four (4) residential structures.

- **Object Free Area (OFA)**
  - *OFA is an area centered on the ground on a runway, taxiway or taxilane provided to enhance the safety of aircraft operations by remaining clear of objects, except for objects that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes.*
  - Vehicles on County Highway CX and Interstate 39 are within the Runway 18 end OFA.
  - Vehicles on Silver Lake Drive are within the Runway 36 end OFA.
  - A field road is within the Runway 22 OFA.
  - Parked aircraft are within the Runway 18-36 OFA.
  - Aircraft holding at Runway 18-36 apron hold position are within the OFZ.
  - The windcone and segmented circle is within the Runway 4-22 OFA.
  - Trees and other vegetation is within the Runway 18-36 and 4-22 OFAs.
- **Other**
  - Runway 4-22 does not meet the existing ARC B-I pavement width standard.

NAVIGATIONAL AIDS & AIRSPACE

Visual Navigation Aids

Visual aids provide additional "visual cues" to pilots for the identification and safe operation at an airport, including during periods of darkness and/or low visibility. Visual aids at C47 include a lighted rotating beacon, runway edge lighting, Runway End Identification Lights (REIL) and Precision Approach Path Indicator (PAPI). Visual and navigational aids are summarized in **Table 2-4**.

Identification Lighting

The airport is equipped with a rotating beacon which operates from dusk until dawn, and during IMC. The rotating beacon is used to help pilots identify the airport in flight by emitting a rotating white and green light, which identifies the airport as a civilian land facility. It is located off-airport approximately 1,500 feet northeast of the Runway 36 end on top of the Portage water tower tank.

Pavement Edge Lighting & Markers

Pavement edge lighting fixtures or reflective markers are installed off the edges of runway and taxiway pavements to help pilots identify the edges and ends of pavement and facilitate safe operations in darkness and/or low visibility environments. A Medium Intensity Runway Edge Lighting (MIRL) system with non-standard light spacing is installed in Runway 18-36 with white edge lights. The first 100 feet of Runway 18 is not lighted and the first 193 feet of Runway 36 is not lighted. The lighting system is nearly 50 years old and in poor condition. Runway lights are operated automatically from dusk till dawn. Runway 4-22 is not equipped with pavement edge lighting. The taxiways do not have edge lighting or markers.

Visual Approach Lighting

The PAPI provides cues to pilots of the approaching aircraft to identify the appropriate glide path to the runway. Red lights indicate the aircraft is too low, white lights indicate the aircraft is too high, and a combination of red and white signifies the proper glide path. A 2-light Precision Approach Path Indicator (PAPI) with a 3.75-degree glide path serves the Runway 18 approach. The system was installed within the last 10 years and is in good condition. The PAPIs are operational 24 hours a day.

Runway End Identification Lighting

Runway End Identifier Lights (REILs) are a set of flashing white strobe lights installed on each side of the runway to provide rapid and positive identification of the approach end of a runway without complex visual approach lighting. The Runway 18 end is served by an omnidirectional REIL in fair condition. The system is not co-located with the runway threshold location. The REIL is operated automatically from dusk till dawn.

Signage

Airport signage provides essential guidance information that is useful to a pilot during all phases of movement on the airfield. FAA AC 150/5340-18, *Standard for Airport Sign Systems* contains the FAA standards for the siting and installation of signs on airport runways and taxiways. There are no mandatory or other airfield guidance signs installed at C47.

Pavement Markings

Pavement markings provide visual guidance to aircraft to critical areas on the runway and taxiway surface. Runway markings vary in complexity depending on the type of approach. FAA AC 150/5340-1, *Standards for Airport Markings* contains the FAA standards for airport markings. Runway 18-36 has non-precision instrument and Runway 4-22 has basic visual runway markings in good condition. The taxilane has a marked yellow centerline from the Runway 36 hold position to the northernmost row of hangars. The apron has a non-standard runway holding position parking. Other markings include yellow aircraft tie-down markings and a white fueling area marking.

Electronic Navigation Aids

Electronic navigational aids provide critical guidance information when operating in the airport environment. These navigational aids often provide horizontal and/or vertical guidance in conjunction with published navigation procedures. Electronic navigation aids for use at C47 are identified below.

Satellite-Based Navigation

Global Positioning System (GPS) is a satellite-based navigation system that allows location to be triangulated from space-based satellites. GPS is a space-based navigation system comprised of satellites, transmitting stations, and user receivers. Equipped aircraft can navigate between user-defined or FAA waypoints with lateral and vertical guidance. With ground-based transmitters known as Wide Area Augmentation System (WAAS) the system can provide accuracy down to a few feet. GPS is widely becoming the preferred aircraft navigation system and FAA is establishing en-route and approach procedures using this satellite-based technology. Because no ground facilities are required at airports to operate this navigational system, the system is reliable in all weather conditions. GPS and WAAS are satellite-based technologies that form the backbone of the FAA's NextGen infrastructure.

Area Navigation (RNAV) non-precision approaches utilize GPS technology for horizontal course guidance. RNAV is comprised of Lateral Navigation (LNAV) and/or Vertical Navigation (VNAV) components. Depending on the type of approach procedure, airports may have LNAV and VNAV capability or only LNAV capability. Localizer Performance (LP) and Localizer Performance with Vertical Guidance (LPV) are the highest precision GPS (WAAS enabled) instrument approach procedures currently available without specialized aircrew training.

C47 has a published RNAV GPS approach to Runway 18 providing horizontal guidance to the runway end. The minimum descent altitude (MDA) is 1,260 feet MSL (441 feet AGL) with a minimum flight visibility of one (1) statute mile.

Ground Based Navigation

There are no ground-based instrument navigational aids at C47. A Very-High Frequency Omni Directional Range (VOR) is a ground-based navigational aid projects an omni-directional signal that allows equipped aircraft to navigate to and from the station. It also has Distance Measuring Equipment (DME) that provides line-of-sight path distance. The nearest VOR facility to Portage is the Dells VORTAC facility. This VORTAC facility (FAA ID: DLL) is located 13 miles west of C47 and transmits on frequency 117.0 MHz. No C47 instrument approaches rely on the VORTAC facility.

Meteorological Facilities

Metrological facilities provide users with up-to-date weather information to aid in pilot decision making for safe flight operations at an airport.

Wind Indicator

Since aircraft takeoff and land into the wind, wind direction and velocity is critical information for safe operations. The primary wind cone (unlighted) is installed about 1,850 feet south the Runway 18 threshold and 175 feet to the east of Runway 18-36 centerline. A segmented circle is also installed at this location. The secondary wind cone is located on the apron adjacent the fuel service station.

Weather Reporting Equipment

C47 is not equipped with any on-site weather reporting equipment. Weather reports are obtained from the nearest reporting station at the Baraboo-Wisconsin Dells Airport (DLL). This Automated Weather Observation System (AWOS-3) provides pilots with the most accurate assessment of airport conditions. The AWOS-3 system measures the following meteorological conditions:

- Wind velocity and direction,
- Temperature and dew point,
- Visibility,
- Cloud cover and sky conditions,
- Liquid precipitation accumulation,
- Barometric pressure, and
- Prevalent weather conditions (fog, thunderstorms, rain).

The AWOS equipment gathers meteorological data every minute and automatically transcribes current conditions on 118.325 MHz. Current weather conditions are also available via telephone and aviation weather websites.

Communication Facilities

Communication facilities allow aircraft to transmit and receive clearances to air traffic control to navigate the national airspace system safely and effectively.

Local Area

C47 is equipped with a Common Traffic Advisory Frequency (CTAF), also called UNICOM, allowing pilots to communicate with each other when operating on the ground or within the Airport airspace. There is no Air Traffic Control Tower (ATCT) at C47. Pilots announce their location and intentions to users and other pilots in lieu of instructions. The CTAF frequency for C47 is 122.70 MHz.

Terminal Area

The terminal area generally describes the airspace within 40 nautical miles of an airport. Approach and departure control for itinerant aircraft is provided by Madison Terminal Radar Approach Control (TRACON) on frequency 135.45 MHz, and from Chicago Air Route Traffic Control Center (ARTCC) on frequency 133.30 MHz whenever Madison Approach Control is closed. The closest Remote Air-to-Ground (RCAG) antenna is 33 miles southwest in Lone Rock, requiring aircraft to be in the air to communicate with ATC. A local Remote Communications Outlet (RCO) to open/close flight plans and obtain updated weather briefings from the Flight Service Station (FSS) is available on 122.10 MHz through the Dells VORTAC.

NAVAID Ownership

Table 2-4 identifies the ownership of navigational aids at the Portage Municipal Airport.

Table 2-4
C47 NAVAIDs Ownership Table

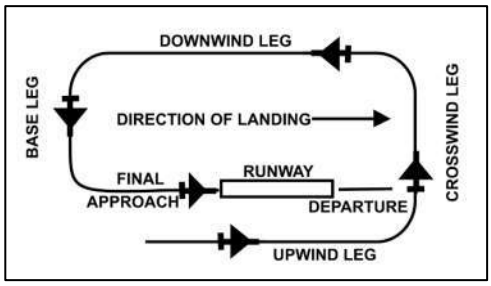
Airport Navigational Aids	Owner
Airport Beacon	City of Portage (airport sponsor)
Runway Edge Lights	City of Portage (airport sponsor)
Runway End Identifier Light (REIL) - 18	City of Portage (airport sponsor)
Precision Approach Path Indicator (PAPI) - 18	City of Portage (airport sponsor)
Wind Cone / Segmented Circle	City of Portage (airport sponsor)

Source: FAA, Airnav.com, TKDA Site Inspection (2018)

Approach/Departure Procedures

Aircraft operate under either VFR or IFR depending on weather conditions and/or operational standards. Each set of rules has its own procedures.

Visual Approach/Departure Procedures



Under VFR, pilots are advised to utilize a standard rectangular traffic pattern around the runway to approach or depart an airport. Standard traffic pattern legs include upwind, crosswind, downwind, base, and final. Departures are typically straight-out from a departing runway, a 90-degree crosswind, or 180-degree downwind. Arrivals typically enter a traffic pattern 45 degrees to a downwind leg for landing. All local procedures are conducted at the discretion of the pilot without ATCT. C47 has a standard left traffic pattern.

Instrument Approach Procedures

Pilots operating under IFR intending to land at an airport must navigate aircraft on published Instrument Approach Procedures (IAP). One IAP (see **Table 2-5**) is available for Runway 18 with satellite-based NAVAIDS. Runway 36, 4, and 22 are authorized for visual circling. Instrument approach weather minimums are a result of the approach type, airport infrastructure, and any prevailing airspace obstructions.

Table 2-5
Instrument Approach Procedures

Approach Procedure	Approach Type	Vertical Guidance	Lowest Altitude (Cloud Ceiling)	Lowest Visibility (Statute Miles)
RNAV(GPS) RWY 18	Non-Precision	No	1,260' MSL (441' AGL)	1 mile

Source: FAA Digital – Terminal Procedures Publications for Portage Municipal Airport (2018)

IFR/Obstacle Departure Procedures

PORTAGE, WI
PORTAGE MUNI (C47)
TAKEOFF MINIMUMS AND (OBSTACLE)
DEPARTURE PROCEDURES
AMDT 2 17005 (FAA)
TAKEOFF MINIMUMS: **Rwy 22,** std. w/min. climb of 259' per NM to 1900 or 1000-2½ for VCOA.
DEPARTURE PROCEDURE: **Rwy 18,** climb on heading 181° to 1900 before turning right.

Special procedures are published at airports to provide aircraft with adequate obstacle clearance. Examples include increased aircraft climb rates or recommended turns. Takeoff minimums exists for Runway 22 with a minimum climb rate of 259 feet per nautical mile to an altitude of 1,900 feet. Runway 18 departures require climbing on heading of 181° to an altitude of 1,900 feet before turning right. Runways 4, 18, 22 and 36 have published obstacles within the departure surface however, no special minimum climb rates are necessary.

Airspace & Surveillance

Airspace Classification

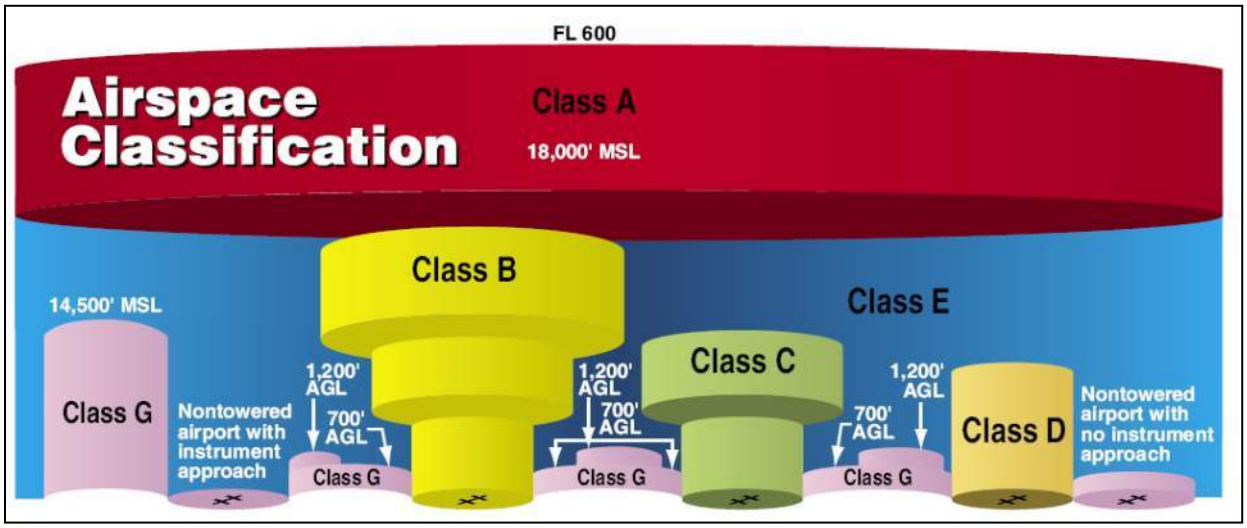
Airspace is segregated into controlled, uncontrolled, special use or other airspace. Each airspace class has different operating rules. Controlled airspace is the term that refers to the different classifications of airspace and defined dimensions within which ATC service is provided. Controlled airspace consists of Class A, B, C, D & E. Uncontrolled airspace or Class G airspace is the portion of the airspace that has not been defined.

The airspace within approximately five (5) nautical miles of C47 is designated as Class G, which represents uncontrolled airspace. The airspace beyond this area includes Madison Class C airspace, a special use airspace designated for military operations, as well as Class G airspace as seen in **Figure 2-5**. Class G airspace extends from the surface to 700 feet above ground level (AGL) and does not need ATC clearance for entry. Class E controlled airspace extends from 700 feet to 17,999 feet Mean Sea Level (MSL) within 5 miles of C47. Aircraft operating in Class E airspaces do not require ATC clearance for VFR flight. Visibility and cloud clearance requirements apply. Class A extends from 18,000 feet MSL and above as shown in **Exhibit 2-2**.

Ground Radar

Radar relies on direct line-of-sight, therefore the further the target is away from a radar site the higher altitude is required. The closest primary radar site is 26 nautical miles to the south in Madison. Radar coverage at C47 begins at an estimated 500 feet above ground level or 1,300 feet above Mean Sea Level.

Exhibit 2-2
FAA Airspace Classification



Source: FAA Pilot's Handbook of Aeronautical Knowledge

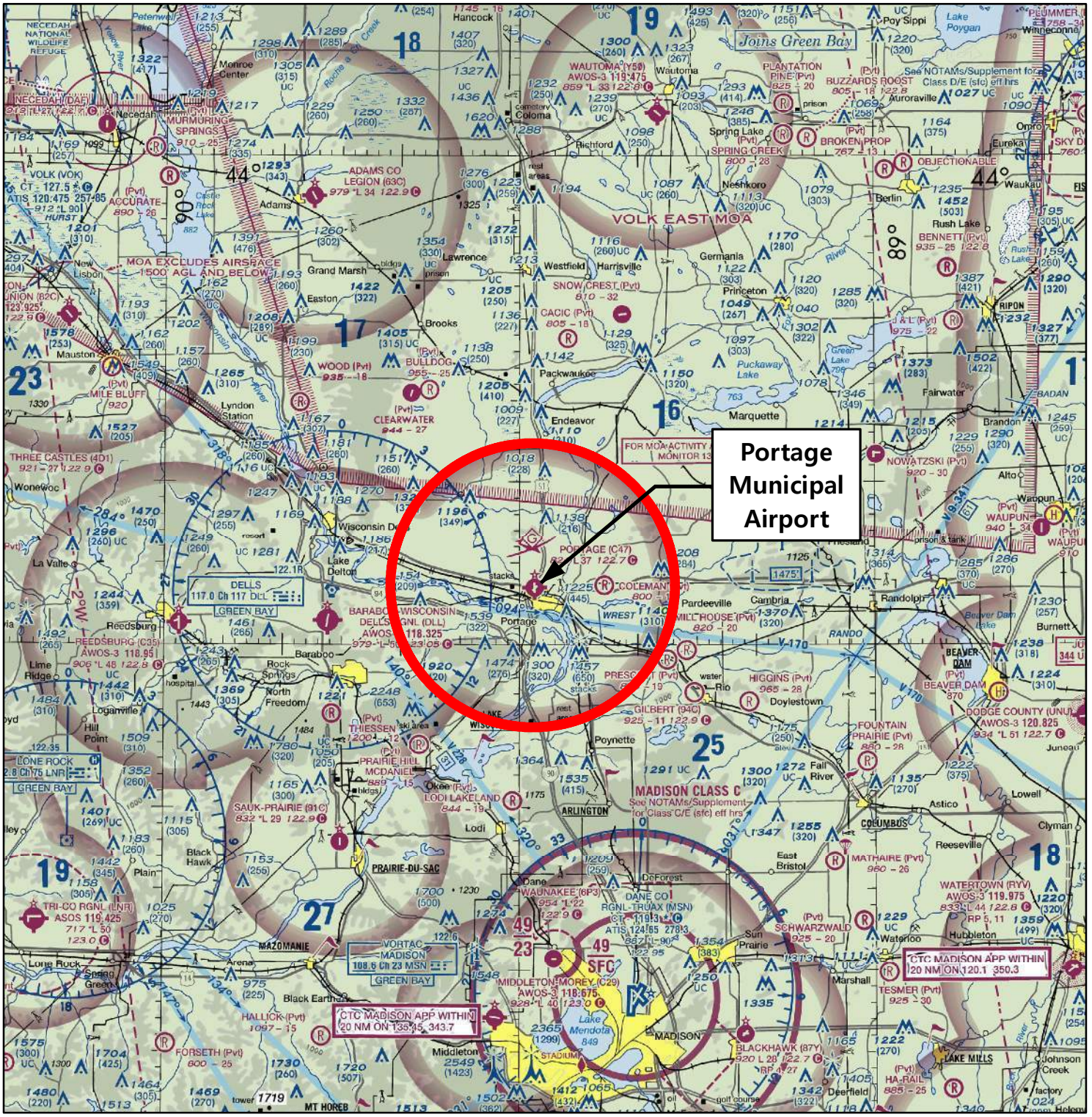
Automatic Dependent Surveillance-Broadcast (ADS-B)

ADS-B is a satellite-based surveillance technology in which aircraft transmit GPS position information to other aircraft and to ATC facilities. ADS-B will supplement primary ground-based radar. FAA requires all aircraft operating within airspace requiring a transponder to have ADS-B transmitting equipment installed by the year 2020 as part of the Next Generation Air Transportation System (NextGen) initiative. Various ground stations have been located nationwide to provide ADS-B coverage.

The closest ground station to C47 is located 45 nautical miles away in Fond Du Lac. ADS-B coverage at C47 begins at an estimated 500 feet above ground level or 1,300 feet above Mean Sea Level.

PORTAGE MUNICIPAL AIRPORT

Figure 2-5: Surrounding Airspace



PORTAGE WISCONSIN

TKDA
Engineering
Architecture
Planning

444 Cedar Street, Suite 1500
Saint Paul, MN 55101
651.292.4400
tkda.com

Data Sources: FAA

Obstructions to Air Navigation

Airspace is an important resource around airports that is very important for safe flight operations. There are established standards to identify airspace obstructions around airports.

Part 77 Airport Imaginary Surfaces

Title 14 CFR (Code of Federal Regulations): Part 77 *Safe, Efficient Use, and Preservation of the Navigable Airspace* establishes various airspace surfaces near airports. Part 77 is used to determine if an object is an obstruction that penetrates an "imaginary" three-dimensional surface. Surfaces include the primary, approach, transitional, horizontal, and conical surfaces each with different standards.

According to FAR Part 77.9, proposed construction or alteration within a specified radius of an airport's runways must be evaluated by FAA using the online obstruction evaluation and airport airspace analysis (OEAAA) portal. When evaluating objects, the FAA determines whether an obstruction is a *hazard* to air navigation. FAA subsequently evaluates the obstruction using more in-depth minimum airspace standards. These include FAA Approach/Departure Surfaces from FAA AC 150/5300-13A, *Airport Design* or instrument procedure surfaces identified in FAA Order 8260.3B, *U.S. Standard for Terminal Instrument Procedures (TERPS)*. Corrective action is then recommended. Examples of corrective actions include removing, lowering, or obstruction lighting an object. A general diagram of the Part 77 surfaces is shown in **Exhibit 2-3**.

Clear airspace is necessary for the safe and efficient use of aircraft arriving at and departing from an airport. The most demanding approach to a runway defines the Part 77 airspace standards for that runway. There are three main approach types:

- **Precision**: A runway having an existing instrument approach procedure utilizing an existing or planned Instrument Landing System (ILS) with horizontal and vertical guidance. Visibility minimums are less than ¾ mile. There are no precision approaches at C47.
- **Non-Precision**: A runway having an existing instrument approach procedure utilizing air navigation facilities with horizontal guidance, or area type navigation equipment, for which a straight-in non-precision instrument approach procedure has been approved or planned. Approaches with vertical guidance are considered non-precision. Visibility minimums are typically 1 mile but as low as ¾ mile. A 1-mile approach exists for Runway 18 at C47.
- **Visual**: A runway intended solely for the operation of aircraft using visual approach procedures, with no straight-in instrument approach procedure published or planned. This approach type applies to Runway 4-22 and Runway 36 at C47.

There are two runway classifications:

- **Utility**: A runway that is constructed for and intended to be used by propeller driven aircraft with a maximum gross weight of 12,500 pounds or less. This is the classification type for Runways 18-36 and 4-22 serving small aircraft.
- **Other-Than-Utility**: A runway that is constructed for and intended to be used by aircraft with a maximum gross weight greater than 12,500 pounds. This does not apply at C47.

The combination of the approach type and the runway classification defines the dimensional criteria for each approach. The Part 77 approach surface dimensional criteria for C47 is identified in **Table 2-6**.

Table 2-6
Existing Part 77 Approach Airspace Standards

Runway End	Approach Standards	Distance from Runway End	Inner Width	Outer Width	Length	Slope
18	Non-Precision Utility Greater Than ¾ Mile	200’	500’	2,000’	5,000’	20:1
36	Visual Utility	0’	500’*	1,250’	5,000’	20:1
4	Visual Utility	0’	250’	1,250’	5,000’	20:1
22	Visual Utility	0’	250’	1,250’	5,000’	20:1

Source: 14 CFR Part 77
**Inner width is also the Primary Surface width driven by the most demanding approach to a runway.*

FAA Form 5010-1, *Airport Master Record* provides critical obstacle data for each approach. The last inspection was November 2017. There are several trees that were identified as obstructions to the FAR Part 77 Approach surfaces for each runway end. All runway ends also have close-in obstructions within the first 200 feet of the runway end. A summary of the controlling approach surface obstacles noted in the Airport Master Record is in **Table 2-7**.

Table 2-7
Controlling Part 77 Approach Airspace Obstacles

Runway End	Object Type	Object Height Above End	Distance from End	Location from Centerline	Slope to Clear (Required)	Close-In Obstacles
18	Road	2’	200’	20’ Left	0:1 (20:1)	Yes
36	Road	10’	200’	210’ Right	0:1 (20:1)	Yes
4	Road	15’	210’	125’ Right	0:1 (20:1)	Yes
22	Road	10’	200’	120’ Left	0:1 (20:1)	Yes

Source: C47 Airport Master Record (2018), TKDA Analysis (2018)

FAA Form 5010 also notes a clear Runway 18 and 36 approach slope (20:1) to the displaced landing threshold at C47. Numerous other obstacles are noted near each runway end including roadways, trees and poles.

FAA records shown an aeronautical survey was performed at C47 in 2011 in accordance with FAA AC 150/5300-18B, *General Guidance and Specifications for Submission of Aeronautical Surveys to NGS: Field Data Collection and Geographic Information System (GIS) Standards*. A total of 1,571 unique points were collected.

Available obstacle data around C47 was collected and analyzed. A supplemental survey was also completed in October 2018 to verify approach obstructions. The analysis identifies the following 2011 FAA and 2018 supplemental survey points that penetrate a FAR Part 77 surface:

- FAR Part 77 Primary Surface: 115 obstruction points
- FAR Part 77 Approach Surface: 91 obstruction points
  - Runway 18: 24 obstruction points
  - Runway 36: 42 obstruction points
  - Runway 4: 15 obstruction points
  - Runway 22: 10 obstruction points
- FAR Part 77 Transitional Surface: 120 obstruction points
- FAR Part 77 Horizontal Surface: 1 obstruction point

FAR Part 77 obstruction points are shown in **Figure 2-6**. Obstruction mitigation is evaluated in the Facility Requirements chapter.

Approach and Departure Surfaces

FAA Approach/Departure surfaces (APDS) identified in Table 3-2 of FAA AC 150/5300-13A and Engineering Brief 99 are critical for runway end design. These airspace protection surfaces are established for runways based on their approach type, visibility minimums and aircraft design category. Clearance of these surfaces is mandatory and, if not clear, may result in operational restrictions including loss of night minimums or reduced takeoff and landing distances. **Table 2-8** identifies the existing APDS standards for C47. More detail on these surfaces is provided in the facility requirements chapter.

Table 2-8
Existing FAA Approach/Departure Surface Standards

Runway Ends	Standards	Table 3-2 Row	Distance from Runway End	Inner Width	Outer Width	Length	Slope
18	Instrument Approaches ≥ ¾ mi.	4	200’	400’	3,400’	10,000’	20:1
36, 4, 22	Circling Approaches	4	200’	400’	3,400’	10,000’	20:1
18, 36, 4, 22	Instrument Departures	7	0’	1,000’	6,466’	10,000’	40:1

Source: FAA AC 150/5300-13A Table 3-2, FAA Engineering Brief No. 99, TKDA Analysis

Based on available obstacle data, all existing FAA approach and departure surfaces to Runway 4-22 and 18-36 are penetrated by obstructions. **Tables 2-9 through 2-12** identify the unique

existing obstructions to the FAA approach surfaces. It is noted the circling approach standards are the same as instrument approach standards per FAA Engineering Brief 99, Table 3-4.

Table 2-9
Existing Runway 36 FAA Approach Surface Airspace Obstructions

Runway End	FAA Row	Object Type	Top Elevation	Penetration
36	4	Tree	888.0’	44.0’
36	4	Transmission Tower	926.0’	34.1’
36	4	Tree	875.0’	23.9’
36	4	Tree	901.0’	21.6’
36	4	Building #13	842.0’ (est.)	21.5’
36	4	Tree	865.0’	21.0’
36	4	Power Poles	848.0’	20.6’
36	4	Tree	875.0’	20.6’
36	4	Tree	858.0’	19.2’
36	4	Transmission Line	905.0’	18.5’
36	4	Tree	878.0’	18.0’
36	4	Tree	898.0’	17.2’
36	4	Tree	888.0’	16.7’
36	4	Wind Cone	842.0’	16.6’
36	4	Fuel Facility	839.0’ (est.)	16.5’
36	4	Tree	859.0’	15.7’
36	4	Tree	866.0’	14.8’
36	4	Tree	884.0’	11.8’
36	4	Tree	873.0’	11.0’
36	4	Silver Lake Drive	835.0’	6.7’
36	4	Tree	890.0’	6.2’
36	4	Tree	881.0’	5.5’
36	4	Tree	893.0’	5.4’
36	4	Tree	877.0’	5.0’
36	4	Tree	888.0’	3.2’
36	4	Trees	891.0’	2.3’
36	4	Building Vent	853.8’	1.9’
36	4	Private Driveway	836.0’	1.1’
36	4	Trees	888.0’	0.9’

Source: FAA Aeronautical Survey for C47 (2011), TKDA Analysis (2018)
Note: Traverse ways include elevation of mobile object (10’ private road, 15’ public road, 17’ interstate highway, 23’ railroad)

Off-airport fixed objects penetrating the Runway 36 approach surface include:

- Building #13, 200 feet from landing threshold, 0:1 clear approach slope
- Power Poles, 300 feet from landing threshold, 3:1 clear approach slope
- Silver Lake Drive, 330 feet from landing threshold, 8:1 clear approach slope
- Private Driveway, 355 feet from landing threshold, 10:1 clear approach slope
- Transmission Tower, 1,580 feet from the landing threshold, 13:1 clear approach slope

- Transmission Line, 1,465 feet from landing threshold, 14:1 clear approach slope
- Building Vent, 790 feet from landing threshold, 17:1 clear approach slope

Table 2-10
Existing Runway 18 FAA Approach Surface Airspace Obstructions

Runway End	FAA Row	Object Type	Top Elevation	Penetration
18	4	Tree	875.0’	33.3’
18	4	Tree	880.0’	23.6’
18	4	Tree	861.0’	16.3’
18	4	Tree	853.0’	15.7’
18	4	Tree	866.0’	14.6’
18	4	Tree	876.0’	10.5’
18	4	Interstate 39 (NB)	821.0’	8.1’
18	4	Tree	821.0’	7.8’
18	4	County Highway CX	817.6’	6.7’
18	4	Tree	820.0’	5.5’
18	4	Interstate 39 (SB)	821.3’	3.4’
18	4	Tree	832.0’	3.4’
18	4	Tree	874.0’	1.6’

Source: FAA Aeronautical Survey for C47 (2011), TKDA Site Survey (October 2018), TKDA Analysis (2018)
Note: Traverse ways include elevation of mobile object (10’ private road, 15’ public road, 17’ interstate highway, 23’ railroad)

Off-airport fixed objects penetrating the Runway 18 approach surface include:

- County Highway CX, 200 feet from landing threshold, 0:1 clear approach slope
- Interstate 39 (Northbound), 240 feet from landing threshold, 3:1 clear approach slope
- Interstate 39 (Southbound), 340 feet from landing threshold, 13:1 clear approach slope

Table 2-11
Existing Runway 4 FAA Approach Surface Airspace Obstructions

Runway End	FAA Row	Object Type	Top Elevation	Penetration
4	4	Tree	890.0’	50.3’
4	4	Tree	887.9’	47.0’
4	4	Tree	862.0’	36.9’
4	4	Tree	860.9’	30.4’
4	4	Tree	870.4’	25.9’
4	4	Tree	878.8’	11.3’
4	4	County Highway CX	838.1’	7.9’
4	4	Building Vent	845.9’	4.5’
4	4	Power Pole	856.7’	2.6’
4	4	Power Pole	850.4’	1.9’

Source: FAA Aeronautical Survey for C47 (2011), TKDA Site Survey (October 2018), TKDA Analysis (2018)
Note: Traverse ways include elevation of mobile object (10’ private road, 15’ public road, 17’ interstate highway, 23’ railroad)

Off-airport fixed objects penetrating the Runway 4 approach surface include:

- County Highway CX, 320 feet from landing threshold, 8:1 clear approach slope
- Building Vent, 520 feet from landing threshold, 14:1 clear approach slope
- Power Pole, 680 feet from landing threshold, 16:1 clear approach slope
- Power Pole, 790 feet from landing threshold, 16:1 clear approach slope

Table 2-12
Existing Runway 22 FAA Approach Surface Airspace Obstructions

Runway End	FAA Row	Object Type	Top Elevation	Penetration
22	4	Tree	909.0’	56.3’
22	4	Tree	868.1’	21.1’
22	4	Mulch Pile	841.6’	19.1’
22	4	Tree	862.7’	18.4’
22	4	Power Pole	853.5’	2.4’
22	4	Tree	892.2’	1.3’
22	4	Tree	874.5’	0.4’
22	4	Power Pole	843.2’	0.1’

Source: FAA Aeronautical Survey for C47 (2011), TKDA Site Survey (October 2018), TKDA Analysis (2018)
Note: Traverse ways include elevation of mobile object (10’ private road, 15’ public road, 17’ interstate highway, 23’ railroad)

Off-airport fixed objects penetrating the Runway 22 approach surface include:

- Power Pole, 895 feet from landing threshold, 9:1 clear approach slope
- Power Pole, 740 feet from landing threshold, 19:1 clear approach slope

All existing FAA departure surfaces to Runway 18, 36, 4 and 22 are penetrated by obstructions. There are 385 unique object points that penetrate an FAA departure surface from the 2011 FAA survey data, including:

- Runway 36 Departure (South): 253 obstruction points
- Runway 18 Departure (North): 78 obstruction points
- Runway 22 Departure (Northeast): 16 obstruction points
- Runway 4 Departure (Southeast): 38 obstruction points

Obstructions are published in the IFR Takeoff Minimums and Obstacle Departure Procedures for C47. Runway 22 requires an increased minimum climb rate of 259 feet per nautical mile.

FAA approach and departure obstruction points are shown in **Figure 2-6**. Obstruction mitigation is evaluated in the Facility Requirements chapter.

Runway 36 Approach

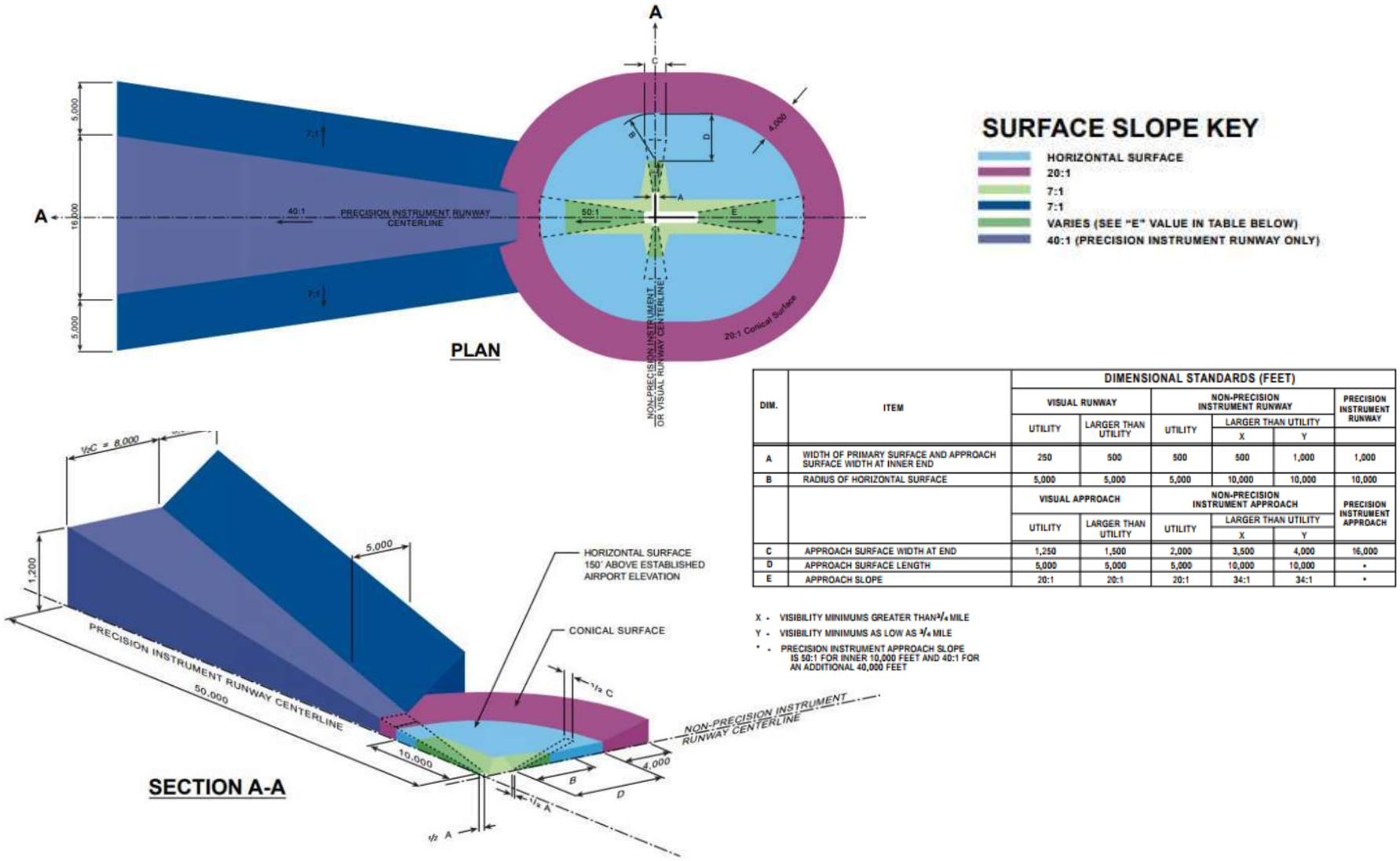
Runway 18 Approach

Runway 4 Approach

Runway 22 Approach

Source: TKDA Survey (October 2018)

Exhibit 2-3
FAR Part 77 Airspace Surfaces



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

X - VISIBILITY MINIMUMS GREATER THAN ¾ MILE
Y - VISIBILITY MINIMUMS AS LOW AS ¾ MILE
* - PRECISION INSTRUMENT APPROACH SLOPE IS 50:1 FOR INNER 10,000 FEET AND 40:1 FOR AN ADDITIONAL 40,000 FEET

Source: Washington State Department of Aviation, Aviation Division

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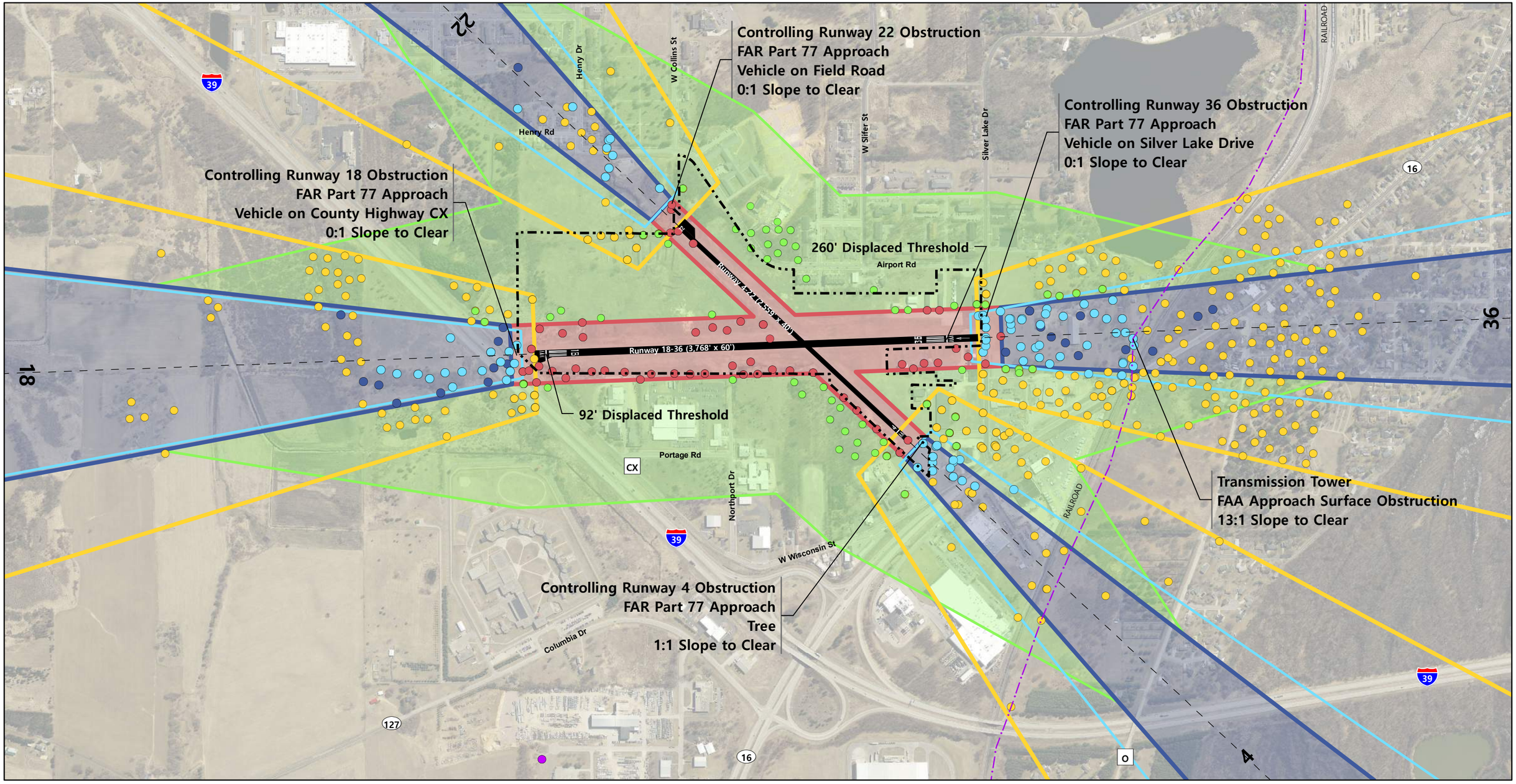
Figure 2-6: Airspace Obstructions



Airspace Obstructions

- Obstruction to FAA Approach
- Obstruction to P77 Approach
- Obstruction to P77 Primary
- Obstruction to P77 Transitional
- Obstruction to FAA Departure
- Obstruction to P77 Horizontal

- FAA Approach Surface Row 4
- FAR P77 Approach Surface
- FAR P77 Primary Surface
- FAR P77 Transitional Surface
- FAA Departure Surface
- Existing Runway
- Airport Boundary
- ATC Transmission Line

0 400 800 1,600 Feet

Engineering
Architecture
Planning
444 Cedar Street, Suite 1500
Saint Paul, MN 55101
651.292.4400
tkda.com

Data source: FAA, Columbia County Land Information Department

Nearby Airports

There are nine (9) public airports within 30 nautical miles of C47. The closest airport with a longer runway and better approach type is Baraboo-Wisconsin Dells Regional with a 5,010-foot jet capable runway and a ground-based approach located 13 miles to the west. The closest runway at least 5,500 feet in length and a precision approach is 26 miles to the south in Madison. **Table 2-13** provides a summary of the nearby airports.

Table 2-13
Nearby Public Airport Profiles

Airport Name	ID	NPIAS	Distance (nm)	Based Aircraft	Longest Runway	Best Approach Type
Portage Municipal	***C47***	***Y***	***-***	***25***	***3,768'***	***Non-Precision***
Gilbert Field	94C	N	12	10	1,092'	Visual
Baraboo-Wisconsin Dells Regional	DLL	Y	13	45	5,010'	Non-Precision
Sauk-Prairie	91C	Y	20	33	2,936'	Non-Precision
Reedsburg Municipal	C35	Y	22	17	4,840'	Non-Precision
Waunakee	6P3	N	23	35	2,223'	Visual
Dane County Regional	MSN	Y	26	156	9,006'	Precision
Middleton Municipal	C29	Y	27	94	4,000'	Non-Precision
Adams County	63C	Y	27	19	3,998'	Non-Precision
Wautoma Municipal	Y50	Y	30	44	3,300'	Non-Precision

Source: Skyvector.com, FAA Form 5010 - Airport Master Record

General Aviation Facilities

General Aviation (GA) facilities are those necessary for the operation of aviation activity, including aircraft parking aprons, terminal buildings and aircraft storage hangars. A map depicting these facilities in the building area is shown in **Figure 2-7**.

Aircraft Parking Apron

There is one aircraft parking apron serving the general aviation needs at C47. This space is located at the south area of the airport adjacent the displaced threshold at the Runway 36 end. The apron provides a total of 5,400 square yards of space for general aviation use including transient aircraft parking, aircraft tie-downs (6), public and private hangars, public fueling facility and aircraft maneuvering. This apron typically serves small single engine aircraft.

Terminal Building

The terminal building serves multiple functions for inbound and outbound general aviation passengers and pilots. The C47 terminal is connected to the city-owned FBO hangar along the south side of the general aviation aircraft parking apron, with the entrance located on the west side of the building. The building is currently leased to Air Portage, Inc. The building is approximately 80' x 16' in size for a total of 1,280 square feet. The building is in fair condition and houses the following facilities and services:

- Flight planning area
- Pilots lounge
- Restrooms
- Waiting area
- FBO/Airport manager's desk

Aircraft Storage Hangars

There are currently eight (8) on-airport hangar buildings at C47 providing approximately 30,000 square feet (SF) of aircraft storage space. Six of these hangars are owned by the City of Portage and the remaining three are privately owned hangars. The on-airport hangars currently all based aircraft at C47. A summary of the facilities is in **Table 2-14**.

There are three aircraft storage hangar connected to the main apron. The main hangar (#1), which is connected to the terminal building, is used to store transient aircraft and complete minor aircraft repairs. Opposite main hangar to the north are rows of T-hangar units for aircraft storage. One structure is a 4-unit T-hangar (#5) and another is a single-unit (#6). These hangars both store based aircraft are in fair condition. The total hangar space along the apron is 9,750 SF.

North of the apron connected via a taxilane are two 4-unit nested T-hangar buildings (#7, #9). These hangars are both full and accommodate eight aircraft. The three remaining box hangars are located to the north. One box hangar is owned by the city (#10), the other is privately owned with a land lease (#11), and the remaining one is privately owned with a land lease is split into two units (#12). These six hangars can accommodate small aircraft and provide a total of 20,300 SF.

There are four (4) buildings located on the west side of Runway 18-36 located off airport property. Two of these are privately owned box hangars (#15, #16) owned by Fall River Foundry Company. These hangars are estimated to have been constructed in the early 1990s, and a through the fence agreement exists granting owners of these hangars direct access to the airfield. Both of these hangars are currently used for non-aeronautical purposes. The remaining two buildings (#13, #14) are owned by the Mael family (Portage Airport Property LLC) and were likely used for aircraft manufacturing when the airport as owned by Robert Mael. Hangar #13 has aeronautical use.

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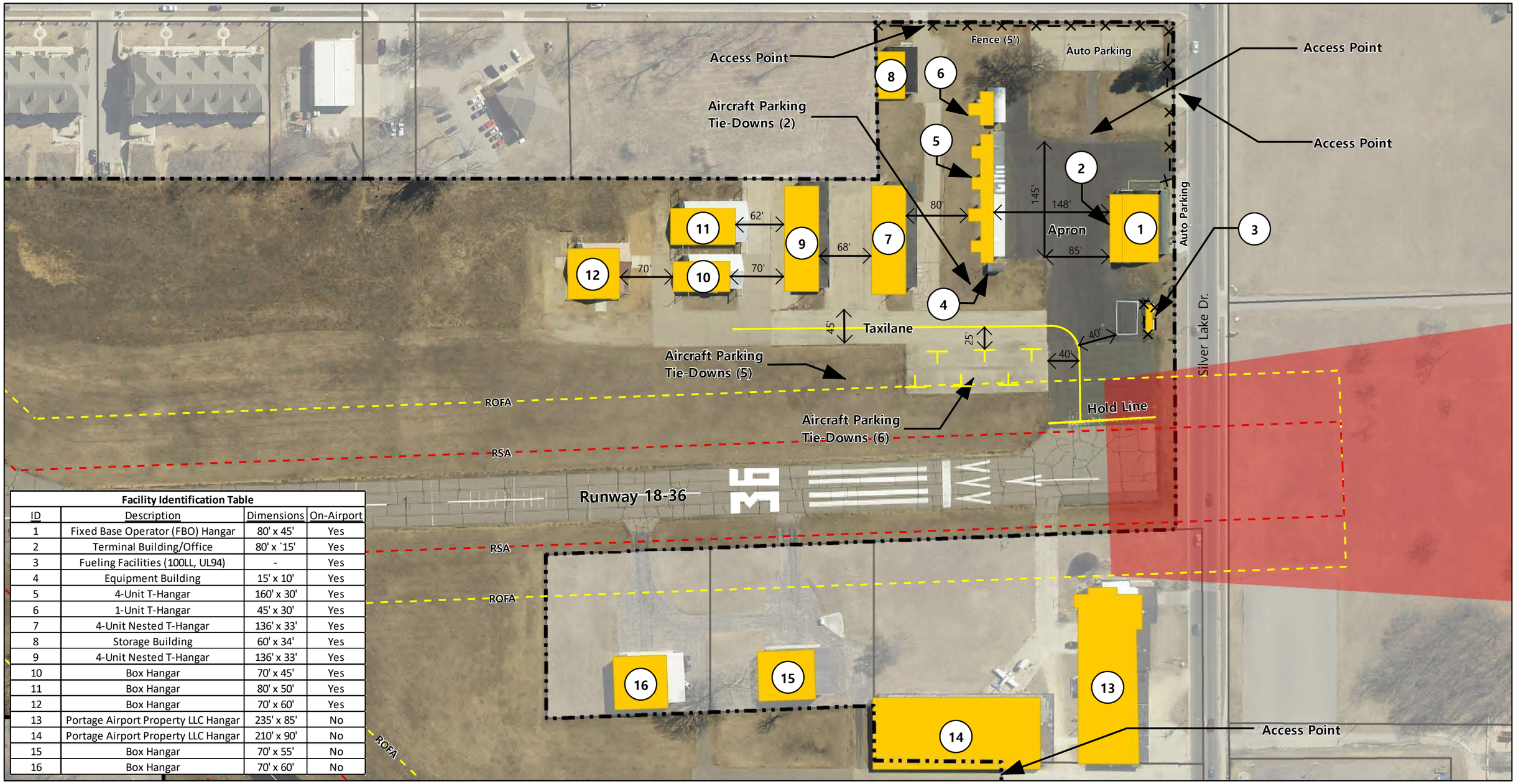
Figure 2-7: Building Area Facilities



Facility Identification Table			
ID	Description	Dimensions	On-Airport
1	Fixed Base Operator (FBO) Hangar	80' x 45'	Yes
2	Terminal Building/Office	80' x `15'	Yes
3	Fueling Facilities (100LL, UL94)	-	Yes
4	Equipment Building	15' x 10'	Yes
5	4-Unit T-Hangar	160' x 30'	Yes
6	1-Unit T-Hangar	45' x 30'	Yes
7	4-Unit Nested T-Hangar	136' x 33'	Yes
8	Storage Building	60' x 34'	Yes
9	4-Unit Nested T-Hangar	136' x 33'	Yes
10	Box Hangar	70' x 45'	Yes
11	Box Hangar	80' x 50'	Yes
12	Box Hangar	70' x 60'	Yes
13	Portage Airport Property LLC Hangar	235' x 85'	No
14	Portage Airport Property LLC Hangar	210' x 90'	No
15	Box Hangar	70' x 55'	No
16	Box Hangar	70' x 60'	No

Fence
Runway Safety Area (RSA)
Runway Object Free Area (ROFA)
Runway Protection Zone (RPZ)
Aeronautical Building
Airport Boundary
Parcels

N

0 60 120 240 Feet

PORTAGE WISCONSIN

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Data source: Columbia County Land Information Department

Table 2-14
Aircraft Storage Hangars

ID	Description	Location	Year Built	Condition	Description	Dimensions (Area)
1	Main Hangar	Main Apron	1944	Fair	Box Hangar	80’ x 45’ (3,600 SF)
5	City Hangar	Main Apron	1962	Fair	4-unit T-Hangar	160’ x 30’ (4,800 SF)
6	City Hangar	Main Apron	1969	Fair	Single unit T-Hangar	45’ x 30’ (1,350 SF)
7	City Hangar	Hangar Area	1964	Fair	4-unit Nested T-Hangar	136’ x 33’ (4,488 SF)
9	City Hangar	Hangar Area	1970s	Fair	4-unit Nested T-Hangar	136’ x 33’ (4,488 SF)
10	City Hangar	Hangar Area	1991	Good	Box Hangar	70’ x 45’ (3,150 SF)
11	Private Hangar	Hangar Area	1998	Good	Box Hangar	80’ x 50’ (4,000 SF)
12	Private Hangar	Hangar Area	1998	Good	Box Hangar	70’ x 60’ (4,200 SF)
13	Private Hangar	Off Airport	N/A	Fair	Manufacturing Building	210’ x 90’ (18,900 SF)
15	Private Hangar	Off Airport	N/A	Good	Box Hangar	70’ x 55’ (3,850 SF)
16	Private Hangar	Off Airport	N/A	Good	Box Hangar	70’ x 60’ (4,200 SF)

Source: Google Earth Imagery, TKDA Analysis (2018)
Note: Year Built is estimated from historical airport records and airport manager interview.

Fixed Base Operator

Fixed Base Operators (FBOs) are commercial businesses that provide multiple aviation services to the public, primarily for general aviation. Specialized Aviation Service Providers (SASOs) are commercial aviation businesses providing one or a few services. Air-Portage, Inc. provides fuel sales and on-site airport management, and there are no other FBOs or SASOs at C47.

SUPPORT FACILITIES

Support facilities are necessary to facilitate the day-to-day maintenance and operation of a safe airport. A map depicting these facilities is shown in **Figure 2-7**.

Airport Administration

The City of Portage employs a part-time airport manager responsible for on-site airport management and operations. The terminal building contains an airport manager's desk area used to coordinate maintenance and operations activities. The Portage City Engineer/Public Works Director along with the Airport Commission is ultimately responsible for the airport management and administration at City Hall.

Airport Maintenance

Per contract, the airport manager shall maintain and make minor lighting repairs to the airport lights, and perform maintenance around the terminal and fuel pumps. The city is responsible for all other airport maintenance including maintaining the airfield surfaces in good condition, removing snow, trimming grass, maintaining the fuel facility, and maintaining other city owned equipment. City maintenance is performed by the City of Portage Public Works Department.

There is no on site dedicated airport maintenance building. A small 15' x 10' equipment building is located adjacent to the T-hangar on the apron.

Fueling Facilities

The C47 fuel facility is owned by the City of Portage. It is located on the south edge of the apron area adjacent to the terminal building, approximately 185 feet east of the Runway 18 end. The facility includes two 1,000-gallon above-ground storage tanks for 100LL AVGAS and UL94 Swift aviation fuel. The fuel is dispensed through a hose and reel system. This system features a self-serve 24-hour automated credit card reader system.

Fencing & Security

C47 has partial fencing around the airport perimeter and access points. Fencing is located at the southeast corner of the airport boundary near the public parking lot. The 4-foot fencing begins behind the terminal building and ends near to Hangar #8 along Airport Road. There are two (2) access points. A controlled access point with a chain-link fence is located near Hangar #8 providing access to the hangars. Another access point is on Silver Lake Drive with no controlled access. This access point leads directly to the parking lot, with a driveway to the apron.

Other Facilities

Located near Airport Road is an Experimental Aircraft Association (EAA) hangar that was built in the 1970's. This building supports aeronautical activities and is used mainly in the summer period during the annual EAA air venture at Oshkosh. There is also an equipment building (#4) adjacent the 4-unit T-hangar (#5) that is used mainly as a cold storage facility.

The electrical vault for the airfield lighting is located in the main hangar building.

GROUND ACCESS, CIRCULATION & PARKING

Ground Access & Circulation

Public airport access is available from Silver Lake Drive. This paved access road is approximately 75 feet long and 20 feet wide, and provides access to the automobile parking lot. There is an additional access drive measuring 90 feet long and 12 feet wide providing uncontrolled access from the parking lot to the apron. The 20-foot wide paved access road with controlled access fencing off Airport Road provides access to the hangar area.

Vehicle Parking

The main automobile parking lot is located east of the terminal building. This asphalt parking lot is approximately 60 feet wide and 170 feet long for vehicle parking and maneuvering. It is not lighted nor does it have striped stalls. All spaces are located within 250 feet of the main entrance to the terminal building. There is also a 90' x 17' paved parking area to the south of the main hangar adjacent to Silver Lake Drive.

Public Transportation

There is no courtesy car at C47. There are no rental car facilities in Portage; the closest car rental facility is located in Baraboo 20 minutes away. Transportation Network Carriers such as Uber and Lyft serve Portage and the surrounding area from Madison. Portage Cab provides taxi service 24 hours a day serving Portage and up to a 10-mile radius around the city. Portage also has an Amtrak station with service to Milwaukee and Chicago to the east, as well as La Crosse and Saint Paul to the west.

AIRPORT UTILITIES

The following utility infrastructure is available at the airport to serve facility demands:

- **Stormwater:** Stormwater on the airport is managed by both an overland flow system of ditches and culverts. Stormwater runoff generally outlets into the wetland complex to the northwest of the runway intersection or north of Runway 18-36. There are however a few low points within airport property. A 30-inch storm sewer line from Silver Lake Drive discharges to the northwest of the runway intersection. There are also three off-airport drainage discharge points located along Airport Drive.

- **Power**: Electric service is provided to the airport via an overhead line on Silver Lake Drive from Alliant Energy. Power service is distributed via underground lines to the hangars and runways.
- **Water:** Water service is provided by Portage Utilities a 12-inch water main along Silver Lake Drive. There is water service to the Terminal Building and the EAA Chapter Building.
- **Sanitary:** Sanitary service for the terminal building is provided by Portage Utilities from an 8-inch sanitary main line along Silver Lake Drive. No sanitary service is provided to on-airport hangars. A sanitary lift station and force main area located on airport property.
- **Telecommunications:** Telecommunications services is provided to the airport terminal building. Several cable, internet and phone service providers serve the City of Portage.
- **Natural Gas:** Natural gas service to the area is provided by Alliant Energy. There is no known natural gas service to on-airport facilities.

Airport Land Use Compliance

If the airport sponsor receives federal funds for airport construction, the sponsor is obligated to maintain airport property for aeronautical use unless otherwise approved by FAA. Additional information is published in *FAA Order 5190.6B, Airport Compliance Manual*.

Using the Exhibit 'A' data collected in 2017 (see **Appendix D**) and this field inventory, non-aeronautical land uses and encumbrances to existing airport property of note for FAA compliance are summarized below:

- Through-the-fence (TTF) operations: Four (4) hangars with existing or potential aeronautical use located outside of airport property on Lot 1 have direct connections to Runway 18-36. Users need to have agreements with a similar fee structure as those located within airport property.
- Non-aeronautical land uses: There are several public city utilities located within airport property including several water main lines and valves, power line, lift station, sanitary force main, and sanitary main lines. The force main crosses under Runway 18-36. The city also performs material excavation operations in areas north of Runway 4-22 and east of Runway 18-36. There is no agricultural production within airport property.
- Encumbrances: There are six (6) airport property interests granted to others as identified on the Exhibit A. These include utility line easements (e.g. water main, electrical) and ingress/egress easements adjacent to Lots 1, 2, 3 and the city well site. In addition, a private property owner has the right of first refusal for airport property near the Runway 4 end.
- Other: The physical end of Runway 22 falls within dedicated right-of-way for West Collins Street. The ends of hangar site taxilanes also fall outside of airport property. Adjacent property (Lots 2, 3, 4) is identified as a contaminated site.

The airport sponsor should discuss land use compliance resolutions to meet grant obligations with State and FAA representatives, particularly before airport property becomes obligated. Non-aeronautical land uses generally require FAA approval. More information is available in FAA Order 5190.6B, *Airport Compliance Manual*.

SURROUNDING LAND USE

The effect of airport planning decisions extends well beyond the airport property boundary. The land uses that surround the airport must be evaluated to help determine the impact of airport planning decisions.

Compatible land uses are defined as those uses that can coexist with a nearby airport without either constraining the safe and efficient operation of the airport or exposing people working or living nearby to unacceptable levels of noise or safety hazards. Typical airport land use compatibility elements include:

- FAA airspace standards
- FAA airport design standards
- Noise exposure
- Visual obstructions and electronic interference
- Wildlife attractants
- Large densities of people

The Wisconsin Bureau of Aeronautics published a Wisconsin Airport Land Use Guidebook in 2011 as a reference for airport stakeholders.

This section provides an overview of existing land uses and plans. Existing surrounding land uses are depicted graphically in **Figure 2-8.**

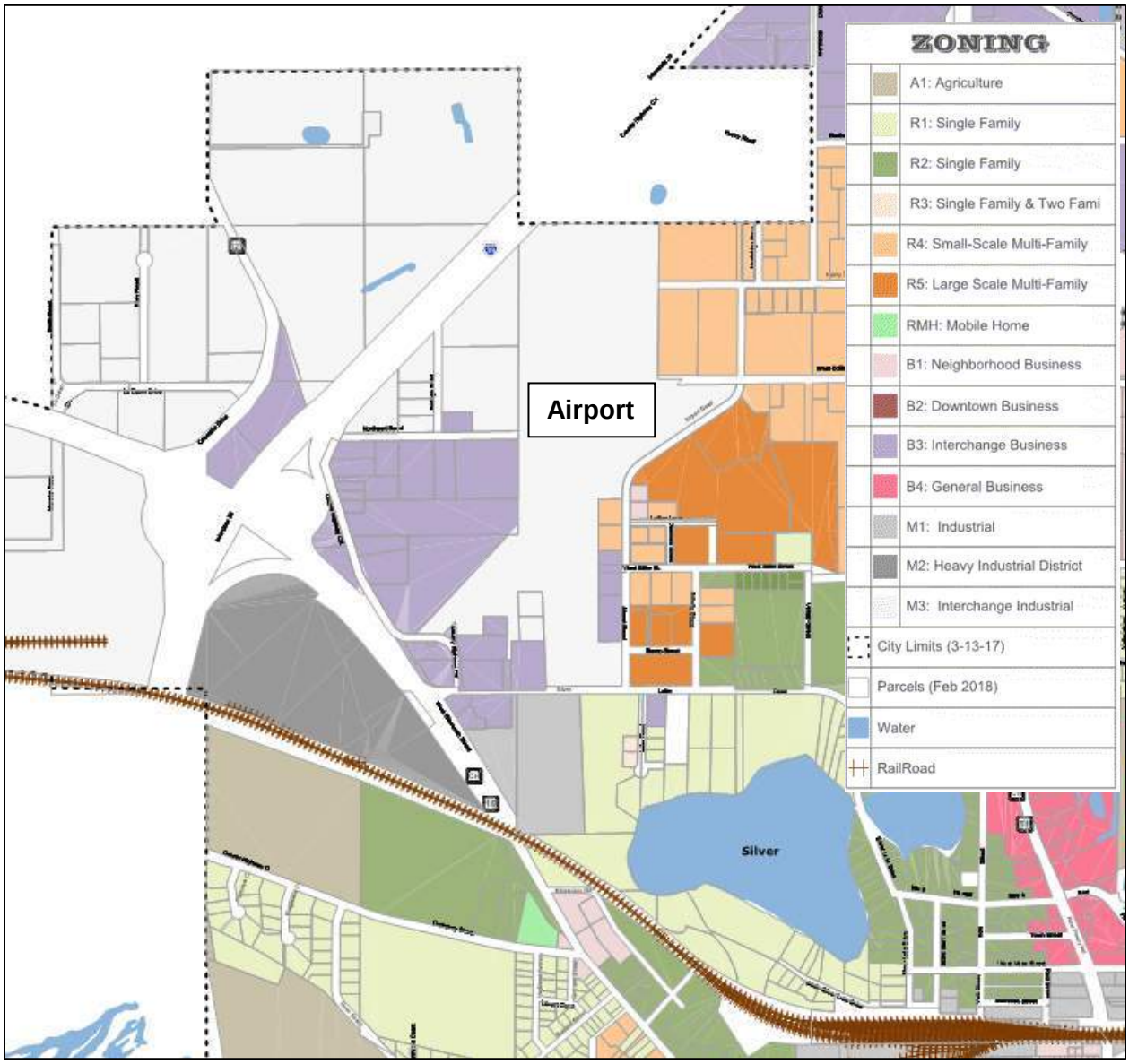
Existing Land Uses

C47 is located with the northwestern edge of Portage city limits in Columbia County, adjacent to the towns of Fort Winnebago and Lewiston to the north. The airport is generally located adjacent to a moderately built-up urban environment. **Exhibit 2-15** depicts the existing city zoning code.

Existing surrounding land uses include multi-family residential housing located to the east and northeast of the airport within the Runway 22 approach. This area also includes St. Mary's Cemetery. Single-family residential properties are located southeast of the airport along Silver Lake. A mix of industrial, commercial, and institutional properties are located adjacent to the airport to the west and southwest of the airport within the Runway 36 approach. There are also a few business properties to the east. Larger industrial land uses are present to the south and southwest of the airport within the Runway 4 approach. Areas outside of city limits within the Runway 18 approach consist of forested or agricultural land uses.

Surrounding roadways include Silver Lake Drive to the south, Airport Drive to the east, County Highway CX to the north as well as to the southwest. Interstate 39 runs parallel to Highway CX. The Canadian Pacific Railroad passes about ¼ mile south of the Runway 36 end.

Exhibit 2-15
City of Portage Zoning Code



Source: City of Portage

A 138 kV and 69 kV power transmission line owned by American Transmission Company (ATC) runs parallel to the railroad. The line has approximately 100-foot high towers south of the airport, which impacts the Runway 36 approach. There are airport records that show the line from as far back as 1970. ATC owns a sub-station located about 1,000 feet west of the Runway 4 end. The approved route for a new 345 kV Badger Coulee transmission line is located about five (5) miles south of the airport.

There is a wetland complex as well as wetland soil indicators on the north side of airport property, surrounding the Runway 18 end. Terrain drops by about 10 feet between the Runway 18 end and the wetlands.

Other significant land uses in the area include:

- Columbia Correctional Institution located about 1,000 feet west of the Runway 18 end
- The interchange of Highway 16 and Interstate 39 about ¼ mile to the west of the airport
- Commercial development ½ mile to the northeast of the airport, and
- Pine Island Wildlife Area along the Wisconsin River less than 1 mile south of the airport.

Land uses within the Runway Safety Area (RSA), Runway Object Free Area (OFA), or approach and departure Runway Protection Zone (RPZ) for the existing airport configuration are noted below:

- Runway 18: Portions of County Highway CX is located within the Runway 18-36 RSA and OFA. A small 25-foot portion of the Interstate 39 northbound lanes is located within the OFA. The RSA and OFA are not entirely within airport property. Approximately 440 feet of County Highway CX, and well as 500 feet of Interstate 39 in both directions are within the RPZ.

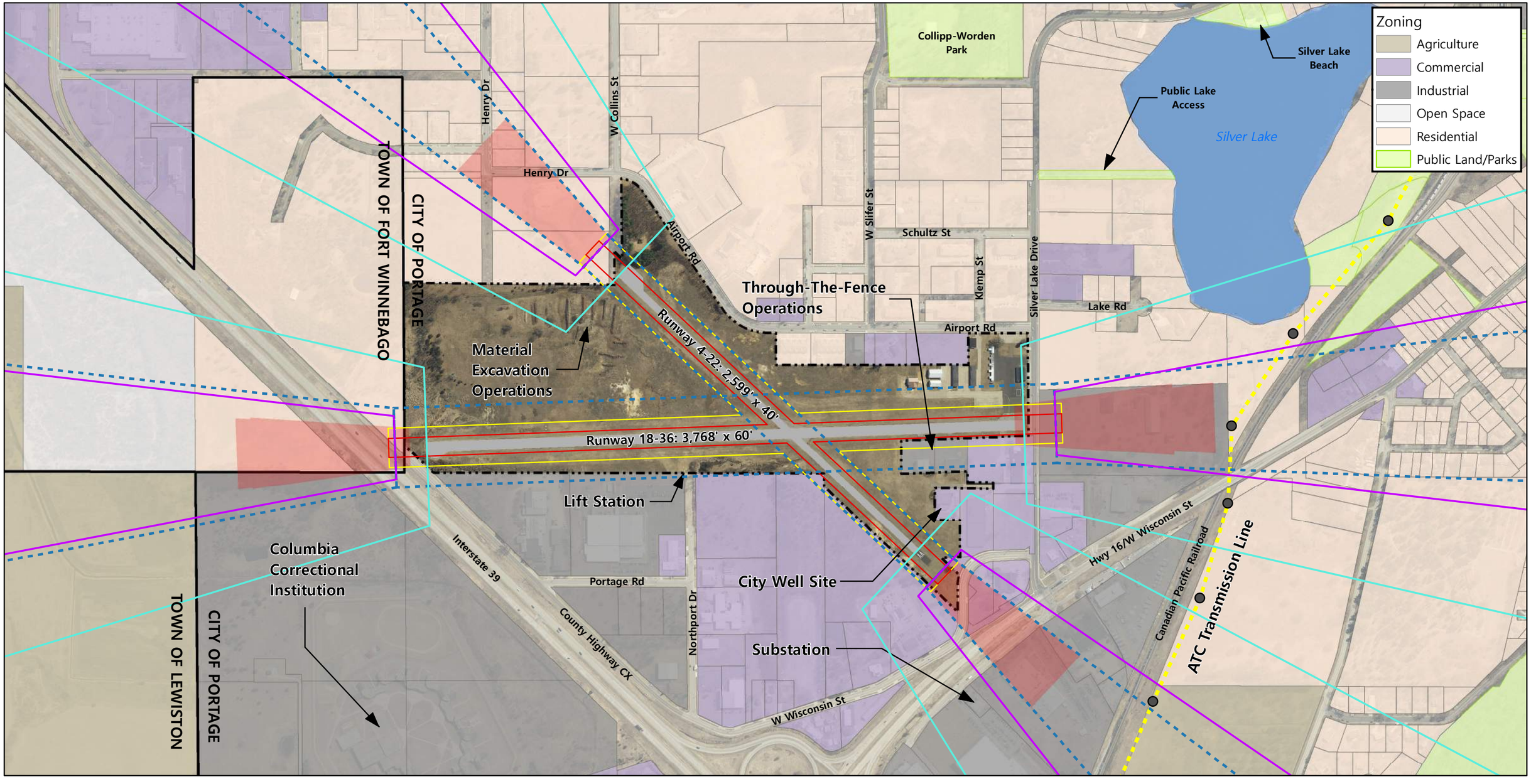
- Runway 36: Silver Lake Drive as well as the apron/taxiway pavement is located within the Runway 18-36 OFA and RSA. The RSA and OFA are not entirely within airport property. Approximately 320 feet of Silver Lake Drive is located within the RPZ. Two off-airport structures on property owned by Hubert H. Hill are located within the RPZ, and one additional structure is located within the Runway 36 arrival RPZ.

- Runway 4: The OFA is not entirely within airport property. A large portion of an industrial building owned by Saint-Gobain Performance Plastics Corporation is within the RPZ. Approximately 370 feet of County Highway CX and 360 feet of State Highway 16 traverse through the RPZ.

- Runway 22: The RSA and OFA is not entirely within airport property. All of portions of four (4) multi-family residential homes are located within the RPZ. Approximately 620 feet of Henry Drive and 60 feet of Henry Road traverse through the RPZ.

PORTAGE MUNICIPAL AIRPORT

Figure 2-8: Surrounding Land Use



Transmission Tower
Transmission Line
Runway Safety Area (RSA)
Runway Object Free Area (ROFA)
Runway Protection Zone (RPZ)
Airport Boundary
Jurisdictional Boundaries
Parcels
Lake
P77 Surface
FAA Approach
FAA Departure

N

0 300 600 1,200 Feet

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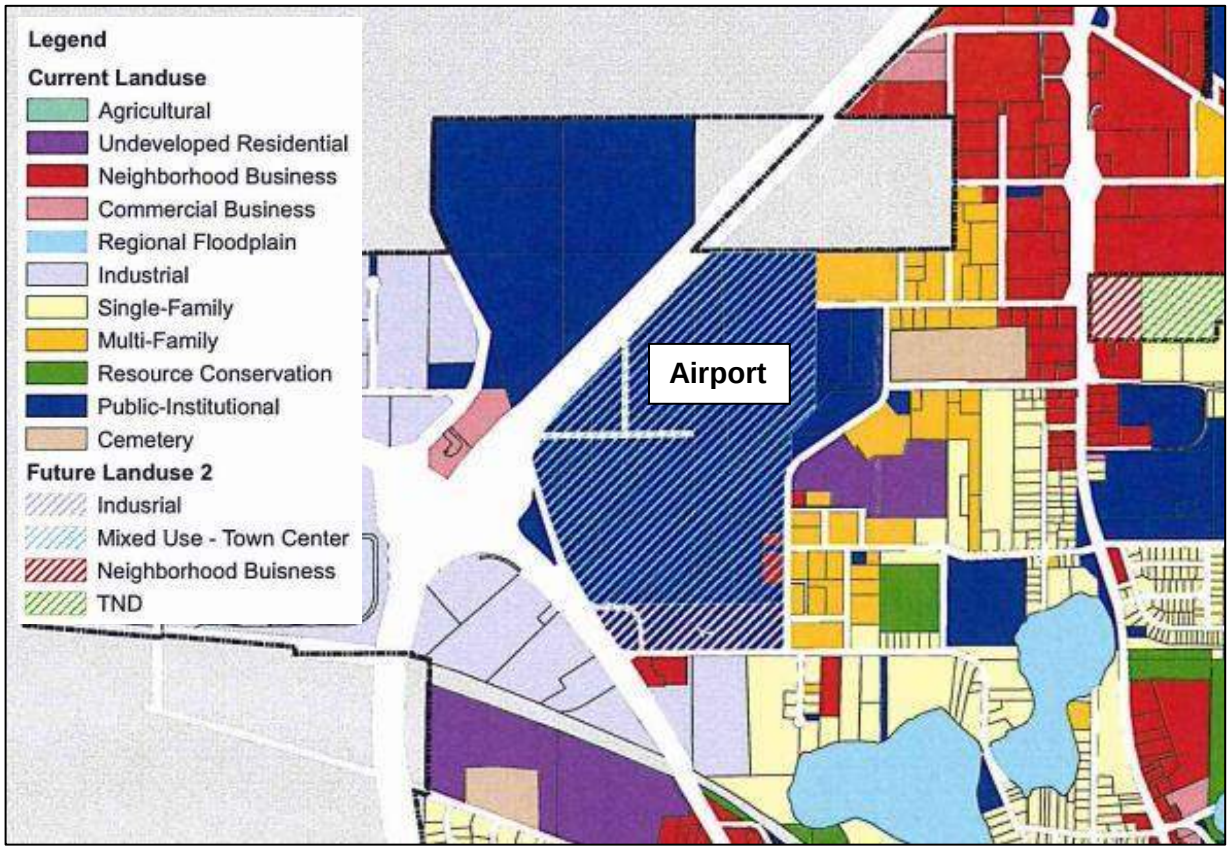
Data source: Columbia County Land Information Department, City of Portage

Land Use Plans

Lands to the north of Runway 22 are currently zoned for small-scale multi-family housing. Land is zoned for interchange business (B3) adjacent to the airport to the south and southwest, including within the Runway 18 approach. Open space to the north of the hangar area is also zoned for interchange business. The parcel to the south of the airport was rezoned by the city in 2018 to interchange business (B3), with other nearby properties rezoned to two-family residential (R-3).

Wisconsin's comprehensive planning law requires jurisdictions to prepare and adopt comprehensive plans. The City of Portage comprehensive plan (2008-2028) identifies economic development priorities to develop the New Portage Airport and redevelop the existing airport site. Accordingly, the future land use plan as seen in **Exhibit 2-16** shows airport property converted to "Mixed-Use Town Center", with Industrial properties adjacent to Silver Lake Drive.

Exhibit 2-16
City of Portage Future Land Use Plan



Source: City of Portage

Within Fort Winnebago, lands to the north of the airport are zoned for single-family residential (R-1) and highway interchange (C-3). There are nearby environmental corridors (e.g. wetlands, floodplains, productive farmland). In Lewiston, existing land uses are zoned agriculture (A-1) north of the airport. Future land uses identified by both towns in their comprehensive plans are

to remain the same as existing except for a transportation corridor reserved approximately ½ mile north of the Runway 36 end.

Airport Zoning

An airport zoning ordinance regulates and restricts the heights of objects and the use of property in proximity to the airport. The purpose is to help ensure airspace and land uses around the airport meet safety requirements for existing and future airport operations. Public airports are require under Wisconsin Administrative Code TRANS 55 requires public airports to adopt and maintain a height limitation zoning ordinance (HLZO) and a vehicle/pedestrian ordinance to receive state aid for airport improvements.

The City of Portage does not have an HLZO enacted for C47. The establishment of an HLZO is conjunction with an updated Airport Layout Plan is highly recommended.

ENVIRONMENTAL INVENTORY

This section provides an overview of environmental conditions and issues at the Portage Municipal Airport and the immediate vicinity. Per FAA AC 150/5070-6B, *Airport Master Plans*, the purpose of this section is to provide a cursory overview of potential or known environmental features considered in subsequent airport development alternatives analysis on this study. The focus of this section is to provide a baseline of environmental conditions at the Airport as well as resources adjacent to the Airport property. **Figure 2-9** provides a graphical depiction of the existing environmental conditions described in this section.

The environmental information was collected based upon the guidelines set forth by FAA to comply with the National Environmental Policy Act (NEPA). Reference documents include:

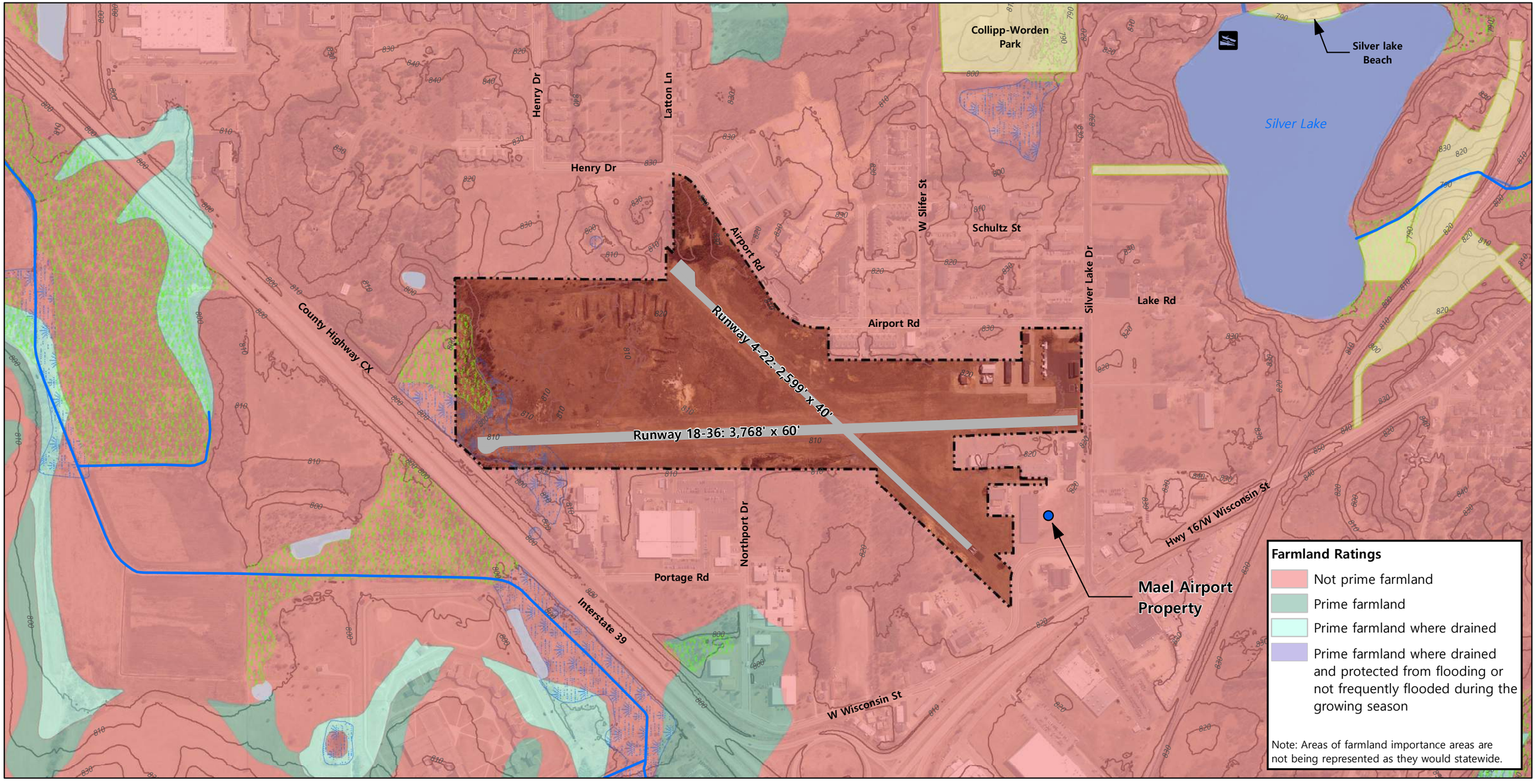
- FAA Order 5050.4B, National Environmental Policy Act (NEPA) implementing Instructions for Airport Actions
- FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*
- FAA 1050.1F Environmental Desk Reference

There are 23 categories of potential areas of impact that must be addressed for project actions in compliance with NEPA regulations. Applicable NEPA impact groups for the existing airport site include:

- Biological Resources
- Department of Transportation Act, Section 4(f)
- Farmlands
- Hazardous Materials
- Historical, Archaeological and Cultural Resources
- Land Use & Noise
- Socioeconomics & Environmental Justice
- Visual Effects
- Water Resources

PORTAGE MUNICIPAL AIRPORT

Figure 2-9: Environmental Inventory



Waterways
Open Remediation Sites
Runway
Public Lands
Airport Boundary
Freshwater Emergent Wetland
Freshwater Forested/Shrub Wetland
Freshwater Pond
Lake
Riverine
Contours (10 ft)

0 300 600 1,200 Feet

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Architecture
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Data source: Columbia County Land Information Department, WI DNR

The environment overview process included a review of available data and literature relating to on and adjacent airport property. This review does not meet the full analytical and procedural requirements associated with a proposed project action under NEPA.

Biological Resources

Biotic resources means include fish, wildlife, plants, and their respective habitats. The Fish and Wildlife Coordination Act requires FAA to coordinate with U.S. Fish and Wildlife Services (USFWS) to determine the effects of proposed actions. Any project needs to address effects and consequences on the state-listed rare or unique species, and state wildlife agencies need to be consulted.

The Endangered Species Act of 1973 requires FAA to determine if a proposed action under its purview would affect a Federally listed species or critical habitat. The following table lists the applicable Federal endangered or threatened species in Columbia County.

Table 2-17
Federal Endangered and Threatened Species

Common Name	Scientific Name	Group	Federal Status
Higgins Eye Pearly Mussel	*Lampsilis higginsii*	Mussels	Endangered
Sheepnose Mussel	*Plethobasus cyphyus*	Mussels	Endangered
Mead's Milkweed	*Asclepias meadii*	Plants	Threatened
Karner Blue Butterfly	*Lycaeides Melissa samuelis*	Insects	Endangered
Rusty Patched Bumble Bee	*Bombus affinis*	Insects	Endangered
Northern Long-Eared Bat	*Myotis septentrionalis*	Mammals	Threatened

Source: U.S. Fish and Wildlife Service (USFWS)

Mead's milkweed is a flowering plant found in upland tallgrass prairie or barren habitat. The Karner blue butterfly habitat is in prairie, oak savanna and jack pine areas with wild lupine flower. The northern long-eared bat hibernates in caves, roosts and forages in upland forests in the summer, and swarms wooded areas in the fall. The rusty patched bumble bee is found in grasslands with flowering plans from April to October, and hibernates in undisturbed soil.

Wisconsin Department of Natural Resources (DNR) publishes the threatened and endangered species: https://dnr.wi.gov/files/PDF/pubs/er/ER001.pdf

Department of Transportation Act, Section 4(f)

Section 4(f) is applicable to projects which require the use of publicly-owned land from a public park, recreation area, or wildlife and waterfowl refuge of national, state, or local significance, or land of an historic site of national, state, or local significance. Legislation was established under the Department of Transportation (DOT) Act of 1966.

Surrounding city-owned public lands include Silver Lake access located ½ mile to the southeast of the airport, Collipp-Worden Park (city park) located ½ mile to the east, and Silver Lake Beach located one mile to the southeast of the airport. State lands include Pine Island Wildlife Area

located one mile to the south, and Indian Agency House located approximately two miles to the east. There are no nearby federal recreational lands.

Farmlands

Farmlands are defined as those agricultural areas considered important and protected by Federal, state, and local regulations. Important farmlands include all pasturelands, croplands, and forests (even if zoned for development) considered to be prime, unique, or of statewide or local importance. The Farmland Protection Policy Act of 1981 (FPPA) requires the evaluation of farmland conversion to non-agricultural areas to determine the impacts any proposed actions. Prime farmland is land best suited for producing food, feed, forage, fiber and oilseed crops.

Data from Columbia County shows there is no prime farmland within or directly adjacent to airport property. According to USDA National Resources Conservation Service (NRCS) data in **Exhibit 2-18**, there is prime farmland or farmland of statewide importance on the northeast portion of airport property. Agricultural production does not occur within airport property. Large portions of land to the northeast of the airport are classified as prime farmland or farmland of statewide importance, but most has been developed. Agricultural production does occur in non-urban areas north of Interstate 39.

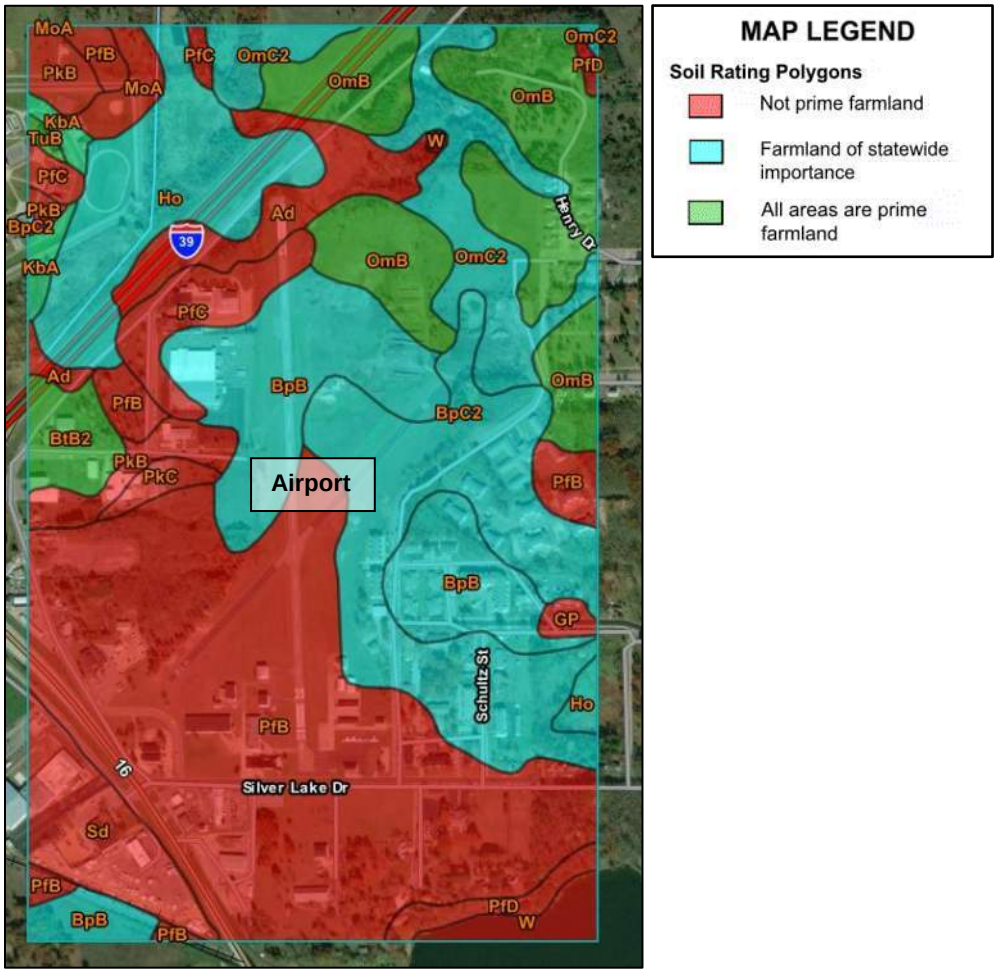
Hazardous Materials

Federal, State, and local laws regulate hazardous materials use, storage, transport, or disposal. Disrupting sites containing hazardous materials or contaminates may cause significant impacts to soil, surface water, groundwater, air quality and the organisms using these resources. An Environmental Due Diligence Audit (EDDA) is the investigation of property to investigate, identify and mitigate hazardous materials.

According to the Wisconsin DNR, Mael Airport Property located adjacent to the airport to the west (Lot 3) is listed as an open environmentally contaminated site (ID #111049840). Impacts include a contaminated private well, groundwater contamination, and soil contamination. A 2005 court order requires the owner to perform soil testing and ground water monitoring. Lot 3 totaling 1.97 acres of property, which includes this site, is within a life estate and is scheduled to be granted to the City of Portage.

There is also evidence of buried materials at the end of Runway 18. According to the airport manager, areas near the end of Runway 22 were historically used as a dump site.

Exhibit 2-18
USDA NRCS Farmland Classification



Source: United States Department of Agriculture (USDA) National Resources Conservation Service (NRCS)

Historical, Archaeological, and Cultural Resources

The National Historic Preservation Act (NHPA) of 1966 provide protection against development impacts that would cause changes to historical resources. Section 106 of the NHPA as amended requires Federal agencies to take into account the effect of any action on any district, site, building, structure or object that is included in, or eligible for, inclusion in the National Register of Historic Places (NRHP). Properties having traditional religious or cultural importance to Native American tribes may quality.

There are 11 national or state registered historic places in or near Portage as shown in the following table. The closest site is one (1) mile southeast of airport property within the built-up portion of the city.

Table 2-19
State or National Historic Places

Name	ID
Society Hill Historic District	92000112
Henry Merrell House	93000545
Fox-Wisconsin Portage Site	73000074
Portage Industrial Waterfront Historic District	95000257
Portage Retail Historic District	95000510
Church Hill Historic District	96001628
Old Indian Agency House	72000045
Zona Gale House	80000113
Portage Canal	77000030
Fort Winnebago Site	79000066
Fort Winnebago Surgeon's Quarters	70000029

Source: U.S. Department of the Interior, Wisconsin Historical Society

Properties 50 years or older are eligible for inclusion into the national register of historic places. The current site was used as an airport since the 1940s. The main hangar (1944) and T-hangar (1964) within airport property, as well as Mael hangars #13 and #14 immediately adjacent to airport property are all believed to be over 50 years old. These properties would require further studies to determine if these structures have any significant historic value.

There are no known archaeological or cultural resources studies to have been completed on airport property.

Land Use & Noise

FAA evaluates typically evaluates impacts of airport actions in terms of noise compatibility of existing and planned uses near the airport. FAA also assesses other land uses such as surrounding development, landfills, and wildlife attractants ensure they do not adversely affect the safety of aircraft flight operations or cause socioeconomic effects.

There are several existing land uses not compatible with FAA airport design standards (Runway Protection Zone) that may require on- or off-airport mitigation. Although there are nearby residential properties that are sensitive noise receptors, noise exposure is not likely a significant issue at C47. Airports like C47 with less than 90,000 propeller operations and 700 turbine operations annually do not require a noise analysis. Any change to the airport fleet mix may trigger an analysis. The existing solid waste landfill is located 5 miles southeast of the airport meeting FAA recommendations. A wildlife hazard assessment has not been completed to determine if there are any wildlife hazards to aircraft operations.

Socioeconomics & Environmental Justice

Environmental justice considers the potential of Federal actions to cause disproportionate and adverse effects on low-income or minority populations. The one demographic indicator that is disproportionate to state averages within one (1) mile of airport property include low-income population (33 percent vs. 30 percent).

The airport is confined between several local, state and federal roadways. If any changes are proposed, potential community disruption needs to be considered from a socioeconomic standpoint during an environmental review process. Factors include impacts to economic activity, employment, income, population, housing, public services and social conditions.

Visual Effects

Airport-related lighting facilities and activities could visually affect surrounding residents and other nearby light-sensitive areas such as homes, parks or recreational areas. Actions could also affect visual resources and the visual character of the area. Airport actions need to be evaluated to determine these effects. Potentially sensitive receptors exist less than 500 feet from the runways to the east. Proposed mixed-use development is located as close as 300 feet southeast of the Runway 36 end.

Water Resources

Water Quality

Airport activities may cause water quality impacts due to their proximity to waterways. Construction, operations or maintenance activities may affect water quality. The resultant water quality impacts may adversely affect animal, plant, or human populations. FAA must evaluate potential impacts of airport actions to navigable waterways, sole-source acquirers, or protected groundwater supplies.

C47 is located with the Puckaway Lake-Fox River Watershed. According to the County's comprehensive plan, Columbia County has a large untapped supply of good quality ground water. Drainage patterns on-airport generally flow to the north and east. The nearest waterway is an unnamed stream is located to the north of Interstate 39 and flows eastward to the Fox River. The airport handles fueling but does not see de-icing operations.

Wetlands

Wetlands are defined in federal Executive Order 11990 as:

> *"those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances, do support a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands*

generally include swamps, marshes, bogs, and similar areas."

Nonjurisdictional wetlands do not involve navigable waters because they are not connected to or adjacent to navigable waters of the United States (U.S.). Dredge and fill activities in these wetlands do not require U.S. Army Corps of Engineers (USACE) approvals. Section 404 of the Clean Water Act (CWA) governs the dredging and filling of navigable waters of the U.S.. "Navigable waters of the U.S." includes wetlands connected or adjacent to navigable waters of the U.S. that have been, are, or will be used to transport interstate or foreign commerce. Executive Order 11990 requires Federal agencies to avoid wetlands when a practicable alternative avoiding a wetland exists. A Section 404 permit is required is required for impacts to "navigable waters of the U.S."

The National Wetland Inventory (NWI) shows a complex of freshwater emergent and forested/shrub wetlands on the north portion of the airport property over the Runway 18 end. This data likely has not been updated since Runway 18-36 was extended in that direction in 1996. Data from the Wisconsin Department of Natural Resources (DNR) confirms there are wetland indicating soils in this area abutting County Highway CX. The only other NWI wetland near airport property is a small complex about 700 feet northeast of Runway 22.

CONCLUSION

The information collected and documented in this Inventory chapter provides a baseline foundation to update the Portage Municipal Airport long-range plan. The information provided herein will be used as the baseline for the remainder of the Master Plan analysis.

CHAPTER THREE

AVIATION DEMAND FORECASTS

PORTAGE MUNICIPAL AIRPORT

AIRPORT MASTER PLAN – PHASE 1

TKDA

AVIATION DEMAND FORECASTS

INTRODUCTION

The Activity Forecasts chapter of the airport master plan study analyzes current and future airport activity at the Portage Municipal Airport (C47). Forecasting the demand for airport use is a critical step in airport development. It allows an airport to examine its ability to satisfy the needs of the aircraft and people it serves, and to determine the approximate timing of necessary improvements by projecting airport activity levels.

The forecasts developed for C47 are important to adequately plan, size, and sequence development of future facilities to meet future aviation demand. Actual development will occur as demand arises, not based on forecasts alone. Planning Activity Levels (PALs) represent anticipated activity triggers used to initiate airport development.

C47 is unique because the existing airport facility heavily restricts airport operations that demand use of an upgraded airport. Therefore, there are two forecast methods developed for this study. The ***official*** forecast assumes the existing airport site remains constrained with restrictions that limit airport activity. The official forecast was reviewed and approved by FAA on August 25, 2020. The ***unconstrained*** forecast scenario identifies Portage aviation demand that may be at an airport without operational restrictions, used for triggering-event facility planning in this study. The unconstrained forecast is an optimistic forecast scenario.

The technical review presented in this study uses several methods to help quantify the potential aviation activity through the planning period. The base year is 2018 with a 20-year forecast period from 2018 through 2038. Interim milestones include near-term (5 years) and mid-term (10 years). The following aviation activity elements are reviewed:

- Based aircraft,
- Airport operations,
- Aircraft fleet mix,
- Critical aircraft,
- Peak activity, and
- Annual instrument approaches

Forecasting efforts use a “snapshot” of existing aviation trends and socioeconomic climate. As such, forecasting tends to be a dynamic element of airport master planning. Forecasts should be updated when conditions change dramatically to reflect the changing environment.

The activity forecasts were prepared in early 2019 prior to the Coronavirus Disease 2019 (COVID-19) outbreak. The ongoing pandemic has had a significant impact to aviation demand worldwide in 2020. Airport activity estimates and forecasts should be updated prior to airport development to support FAA funding for airport improvements.

FORECAST RATIONALE

Forecasting the demand for airport use is a critical step in airport development. It allows an airport to examine its ability to satisfy the needs of the aircraft and people it serves, and to determine the approximate timing of necessary improvements.

Forecasts developed for airport master plans and/or federal grants must be approved by the Federal Aviation Administration (FAA). It is the FAA's policy, listed in FAA AC 150/5070-6B, *Airport Master Plans*, that FAA approval of forecasts should be consistent with the Terminal Area Forecasts (TAF). Master plan forecasts for operations and based aircraft are consistent with the TAF if they meet the following criteria:

1. Forecasts differ by less than 10 percent in the five-year forecast and 15 percent in the 10-year period, or
2. Forecasts do not affect the timing or scale of an airport project, or
3. Forecasts do not affect the role of the airport as defined in the current version of FAA Order 5090.3, *Field Formulation of the National Plan of Integrated Airport Systems*.

Forecasts that are inconsistent with the TAF require additional FAA review to confirm the planning assumptions and appropriate methodologies are used.

Furthermore, FAA Order 5090.3C states forecasts should be:

1. Realistic,
2. Based on the latest available data,
3. Reflect the current conditions at the airport,
4. Supported by information in the study, and
5. Provide an adequate justification for the airport planning and development

The TAF model used for this report was published in January 2018.

Factors Affecting Forecasts

FAA provides general guidance in evaluating factors that affect aviation activity. FAA AC 150-5070-6B states:

> *"Planners preparing forecasts of demand or updating existing forecasts should consider socioeconomic data, demographics, disposable income, geographic attributes, and external factors such as fuel costs and local attitudes towards aviation."*

For purposes of this forecast, the following defining factors have been used to develop the forecast:

- Based on availability of data when the project began (October 2018), Federal or calendar year 2018 is the baseline year.
- The forecast period is 20 years encompassing years 2018 through 2038.

- Estimates and future projections of socioeconomic and demographic trends from 2018 have been utilized for the airport service area.
- The core airport service area is Columbia County, Wisconsin.
- Socioeconomic forecasts are derived from Woods & Poole data (2018) and other national and state sources.

Forecasts may be developed using a composite of methodologies over the planning period.

Aviation forecasts attempt to predict the future based on known conditions. Several local and national factors can affect the future activity at any airport. Several scenarios could measurably alter the number of forecasted based aircraft and operational activity at C47 including the presence of a commercial operator.

Forecasting Methods

Various methodologies are used to develop aviation activity forecasts. Forecasts should not be considered predictions of the future but rather an educated projection of future activity. Some of the following forecasting methods used in this study include trend analysis, share analysis, and professional judgment.

Trend Extensions

A trend extension forecast identifies historical growth patterns and projects those patterns into the future. Often, a trend line can be drawn through a graph of the historical data to reveal an overall trend, which can then be extended into the immediate future to develop a forecast.

Market Share Analysis

Market share analysis assumes a relationship between local and national/regional forecasts. The market share approach to forecasting is a top-down method where activity at an airport is assumed to be tied to growth in some external measure (typically a regional, state, or national forecast).

Professional Judgment

Judgmental methods are educated estimations of future events from the experience and intuition of the forecaster using user/airport trends and industry knowledge. This method permits the inclusion of a broad range of relevant information into the forecasting process, and is used to refine and/or select the results of the other methods.

SOCIOECONOMIC DATA

Socioeconomic information within the airport service area can provide insight into factors that affect aviation activity at an airport. Commonly evaluated socioeconomic metrics include population, employment, and income. Historic trends, current data and forecast estimates are evaluated in this section to identify socioeconomic trends that may affect aviation activity

forecasts at C47. Growth rates are used as a method to compare the airport service area to other regional, statewide, and national trends.

Population

Population is a basic indicator of the number of people who may use the airport. Typically, as the population surrounding the airport rises, so too does the number of based aircraft and activity. A rise in population will not guarantee a rise in based aircraft or activity, but it is an indicator of the potential for based aircraft and activity to rise. Historical and forecast population data for the United States, Wisconsin, Madison Metropolitan Statistical Area (MSA), Columbia County, and the City of Portage is shown in **Table 3-1**.

Table 3-1
Population Data & Projections

Year	United States	Wisconsin	Madison MSA	Columbia County*	City of Portage*
1998	275,854,094	5,297,672	527,073	51,323	9,439
2018	328,910,900	5,847,745	662,071	57,248	10,473
2023	344,505,100	6,033,820	697,099	61,410	10,900
2028	360,689,500	6,219,898	733,071	64,745	11,370
2038	392,026,500	6,542,762	801,822	68,460	11,790
Historical AAGR (1998-2018)	*0.88%*	*0.50%*	*1.15%*	*0.49%*	*0.47%*
Forecast AAGR (2018-2038)	*0.88%*	*0.56%*	*0.96%*	*0.89%*	*0.59%*

Source: Woods & Poole Economics (2018), Wisconsin Department of Administration, U.S. Census Bureau
**Data used from 1998, 2017, 2020, 2025, and 2035 from WI DOA*
MSA = Metropolitan Statistical Area, AAGR = Average Annual Growth Rate

The airport's service area (Columbia County) has seen historic population growth. Population within the airport's service area and Madison MSA is projected to grow at a faster rate than the statewide forecast according to 2015-2035 forecast data from the Wisconsin Department of Administration. The City of Portage's population has also grown historically and is forecast to grow at about the same rate as the statewide forecast.

Employment

Employment is important socioeconomic characteristic that could lead to increased activity at the airport. Declining trends in recreational aircraft use compared to business aircraft might illustrate that employment could be a better indicator of aeronautical activity. A higher rate of employment, especially in certain types of businesses, may yield increased aeronautical activity or may be a driver for some businesses to expand or relocate facilities to a specific area to enhance or supplement their operations. **Table 3-2** illustrates the historical and forecast total employment. **Table 3-3** identifying major employment sectors.

Table 3-2
Total Employment Data & Projections

Year	United States	Wisconsin	Madison MSA	Columbia County
1998	158,482,333	3,287,634	390,105	27,597
2018	202,637,900	3,842,151	527,752	32,965
2023	217,444,800	4,070,451	568,846	34,407
2028	232,064,800	4,286,240	608,324	35,751
2038	259,305,800	4,664,703	676,553	38,207
Historical AAGR (1998-2018)	*1.24%*	*0.78%*	*1.52%*	*0.89%*
Forecast AAGR (2018-2038)	*1.24%*	*0.97%*	*1.25%*	*0.74%*

Source: Woods & Poole Economics (2018)
MSA = Metropolitan Statistical Area, AAGR = Average Annual Growth Rate

Table 3-3
Top Employment Sectors in Airport Service Area

Year	1998	2018	2038
Manufacturing	18.69%	18.11%	16.09%
Retail Trade	12.69%	11.08%	10.47%
State and Local Government	11.56%	10.89%	10.09%
Health Care and Social Assistance	8.59%	10.40%	12.04%
Accommodation and Food Service	7.11%	7.37%	7.42%
Farm	7.19%	5.61%	4.94%
Construction	6.41%	5.33%	4.58%

Source: Woods & Poole Economics (2018)

Columbia County has an economy heavily based on manufacturing, with strong retail trade and state/local government sectors. Woods & Poole forecasts nearly 1,500 new jobs in the 20-year planning period within the County, with the highest share growth in the health care and social assistance sector.

Income

Per Capital Personal Income (PCPI) is another factor affecting aviation activity. Those who have more disposable income may have a higher propensity to utilize the time savings of aviation for travel, or simply more disposable income for leisure. **Table 3-4** illustrates the historical and forecast PCPI.

Table 3-4
Per Capita Personal Income Data & Projections (2009 Dollars)

Year	United States	Wisconsin	Madison MSA	Columbia County
1998	$34,415	$33,749	$37,792	$33,457
2018	$46,097	$43,730	$49,689	$42,224
2023	$49,081	$46,636	$52,696	$44,398
2028	$51,873	$49,344	$55,488	$46,413
2038	$56,228	$53,647	$59,939	$49,546
Historical AAGR (1998-2018)	*1.47%*	*1.30%*	*1.38%*	*1.17%*
Forecast AAGR (2018-2038)	*1.00%*	*1.03%*	*0.94%*	*0.80%*

Source: Woods & Poole Economics (2018)
MSA = Metropolitan Statistical Area, AAGR = Average Annual Growth Rate

Growth in PCPI for Columbia County has historically increased at a slightly lower rate than average national, state and regional figures. Forecast PCPI will continue to increase at a lower rate than other areas. The U.S. Census Bureau determined the cost of living index of Columbia County is 88.4 (2016), which is nearly 10% lower than the statewide average. These factors suggest a higher disposable income rate Columbia County.

AVIATION ACTIVITY TRENDS

Historical and existing local, regional and national data as well as historical trends aid in establishing aviation activity demand. Historical data came from a variety of sources including airport records, FAA databases, WBOA databases, as well as various state and national forecasts. Studies referenced include but were not limited to the FAA Terminal Area Forecast (TAF), 2030 State Aviation System Plan and the FAA Aerospace Forecast (2018-2038). The FAA Aerospace Forecast provides a national overview of historical trends in addition to national activity forecasts for various segments of the aviation industry including general aviation.

National

Historical

The early part of the 21st century was full of uncertainty in the aviation industry. The terrorist attacks on September 11th, abnormally high fuel prices, and the 2007-2009 economic recession all contributed to volatility in the aviation community. According to the General Aviation Manufacturers Association (GAMA), total GA aircraft shipments decreased by 50% between 2008 and 2009. Total aircraft shipments have remained steady since 2009, with the average billings increasing.

The active GA fleet was in decline between 2007 and 2013. Some of the decline was from a 2010 law requiring all aircraft to be re-registered that reduced airworthy aircraft. The total GA fleet has increased by over 6% from 2013 through 2017. GA operations have decreased by 15% since 2007 according to the Terminal Area Forecast.

Growth has occurred in turbine-powered aircraft types with a 12.8% increase in total aircraft and hours flown from 2010 to 2017. The total number of turbojet aircraft increased by 22.5% alone. During that same period, total estimated GA hours flown increased by 2.3% annually overall.

Forecast

According to the FAA Aerospace Forecasts, the FAA's long-term outlook for GA is stable to optimistic. The active GA fleet is forecast to remain relatively stable between 2018 and 2038. Steady growth in Gross Domestic Product (GDP) and corporate profits result in continued growth in more expensive turbine and rotorcraft. The GA turbojet aircraft fleet is forecast to increase 2.2% per year. Fixed-wing piston aircraft, the largest segment of the GA fleet, is forecast to continue to shrink at a rate of 0.8% per year. Unfavorable pilot demographics, and overall increasing cost of aircraft ownership are the drivers of the decline.

The number of GA hours flown is projected to increase an average of 0.8% per year through 2038, resulting over 5 million new GA aircraft hours annually at the end of the 20-year planning period. Turbine-powered aircraft are expected to increase in activity by 2.4% annually as new aircraft are flown more often. Piston-powered aircraft are expected to decrease in activity by 1.0% annually as activity is replaced by light-sport and turbine-powered aircraft.

State

According to the FAA TAF, the total number of based aircraft increased by 212 or 5.3% in Wisconsin from 2012 to 2017 to 4,125. The Statewide based aircraft count in 2017 are still 11% below the peak that occurred in 2007. Total GA airport operations decreased by 7.0% in the same time. Data confirms there are more total aircraft in Wisconsin but they are operating less within the state than in 2012.

The FAA TAF predicts the total number of based aircraft in Wisconsin will increase by 0.49% annually through the 20-year planning period. Total GA airport operations are forecast to increase by 0.24% annually in the same period. The 2030 State Aviation System Plan (SASP) forecasts based aircraft would grow an average of 0.38% annually, with GA operations increasing at the same rate. Forecasts suggest activity rates may not increase as much in Wisconsin as nationwide averages.

Airport

Available data to historical data and forecasts include the FAA's Terminal Area Forecast, FAA Traffic Flow Management Systems Counts (TFMSC), State Aviation System Plans (SASP), and historical airport planning documents.

The TAF is the official FAA forecast of aviation activity for individual airports within the United States. The TAF is developed by FAA Headquarters, and utilizes airport manager surveys, operational data, and other socioeconomic metrics to estimate aircraft operations. The January 2018 TAF for C47 is illustrated in **Table 3-5**.

Table 3-5
FAA Terminal Area Forecast for C47 (January 2018)

Year	Itinerant			Local		Total Operations	Total Based Aircraft*
	AT	GA	M	GA	M		
1998	300	8,500	50	5,900	0	14,750	19
2008	300	4,500	50	4,000	0	8,850	17
2018	50	2,500	200	2,000	0	4,750	26
2023	50	2,500	200	2,000	0	4,750	26
2028	50	2,500	200	2,000	0	4,750	26
2033	50	2,500	200	2,000	0	4,750	26
2038	50	2,500	200	2,000	0	4,750	26
Historical AAGR (1998-2018)	*-8.57%*	*-5.94%*	*7.18%*	*-5.27%*	-	*-5.51%*	*1.58%*
Forecast AAGR (2018-2038)	*0.00%*	*0.00%*	*0.00%*	*0.00%*	-	*0.00%*	*0.00%*

Source: FAA Terminal Area Forecast (January 2018)
AT = Air Taxi, GA = General Aviation, M = Military, C = Civil, AAGR = Average Annual Growth Rate
**FAA does not count gliders or experimental aircraft in TAF based aircraft counts.*

Historical TAF information is available from 1990. The recorded annual operations as high as 15,100 through 1994. This count has decreased over time, with 8,850 through 2014 then reduced to the current 4,750 level. This calculates to be a 68% decrease in operations reported by the TAF since 1990.

FAA estimates future activity at C47 will remain static with no growth, as it does with many GA airports nationwide. A forecast showing neither growth nor decline may be unrealistic; therefore, alternative forecasting methods will be reviewed in this study.

The FAA TAF does not reflect actual historical changes in based aircraft at C47. In 2003, airport planning documents show 35 based aircraft at C47, including one (1) turbojet. Based aircraft dropped to 25 in 2008, with one turbojet (1) and two (2) multi-engine aircraft. Currently there are currently 25 based aircraft – all single-engine airplanes. Reasons for the decrease may include the lack of investment by the airport sponsor into C47 airport facilities.

FAA Traffic Flow Management System Counts (TFMSC) provides data from flights operated on an Instrument Flight Rules (IFR) flight plans to or from an airport. These counts provide an indication of overall airport activity. The historical TFMSC data for C47 is illustrated in **Table 3-6**.

Table 3-6
FAA TFMSC Data for C47 (2000-2017)

Year	IFR Operations	Year	IFR Operations
2000	496	**2009**	286
2001	458	**2010**	224
2002	426	**2011**	247
2003	433	**2012**	218
2004	510	**2013**	190
2005	375	**2014**	147
2006	356	**2015**	225
2007	316	**2016**	146
2008	245	**2017**	81
Historical AAGR (2000-2017)	*-10.11%*		

Source: FAA Traffic Flow Management System Counts (Accessed January 2019)

The TFMSC data shows more than an 80% drop in IFR operations since 2000. The downward trend in C47 operations from the FAA TAF and TFMSC is contrary to the upward trend of regional socioeconomic measures and overall state/national aviation activity trends. This fact suggests unrealized aviation demand exists today at C47. Reasons for the decrease are likely due to the reduction in the number of based aircraft, change in the based aircraft fleet, prevailing airspace obstructions that limit certain operators, condition of existing facilities, lack of local flight instructors to serve C47, and the movement of a local flying club from C47 to DLL.

Another forecast of aviation activity at C47 is derived from the SASP. The SASP establishes categories of airports within the state, and identifies goals and objectives for those airports based on their categories and other local factors. The latest Wisconsin SASP presents forecasts for the years 2010-2030 at individual airports. As shown in **Table 3-7**, only one (1) additional based aircraft was forecast at end of the planning period. Airport operations were forecast to increase at a similar rate of 0.23% annually.

Table 3-7
Wisconsin 2030 State Aviation System Plan Forecast for C47

Year	Based Aircraft	Operations
2010	25	8,800
2015	25	8,790
2020	25	8,790
2030	26	9,220
AAGR	*0.20%*	*0.23%*

Source: Wisconsin State Aviation System Plan (2010)
AAGR = Average Annual Growth Rate

AIRPORT ACTIVITY ANALYSIS

Airport User Survey

An online airport user survey was completed as part of this master plan effort. The survey data was collected in December 2018 to help identify user needs and activity trends. Individuals who had aircraft based in C47, had FAA registered aircraft in Columbia and surrounding counties, or owned an aircraft that had a FlightAware recorded flight operation between 2015 and 2017 at C47 received an invitation to complete the survey. The survey was made available on the project website (www.portageairportplan.tkda.com). Out of the 292 individuals that received a survey invitation, 62 individuals responded to the survey. A summary of the airport user survey is in **Appendix B**. Key findings include:

- 100% use the airport for personal/recreational flights, 28% for corporate/business travel, and 28% for flight training.
- 11 of the 25 based aircraft (44%) responded to the survey.
- 1,215 annual flight operations were estimated in 2018.
- Operations are projected by users to grow by 58% to 1,927 annually in 2023.
- 90% of the respondents will continue flying into Portage in the next 5 years
- The highest ranked must have or desired facility needs include improved visual aids, improved obstacle clearance, crosswind runway, improved terminal building, and improved approach minimums.
- There were several comments from users desiring a maintenance facility (FBO), upgraded terminal building, additional hangars, upgraded facilities, car rental capability, and improved snow removal.
- Three (3) users stated that they would consider moving their operations to Portage if some of the airport deficiencies were addressed.
- One user stated they would move their fleet of airplanes from Baraboo-Wisconsin Dells Airport to Portage if the airport were suitable (longer runway length).
- Desires to establish an aircraft repair facility if the airport were to remain operational.
- One respondent is interested in opening a maintenance facility if the airport were to remain in the long-term.
- The busiest month of flight operations is July.
- Minimum runway length is about 2,800 feet, the average runway length is 3,100 feet, and at least 5,000 feet is needed for corporate aircraft (insurance).

The user survey indicates there is “pent-up” aviation activity demand in small aircraft that is restricted by the existing airport facilities. This is supported by user statements about moving to C47 if the airport were suitable, and the increase in airport flight operations. This demand should be reflected in the unconstrained activity forecasts.

Business Survey

In addition to the airport user survey, a business survey was completed in November 2018 to help identify the business needs for aviation in Portage. The link the survey was distributed by

the Portage Area Chamber of Commerce. A total of 45 businesses completed the survey. Follow-up interviews were completed in March 2019. A summary of the business survey is in **Appendix C**. Key findings include:

- One-third of the businesses responded that the location of C47 as somewhat, very or extremely important to their business or customers.
- Five (5) businesses use GA to support their business operations
- Three (3) GA users identified a demand for 240 annual flight operations in business jet aircraft in the next five years.
- The Baraboo-Wisconsin Dells Airport is primarily used as an alternative airport to the short runway length at C47.
- C47 only captures 5% of the GA business demand of survey respondents.
- General comments received include the runway is too short for corporate aircraft, the airport needs safety and other improvements, jet fuel, and local weather reporting.

The business user survey indicates business aviation demand not realized at C47. This is supported by data indicating the existing airport facility restrictions and resulting use of alternative airports. Actual business aviation demand should be reflected in the unconstrained activity forecasts.

Critical Airport Operators

The majority of existing C47 airport users that responded to the survey are operating small single aircraft, with sporadic operations in multi-engine aircraft. There were no existing regular operations found in airplanes that would require a change to the existing airport design for the official forecast. Critical airport operators that would potentially drive a change to the existing airport design do not currently use the airport because the facilities do not meet their needs.

Hawker 900XP

Source: Globalair.com

Several Portage businesses operating larger corporate aircraft were contacted to identify the need to use C47 if the airport had facilities capable of accommodating their aircraft. Support letters are in **Appendix C**. A summary of confirmed business jet operations is in the **Table 3-8**.

Table 3-8
Confirmed Portage Critical Airport Operators

Operator	Aircraft Type	Annual C47 Operations Demand (2022)*
S&L Companies	Hawker 900XP	100
Cardinal Glass	Cessna Citation Excel	25
	TOTAL	**125**

Source: Follow-Up Interviews (2019); AAGR = Average Annual Growth Rate
**Operations at C47 predicated on airport facilities capable of accommodating the aircraft type*

The above table provides a sample of Portage businesses and users have responded to requests for data. In a community the size of Portage serving other surrounding towns, it is highly likely other transient operations in larger aircraft such as multi-engine piston, turboprop and turbojet aircraft would increase at Portage if current facility restrictions were removed. These aircraft types are assumed to become the critical aircraft in an unconstrained forecast scenario.

Unconstrained Forecasts

The unconstrained forecasts prepared in this report presume the Portage airport facility is designed to meet the aeronautical demands of the community as validated by the user survey responses. Other airports in Wisconsin serving a similar population with a jet-capable runway were analyzed to help determine potential aeronautical activity at Portage. The airports reviewed included:

- **Monroe Municipal Airport (EFT)**
  - 5,000’ x 75’ primary runway
  - 36 based aircraft including 1 based jet, 17,300 annual operations (FAA)
  - Serves the City of Monroe with a population of 10,827
- **Merrill Municipal Airport (RRL)**
  - 5,100’ x 75’ primary runway
  - 31 based aircraft, 18,710 annual operations (FAA)
  - Serves the City of Merrill with a population of 9,161

The user survey revealed many of the larger aircraft operations that are destined for C47 utilize the Baraboo-Wisconsin Dells Airport (DLL). Operational data from DLL airport was also analyzed to help estimate the potential aircraft fleet mix at C47 in an unconstrained scenario.

- **Baraboo-Wisconsin Dells Airport (DLL)**
  - 5,010’ x 100’ primary runway
  - 42 based aircraft (FAA)
  - 30,000 annual operations (FAA)
  - Serves the City of Baraboo and Wisconsin Dells with a total population of 15,142
  - Several businesses located in the popular Midwest tourist destination of Wisconsin Dells own and operate business jets

COMMERCIAL AVIATION FORECASTS

Commercial aviation consists of civil aviation that involves operating an aircraft for hire to transport passengers or cargo. The forecast elements evaluated in this report applicable to C47 include Air Taxi & Commuter aircraft operations forecasts.

Passenger Enplanements

Enplanements at an airport represent the number of revenue passengers boarding of commercial service aircraft that depart an airport. There are no FAA-recorded enplanements at C47 nor are any forecast for this GA airport.

Air Taxi & Commuter Operations

An operation is a takeoff or a landing of an aircraft conducting a passenger carrying operation on a scheduled or unscheduled basis. An air taxi operation operates airplanes with no more than 60 passenger seats or 18,000 pounds of cargo payload. A commuter operation is a scheduled operation on a published flight schedule in other-than-turbojet airplanes up to nine (9) passenger seats and up to 7,500 pounds of payload.

According to FAA rules, operations at C47 that would qualify as commercial include passenger charter operators operated under FAR Part 135: Operating Requirements: *Commuter and On Demand Operations and Rules Governing Persons On Board Such Aircraft*. The need for point-to-point on-demand commercial air service (air charter) is a primary driver for air taxi & commuter passenger operations. Many factors drive this demand including the presence of local businesses with regional air travel needs.

Baseline

According to FAA Traffic Flow Management System Counts (TFMSC) from 2000 to 2018, there have only been 31 operations classified as air carrier or freight at C47. No commercial operations were captured since 2015. Therefore, there are no estimated existing commercial operations at C47.

Official Forecast

In the future, no significant changes in the number of annual operations is anticipated at C47 because of the shorter runway length, limited instrument approaches, and lack of aircraft storage space/services for corporate aircraft. Therefore, no growth in Air Taxi operations is the recommended forecast, matching the FAA TAF growth rate.

Unconstrained Forecast

The unconstrained forecast evaluates potential activity for the Portage community with an unconstrained airport facility capable of meeting demands. The business user survey was clear that alternative airports such as DLL are used to meet Portage's aviation needs. DLL had 188 total non-freight commercial operations in 2017. Monroe, a comparable community, saw 123 annual non-freight commercial operations in 2017 at its airport.

Based on this data, the unconstrained commercial operations demand at Portage is estimated at 100 and grow to 160 by the end of the planning period. This value is forecast to grow at the same rate as turbine hours flown (2.37% annually) identified by FAA in their 2018-2038 aerospace forecasts. This method is used to estimate potential demand for turboprop and business jet air charter operations. The unconstrained forecast is summarized in **Table 3-9**.

Table 3-9
C47 Commercial Aviation Forecasts - Unconstrained

Year	Passenger Enplanements	Air Carrier Operations	Air Taxi Operations	Total Commercial Operations
2018	0	0	100	**100**
2023	0	0	112	**112**
2028	0	0	126	**126**
2033	0	0	142	**142**
2038	0	0	160	**160**
AAGR	*0.00%*	*0.00%*	*2.37%*	***2.37%***

Source: TKDA Analysis (2019)
AAGR = Average Annual Growth Rate

BASED AIRCRAFT FORECASTS

A based aircraft is an operational and airworthy aircraft claiming an airport as its home for a majority of the year.

Background

The National Based Aircraft Inventory as of May 2017 confirms 25 based aircraft in inventory at C47. This is the current baseline. The fleet mix includes 25 single-engine aircraft and no other aircraft types. Gliders, military and ultralight aircraft are not recognized in FAA based aircraft counts. A total of 22 of the 25 based aircraft (88%) have an approach speed of greater than or equal to 50 knots.

The number of based aircraft at C47 has decreased over the past several years, from 35 in 2003 to 25 today. The fleet mix has changed from a mix of single-engine, multi-engine, and turbojet aircraft to all single-engine aircraft today.

There are 155-based aircraft at public GA airports within and in close proximity to the airport's service area, which is approximately a 40-minute drive time from the airport. A total of 16.1% of the area's based aircraft reside at C47. There are 98 FAA-registered aircraft in Columbia County. Area based aircraft are summarized in **Table 3-10**.

Table 3-10
Based Aircraft in C47 Catchment Area

Airport Name	FAA ID	Based Aircraft	% of Total	Drive Time
Portage Muni	C47	25	16.1%	-
Gilbert Field	94C	8	5.1%	22 minutes
Baraboo-Wisconsin Dells	DLL	42	27.1%	26 minutes
Waunakee Muni	6P3	35	22.6%	35 minutes
Sauk Prairie Muni	91C	28	18.1%	36 minutes
Reedsburg Muni	C35	17	11.0%	38 minutes
	TOTAL	**155**	-	-

Source: TKDA Analysis (2019), FAA Airport 5010, Google Maps
AAGR = Average Annual Growth Rate

According to FAA data, based aircraft historically has decreased by nearly 0.5% annually nationwide since 2002, and by nearly 0.6% in Wisconsin. FAA forecasts the total Wisconsin based aircraft to increase by 0.47% annually through the planning period. The 2010 WI SASP assumes based aircraft will increase by over 8% through year 2030.

Factors that could result in new based aircraft include but are not limited to a new aviation service provider (e.g. fixed base operator), new residents with aircraft, aircraft moving from another nearby airport, or new aircraft to support new or growing local businesses. The airport user survey indicated interest in a private party in developing an aviation business at C47.

Based aircraft is commonly restricted at GA airports by the lack of available aircraft storage infrastructure. There has been expressed demand for new based aircraft over the past several years. However, factors such as aging infrastructure, lack of new investment, and potential for the airport's closure has stifled most aeronautical demand from being realized at C47.

Official Forecast

Several forecast methods reviewed include trend and share analysis of various aviation and socioeconomic forecasts. The official forecast presumes demand for based aircraft is realized if C47 remains at the current site and improvements are made.

The trend analysis methodology results in a significant decrease in the number of based aircraft. The market share analysis using aviation and socioeconomic measures results in a modest increase to based aircraft at less than a 1.0% annual growth rate. The FAA TAF results in no change to based aircraft over time.

The official based aircraft forecast uses a share of the FAA's Based Aircraft forecast for the State of Wisconsin derived from the TAF. This 20-year growth rate of 0.49%. Economic indicators show lower growth rates in Columbia County than statewide averages, which may suggest lower growth rates. However, it is estimated that new based aircraft growth will also be derived from individuals moving their aircraft from other airports to C47 if the existing airport site remains with new hangar units available. Overall, the forecast results in three (3) new aircraft with the fleet mix remaining the same with the constrained airfield facility. The forecast is illustrated in **Table 3-11**.

Table 3-11
C47 Based Aircraft Forecasts - Official

Year	Single-Engine	Multi-Engine	Jet	Helicopter	FAA Based Aircraft	Ultralight / Other	Total Based Aircraft
2018	25	0	0	0	**25**	0	**25**
2023	26	0	0	0	**26**	0	**26**
2028	26	0	0	0	**26**	0	**26**
2033	27	0	0	0	**27**	0	**27**
2038	28	0	0	0	**28**	0	**28**
AAGR	*0.49%*	-	-	-	***0.49%***	-	***0.49%***

Source: TKDA Analysis (2019)

A total of 88% of the based aircraft are expected to have approach speeds of 50 knots or greater, matching the existing percentage. This results in 25 of the 28 based aircraft in the long-term having the faster approach speed. This data is used for future runway length calculations.

Unconstrained Forecast

The unconstrained "optimistic" forecast for C47 utilizes data from other comparable communities with jet-capable runways. A ratio of city population per based aircraft was developed for Monroe and Merrill to determine potential based aircraft demand at Portage. This calculation yields a demand for 36-based aircraft as seen below:

- 68 based aircraft / 19,988 population = 293.94 people per BA
- 10,473 population of Portage x 293.94 people per BA = 36 based aircraft at C47

Based aircraft is projected to grow using the Wisconsin Department of Administration population forecasts for the City of Portage (0.59% annually). Based aircraft is forecast to grow to 40 by the end of the planning period. Even in an unconstrained Portage airport scenario, based aircraft will be limited by its relative proximity to DLL. A growth in Portage's based aircraft market share from 16% to 20% will also result in about 40-based aircraft.

The long-term based aircraft fleet mix is forecast to be more diverse like DLL, with two (2) multi-engine aircraft, two (2) turboprop aircraft, and two (2) turbojet aircraft. The business survey in this study demonstrates demand for up at least one (1) based turbojet aircraft now at C47 if the airport were upgraded to a jet-capable runway. This optimistic forecast estimates another based jet at C47 in the long-term future is possible at a community the size of Portage. The unconstrained based aircraft forecast is illustrated in **Table 3-12**.

Table 3-12
C47 Based Aircraft Forecasts - Unconstrained

Year	Single-Engine	Multi-Engine	Jet	Helicopter	FAA Based Aircraft	Ultralight / Other	Total Based Aircraft
2018	33	2	1	0	**36**	0	**36**
2023	34	2	1	0	**37**	0	**37**
2028	35	2	2	0	**39**	0	**39**
2033	36	2	2	0	**40**	0	**40**
2038	36	2	2	0	**40**	0	**40**
AAGR	*0.45%*	*0.00%*	*3.54%*	-	***0.59%***	-	***0.59%***

Source: TKDA Analysis (2019)
Note: Growth rates adjusted due to rounding, AAGR = Average Annual Growth Rate

The overall unconstrained based aircraft growth rate is forecast to be 0.59% annually through the planning period. The unconstrained forecast shows a demand for up to 40 based aircraft by the end of the planning period. Please note with the numbers so low, small differences in based aircraft and rounding have a significant effect on growth rates.

General Aviation Forecasts

An operation is an aircraft landing or a takeoff. Aircraft operations are split into two categories: local and itinerant.

- **Local operations** are performed by aircraft that remain in the local traffic pattern and stay within a 20−mile radius. These operations typically include practice landings, touch-and-go operations, practice approaches and maneuvering within the local area in non-military aircraft. Local operations are usually performed by recreational and flight training aircraft, as well as agricultural spray aircraft in rural settings.
- **Itinerant operations** are performed by a landing aircraft arriving from outside the airport area (20 miles) or a departing aircraft that leaves the airport area. Itinerant operations are conducted in all types of aircraft.

At non-towered airports like C47, FAA estimates operations and classifies them as civil local and general aviation itinerant. Combined these include all types of GA operations.

Civil Local

Background

The current FAA TAF estimates C47 civil local operations at 2,000 annually. On average, this equates to over five (5) takeoffs and landings each day originating from within a 20-mile radius.

Historically, civil local operations have annually declined by 1.17% nationwide and 1.82% in Wisconsin according to the FAA TAF since 2002. FAA decreased the local operations estimate at C47 from 4,000 to 2,000 in 2015. FAA forecasts civil local operations however to increase 0.38% annually nationwide, with a lesser 0.23% annual growth rate in Wisconsin. The SASP forecasts total C47 airport operations would grow at a 0.23% average annual growth rate.

Factors that could affect civil local operations at C47 include increased operations within the airport traffic pattern generated by flight training activities and local recreational flights.

Official Forecast

Several forecast methods reviewed to estimate and forecast civil local operations at C47. As with based aircraft, the trend analysis methodology results in a significant decrease in the number of civil local operations. The market share analysis using aviation and socioeconomic measures results in a modest increase to operations at less than a 1.0% annual growth rate. The FAA TAF results in no change to civil local operations over time.

Specific methodologies evaluated in this forecast include developing share/trend analysis scenarios from FAA operations forecasts, operations per based aircraft (OBPA), and actual data from air traffic control tower (ATCT) facilities in Wisconsin serving GA airports (Kenosha, Janesville, Milwaukee-Timmerman, Oshkosh, and Waukesha).

The official civil local operations baseline was developed in part using C47 airport user survey data. The user survey indicated 1,215 total annual operations from the 11 based aircraft. Operations were increased by 25% using professional judgement to estimate the additional operations experienced during the month of July during EAA Oshkosh AirVenture not adequately captured in the user survey. This totals about 3,450 operations when the rate is projected for 25 actual based aircraft. A civil local operational percentage of 42.7% was applied using the average from Wisconsin GA ATCT facilities. When rounded, this results in 60 operations per based aircraft, or 1,500 civil local operations at C47 for the base year. The airport manager confirms the overall level of activity at C47 is in this range.

The official forecast uses an OPBA market share method to model future growth. Civil local OPBA is forecast to grow from 60 to about 63 using the same growth rate trend as the FAA's Civil Local operations forecast for Wisconsin. Civil local operations are forecast to grow to 1,735 by the end of the planning period when new based aircraft are factored. This method was selected because it reflects a modest potential increase in local activity resulting from new based aircraft and some increase in flight training activity. The resultant 0.73% annual growth rate is validated by FAA's forecast of the number of hours flown in each GA aircraft will increase by 0.81% annually through 2038. The recommended local operations forecast is illustrated in **Table 3-13**.

Table 3-13
C47 Local Operations Forecasts - Official

Year	Civil Local Operations
2018	**1,500**
2023	**1,554**
2028	**1,610**
2033	**1,671**
2038	**1,735**
AAGR	***0.73%***

Source: TKDA Analysis (2019)
Note: Growth rates adjusted due to rounding, AAGR = Average Annual Growth Rate

Unconstrained Forecast

The unconstrained civil local operations forecast uses a similar method to the official forecasts. The existing OPBA increases to 107 resulting in an existing baseline of 3,867 civil local operations with 36-based aircraft. This OPBA is derived from the average civil local OPBA from all five GA ATCT facilities in Wisconsin.

The forecast assumes OPBA will increase from 107 to 113 using the same growth rate trend as the FAA's Civil Local operations forecast for Wisconsin. The total C47 civil local operations is forecast to grow to 4,518 by the end of the planning period. This forecast presumes increases in local activity generated from new based aircraft, flight instruction, flight training and an FBO facility. The recommended local operations forecast is illustrated in **Table 3-14**.

Table 3-14
C47 Local Operations Forecasts - Unconstrained

Year	Civil Local Operations
2018	3,867
2023	4,026
2028	4,248
2033	4,436
2038	4,518
AAGR	*0.78%*

Source: TKDA Analysis (2019)
Note: Growth rates adjusted due to rounding, AAGR = Average Annual Growth Rate

GA Itinerant

Background

The FAA TAF estimates the C47 GA itinerant operations at 2,500 annually. On average, this equates to over six (6) takeoffs and landings each day from aircraft originating beyond 20 miles from the airport.

GA itinerant operations historically have annually declined by 1.90% nationwide and 1.68% in Wisconsin according to the FAA TAF since 2002. FAA reduced the GA itinerant operations estimate at C47 from 4,500 to 2,500 in 2015. FAA forecasts GA itinerant operations to increase 0.36% annually nationwide, and a more modest 0.24% annual growth rate in Wisconsin. The SASP forecasts C47 airport operations would grow at a 0.23% average annual growth rate.

Factors that could affect GA itinerant operations at C47 include growth in recreational and business flights from those that require timely air transportation. These flights are conducted in both aircraft based at the airport, and from those visiting from other airports. An increase in based aircraft typically results in an increase in itinerant flight operations.

Official Forecast

Several forecast methods reviewed to estimate and forecast GA itinerant operations at C47. As with based aircraft, the trend analysis methodology results in a significant decrease in the number of civil local operations. The market share analysis using aviation and socioeconomic measures results in a modest increase to operations at less than a 1.0% annual growth rate. The FAA TAF results in no change to civil local operations over time.

Specific methodologies evaluated for this forecast include developing share/trend analysis scenarios from FAA operations forecasts, OPBA, data from GA ATCT facilities, and population.

The official GA itinerant operations baseline was developed in part using C47 airport user survey data. The user survey indicated 1,215 total annual operations from the 11 based aircraft. Operations were increased by 25% using professional judgement to estimate the additional operations experienced during the month of July during EAA Oshkosh AirVenture not adequately captured in the user survey. This totals about 3,450 operations when the rate is

projected for 25 actual based aircraft. A civil local operational percentage of 57.3% was applied using the average from Wisconsin GA ATCT facilities. When rounded, this results in 80 operations per based aircraft, or 2,000 civil local operations at C47 for the base year. The airport manager confirms the overall level of activity at C47 is in this range.

The official forecast uses a market share OPBA method to model future growth. GA Itinerant OPBA is forecast to grow from 80 to about 84 using the same growth rate trend as the FAA's Civil Local operations forecast for Wisconsin. The total GA itinerant operations is forecast to grow to 2,320 by the end of the planning period. This method was selected because it reflects an increase in activity from new based aircraft, as well as from some additional usage from local businesses. The recommended local operations forecast is illustrated in **Table 3-15**.

Table 3-15
C47 GA Itinerant Operations Forecasts - Official

Year	Civil Local Operations
2018	**2,000**
2023	**2,072**
2028	**2,149**
2033	**2,232**
2038	**2,320**
AAGR	***0.75%***

Source: TKDA Analysis (2019)
Note: Growth rates adjusted due to rounding, AAGR = Average Annual Growth Rate

Unconstrained Forecast

The unconstrained GA itinerant operations forecast uses a similar method to the official forecast. The existing OPBA increases to 144 resulting in an existing baseline of 5,133 civil local operations with 36-based aircraft. The OPBA is derived from the average civil local OPBA from all five GA ATCT facilities in Wisconsin. This represents an optimistic outlook on airport activity similar to other jet-capable GA airports but scaled for Portage.

The unconstrained forecast assumes OPBA will increase from 144 to 152 using the same growth rate trend as the FAA's GA Itinerant operations forecast for Wisconsin. The total GA itinerant operations is forecast to grow to 6,078 by the end of the planning period. This method was selected because it reflects an increase in activity from new based aircraft and itinerant traffic from generated from an unrestricted airport in a growing metropolitan area. Given the high percentage of operations using alternative airports and the community's strong business climate, an increase in GA itinerant operations seems reasonable. The recommended unconstrained itinerant operations forecast is depicted in **Table 3-16**.

Table 3-16
C47 GA Itinerant Operations Forecasts - Unconstrained

Year	Civil Local Operations
2018	**5,133**
2023	**5,402**
2028	**5,703**
2033	**5,961**
2038	**6,078**
AAGR	**0.85%**

Source: TKDA Analysis (2019)
Note: Growth rates adjusted due to rounding, AAGR = Average Annual Growth Rate

MILITARY FORECASTS

The FAA TAF estimates 200 annual itinerant military operations at C47. According to the airport manager, this activity is from military helicopters performing practice approaches, landings or takeoffs from the Wisconsin Air National Guard base in Madison. The airport estimates the same number of annual military itinerant operations as the FAA TAF.

There is no indication of any new military activity in the local or surrounding area. The forecast is for the 200 military itinerant operations annually, or about 4 operations per week through the 20-year planning period at C47. Military operations forecasts are illustrated in **Table 3-17**. These forecasts apply to both the official and unconstrained forecast scenarios.

Table 3-17
C47 Military Operations Forecasts – Official & Unconstrained

Year	Local Military Operations	Itinerant Military Operations	Total Military Operations
2018	0	200	**200**
2023	0	200	**200**
2028	0	200	**200**
2033	0	200	**200**
2038	0	200	**200**
AAGR	-	*0.00%*	***0.00%***

Source: TKDA Analysis (2019)
Note: Growth rates adjusted due to rounding, AAGR = Average Annual Growth Rate

OPERATIONS FORECAST SUMMARY

The total official annual operations forecast for C47 is summarized in **Table 3-18**. The unconstrained forecast scenario is summarized in **Table 3-19.**

Table 3-18
C47 Operations Forecast Summary - Official

Year	Itinerant					Local			Total
	AC	AT	GA	M	Total	C	M	Total	
2018	0	0	2,000	200	2,200	1,500	0	1,500	**3,700**
2023	0	0	2,072	200	2,272	1,554	0	1,554	**3,826**
2028	0	0	2,149	200	2,349	1,610	0	1,610	**3,960**
2033	0	0	2,232	200	2,432	1,671	0	1,671	**4,102**
2038	0	0	2,320	200	2,520	1,735	0	1,735	**4,255**
AAGR	-	-	*0.75%*	*0.00%*	*0.68%*	*0.73%*	-	*0.73%*	***0.70%***

Source: TKDA Analysis (2019). Totals may differ due to rounding.
AC = Air Carrier, AT = Air Taxi, GA = General Aviation, M = Military, C = Civil, AAGR = Average Annual Growth Rate

Table 3-19
C47 Operations Forecast Summary - Unconstrained

Year	Itinerant					Local			Total
	AC	AT	GA	M	Total	C	M	Total	
2018	0	100	5,133	200	5,333	3,867	0	3,867	**9,301**
2023	0	112	5,402	200	5,602	4,026	0	4,026	**9,740**
2028	0	126	5,703	200	5,903	4,248	0	4,248	**10,277**
2033	0	142	5,961	200	6,161	4,436	0	4,436	**10,739**
2038	0	160	6,078	200	6,278	4,518	0	4,518	**10,955**
AAGR	-	*2.37%*	*0.85%*	*0.00%*	*0.85%*	*0.78%*	-	*0.78%*	***0.82%***

Source: TKDA Analysis (2019). Totals may differ due to rounding.
AC = Air Carrier, AT = Air Taxi, GA = General Aviation, M = Military, C = Civil, AAGR = Average Annual Growth Rate

Unconstrained Forecast Validation

FAA's *Model for Estimating General Aviation Operations at Non-Towered Airports using Towered and non-Towered Airport Data* was referenced to help validate the unconstrained airport operations baseline. This model had developed an equation to estimate airport operations based on surrounding population and based aircraft. The calculated annual operations is 13,067 with 36-based aircraft when adjusted for 2018 operations nationwide. C47 has an overlapping service area with DLL, therefore, the unconstrained operations count at Portage is going to be less than the forecast models.

Additionally, the airport user survey also suggests there is "pent up" demand for use of C47. The respondents show operational growth of 58% from existing to future operations in five years. This supports projections that an unconstrained airport will attract additional operations. Historic IFR operations at C47 up to five times more than they are today shows the capability of this airport to generate higher levels of activity.

The official forecast suggests the Portage community is realizing only about 40% of its estimated aeronautical demand by utilizing the existing C47 constrained airport site. The unconstrained Portage operations and based aircraft forecast, when validated, seems reasonable for airport planning purposes.

OPERATIONS FLEET MIX

Background

The overall airport operations fleet mix utilizes known data to estimate the percentage of various aircraft types to use the airport. The preferred forecast is analyzed.

Reference data used to help determine the existing aircraft fleet mix includes Flight Aware and FAA TFMSC database data. FAA TFMSC data captures activity conducted in a radar environment under an IFR flight plan.

Official Forecast

TFMSC data from 2013 through 2017 was analyzed by aircraft type at C47 to help identify the types of aircraft operating at the airport. Available FAA data only represents a small sample of total C47 airport operations given there is no air traffic control tower (ATCT). Aircraft operating under IFR at GA airports also tend to be larger, corporate airplanes. The fleet of aircraft by operational type is summarized in **Table 3-20**.

Table 3-20
C47 TFMSC Fleet Mix (2013-2017)

Year	SEP	MEP	TP	TJ	Total
2013	94	14	7	75	**190**
2014	69	11	10	57	**147**
2015	91	15	8	111	**225**
2016	94	8	5	39	**146**
2017	62	8	7	4	**81**
Total	**410**	**56**	**37**	**286**	**789**
Share	***52.0%***	***7.1%***	***4.7%***	***36.2%***	***100%***

Source: FAA Traffic Flow Management System Counts (C47: 2013-2017), TKDA Analysis (2019)
SEP = Single-Engine Piston, MEP = Multi-Engine Piston, TP = Turboprop, TJ = Turbojet

The C47 fleet mix has evolved in the last several years. Turbojet aircraft no longer fly into C47 on a frequent basis. Turbojet aircraft were nearly half of the recorded TFMSC fleet mix in 2015, but has decreased to less than 10% of the operations in 2017. Past demand suggests the ability for the community to support larger business aviation operations.

Without an air traffic control tower, available FAA data represents a small sample of total C47 airport operations. The clear majority of operations are conducted under Visual Flight Rules (VFR) mainly in single-engine piston aircraft. An estimated 17.2% of the traffic are operated under IFR based on data from Wisconsin ATCT facilities at non-commercial service airports.

Unconstrained Forecast

TFMSC data was gathered for jet-capable airports including Monroe (EFT), Merrill (RRL), and Baraboo-Wisconsin Dells (DLL) from 2013 to 2017 to estimate a potential fleet mix at an unconstrained Portage airport. The fleet of aircraft by operational type is summarized in **Table 3-21**.

Table 3-21
EFT, RRL, DLL TFMSC Fleet Mix (2013-2017)

Year	SEP	MEP	TP	TJ	Total
2013	818	248	390	548	**2,004**
2014	777	248	437	525	**1,987**
2015	836	191	411	490	**1,928**
2016	829	215	410	639	**2,093**
2017	768	219	336	605	**1,928**
Total	**4,028**	**1,121**	**1,984**	**2,807**	**9,940**
Share	***40.5%***	***11.3%***	***20.0%***	***28.2%***	***100%***

Source: FAA Traffic Flow Management System Counts (EFT, RRL, DLL: 2013-2017), TKDA Analysis (2019).
Totals may differ due to rounding.
SEP = Single-Engine Piston, MEP = Multi-Engine Piston, TP = Turboprop, TJ = Turbojet, H = Helicopter, O = Other

The overall fleet mix at comparable jet-capable airports has a consistently higher percentage of multi-engine piston, turboprop, and turbojet aircraft than actual 2017 activity at C47. As an example, the turbojet and turboprop fleet mix percentage in 2017 at jet-capable airports is 48.8%, as compared to only 13.5% at C47. This data shows that airports in communities sized similar to Portage with jet-capable runways attract larger aircraft types.

Fleet Mix Forecast

Using FAA TFMSC data as a reference, estimated fleet mix percentages were developed for commercial, local, and itinerant airport operations conducted under IFR and VFR. The estimated fleet mix percentage for each operation type is multiplied by the annual operations to result is an operational breakdown by aircraft type.

Official Forecast

The official airport fleet mix reflects regular use of single and multi-engine aircraft as validated by airport user survey data and airport management observations. The estimated and forecast fleet mix percentages for each operation type were developed with the following assumptions:

- GA Itinerant + Military – IFR (4.2% of total operations): 70% Single-Engine Piston, 10% Multi-Engine Piston, 10% Turboprop, 5% Turbojet, 5% Helicopter
- GA Itinerant + Military – VFR (55.2% of total operations): 87% Single-Engine Piston, 5% Multi-Engine Piston, 3% Turboprop, 5% Helicopter
- GA Local – VFR (40.6% of total operations): 90% Single-Engine Piston, 4% Multi-Engine Piston, 1% Helicopter, 5% Other

The operational fleet mix based on the official C47 forecast is shown in **Table 3-22**.

Table 3-22
C47 Operations Fleet Mix Operations – Official

Year	Single-Engine Piston	Multi-Engine Piston	Turboprop	Turbojet	Helicopter	Ultralight / Other
2018	3,200	189	92	19	125	75
2023	3,309	195	96	20	129	78
2028	3,425	202	99	20	134	81
2033	3,548	209	102	21	138	84
2038	3,680	217	106	22	143	87

Source: TKDA Analysis (2019), Totals may differ due to rounding.

Unconstrained Forecast

The unconstrained airport fleet mix references data from DLL and other similar communities with jet-capable runways. The results show a higher overall percentage of turboprop and turbojet aircraft. The forecast unconstrained C47 forecast fleet mix percentages for each operation type were developed with the following assumptions:

- Commercial (~1.5% of operations): 10% Turboprop, 90% Turbojet
- GA Itinerant + Military – IFR (~9.9% of operations): 35% Single-Engine Piston, 9% Multi-Engine Piston, 20% Turboprop, 33% Turbojet, 3% Helicopter
- GA Itinerant + Military – VFR (~47.4% of operations): 75% Single-Engine Piston, 10% Multi-Engine Piston, 10% Turboprop, 5% Helicopter
- GA Local – VFR (~41.6% of operations): 88% Single-Engine Piston, 8% Multi-Engine Piston, 1% Helicopter, 3% Other

The operational fleet mix based for the unconstrained forecast in shown in **Table 3-23**.

Table 3-23
C47 Operations Fleet Mix Operations – Unconstrained

Year	Single-Engine Piston	Multi-Engine Piston	Turboprop	Turbojet	Helicopter	Ultralight / Other
2018	7,036	834	635	393	287	116
2023	7,359	873	668	419	301	121
2028	7,759	920	704	449	317	127
2033	8,100	960	736	478	331	133
2038	8,252	978	752	500	337	136

Source: TKDA Analysis (2019), Totals may differ due to rounding.

CRITICAL AIRCRAFT

Background

The critical aircraft is the most demanding aircraft or grouping of aircraft with similar characteristics that regularly uses the airport. FAA AC 150/5000-17, *Critical Aircraft and Regular Use Determination* provides guidance on the use of the critical aircraft concept for facility

planning. An accurate critical aircraft determination helps to ensure the proper development of airport facilities. It is appropriate to have different critical aircraft determinations for different airside elements. The critical aircraft determination is a key consideration in FAA decision making on project justification.

A critical aircraft type or group of aircraft with similar characteristics must achieve the regular use threshold. Regular use is defined by FAA as 500 annual operations, including both itinerant and local operations but excluding touch-and-go operations. The following FAA design characteristics are evaluated in this section to determine the critical aircraft for airport design.

- Aircraft Approach Category (AAC)
- Airplane Design Group (ADG)
- Taxiway Design Group (TDG)
- Maximum Takeoff Weight

Official Forecast

FAA TFMSC data was reviewed with design characteristics from FAA's database for C47 from 2013 to 2017 to identify the critical aircraft for the official forecast. This data provides a small sample of overall activity. **Table 3-24** itemizes the operations by FAA design characteristics.

Table 3-24
C47 FAA TFMSC Aircraft Design Characteristics (2013-2017)

Design Characteristics	Total Operations	Share of Category
Aircraft Approach Category (AAC)		
AAC-A	448	56.8%
AAC-B or greater	341	43.2%
Airplane Design Group (ADG)		
ADG-I	492	62.4%
ADG-II or greater	297	37.7%
Taxiway Design Group (TDG)		
TDG-1A/1B	493	62.5%
TDG-2	296	37.5%
Weight Classification		
Small Aircraft (≤12,500 lbs.)	504	63.8%
Large Aircraft (>12,500 lbs.)	285	36.2%

Source: FAA Traffic Flow Management System Counts (2013-2017, Accessed January 2019), TKDA Analysis (2019)

Unconstrained Forecast

FAA TFMSC data was reviewed with FAA design characteristics from FAA's database for DLL, EFT, and RRL from 2013 to 2017 to develop a fleet mix at a jet-capable airport in a community the size of Portage with a jet-capable runway. **Table 3-25** itemizes the operations by FAA design characteristics.

Table 3-25
EFT, RRL, DLL TFMSC Aircraft Design Characteristics (2013-2017)

Design Characteristics	Total Operations	Share of Category
Aircraft Approach Category (AAC)		
AAC-A	5,321	55.4%
AAC-B	3,502	36.5%
AAC-C/D	778	8.1%
Airplane Design Group (ADG)		
ADG-I	6,958	72.5%
ADG-II or greater	2,643	27.5%
Taxiway Design Group (TDG)		
TDG-1A/1B	8,855	92.2%
TDG-2	746	7.8%
Weight Classification		
Small Aircraft (≤12,500 lbs.)	7,394	73.5%
Large Aircraft (>12,500 lbs.)	2,546	26.5%

Source: FAA Traffic Flow Management System Counts (2013-2017, Accessed January 2019) for EFT, RRL, DLL TKDA Analysis (2019)

Critical Aircraft Forecast

Official Forecast

TFMSC data and professional judgement was used to assign each aircraft type with a percentage of operations within each FAA design characteristic. The estimated C47 fleet mix percentages for each aircraft characteristic is identified in **Table 3-26** for the official forecast.

Table 3-26
C47 Critical Aircraft Operations Percentage – Official

Design Characteristics	SEP	MEP	TP	TJ	O
Aircraft Approach Category (AAC)					
AAC-A	100%	48%	4%	0%	100%
AAC-B	0%	52%	96%	100%	0%
Airplane Design Group (ADG)					
ADG-I	100%	100%	10%	4%	100%
ADG-II or greater	0%	0%	90%	96%	0%
Taxiway Design Group (TDG)					
TDG-1A/1B	100%	100%	14%	75%	100%
TDG-2	0%	0%	86%	25%	0%
Weight Classification					
Small Aircraft (≤12,500 lbs.)	100%	100%	94%	4%	100%
Large Aircraft (>12,500 lbs.)	0%	0%	6%	96%	0%

Source: TKDA Analysis (2019); SEP = Single-Engine Piston, MEP = Multi-Engine Piston, TP = Turboprop, TJ = Turbojet, O = Other

Table 3-27 shows the results of the design characteristics percentages applied to the total operations by type identified in **Table 3-22** for the official forecast.

Table 3-27
C47 Critical Aircraft Operations - Official

Design Characteristics	2018	2023	2027	2033	2038
Aircraft Approach Category (AAC)					
AAC-A	3,369	3,484	3,606	3,736	3,875
AAC-B or greater	206	213	220	228	236
Airplane Design Group (ADG)					
ADG-I	3,369	3,484	3,606	3,736	3,875
ADG-II	206	213	220	228	236
Taxiway Deign Group (TDG)					
TDG-1A/1B	3,491	3,610	3,736	3,871	4,015
TDG-2	84	87	90	93	97
Weight Classification					
Small Aircraft (≤12,500 lbs.)	3,551	3,672	3,801	3,938	4,084
Large Aircraft (>12,500 lbs.)	24	24	25	26	27
Critical Aircraft					
AAC-ADG-TDG-Weight	**A-I-1-S**	**A-I-1-S**	**A-I-1-S**	**A-I-1-S**	**A-I-1-S**

Source: TKDA Analysis (2019)

The existing critical aircraft fleet will remain an AAC-A, ADG-I, TDG-1A, small aircraft through the 20-year planning period for the official forecast. The representative C47 critical aircraft types are listed in **Table 3-28**.

Table 3-28
C47 Critical Aircraft Characteristics - Official

Critical Aircraft	Code	AAC	ADG	TDG	MTOW	Ops
Official Forecast Critical Aircraft						
Beechcraft Bonanza 36	BE36	A	I	1A	3,650 (S)	22
Cessna 182	C182	A	I	1A	3,100 (S)	21
Beechcraft Baron 58	BE58	B	I	1A	5,524 (S)	2

Source: FAA Traffic Flow Management System Counts (2017), FAA Aircraft Characteristics Database, TKDA Analysis (2019)
AAC = Aircraft Approach Category, ADG = Airplane Design Group, TDG = Taxiway Design Group, MTOW = Maximum Takeoff Weight (pounds), S = Small Aircraft, L = Large Aircraft Ops = TFMSC Operations (2017)

Beechcraft Bonanza G36

Source: Flickr

Cessna 182 Skylane

Source: Flickr

Beechcraft Baron G58

Source: Pinterest

The official forecast critical aircraft for primary Runway 18-36 is an FAA Airport Reference Code (ARC) A-I/B-I small airplane. Using FAA design methodologies, primary Runway 18-36 can be used 93.44% of the time with a crosswind component of 10.5 knots or less. This calculates to 3,575 annual operations in 5 years.

Crosswind Runway 4-22 is also designed for ARC A-I/B-I small airplane. According to FAA design methodologies, this crosswind runway is needed only 3.77% of the time to provide additional wind coverage. This results in 144 annual operations needing Runway 4-22 in five years. However, it is noted the user survey respondents indicated 20% their operations were on Runway 4-22 which suggests upwards of 740 annual operations in the base forecast year.

Considerations should also be made to physically accommodate occasional ADG-II or TDG-2 aircraft operations with adequate object-free areas or wider taxiways in specific areas.

Unconstrained Forecast

The estimated C47 fleet mix percentages for each aircraft characteristic is identified in **Table 3-29** for the unconstrained forecast.

Table 3-29
C47 Critical Aircraft Operations Percentage – Unconstrained

Design Characteristics	SEP	MEP	TP	TJ	O
Aircraft Approach Category (AAC)					
AAC-A	100%	50%	35%	5%	100%
AAC-B	0%	50%	65%	100%	0%
AAC-C/D	0%	0%	0%	5%	0%
Airplane Design Group (ADG)					
ADG-I	100%	100%	35%	30%	100%
ADG-II or greater	0%	0%	65%	70%	0%
Taxiway Design Group (TDG)					
TDG-1A/1B	100%	100%	25%	85%	100%
TDG-2	0%	0%	75%	15%	0%
Weight Classification					
Small Aircraft (≤12,500 lbs.)	100%	100%	80%	15%	100%
Large Aircraft (>12,500 lbs.)	0%	0%	20%	85%	0%

Source: TKDA Analysis (2019); SEP = Single-Engine Piston, MEP = Multi-Engine Piston, TP = Turboprop, TJ = Turbojet, O = Other

Table 3-30 shows the results of the design characteristics percentages applied to the total operations by type identified in **Table 3-23** for the unconstrained forecast.

Table 3-30
C47 Critical Aircraft Operations - Unconstrained

Design Characteristics	2018	2023	2027	2033	2038
Aircraft Approach Category (AAC)					
AAC-A	7,811	8,171	8,615	8,995	9,165
AAC-B	1,183	1,248	1,322	1,389	1,428
AAC-C	20	21	22	24	25
Airplane Design Group (ADG)					
ADG-I	8,326	8,712	9,187	9,595	9,779
ADG-II	688	727	772	813	839
Taxiway Deign Group (TDG)					
TDG-1A/1B	8,796	9,209	9,716	10,152	10,355
TDG-2	218	230	243	256	263
Weight Classification					
Small Aircraft (≤12,500 lbs.)	8,553	8,949	9,437	9,855	10,042
Large Aircraft (>12,500 lbs.)	461	490	522	553	575
Critical Aircraft					
AAC-ADG-TDG-Weight	**B-II-1-S**	**B-II-1-S**	**B-II-1-L**	**B-II-1-L**	**B-II-1-L**

Source: TKDA Analysis (2019)

The unconstrained critical aircraft is expected to transition from an AAC-B, ADG-II small aircraft through the near-term, then transition to a large aircraft. The representative C47 critical airplanes are listed in **Table 3-31**.

Table 3-31
C47 Critical Aircraft Characteristics - Unconstrained

Critical Aircraft	Code	AAC	ADG	TDG	MTOW
Unconstrained Forecast Critical Aircraft					
Beechcraft King Air B200	B200	B	II	2	12,500 (S)
Hawker Beechcraft 900 XP	H25B	B	II	1B	28,000 (L)
Cessna Citation Excel	C56X	B	II	1B	20,200 (L)
Beechcraft King Air 350i	B350	B	II	2	15,000 (L)

Source: Business User Survey (2018), TKDA Analysis (2019)
AAC = Aircraft Approach Category, ADG = Airplane Design Group, TDG = Taxiway Design Group, MTOW = Maximum Takeoff Weight (pounds), S = Small Aircraft, L = Large Aircraft

Hawker 900 XP

Source: Flickr

Cessna Citation Excel

Source: Flickr

Beechcraft King Air B200

Source: Flickr

Beechcraft King Air 350i

Source: Flickr

The unconstrained forecast critical aircraft requires the primary runway to be designed for an FAA Airport Reference Code (ARC) B-II large airplane in the next 10-20 years. A crosswind would be designed for ARC A-I/B-I small airplane. Operational use of the crosswind runway per FAA design methodologies is dependent upon the orientation of the runways. Usage may exceed 500 in the long-term but would need to be calculated. The existing airfield configuration results in 413 needed crosswind runway operations in 20 years.

Although these forecasts show the critical aircraft remains TDG-1B, it should be noted there are several business jet and turboprop aircraft types are classified as TDG-2. These TDG-2 standards result in wider taxiways, and should be planned for contingency purposes.

INSTRUMENT OPERATIONS

An instrument operation is defined by FAA as an arrival, departure, or overflight conducted by an aircraft with an IFR flight plan or operating under a special VFR clearance. An instrument approach is defined as an approach to an airport conducted in actual instrument meteorological conditions. Instrument approaches are important to quantify to determine the use of published approach procedures to an airport. The number of annual instrument approaches also help to define the role of a non-primary GA airport according to FAA guidance.

The number of itinerant instrument operations is first calculated. The official forecast presumes 7.11% of the operations are conducted under IFR, based on the percentage of time where the meteorological conditions require an instrument approach. For the unconstrained forecast, samples from other Wisconsin GA airports with ATCT facilities are used where the percentage of IFR traffic is calculated to be 17.2% of GA itinerant operations. Commercial operations are expected to be operated IFR all the time.

The number of instrument approaches is assumed to be half of the instrument operations. **Tables 3-32 and 3-33** itemize the results for the official and unconstrained forecast, respectively.

Table 3-32
C47 Annual Instrument Operations - Official

Year	Annual Operations	Instrument Operations	Instrument Approaches
2018	3,700	156	78
2023	3,826	162	81
2028	3,960	167	84
2033	4,102	173	86
2038	4,255	179	90
AAGR	*0.70%*	*0.68%*	*0.68%*

Source: TKDA Analysis (2019), AAGR = Average Annual Growth Rate

Table 3-33
C47 Annual Instrument Approaches - Unconstrained

Year	Annual Operations	Instrument Operations	Instrument Approaches
2018	9,301	1,017	509
2023	9,740	1,076	538
2028	10,277	1,142	571
2033	10,739	1,202	601
2038	10,955	1,240	620
AAGR	*0.82%*	*0.99%*	*0.99%*

Source: TKDA Analysis (2019), AAGR = Average Annual Growth Rate

Both forecast scenarios sees an increase in the amount of instrument operations corresponding with the increase in overall airport operations.

PEAK ACTIVITY

Peak demand periods help quantify aviation activity during busy periods. Periods evaluated include the peak month, design day, and design hour characteristics for airport operations. Peak periods are defined in FAA AC 150/5060-5, *Airport Capacity and Delay*. Peak activity is important when planning the size of facilities with fixed capacities such as aprons and terminals.

- **Peak Month:** The calendar month when peak operations occur
- **Design Day**: The average day in a peak month
- **Design Hour**: The peak hour within the design day

At northern-tier airports such as C47, much of the VFR aviation activity is based on seasonal weather conditions and special events. C47 is popular aircraft parking destination for the EAA AirVenture, held in July each year in Oshkosh. The airport manager reports about 40% of the airport's annual activity is captured during this month. IFR activity is more constant and spread out over the year. Peak period activity allows the airport to plan for facilities to meet peak period activity demands.

Activity is easily measured at towered airports because personnel are constantly monitoring aviation traffic. However, at non-towered airports like C47, planners must find other ways to gather aviation activity information from fuel sales or other available operational records.

Peak Month

The peak month of operations was determined using both known operations and airport management observations. The peak month is determined to be July, corresponding with EAA AirVenture. Fuel sales records in 2017 were referenced to estimate about 35% of the annual airport activity occurs during the peak month. This is considered the peak month activity percentage for the official forecast. For the unconstrained forecast, a decreased share of EAA visitors with an increase in overall airport operations is forecast to result in a lower peak operational month of 25% of annual operations.

Design Day

The design day represents the average day in the peak month (ADPM). For a non-towered airport, there are no airport operation counts to quantify airport activity each day. ADPM is calculated by dividing the peak month activity by the number of days in the month. The peak month of July has 31 days.

Design Hour

The design hour is based on the average hourly operations during a design day with an additional factor for concentrated activity. The industry standard for GA airports is 90% of the daily airport operations occur within a 12-hour period, with the maximum peak hour activity

estimated to be 50% greater than the average hourly operations calculated for this period. This calculates to 11.25% of daily traffic concentrated in the design hour. This ratio is used for C47 design hour calculations.

The calculated C47 peak activity periods are identified in **Tables 3-34 and 3-35** for the official and unconstrained forecast scenarios, respectively.

Table 3-34
C47 Peak Activity: Total Operations - Official

Year	Annual Operations	Peak Month Operations	ADPM Operations	Design Hour Operations
2018	3,700	1,295	41.8	4.7
2023	3,826	1,339	43.2	4.9
2028	3,960	1,386	44.7	5.0
2033	4,102	1,436	46.3	5.2
2038	4,255	1,489	48.0	5.4
AAGR	*0.70%*	*0.70%*	*0.70%*	*0.70%*

Source: TKDA Analysis (2019), ADPM = Average Day Peak Month, AAGR = Average Annual Growth Rate

Table 3-35
C47 Peak Activity: Total Operations - Unconstrained

Year	Annual Operations	Peak Month Operations	ADPM Operations	Design Hour Operations
2018	9,301	2,325	75.0	8.4
2023	9,740	2,435	78.6	8.8
2028	10,277	2,569	82.9	9.3
2033	10,739	2,685	86.6	9.7
2038	10,955	2,739	88.3	9.9
AAGR	*0.82%*	*0.82%*	*0.82%*	*0.82%*

Source: TKDA Analysis (2019), ADPM = Average Day Peak Month, AAGR = Average Annual Growth Rate

FORECAST SUMMARY

A complete summary of the official airport activity forecasts is prepared accordance with FAA's Forecasting Aviation Activity by Airport guidance document. **Table 3-36** provides the forecast summary, and **Table 3-37** provides a forecast comparison to the FAA TAF.

Table 3-36
C47 Aviation Activity Forecast Summary – Official

	Activity Levels					Average Annual Growth Rate			
Forecast Levels	**2018**	**2023**	**2028**	**2033**	**2038**	**0-5 Years**	**0-10 Years**	**0-15 Years**	**0-20 Years**
Passenger Enplanements									
Air Carrier	0	0	0	0	0	-	-	-	-
Commuter	0	0	0	0	0	-	-	-	-
Total Enplanements	0	0	0	0	0	-	-	-	-
Operations									
Itinerant									
Air Carrier	0	0	0	0	0	-	-	-	-
Commuter/Air Taxi	0	0	0	0	0	-	-	-	-
Total Commercial	0	0	0	0	0	-	-	-	-
General Aviation	2,000	2,072	2,149	2,232	2,320	0.71%	0.72%	0.73%	0.75%
Military	200	200	200	200	200	0.00%	0.00%	0.00%	0.00%
Total Itinerant	2,200	2,272	2,349	2,432	2,520	0.65%	0.66%	0.67%	0.68%
Local									
Civil	1,500	1,554	1,610	1,671	1,735	0.70%	0.71%	0.72%	0.73%
Military	0	0	0	0	0	-	-	-	-
Total Local	1,500	1,554	1,610	1,671	1,735	0.70%	0.71%	0.72%	0.73%
Total Operations	**3,700**	**3,826**	**3,960**	**4,102**	**4,255**	**0.67%**	**0.68%**	**0.69%**	**0.70%**
Annual Instrument Approaches	32	33	34	35	36	0.65%	0.66%	0.67%	0.68%
Design Hour Operations	4.7	4.9	5.0	5.2	5.4	0.67%	0.68%	0.69%	0.70%
Cargo/Mail (Pounds)	N/A	N/A	N/A	N/A	N/A	-	-	-	-
Based Aircraft (BA)									
Single-Engine	25	26	26	27	28	0.49%	0.49%	0.49%	0.49%
Multi-Engine	0	0	0	0	0	-	-	-	-
Turbojet	0	0	0	0	0	-	-	-	-
Helicopter	0	0	0	0	0	-	-	-	-
FAA Total Based Aircraft	25	26	26	27	28	0.49%	0.49%	0.49%	0.49%
Other	0	0	0	0	0	-	-	-	-
Total Based Aircraft	**25**	**26**	**26**	**27**	**28**	**0.49%**	**0.49%**	**0.49%**	**0.49%**
GA Operations per BA	140	142	143	145	147	0.22%	0.23%	0.24%	0.25%

Source: TKDA Analysis (2019)

Table 3-37
C47 Aviation Activity Forecast Comparison with FAA TAF – Official

Metric	Year	Airport Forecast (AF)	FAA TAF	AF/TAF Difference
Passenger Enplanements				
Base Year	2018	0	0	0.0%
Base Year + 5	2023	0	0	0.0%
Base Year + 10	2028	0	0	0.0%
Based Aircraft				
Base Year	2018	25	26	-3.8%
Base Year + 5	2023	26	26	0.0%
Base Year + 10	2028	26	26	0.0%
Commercial Operations				
Base Year	2018	0	50	-100.0%
Base Year + 5	2023	0	50	-100.0%
Base Year + 10	2028	0	50	-100.0%
Total Operations				
Base Year	2018	3,700	4,750	-22.1%
Base Year + 5	2023	3,826	4,750	-19.5%
Base Year + 10	2028	3,960	4,750	-16.6%

Source: FAA Terminal Area Forecast (January 2018), TKDA Analysis (2019)

FORECAST APPROVAL

FAA approved the official “constrained” forecast scenario and critical aircraft for use in the master plan study on August 25, 2020. Due to the ongoing COVID-19 pandemic, FAA will require additional documentation on airport activity estimates and forecasts to support funding for upcoming airport improvements. The FAA approval letter is shown in **Exhibit 3-38**.

Exhibit 3-38
FAA Approval of C47 Official Forecast

U.S. Department
of Transportation
Federal Aviation Administration

Chicago Airports District Office
2300 E. Devon Avenue
Des Plaines, Illinois 60018

August 25, 2020

Mr. Eric Peterson
Airport Manager
115 W Pleasant St.
Portage, WI 53901

Portage Municipal Airport (C47)
Portage, WI
Approval of Forecast

Dear Mr. Peterson:

The Federal Aviation Administration (FAA) is in receipt of Chapter Three, Aviation Demand Forecasts, Portage Municipal Airport Master Plan- Phase 1, dated July 2019.

This aviation forecast was scoped and prepared prior to the effects of the Coronavirus Disease 2019 (COVID-19) outbreak. It is uncertain if there are, or will be, impacts to this forecast. For this reason, the FAA approval of the information provided in this forecast document is limited to the reasonability of the methodologies used and analysis completed. This is not an assessment of the forecasted number of operations or enplanements. FAA approval of the forecast does not provide justification to begin construction of airport development. Further documentation of actual activity levels reaching the forecasted activity levels will be needed prior to FAA participation in funding for those types of projects.

Given the above, the FAA approves the forecast provided in Tables 3-36 and 3-37, for planning purposes only, as captured below.

2

Table 3-36
C47 Aviation Activity Forecast Summary – Official

	Activity Levels					Average Annual Growth Rate			
Forecast Levels	2018	2023	2028	2033	2038	0-5 Years	0-10 Years	0-15 Years	0-20 Years
Passenger Enplanements									
Air Carrier	0	0	0	0	0	-	-	-	-
Commuter	0	0	0	0	0	-	-	-	-
Total Enplanements	0	0	0	0	0	-	-	-	-
Operations									
Itinerant									
Air Carrier	0	0	0	0	0	-	-	-	-
Commuter/Air Taxi	0	0	0	0	0	-	-	-	-
Total Commercial	0	0	0	0	0	-	-	-	-
General Aviation	2,000	2,072	2,149	2,232	2,320	0.71%	0.72%	0.73%	0.75%
Military	200	200	200	200	200	0.00%	0.00%	0.00%	0.00%
Total Itinerant	2,200	2,272	2,349	2,432	2,520	0.65%	0.66%	0.67%	0.68%
Local									
Civil	1,500	1,554	1,610	1,671	1,735	0.70%	0.71%	0.72%	0.73%
Military	0	0	0	0	0	-	-	-	-
Total Local	1,500	1,554	1,610	1,671	1,735	0.70%	0.71%	0.72%	0.73%
Total Operations	3,700	3,826	3,960	4,102	4,255	0.67%	0.68%	0.69%	0.70%
Annual Instrument Approaches	32	33	34	35	36	0.65%	0.66%	0.67%	0.68%
Design Hour Operations	4.7	4.9	5.0	5.2	5.4	0.67%	0.68%	0.69%	0.70%
Cargo/Mail (Pounds)	N/A	N/A	N/A	N/A	N/A	-	-	-	-
Based Aircraft (BA)									
Single-Engine	25	26	26	27	28	0.49%	0.49%	0.49%	0.49%
Multi-Engine	0	0	0	0	0	-	-	-	-
Turbojet	0	0	0	0	0	-	-	-	-
Helicopter	0	0	0	0	0	-	-	-	-
FAA Total Based Aircraft	25	26	26	27	28	0.49%	0.49%	0.49%	0.49%
Other	0	0	0	0	0	-	-	-	-
Total Based Aircraft	25	26	26	27	28	0.49%	0.49%	0.49%	0.49%
GA Operations per BA	140	142	143	145	147	0.22%	0.23%	0.24%	0.25%

Source: TKDA Analysis (2019)

Table 3-37
C47 Aviation Activity Forecast Comparison with FAA TAF – Official

Metric	Year	Airport Forecast (AF)	FAA TAF	AF/TAF Difference
Passenger Enplanements				
Base Year	2018	0	0	0.0%
Base Year + 5	2023	0	0	0.0%
Base Year + 10	2028	0	0	0.0%
Based Aircraft				
Base Year	2018	25	26	-3.8%
Base Year + 5	2023	26	26	0.0%
Base Year + 10	2028	26	26	0.0%
Commercial Operations				
Base Year	2018	0	50	-100.0%
Base Year + 5	2023	0	50	-100.0%
Base Year + 10	2028	0	50	-100.0%
Total Operations				
Base Year	2018	3,700	4,750	-22.1%
Base Year + 5	2023	3,826	4,750	-19.5%
Base Year + 10	2028	3,960	4,750	-16.6%

Source: FAA Terminal Area Forecast (January 2018), TKDA Analysis (2019)

Based on the approved forecasts, the FAA also approves A-I small aircraft for the existing and future critical aircraft for the airport and both runways.

The FAA concurs with the use of the forecast contained in the above referenced forecast summary for the remainder of your current master planning efforts only.

If you have any questions, I can be reached at (847) 294-8253 or at sandy.lyman@faa.gov.

Sincerely,

SANDRA ANN LYMAN Digitally signed by SANDRA ANN LYMAN Date: 2020.08.25 09:34:44 -05'00'

Sandra A. Lyman
Community Planner
Chicago Airports District Office

cc: Lucas Ward, Wisconsin Bureau of Aeronautics

CHAPTER FOUR

FACILITY REQUIREMENTS

PORTAGE MUNICIPAL AIRPORT

AIRPORT MASTER PLAN – PHASE 1

TKDA

FACILITY REQUIREMENTS

INTRODUCTION

This chapter of the Airport Master Plan analyzes the existing and anticipated future facility needs at the Portage Municipal Airport (C47) including airside facilities, general aviation (GA) facilities, landside elements, and support facilities.

Airfield requirements are those necessary for the operation of aircraft. Landside requirements are those necessary to support airport, aircraft and passenger operations. Needs are based on a review of existing conditions, capacity levels, activity demand forecasts, and airport design standards using FAA guidance and industry standards. Existing deficiencies to FAA airport design standards are also identified.

Potential solutions to address the facility needs through the planning period are discussed in this chapter. Specific alternatives that implement the recommendations are evaluated in the Alternatives Analysis chapter.

PLANNING ACTIVITY LEVELS

Several airport activity measures are used to help determine airport facility needs. Airport activity can be sensitive to industry changes, as well as national and local economic conditions. These result in difficulty in identifying a specific calendar year for the airport to reach demand levels associated with recommended improvements.

Planning Activity Levels (PALs) identify demand thresholds for recommended facility improvements. If an activity level is approaching a PAL, then the airport should prepare to implement the improvements. Alternatively, activity levels that are not approaching a PAL can lead to deferred improvements. The demand forecasts developed in this study correspond an anticipated planning level calendar year to each PAL (2023 and 2038) from the official and unconstrained aviation forecasts. **Table 4-1** identifies the PALs for this study.

Table 4-1
C47 Planning Activity Levels

Metric	PAL 1	PAL 2	PAL 3	PAL 4
Forecast Type	Official	Official	Unconstrained	Unconstrained
Estimated Year	2023	2038	2023	2038
Annual Operations	3,826	4,255	9,740	10,955
Based Aircraft	26	28	37	40

Source: TKDA Analysis (2019)

EMERGING TRENDS

GA Activity

As discussed in the previous chapter, total GA activity (hours flown) nationwide is forecast by FAA to increase 0.80% annually on average through the year 2038. Total number of airplanes in the GA fleet is expected to remain relatively constant, however, the turbine-powered (turboprop

and turbojet) aircraft fleet is forecast is forecast to grow 2.0% annually. Fixed-wing turbine aircraft hours flown are forecast to increase 2.4% annually, with 2.7% growth in turbojet aircraft alone. Rotorcraft and sport aircraft are also expected to grow at more than 2.0% annually. These trends indicate a strong demand for corporate aircraft activity making up for reduced piston aircraft use over time.

NextGen

The Next Generation Air Transportation System, or NextGen, is the FAA-led modernization of America's air transportation system to make flying even safer and more efficient. New technologies are being implemented into the National Airspace System (NAS) to support NextGen initiatives. Several of these initiatives will affect GA airports:

- Automatic Dependent Surveillance-Broadcast (ADS-B) to replace ground-based radar facilities. Aircraft flying within controlled airspace must be equipped with ADS-B Out avionics by January 1, 2020.
- Replacement of ground-based electronic navigational aids with satellite-based aids. The system is known as Wide Area Augmentation System (WAAS).
- Establishing performance-based navigation (PBN); an advanced, satellite-based form of air navigation with 3-D flight paths. New procedures using WAAS technology include precise approach/departure flight paths, and GPS vertically-guided landing approaches to runway ends.
- Implementing Ground-Based Augmentation System (GBAS) that supplements satellite-based approaches to provide improved GPS accuracy, and enables precision approach minimums to runway ends with reduced ground-based infrastructure.
- Data communication enhancements including digital text-based messages between controllers and pilots, and Voice Over Internet Protocol (VOIP).
- Collection of airport aeronautical data to nationwide GIS standards to facilitate improved data management.

Unmanned Aircraft Systems (UAS)

A UAS is an aircraft without a human pilot onboard. The use of UAS (drones) has dramatically increased over the past several years. Some airport sponsor's consider UAS near airports to be a safety hazard.

Recreational "hobby" UAS pilots must notify the airport and control tower (if present) if flying within 5 miles of airport. Airport sponsors can object to UAS operations near airports, however they cannot prohibit operations. Commercial UAS operators must obtain a remote pilot certificate from FAA and follow FAR Part 107 (Small UAS Rule). UAS operations must not interfere with airport operations and traffic patterns. Operators not covered by Part 107 require a waiver.

It is imperative that airports continue to monitor and track changes in evolving UAS rules and regulations because these can affect airport operations, infrastructure and procedures.

Regional Access/Multi-Modal

Regional access to airports is an issue nationwide as airports are not always considered in the regional transportation planning process. Viable multi-modal transportation options that connect GA airports to the communities they serve are needed as populations and flight activity increase and users look for alternative travel methods.

Alternative Fuels

Aviation fuel is a higher quality fuel than fuel used for heating or ground transportation. GA aircraft have historically been fueled by aviation gasoline (AVGAS), jet fuel (Jet-A), and motor gasoline. Emerging fuels for aircraft explored include electric, hydrogen, natural gas, unleaded fuel, and renewable jet fuel. FAA is currently testing unleaded fuels that can be used by most of the piston-engine aircraft fleet. GA airports need to be flexible to accommodate infrastructure for different types of aircraft fuels. C47 sells UL94 AVGAS, a 94-octane unleaded fuel that is a substitute for traditional 100-octane low-lead fuel for use in piston-driven aircraft rated for 94 motor octane or lower.

AIRFIELD FACILITIES

Airfield Design Standards

FAA publishes airport design standards in FAA AC 150/5300-13A, *Airport Design*. Airport design standards provide basic guidelines for a safe, efficient, and economic airport system. Careful selection of basic aircraft characteristics for which the airport will be designed is important. Airport designs based only on existing aircraft can severely limit the ability to expand the airport to meet future requirements for larger, more demanding aircraft. Airport designs that are based on large aircraft unlikely to operate at the airport are not economical.

Design Aircraft

Aircraft characteristics relate directly to the design components on an airport. Planning a new airport or improvements to an existing airport requires the selection of one or more “design aircraft.” FAA design standards for an airport are determined by a coding system that relates the physical and operational characteristics of an aircraft to the design and safety separation distances of the airfield facility. The design aircraft is the most demanding aircraft fleet operating or forecast to operate at the airport on a regular basis. Projects are eligible for FAA funding if there is regular use by the design aircraft. The “regular use” threshold is 500 annual itinerant operations. More information on this topic is in FAA AC 150/5000-17, *Critical Aircraft and Regular Use Determination*.

Airfield Design Classifications

The FAA has established aircraft classification systems that group aircraft types based on their performance and geometric characteristics. These classification systems are used to determine the appropriate airport design standards for specific runway, taxiway, apron, or other facilities, as described in FAA AC 150/5300-13A. Detailed characteristics are identified in **Table 4-2**.

- **Aircraft Approach Category (AAC):** a grouping of aircraft based on approach reference speed, typically 1.3 times the stall speed. Approach speed drives the dimensions and size of runway safety and object free areas.
- **Airplane Design Group (ADG)**: a classification of aircraft based on wingspan and tail height. When the aircraft wingspan and tail height fall in different groups, the higher group is used. Wingspan drives the dimensions of taxiway and apron object free areas, as well as apron and parking configurations.
- **Taxiway Design Group (TDG):** a classification of airplanes based on outer to outer Main Gear Width (MGW) and Cockpit to Main Gear (CMG) distance. TDG relates directly to taxiway/taxilane pavement width and fillet design at intersections.

In addition, approach visibility minimums are added to determine the Runway Design Code (RDC) for a runway:

- **Approach Visibility Minimums:** relates to the visibility minimums expressed by Runway Visual Range (RVR) values in feet. These distances relate to the minimum distance pilots must be able to see the runway or lighting from the runway. Visibility categories include visual (V), non-precision (NPA), approach procedure with vertical guidance (APV) and precision (PA). Lower visibility minimums require more complex airfield infrastructure and enhanced protection areas including safety and object free areas as well as runway-to-taxiway separation distances.

Although not a classification, runway length is driven by the landing and departure performance characteristics of the most demanding design aircraft as identified in FAA AC 5325-4B, *Runway Length Recommendations for Airport Design*.

Airport Reference Code (ARC)

The Airport Reference Code (ARC) is an airport designation that represents the highest AAC and ADG of the aircraft the airfield is intended to accommodate on a regular basis. The ARC is used for planning and design only and does not limit the aircraft that may be able to operate safely on the airport.

Runway Design Code (RDC)

RDC is a code signifying the design standards to which the overall runway is to be planned and built, typical based on the design aircraft and approach visibility minimums for a runway. RDC provides the information needed to determine the design standards that apply.

Approach and Departure Reference Codes

The approach and departure reference codes signify the current operational capabilities of each specific runway end and adjacent parallel taxiway. The codes are split into Approach Reference Code (APRC) and Departure Reference Codes (DPRC) for each phase of flight. APRC classifications are expressed in three components: AAC, ADG, and the lowest approach visibility minimums that either end of the runway is planned to provide. DPRC classifications utilize AAC and ADG components only. A runway end may have more than one RRC depending on the minimums available to a specific AAC.

Table 4-2
Airfield Classification Systems

Aircraft Approach Category (AAC)		
AAC	**Approach Speed**	
A	Approach speed less than 91 knots	
B	Approach speed 91 knots or more but less than 121 knots	
C	Approach speed 121 knots or more but less than 141 knots	
D	Approach speed 141 knots or more but less than 166 knots	
E	Approach speed 166 knots or more	
Airplane Design Group (ADG)		
ADG	**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’
Approach Visibility Minimums		
RVR (ft.)*	**Instrument Flight Visibility Category (statue mile)**	
N/A (VIS)	Visual (VIS)	
5000	Not lower than 1 mile (NPA)	
4000	Lower than 1 mile but not lower than ¾ mile (NPA)	
2400	Lower than ¾ mile but not lower than ½ mile (CAT-I PA)	
1600	Lower than ½ mile but not lower than ¼ mile (CAT-II PA)	
1200	Lower than ¼ mile (CAT-III PA)	

*Source: FAA AC 150/5300-13A, Airport Design; *RVR values are not exact equivalents*
NPA = Non-Precision Approach, PA = Precision Approach, CAT = Precision Approach Category

Taxiway Design Group (TDG)

TDG relates to the dimensions of the aircraft landing gear including distance from cockpit to main gear (CMG) or wheelbase and main gear width (MGW). These dimensions relate to an aircraft’s ability to safely maneuver taxiways at an airport within an identified edge safety margin. Taxiways/taxilanes on an airport can be constructed to a different TDG based on the expected use of that taxiway/taxilane by the design aircraft.

Other Design Considerations

Other airport design principles are important to consider for a safe and efficient airport design:

- **Runway/Taxiway Configuration:** The configuration of runways and taxiways affects the airport’s capacity/delay, risk of incursions with other aircraft on the runway and overall operational safety. Location of and type of taxiways connecting with runways correlates to runway occupancy time. The design of taxiway infrastructure should promote safety by minimizing confusing or complex geometry to reduce risk of an aircraft inadvertently entering the runway environment.

- **Approach and Departure Airspace & Land Use**: Runways each have imaginary surfaces that extend upward and outward from the runway end to protect normal flight operations. Runways also have land use standards beyond the runway end to protect the flying public as well as persons and property on the ground from potential operational hazards. Runways must meet grading and clearance standards considering natural and man-made obstacles that may obstruct these airspace surfaces. Surrounding land use should be compatible with airport operations. Airports should develop comprehensive land use controls to prevent new hazards outside the airport property line. Obstructions can limit the operational utility of a runway.
- **Meteorological Conditions**: An airport's runways should be designed so that aircraft land and takeoff into the prevailing wind. As wind conditions change, a crosswind runway may be needed to mitigate the effects of significant crosswind conditions that occur more than five percent of the year. Airports that experience lower cloud ceiling and/or visibility should also consider implementing instrument procedures and related navigational aids to runways to maximize airport operational utility.
- **Navigation Aids & Critical Areas:** Visual navigational aids (NAVAIDs) to a runway or the airfield require necessary clear areas for these NAVAIDs to be effective for pilots. Instrument NAVAIDs on an airport require sufficient clear areas for the NAVAID to properly function without interference to provide guidance to pilots. These NAVAID protection areas restrict development.
- **Airfield Line of Sight:** Runways need to meet grading standards so that objects and aircraft can be seen along the entire runway. A clear line of sight is also required for intersecting runways within the Runway Visibility Zone to allow pilots to maintain visual contact with other objects and/or aircraft that may pose a hazard.
- **Interface with Landside:** The airfield configuration should be designed to provide for the safe and efficient operation of aircraft as they transition from the airfield to landside facilities such as hangars and terminals.
- **Environmental Factors:** Airport development must consider potential impacts in and around the airport environs through the National Environmental Policy Act (NEPA). Additionally, development should also reduce the risk of potential wildlife hazards such as deer and birds that may cause hazards to flight operations.

Critical Aircraft

Overall / Primary Runway

Critical design aircraft types determine the appropriate airport design standards to incorporate into airport planning and design. Aviation activity estimates and demand forecasts show the overall design aircraft at C47 is AAC-A/B, ADG-I, TDG-1A small aircraft through PAL 2. The design aircraft is forecast to evolve to an AAC-B, ADG-II airplane in PAL 3, with the design aircraft becoming an AAC-B, ADG-II large business jet by PAL 4. Design aircraft operations are summarized in **Table 4-3**. The primary runway should be designed to accommodate the design airplane.

Table 4-3
C47 Design Aircraft Operations

Characteristics	Base	PAL 1	PAL 2	PAL 3	PAL 4
Aircraft Approach Category (AAC)					
AAC-A	3,401	3,517	3,912	8,171	9,165
AAC-B or greater	174	180	200	1,269	1,453
Airplane Design Group (ADG)					
ADG-I	3,498	3,617	4,024	8,712	9,779
ADG-II or greater	77	79	88	727	839
Taxiway Design Group (TDG)					
TDG-1A and TDG-1B	3,507	3,626	4,033	9,209	10,355
TDG-2	68	70	78	230	263
Maximum Takeoff Weight (MTOW)					
Small Aircraft $\leq$ 12,500 lbs.	3,563	3,684	4,098	8,949	10,042
Large Aircraft > 12,500 lbs.	12	13	14	490	575
Aircraft Type					
Fixed-Wing Piston	3,490	3,609	4,014	8,352	9,366
Fixed-Wing Turboprop	77	79	88	668	752
Fixed-Wing Turbojet	8	8	9	419	500
Rotary-Wing Helicopter	125	129	143	301	337
Crosswind Runway Considerations					
ARC A-I/B-I Operations	3,498	3,617	4,024	8,712	9,779
ARC A-II/B-II Operations	77	79	88	707	814
Design Aircraft					
AAC-ADG-TDG-Weight	**A-I-1A-S**	**B-I-1A-S**	**B-I-1A-S**	**B-II-1B*-S**	**B-II-1B*-L**

Source: TKDA Analysis (2019); Green indicates operations exceed FAA regular use threshold
**Forecast design aircraft is TDG-1B but there are frequent operations of TDG-2 airplanes will make up the design fleet.*

Crosswind Runway

The airport's all-weather wind coverage on the existing primary Runway 18-36 is less than 95% at a maximum 10.5-knot crosswind component. More information is found in the Meteorological Conditions section on this topic.

Current FAA guidance indicates a crosswind runway is eligible and justified for funding if the wind coverage on the primary runway is less than 95%, and there are more than 500 annual operations at the airport in the crosswind-critical aircraft. The crosswind-critical aircraft at C47 is AAC-A/B and ADG-I aircraft based on a maximum 10.5-knot crosswind component. There are more than 500 annual operations in this aircraft as shown in **Table 4-3**.

The airport user survey respondents indicated approximately 20% of the airport operations utilize Runway 4-22. Using this method, Runway 4-22 is estimated to be used more than 500 operations annually. The operational calculations are presented in **Table 4-4**.

Table 4-4
C47 Runway 4-22 Crosswind Critical Operations

Characteristics	Base	PAL 1	PAL 2	PAL 3	PAL 4
ARC A-I/B-I Operations	3,498	3,617	4,024	8,712	9,779
Estimated Runway 4-22 Use	20.0%				
Est. Runway 4-22 Operations	**700**	**723**	**805**	**1,742**	**1,956**

Source: TKDA Analysis (2019)

Taxiway/Taxilanes/Apron

The entrance, exit, or parallel taxiway serving a runway should accommodate the design aircraft for the runway. Taxiways should meet the overall design aircraft if they providing routes to/from the runway, apron, and other aircraft parking areas for those aircraft. Occasional use by more critical airplanes (e.g. ADG-II, TDG-2) should also be considered in the near-term for operational safety for all aircraft. Aircraft parking areas and ingress/egress taxiways meant to serve for the design airplane needs to meet design airplane standards.

Taxilanes or other areas designed specifically for smaller aircraft (e.g. ADG-I, TDG-1A) should meet standards for the particular design groups. Examples include hangar taxilanes exclusively serving aircraft storage hangars with aircraft wingspans limited by the hangar door width.

Design Aircraft Characteristics

The existing design aircraft characteristics associated with the runways at C47 are identified in **Table 4-5**, with the future design aircraft characteristics identified in **Table 4-6** and **Table 4-7**. Example aircraft that have existing or future operations at C47 organized by Airport Reference Code (ARC) are shown in **Exhibit 4-1.**

Table 4-5
C47 Airfield Design Aircraft (PAL 1-2)

Design Characteristics	Primary Runway	Crosswind Runway
Representative Aircraft Type(s)	Beechcraft Baron 58	Beechcraft Bonanza G36
Aircraft Approach Category	B	A
Airplane Design Group	I	I
Taxiway Design Group	1A	1A
Wingspan	37.8’	33.5’
Length	29.8’	27.5’
Tail Height	9.7’	8.6’
Cockpit to Main Gear	8.0’	3.0’
Main Gear Width	9.6’	9.7’
Approach Speed	96 knots	72 knots
Maximum Takeoff Weight	5,500 pounds	3,650 pounds
Landing Gear Configuration	Single-Wheel	Single-Wheel
Aircraft Classification Number	4	3

Source: FAA Aircraft Characteristics Database, TKDA Analysis (2019)
Notes: ACN based on COMFAA software results using representative GA aircraft, flexible pavement, and subgrade category C

Table 4-6
C47 Airfield Design Aircraft (PAL 3)

Design Characteristics	Primary Runway	Crosswind Runway
Representative Aircraft Type(s)	Beechcraft King Air B200	Beechcraft Bonanza G36
Aircraft Approach Category	B	A
Airplane Design Group	II	I
Taxiway Design Group	2*	1A
Wingspan	57.9’	33.5’
Length	46.7’	27.5’
Tail Height	14.3’	8.6’
Cockpit to Main Gear	16.3’	3.0’
Main Gear Width	17.2’	9.7’
Approach Speed	107 knots	72 knots
Maximum Takeoff Weight	12,500 pounds	3,650 pounds
Landing Gear Configuration	Dual-Wheel	Single-Wheel
Aircraft Classification Number	4	3

Source: FAA Aircraft Characteristics Database, COMFAA, TKDA Analysis (2019)
Notes: ACN based on COMFAA software results using representative GA aircraft, flexible pavement, and subgrade category C
**TDG for aircraft is higher than design aircraft group*

Table 4-7
C47 Airfield Design Aircraft (PAL 4)

Design Characteristics	Primary Runway	Crosswind Runway
Representative Aircraft Type(s)	Cessna Citation Excel (C56X), Hawker 900XP (H25B), Beechcraft King Air 350i (B300)	Beechcraft Baron 58
Aircraft Approach Category	B	B
Airplane Design Group	II	I
Taxiway Design Group	2 (B300)*	1A
Wingspan	57.9’ (B300)	37.8’
Length	51.8’ (C56X)	29.8’
Tail Height	18.1’ (H25B)	9.7’
Cockpit to Main Gear	21.9’ (C56X)	8.0’
Main Gear Width	17.2’ (B300)	9.6’
Approach Speed	120 knots (H25B)	96 knots
Maximum Takeoff Weight	28,000 lbs. (H25B), 20,000 lbs. (C56X)	5,500 pounds
Landing Gear Configuration	Single (C56X), Dual (H25B, B350)	Single-Wheel
Aircraft Classification Number	8 (C56X)	4

Source: FAA Aircraft Characteristics Database, COMFAA, TKDA Analysis (2019)
Notes: ACN based on COMFAA software results using representative GA aircraft, flexible pavement, and subgrade category C
**TDG-2 is the highest of the representative aircraft (B300), TDG-1B standards apply for H25B and C56X aircraft*

Exhibit 4-1
Example Aircraft by Airport Reference Code (ARC)

ARC A-I/Small		ARC A-II/Small	
Beech Bonanza G36		**Cessna 208**	
Cessna 182		Beech Queen Air 80	
Mooney M20		Pilatus PC-12	
Piper Navajo		Air Tractor AT-502	
ARC B-I/Small		**ARC B-II/Small**	
Beech Baron 58		Beech King Air 90	
Beech 99		**Beech King Air 200**	
Cessna Citation Jet		Cessna 441	
Piper Cheyenne		Cessna Citation CJ2	
ARC B-II		**ARC C-I, C-II**	
Beech King Air 350i		Learjet 31	
Cessna Excel		Learjet 60	
Hawker 900XP		Challenger 600	
Air Tractor AT-802		**Gulfstream G280**	

Source: TKDA Analysis (2019), FAA Aircraft Characteristics Database

Airport Role

Federal

The FAA classifies C47 as one of 48 Local GA airports in Wisconsin. A Local airport serves local and regional markets with moderate levels of activity, not necessarily in metropolitan or micropolitan areas. This classification is appropriate for the existing and future airport activity in Portage. The next threshold of activity for C47 to reach Regional GA airport status is 10 or more domestic flights over 500 miles, 1,000 or more instrument operations, and one (1) or more based jet. DLL is classified as a Regional airport. It is expected C47 will retain Local airport classification through the planning period.

State

The 2010 Wisconsin State Aviation System Plan (SASP) classifies C47 as a Medium GA airport. According to the plan, Medium GA airports support most single and multi-engine GA aircraft, including those aircraft commonly used by businesses. These airports support regional and in-state air transportation needs. Typical facility and service attributes (FSA) for Medium GA airports not met at C47 include:

- Primary runway length 4,000 feet to 5,499 feet or greater
- Primary runway width 75 feet
- Full parallel taxiway with reflectors
- Pavement condition 70 PCI or greater (area weighted)

- Visibility minimum ¾ mile
- Weather reporting station
- Minor airframe and powerplant maintenance
- Jet-A fuel for itinerant aircraft
- Public phone
- Sufficient automobile parking spaces
- Operations and maintenance building
- Land use zoning ordinance
- Height Limitation Zoning Ordinance (HLZO)
- Vehicle pedestrian ordinance
- Stormwater management plan
- Fee/easement ownership of existing RPZ

C47 is recommended by the SASP to remain a Medium GA airport. The next classification is Large GA airport, which supports daily operations of business jets. This classification is not forecast to not apply to C47 through the planning period, but may be considered ultimately.

Airfield Capacity

The total capacity of the airfield is the measure of the maximum number of aircraft arrivals and departures capable of being accommodated for a runway and taxiway configuration. Airports should implement capacity enhancements at an 80% capacity level to avoid undue operational delays. A master planning-level analysis was completed using the methods outlined in FAA AC 150/5060-5, *Airport Capacity and Delay* and Airport Cooperative Research Program (ACRP) Report 79: *Evaluating Airport Capacity*.

- **Hourly Capacity**: The maximum throughput of arrivals and departures an airfield can safely accommodate in a one-hour period. The calculated Visual Meteorological Conditions (VMC) hourly capacity is 68 and the calculated Instrument Meteorological Conditions (IMC) hourly capacity is 51 operations. The average weighted hourly capacity is 66 operations.
- **Annual Service Volume**: The maximum throughput of annual operations and airfield can safely accommodate in one year with an acceptable level of delay. Calculated ASV is 182,800 ASV based on 124.1 daily and 8.9 hourly ratios by PAL 4. The ASV is reduced because of the high monthly operational peak activity percentage at C47.
- **Aircraft Delay**: The difference in time between a constrained and an unconstrained aircraft operation, measured in minutes. There is zero minutes of average aircraft delay in all PAL scenarios.
- **Fleet Mix**: The PAL 4 scenario presumes 79.6% small single-engine aircraft, 8.9% small multi-engine aircraft, and 11.5% in larger aircraft less than 41,000 pounds.
- **Other Input Factors**: Single primary runway configuration, 88.30% visual meteorological conditions, 7.1% instrument meteorological conditions (at or above minimums), 25% touch-and-go aircraft operations, excellent runway exit availability, a full parallel taxiway, and no airport traffic control tower. Model weighting factors are not used.

The results of the C47 capacity analysis are shown in **Table 4-8**.

Table 4-8
C47 Airport Capacity Calculation

Metric	PAL 1	PAL 2	PAL 3	PAL 4
Avg. Hourly Ops. Capacity	66	66	66	66
Annual Operations	3,826	4,255	9,740	10,955
Annual Service Volume	182,800	182,800	182,800	182,800
Capacity Level	**2.1%**	**2.3%**	**5.3%**	**6.0%**

Source: TKDA Analysis (2019), ACRP Report 79

C47 meets future airfield capacity needs; the capacity level does not approach the 60% threshold to plan for capacity enhancements, particularly if a parallel taxiway is constructed. The addition of a parallel taxiway with sufficient exits alone increases the average hourly operational capacity by 37.5%.

Meteorological Conditions

Meteorological conditions that affect the facility requirements of an airport include wind coverage and weather conditions encountered.

Wind Coverage

Wind coverage is important to airfield configuration and utilization. Aircraft ideally takeoff and land into a headwind aligned with the runway orientation. Aircraft are designed and pilots are trained to land aircraft during crosswind conditions but there are limitations. Small, light aircraft are most affected by crosswinds. To mitigate the effect of crosswinds, FAA recommends runways be aligned so that excessive crosswind conditions are encountered at most 5 percent of the time, known as the “95 percent wind coverage” standard. Each aircraft’s AAC-ADG combination corresponds to a maximum crosswind wind speed component.

Even when 95 percent wind coverage is met for the design airplane, cases arise where certain airplanes with lower crosswind capabilities are unable to utilize the primary runway. **Table 4-9** identfies the maximum crosswind component for different aircraft design standards. The official forecast scenario requires a maximum crosswind compoent of 10.5 knots, increasing to 13.0 knots in the unconstrained scenario.

Table 4-9
FAA Wind Coverage Standards

AAC-ADG	Maximum Crosswind Component
A-I & B-I	10.5 knots
A-II & B-II	13.0 knots
A-III, B-III, C-I through D-II	16.0 knots
A-IV through D-VI	20.0 knots

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

Wind coverage for the airport is separated into all-weather and instrument meteorological conditions (IMC). All-weather analysis helps determine runway orientation and use. An IMC review helps determine the runway configuration for establishing instrument approach procedures. Local weather patterns can change in IMC. The existing C47 wind coverage calculations are in **Table 4-10**.

Table 4-10
C47 Wind Coverage

Runway	Crosswind Component (Wind Speed)	
	10.5 knots	13.0 knots
All-Weather Wind Coverage		
Runway 18-36	93.44%	96.53%
Runway 4-22	94.45%	97.94%
Combined*	97.21%	99.00%
IMC Wind Coverage		
Runway 18-36	93.43%	96.59%
Runway 4-22	95.63%	97.94%
Combined*	98.11%	99.40%
Runway 18 Only	49.13%	49.88%
Runway 36 Only	63.49%	65.90%
Runway 4 Only	66.62%	67.75%
Runway 22 Only	48.21%	49.39%

Source: DLL AWOS 2008-2017 from National Climatic Data Center; FAA AGIS Wind Analysis Tool

C47 should have total combined airfield wind coverage of at least 95% at a maximum crosswind component of 10.5 knots. Based on the lowest crosswind succeptable design aircraft (ARC A-I/B-I), no single existing runway alignment provides all-weather coverage at or above 95% for small aircraft. Therefore, a crosswind runway is recommended at C47. Runway 4-22 alone provides better all-weather wind coverage than Runway 18-36, despite it currently serving as the airport's "crosswind" runway. Runway 4-22 is shorter and constrained by incompatible land uses, making its ability to serve as the primary runway a challenge without significant improvements.

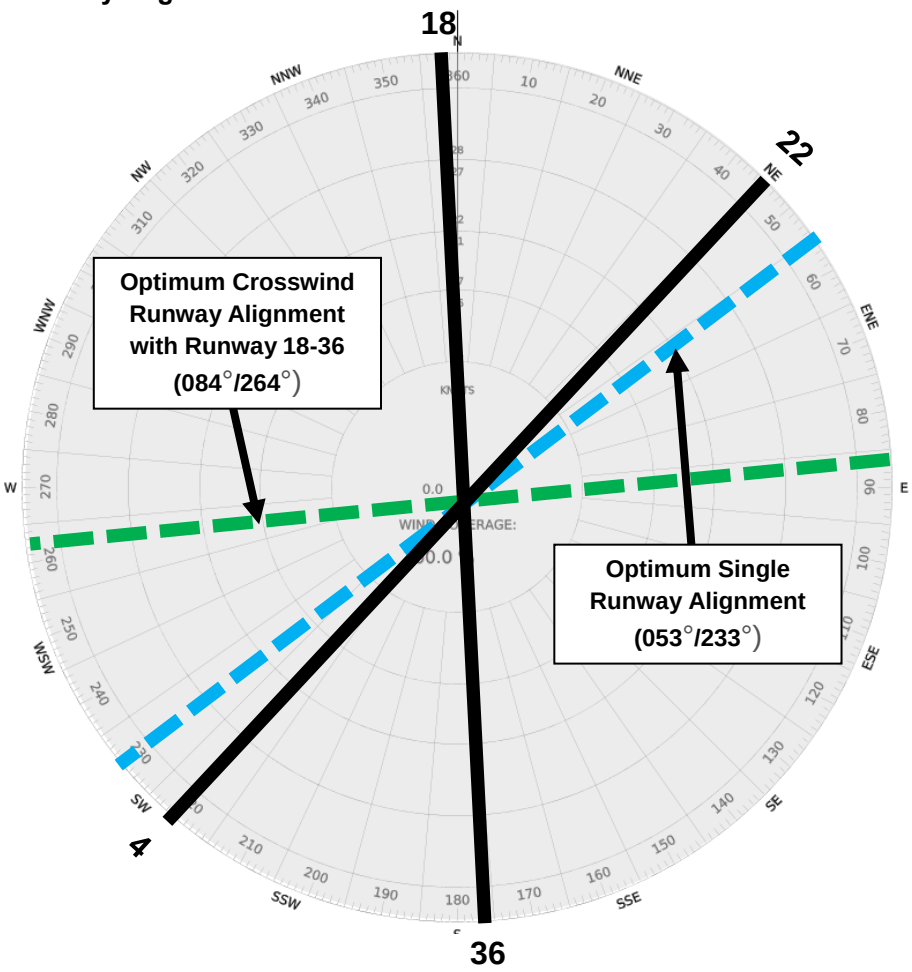
Based on current FAA guidance and activity levels, a crosswind runway is eligible and justified at C47 to accommodate ARC A-I/B-I aircraft.

Wind coverage in instrument meteorological conditions (IMC) does not meet 95% coverage recommendation for Runway 18-36 alone. Runway 18 has the single straight-in instrument approach procedure. Runway 4-22 however has IMC wind coverage that exceeds 95%. To improve IMC wind coverage, paved Runway 4-22 should have at least circling approach capability to utilize for landings in IMC. Instrument departures on paved Runway 4-22 should continue. Runway 4 has the best IMC wind coverage when analyzed by runway end. Implementing or maintaining instrument approaches at C47 is may be challenging to implement due to existing site constraints.

Runway Orientation Analysis

An analysis was completed to determine the optimum runway alignments at a maximum 10.5-knot crosswind component during all-weather conditions. A more northeast-southwest primary runway alignment maximizes single-runway wind coverage. An alignment of 053°/233° is optimum with 94.53% total 10.5-knot all-weather wind coverage. This increases single-runway wind coverage by 1.09% from Runway 18-36, and 0.07% from Runway 4-22. Runway 4-22 is more suitable today to serve as the primary runway from a wind coverage standpoint. The optimum crosswind runway alignment with Runway 18-36 remaining is 084°/264° to yield a total wind coverage of 99.43%. This increases total airfield wind coverage by 2.22%. The all-weather optimum runway alignments are shown graphically in **Exhibit 4-2**.

Exhibit 4-2
C47 Optimum Runway Alignments



Source: DLL AWOS 2008-2017 from National Climatic Data Center; FAA AGIS Wind Analysis Tool

Cloud Ceiling & Visibility

Hourly meteorological data from 2008-2017 was reviewed for the Baraboo/Wisconsin Dells Airport AWOS to determine the benefit of lower approach minimums.

Visual Meteorological Conditions (VMC) are encountered when the visibility is three (3) nautical miles or greater, and the cloud ceiling height is 1,000 feet or greater. Instrument Meteorological Conditions (IMC) occur when cloud ceiling or visibility values are less. Aircraft must operate under an instrument flight plan and utilize instrument approach procedures in IMC. IMC conditions drive the need to accommodate instrument approach procedures with sufficient weather minimums to enhance airport utilization.

Current instrument approach weather minimums are 488-foot (500-foot reported) cloud celling and one (1) mile flight visibility for Runway 18. Circling minimums to Runway 36, 4, and 22 ends

are higher. Weather conditions are broken down into occurrence percentages based on current instrument approach minimums in **Table 4-11**.

Table 4-11
Meteorological Analysis

Weather Condition	Percentage	Days per Year	Hours per Year
Visual (VMC)	88.30%	322.3	7,735
Usable Instrument (IMC)	7.11%	25.9	622
Below Minimums (IMC)*	4.59%	16.8	403

Source: DLL AWOS 2008-2017 from National Climatic Data Center; TKDA Analysis (2018)
**Lowest instrument approach minimums are 500-foot reported cloud ceiling and 1-mile visibility*

The accessibility of each runway end was analyzed and shown in **Table 4-12**. The Runway 36 end with circling minimums captures the highest percentage based on IMC wind conditions, followed by Runway 4 then Runway 18.

Table 4-12
Existing Runway Accessibility Meteorological Analysis

Runway End(s)	Existing Minimums	% of Year Usable IMC	Wind Coverage**	IMC Runway Capture	Hours per Year
18	488 feet, 1 mile	7.11%	49.59%	3.52%	**308**
36	596 feet, 1 mile*	6.09%	63.67%	4.53%	**396**
4	596 feet, 1 mile*	6.09%	67.46%	4.11%	**360**
22	596 feet, 1 mile*	6.09%	48.06%	2.93%	**256**

Source: DLL AWOS 2008-2017 from National Climatic Data Center; TKDA Analysis (2019)
**Indicates circling minimums*
***Wind coverage by runway end only using 10.5-knot maximum crosswind component and no tailwind component.*

Several scenarios were reviewed to identify potential additional operational utility from lowering instrument approach minimums. The results are in **Table 4-13**.

Table 4-13
Runway Accessibility Meteorological Analysis

Proposed Minimums Scenario	Existing Capture	Airport Additional Capture	Rwy End Wind Coverage*	Runway Additional Capture	Additional Hours per Year
Runway 18					
488 feet, 1 mile	*95.41%*	-	*52.38%*	-	**-**
250 feet, 1 mile	-	2.05%	59.73%	1.23%	**107**
200 feet, ¾ mile	-	3.00%	66.86%	2.01%	**176**
200 feet, ½ mile	-	3.52%	72.75%	2.56%	**225**
Runway 36					
596 feet, 1 mile	*94.39%*	-	*67.72%*	-	**-**
250 feet, 1 mile	-	3.07%	72.19%	2.27%	**199**
200 feet, ¾ mile	-	4.03%	73.90%	3.04%	**266**
200 feet, ½ mile	-	4.55%	75.88%	3.47%	**304**
Runway 4					
596 feet, 1 mile	*94.39%*	-	*73.89%*	-	**-**
250 feet, 1 mile	-	3.07%	77.54%	2.40%	**210**
200 feet, ¾ mile	-	4.03%	78.95%	3.20%	**281**
200 feet, ½ mile	-	4.55%	78.95%	3.60%	**315**
Runway 22					
596 feet, 1 mile	*94.39%*	-	*46.88%*	-	**-**
250 feet, 1 mile	-	3.07%	56.29%	1.75%	**153**
200 feet, ¾ mile	-	4.03%	63.54%	2.58%	**266**
200 feet, ½ mile	-	4.55%	70.20%	3.20%	**280**

Source: DLL AWOS 2008-2017 from National Climatic Data Center; TKDA Analysis (2019)
**Wind coverage by runway end only using 10.5-knot maximum crosswind component and no tailwind component, assuming wind conditions lower than indicated minimums.*

Assuming standard 250-foot ceilings and 1-mile visibility non-precision approaches expected for a Regional GA airport, Portage would see the greatest additional benefit by establishing an approach to Runway 4 or 36 based on runway end wind coverage. This approach type could increase airport accessibility by up to 2.40% or 8 days per year, depending on runway end.

Lowering approach visibility minimums to ¾-mile standards increases airport accessibility by up to 3.20%, reducing weather-related diversions by up to 11 days per year. This type of approach is a FSA for Medium GA airports in Wisconsin. The airport has the highest wind coverage in ¾-mile approach conditions in a 035°/215° alignment. Implementing a ¾-mile approach at C47 is challenging given the existing surrounding land uses.

Lowering weather minimums to precision approach standards would increase airport accessibility by up to 3.60%, reducing weather-related diversions by up to 13 days per year. This type of approach is a facility attribute for Large GA airports in Wisconsin.

Lowering minimums may require additional airfield infrastructure and safety areas of varying degrees. A basic summary of the changes from existing standards is below:

- 250-foot cloud ceiling, 1-mile visibility: Lowest cloud ceiling minimums for GPS approach with no critical obstacle penetrations. Increases airport design standards (e.g. Part 77, RPZ, FAA approach surface) from visual approach standards. Minimum runway length is 3,200 feet without applying additional clearance standards.
- 200-foot cloud ceiling: Requires clear Precision Obstacle Free Zone (POFZ) and coordination with FAA flight procedures.
- 100-foot cloud ceiling: Installation of a basic, intermediate or full approach lighting system which allows pilots to fly as low as 100 feet above runway elevation on approach with visual reference to the lights (FAR Part 91.175). Published celling is still 200 feet.
- ¾-mile visibility: More critical airport design standards (e.g. Part 77, RPZ, FAA approach surface) than 1-mile visibility standards and parallel taxiway. An approach lighting system may be required depending on the lowest cloud ceiling.
- Vertical guidance: An approach with vertical guidance (APV) requires a FAA approach surface with a 30:1 slope to be clear starting at the landing threshold.
- ½-mile visibility (precision): Further increases airport design standards (e.g. Part 77, RPZ, RSA/OFZ dimensions, runway design standards, FAA approach surface slope), runway length greater than 4,200 feet, full approach lighting system.

The airport sponsor should review the impacts of airport design modifications and approach infrastructure enhancements for existing Runway 4 and 36 ends.

Temperature & Precipitation

Average high temperature data for the hottest month in Portage is 82.8°F (28.2°C). Temperature affects recommended runway lengths for all aircraft types. This data is used for runway length calculations.

The average annual precipitation in Portage is 36.1 inches, including average annual snowfall of 38.4 inches. Precipitation affects the takeoff and landing performance of aircraft. Wet runway conditions will be factored into aircraft runway length calculations.

Runway

Runway Design Code

The design aircraft and instrument approach minimums drive the RDC designation for each runway. Runway 18-36 has a RDC of B-I(S)-5000 and Runway 4-22 has a RDC of B-I(S)-VIS[1] for the existing design aircraft.

In the future, the RDC for Runway 18-36 would increase to B-II-5000 for the design aircraft. If visibility minimums were lowered to no lower than ¾-mile, then the RDC would also change to B-II-4000. The RDC for Runway 4-22 would remain at B-I(S)-VIS serve small aircraft exclusively

[1] *ARC B-I (Small Aircraft) also represents ARC A-I (Small Aircraft) because they both result in the same runway design standards.*

on a regular basis, but may change to B-I-5000 if the runway were to accommodate an instrument approach with visibility minimums as low as 1 mile.

Approach and Departure Reference Codes

Approach and departure reference codes describe the current operational capabilities of a runway and adjacent taxiways. The existing partial parallel taxiway is located as close as 195 feet from Runway 18-36, limiting the APRC to B-I(S)-4000 and the DPRC to B-I(S). A runway-to-taxiway centerline separation distance of at least 240 feet is required to accommodate the future ARC B-II design airplane. Runway 4-22 does not have a parallel taxiway, and as such APRC and DPRC separation standards do not apply.

Table 4-14 summarizes the RDC, APRC and DPRC standards for each runway and PAL.

Table 4-14
Runway Design Aircraft Standards

Design Aircraft	PAL 1	PAL 2	PAL 3	PAL 4
Primary Runway				
Runway Design Code (RDC)	B-I(S)-5000	B-I(S)-5000	B-II(S)-5000	B-II-4000
Approach Reference Code (APRC)	B-I(S)	B-I(S)	B-II	B-II
Departure Reference Code (RPRC)	B-I(S)	B-I(S)	B-II	B-II
Crosswind Runway				
Runway Design Code (RDC)	B-I(S)-VIS	B-I(S)-VIS	B-I(S)-VIS	B-I(S)-VIS
Approach Reference Code (APRC)	*N/A*	*N/A*	*N/A*	*N/A*
Departure Reference Code (RPRC)	*N/A*	*N/A*	*N/A*	*N/A*

Source: TKDA Analysis (2019)

Design Standards

Basic Design Standards

One primary purpose of this master plan is to review and achieve compliance with all FAA safety and design standards. The design standards vary based on the RDC as established by the design aircraft. In addition to the runway pavement width, some of the safety standards include:

- **Runway Safety Area (RSA):** A defined graded surface surrounding the runway prepared or suitable for reducing the risk of damage to aircraft in the event of an undershoot, overshoot or excursion from the runway. The RSA must be free of objects, except those required to be in the RSA to serve their function. The RSA should also be capable to supporting airport equipment and the occasional passage of aircraft. The RSA does not meet standards at C47.
- **Runway Obstacle Free Zone (ROFZ):** The OFZ is the three-dimensional volume of airspace along the runway and extended runway centerline that is required to be clear of taxiing or parked aircraft as well as other obstacles that do not need to be within the OFZ to function. The purpose of the OFZ is for protection of aircraft landing or taking off from the runway and for missed approaches. The OFZ does not meet standards at C47.
- **Runway Object Free Area (ROFA):** An area centered on the ground on a runway provided to enhance the safety of aircraft operations by remaining clear of objects,

except for objects that need to be in the OFA for air navigation or aircraft ground maneuvering purposes. The OFA does not meet standards at C47.

Other design standards include runway gradient, runway shoulder width to prevent soil erosion or debris ingestion for jet engines, blast pad to prevent soil erosion from jet blast, and required separation distances to markings, objects, and other infrastructure for safety. Critical areas associated with navigational aids as well as airspace requirements are described further in this chapter.

Basic design standards applied to the existing and future design aircraft at C47 are shown in **Table 4-15**. Key thresholds that change design standards include ADG-II aircraft, and large aircraft (> 12,500 pounds).

Table 4-15
Basic Airport Design Standards

Runway Design Code (RDC)	B-I(S)-VIS	B-I(S)-5000	B-II(S)-5000	B-II-5000	B-II-4000
Runway Width	60 feet	60 feet	**75 feet**	75 feet	75 feet
Shoulder Width	10 feet	10 feet	10 feet	10 feet	10 feet
Blast Pad Length x Width	60' x 80'	**100' x 80'**	**150' x 95'**	150' x 95'	150' x 95'
Crosswind Component	10.5 knots	10.5 knots	**13 knots**	13 knots	13 knots
RSA Length Beyond Departure End	240 feet	240 feet	**300 feet**	300 feet	300 feet
RSA Length Prior to Threshold	240 feet	240 feet	**300 feet**	300 feet	300 feet
RSA Width	120 feet	120 feet	**150 feet**	150 feet	150 feet
ROFA Length Beyond Runway End	240 feet	240 feet	**300 feet**	300 feet	300 feet
ROFA Length Prior to Threshold	240 feet	240 feet	**300 feet**	300 feet	300 feet
ROFA Width	250 feet	**400 feet**	**500 feet**	500 feet	500 feet
ROFZ Length Beyond Runway End	200 feet	200 feet	200 feet	200 feet	200 feet
ROFZ Width	250 feet	250 feet	250 feet	**400 feet**	**400 feet**
Holding Position	125 feet	125 feet	125 feet	**200 feet**	**200 feet**
Runway to Taxiway Centerline	125 feet	**150 feet**	**240 feet**	240 feet	240 feet

*Source: FAA AC 150/5300-13A; Changes from each subsequent RDC identified in **bold**.*

Runway Line-of-Sight

Runway line of sight requirements facilitate coordination among aircraft, and between aircraft and vehicles that are operating on active runways. The Runway Visibility Zone (RVZ) standards require a clear visible 5-foot high line-of-sight to enhance safety amongst airport users when runways intersect. There are obstacles within the RVZ at C47.

Runways without a full parallel taxiway require any point 5 feet above the runway centerline to be mutually visible with any other point 5 feet above the runway centerline the length of the runway. Runways with a full parallel taxiway require any point 5 feet above the runway centerline to be mutually visible with any other point 5 feet above the runway centerline for half the length of the runway. Runways 18-36 and 4-22 have clear line-of-sight.

Deficiencies to Runway Design Standards

Basic runway safety standards must be met as it enhances the margin of safety for aircraft. Currently there are several design deficiencies to the RSA, OFA, OFZ, and RVZ for both Runway 18-36 and Runway 4-22 such as roads, terrain, and trees. **Table 4-16** describes the obvious existing deficiencies, and potential mitigation options. Action needs to be taken by the

airport to meet these FAA airport design standards. These are shown graphically in **Figure 4-1**. See **Appendix E** for more details.

Table 4-16
Existing Runway Design Standard Deficiencies

Runway	Standard(s)	Location	Deficiency	Mitigation Options
18-36	RSA, OFZ, OFA	South of RWY 36 End	Silver Lake Drive	✈ Relocate road ✈ Shift RWY 36 end (215')
18-36	OFZ, OFA	South of RWY 36 End	Power Pole	✈ Remove/relocate pole ✈ Shift RWY 36 end (215')
18-36	OFZ, OFA	West of RWY 36 End	Tree, sign, parked aircraft	✈ Acquire land, remove/relocate objects ✈ Shift RWY 36 end (1,020')
18-36	RSA, OFZ, OFA	North of RWY 18 end	Interstate 39, County Hwy CX	✈ Remove/relocate roads ✈ Shift RWY 18 end (240')
18-36	OFZ, OFA	Near RWY 18 end	Trees	✈ Acquire land rights and trim/remove trees ✈ Shift RWY 36 end (600')
18-36	RSA	Near RWY 18 end	Terrain > 5% slope along and beyond runway	✈ Regrade RSA ✈ Shift RWY 18 end (240') ✈ Implement declared distances (240')
18-36	RVZ	West of RWY Intersection	Trees	✈ Acquire land rights and trim/remove trees ✈ Close Runway 4-22
4-22	RSA, OFZ, OFA	Northeast of RWY 22 end	Field Road, Trees	✈ Shift RWY 22 end (240') ✈ Remove/relocate field road, acquire land, re-grade terrain
4-22	OFZ, OFA	NE of RWY Intersection	Segmented circle pylons	✈ Relocate wind cone and segmented circle
4-22	RSA, OFZ, OFA	Near RWY 4 end	Trees	✈ Acquire land, remove trees
4-22	Runway Design	RWY 4-22	Excess pavement beyond published runway ends	✈ Remove pavement ✈ Restripe markings

Source: TKDA Analysis (2019)

FIGURE 4-1: RUNWAY DESIGN DEFICIENCIES

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AIRPORT MASTER PLAN STUDY

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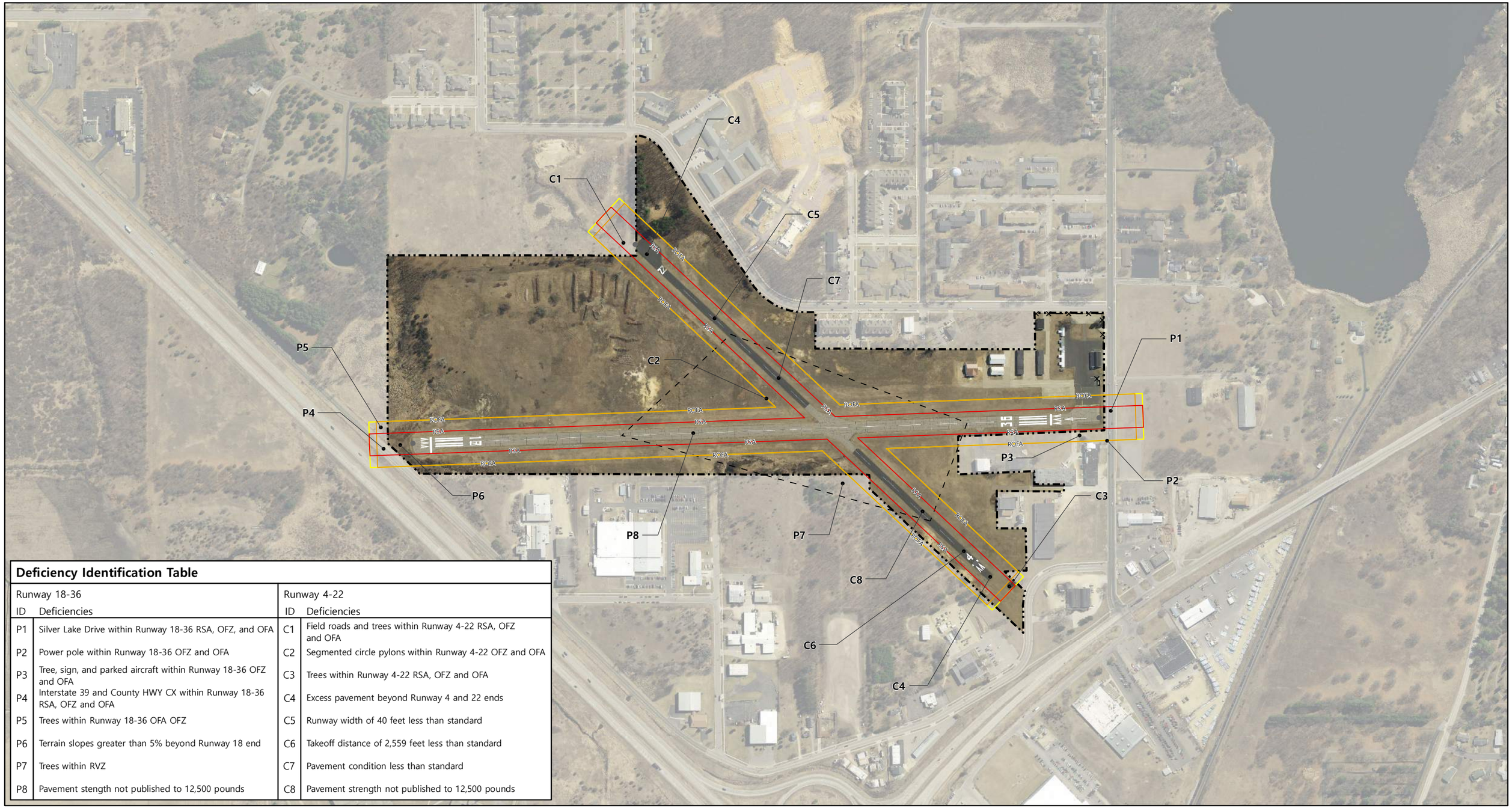

Deficiency Identification Table

Runway 18-36		Runway 4-22	
ID	Deficiencies	ID	Deficiencies
P1	Silver Lake Drive within Runway 18-36 RSA, OFZ, and OFA	C1	Field roads and trees within Runway 4-22 RSA, OFZ and OFA
P2	Power pole within Runway 18-36 OFZ and OFA	C2	Segmented circle pylons within Runway 4-22 OFZ and OFA
P3	Tree, sign, and parked aircraft within Runway 18-36 OFZ and OFA	C3	Trees within Runway 4-22 RSA, OFZ and OFA
P4	Interstate 39 and County HWY CX within Runway 18-36 RSA, OFZ and OFA	C4	Excess pavement beyond Runway 4 and 22 ends
P5	Trees within Runway 18-36 OFA OFZ	C5	Runway width of 40 feet less than standard
P6	Terrain slopes greater than 5% beyond Runway 18 end	C6	Takeoff distance of 2,559 feet less than standard
P7	Trees within RVZ	C7	Pavement condition less than standard
P8	Pavement stength not published to 12,500 pounds	C8	Pavement strength not published to 12,500 pounds

- Fence
- Runway Safety Area (RSA)
- Runway Object Free Area (ROFA)
- Runway Obstacle Free Zone (ROFZ)
- Runway Visibility Zone (RVZ)
- Airport Boundary

N

0 250 500 1,000 Feet

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DATA SOURCE: COLUMBIA COUNTY LAND INFORMATION DEPARTMENT

Land Use

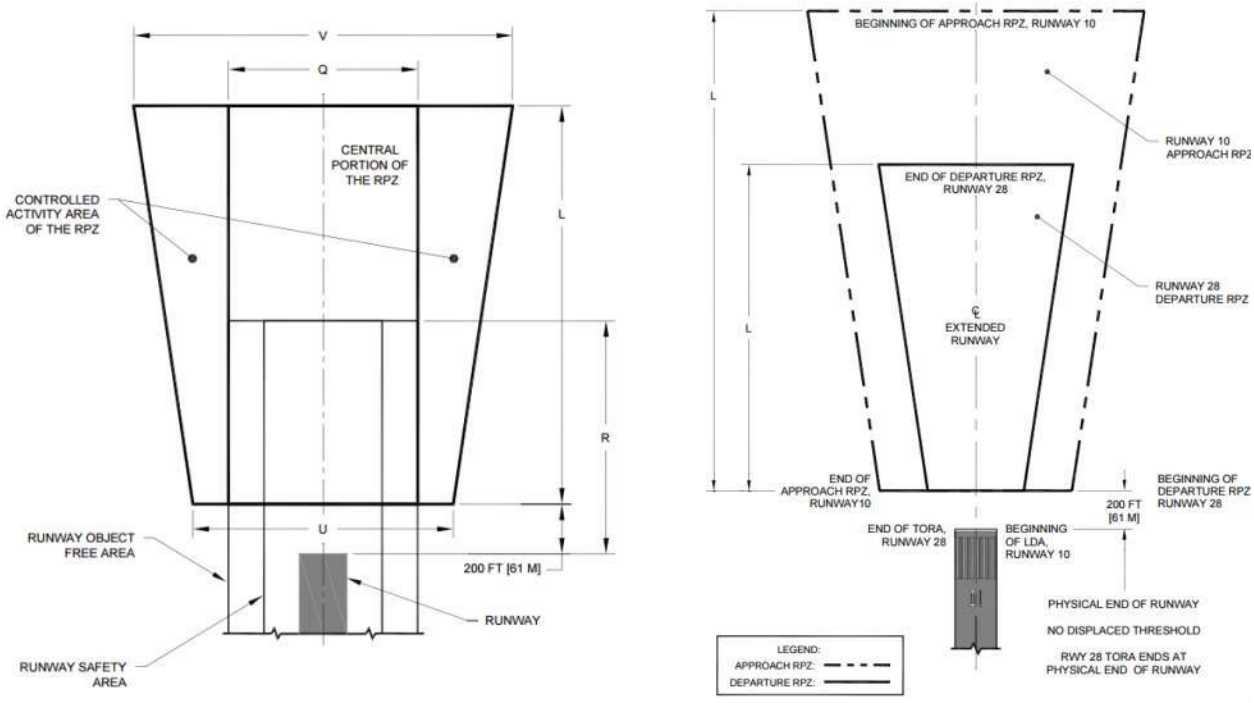
FAA Runway Protection Zone

The Runway Protection Zone (RPZ) is a trapezoidal land use area at ground level prior to the landing threshold or beyond the runway end. The RPZ's function is to enhance the protection of people and property on the ground. The RPZ size varies based on the runway's RDC. The RPZ is further broken down into two types and two areas:

- **Approach RPZ:** Approach RPZ extends from a point 200 feet from the runway threshold.
- **Departure RPZ:** Departure RPZ extends 200 feet from the runway end or claimed Takeoff Runway Available (TORA). Departure RPZ is typically the same size or smaller than the approach RPZ.
- **Central Portion:** Land within the RPZ centered on runway centerline with a width matching the width of the ROFA.
- **Controlled Activity Area:** Land with the RPZ on the sides of the central portion.

FAA permissible land uses without further evaluation include farming that meets airport design standards, irrigation channels that do not attract wildlife, controlled airport service roads, underground facilities and unstaffed NAVAIDs that are required to be within the RPZ. Airport owners should maintain the RPZ clear of all facilities supporting incompatible activities. It is desirable to clear all above ground objects from the RPZ. **Exhibit 4-3** depicts typical size and shape of the RPZ.

Exhibit 4-3
FAA Runway Protection Zone (RPZ)



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

RPZs and the effort to ensure compatible land use within them are currently a high priority for the FAA. Protection of the RPZ is achieved through airport control over RPZs including fee title ownership or clear zone easement. The increased emphasis has resulted in additional requirements to monitor and analyze RPZs for conformance to established policies and standards.

In September 2012, FAA issued an interim policy on activities within an RPZ providing airports with guidance on land use compatibility standards. The standards from the interim guidance are summarized below:

- **New or Modified Land Uses:** FAA coordination is required for new or modified land uses within the RPZ because of an airfield project, change in RPZ dimensions or local development proposal.
- **Land Uses Requiring FAA Coordination:** Building and structures, recreational land uses, transportation facilities (i.e. roads, parking, rail), fuel storage, hazardous material storage, wastewater treatment, above-ground utility infrastructure, and parked aircraft.
- **Alternatives Analysis:** A full range of alternatives must be evaluated prior to FAA coordination that avoid introducing the land use into the RPZ, minimize the impact of the land use in the RPZ and mitigate risk to people and property on the ground.
- **Existing Land Uses in the RPZ:** No change in policy, airports should work with FAA to remove or mitigate the risk of any existing incompatible land uses in the RPZ. Incompatible land uses in the RPZ from previous FAA guidance include but are not limited to residences, places of public assembly (i.e. uses with high concentration of persons), fuel storage facilities, and wildlife attractants.

The RPZ dimensions associated with the existing and future design aircraft are identified in **Table 4-17** below.

Table 4-17
RPZ Dimension Standards

Runway Design Code (RDC)	B-I(S)-VIS	B-I(S)-5000	B-II(S)-5000	B-II-5000	B-II-4000
Approach RPZ Length	1,000 feet	1,000 feet	1,000 feet	1,000 feet	**1,700 feet**
Approach RPZ Inner Width	250 feet	250 feet	250 feet	**500 feet**	**1,000 feet**
Approach RPZ Outer Width	450 feet	450 feet	450 feet	**700 feet**	**1,510 feet**
Departure RPZ Length	1,000 feet	1,000 feet	1,000 feet	1,000 feet	1,000 feet
Departure RPZ Inner Width	250 feet	250 feet	250 feet	**500 feet**	**500 feet**
Departure RPZ Outer Width	450 feet	450 feet	450 feet	**700 feet**	**700 feet**

*Source: FAA AC 150/5300-13A; Changes from each subsequent RDC identified in **bold**.*

Existing RPZ Land Uses

The Runway 36 approach and departure RPZ contains a portion of Silver Lake Drive, power pole, and two (2) structures. Open space is zoned for industrial or residential development. The Runway 18 approach and departure RPZ contains a portion of County Highway CX and Interstate 39, as well as open space zoned for single-family residential within the Town of Fort Winnebago. Almost the entirety of both RPZs are outside of airport property.

The Runway 4 RPZ contains a portion of County Highway CX, State Trunk Highway 16, a public service road, parking lots and contains about two-thirds of a 72,000 square foot industrial manufacturing building. The Runway 22 RPZ contains a portion of a field road and Henry Drive, two (2) residential multi-family structures and portions of two other residential multi-family structures. The entire Runway 22 RPZ and almost the entirety of the Runway 4 RPZ are outside of airport property.

According to FAA, existing land uses within the RPZ that are potentially incompatible (e.g. structures, transportation facilities) can remain provided they clear FAA approach airspace surfaces. New potentially incompatible land uses introduced into the RPZ must be reviewed and approved by FAA through an RPZ Alternatives Analysis.

Table 4-18 summarizes the existing land uses within the RPZ that may be incompatible, and provides potential mitigation options. Further coordination with FAA is needed to determine the appropriate action(s) to take. These deficiencies are shown graphically in **Figure 4-2**.

Table 4-18
Potential Existing RPZ Incompatible Land Uses

Runway End	Standard(s)	Location	Deficiency	Mitigation Options
36	Approach & Departure RPZ	500’ to 800’ South of RWY 36 End	Commercial Storage Buildings (2)	✈ Remove Buildings ✈ Reduce RWY 36 LDA and RWY 18 TODA by 720’
22	Approach & Departure RPZ	960’ to 1,200’ Northeast of RWY 22 End	Multi-Family Residential Structures (4)	✈ Remove Homes ✈ Reduce RWY 4 TODA and RWY 22 LDA by 250’
4	Approach & Departure RPZ	750’ Southwest of RWY 4 End	52,000 SF of an Industrial Building	✈ Remove Building ✈ Reduce RWY 4 LDA and RWY 22 TODA by 300’

Source: TKDA Analysis (2019)
TODA = Takeoff Distance Available, LDA = Landing Distance Available

Land Use Control

Per FAA, off-airport development has the potential to have a negative impact on current and future airport operations when it creates obstacles to airport design, land use and airspace standards surrounding the airport. Land use control allows the airport to protect airspace and land use areas from possible intrusions. Acquiring all land around the airport is generally not feasible, and is supplemented by avigation easements and local zoning to mitigate potential incompatible land uses and potential obstacle conflicts.

FAA and WBOA encourage the airport sponsor to control the following land for existing and planned airport configuration:

- ✈ Airport Infrastructure (e.g. runways, taxiways, apron, buildings, navigational aids)
- ✈ Runway Safety Areas (RSA)
- ✈ Runway Obstacle Free Zones (OFZ)
- ✈ Runway and Taxiway Object Free Areas (OFA)

- Runway Visibility Zone (RVZ)
- Runway Protection Zones (RPZ)
- Building Restriction Line (BRL)
- Navigational aid critical areas
  Airspace protection areas

There are several areas that are not owned by the airport, including RSA/OFZ/OFA overrun areas beyond each runway end. The FAA's minimum standard is for the airport sponsor to own the entire RSA and OFZ. **Table 4-19** summarizes the existing land use control deficiencies, as well as potential mitigation options. These land use deficiencies are shown graphically in **Figure 4-2**. The sponsor should plan for acquisition of the areas to ensure control of critical safety areas and that safety standards are met. The RSA, OFZ, OFA, RVZ, and RPZ need to be controlled by the airport sponsor, ideally through fee ownership. Airspace obstruction areas should be controlled through an avigation easement to regulate the height of objects. Land required for future airport development will be identified in the **Alternatives Analysis** chapter.

Airport Zoning

FAA recommends airport sponsors protect airport land use and airspace through local zoning. The intent of zoning is to:

- Protect the airport from incompatible land uses that could interfere with the safety operation of the airport,
- Protect public safety by reducing the potential for fatalities, property damage or noise complaints within the vicinity of the airport, and
- Protect the public investment made by taxpayers in the airport and the economic benefits it provides to the region.

Public airports are required under Wisconsin Administrative Code TRANS 55 to adopt and maintain a height limitation zoning ordinance (HLZO) to receive state aid for airport improvements. Airport owners have the power to establish land use controls within 3 miles of the airport per Wisconsin Statute Chapter 114.136. Airports also have the option to adopt additional restrictions to maintain land use compatibility around airports.

Currently there is not a Height Limitation Zoning Ordinance for the Portage Municipal Airport. A HLZO should be created and enacted to protect the airport and environs from incompatible land uses for the existing and future airport configurations.

Table 4-19
Existing Land Use Control Deficiencies

Runway	Standard(s)	Location	Deficiency	Mitigation Options
36	RSA, OFZ, OFA	South of RWY 36 End	Land not owned by Airport	✈ Acquire land (+/- 1.3 acres) and relocate road ✈ Shift runway end by 220’
36	RPZ	South of RWY 36 End	Land not controlled by Airport	✈ Acquire land outside of public road right-of-way (+/- 10.3 acres)
18-36	OFZ, OFA	West of RWY 36 near end	Land not owned by Airport	✈ Acquire land (+/- 1 acre) ✈ Shift runway end by 1,020’
18	RSA, OFZ, OFA	North of RWY 18 End	Land not owned by Airport	✈ Acquire land (+/- 0.8 acres) and relocate roads ✈ Shift runway end by 240’
18	RPZ	North of RWY 18 End	Land not controlled by Airport	✈ Acquire land outside of public road right-of-way (+/- 6.2 acres)
18-36	RVZ	West of RWY intersection	Land not controlled by Airport	✈ Acquire land use control (+/- 1.3 acres) ✈ Close Runway 4-22
22	RSA, OFZ, OFA	Northeast of RWY 22 End	Land not owned by Airport	✈ Acquire land and relocate road ✈ Shift runway end by 240’
22	RPZ	Northeast of RWY 22 End	Land not controlled by Airport	✈ Acquire land (+/- 8 acres) and remove/relocate homes (4) ✈ Shift runway end (260’), and acquire land (+/- 7.4 acres) outside of public road right-of-way
4-22	OFZ, OFA	West of RWY 4-22 End	Land not owned by Airport	✈ Acquire land (+/- 0.9 acres) ✈ Close Runway 4-22
4	OFZ, OFA	Southwest of RWY 4 End	Land not owned by Airport	✈ Acquire land (+/- 0.2 acres) and relocate roads ✈ Shift runway end by 120’ ✈ Close Runway 4-22

Table 4-19
Existing Land Use Control Deficiencies (cont'd)

Runway	Standard(s)	Location	Deficiency	Mitigation Options
4	RPZ	Southwest of RWY 4 End	Land not controlled by Airport	✈ Acquire land (+/- 7.5 acres) and relocate industrial building ✈ Implement declared distances (300'), and acquire land (+/- 5.8 acres) outside of public road right-of-way ✈ Close Runway 4-22
18-36, 4-22	Airport Zoning	Off-airport land uses	No HLZO to meet State standards	✈ Establish Height Limitation Zoning Ordinance (HLZO) based on the existing and future airport configurations

Source: TKDA Analysis (2019)

FIGURE 4-2: LAND USE DEFICIENCIES

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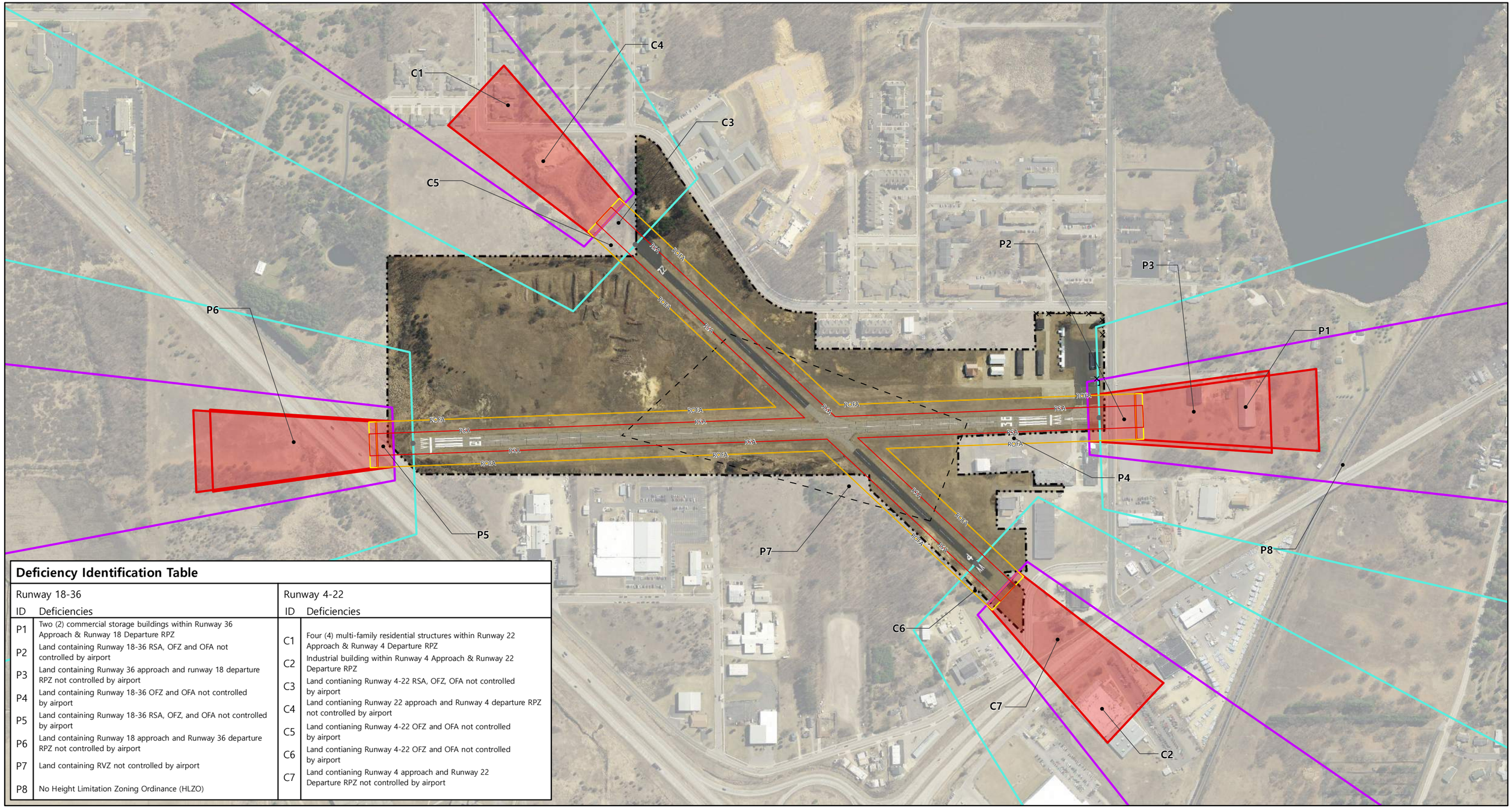
AIRPORT MASTER PLAN STUDY

PORTAGE, WI



Deficiency Identification Table

Runway 18-36		Runway 4-22	
ID	Deficiencies	ID	Deficiencies
P1	Two (2) commercial storage buildings within Runway 36 Approach & Runway 18 Departure RPZ	C1	Four (4) multi-family residential structures within Runway 22 Approach & Runway 4 Departure RPZ
P2	Land containing Runway 18-36 RSA, OFZ and OFA not controlled by airport	C2	Industrial building within Runway 4 Approach & Runway 22 Departure RPZ
P3	Land containing Runway 36 approach and runway 18 departure RPZ not controlled by airport	C3	Land contianing Runway 4-22 RSA, OFZ, OFA not controlled by airport
P4	Land containing Runway 18-36 OFZ and OFA not controlled by airport	C4	Land contianing Runway 22 approach and Runway 4 departure RPZ not controlled by airport
P5	Land containing Runway 18-36 RSA, OFZ, and OFA not controlled by airport	C5	Land contianing Runway 4-22 OFZ and OFA not controlled by airport
P6	Land containing Runway 18 approach and Runway 36 departure RPZ not controlled by airport	C6	Land contianing Runway 4-22 OFZ and OFA not controlled by airport
P7	Land containing RVZ not controlled by airport	C7	Land contianing Runway 4 approach and Runway 22 Departure RPZ not controlled by airport
P8	No Height Limitation Zoning Ordinance (HLZO)		

- Fence
- Runway Safety Area (RSA)
- Runway Object Free Area (ROFA)
- Runway Obstacle Free Zone (ROFZ)
- Runway Visibility Zone (RVZ)
- Airport Boundary
- Runway Protection Zone (RPZ)
- FAA Approach Surfaces
- FAA Departure Surfaces

N

0 250 500 1,000 Feet

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DATA SOURCE: COLUMBIA COUNTY LAND INFORMATION DEPARTMENT

Runway Length

Sufficient runway length is important for the airport to maintain operational capability. It allows an aircraft to operate from an airport to their destination with the appropriate load factor. Restrictions on runway length may lead to reduced aircraft weight, which then translates in reduced fuel, passenger and/or cargo loads.

It is very important for airports to adequately plan for a future runway configuration, as these projects tend to affect the community beyond the property line. Projects of these magnitudes require many resources and long lead times for planning, environmental review, and funding allocation.

The recommended runway length for an airport facility varies widely based on runway usage (operational frequency), specific aircraft operational demands (aircraft type, weight/load), configuration (elevation, gradient) and meteorological conditions (temperature, runway surface condition). Runway length should be suitable for the forecasted design aircraft fleet.

FAA Runway Length Standards

A runway length analysis was performed using the FAA's current methodology found in FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design*. The design approach in Chapter 2 is used for aircraft with maximum takeoff weight of 12,500 pounds and less, and Chapter 3 identifies a recommended runway length based on a family grouping of business jet aircraft less than 60,000 pounds. The results are in **Table 4-20**.

Table 4-20
FAA Runway Length Requirements

Airport and Runway Data		
Airport Elevation	824 feet	
Mean Daily Maximum Temperature of Hottest Month	82.8°F (28.2°C)	
Maximum Difference in Runway Centerline Elevation	10 feet (+100 feet)*	
Aircraft Classification	**Recommended Runway Length**	
	Takeoff	**Landing (Wet)**
Small Airplanes 12,500 Pounds or Less (50 knots or greater approach speed)		
Less than 10 passenger seats at 95% of fleet	3,300 feet	3,300 feet
Less than 10 passenger seats at 100% of fleet	3,800 feet	3,800 feet
10 or more passenger seats	4,300 feet	4,300 feet
Large Airplanes Less Than 60,000 Pounds but Greater Than 12,500 Pounds		
75% of fleet at 60% useful load	4,800 feet	5,500 feet
75% of fleet at 90% useful load	6,400 feet	7,000 feet
100% of fleet at 60% useful load	5,400 feet	5,500 feet
100% of fleet at 90% useful load	8,100 feet	7,000 feet

Source: FAA AC 150/5325-4B, Runway Length Requirements for Airport Design
**Adjustment applies to large airplane takeoff length only*

The recommended length through PAL 2 for 95% of the small aircraft fleet with a maximum takeoff weight of 12,500 pounds or less rounds up to **3,300 feet**. According to FAA, the 95% of fleet classification applies to "airports that are primarily intended to serve medium size population communities with a diversity of usage and a greater potential for increased aviation activities." The 100% of fleet classification is "primarily intended to serve communities located

on the fringe of a metropolitan area". Although C47 is located within the Madison metropolitan statistical area, Portage is not directly connected to Madison's suburban development. Therefore, the 95% of fleet classification applies for airport activity through PAL 2.

The 100% of fleet classification should be considered when the design aircraft fleet increases to an ARC B-II, small airplane in PAL 3. A representative airplane is a Beechcraft King Air B200. This twin-engine turboprop airplane is on the upper end of the small aircraft fleet mix with less than 10 passenger seats. The FAA recommended runway length in PAL 3 is **3,800 feet**.

The design aircraft is forecast evolves to become an AAC-B, ADG-II, TDG-1B large turbojet aircraft by PAL 4 at the end of the planning period. Representative aircraft in this category include the Hawker Beechcraft 900XP and the Cessna Citation Excel. These aircraft fall into the FAA runway length category of large airplanes less than 60,000 pounds but greater than 12,500 pounds. The Cessna Citation Excel falls under the 75% of fleet curve. Projected destinations are estimated to be less than 1,000 nautical miles in length with a less than maximum load, equating to a 60% useful load factor. Therefore, the FAA recommended runway length in PAL 4 is **4,800 feet** for takeoff and **5,500 feet** of landing with a wet runway.

Aircraft-Specific Runway Length Data

No airport-specific detailed analysis of specific aircraft types was performed as part of this study. However, available data was used to broadly identify runway length needs in common aircraft types at maximum takeoff and landing weight as shown in **Table 4-21**.

Table 4-21
Sample Aircraft Runway Performance Data

Aircraft	Type	Size	ARC	Takeoff Length	Landing Length
Cirrus SR-22	Single Piston	Small	A-I	1,900 feet	**2,500 feet**
Beechcraft Bonanza A36	Single Piston	Small	A-I	**2,900 feet**	1,700 feet
Beechcraft Baron 58	Multi Piston	Small	B-I	**3,400 feet**	2,600 feet
Beechcraft King Air B200	Turboprop	Small	B-II	**3,800 feet**	3,100 feet
Beechcraft King Air B350i	Turboprop	Large	B-II	**4,400 feet**	2,800 feet
Cessna Citation Encore	Turbojet	Large	B-II	4,100 feet	**5,100 feet**
Beechcraft Hawker 850XP	Turbojet	Large	B-II	**5,900 feet**	5,200 feet

Source: Airplane Performance Manuals, TKDA Analysis (2019)

This review demonstrates most, but not all, ARC A-I and B-I aircraft are accommodated by the FAA's recommended length of 3,300 feet for 95% of the small aircraft fleet. The FAA's recommended length of 3,800 feet for 100% of the small aircraft fleet matches the required length for a Beechcraft King Air B200. The runway length needs of business jet fleet vary, but could largely be accommodated with FAA's recommended length of 5,500 feet.

A comprehensive analysis of specific aircraft types may be needed to evaluate whether a runway length differing from FAA recommendations can serve the takeoff and landing length needs of the aircraft fleet mix.

Other Considerations

The FAA recommends a minimum runway length of 3,200 feet for runways accommodating circling and non-precision instrument approaches with visibility minimums as low as ¾ mile. An

approach lower than ¾ mile requires a length of 4,200 feet. This standard would apply to the primary runway. In addition, the SASP indicates the runway length facility service attribute for a Medium GA airport is 4,000 feet to 5,499 feet or greater, however actual runway dimensions are determined by the critical aircraft.

The airport user survey conducted as part of this study indicated the average runway length needed is 3,100 feet, with a minimum landing distance of 2,800 feet and minimum takeoff distance of 2,700 feet. The average minimum crosswind runway distance is 2,700 feet. The results are only a sample of the needs of those that responded to the survey.

Crosswind runways require a runway length for the lower crosswind capable airplanes using the primary runway. This equates to ARC A-I/B-I small aircraft, for which the FAA's recommended length is 3,300 feet. Another factor that may reduce actual crosswind runway length needs is a prevailing headwind during takeoff and landing operations. Analysis performed at other airports demonstrates a paved crosswind runway length as short as 2,600 feet could accommodate the takeoff distance needs of all single-engine and some multi-engine aircraft operations with a 10-knot headwind.

Recommended Runway Lengths

Table 4-22 summarizes the recommended runway length for various design aircraft. The actual planned runway length may be different considering the impacts of implementing such a length. Runway length alternatives exploring these recommendations would be analyzed in the **Alternatives Analysis** chapter.

Table 4-22
FAA Recommended Runway Length

Runway	ARC	PAL	Standards	Takeoff Length	Landing Length
Primary	B-I(S)	1-2	Small Aircraft < 10 passengers, 95% of Fleet	3,300 feet	3,300 feet
Primary	B-II(S)	3	Small Aircraft < 10 passengers, 100% of Fleet	3,800 feet	3,800 feet
Primary	B-II(L)	4	Large Aircraft < 60,000 pounds 75% of Fleet, 60% Useful Load	4,800 feet	5,500 feet
Crosswind	B-I(S)	1-4	Small Aircraft < 10 passengers, 95% of Fleet	3,300 feet	3,300 feet

Source: TKDA Analysis (2019)

Declared Distances

Declared distances are the maximum runway lengths available and suitable to meet takeoff, rejected takeoff and landing distance performance requirements for turboprop and turbojet powered aircraft. Declared distance elements include:

- **Takeoff Run Available (TORA):** the distance available for ground run of an aircraft taking off
- **Takeoff Distance Available (TODA):** TORA plus any remaining runway or clearway length

- **Accelerate-Stop Distance Available (ASDA):** the runway plus stopway length available for the acceleration and deceleration of an aircraft aborting a takeoff
- **Landing Distance Available (LDA):** the runway length available for the landing of an aircraft

All declared distances equal the total runway length for a normal runway. A special application of declared distances can be used to meet operational safety requirements. Declared distances can be used to mitigate approach/departure obstructions, RPZ land use incompatibilities, or incompatible RSA/OFA airport design areas by adjusting usable runway lengths. They cannot be used to increase available runway length or meet OFZ requirements.

FAA defines declared distances are used to satisfy performance requirements for turbine-powered aircraft. Existing runways have the capability of serving A-I/B-I small turbine-powered aircraft such as the Cirrus SF-50 Vision (turbojet), Cessna 425 (twin-engine turboprop), or Socata TBM-850 (single-engine turboprop) aircraft. The landing distance of single-engine turboprop aircraft is as short as 2,500 feet.

C47 has a published displaced threshold for Runway 36 (260') and Runway 18 (92'), resulting in a reduced LDA. No declared distances are formally published for the airport. The current runway length results in runway design standard deficiencies.

Implementing declared distances may be a cost efficient way to mitigate deficiencies to airport design standards within airport property. Many deficiencies such as obstacles within the RSA and OFA beyond the runway ends, airspace obstructions to the FAA approach surface, and incompatible land uses to the RPZ can be addressed in this manner. Runway operational utility is reduced. The OFZ cannot be mitigated using declared distances – this requires a runway shift. Possible actions that may involve the continued use of declared distances at C47 include:

- Runway 36
  - Shift runway end to the north by 240 feet to remove roadway from RSA/OFA/OFZ
  - Displace landing threshold by 700 feet to clear the FAA approach surface from the controlling man-made obstacle (transmission line)
- Runway 18
  - Shift runway end to the south by 240 feet to remove roadway from OFA/OFZ and achieve compatible RSA beyond runway end
  - Displace landing threshold by 140 feet to clear the FAA approach surface from the controlling man-made obstacle (15' vehicle on County Highway CX)
- Runway 4
  - Keep runway end in published location
- Runway 22
  - Shift runway end by 240 feet to the southwest to remove field road from RSA/OFA/OFZ

Applying declared distances will be reviewed for compliance with other airport design standards in the **Alternatives Analysis** chapter.

Runway Width

The FAA runway width requirement for an RDC B-I(S)-VIS or B-I(S)-5000 runway is 60 feet. The width increases to 75 feet for runways with an RDC of B-II(S)-5000. Runways accommodating ARC B-II aircraft with approach visibility minimums lower than ¾ mile require a runway width of 100 feet. The Wisconsin SASP states the facility service objective for a medium GA airport is a 75-foot wide primary runway, however actual runway dimensions are determined by the critical aircraft.

The recommended primary runway width through PAL 2 is 60 feet. The width increases to 75 feet in PAL 3. The crosswind runway width is 60 feet.

Pavement Strength

Airfield pavements should be adequately maintained, rehabilitated and reconstructed to meet the operational needs of the airport. Airport pavements have a minimum 20-year design life. The published pavement strength is based on the subgrade condition, construction materials, thickness, aircraft weight, gear configuration and operational frequency for the pavement to perform over its useful life. Larger aircraft could occasionally exceed the pavement strength but not on a regular basis.

The design aircraft through PAL 3 requires a primary runway and taxiway pavement strength of 12,500 pounds in a single-wheel configuration. The PAL 4 design airplane transitions to a large business jet with a 20,000 pound single-wheel and 30,000 pound dual-wheel pavement strength requirement. The crosswind runway requires a pavement strength up to 12,500 pounds in a single-wheel configuration through the planning period.

There is no existing published pavement strength for the airport's runways, and it is assumed the pavement strength is 12,500 pounds and meets current needs. An engineering evaluation should be completed to verify the existing runway pavement strength to ensure the design aircraft can be accommodated.

The FAA standard for measuring the reporting pavement strength on runways with pavement strengths greater than 12,500 pounds is defined in FAA AC 150/5335-5C, *Standard Method of Reporting Airport Pavement Strength*. The Aircraft Classification Number – Pavement Classification Number (ACN-PCN) method is defined within this guidance. The PCN value should equal or exceed the ACN value assigned for the design aircraft. The minimum recommended PCN value is 8 for the primary runway in PAL 4 to accommodate the design airplane greater than 12,500 pounds.

Pavement Surface Type

The primary runway is a bituminous asphalt surface without any surface treatment. This meets the needs of the airport through PAL 3.

Runway grooving improves aircraft stopping performance in wet or contaminated runway conditions. This is particularly critical during the landing phase of flight to mitigate the risk of a runway overrun. Runway grooving is now eligible for FAA funding when the design aircraft becomes a turbojet airplane and the runway length is at least 4,000 feet. Runway grooving is recommended on the primary runway in PAL 4.

The crosswind runway is currently a paved surface with an aggregate friction seal coat. A paved runway without any surface treatment meets the existing and future needs for this runway's operation.

Runway Designation

Runway designation is determined by the magnetic bearing (azimuth) of the runway centerline which is relative to the location of the magnetic north pole. The runway designator number is the whole number nearest the one-tenth of the magnetic azimuth along the runway centerline when viewed from the direction of aircraft approach.

The June 2019 magnetic variation at C47 is 2° 42' west. As the location of the magnetic North Pole changes over time (0° 2' west per year), runway designations may need to be adjusted. The current Runway 18-36 (181.19°/001.19° magnetic bearing in 2039) is appropriately designated for the planning period. Runway 4-22 (46.40°/226.40° magnetic bearing in 2039) should be re-designated as Runway 5-23 as soon as 2027.

Pavement Condition

Airfield pavement needs to be adequately maintained to provide a safe operating surface for the design aircraft fleet. The typical useful life of a bituminous asphalt pavement ranges from 20 to 30 years if properly maintained. The useful life for a concrete pavement can extend to 40 years and beyond. Pavement should undergo regular pavement maintenance by crack sealing joints annually and applying surface treatment every 5-7 years. Major rehabilitation is needed when the pavement surface requires replacement. Reconstruction is necessary when the base layers require rework.

The last pavement inspection at C47 was completed in October 2015. Runway 18-36 has a pavement condition index (PCI) rating ranging between 70 to 72. The crosswind runway 4-22 has a PCI rating of 56. The runway intersection has a PCI value of 73. The area weighted PCI of all runway pavements is 70, which meets SASP facility objectives of 70. Future pavement condition needs to be monitored with pavement rehabilitation, resurfacing, or reconstruction actions taken as needed.

Physical Runway Deficiencies

Table 4-23 summarizes the deficiencies in the existing runway length and width to the recommended standards.

Table 4-23
Existing Physical Runway Deficiencies

Runway	Standard(s)	Deficiency	Mitigation Options
4-22	Runway width	40' pavement width	✈ Widen runway by 20'
4-22	Runway length	2,559' takeoff and landing distance	✈ Extend runway by 741'
4-22	Pavement condition	2015 PCI = 56	✈ Rehabilitate runway
18-36, 4-22	Pavement strength	Pavement not published to 12,500 pounds	✈ Confirm or strengthen runway

Source: TKDA Analysis (2019)

Instrument Procedures

Instrument approach procedures are used by landing aircraft to navigate to the airport during IMC. Establishing approaches with the lowest possible weather minimums allow the airport to maximize its operational utility. Lower instrument approach minimums increase airport accessibility and reduce weather-related diversions to other airports. This is important to support on-demand corporate aircraft operations.

Each approach type requires differing infrastructure and navigational aids. Approaches with lower visibility minimums typically have additional infrastructure and navigational aids requirements. Types of approach procedures include non-precision approach (NPA), approach with vertical guidance (APV) and precision approach (PA).

More details on the airspace and navigational aids required for instrument procedures can be found in later sections of this chapter.

Primary Runway

Existing

C47 currently has a GPS-based Localizer Performance (LP) and Lateral Navigation (LNAV) approach to the Runway 18 end. A circling approach is available to the Runway 36 end. The airport can be accessed 95.41% of the time with an existing instrument approach, increasing airport utility by 7.11% over visual approaches. The existing C47 primary runway approaches have cloud ceiling minimums that are about 300 feet higher than the lowest practical minimums for the approach type.

There are numerous obstructions to the Runway 18 and 36 FAA approach surface “Row 4” with a 20:1 slope for a non-precision or circling approach. The airport sponsor will need to take action to mitigate obstructions to maintain existing instrument procedures. Actions may include tree trimming/removal, and changes to the runway threshold locations. This is a priority recommendation.

Future

It is generally recommended to establish an approach with vertical guidance (APV) to the runway end with the highest wind coverage and a non-precision approach (NPA) on the opposite runway end. Runway 36 at Portage has the highest wind coverage but does not have a straight-in instrument approach. An APV procedure enables more precise vertical navigation, and possibly lower instrument approach minimums. An APV requires a clear FAA Approach Surface “Row 6” with a 30:1 slope. At Portage, implementing these NPA and APV recommendations may not be practical considering surrounding land use impacts.

In PAL 4, the design aircraft becomes a large turbojet aircraft. It is recommended the airport consider establishing an approach with ¾-mile visibility minimums. The establishment of a ¾-mile approach with an approach lighting system can increase airport utility by over 3%. An APV procedure with ¾-mile visibility minimums triggers the following requirements over a non-precision approach:

- Full-length parallel taxiway
- Widened FAR Part 77 Primary Surface to 1,000 feet

- Widened FAR Part 77 Approach Surface with a 34:1 approach slope
- Clear FAA Approach Surface Row 6 (30:1) for a vertically-guided approach
- Approach Runway Protection Zone (RPZ) with dimensions of 1,000-foot wide inner width, 1,510-foot outer width, and 1,700-foot length

Improving instrument approach minimums was desired or needed by 64% of the user survey respondents, ranking #5 on the list of facility needs. The airport should take steps to at least maintain existing approaches, and enhancing approaches if practical. Instrument approach options and impacts will be evaluated in the **Alternatives Analysis** chapter.

Crosswind Runway

Existing

Runway 4 and 22 are served by circling instrument approaches from the GPS Runway 18 procedure. Circling minimums require 300 feet of obstacle clearance within the circling area. Other airports have similar circling minimums to Portage at 600 feet. There are numerous obstructions to the FAA approach surface “Row 4” with a 20:1 slope for a circling approach. The airport sponsor will need to take action to mitigate obstructions to maintain existing circling approach procedures. Actions may include tree trimming/removal, and changes to the runway threshold locations.

Future

It is generally recommended to maintain at least circling instrument approaches to paved crosswind runways if IMC wind coverage does not achieve 95%. At Portage, the Runway 18-36 IMC wind coverage at 10.5 knots is 93.43%, therefore a crosswind runway with instrument capability is recommended. An instrument approach triggers the following additional requirements over a visual approach:

- Medium intensity runway lighting (MIRL) for night minimums
- Widened FAR Part 77 Primary Surface to 500 feet
- Widened FAR Part 77 Approach Surface with a 20:1 approach slope
- Clear FAA Approach Surface Row 4 (20:1)

Instrument Approach Recommendations

Table 4-24 summarizes the general instrument approach recommendations applied to C47.

Table 4-24
Instrument Approach Recommendations

Runway	End(s)	PAL	Approach Type	Ideal Weather Minimums
Primary	Best Wind Coverage (36)	1-3	Approach with Vertical Guidance (APV)	250' cloud ceiling, 1-mile visibility
Primary	Opposite Runway End (18)	1-3	Non-Precision (NPA)	250' cloud ceiling, 1-mile visibility
Primary	Best Wind Coverage (36)	4	Approach with Vertical Guidance (APV)	200' ceiling, ¾-mile visibility
Primary	Opposite Runway End (18)	4	Approach with Vertical Guidance (APV)	250' cloud ceiling, 1-mile visibility
Paved Crosswind	Both (4, 22)	1-4	Circling	350' cloud ceiling, 1-mile visibility

Source: TKDA Analysis (2019)

Airspace Protection

Airspace is an important resource around airports that is essential for safe flight operations. There are established standards to identify airspace obstructions around airports. FAA grant assurances (obligations) require the airport sponsor to take appropriate action to assure that airspace is adequately cleared to protect instrument and visual flight operations by removing, lowering, relocating, marking or lighting, or otherwise mitigating existing airport hazards and preventing the establishment or creating of future airport hazards. Examples of obstructions include trees, buildings, poles, towers, terrain, mobile objects (i.e. vehicles on roads), and aircraft tails. Sufficiently clear airspace near the approach and departure runway ends are vitally important for safe airport operations. An FAA aeronautical study should be completed to determine the operational impacts and necessary mitigation of obstructions (i.e. lowering, lighting, marking, or publishing operational restrictions).

FAR Part 77 Civil Airport Imaginary Surfaces

The "imaginary" three-dimensional airspace surfaces identified under Title 14 CFR (Code of Federal Regulations) Part 77 *Safe, Efficient Use, and Preservation of the Navigable Airspace* is used to determine whether man-made or natural objects penetrate and become obstructions. Obstructions are a presumed hazard to air navigation by FAA unless an aeronautical study is conducted by FAA after submission by the Sponsor.

Federal Aviation Regulation (FAR) Part 77 surfaces are the protective surfaces most often used to provide height restriction zoning protection around an airport. Sufficiently clear airspace is necessary for the safe and efficient use of aircraft arriving and departing an airport. Part 77 airspace standards are defined by the most demanding approach to a runway. These airspace surfaces include the primary, approach, transitional, horizontal, and conical surfaces each with different standards. Part 77 considers the height of mobile objects over traverse ways. Public roads must clear by 15 feet, interstate highways by 17 feet, railroads by 23 feet, and private roads by 10 feet or the height of the most critical vehicle.

Table 4-25 depicts the recommended existing and future approach airspace surfaces for C47 based on instrument approach recommendations. The feasibility of establishing an instrument approach to Runway 36 will need to be reviewed in detail.

Table 4-25
Part 77 Approach Airspace Standards & Recommendations

Runway End	Approach Standards	Code	End Offset	Inner Width	Outer Width	Length	Slope
Existing							
18	Non-Precision Utility Greater Than ¾ Mile	A(NP)	200’	500’	2,000’	5,000’	20:1
36	Visual Utility	A(V)	200’	500’	1,250’	5,000’	20:1
4	Visual Utility	A(V)	200’	250’	1,250’	5,000’	20:1
22	Visual Utility	A(V)	200’	250’	1,250’	5,000’	20:1
PAL 1-3							
36	Non-Precision Utility Greater Than ¾ Mile	A(NP)	200’	500’	**2,000’**	5,000’	20:1
PAL 4							
36	Non-Precision, Other-Than-Utility, As low as ¾ mile	D	200’	**1,000’**	**4,000’**	**10,000’**	**34:1**
18	Non-Precision, Other-Than-Utility, Greater Than ¾ Mile	C	200’	**1,000’***	**3,500’**	**10,000’**	**34:1**

*Source: 14 CFR Part 77, TKDA Analysis (2019); *Inner width is also the Primary Surface width driven by the most demanding approach to a runway. Existing standard to remain unless identified in **bold**.*
Code: A(NP) = Non Precision Approach (Utility Runway), A(V) = Visual Approach (Utility Runway), C = Non Precision Approach (Visibility Minimums greater than ¾ mile), D = Non Precision Approach (Visibility Minimums as low as ¾ mile)

There are dozens of existing Part 77 obstructions analyzed in the **Inventory** chapter and summarized in **Table 4-26**. Obstructions and mitigation will be identified in detail in a future Airport Layout Plan (ALP) Update.

Generally speaking, objects should be kept clear of Part 77 surfaces. The airport sponsor is not required to prevent or clear penetrations to FAR Part 77, however they need to be identified on an ALP. Part 77 obstructions may be airport design standard deficiencies that need to be addressed. Part 77 obstructions should be removed whenever opportunities exist. New development should be kept below the Part 77 airspace surfaces whenever possible to maintain airport operational utility.

Table 4-26
Existing FAR Part 77 Obstructions

Surface	Obstruction Points
Primary	115
Approach	91
Transitional	120
Horizontal	1
Conical	0

Source: TKDA Analysis (2019)

FAA Approach/Departure Surfaces

FAA identifies sloping approach surfaces that must be cleared at an absolute minimum for safety for landing and departing aircraft. These surfaces are identified in Table 3-2 of Engineering Brief 99, an interim update to FAA AC 150/5300-13A. These surfaces are intended to be similar to the more complex surfaces identified in Terminal Instrument Procedures (TERPS) standards.

All objects must clear the surface for the applicable runway operational design standard to meet minimum aviation safety standards for a given runway landing threshold location. Approach airspace penetrations typically require the removal of the object, operational restrictions, or the runway landing threshold to be shifted or displaced down the runway.

The departure surface applies to runway where IFR departures are allowed. The departure surface should remain clear of obstacles. The surface begins at the end of the takeoff distance and extends upward and outward at a 40:1 slope. Penetrations to the departure surface may require the obstacle to be published, or require mitigation including increasing the minimum aircraft climb rate or runway length operational restrictions. Many runway ends at other airports have obstructions that remain and are published for pilot information. In general, the airport should remove or mitigate on-airport 40:1 departure surface obstructions whenever possible, address off-airport obstructions as opportunities arise and prevent any new 40:1 obstructions.

The applicable existing and future approach/departure surface standards are identified in **Table 4-27**, with further analysis in the subsequent sections.

Table 4-27
FAA Approach/Departure Surface Standards & Recommendations

Runway End	Table 3-2 Row	Description	Slope
Existing			
18, 36, 4, 22	4	Approach end of runways expected to accommodate instrument approaches having visibility minimums ≥ ¾ mile, and circling approaches	20:1
18, 36, 4, 22	7	Departure runway ends for all instrument operations	40:1
PAL 1-3			
36	**6**	**Approach end of runways expected to accommodate instrument approaches with vertical guidance**	**30:1**
PAL 4			
18	**6**	**Approach end of runways expected to accommodate instrument approaches with vertical guidance**	**30:1**

Source: FAA AC 150/5300-13A, FAA Engineering Brief 99, TKDA Analysis (2019)
*Note: Most critical row(s) shown. Existing standard to remain unless identified in **bold**.*

FAA Approach Surface

There are dozens of object points that are penetrations to the FAA 20:1 approach surfaces to all existing runway ends based on how the airport operates today. Object types include trees, buildings, poles, vehicles on roads, and other vertical objects. Unlike the FAR Part 77 Approach Surface, the airport sponsor ***must*** take action to ensure that all on airport obstructions to the FAA approach surfaces are removed. Mitigation options include obstruction removal, changing runway end utility, and/or displacing the runway landing threshold. FAA approach surface obstruction groups are listed in **Table 4-28** with potential mitigation options, grouped by runway end.

FAA Departure Surface

There are hundreds of FAA survey object points that are penetrations to the FAA 40:1 departure surface for all runway ends. Object types include poles, buildings, and trees. All runway ends allow for instrument departures per published FAA procedures. While it is more critical to ensure that approach surfaces obstructions are addressed, the FAA departure surface should not be ignored. Mitigation options include removal where possible, or eliminating IFR departures. A list of departure surface obstructions are listed in **Table 4-28** with potential mitigation options, grouped by runway end.

Terminal Instrument Procedures (TERPS)

The FAA has established standards to develop instrument procedures in the United States. FAA Order 8260.3D, *U.S. Standards for Terminal Instrument Procedures (TERPS)* and related orders outlines these complex standards to develop instrument procedures. Some critical TERPS obstruction clearance surface (OCS) standards are integrated into FAA Airport Design standards, including many final approach segments and the departure surface. Other TERPS surfaces are standalone such as the missed approach surface. Some TERPS surfaces may even be more restrictive than Part 77 or FAA Airport Design standards. Penetrations to TERPS surfaces may result in higher weather minimums or operational restrictions.

Removal or mitigation of the obstructions to the FAA approach surface may allow for the removal of the current night restriction on the GPS RWY 18 procedure in coordination with the FAA's Flight Procedure Office (FPO). The current cloud ceiling minimums for the GPS RWY 18 procedure are higher than the ideal design. Coordination with FAA FPO is recommended to determine the critical obstacle(s) and if they can be lowered/removed to improve the approach minimums. Future instrument approach procedures will need to be evaluated by FAA FPO for feasibility based upon available obstacle data. The airport sponsor should also periodically update the obstruction data with an FAA aeronautical survey or directly with the FPO for individual points to ensure the FAA's obstacle database is current.

Table 4-28
Existing FAA Approach & Departure Surface Deficiencies

Runway End	Standard(s)	Location	Deficiency	Mitigation Options
36	FAA Approach Surface (Row 4)	East of Runway 36 End	Aircraft tails and wind cone obstruct by up to 20’	✈ Shift RWY 36 threshold by 400’ ✈ Reclassify RWY 36 for VFR landings and shift threshold by 200’ ✈ Relocate fuel facility and wind cone
36	FAA Approach Surface (Row 4)	West of Runway 36 End	Buildings and antenna obstruct by up to 33’	✈ Shift RWY 36 threshold by 660’ ✈ Reclassify RWY 36 for VFR landings and shift threshold by 460’ ✈ Remove building
36	FAA Approach Surface (Row 4)	South of Runway 36 End	Silver Lake Drive and parking lot obstruct by up to 9’	✈ Shift RWY 36 threshold by 180’ ✈ Reclassify RWY 36 for VFR landings ✈ Remove/relocate roads
36	FAA Approach Surface (Row 4)	South of Runway 36 End	Trees obstruct surface by up to 20’	✈ Acquire land rights and trim/remove trees ✈ Shift RWY 36 threshold by 400’ ✈ Reclassify RWY 36 for VFR landings and shift threshold by 200’
36	FAA Approach Surface (Row 4)	South of Runway 36 End	Building vent obstructs surface by 16’	✈ Acquire land rights and remove building ✈ Shift RWY 36 threshold by 320’ ✈ Reclassify RWY 36 for VFR landings and shift threshold by 120’
36	FAA Approach Surface (Row 4)	South of Runway 36 End	Power lines and poles obstruct surface by up to 37’	✈ Shift RWY 36 threshold by 740’ ✈ Reclassify RWY 36 for VFR landings and shift threshold by 540’ ✈ Bury high-voltage power line through approach
36	Runway 18 FAA Departure Surface	South of Runway 36 End	Over 240 objects (buildings, poles, vehicles on roads, trees) penetrating by up to 87’	✈ Remove/mitigate on-airport obstructions as opportunities arise ✈ Prevent establishment of new obstructions ✈ Do not allow instrument departures on RWY 18

Table 4-28
Existing FAA Approach & Departure Surface Deficiencies (cont'd)

Runway End	Standard(s)	Location	Deficiency	Mitigation Options
18	FAA Approach Surface (Row 4)	North of Runway 36 End	Interstate 39 and CTH CX obstruct surface by up to 9'	✈ Shift RWY 36 threshold by 280' ✈ Reclassify RWY 36 for VFR landings and shift threshold by 20' ✈ Remove/relocate roads
18	FAA Approach Surface (Row 4)	North of Runway 36 End	Trees obstruct surface by up to 34'	✈ Acquire land rights and trim/remove trees ✈ Shift RWY 18 threshold by 680' ✈ Reclassify RWY 18 for VFR landings and shift threshold by 480'
18	Runway 36 FAA Departure Surface	North of Runway 18 End	Over 90 objects (pole, vehicles on roads, trees) penetrating by up to 58'	✈ Remove/mitigate on-airport obstructions as opportunities arise ✈ Prevent establishment of new obstructions ✈ Do not allow instrument departures on RWY 36
22	FAA Approach Surface (Row 4)	Northeast of Runway 22 End	Trees, poles, and field road penetrate by up to 22'	✈ Acquire land rights (city) and trim/remove trees, bury/relocate pole, and remove/relocate road ✈ Shift RWY 4 threshold by 60' ✈ Reclassify RWY 22 for VFR landings and remove trees and field road
22	FAA Approach Surface (Row 4)	Northeast of Runway 22 End	80' tall trees in residential area penetrate up to 57'	✈ Acquire land rights and trim/remove trees ✈ Shift RWY 22 threshold by 1,140' ✈ Reclassify RWY 22 for VFR landings and shift threshold southwest by 940'
22	Runway 4 FAA Departure Surface	Northeast of Runway 4 End	Over 40 objects (buildings, poles, vehicles on roads, trees) penetrating by up to 79'	✈ Remove/mitigate on-airport obstructions as opportunities arise ✈ Prevent establishment of new obstructions ✈ Do not allow instrument departures on RWY 22

Table 4-28
Existing FAA Approach & Departure Surface Deficiencies (cont'd)

Runway End	Standard(s)	Location	Deficiency	Mitigation Options
4	FAA Approach Surface (Row 4)	Southwest of Runway 4 End	CTH CX and parking lot obstructs surface by up to 10'	✈ Shift RWY 4 threshold by 200' ✈ Reclassify RWY 22 for VFR landings ✈ Remove/relocate road and parking lot
4	FAA Approach Surface (Row 4)	Southwest of Runway 4 End	Building obstructs surface by 5'	✈ Shift RWY 4 landing threshold by 100' ✈ Reclassify RWY 4 for VFR landings ✈ Remove building
4	FAA Approach Surface (Row 4)	Southwest of Runway 4 End	Trees obstruct surface by up to 51'	✈ Acquire land rights and remove trees ✈ Shift RWY 4 threshold by 1,020' ✈ Reclassify RWY 4 for VFR landings and shift threshold by 820'
4	FAA Approach Surface (Row 4)	Southwest of Runway 4 End	Power poles obstruct surface by up to 3'	✈ Acquire land rights and lower/remove power pole ✈ Shift RWY 4 landing threshold by 60' ✈ Reclassify RWY 4 for VFR landings
4	Runway 22 FAA Departure Surface	Northeast of Runway 22 End	Over 80 objects (buildings, poles, vehicles on roads, trees) penetrating by up to 74'	✈ Remove/mitigate on-airport obstructions as opportunities arise ✈ Prevent establishment of new obstructions ✈ Do not allow instrument departures on RWY 4

Source: TKDA Analysis (2019)

Other Design Surfaces

Inner-Approach Obstacle Free Zone (IA-OFZ)

A clear inner-approach OFZ is necessary if an Approach Lighting System (ALS) is installed. The inner-approach OFZ is a 50:1 sloped surface begins 200 feet from the runway threshold and extends 200 feet beyond the last approach light. The IA-OFZ would be applicable in PAL 4 when an ALS is recommended for a ¾-mile approach.

Visual Aids

Visual aids at an airport require clear Obstacle Clearance Surface (OCS) to provide sufficient guidance for pilots. These include approach lighting systems and visual guidance slope indicators. For a Precision Approach Path Indicator (PAPI) system with a typical 3-degree glidepath, a 31.29:1 sloped surface must be clear. The specific airspace standards for this and other approach lighting systems are defined in FAA Order 6850.2B and FAA Engineering Brief 95. If the Runway 18 landing threshold is adjusted, the PAPI will need to be moved and should be designed at that time so the PAPI light plane clears objects.

FAA Aeronautical Surveys

The FAA has implemented Aeronautical Survey requirements per FAA AC 150/5300-18B: *General Guidance and Specifications for Submission of Aeronautical Data to NGS: Field Data Collection and Geographic Information System (GIS) Standards*. FAA airport survey requirements require obstruction data to be collected using assembled aerial imagery for the airport. This data is used in aeronautical publications and to develop instrument approach procedures.

The most recent FAA aeronautical survey was completed in April 2011. When safety-critical data is needed to update runway end data or enhance an instrument approach, then a new aeronautical survey is required to meet FAA standards.

Navigational Aids (NAVAIDs)

Airfield NAVAIDs are any ground or satellite-based electronic or visual device to assist pilots with airport operations. They provide for the safe and efficient operations of aircraft on an airport or within the vicinity of an airport. The type of NAVAIDS required are determined by FAA guidance based on an airport's usage, activity and approach type.

Area Navigation

Consistent with FAA's NextGen initiative, satellite-based systems will primarily be used for area navigation with ground-based NAVAIDs used for secondary purposes. Wide Area Augmentation System (WAAS) provides the framework for satellite-based navigation and approach procedures. Supporting ground infrastructure that may be needed include ADS-B antennas at certain airports, and Ground Based Augmentation System (GBAS) antennas to support precision approaches. C47 should plan for the continued use of satellite-based area navigation at the airport, as Very-High Frequency Omnidirectional Range (VOR) are being decommissioned throughout the region to support the FAA's Minimum Operational Network.

Runway Approach

Some NAVAIDs are developed specifically to provide "approach" navigation guidance, which assists aircraft in landing at a specific airport or runway. These NAVAIDs are electronic or visual in type. FAA Order 6750.16E, *Siting Criteria for Instrument Landing Systems* and FAA Order 6850.2B, *Visual Guidance Lighting Systems* defines the standards for establishing these systems.

Approach Enhancements

Recommended approach enhancements include establishing new instrument approaches with vertical guidance (APV) where feasible. Visibility minimums are recommended to be as low as ¾-mile on the primary runway. C47 should plan for the continued use of GPS technology to provide for APV approaches through PAL 4.

Visual Guidance Slope Indicator (VGSI)

A VGSI system provides visual descent guidance to aircraft on approach to landing. A Precision Approach Path Indicator (PAPI) system is a typical VGSI system. They are installed on runway ends to enhance visual vertical guidance to the runway end. PAPI systems consist of a single row of four lights for jet-capable runways. The PAPI light plane needs to meet obstacle clearance requirements or be mitigated. Any change to the Runway 18 threshold will require the existing 2-box PAPI to be relocated or replaced. The airport should also consider adding a PAPI system to the Runway 36 end for operational safety to ensure obstacle clearance. Upgrading 2-box PAPIs to a 4-box PAPI in PAL 4 is also recommended. PAPIs on the crosswind runway likely do not meet minimum FAA activity thresholds identified in FAA Order 7031.2 and are therefore not recommended.

Runway End Identifier Lights (REIL)

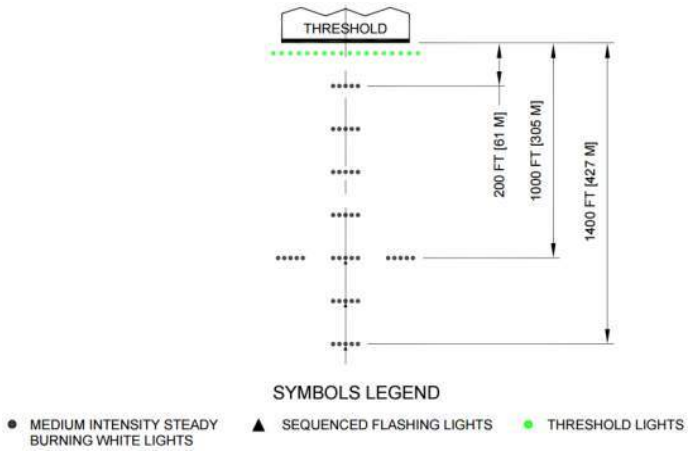
REILs consist of high-intensity flashing white strobe lights located on the approach ends of runways to assist the pilot in early identification of the runway threshold. These are not installed with an approach lighting system. The existing REIL at the Runway 18 threshold are in fair condition. Omnidirectional REILs are recommended for primary runway ends with at least circling instrument approaches. The airport should consider replacing the REIL in the near-term if the Runway 18 threshold is relocated. A new REIL is recommended on the Runway 36 threshold. REILs on the crosswind runway likely do not meet minimum FAA activity thresholds identified in FAA Order 7031.2 and are therefore not recommended.

Approach Lighting System (ALS)

ALS help pilots transition from instrument flight to visual flight for landing. An ALS may help provide ¼-mile visibility credit for instrument approach minimums. There are various configurations, lighting types and complexities to these systems. The requirement for an airport runway end is dependent upon the type of approach and visibility minimums.

There is no ALS currently installed at C47. A MALSF system is recommended by PAL 4 associated with ¾-mile visibility minimums for the primary runway approach:

MALSF Configuration



- **Medium-intensity Approach Lighting System with Sequencing Flashing Lights (MALSF):** Consists of seven rows of lights, three flashing lights and a row of steady burning green lights prior to runway threshold. The system is 1,400 feet in total length providing visual guidance to non-precision runways. This system is an option to help achieve ¾-mile visibility minimums. This system is a typical facility and service attribute for a Medium GA airport in Wisconsin.

In addition, ALS installation requires a clear Inner-Approach OFZ at a 50:1 slope extending to 200 feet beyond the last approach light.

Airfield Visual

Visual NAVAIDs provide airport users with visual references within the airport environment. They consist of lighting, signage, and pavement markings on an airport. Visual NAVAIDS are necessary airport facility components on the airfield, promoting enhancing situational awareness, operational capability, and safety. FAA AC 150/5340-30, *Design and Installation of Airport Visual Aids* defines the standards for these systems.

Airport Beacon

The airport beacon serves as the airport identification light so approaching pilots can identify the airport location from sunset to sunrise. The minimum light beam angle is 2 degrees. The existing airport beacon at C47 is currently located approximately 1,500 feet to the east of airport property on top of the city's water tower. Although not a local proirity at this time, C47 should plan to have the airport beacon located on airport property for ease of maintenance provided there would be no large-scale line-of-sight obstructions.

Runway Lighting

Runway edge lights are placed off the sides of the runway surface to help pilots define the edges and end of the runway during night and low visibility conditions. Runway lights are classified by the intensity of light they produce. The existing medium intensity runway lights (MIRL) at C47 on primary Runway 18-36 have non-standard spacing in addition to portions of the runway that are not lighted. A MIRL system is recommended for the primary runway through

PAL 4. The airport should install a new MIRL system on Runway 18-36 in the near-term, particularly when the runway thresholds are relocated. Runway lighting is recommended for the crosswind runway by PAL 4, or if the runway is used at night, and/or for instrument operations.

Taxiway Lighting

Taxiway edge lighting delineates the taxiway and apron edges. The FAA standard taxiway edge lighting system is Medium Intensity Taxiway Lights (MITL), however reflective markers can be used as a lower-cost method. The taxiways at C47 are not equipped with any edge lighting. C47 should plan for taxiway edge markers to provide for economical visual guidance at night through PAL 3, then MITL for the parallel and connecting taxiways in PAL 4.

Lighting Activation

The pilot activates runway edge and visual approach lights through a Pilot Controlled Lighting (PCL) transmitter system. A new PCL system is recommended to be installed during the next airfield lighting project.

Airfield Signage

Airfield signage is essential for the safe and efficient operation of aircraft and ground vehicles on the airport movement area. New mandatory airfield guidance signs need to be installed during the next airfield project to meet FAA standards.

Pavement Markings

Pavement markings help airport users visually identify important features on the airfield. FAA has defined numerous different pavement markings to promote safety and situational awareness as defined by FAA AC 150/5340-1, *Standards for Airport Markings*.

Runway

Runway pavement markings are white in color. The type and complexity of the markings are determined by the approach threshold category to the runway end. The required markings for primary Runway 18-36 is non-precision markings. Visual runway markings are required for crosswind Runway 4-22 if it remains to accommodate circling instrument approaches. Displaced threshold markings on the Runway 4 end should be removed, and a threshold bar added to the Runway 22 end. FAA prohibits aligned taxiways and they should be removed or striped unusable pavement as soon as practicable.

Taxiway/Taxilane

Taxiway and taxilane markings are important for directional guidance for taxiing aircraft and ground vehicles. Common taxiway and apron markings include taxiway/taxilane centerline and edge. Taxilane centerline markings should be revised through the apron and hangar areas to ensure adequate taxilane object free area (TOFA) clearance standards are met for the design aircraft wingspan to use that area. Markings should terminate where TOFA standards are not met. Taxiway edge markings should be used where appropriate if there is a wide expanse of pavement such as near the Runway 36 end.

Holding Position

Holding position markings are a required visual reference to prevent aircraft and vehicles from entering critical areas such as an active runway environment. C47 should install standard holding position markings located 125 feet from runway centerline at all entrance and connecting taxiway locations through PAL 3. At PAL 4 the design aircraft requires an offset of 200 feet.

Meteorological

Aircraft operating to and from an airport require meteorological aids to provide current weather data. Weather information helps pilots make informed decision about flight operations. Airports have various aids installed providing local weather information.

Surface Weather Observation

An Automated Weather Observation System (AWOS) provides continuous reporting of local airport weather conditions for safe and efficient aviation operations. C47 currently does not have any on-site weather reporting equipment. The nearest reporting station at the Baraboo-Wisconsin Dells Airport. One of the Wisconsin SASP facility objectives is to have an AWOS or ASOS be available at Medium General Aviation Airport like C47. C47 should plan a site for an AWOS in the future, but must pass a benefit-cost analysis (BCA) before it can eligible for federal funding.

An AWOS must meet siting criteria identified in FAA JO 6560.20C. The height of the wind sensor is typically 30-33 feet. The system should be kept clear of objects 15 feet below the wind sensor height within 500 feet, and clear of objects greater than 10 feet above the wind sensor within 1,000 feet. If these standards cannot be achieved, then a less desirable location may have to be selected. Ultimately the AWOS must demonstrate reliable weather information can be gathered.

Wind Cone

Wind cones visually indicate the current wind direction and velocity on an airfield. The wind cone and segmented circle is in a central location, visible to pilots on approach or takeoff at each runway end, and lighted for night operations. Supplement wind cones are needed if the primary wind cone is not visible from a particular location.

The primary C47 wind cone is currently an obstruction to the Runway 4-22 Obstacle Free Zone (OFZ), and also within the Object Free Area (OFA). C47 should plan to relocate the wind cone and segmented circle to another centralized area compatible with FAA airport design standards. The supplemental wind cone is also an obstruction to the Runway 36 FAA approach surface and should be removed or relocated.

Communications & Air Traffic Control

The ability for pilots to communicate with other pilots and air traffic control (ATC) is critical for the safety and efficiency of the overall air transportation system. C47 will continue to be an uncontrolled airport with a UNICOM based on its activity. No changes are needed. On-site communications facilities are minimally sufficient; Flight Service Station communication is

available via the Remote Communications Outlet (RCO) co-located with the Dells VORTAC. This RCO will need to remain operational if the VORTAC is decommissioned in the future.

Existing NAVAID Deficiencies

Table 4-29 summarizes the obvious existing navigational aid deficiencies. These are also shown graphically in **Figure 4-3**. Action needs to be taken by the airport to meet these FAA airport design standards.

Table 4-29
Existing Navigational Aid Deficiencies

Standard	Location	Deficiency	Mitigation Options
Runway 18-36 edge lighting	RWY 18-36	Pavement edge lights do not have standard spacing	✈ Reconfigure runway edge lights
Runway 4 markings	RWY 4 end	Displaced threshold markings instead of unusable pavement markings	✈ Restripe unusable pavement with yellow chevrons
Runway 22 markings	RWY 22 end	No threshold bar or unusable pavement markings	✈ Restripe unusable pavement with yellow chevrons, add threshold bar
Wind cone and segmented circle	Near runway intersection	Located within RWY 4-22 ROFA and ROFZ	✈ Relocate wind cone and segmented circle
Mandatory airfield guidance signs	Runway hold positions	No mandatory airfield guidance signs installed	✈ Install mandatory airfield guidance signs
Runway hold position markings	RWY 18-36 entrance taxiways	Hold line 75’ from runway centerline at RWY 36 end, no not exist for other taxiways	✈ Install hold line 125’ from runway centerline on all taxiways

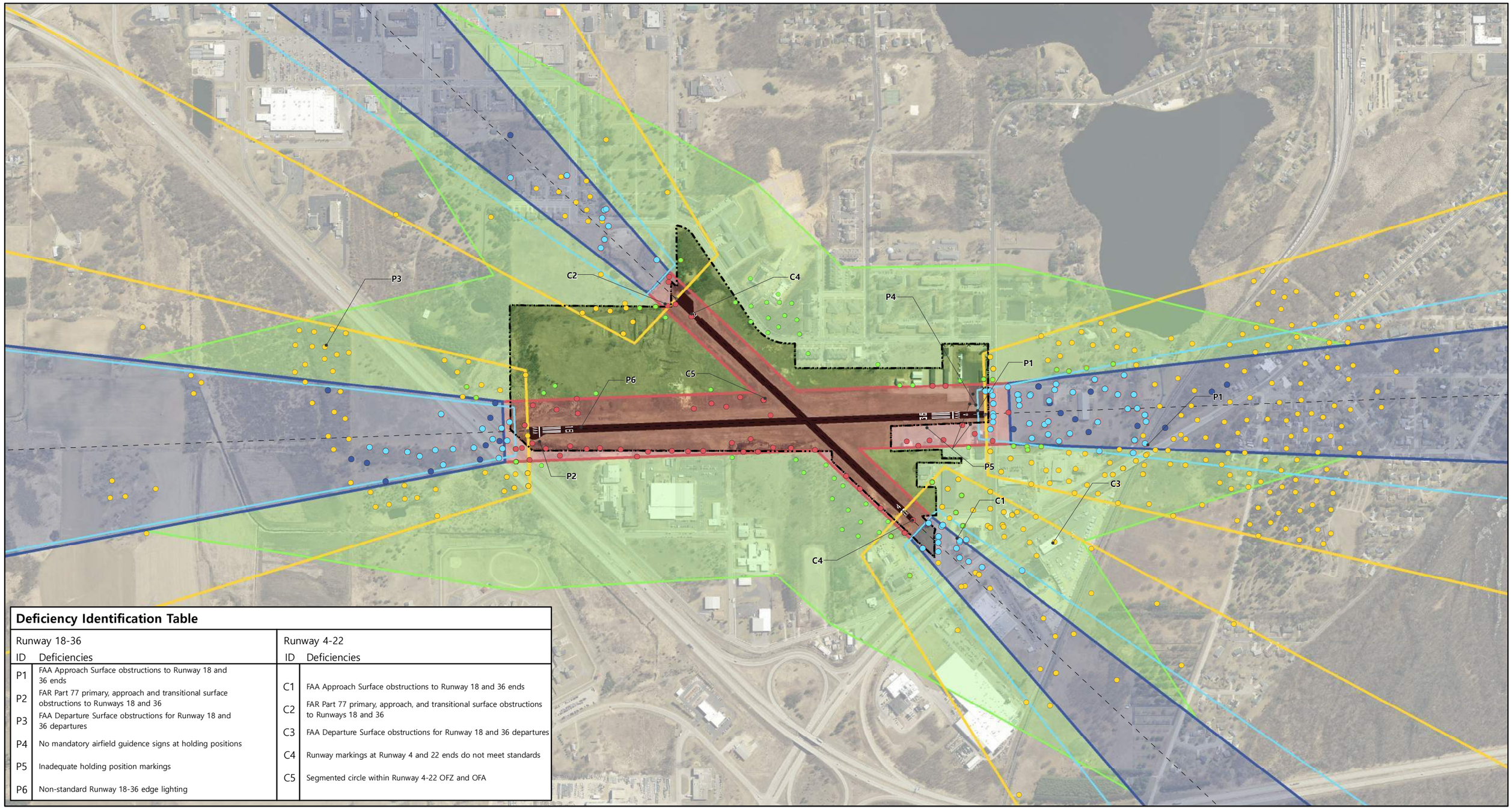
Source: TKDA Analysis (2019)

FIGURE 4-3: AIRSPACE & NAVIGATIONAL AID DEFICIENCIES

PORTAGE MUNICIPAL AIRPORT

AIRPORT MASTER PLAN STUDY

PORTAGE, WI



Deficiency Identification Table

Runway 18-36		Runway 4-22	
ID	Deficiencies	ID	Deficiencies
P1	FAA Approach Surface obstructions to Runway 18 and 36 ends	C1	FAA Approach Surface obstructions to Runway 18 and 36 ends
P2	FAR Part 77 primary, approach and transitional surface obstructions to Runways 18 and 36	C2	FAR Part 77 primary, approach, and transitional surface obstructions to Runways 18 and 36
P3	FAA Departure Surface obstructions for Runway 18 and 36 departures	C3	FAA Departure Surface obstructions for Runway 18 and 36 departures
P4	No mandatory airfield guidence signs at holding positions	C4	Runway markings at Runway 4 and 22 ends do not meet standards
P5	Inadequate holding position markings	C5	Segmented circle within Runway 4-22 OFZ and OFA
P6	Non-standard Runway 18-36 edge lighting		

Airspace Obstructions

- Obstruction to FAA Approach
- Obstruction to P77 Approach
- Obstruction to P77 Primary
- Obstruction to P77 Transitional
- Obstruction to FAA Departure
- Obstruction to P77 Horizontal

- FAA Approach Surface Row 4
- FAR P77 Approach Surface
- FAR P77 Primary Surface
- FAR P77 Transitional Surface
- FAA Departure Surface
- Existing Runway
- Airport Boundary

N

0 375 750 1,500 Feet

PORTAGE WISCONSIN

TKDA

DATA SOURCE: COLUMBIA COUNTY LAND INFORMATION DEPARTMENT

Taxiways

Taxiways provide for the safe and efficient movement of aircraft between the runway and other operational areas of the airport. The taxiway system should provide critical links to airside infrastructure, increase capacity and reduce the risk of an incursion with traffic on the runway. The taxiway system should meet the standards design requirements identified in FAA AC 150/5300-13A.

System Design

FAA has placed a renewed emphasis on taxiway design in their updated airport design standards. Fundamental elements help develop and efficient system to meet demands, reduce pilot confusion and enhance safety. Considerations include:

- Design taxiways to meet FAA design standards for existing and future users considering expandability of airport facilities.
- Design taxiway intersections so the cockpit is over the centerline with a sufficient taxiway edge safety margin.
- Simplify taxiway intersections to reduce pilot confusion using the three-node concept, where a pilot has no more than three choices at an intersection.
- Eliminate “hot spots” identified by the FAA Runway Safety Action Team where enhanced pilot awareness is encouraged.
- Minimize the number of runway crossings and avoid direct access from the apron to the runway.
- Eliminate aligned taxiways whose centerline coincides with a runway centerline.
- Other considerations include avoiding wide expanses of pavement and avoiding “high energy intersections” near the middle third of a runway.

Design Standards

FAA identifies the design requirements for taxiways. The design standards vary based on individual aircraft geometric and landing gear characteristics. The Taxiway Design Group (TDG) and Airplane Design Group (ADG) identified for the design aircraft using a taxiway. In addition to taxiway/taxilane pavement width, some of the safety standards include:

- **Taxiway/Taxilane Safety Area (TSA):** A defined graded and drained surface alongside the taxiway prepared or suitable for reducing the risk of damage to an aircraft deviating from the taxiway.
- **Taxiway Edge Safety Margin (TESM):** The minimum acceptable distance between the outside of the airplane wheels and the pavement edge.
- **Taxiway/Taxilane Object Free Area (TOFA):** An area centered on the centerline to provide enhanced safety for taxiing aircraft by prohibiting parked aircraft and above ground objects except for those objects that need to be in the OFA for aircraft ground maneuvering purposes.

Other design standards include taxiway shoulder width to prevent soil erosion or debris ingestion for jet engines.

Table 4-30 lists the applicable Airplane Design Group (ADG) and Taxiway Design Group (TDG) standards for the design aircraft based on PAL. **Table 4-31 and 4-32** describe the specific FAA taxiway design standards based on various ADG and TDG classifications that may operate at C47, respectively.

Table 4-30
Taxiway Design Aircraft Standards

Design Aircraft	PAL 1	PAL 2	PAL 3	PAL 4
Airplane Design Group (ADG)	I	I	II	II
Taxiway Design Group (TDG)	1A	1A	1B (2)*	1B (2)*

*Source: TKDA Analysis (2019); *Parenthesis represents TDG of frequent operators but less than 500 annual operations*

The design aircraft identifies less than 500 annual operations in aircraft with TDG-2 standards. In PAL 3, the representative design aircraft as part of the fleet has TDG-2 standards. Because these aircraft would occasionally use the airport, the airport sponsor should plan to meet TDG-2 standards as soon as PAL 3 and beyond.

Table 4-31
Taxiway Design Standards (ADG)

Airplane Design Group (ADG) Standard	ADG-I	ADG-II
Representative Aircraft Code	BE58	B200
Taxiway Safety Area	49 feet	79 feet
Taxiway Object Free Area	89 feet	131 feet
Taxilane Object Free Area	79 feet	115 feet
Taxiway Centerline to Parallel Taxiway/Taxilane Centerline	70 feet	105 feet
Taxilane Centerline to Parallel Taxiway/Taxilane Centerline	64 feet	97 feet
Taxiway Centerline to Fixed or Movable Object	44.5 feet	65.5 feet
Taxilane Centerline to Fixed or Movable Object	39.5 feet	57.5 feet
Taxiway Wingtip Clearance	20 feet	26 feet
Taxilane Wingtip Clearance	15 feet	18 feet

Source: FAA AC 150/5300-13A

Table 4-32
Taxiway Design Standards (TDG)

Taxiway Design Group (TDG) Standard	TDG-1A	TDG-1B	TDG-2
Representative Aircraft Code	BE58	C56X	B200
Taxiway Width	25 feet	25 feet	35 feet
Taxiway Edge Safety Margin (TESM)	5 feet	5 feet	7.5 feet
Taxiway Shoulder Width	10 feet	10 feet	15 feet
Crossover Taxiway Separation for Reverse Turns (Minimum)	70 feet	105 feet	162 feet
Centerline Turn Radius (90 degrees)	25 feet	40 feet	60 feet

Source: FAA AC 150/5300-13A

Table 4-33 describes the existing taxiway/taxilane design data**.** There are several deficiencies to taxiway design standards and guidelines including direct access to runway, aligned taxiways, wide expanses of pavement, object free areas penetrations, and inadequate hold positions that are described at the end of this section.

Table 4-33
Taxiway/Taxilane Design Data

Name	ADG -TDG	Width					Lighting	Objects in TSA or TOFA?	Separation from CL to Object
		Full-Strength	Paved Shoulder	TSA	TOFA	TESM			
TW A	I-1A	80’	0’	49’	89’	5’	None	No	45.0’
TL H	I-1A	40’	0’	49’	79’	5’	None	**YES**	30.0’
TL H1	I-1A	20’	0’	49’	79’	5’	None	**YES**	23.5’
TL H2	I-1A	25’	0’	49’	79’	5’	None	**YES**	37.5’
TL H3	I-1A	25’	0’	49’	79’	5’	None	**YES**	30.0’
TL H4	I-1A	20’	0’	49’	79’	5’	None	**YES**	27.0’

Source: FAA AC 150/5300-13A, TKDA Analysis (2019), Airport Layout CAD Linework

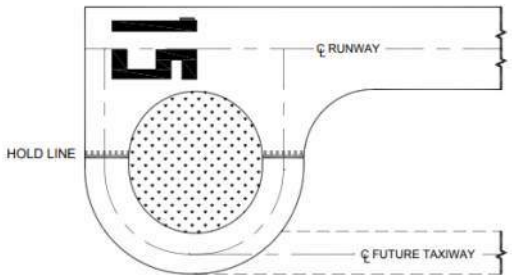
Parallel Taxiway & Taxiway Turnarounds

A full length parallel taxiway is a taxiway parallel with the runway connected to each runway end. A partial parallel taxiway connects to a single runway end and a mid-field. Parallel taxiways greatly enhance the safety and efficiency of the airfield. A parallel taxiway eliminates using the runway for back-taxiing, thus enhancing safety, increasing capacity, and protecting the runway during low visibility conditions.

A parallel taxiway is required when the runway approach visibility minimums are less than 1-mile. A full parallel taxiway is recommended by the Wisconsin SASP for Medium GA airport. C47 should plan for a mid-field partial parallel taxiway to one runway end by PAL 3, and a full-length parallel taxiway by PAL 4 when ¾-mile visibility minimums are established.

Taxiway turnarounds are small taxiways constructed at the end of runways so aircraft can change direction on the runway. These are established at lower activity airports where it is not economically feasible to construct a parallel taxiway. To reduce operational risk, a turnaround allowing aircraft to turnaround and hold behind the runway holding position is recommended for each runway end, particularly for the primary runway when no parallel taxiway exists. The existing turnarounds should be reconfigured.

Taxiway Turnaround



Entrance & Exit Taxiways

Entrance taxiways provide access to the runway ends for departures. Exit taxiways serve to achieve an efficient flow of traffic to reduce runway occupancy time and increase runway capacity. These taxiways are located perpendicular to the runway at ideal aircraft deceleration and exit locations. Taxiways can serve both as an entrance and exit taxiway. Guidance from FAA AC 150/5300-13A is used determine ideal exit taxiway locations.

Right-angle runway entrance taxiways are recommended at all runway ends. The single on-airport entrance taxiway that provides access to Runway 36 end should be reconfigured to

reduce the wide-expanse of pavement, and be perpendicular to the runway at its end. Runways serving single-engine aircraft should have a mid-field exit taxiway approximately 2,000 feet to 2,500 feet from most used the runway end. An additional exit at 4,000 feet is recommended for longer runways serving twin-engine aircraft. All hold positions need to be re-marked to meet RDC standards.

Holding Bays & Bypass Taxiways

Runway departure delays can be caused by aircraft awaiting departure clearance or completing pre-flight checks. Holding bays at busier airports provide space for multiple aircraft away from the taxiway environment outside of the object free area, which improve capacity and overall flow. Bypass taxiways (secondary entrance taxiway) near a runway end to aid in flow and reduce congestion when a single aircraft is holding before departure.

A holding bay is not recommended because runway operations at C47 will not meet the FAA threshold level of 30 operations per hour to fund its construction. A bypass taxiway is recommended on a case-by-case basis if it will enhance operational traffic flow. A bypass taxiway is recommended for Runway 36 because it is currently the only access point to the terminal/hangar area, and its implementation would reduce the risk of head-to-head aircraft conflicts when more than one aircraft is using Runway 18-36.

Pavement Condition & Strength

Airfield pavement needs to be adequately maintained to provide a safe operating surface for the design aircraft fleet. The last pavement evaluation at C47 in October 2015 revealed a PCI rating ranging from 35 on the aircraft parking apron/taxilane to 4 on the main hangar access taxilane. These ratings suggest that the apron is in need of reconstruction. C47 should plan for a pavement reconstruction project to address areas with low PCI ratings and ensure the airport can meet minimum state standards. The current taxiway/taxilane pavement strength is unknown and assumed to be 12,500 pounds for a small aircraft. Reconstructed pavement should be confirmed to meet pavement strength requirements for the design aircraft fleet.

Deficiencies to Taxiway/Taxilane Design Standards

Critical deficiencies to the existing taxiway design standards identified throughout this section are depicted in **Table 4-34**, and shown graphically in **Figure 4-4**.

Table 4-34
Existing Taxiway Design Deficiencies

Standard	Location	Deficiency	Mitigation Options
Taxiway direct access to runway	RWY 36 end	Apron leads directly to runway without a turn	✈ Remove wide expanse of pavement and reconfigure access to runway
Wide expanse of pavement, holding position	RWY 36 end	Wide expanse of pavement not at runway end, holding positions too close	✈ Restripe and reconfigure entrance taxiway and holding positions

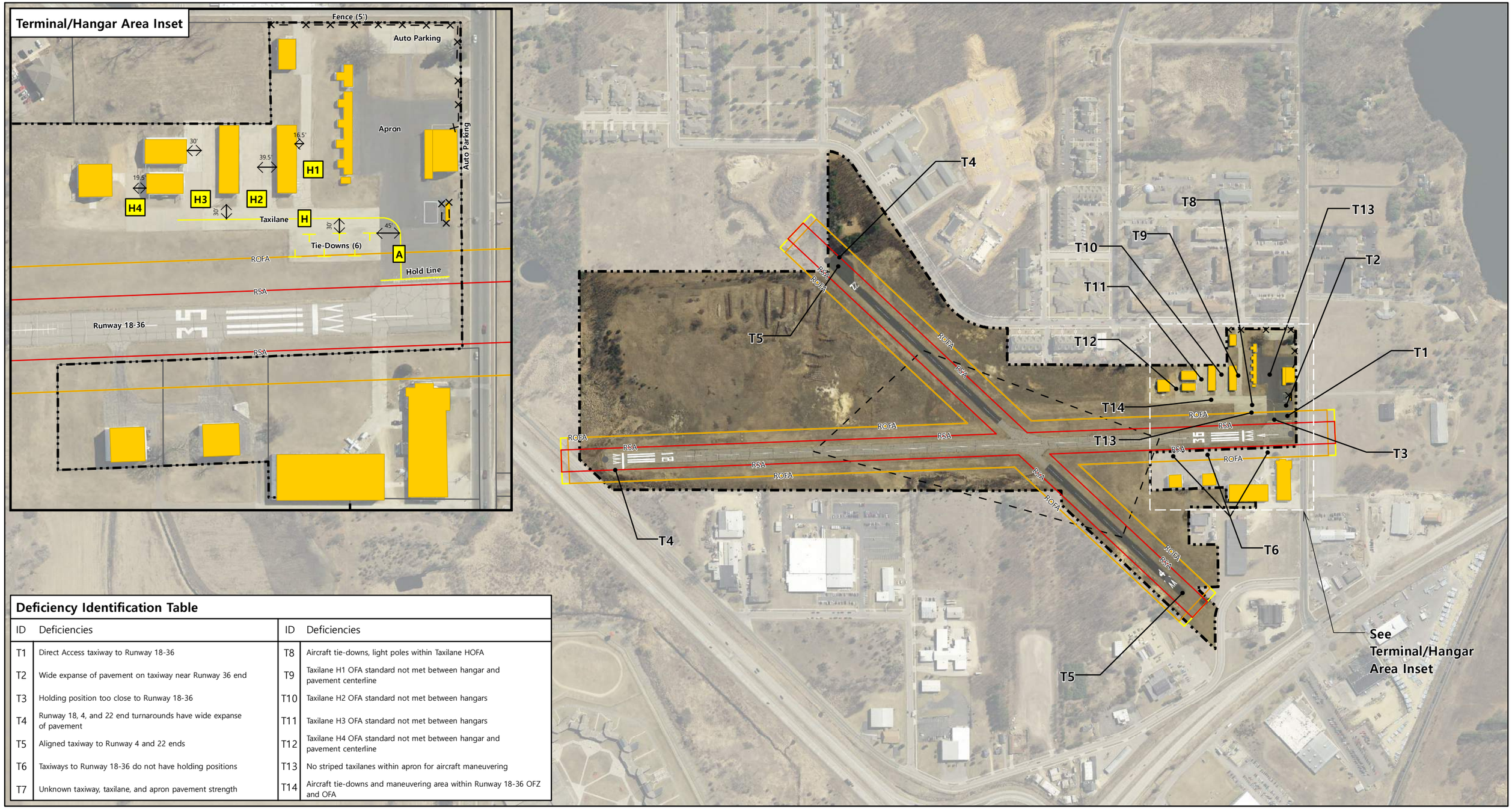
Table 4-34 (cont'd)
Existing Taxiway Design Deficiencies

Standard	Location	Deficiency	Mitigation Options
Runway turnarounds	RWY 18, 4, 22 ends	Turnarounds have wide expanse of pavement and no holding positions	✈ Construct or reconfigure turnarounds during next runway project
Aligned taxiway	RWY 4 and 22 ends	Aligned taxiway to runway end	✈ Restripe pavement and remove during next runway project
Holding positions	Private taxiways west of RWY 18-36	Taxiways do not have holding positions	✈ Stripe holding positions and signs with easement from landowners
Pavement strength	All taxiways and taxilanes	Unknown pavement strength	✈ Confirm pavement strength, reconstruct pavement to for design aircraft
Taxilane object free area (TOFA)	Taxilane H	30' distance to parked aircraft and light poles where 39.5' is required	✈ Reconfigure aircraft parking positions and shift taxilane centerline
Taxilane object free area (TOFA)	Taxilane H1	19.5' distance from assumed centerline to hangar door where 39.5' is required	✈ Widen taxiway and shift centerline
Taxilane object free area (TOFA)	Taxilane H2	75' distance from hangars where 79' is required	✈ Restrict aircraft wingspan to 45'
Taxilane object free area (TOFA)	Taxilane H3	30' distance from assumed centerline to hangar door where 39.5' is required	✈ Shift taxilane centerline and restrict aircraft wingspan to 40'
Taxilane object free area (TOFA)	Taxilane H4	27' distance from assumed centerline to hangar door where 39.5' is required	✈ Widen taxilane, shift centerline, and restrict aircraft wingspan to 44'
Taxilane object free area (TOFA)	Adjacent to Hangars #1, 5, and 6	No striped taxilanes to hangars	✈ Stripe aircraft maneuvering taxilanes compliant with standards

Source: TKDA Analysis (2019)

FIGURE 4-4: DEFICIENCIES TO TAXIWAY/TAXILANE/APRON DESIGN STANDARDS

PORTAGE MUNICIPAL AIRPORT



Deficiency Identification Table

ID	Deficiencies	ID	Deficiencies
T1	Direct Access taxiway to Runway 18-36	T8	Aircraft tie-downs, light poles within Taxilane HOFA
T2	Wide expanse of pavement on taxiway near Runway 36 end	T9	Taxilane H1 OFA standard not met between hangar and pavement centerline
T3	Holding position too close to Runway 18-36	T10	Taxilane H2 OFA standard not met between hangars
T4	Runway 18, 4, and 22 end turnarounds have wide expanse of pavement	T11	Taxilane H3 OFA standard not met between hangars
T5	Aligned taxiway to Runway 4 and 22 ends	T12	Taxilane H4 OFA standard not met between hangar and pavement centerline
T6	Taxiways to Runway 18-36 do not have holding positions	T13	No striped taxilanes within apron for aircraft maneuvering
T7	Unknown taxiway, taxilane, and apron pavement strength	T14	Aircraft tie-downs and maneuvering area within Runway 18-36 OFZ and OFA

- Fence
- Runway Safety Area (RSA)
- Runway Object Free Area (ROFA)
- Runway Obstacle Free Zone (ROFZ)
- Runway Visibility Zone (RVZ)
- Airport Boundary
- Building

N

0 250 500 1,000 Feet

DATA SOURCE: COLUMBIA COUNTY LAND INFORMATION DEPARTMENT

Airfield Data Summary

The following tables provide summary data of the recommended airfield facility requirements through the planning period(s) identified in this Master Plan study.

Table 4-35
Primary Runway Data Table Summary

Design Standard	Planning Activity Level (PAL)		
	PAL 1-2 Needs	PAL 3 Needs	PAL 4 Needs
Runway Dimensions	3,300' x 60'	3,800' x 75'	5,500' x 75'
Runway Shoulder Width	10'	*Same*	*Same*
Runway Blast Pad Dimensions	N/A	N/A	150' x 95'
Runway Classification	Utility	*Same*	Other-Than-Utility
Runway Design Code (RDC)	A/B-I(S)-5000	B-II(S)-5000	B-II-4000
Runway Crosswind Component	10.5 knots	13.0 knots	*Same*
Pavement Surface (Treatment)	Asphalt (None)	*Same*	Asphalt (Grooved)
Pavement Strength (Wheel Type)	12,500 lbs. (SW)	*Same*	20,000 lbs. (SW)
Pavement Classification Number	4	*Same*	8
Runway Markings	Non-Precision	*Same*	*Same*
Runway Lighting Type	MIRL	*Same*	*Same*
Visual and Instrument NAVAIDS	GPS, PAPI-2, REIL	*Same*	GPS, PAPI-4, REIL, MALSF
Runway Safety Area (RSA)*	120' x 240'	150' x 300'	150' x 300'
Runway Object Free Area (OFA)*	400' x 250'	500' x 300'	*Same*
Runway Obstacle Free Zone (OFZ)*	250' x 200'	*Same*	400' x 200'
Inner-Approach OFZ (IA-OFZ)	No	*Same*	1,600' x 400' (50:1)
Approach Runway Protection Zone	250' x 1000' x 450'	250' x 1000' x 450'	1000' x 1700' x 1510'
Departure Runway Protection Zone	250' x 1000' x 450'	250' x 1000' x 450'	*Same*
Approach Visibility Minimums	1-mile	*Same*	¾-mile
14 CFR Part 77 Primary Approach Type	Non-Precision	*Same*	*Same*
14 CFR Part 77 Approach Code (Slope)	A(NP) (20:1), A(NP) (20:1)	*Same*	D (34:1), C (34:1)
Vertically-Guided / Circling Approach	Yes (1 end) / Yes	*Same*	Yes / Yes
FAA Approach Surface Rows (Slope)	4 (20:1), 6 (30:1), 1 end	*Same*	4, 6
FAA Instrument Departure Surf. (Slope)	Yes (40:1)	*Same*	*Same*
Parallel Taxiway / Runway Separation	Partial / 150'	Partial / 240'	Full / 240'
Holding Position	125'	*Same*	200'

Source: FAA AC 150/5300-13A, TKDA Analysis (2019)
**RSA, OFA, OFZ dimensions are width x distance beyond runway*

Table 4-36
Crosswind Runway Data Table Summary

Design Standard	Planning Activity Level (PAL)
	PAL 1-4 Needs
Runway Dimensions	3,300’ x 60’
Runway Shoulder Width	10’
Runway Blast Pad Dimensions	N/A
Runway Classification	Utility
Runway Design Code (RDC)	A/B-I(S)-5000
Runway Crosswind Component	10.5 knots
Pavement Surface (Treatment)	Asphalt (None)
Pavement Strength (Wheel Type)	12,500 lbs. (SW)
Pavement Classification Number	3
Runway Markings	Visual
Runway Lighting Type	MIRL
Visual and Instrument NAVAIDS	None
Runway Safety Area (RSA)*	120’ x 240’
Runway Object Free Area (OFA)*	250’ x 400’
Runway Obstacle Free Zone (OFZ)*	250’ x 200’
Inner-Approach OFZ (IA-OFZ)	No
Approach Runway Protection Zone	250’ x 1000’ x 450’
Departure Runway Protection Zone	250’ x 1000’ x 450’
Approach Visibility Minimums	Visual
14 CFR Part 77 Approach Type	Visual
14 CFR Part 77 Approach Code (Slope)	A(V) (20:1), A(V) (20:1)
Vertically-Guided / Circling Approach	No / Yes
FAA Approach Surface Rows (Slope)	4 (20:1)
FAA Instrument Departure Surf. (Slope)	Yes (40:1)
Parallel Taxiway / Runway Separation	None / 150’
Holding Position	125’

Source: FAA AC 150/5300-13A, TKDA Analysis (2019)
**RSA, OFA, OFZ dimensions are width x distance beyond runway*

GENERAL AVIATION FACILITIES

General Aviation (GA) includes all civil aviation activities except for commercial service. The airport sponsor should continue to provide the necessary facilities to satisfy aviation demand. Based aircraft is expected to grow a total of 12% and operations by 15% through the end of the planning period in the official forecast. Facilities to accommodate unconstrained aviation activity should also be considered in this study to provide flexibility to meet potential demands. GA facilities evaluated in this section include aircraft storage hangars, aircraft parking apron, and terminal building.

Aircraft Storage

Aircraft storage requirements are driven by operational requirements, aircraft size, local climate, and owner preferences. For based aircraft, the harsh winters in the Upper Midwest drive all owners to seek aircraft storage facilities rather than outdoor parking on an aircraft parking apron. Owners prefer to have covered, secure storage for their aircraft with space for other aeronautical facilities including an office or maintenance/storage areas. All based aircraft are currently stored in aircraft storage hangars at C47. Transient aircraft travel to airports for up to a few days at a time. These aircraft typically park on the aircraft apron or seek temporary indoor aircraft storage, especially during adverse weather conditions.

A facility space model was developed to estimate aircraft storage hangar size needs. The model uses the based aircraft fleet mix forecast and estimates a size per aircraft type to determine recommended facility space. The C47 based aircraft forecast estimate another 3 single engine based aircraft through PAL 2 with an additional 12 based aircraft through PAL 4 consisting of 8 single engine, two (2) multi and two (2) turbo jet aircraft.

Based Aircraft

All based aircraft are currently stored in approximately 30,000 square feet of available aircraft storage space. The following assumptions were made about aircraft storage space requirements:

- Single-Engine/Other/Ultralight: 40’ x 30’ storage area (1,575 SF)
- Multi-Engine: 45’ x 35’ storage area (2,000 SF)
- Turbojet: 60’ x 60’ storage area (4,225 SF)
- Helicopter: 40’ x 40’ storage area (2,025 SF)
- Additional 10 percent for general aeronautical storage and maintenance

Using these assumptions with based aircraft forecasts, a projected need for based aircraft storage space is determined. The results are in **Table 4-37**. This projection provides a broad estimate of future space for facility planning purposes. Actual space needs are demand-driven. For example, the presence of an FBO may require additional space for aircraft maintenance.

Table 4-37
Based Aircraft Storage Needs

Category	Base	PAL 1	PAL 2	PAL 3	PAL 4
Aircraft Storage Space (SF)	**43,313**	**44,388**	**47,777**	**67,447**	**75,293**
Capacity/**Deficiency**	**-13,237**	**-14,312**	**-17,701**	**-37,371**	**-45,217**

Source: TKDA Analysis (2019)

The above analysis suggests the existing hangars are undersized for typical based aircraft needs. Re-built hangars should meet these space requirements. Over time, C47 will need an additional 10% of space above the base need by PAL 2, and a total of 74% additional space by the end of PAL 4.

The recommended hangar types to accommodate aircraft storage depend on airport and aircraft owner preferences and financial position. There are two main hangar types:

- T-Hangar: Nested small aircraft storage units within a rectangular building.
- Conventional Hangar: Commonly known as “box” hangars are square/rectangular.

It can be expected the increase in corporate traffic will drive the need for box hangars into the near future. This type of development should be prioritized in the plan. Hangars are constructed with public or private funds as demand warrants. The airport should plan for both hangar development types for the flexibility to react to actual needs.

Transient Aircraft

Transient aircraft storage is utilized on an as-needed basis as aircraft require temporary storage. Aircraft types that require this type of storage are typically larger and more expensive airplanes such as turboprop and turbojet aircraft. Storage timeframes vary but can be for a few hours to several days. Storage space needs are calculated in **Table 4-38** based on accommodate up to the design aircraft.

Table 4-38
Transient Aircraft Storage Needs

Category	Base	PAL 1	PAL 2	PAL 3	PAL 4
Aircraft Storage Space (SF)	**4,050**	**4,050**	**4,050**	**4,050**	**7,625**
Capacity/**Deficiency**	**-450**	**-450**	**-450**	**-450**	**-4,025**

Source: TKDA Analysis (2019)

Transient aircraft storage should accommodate 1 single, 1 multi-engine, and 1 turboprop or turbojet airplane by PAL 4, up to the size of the design aircraft. The existing space is minimally sufficient for a single and multi-engine aircraft. The minimum clear door clearance height is 19 feet for a Hawker 900XP in PAL 4, with a clear door width of 75 feet to serve up to ADG-II mid-size business jets. The recommended space in PAL 4 equates to an 80-foot by 95-foot hangar.

Aircraft Parking Apron

GA aircraft parking space needs to be considered for both transient and based aircraft. With all the based aircraft stored in hangars, the aircraft parking apron is used by transient aircraft needing space for a few minutes to a few days for the loading/unloading of passengers and cargo, as well as maneuvering and fueling.

Size, Configuration & Location

The quantity and size of the aircraft drives the size of the apron. The purpose of this analysis is to determine the triggering point for additional GA apron space using the activity demand forecasts. Assumptions include:

- Use of annual itinerant operations fleet mix based on the aviation forecasts
- Use of Average Day in the Peak Month (ADPM), or 0.806% of annual operations
- 50% of the arriving itinerant aircraft will require apron space during arrival
- Remainder of arriving aircraft will require a transient or based aircraft hangar

The size of the aircraft parking positions drives the dimensions of the parking area. A standard tie-down position accommodates a typical multi-engine small aircraft. Larger aircraft occupy additional space and are accommodated with a nested tie-down configuration. The following factors are used per ACRP Report 113, *Guidebook on General Aviation Facility Planning*:

- Single-Engine/Multi-Engine/Other (e.g. Piper Navajo): 1.00
- Helicopter (e.g. AgustaWestland 109): 1.00
- Large Multi-Engine/Turboprop (e.g. Beechcraft King Air B200): 3.00
- Turbojet (e.g. Cessna Citation Excel): 3.00

The number of total and equivalent aircraft parking positions required is identified in **Table 4-39**.

Table 4-39
Transient Aircraft Parking Requirements

Category	Base	PAL 1	PAL 2	PAL 3	PAL 4
Itinerant Operations	2,200	2,272	2,520	5,714	6,437
ADPM Operations	17.7	18.3	20.3	46.1	51.9
ADPM Arrivals	8.9	9.2	10.2	23.0	26.0
Total Parked Aircraft	4.5	4.6	5.1	11.5	13.0
Equivalent Small Aircraft	**4.8 (5)**	**4.9 (5)**	**5.5 (6)**	**15.9 (16)**	**18.0 (18)**
Capacity/**Deficiency**	**1.2 (1)**	**1.1 (1)**	**0.5 (0)**	**-9.9 (10)**	**-12.0 (12)**

Source: TKDA Analysis (2019); ADPM = Average Day Peak Month

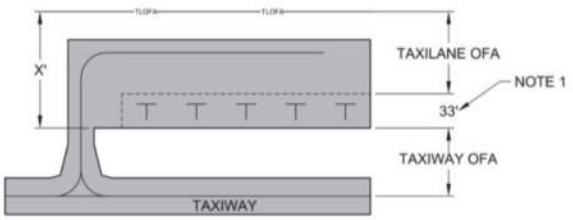
An analysis of transient aircraft parking needs at C47 shows that the airport essentially meets parked aircraft needs today thru PAL 2. However as future aviation demand grows, there needs to be additional parking positions with the ability to serve ADG-II aircraft in PAL 3 and beyond.

Wisconsin SASP guidelines for aircraft parking needs address aircraft tie downs requirements. The SASP recommends tie-downs for 25% of the average daily transient aircraft. This equates to three (3) tie-downs in base timeframe, increasing to seven (7) by PAL 4.

ACRP Report 113 was referenced to determine apron space needs. Apron size should accommodate both the required aircraft parking positions and maneuvering standards. Aircraft maneuvering standards at C47 should incorporate safety setbacks for ADG-I wingspans through PAL 2 planning period, and ADG-II aircraft in PAL 3/4. The existing apron does not meet maneuvering and parking standards for the existing ADG-I design aircraft, and does not provide provisions for any transient ADG-II aircraft that occasionally operate at C47.

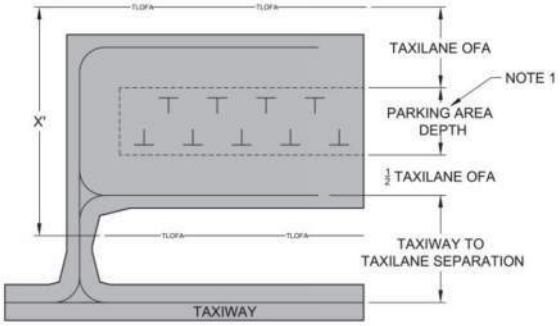
C47 can benefit from a redesigned apron that accommodates ADG-I aircraft in a single lane configuration that maximizes the use the existing available depth. This leaves adequate space for GA facilities and provides sufficient parking areas outside of the required taxilane object free areas. This configuration serves the PAL 1 and 2 needs.

Single-Taxilane Apron Configuration (ACRP Report 113)



The preferred apron design in PAL 3 and 4 for ADG-II aircraft is a dual-taxilane configuration to support taxi-in and taxi-out operations. This "nested" aircraft parking configuration serves ADG-I aircraft but also provide sufficient depth to serve a larger ADG-II aircraft.

Dual-Taxilane Apron Configuration (ACRP Report 113)



Individual ADG-I parking positions should be 33 feet deep and 41 feet wide to accommodate up to a Piper PA-31 Navajo aircraft (equivalent aircraft). This results in a total parking depth of 72 feet in a dual-taxilane nested parking configuration to meet FAA standards. This depth is flexible to accommodate ADG-II aircraft as large as a mid-size business jet (e.g. Cessna Citation X).

The transient apron size is calculated using the size and number of aircraft, as well as the design standards for maneuvering taxilanes surrounding the parking positions. The minimum transient apron size needs for the design aircraft are calculated in **Table 4-40**.

Table 4-40
Transient Apron Size Requirements

Category	Base	PAL 1	PAL 2	PAL 3	PAL 4
Apron Taxilane Design	Single	Single	Single	Dual	Dual
Equivalent Tie-Downs	5	5	6	16	18
Apron Depth	112	112	112	262	262
Apron Length	297	297	348	573.5	624.5
Total Apron Area (SY)	**3,696**	**3,696**	**4,331**	**16,695**	**18,180**
Capacity/**Deficiency**	1,904	1,904	1,269	**-11,095**	**-12,580**

Source: TKDA Analysis (2019)

The analysis shows C47 has total apron space to meet the needs thru PAL 2, however the space needs to be reconfigured to meet aircraft maneuvering needs. In the future, C47 will need additional total apron space to meet aircraft parking needs. The airport requires three times the apron space of total by PAL 3 to accommodate ADG-II design aircraft maneuvering and total parked aircraft.

Existing aircraft parking positions need to be relocated outside of the Runway 18-36 and adjacent taxilane Obstacle Free Area (OFA). Considerations need to be made to provide adequate airspace clearance over the tails of parked aircraft, as well as providing aircraft

maneuvering space to and from the fuel facility. A designated route and transient parking position for the occasional use of larger ADG-II aircraft should also be considered. It is recommended that the apron be reconfigured during the next project to meet apron capacity and safely needs.

Pavement Condition & Strength

Airfield pavement needs to be adequately maintained to provide a safe operating surface for the design aircraft fleet. The main apron at C47 has a 2015 PCI rating ranging from 61 on the aircraft parking apron, to 36 near the main hangar, and 29 near the fuel facility. The pavement would be eligible for reconstruction in the near-term as the PCI drops below 55 in all areas after the year 2020. The apron should be designed to accommodate a fleet mix of aircraft types expected to use C47, which means regular use of aircraft up to 12,500 pounds single-wheel through PAL 2, and use of up to 20,000 pound single-wheel aircraft in PAL 3 and beyond.

GA Terminal/Administration Building

The size of the GA terminal/administration building is calculated based on the number of passengers and types of services offered. Although additional facilities can be provided, generally a GA terminal building should include the following services:

- Pilot/Passenger Waiting Area
- Restrooms
- Vending
- Pilots Lounge/Flight Planning
- Mechanical room
- Storage Room
- Circulation

A GA Terminal/Administration building with a phone and restrooms is a facility objective for a Medium GA airport in Wisconsin. The existing terminal building currently has restroom but does not provide the recommended public phone access. Not all building areas noted above are eligible for FAA funding. An FAA funding eligibility determination is completed when development is imminent. Additional areas may be eligible for State funding participation.

The GA terminal building should be located adjacent to the transient aircraft parking apron with good visibility to the airfield. It should also be close to the automobile parking and pick up/drop off areas. The location of the existing building suits the needs of the airport.

The estimated planning-level size of the GA terminal building is based on peak hour total airport operations, 2.5 passengers per peak hour operation and 100 square feet of space per passenger as identified in ACRP Report 113. These figures provide an estimate of the number of passengers to arrive, depart and generally flow through the terminal. The space calculations are in **Table 4-41**.

Table 4-41
GA Terminal/Administration Building Size Requirements

Category	Base	PAL 1	PAL 2	PAL 3	PAL 4
Peak Hour Operations	4.7	4.9	5.4	8.8	9.9
Passenger per Operation	2.5	2.5	2.5	2.5	2.5
Number of Passengers	11.7	12.1	13.5	22.1	24.8
Space Factor per Person	100	100	100	125	150
Total Building Size (SF)	**1,175**	**1,215**	**1,351**	**2,762**	**3,727**
Capacity/**Deficiency**	**25**	**-15**	**-151**	**-1,562**	**-2,527**

Source: TKDA Analysis (2019)

The existing 1,200 square foot GA terminal building provides slightly more than the calculated space needed to accommodate existing demand. As demand increases, so does the size of the GA terminal building to accommodate upwards of 25 people during the peak hour. Due to the condition of the existing GA terminal at C47, the airport should consider replacing the building in the future.

Passenger Convenience

Passenger convenience elements for the GA pilots and passengers were reviewed. The proximity of the aircraft apron and automobile parking to the GA terminal building is sufficient. The building is within a 300-foot walk from the automobile parking lot and minimizes outdoor exposure time. Aeronautical support services are available from the City of Portage via self-service or the contract Airport Manager.

GA Facility Deficiencies

Critical deficiencies to the existing GA facilities identified throughout this section are depicted in **Table 4-42**.

Table 4-42
Existing GA Facility Deficiencies

Facility	Location	Deficiency	Mitigation Options
Aircraft tie-downs	Northeast of Hangar #1	Tie-downs and maneuvering within RWY 18-36 OFZ and OFA, tie-downs in TOFA	✈ Reconfigure tie-down positions
Apron taxilanes	Main Apron	No taxilanes for aircraft maneuvering	✈ Establish taxilane(s) to maneuver to hangars, identify object free areas

Source: TKDA Analysis (2019)

SUPPORT FACILITIES

Support facilities are necessary for the airport owner to maintain a safe and efficiently run airport supporting airport operations and the travelling public.

Airport Administration

C47 is owned and operated by the City of Portage. The airport manager has an office in the GA terminal building. Other airport administration such as Airport Commission meetings is conducted at City Hall. This arrangement is expected to continue and be sufficient to meet existing and future needs.

Fixed-Base Operators

Fixed-Base Operators (FBOs) or Specialized Aviation Service Operators (SASOs) provide aeronautical services to the public. FBOs and SASOs are typically private businesses. FBOs provide multiple aeronautical services whereas a SASO is typically a single service. Example aeronautical services that may be provided at a GA airport include:

- Aircraft parking/line services
- Aircraft fueling
- Overnight hangar storage
- Flight instruction
- Aircraft maintenance
- Aircraft rental
- Air charter
- Rental car/courtesy car
- Crew rest area

C47 currently has facilities for a limited service FBO on-site. Services are provided in the main hangar (Hangar #1), owned by the City of Portage and connected to the GA terminal building. This space is used for transient aircraft storage and occasional aircraft maintenance. The FBO meets the minimum requirements required by the State. Future GA development should consider separate commercial space for potential new FBO(s).

FAA encourages the establishment of minimum standards for commercial aeronautical activities to make these services available on fair and reasonable terms to the flying public without unjust discrimination.

Snow Removal Equipment

Currently the City of Portage utilizes city equipment for snow/ice removal of the airfield areas at C47. As the airport accommodate more corporate operations in the future, it is recommended the airport sponsor acquire dedicated airport snow removal equipment for timelier snow/ice control. The airport is eligible for FAA funding for one (1) carrier vehicle, one (1) rotary plow, two (2) displacement plows, one (1) sweeper, and one (1) hopper spreader to remove snow from priority removal areas in 4-6 hours. Equipment should be stored indoors at the airport, as discussed in the following section.

Maintenance & Equipment Storage

Airports that own maintenance equipment should consider a dedicated mechanical equipment storage (MES) or snow removal equipment (SRE) building to protect the investment in equipment assets. Currently there is no airport-owned large equipment, however airport-owned equipment should be planned in the future. As such, there is no MES or SRE building currently as C47.

Snow and ice control equipment typically used includes a carrier vehicle (i.e. dump truck or tractor), snow plows, spreaders, sweepers, and blowers. Many of this equipment is eligible for state or federal funding. For non-winter operations, grass cutting is accomplished with a carrier vehicle (i.e. tractor) and mower attachment. Smaller equipment is also used to facilitate snow removal or grass cutting. Equipment should be stored in a dedicated heated building for timely access and protection from the weather. North facing building doors should be avoided if possible to minimize prolonged snow and ice accumulation.

Total general MES/SRE space needs are determined by type of equipment planned to be stored. Per ACRP Report 113 and other industry standards, the following space assumptions are made to estimate the size of an MES/SRE building:

- 2 equipment bays (carrier vehicle w/ plow + equipment/material storage)
- 1,200 SF for each equipment storage bay (48' deep x 25' wide)
- 10% additional space for ingress/egress and mechanical space

The results of the analysis are in **Table 4-43**.

Table 4-43
Mechanical Equipment Storage Building Size Requirements

Category	Base	PAL 1	PAL 2	PAL 3	PAL 4
Equipment Storage Bays	2	2	2	2	2
Equipment Bay Size	2,400	2,400	2,400	2,400	2,400
Additional Space	240	240	240	240	240
Total Building Size (SF)	**2,640**	**2,640**	**2,640**	**2,640**	**2,640**
Capacity/**Deficiency**	**-2,490**	**-2,490**	**-2,490**	**-2,490**	**-2,490**

Source: TKDA Analysis (2019)

C47 does not have a maintenance and equipment storage building at the airport. The 150 square foot structure that is used to store basic equipment does meet the requirements recommended by the state. A dedicated storage building is needed as the airport acquires additional equipment with state or federal funds. An MES/SRE building of approximately 55-feet long and 48-feet deep should be planned at C47 to store airport equipment into the future. It should be noted that not all space areas described in this section are eligible for FAA funding.

Fueling Facilities

Fuel Storage

The City of Portage owns and operates the airport fueling facility, storing and dispensing 100LL Avgas and UL94 Swift aviation fuel. Fuel storage needs are driven by having sufficient supply to

meet demand and by the size of the fuel delivery truck. An ideal fuel farm at a small GA airport should provide a tank capacity for a peak 2-week supply of fuel, and accommodate a full (8,000 gallons) or half tanker load (4,000 gallons) to minimize the cost of deliveries.

The fuel consumption rate was considered using C47 fuel sales data from the past two years. Airports should have sufficient fuel for a peak 2-week supply. A simple fuel use projection is identified below based on peak month usage (42% of annual), and historical usage ratios of approximately 2.9 gallons per piston operation. Jet-A fuel for turbine operations is estimated at 5.0 gallons per operation with 20% peak month usage.

The fuel storage requirement calculation results are shown in **Table 4-44**.

Table 4-44
Fuel Storage Requirements

Category	Base	PAL 1	PAL 2	PAL 3	PAL 4
AVGAS Fuel Storage					
Annual Piston Operations	3,490	3,609	4,014	8,352	9,366
Annual AVGAS Gallons	9,950	10,289	11,444	23,811	26,700
Peak 2-Week Demand	1,929	1,995	2,218	4,616	5,176
Recommended Tank Size	**5,000**	**5,000**	**5,000**	**10,000**	**10,000**
Capacity/**Deficiency**	**-3,000**	**-3,000**	**-3,000**	**-8,000**	**-8,000**
Jet-A Fuel Storage					
Annual Turbine Operations	210	217	240	1,388	1,589
Annual Jet-A Gallons	1,049	1,084	1,202	6,940	7,946
Peak 2-Week Demand	203	210	233	1,345	1,540
Recommended Tank Size	**0**	**0**	**0**	**5,000**	**5,000**
Capacity/**Deficiency**	0	0	0	**-5,000**	**-5,000**

Source: TKDA Analysis (2019)

The forecast shows a steady growth in AVGAS (or equivalent fuel) demand at C47. The existing two 1,000-gallon fuel tanks for piston aircraft is not adequate. A total of 5,000 gallons of AVGAS fuel storage is recommended through PAL 2, then a 10,000-gallon tank is recommended as the 2-week demand approaches tank capacity plus reserves. A Jet-A fuel facility with 5,000-gallon storage capacity is recommended by PAL 3 as the design aircraft transitions to a turbine-powered aircraft.

Fuel Dispensing & Location

C47 offers 24-hour self-service fuel pumps for AVGAS. This design is sufficient for the planning period. No fuel trucks are needed for an airport this size. A co-located facility for Jet-A fueling is recommended when this facility is installed.

The fuel facility location should be compatible with future apron configurations and not be an obstruction to any runway or taxiway design standard. To ensure safe and efficient operations the fuel facility should allow for aircraft parked for fueling operations to be outside of the apron taxilane OFA.

Fencing, Security & Wildlife

Security is an important consideration when operating a safe airport. Transportation Security Administration (TSA) published a Security Guidelines for GA Airport Operators and Users document in July 2017 providing recommended security guidelines. The National Safe Skies Alliance also published Recommended Security Guidelines for Airport Planning, Design and Construction in 2017. Suggested security enhancements include but are not limited to signage, lighting, fencing, surveillance, documented security procedures, positive user identification, aircraft security, and airport watch program. With the exception of commercial passenger/cargo and federal facilities, the airport owner is responsible for airport security.

The first line of security protection infrastructure is fencing. Full perimeter fencing is only an FAA requirement for FAR Part 139 certificated airports. Fencing, even partial fencing at sensitive areas, helps deter or prevent unauthorized persons from entering the airfield. A 5-foot fence is recommended in the hangar/terminal area to replace the existing partial 4-foot fence. An automatic locking gate should be installed at main access points, and manual locked gates should be installed at other locations. Lighting should also be installed at access points and aircraft parking areas.

Controlling wildlife on or near the airport helps mitigate existing and prevent the creation of potential new hazards to aircraft. FAA recommends all airports conduct a Wildlife Hazard Site Visit (WHSV) with a qualified airport wildlife biologist to identify potentially hazardous wildlife habitat on and around the airport. If applicable, the airport can then prepare a Wildlife Hazard Management Plan (WHMP) to take steps to help increase safety of the airfield. Management, mitigation, and infrastructure recommendations will be made in the WHMP. None of these studies have been completed at C47. A common infrastructure recommendation is to install a 10-foot high wildlife fence with a barbed-wire top and buried skirt around the perimeter of the airport to deter access by potentially hazardous mammals.

Utilities

The airport is currently connected to public water and sanitary sewer utilities, with electric power service provided by Alliant Energy. The services provided to the airport is adequate and the airport should plan to maintain its existing utility services. Sufficient space (setbacks) should be allocated in hangar development areas for private utilities.

Additionally, the sanitary city lift station located on the west side of the airport is located over 200 feet from Runway 18/36 and should not be affected by a runway design to meet the official forecast demand. Provisions should also be made to protect existing water main, storm sewer, and sanitary sewer utilities that traverse through airport property.

LANDSIDE FACILITIES

Ground Access, Circulation & Parking

Ground Access & Circulation

The overall design objective is to provide ground vehicles with access to and from the terminal building and hangar facilities using dedicated access roads. To achieve this, access points should be secured to the airside facilities and hangars to reduce undesired automobile access. The number of hangar access points should be limited to reduce the possibility of vehicle/aircraft incidents, which in turn improves safety. Fuel delivery trucks ideally should have access to tanks without entering airside operations areas. Access roads should be paved close to airfield access points to reduce the likelihood of foreign object debris (FOD) on the airside areas where it may become a hazard to aircraft.

Public airport access is provided via a paved access road from Silver Lake Drive. The pavement should be of sufficient strength to accommodate a plow truck, fuel tanker and emergency equipment. A secondary access is provided via Airport Road that leads to the hangar area. These are sufficient to serve the existing hangar area. Any new development should have dedicated access roads to minimize vehicle/pedestrian deviations.

There is no full internal perimeter/service roadway to access airport facilities. This is typical for lower activity airports such as C47. Two field roads exist that provide access to the east and west portions of the airfield. All access points should be secured.

Automobile Parking

Automobile parking at GA airports should accommodate landside access needed to serve aeronautical facilities. Facilities requiring automobile parking include the GA terminal building, aircraft storage hangars, administration, maintenance equipment storage buildings, and FBOs. Vehicles should be discouraged from parking in airside areas. Both public and exclusive-use parking lots may be needed to serve all needs. Automobile parking lots should be sized for the demand and have appropriate number of handicapped accessible spaces. Circulation patterns and pick-up and drop-off points should also be considered. Lighting is recommended for night-time use and security. Pavement markings are recommended to maximize capacity and promote adequate pick-up and drop-off circulation in front of the terminal for corporate operations.

Tenants utilizing hangars and the GA terminal building at C47 park in the paved main parking lot. The parking lot is in an efficient area being within a few hundred feet of the hangar area and GA terminal building. It is recommend that the parking lot remain in this centralized area. A secondary automobile parking lot is available and allows tenants to park near the main hangar without requiring vehicles to drive on active airfield pavements. This will help prevent vehicle/pedestrian deviations.

Total automobile parking stalls needed were calculated. The demand model, based on the methodology from ACRP Report 113 with revisions, reviews automobile parking space demand

based on hangar space, FBO facilities, GA terminal passengers, and support facilities per ACRP Report 113. The SASP Service Objective is also calculated which is based on 0.5 parking spaces per based aircraft. **Table 4-45** shows these results.

Table 4-45
Automobile Parking Requirements

Category	Base	PAL 1	PAL 2	PAL 3	PAL 4
Public Parking Needs	21	21	23	35	38
FBO Parking Needs	0	0	0	5	5
Total Parking Needs	**21**	**21**	**23**	**40**	**43**
Capacity/**Deficiency**	**3**	**2**	**0**	**-17**	**-20**
SASP Service Objective	13	13	14	19	20

Source: TKDA Analysis (2019)

The main parking lot can accommodate approximately 20 parking stall positions if striped. There are an additional three (3) stalls near the main hangar. Calculated parking needs shows that existing needs thru PAL 2 are met. Additional parking stalls will be needed as airport activity grows and if a private FBO is established. The airport should plan for additional parking at the PAL 3 planning period.

Through-The-Fence Operations

There are currently at least two (2) aircraft storage hangars currently located off-airport property to the west of Runway 18-36 with direct access to the airfield. This activity is known as Through-The-Fence (TTF) operations. There is no known access agreement. TTF operations are not supported by FAA and WBOA. TTF arrangements may be contrary to FAA grant assurances. It the recommended the airport sponsor acquire the land underlying the hangars and lease the space for aeronautical use. Any existing TTF access points must be noted on the ALP.

Public Transportation

There are no public transportation options to/from the Portage Municipal Airport. A courtesy car is recommend to provide transportation into town for users flying into the airport. Rideshare services such as Uber and Lyft can also be used to supplement transportation needs at the airport.

SUMMARY

This chapter identifies safety, capacity and development needs for the Portage Municipal Airport based on FAA and state standards at forecasted activity levels. These recommendations provide the basis for formulating development alternatives in **Alternatives Analysis** chapter to adequately address recommended improvements. The following summarizes the facility recommendations:

Airside

- ✈ Correct existing FAA runway design standard deficiencies including but not limited to the non-compliant RSA, ROFA, ROFZ, and RVZ for Runway 18-36 and 4-22. Meet future design standards for the critical design aircraft.

- Acquire land rights to have adequate control over lands to meet FAA design standards and control land uses within the FAA RPZ. Mitigate incompatible land uses per FAA recommendations. Implement a Height Limitation Zoning Ordinance.
- Maintain a primary runway dimensions of 3,300' x 60' through PAL 2, and plan for 3,800' x 75' in PAL 3, and 5,500' x 75' in PAL 4. Provide a pavement strength for aircraft over 12,500 pounds in PAL 4.
- Remove or mitigate airspace obstructions to all existing runway approaches to meet FAA approach standards, at a minimum.
- Maintain existing circling approaches to Runway 4-22, if possible. Establish a non-precision approach to Runway 36, if feasible. Implement vertically-guided approaches. Plan for a ¾-mile primary runway end approach by PAL 4.
- Upgrade primary runway airfield lighting to include MIRL, PAPI, and REILs. Install an Approach Lighting System in PAL 4 to support the ¾-mile approach. Install mandatory airfield guidance signs at holding positions.
- Correct FAA taxiway design standard deficiencies including providing a compliant TOFA, remove aligned taxiways, and correct the Runway 36 entrance taxiway. Plan for a partial parallel taxiway to the primary runway through PAL 3, with a full-length parallel taxiway by PAL 4.

General Aviation

- Plan to provide 10% more total aircraft storage space (e.g. conventional and T-hangars) than existing by PAL 2, and 74% by PAL 4 to meet forecasted needs. Expand transient aircraft storage by PAL 3.
- Reconfigure the existing apron to meet FAA design standards. Provide for up to 225% additional apron space to meet future total parked aircraft needs through PAL 4.
- Plan to replace existing GA terminal building with new expanded stand-along building.

Support

- Provide expandable space for a stand-alone FBO facility.
- Acquire airport-owned SRE for timely snow/ice control. Construct a 55' x 48' storage building to protect equipment.
- Increase total piston aircraft fuel storage capacity meet demand and deliver needs, and add Jet-A fueling in PAL 3.
- Install terminal/hangar area fencing, and perimeter fencing for wildlife control as needed.

Landside

- Expand automobile parking lot by PAL 3 to meet growing automobile parking needs.
- Provide a courtesy car for pilot/passenger transportation.
- Acquire land to remove existing TTF operation.

CHAPTER FIVE

ALTERNATIVES ANALYSIS

PORTAGE MUNICIPAL AIRPORT

AIRPORT MASTER PLAN – PHASE 1

TKDA

ALTERNATIVES ANALYSIS

INTRODUCTION

This chapter of the Airport Master Plan discusses airport development alternatives considered in the planning process for the Portage Municipal Airport (C47). The objective of this chapter is to document the recommended airport development that meets the needs of airport users, as well as the strategic vision of the City of Portage.

Development concepts evaluated for this study are formulated using demand factors and facility requirements identified in previous study chapters. Alternatives are selected from the concepts and analyzed for impacts. Evaluation criteria is used to analyze potential impacts of each alternative to aid the airport in selecting a preferred alternative(s).

Alternatives presented in this chapter are formulated based on a certain Planning Activity Level (PAL). The approach allows the airport owner to understand the community impacts of accommodating demand scenarios.

Primary alternatives are the main functional facility elements analyzed first. Primary elements in the study include Runway 18-36 and the existing terminal/hangar area. Once the primary alternative(s) are selected, refinements are made and any secondary alternatives are evaluated.

A preferred development strategy based on the selected alternative(s) is summarized after the analysis is completed. This preliminary plan provides a guideline for implementation based on identified needs and priorities. The recommended plan to implement the proposed development is outlined in **Chapter 6: Implementation Plans**.

OVERVIEW

The recommended airport development identified in this chapter includes:

- Explore the feasibility of a new airport site. The existing airport site cannot practically accommodate all existing (PAL 2) or potential future (PAL 3 or 4) aviation demand.
- If the airport site were to remain, the recommended development includes:
  - Shift Runway 18 and 36 ends by 240 feet each to meet FAA design standards up to small twin-engine aircraft (ARC A-I / B-I).
  - Install 700-foot displaced threshold to Runway 36 approach, and 140-foot displaced threshold to Runway 18 approach to clear man-made obstructions.
  - Decommission circling instrument approach to Runway 36.
  - Acquire land as needed for land use compatibility. Remove natural growth airspace obstructions.
  - Maintain Runway 4-22 at the option of the airport sponsor. Reduce crosswind Runway 4-22 length to 2,270 feet to meet FAA design standards.
  - Reconfigure the aircraft parking apron to meet FAA runway design standards.
  - Relocate the existing fuel facility to meet RPZ compatible land use guidelines.
  - Construct new entrance taxiway to Runway 36. Construct bypass taxiway to eliminate single aircraft access to the runway and terminal/hangar area.

- Acquire land underlying aircraft storage hangars to the west of Runway 18-36 to remove through-the-fence access. Construct new hangar access taxiway.
- Preserve the ability for the airport sponsor to accommodate future hangar re-development and serve hangar development to the north.

BACKGROUND

The overall guiding principle is to plan an airport facility that safely and efficiently serves aviation users. Airport development at C47 is needed to meet design standards and facility needs on the existing site while considering best planning tenets, environmental, financial factors.

The priority near-term (1-5 years) need is to implement safety improvements to allow C47 to meet FAA design standards for the existing critical design aircraft. Objectives include but are not limited to:

1. Clear obstructions from the FAA approach surface for each runway end
2. Meet FAA runway design standards (e.g. Runway Safety Area / Obstacle Free Zone)
3. Provide acceptable compatible land use within the FAA Runway Protection Zone
4. Improve taxiway geometry to facilitate the safety and efficient movement of aircraft

Each functional area of the airport has specific needs and constraints that affect the formulation of realistic, implementable development options. **Table 5-1** identifies the key facility needs for each Planning Activity Level (PAL). More detail can be found in **Chapter 4: Facility Requirements**.

Table 5-1
C47 Facility Needs and Assumptions

Facility Element	PAL 1 - PAL 2	PAL 3	PAL 4
Overall			
Forecast Type	Constrained	Unconstrained	Unconstrained
Forecast Year(s)	2018-2038	2023	2038
Primary Runway and Taxiway			
FAA Design Standards	A-I/B-I, Small Aircraft	B-II, Small Aircraft	B-II, Large Aircraft
Length and Width	3,300’ x 60’	3,800’ x 75’	5,500’ x 75’
Approach Type	Non-Precision	Non-Precision	Non-Precision
Visibility Minimums	1 mile	1 mile	3/4 mile
Taxiway Type	Partial Parallel	Partial Parallel	Full-Parallel
Crosswind Runway			
FAA Design Standards	B-I, Small Aircraft	B-I, Small Aircraft	B-I, Small Aircraft
Length and Width	2,500’ x 60’	2,500’ x 60’	2,500’ x 60’
Approach Type	Visual	Visual	Visual
Terminal and Hangar Area			
Aircraft Tie-Downs	6 (PAL 2)	16	18
Based Aircraft Storage	47,800 SF (PAL 2)	67,500 SF	75,300 SF
Automobile Parking	23 (PAL 2)	40	43

Source: TKDA Analysis (2020)

EVALUATION PROCESS

Steps

A wide range of alternatives are evaluated to determine the best solution for the airport to meet facility needs. In many cases, the process is iterative to react to new information and input. FAA Advisory Circular (AC) 150/5070-6B, Airport Master Plans identifies an alternatives analysis process to progressively screen alternatives to arrive at a recommended development plan. The process includes these steps:

1. **Identify** the functional airport elements to be analyzed as primary and secondary elements. Primary elements require large land areas whereas secondary elements can fill-in around primary elements. Identify a comprehensive set of primary (then secondary) alternative concepts that appear to meet basic objectives such as technical feasibility, economic and fiscal soundness, and aeronautical utility.

2. **Evaluate** each alternative in an initial screening process to determine the ability for each to meet basic objectives. Utilize subjective criteria to analyze and document any alternatives that are dismissed. Refine the remaining short-list of alternatives as needed and perform a more detailed quantitative impact analysis. Criteria used to evaluate alternatives include operational performance, best planning tenets, environmental and fiscal factors. No quantitative weighting factors are used for evaluation as they could skew the results.

3. **Select** preferred alternative(s) that best meet the needs of the airport based on the benefits and impacts. The primary alternative is selected first, which becomes the basis for the secondary alternative evaluation. Both the primary and secondary preferred alternatives are combined into a single recommended alternative with refinements made as needed.

This report discusses the alternatives evaluation process for C47 and consists of three sections; Airfield Configuration, Terminal and Hangar Area Configuration, and Other Facilities. The sections address the needs that are identified in the facility requirements analysis. The features and impacts of each alternative is analyzed allowing for comparisons to be made. A recommended alternative is then identified based on the analysis. All costs are planning-level cost estimates in 2019 dollars.

Review and Approval

The alternatives evaluation process is the most collaborative portion of the master plan study. The alternatives were reviewed and refined using feedback collected from the Wisconsin Bureau of Aeronautics (WBOA), Federal Aviation Administration (FAA), Technical Advisory Committee (TAC), and public-at-large.

The initial alternatives analysis was shared with the TAC in November 2019. An agency meeting with FAA and WBOA was held in January 2020. Both meetings provided opportunities to collect feedback to aid in refining the alternatives.

Subsequent meetings were delayed due to the ongoing COVID-19 pandemic. A public open house was held in September 2020 to collect input from the public at large. The TAC met in October 2020 to identify the safety & compliance alternative as the preferred option. The Airport Commission recommended this option to the Common Council in November 2020.

The Common Council considered the airport master plan at their January 28, 2021 regular meeting. A public information meeting was held prior to the Council meeting to share information and answer questions. The Council ultimately recommended proceeding with a new airport site selection study, while making required maintenance and safety improvements to the existing airport site. The majority of the Council concluded it would be worthwhile to invest in a new airport site rather than make significant investments in the existing airport that would reduce its operational capabilities.

EVALUATION CRITERIA

Evaluation criteria determines the relative strength and weaknesses of the alternatives, and should be examined in any alternatives evaluation. Airport-specific criteria has been developed using FAA guidance and local considerations. The alternative evaluation criteria utilized for this study is as follows:

Operational Performance

This factor evaluates how well the airport operates as a functional system. These generally include:

- **Capacity** to meet forecasted activity demands within and beyond the planning horizon
- **Capability** to meet FAA standards to safely accommodate the critical design aircraft
- **Efficiency** to accommodate alternative elements as a combined airport system

Specific operational performance factors considered at C47 include:

- Capacity to meet overall needs for each PAL period
- Capacity to meet runway length requirements
- Capability to meet FAA airport design standards for the critical design aircraft
- Capability to clear FAR Part 77 Primary Surface and FAA approach surface airspace
- Capability to meet FAA RPZ land use compatibility standards
- Capability to accommodate recommended instrument approaches
- Capability to accommodate recommended taxiway configuration
- Capability to meet FAA recommended wind coverage
- Capacity to meet terminal/hangar area facility needs

Best Planning Tenets and Other Factors

This factor involves determining the relative strengths and weaknesses of the alternatives, generally including:

- Conformance to industry best practices for safety and security
- Conforms to the intent of FAA design standards and other guidelines
- Provides for the highest and best on- and off-airport land use

- Allows for forecast growth and growth beyond the planning horizon
- Provides flexibility to react to unforeseen changes
- Conforms to the airport sponsor's strategic vision
- Conforms to appropriate local, regional and state transportation and other plans
- Technically feasible, constructible, and implementable
- Socially and politically feasible
- Satisfies airport user needs

Other specific planning tenets and other factors considered at C47 include:

- Impacts to American Transmission Company (ATC) transmission lines
- Triggers residential, business, or other tenant relocations
- Results in public roadway closures
- Overall implementation practicality
- Impacts to existing airport infrastructure (i.e. aircraft parking, FBO, fuel facility)

Environmental Factors

The potential effects of the alternatives upon the natural and built environment is an important consideration. These factors are evaluated early in the process to determine whether alternatives could comply with the National Environmental Policy Act (NEPA), or if additional alternatives need to be considered. The C47 primary runway alternatives have the potential to result in impacts to the following NEPA categories:

- Land Use
  - Land acquisition
- Socioeconomic
  - Residential tenant relocations
  - Commercial/Industrial tenant relocations
  - Roadway system impacts
- Wetland Disturbance

Fiscal Factors

A fiscal analysis is necessary to determine if the alternative fits within the financial resources of the airport, as well as potential federal and state funding partners. Preparing planning-level development cost estimates is an effective way to compare alternatives. Evaluating the ability for the airport sponsor to finance each alternative is also important as it will provide an indication of the feasibility of proposed development. Fiscal factors to be reviewed in this study include:

- Total planning-level project cost
- Ability to receive FAA and/or State funding
- Total estimated local funding share
- Ability to fund Local Share

AIRFIELD CONFIGURATION

The alternatives analysis for the airfield configuration reviews primary runway/taxiway configuration options to meet forecasted facility requirements for various PALs on the existing airport site.

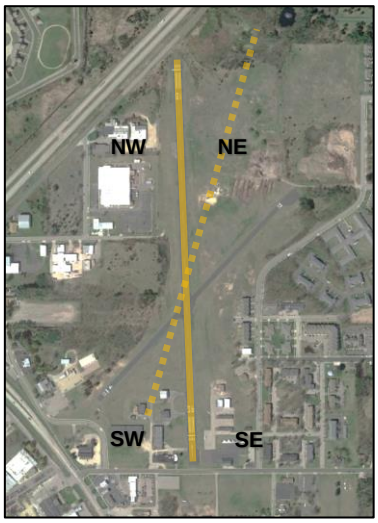
The airfield configuration analysis was completed at a higher-level to compare key impacts of each alternative. This method was selected to help the airport sponsor identify an overall development direction to explore for the existing airport site. More detailed impact review would be completed once an initial preferred airfield configuration options was selected.

Options Considered and Dismissed

Several runway extension and realignment options were considered as part of this analysis. The following concepts were reviewed but did not proceed ahead with further analysis due to impacts to the built and natural environment.

Runway 18-36 Realignment

The existing airport site is constrained by its built and natural environment. These constraints adjacent to the primary Runway 18-36 include wetlands and residential homes to the northeast, industrial land uses to the northwest, hangars and city utilities (e.g. well house) to the southwest, and the main terminal/hangar area to the southeast. It was determined rotating Runway 18-36 would present unacceptable impacts to impacts to one or more of these existing land uses and resources, and other options should be explored. A realignment of Runway 18-36 is not recommended for further consideration. This on-site airfield alternatives analysis assumes the existing Runway 18-36 alignment will remain whenever feasible.



Significant South Extension of Runway 18-36

Land uses to the south of Runway 36 include commercial properties, ATC transmission lines, railroad, State Trunk Highway (STH) 16, and residential neighborhood. Impacts to STH 16, railroad, commercial areas, and residential neighborhoods are not feasible because they would result in significant socioeconomic to community. Runway extension alternatives that are not compatible with STH 16 Bridge over the Canadian Pacific Railroad line were dismissed from consideration in this master plan.

Close Airport

Closure of the Portage Municipal Airport without replacement at a new airport site was dismissed from consideration for this analysis. The airport serves the aeronautical needs of the City of Portage and surrounding area in Columbia County. The airport is an important public asset for the community and needs to remain to efficiently meet transportation needs.

On-Site Alternatives Carried Forward

Airfield alternatives that carry forward are evaluated based on a matrix of scenarios. The alternative number represents the facility standards. These include:

- Series 1 Alternatives: Existing Conditions Safety and Compliance
- Series 2 Alternatives: PAL 2 (Small Twin-Engine Aircraft)
- Series 3 Alternatives: PAL 3 (Small Turboprop)
- Series 4 Alternatives: PAL 4 (Large Business Jet)

The alternative letter represents the different alternatives within each series. Up to three alternatives in each series are shown, representing the "best fit" scenario for utilizing Runway 18-36, Runway 4-22, or a new runway alignment. The following alternatives carry forward for further impact analysis, and are shown graphically in **Figures 5-1** through **5-8**.[1]

No Build

This scenario is the baseline condition. All alternative options are compared to the No Build condition for impact evaluation. The No Build alternative would maintain Runway 18-36 with its existing configuration and length. Important FAA and State safety and compliance standards are not met for the existing critical design aircraft. The No Build alternative does not meet basic airport design standards or the airport sponsor's long-term vision, therefore is dismissed from consideration.

Alternative 1A: Safety and Compliance

Alternative 1A improves Runway 18-36 and Runway 4-22 to correct FAA airport safety and design standards deficiencies. This option "fits" the airport facility within the existing surrounding built environment to minimize impacts outside of airport property. This alternative does not satisfy the PAL 2 airfield facility requirements. The alternative affects the utility of the airport by reducing the usable runway length, most notably the Runway 36 landing distance to 2,588 feet to clear the FAA approach surface of the existing ATC transmission line. It also requires the Runway 36 to be limited to visual approaches only. Vertical guidance is added to the instrument Runway 18 approach. The existing fuel facility and aircraft tie-downs are relocated in the terminal/hangar area to meet FAA standards.

For evaluation purposes, Runway 4-22 is proposed to remain, with usable runway length reduced to clear fixed objects such as power poles.

Relative strengths of this alternative include:

- Addresses FAA safety and design standards deficiencies
- Lowest project cost and local share of all alternatives ($4.4 million total cost)
- Does not require burial of ATC transmission lines or roadways
- Minimizes off-airport impacts compared to other build alternatives

Relative weaknesses include:

[1] Alternatives have been revised from previous versions to shift runway ends to meet Obstacle Free Zone (OFZ) standards.

- Requires approximately 45[2] acres of land acquisition (fee or easement)
- Does not meet PAL 2 facility requirement needs
- Reduces Runway 36 end landing distance to below recommended length of 3,300 feet
- Reduces overall airport utility by eliminated Runway 36 circling instrument approach
- Triggers Runway 36 RPZ Alternatives Analysis
- Reduces Runway 4-22 landing distances to below recommended length
- Constrained terminal/hangar area development space remains

Alternative 2A: Improve Runway 18-36 to 3,300 Feet Usable Length

Alternative 2A meets PAL 2 needs for small single/twin-engine aircraft. The option improves Runway 18-36 to achieve at least 3,300 feet of usable runway length for takeoff and landing, with non-precision instrument approaches to each runway end. Off-airport impacts include the ATC transmission lines to be buried and Silver Lake Drive to be realigned to clear the FAA approach surface to Runway 36. Crosswind Runway 4-22 is proposed to be improved to meet basic FAA airport design standards.

Relative strengths of this alternative include:

- Addresses FAA safety and design standards deficiencies
- Meets PAL 2 needs for a small multi-engine aircraft including runway length (3,300')
- Allows for non-precision approaches to both end primary runway ends

Relative weaknesses include:

- Highest estimated local cost share of Series 2 alternatives ($14.0 million)
- Requires approximately 50 acres of land acquisition
- Requires burial of ATC transmission lines
- Impacts surrounding roadways
- Constrained terminal/hangar area development space remains
- FAA funding support unlikely when compared to project cost for new airport site

Alternative 2B: Extend Runway 4-22 to 3,300 Feet Usable Length

Alternative 2B meets PAL 2 needs for small single/twin-engine aircraft. It proposes to improve Runway 4-22 to become the primary runway. Runway 4-22 is extended to the northeast to achieve at least 3,300 feet of usable runway length for takeoff and landing, with non-precision instrument approaches established to each runway end. This runway configuration directly impacts several multi-family residential homes and St. Mary's Cemetery. Runway 18-36 becomes a crosswind runway in this alternative and is improved to meet basic FAA airport design standards as shown in Alternative 1A.

Relative strengths of this alternative include:

- Addresses FAA safety and design standards deficiencies
- Meets PAL 2 needs for a small multi-engine aircraft including runway length (3,300')
- Primary runway alignment avoids require burial of transmission lines

[2] Refinement of this alternative with FAA and WBOA increases land acquisition to 64 acres.

- Allows for non-precision approaches to both primary runway ends

Relative weaknesses include:

- Requires removal of 11 multi-family homes and tenant relocations
- Direct impacts to a cemetery
- Highest cost Series 2 alternative to meet PAL 2 needs ($23.3 million)
- Requires approximately 75 acres of land acquisition
- Constrained terminal/ hangar area development space remains
- FAA funding support unlikely when compared to project cost for new airport site

Alternative 2C: Construct New Runway to 3,300 Feet

Alternative 2C meets PAL 2 needs for small single/twin-engine aircraft. It proposes to construct a new northeast-southwest runway alignment at 3,300 feet with non-precision instrument approaches to each runway end. The alignment results in clear RPZs on both ends. This runway configuration impacts four single-family residential homes to the northeast of the existing airport. Runway 18-36 becomes a crosswind runway in this alternative and is improved to meet basic FAA airport design standards as shown in Alternative 1A.

Relative strengths of this alternative include:

- Addresses FAA safety and design standards deficiencies
- Meets PAL 2 needs for a small multi-engine aircraft including runway length (3,300')
- Primary runway alignment does not require burial of transmission lines
- Allows for non-precision approaches to both primary runway ends
- Increased terminal/hangar area development space
- Lowest cost alternative to meet PAL 2 needs ($13.7 million)

Relative weaknesses include:

- Requires removal of four single-family homes and tenant relocations
- Requires approximately 80 acres of land acquisition
- Increased wetland impacts compared to other Series 2 alternatives
- Possible impacts to Army National Guard Armory facilities that require further evaluation

Alternative 3A: Extend Runway 18-36 to 3,800 Feet Usable Length

Alternative 3A best meets PAL 3 needs for small turboprop aircraft, while improving Runway 18-36. It proposes to extend Runway 18-36 to the south with non-precision instrument approaches to each runway end. This configuration requires the ATC transmission lines to be buried, Silver Lake Drive closed, and a structures to the south of the airport removed. Runway 36 landing distance is limited to 3,500 feet to clear the STH 16 Bridge. Required setbacks for an ADG-II aircraft trigger the existing terminal/hangar area to be relocated to another portion of the airport. Crosswind Runway 4-22 is closed to provide space for a new terminal/hangar development location.

Relative strengths of this alternative include:

- Addresses FAA safety and design standards deficiencies
- Primarily meets PAL 3 runway length requirements (3,800')

- Meets most other PAL 3 airfield needs for a turboprop aircraft
- Increased terminal/hangar area development space
- Highest total cost to meet PAL 3 needs ($26.1 million)

Relative weaknesses include:

- Highest estimated cost share cost of Series 2 alternatives ($14.5 million)
- Requires approximately 60 acres of land acquisition
- Results in relocation of the existing terminal/hangar area
- Triggers burial of ATC transmission lines
- Runway 36 landing length restricted to 3,500 feet
- Closes crosswind runway

Alternative 3B: Construct New Runway to 3,800 Feet

Alternative 3B meets PAL 3 needs for turboprop aircraft. It proposes to construct a new northeast-southwest runway alignment at 3,800 feet with non-precision instrument approaches to each runway end. This runway configuration impacts four single-family residential homes and the Army National Guard Armory. Required setbacks trigger the existing terminal/hangar area to be relocated to another portion of the airport. Runway 18-36 becomes a crosswind runway in this alternative and is improved to meet basic FAA airport design standards as shown in Alternative 1A.

Relative strengths of this alternative include:

- Addresses FAA safety and design standards deficiencies
- Meets PAL 3 airfield needs for a turboprop aircraft including runway length (3,800')
- Increased terminal/hangar area development space
- Does not require burial of ATC transmission lines

Relative weaknesses include:

- Highest total cost to meet PAL 3 needs ($43.8 million)
- Requires approximately 115 acres of land acquisition
- Requires removal of four single-family homes and tenant relocations
- Impacts to Wisconsin Army National Guard Armory
- Results in relocation of the terminal/hangar area

Alternative 4A: Extend Runway 18-36 to 5,500 Feet

Alternative 4A meets PAL 4 needs for a business jet, improving Runway 18-36. This option proposes to extend Runway 18-36 to the north to achieve 5,500 feet of runway length, with a ¾-mile approach to the Runway 18 end. This configuration requires lowering and tunneling Interstate 39 and County Highway CX under the runway, a lower cost than relocating the interstate and reconstructing an interchange. In addition, ATC transmission lines need to be buried and Silver Lake Drive closed. Several businesses would need to be relocated. Required ADG-II setbacks trigger relocating the existing terminal/hangar area to another portion of the airport. Crosswind Runway 4-22 is closed to provide for a new terminal/hangar development location.

Relative strengths of this alternative include:

- Addresses FAA safety and design standards deficiencies
- Meets PAL 4 airfield needs for a business jet including runway length (5,500')
- Lowest cost of Series 4 alternatives ($82.6 million)

Relative weaknesses include:

- Highest local cost share of all alternatives ($17.2 million)
- Requires approximately 215 acres of land acquisition
- Several commercial and industrial business impacted
- Results in relocation of the terminal/hangar area
- Results in limited terminal/ hangar area development space to serve the demand
- Requires burial of ATC transmission lines

Alternative 4B: Construct New Runway to 5,500 Feet

Alternative 4B meets PAL 4 needs for a business jet. It proposes to construct a new northeast-southwest runway at 5,500 feet, with a 3/4-mile approach to one runway end. This alternative triggers relocation of four single-family homes, one multi-family home, and 16 commercial or industrial businesses near U.S. Highway 51/New Pinery Road. This configuration requires portions of several local roads to be closed including a portion of County Highway CX toward U.S. Highway 51. Required setbacks trigger the existing terminal/hangar area to be relocated to another portion of the airport. Crosswind Runway 4-22 is closed to provide for a new terminal/hangar development location.

Relative strengths of this alternative include:

- Addresses FAA safety and design standards deficiencies
- Meets PAL 4 airfield needs for a business jet including runway length (5,500')

Relative weaknesses include:

- Highest total cost of Series 4 alternatives ($102.2 million)
- Requires approximately 230 acres of land acquisition
- Significant socioeconomic impacts with 16 commercial or industrial business impacted
- Multiple local roadways impacted, including closure of County Highway CX
- Impacts to 4 multi-family and 1 multi-family homes
- Results in relocation of the terminal/hangar area

Alternatives Impact Summary

A summary of the airfield alternatives impacts using the evaluation criteria is tabulated in **Table 5-2**. The alternative cost estimates are located in **Appendix F**. The table identifies features and impacts for the on-site alternatives split by primary runway, crosswind runway, and combined system impacts.

Series 1 Alternative (Safety and Compliance)

Alternative 1A, also known as the safety and compliance alternative, improves the airport to basic airport design standards. Not all recommended facility needs are met. This option results

in the lowest cost ($4.4 million) and fewest off-airport impacts of all the options, at the expense of the usability and utility of the airport. The cost to improve the primary runway is $3.0 million, and $1.4 million for the crosswind runway.

Series 2 Alternatives (PAL 2)

Series 2 alternatives best meet PAL 2 standards for a small multi-engine aircraft. The on-site development costs range from $13.7 to $23.3 million. The lowest cost option is Alternative 2C to construct a new runway alignment, however due to its complexity further study is needed to determine if other impacts are triggered. This option requires four residential homes to be impact. Alternative 2B to utilize Runway 4-22 alignment results in a significant impact to a cemetery and multi-family residential complex, and is the highest cost. Alternative 2A to improve Runway 18-36 results in the highest local share, largely because it requires ATC transmission lines to be buried at an estimated local cost of $11.6 million.

Series 3 Alternatives (PAL 3)

Series 3 alternatives best meet PAL 3 standards for a small turboprop aircraft. The on-site development costs range from $26.1 to $43.8 million. The lower cost option is Alternative 3A to extend and improve Runway 18-36 and construct a new terminal/hangar area. Alternative 3B to construct a new runway alignment impacts single-family residential homes and a few businesses, and accordingly has the higher estimated cost.

Series 4 Alternatives (PAL 4)

Series 4 alternatives best meet PAL 4 standards for a large business jet aircraft. The costs range from $82.6 to $102.2 million. The lower cost option is Alternative 4A to extend Runway 18-36. The impacts are significant and include burying ATC transmission lines, lowering and tunneling County Highway CX and several business relocations. The higher cost option is Alternative 4B to realign the runway. This alternative results in significant community impacts including roadway closures and relocation of retail businesses near U.S. Highway 51.

Off-Site Comparative Alternatives

In addition to developing on-site alternatives that meet forecasted PAL facility needs, a generic off-site alternative was developed for PAL 2, PAL 3, and PAL 4 (large business jet) facility types. The purpose of this exercise was to compare the cost of re-developing the airport on the existing airport site with the cost of a new generic airport site with characteristics similar to the surrounding environment. No specific location is identified in this analysis.

The estimated cost of a new airport site for each development scenario is as follows:

- PAL 2 (3,300-foot runway): $21.3 million
- PAL 3 (3,800-foot runway): $26.6 million
- PAL 4 (5,500-foot runway): $44.9 million

The estimated costs include land acquisition, primary runway/taxiway, apron, terminal building, FBO hangar, and other public infrastructure.

To meet PAL 2 needs, which includes developing a 3,300-foot runway needed today, the cost for a generic new airport site is comparable to alternatives that were developed on-site. The main takeaway from this analysis is that a new airport would be designed with the ability to accommodate future development and expansion, whereas on-site PAL 2 alternatives are constrained by the natural and built environment which stymies further growth.

Both the PAL 3 and PAL 4 generic new airport cost estimates range from comparable to up to 56% less than the costs associated with improving the existing airport site to meet those needs. This off-site evaluation highlights the feasibility of the airport sponsor considering a new airport site when implementing PAL 3 or PAL 4 facility needs.

FIGURE 5-1: ALTERNATIVE 1A - SAFETY & COMPLIANCE (REVISED)

PORTAGE MUNICIPAL AIRPORT (C47)

MASTER PLAN STUDY

PORTAGE, WI

RUNWAY DESIGN STANDARDS

PRIMARY RUNWAY 18/36:
- DESIGN AIRCRAFT: SMALL TWIN ENGINE
- RUNWAY DIMENSIONS: 3,288' x 60'
- FAA RUNWAY DESIGN CODE: B-I(S)-5000
- APPROACH VISIBILITY MINIMUMS: 1 MILE | VISUAL

CROSSWIND RUNWAY 4/22:
- DESIGN AIRCRAFT: SMALL TWIN ENGINE
- RUNWAY LENGTH: 2,270' X 60'
- RUNWAY DESIGN CODE: B-I(S)-VIS
- APPROACH VISIBILITY MINIMUMS: VISUAL

CONCEPTUAL LAYOUT FOR AIRPORT MASTER PLANNING PURPOSES ONLY

ALTERNATIVE SUMMARY

DESCRIPTION
- IMPROVE PRIMARY RUNWAY TO MEET SAFETY STANDARDS
- IMPROVE CROSSWIND RUNWAY TO MEET SAFETY STANDARDS
- 7.0 ACRES TERMINAL/HANGAR REDEVELOPMENT SPACE

PLANNING-LEVEL COST ESTIMATE
- $4.4 MILLION

KEY BENEFITS
- ADDRESSES FAA SAFETY AND DESIGN STANDARDS DEFICIENCIES
- MINIMIZES OFF-AIRPORT IMPACTS

KEY IMPACTS / CONSTRAINTS
- 45 ACRES LAND ACQUISITION (FEE + EASEMENT)
- REDUCES RUNWAY OPERATIONAL UTILITY
- DOES NOT MEET PAL 2 CONSTRAINED AIRFIELD FACILITY NEEDS
- LIMITED TERMINAL/HANGAR AREA DEVELOPMENT SPACE

ST. MARY'S CEMETERY

TOWN OF FORT WINNEBAGO

CITY OF PORTAGE

AIRPORT ROAD

SILVER LAKE DR

TERMINAL/HANGAR REDEVELOPMENT AREA

RUNWAY 4/22: 2,270' x 60'

RUNWAY 18/36: 3,288' X 60'

INTERSTATE 39

COUNTY HIGHWAY CX

STATE HWY 16 / W WISCONSIN ST

CANADIAN PACIFIC RAILROAD

TRANSMISSION LINE

DECLARED DISTANCES

RUNWAY ID	TORA	TODA	ASDA	LDA
18	3,288'	3,288'	3,288'	3,148'
36	3,288'	3,288'	3,288'	2,588'
4	2,270'	2,270'	2,270'	2,270'
22	2,270'	2,270'	2,270'	2,270'

GENERAL NOTES

1) THE PURPOSE OF THIS DRAWING IS FOR COMPARING PLANNING-LEVEL IMPACTS WITH OTHER AIRPORT MASTER PLAN CONCEPTS.
2) LAND ACQUISITION ASSUMES FEE OR EASEMENT ACQUISITION DEPENDING ON MINIMUM REQUIRED COMPATIBLE LAND USE STANDARDS.
3) FAA APPROVAL REQUIRED FOR BUILDINGS TO REMAIN WITHIN A TYPICAL BUILDING RESTRICTION LINE (BRL) AS SHOWN.

Future Runway Protection Zone (RPZ)
Building Restriction Line (BRL)
Runway Safety Area (RSA)
Runway Object Free Area (ROFA)
Runway Obstacle Free Zone (ROFZ)
FAR Part 77 Approach Surface
FAA Approach Surface
FAA Departure Surface
Future Pavement
Airport Pavement Removal
Existing Airport Pavement
Existing Buildings
Affected Parcels
Future Land Acquisition
Existing Airport Boundary
Municipal Boundaries
Freshwater Pond
Freshwater Wetland

N

0 250 500 1,000 Feet

PORTAGE WISCONSIN

TKDA

DATA SOURCE: COLUMBIA COUNTY LAND INFORMATION DEPARTMENT, WI DNR

FIGURE 5-2: ALTERNATIVE 2A: IMPROVE RUNWAY 18/36 TO 3,300 FEET USABLE LENGTH (REVISED)

PORTAGE MUNICIPAL AIRPORT (C47)

MASTER PLAN STUDY

PORTAGE, WI

RUNWAY DESIGN STANDARDS

PRIMARY RUNWAY 18/36:
- DESIGN AIRCRAFT: SMALL TWIN ENGINE
- RUNWAY DIMENSIONS: 3,528' x 60'
- FAA RUNWAY DESIGN CODE: B-I(S)-5000
- APPROACH VISIBILITY MINIMUMS: 1 MILE

CROSSWIND RUNWAY 4/22:
- DESIGN AIRCRAFT: SMALL TWIN ENGINE
- RUNWAY LENGTH: 2,270' X 60'
- RUNWAY DESIGN CODE: B-I(S)-VIS
- APPROACH VISIBILITY MINIMUMS: VISUAL

CONCEPTUAL LAYOUT FOR AIRPORT MASTER PLANNING PURPOSES ONLY

ALTERNATIVE SUMMARY

DESCRIPTION
- IMPROVE PRIMARY RUNWAY TO 3,300 USABLE LENGTH
- IMPROVE CROSSWIND RUNWAY TO MEET SAFETY STANDARDS
- 7.0 ACRES TERMINAL/HANGAR REDEVELOPMENT SPACE

PLANNING-LEVEL COST ESTIMATE
- $18.8 MILLION

KEY BENEFITS
- MEETS PAL 2 CONSTRAINED AIRFIELD FACILITY NEEDS
- ADDRESSES FAA SAFETY AND DESIGN STANDARDS DEFICIENCIES

KEY IMPACTS / CONSTRAINTS
- 50 ACRES LAND ACQUISITION (FEE + EASEMENT)
- BURY TRANSMISSION LINES
- LIMITED TERMINAL/HANGAR AREA DEVELOPMENT SPACE

US HWY 51 / NEW PINERY RD
NORTHRIDGE PLAZA
WAL-MART
HENRY DR
COLLIPP-WORDEN PARK
ST. MARY'S CEMETERY
SILVER LAKE
SILVER LAKE DR
AIRPORT ROAD
TERMINAL/HANGAR REDEVELOPMENT AREA
NEW ROAD ALIGNMENT
CANADIAN PACIFIC RAILROAD
INTERSTATE 39
TOWN OF FORT WINNEBAGO
CITY OF PORTAGE
RUNWAY 18/36 3,528' X 60'
RUNWAY 4/22 2,270' X 60'
TOWN OF FORT WINNEBAGO
TOWN OF LEWISTON
COUNTY HIGHWAY CX
STATE HWY 16 / W WISCONSIN ST
TRANSMISSION LINE
COLUMBIA CORRECTIONAL INSTITUTION

DECLARED DISTANCES				
RUNWAY ID	TORA	TODA	ASDA	LDA
18	3,528'	3,528'	3,528'	3,388'
36	3,528'	3,528'	3,528'	3,300'
4	2,270'	2,270'	2,510'	2,270'
22	2,270'	2,270'	2,270'	2,270'

GENERAL NOTES

1) THE PURPOSE OF THIS DRAWING IS FOR COMPARING PLANNING-LEVEL IMPACTS WITH OTHER AIRPORT MASTER PLAN CONCEPTS.
2) LAND ACQUISITION ASSUMES FEE OR EASEMENT ACQUISITION DEPENDING ON MINIMUM REQUIRED COMPATIBLE LAND USE STANDARDS.
3) FAA APPROVAL REQUIRED FOR BUILDINGS TO REMAIN WITHIN A TYPICAL BUILDING RESTRICTION LINE (BRL) AS SHOWN.

Future Runway Protection Zone (RPZ)
Building Restriction Line
Runway Safety Area (RSA)
Runway Object Free Area (ROFA)
Runway Obstacle Free Zone (ROFZ)
FAR Part 77 Approach Surface
FAA Approach Surface
FAA Departure Surface
Future Pavement
Airport Pavement Removal
Existing Airport Pavement
Road Removal
Existing Buildings
Affected Parcels
Future Land Acquisition
Existing Airport Boundary
Municipal Boundaries
Freshwater Pond
Freshwater Wetland

0 400 800 1,600 Feet

DATA SOURCE: COLUMBIA COUNTY LAND INFORMATION DEPARTMENT, WI DNR

PORTAGE WISCONSIN

TKDA

FIGURE 5-3: ALTERNATIVE 2B - EXTEND RUNWAY 4/22 TO 3,300 FEET USABLE LENGTH (REVISED)

PORTAGE MUNICIPAL AIRPORT (C47)

MASTER PLAN STUDY

PORTAGE, WI

RUNWAY DESIGN STANDARDS

PRIMARY RUNWAY 4/22:
- DESIGN AIRCRAFT: SMALL TWIN ENGINE
- RUNWAY DIMENSIONS: 3,288' x 60'
- FAA RUNWAY DESIGN CODE: B-I(S)-5000
- APPROACH VISIBILITY MINIMUMS: 1 MILE

CROSSWIND RUNWAY 18/36:
- DESIGN AIRCRAFT: SMALL TWIN ENGINE
- RUNWAY LENGTH: 3,768' X 60'
- RUNWAY DESIGN CODE: B-I(S)-VIS
- APPROACH VISIBILITY MINIMUMS: VISUAL

CONCEPTUAL LAYOUT FOR AIRPORT MASTER PLANNING PURPOSES ONLY

ALTERNATIVE SUMMARY

DESCRIPTION
- IMPROVE RUNWAY 4/22 TO 3,300' USABLE LENGTH
- IMPROVE RUNWAY 18/36 TO MEET SAFETY STANDARDS
- 6.0 ACRES TERMINAL/HANGAR REDEVELOPMENT SPACE

PLANNING-LEVEL COST ESTIMATE
- $23.3 MILLION

KEY BENEFITS
- MEETS PAL 2 CONSTRAINED AIRFIELD FACILITY NEEDS
- ADDRESSES FAA SAFETY AND DESIGN STANDARDS DEFICIENCIES

KEY IMPACTS / CONSTRAINTS
- 75 ACRES LAND ACQUISITION (FEE + EASEMENT)
- 11 MULTI-FAMILY STRUCTURES, CEMETERY AFFECTED
- LIMITED TERMINAL/HANGAR AREA DEVELOPMENT SPACE

US HWY 51 / NEW PINERY RD
NORTHRIDGE PLAZA
WAL-MART
HENRY DR
COLLIPP-WORDEN PARK
ST. MARY'S CEMETERY
SILVER LAKE
SILVER LAKE DR
AIRPORT ROAD
TERMINAL/HANGAR REDEVELOPMENT AREA
RUNWAY 4/22 3,580' X 60'
RUNWAY 18/36 3,288' X 60'
CANADIAN PACIFIC RAILROAD
STATE HWY 16 / W WISCONSIN ST
TRANSMISSION LINE
INTERSTATE 39
TOWN OF FORT WINNEBAGO
CITY OF PORTAGE
TOWN OF FORT WINNEBAGO
TOWN OF LEWISTON
COUNTY HIGHWAY CX
COLUMBIA CORRECTIONAL INSTITUTION

DECLARED DISTANCES

RUNWAY ID	TORA	TODA	ASDA	LDA
18	3,288'	3,288'	3,288'	3,148'
36	3,288'	3,288'	3,288'	2,588'
4	3,580'	3,580'	3,580'	3,300'
22	3,300'	3,580'	3,580'	3,580'

GENERAL NOTES

1) THE PURPOSE OF THIS DRAWING IS FOR COMPARING PLANNING-LEVEL IMPACTS WITH OTHER AIRPORT MASTER PLAN CONCEPTS.
2) LAND ACQUISITION ASSUMES FEE OR EASEMENT ACQUISITION DEPENDING ON MINIMUM REQUIRED COMPATIBLE LAND USE STANDARDS.
3) FAA APPROVAL REQUIRED FOR BUILDINGS TO REMAIN WITHIN A TYPICAL BUILDING RESTRICTION LINE (BRL) AS SHOWN.

Future Runway Protection Zone (RPZ)
Building Restriction Line
Runway Safety Area (RSA)
Runway Object Free Area (ROFA)
Runway Obstacle Free Zone (ROFZ)
FAR Part 77 Approach Surface
FAA Approach Surface
FAA Departure Surface
Future Pavement
Airport Pavement Removal
Existing Airport Pavement
Road Removal
Existing Buildings
Buildings To Be Removed
Affected Parcels
Future Land Acquisition
Existing Airport Boundary
Municipal Boundaries
Freshwater Pond
Freshwater Wetland

0 400 800 1,600 Feet

PORTAGE WISCONSIN

TKDA

DATA SOURCE: COLUMBIA COUNTY LAND INFORMATION DEPARTMENT, WI DNR

FIGURE 5-4: ALTERNATIVE 2C - CONSTRUCT NEW RUNWAY TO 3,300 FEET (REVISED)

PORTAGE MUNICIPAL AIRPORT (C47)

MASTER PLAN STUDY

PORTAGE, WI

RUNWAY DESIGN STANDARDS

PRIMARY RUNWAY 3/21:
- DESIGN AIRCRAFT: SMALL TWIN ENGINE
- RUNWAY DIMENSIONS: 3,300' x 60'
- FAA RUNWAY DESIGN CODE: B-I(S)-5000
- APPROACH VISIBILITY MINIMUMS: 1 MILE

CROSSWIND RUNWAY 18/36:
- DESIGN AIRCRAFT: SMALL TWIN ENGINE
- RUNWAY LENGTH: 3,528' x 60'
- RUNWAY DESIGN CODE: B-I(S)-VIS
- APPROACH VISIBILITY MINIMUMS: 1 MILE | VISUAL

CONCEPTUAL LAYOUT FOR AIRPORT MASTER PLANNING PURPOSES ONLY

ALTERNATIVE SUMMARY

DESCRIPTION
- CONSTRUCT NEW PRIMARY RUNWAY TO 3,300 FEET
- CLOSE RUNWAY 4/22
- IMPROVE RUNWAY 18/36 TO MEET SAFETY STANDARDS
-19.0 ACRES TERMINAL/HANGAR REDEVELOPMENT SPACE

PLANNING-LEVEL COST ESTIMATE
- $13.7 MILLION

KEY BENEFITS
- MEETS PAL 2 CONSTRAINED AIRFIELD FACILITY NEEDS
- ADDRESSES FAA SAFETY AND DESIGN STANDARDS DEFICIENCIES
- INCREASED TERMINAL/HANGAR DEVELOMENT SPACE

KEY IMPACTS / CONSTRAINTS
- 80 ACRES LAND ACQUISITION (FEE + EASEMENT)
- 4 SINGLE-FAMILY RESIDENTIAL STRUCTURES AFFECTED

US HWY 51 / NEW PINERY RD
WAL-MART
NORTHRIDGE PLAZA
HENRY DR
ST. MARY'S CEMETERY
COLLIPP-WORDEN PARK
SILVER LAKE DR
SILVER LAKE
AIRPORT ROAD
RUNWAY 3/21: 3,300' X 60'
RUNWAY 4/22 (REMOVAL)
TERMINAL/HANGAR REDEVELOPMENT AREA
RUNWAY 18/36 3,528' X 60'
INTERSTATE 39
TOWN OF FORT WINNEBAGO
TOWN OF LEWISTON
CANADIAN PACIFIC RAILROAD
STATE HWY 16 / W WISCONSIN ST
TRANSMISSION LINE
COUNTY HIGHWAY CX
CITY OF PORTAGE
COLUMBIA CORRECTIONAL INSTITUTION

DECLARED DISTANCES				
RUNWAY ID	TORA	TODA	ASDA	LDA
18	3,528'	3,528'	3,528'	3,148'
36	3,528'	3,528'	3,528'	2,588'
4	3,300'	3,300'	3,300'	3,300'
22	3,300'	3,300'	3,300'	3,300'

GENERAL NOTES

1) THE PURPOSE OF THIS DRAWING IS FOR COMPARING PLANNING-LEVEL IMPACTS WITH OTHER AIRPORT MASTER PLAN CONCEPTS.
2) LAND ACQUISITION ASSUMES FEE OR EASEMENT ACQUISITION DEPENDING ON MINIMUM REQUIRED COMPATIBLE LAND USE STANDARDS.
3) FAA APPROVAL REQUIRED FOR BUILDINGS TO REMAIN WITHIN A TYPICAL BUILDING RESTRICTION LINE (BRL) AS SHOWN.

- Future Runway Protection Zone (RPZ)
- Building Restriction Line
- Runway Safety Area (RSA)
- Runway Object Free Area (ROFA)
- Runway Obstacle Free Zone (ROFZ)
- FAR Part 77 Approach Surface
- FAA Approach Surface
- FAA Departure Surface
- Future Pavement
- Airport Pavement Removal
- Existing Airport Pavement
- Road Removal
- Existing Buildings
- Buildings To Be Removed
- Affected Parcels
- Future Land Acquisition
- Existing Airport Boundary
- Municipal Boundaries
- Freshwater Pond
- Freshwater Wetland

0 400 800 1,600 Feet

PORTAGE WISCONSIN

TKDA

DATA SOURCE: COLUMBIA COUNTY LAND INFORMATION DEPARTMENT, WI DNR

FIGURE 5-5: ALTERNATIVE 3A - EXTEND RUNWAY 18/36 TO 3,800 FEET (REVISED)

PORTAGE MUNICIPAL AIRPORT (C47)

MASTER PLAN STUDY

PORTAGE, WI

RUNWAY DESIGN STANDARDS

PRIMARY RUNWAY 18/36:
- DESIGN AIRCRAFT: SMALL TURBOPROP
- RUNWAY DIMENSIONS: 3,840' x 75'
- FAA RUNWAY DESIGN CODE: B-II(S)-5000
- APPROACH VISIBILITY MINIMUMS: 1 MILE

CROSSWIND RUNWAY:
- CLOSED RUNWAY

CONCEPTUAL LAYOUT FOR AIRPORT MASTER PLANNING PURPOSES ONLY

ALTERNATIVE SUMMARY

DESCRIPTION
- EXTEND RUNWAY 18/36 TO AT LEAST 3,800 FEET
- CLOSE RUNWAY 4/22
- 32.0 ACRES TERMINAL/HANGAR REDEVELOPMENT SPACE

PLANNING-LEVEL COST ESTIMATE
- $26.1 MILLION

KEY BENEFITS
- MEETS MOST PAL 3 UNCONSTRAINED AIRFIELD NEEDS
- ADDRESSES FAA SAFETY AND DESIGN STANDARDS DEFICIENCIES
- INCREASES AVAILABLE TERMINAL/HANGAR DEVELOPMENT SPACE

KEY IMPACTS / CONSTRAINTS
- 60 ACRES LAND ACQUISITION (FEE + EASEMENT)
- RELOCATE TERMINAL/HANGAR AREA
- BURY TRANSMISSION LINES
- INTERSTATE AND HIGHWAY 16 LIMIT USABLE RUNWAY LENGTH

US HWY 51 / NEW PINERY RD
NORTHRIDGE PLAZA
WAL-MART
HENRY DR
COLLIPP-WORDEN PARK
ST. MARY'S CEMETERY
INTERSTATE 39
TERMINAL/HANGAR REDEVELOPMENT AREA
AIRPORT ROAD
SILVER LAKE
CANADIAN PACIFIC RAILROAD
RUNWAY 4/22 (REMOVED)
RUNWAY 18/36: 4,100' X 75'
305.68'
STATE HWY 16 / W WISCONSIN ST
TRANSMISSION LINE
TOWN OF FORT WINNEBAGO
TOWN OF LEWISTON
COUNTY HIGHWAY CX
TOWN OF LEWISTON
CITY OF PORTAGE
COLUMBIA CORRECTIONAL INSTITUTION

DECLARED DISTANCES				
RUNWAY ID	TORA	TODA	ASDA	LDA
18	3,840'	3,840'	3,840'	3,840'
36	3,840'	3,840'	3,840'	3,540'

GENERAL NOTES

1) THE PURPOSE OF THIS DRAWING IS FOR COMPARING PLANNING-LEVEL IMPACTS WITH OTHER AIRPORT MASTER PLAN CONCEPTS.
2) LAND ACQUISITION ASSUMES FEE OR EASEMENT ACQUISITION DEPENDING ON MINIMUM REQUIRED COMPATIBLE LAND USE STANDARDS.
3) FAA APPROVAL REQUIRED FOR BUILDINGS TO REMAIN WITHIN A TYPICAL BUILDING RESTRICTION LINE (BRL) AS SHOWN.

- Future Runway Protection Zone (RPZ)
- Building Restriction Line
- Runway Safety Area (RSA)
- Runway Object Free Area (ROFA)
- Runway Obstacle Free Zone (ROFZ)
- FAR Part 77 Approach Surface
- FAA Approach Surface
- FAA Departure Surface
- Future Pavement
- Airport Pavement Removal
- Existing Airport Pavement
- Road Removal
- Existing Buildings
- Buildings To Be Removed
- Affected Parcels
- Future Land Acquisition
- Existing Airport Boundary
- Municipal Boundaries
- Freshwater Pond
- Freshwater Wetland

N

0 400 800 1,600 Feet

PORTAGE WISCONSIN

TKDA

DATA SOURCE: COLUMBIA COUNTY LAND INFORMATION DEPARTMENT, WI DNR

FIGURE 5-6: ALTERNATIVE 3B - CONSTRUCT NEW RUNWAY TO 3,800 FEET (REVISED)

PORTAGE MUNICIPAL AIRPORT (C47)

MASTER PLAN STUDY

PORTAGE, WI

RUNWAY DESIGN STANDARDS

PRIMARY RUNWAY 4/22:
- DESIGN AIRCRAFT: SMALL TURBOPROP
- RUNWAY DIMENSIONS: 3,800' x 75'
- RUNWAY DESIGN CODE: B-II(S)-5000
- APPROACH VISIBILITY MINIMUMS: 1 MILE

CROSSWIND RUNWAY 18/36:
- DESIGN AIRCRAFT: SMALL TWIN ENGINE
- RUNWAY DIMENSIONS: 3,288' x 60'
- RUNWAY DESIGN CODE: B-I(S)-VIS
- APPROACH VISIBILITY MINIMUMS: 1 MILE | VISUAL

CONCEPTUAL LAYOUT FOR AIRPORT MASTER PLANNING PURPOSES ONLY

ALTERNATIVE SUMMARY

DESCRIPTION
- CONSTRUCT NEW PRIMARY RUNWAY TO 3,800 FEET
- CLOSE EXISTING RUNWAY 4/22
- IMPROVE RUNWAY 18/36 TO MEET SAFETY STANDARDS
- 16.0 ACRES TERMINAL/HANGAR REDEVELOPMENT SPACE

PLANNING-LEVEL COST ESTIMATE
- $43.8 MILLION

KEY BENEFITS
- MEETS PAL 3 UNCONSTRAINED AIRFIELD NEEDS
- ADDRESSES FAA SAFETY AND DESIGN STANDARDS DEFICIENCIES
- INCREASES AVAILABLE TERMINAL/HANGAR DEVELOPMENT SPACE

KEY IMPACTS / CONSTRAINTS
- 115 ACRES LAND ACQUISITION (FEE + EASEMENT)
- 4 SINGLE-FAMILY RESIDENTIAL STRUTURES AFFECTED
- RELOCATE TERMINAL/HANGAR AREA FOR DESIGN AIRCRAFT

US HWY 51 / NEW PINERY RD
NORTHRIDGE PLAZA
WAL-MART
HENRY DR
ST. MARY'S CEMETERY
COLLIPP-WORDEN PARK
SILVER LAKE DR
AIRPORT ROAD
TERMINAL/HANGAR REDEVELOPMENT AREA
INTERSTATE 39
RUNWAY 4/22: 3,800' X 75'
RUNWAY 18/36: 3,288' X 60'
RUNWAY 4/22 (REMOVED)
CANADIAN PACIFIC RAILROAD
STATE HWY 16 / W WISCONSIN ST
TRANSMISSION LINE
TOWN OF FORT WINNEBAGO
TOWN OF LEWISTON
TOWN OF LEWISTON
CITY OF PORTAGE
COUNTY HIGHWAY CX
COLUMBIA CORRECTIONAL INSTITUTION

DECLARED DISTANCES

RUNWAY ID	TORA	TODA	ASDA	LDA
18	3,288'	3,288'	3,288'	3,148'
36	3,288'	3,288'	3,288'	2,588'
4	3,800'	3,800'	3,800'	3,800'
22	3,800'	3,800'	3,800'	3,800'

GENERAL NOTES

1) THE PURPOSE OF THIS DRAWING IS FOR COMPARING PLANNING-LEVEL IMPACTS WITH OTHER AIRPORT MASTER PLAN CONCEPTS.
2) LAND ACQUISITION ASSUMES FEE OR EASEMENT ACQUISITION DEPENDING ON MINIMUM REQUIRED COMPATIBLE LAND USE STANDARDS.
3) FAA APPROVAL REQUIRED FOR BUILDINGS TO REMAIN WITHIN A TYPICAL BUILDING RESTRICTION LINE (BRL) AS SHOWN.

Future Runway Protection Zone (RPZ)
Building Restriction Line
Runway Safety Area (RSA)
Runway Object Free Area (ROFA)
Runway Obstacle Free Zone (ROFZ)
FAR Part 77 Approach Surface
FAA Approach Surface
FAA Departure Surface
Future Pavement
Airport Pavement Removal
Existing Airport Pavement
Road Removal
Existing Buildings
Buildings To Be Removed
Affected Parcels
Future Land Acquisition
Existing Airport Boundary
Municipal Boundaries
Freshwater Pond
Freshwater Wetland

N

0 400 800 1,600 Feet

PORTAGE WISCONSIN

TKDA

DATA SOURCE: COLUMBIA COUNTY LAND INFORMATION DEPARTMENT, WI DNR

FIGURE 5-7: ALTERNATIVE 4A - EXTEND RUNWAY 18/36 TO 5,500 FEET

PORTAGE MUNICIPAL AIRPORT (C47)

MASTER PLAN STUDY

PORTAGE, WI

RUNWAY DESIGN STANDARDS

PRIMARY RUNWAY 18/36:
- DESIGN AIRCRAFT: BUSINESS JET
- RUNWAY LENGTH: 5,500' X 75'
- RUNWAY DESIGN CODE: B-II-4000
- APPROACH VISIBILITY MINIMUMS: 3/4 MILE | 1 MILE

CROSSWIND RUNWAY 4/22:
- CLOSE RUNWAY

CONCEPTUAL LAYOUT FOR AIRPORT MASTER PLANNING PURPOSES ONLY

ALTERNATIVE SUMMARY

DESCRIPTION
- EXTEND RUNWAY 18/36 TO 5,500 FEET
- CLOSE RUNWAY 4/22
- 16.0 ACRES TERMINAL/HANGAR REDEVELOPMENT SPACE

PLANNING-LEVEL COST ESTIMATE
- $82.6 MILLION

KEY BENEFITS
- MEETS PAL 4 UNCONSTRAINED AIRFIELD NEEDS
- ADDRESSES FAA SAFETY AND DESIGN STANDARDS DEFICIENCIES

KEY IMPACTS / CONSTRAINTS
- 215 ACRES LAND ACQUISITION (FEE + EASEMENT)
- BURY TRANSMISSION LINES
- SEVERAL COMMERCIAL/INDUSTRIAL BUSINESSES AFFECTED
- RELOCATE TERMINAL/HANGAR AREA

US HWY 51 / NEW PINERY RD
NORTHRIDGE PLAZA
WAL-MART
HENRY DR
COLLIPP-WORDEN PARK
ST. MARY'S CEMETERY
INTERSTATE 39
TOWN OF FORT WINNEBAGO
CITY OF PORTAGE
TERMINAL/HANGAR REDEVELOPMENT AREA
SILVER LAKE DR
SILVER LAKE
AIRPORT ROAD
CANADIAN PACIFIC RAILROAD
RUNWAY 4/22 (REMOVED)
RUNWAY 18/36: 5,500' X 75'
TUNNEL
STATE HWY 16 / W WISCONSIN ST
TRANSMISSION LINE
COUNTY HIGHWAY CX
TOWN OF LEWISTON
CITY OF PORTAGE
COLUMBIA CORRECTIONAL INSTITUTION

DECLARED DISTANCES

RUNWAY ID	TORA	TODA	ASDA	LDA
18	5,500'	5,500'	5,500'	5,500'
36	5,500'	5,500'	5,500'	5,500'

GENERAL NOTES

1) THE PURPOSE OF THIS DRAWING IS FOR COMPARING PLANNING-LEVEL IMPACTS WITH OTHER AIRPORT MASTER PLAN CONCEPTS.
2) LAND ACQUISITION ASSUMES FEE OR EASEMENT ACQUISITION DEPENDING ON MINIMUM REQUIRED COMPATIBLE LAND USE STANDARDS.
3) FAA APPROVAL REQUIRED FOR BUILDINGS TO REMAIN WITHIN A TYPICAL BUILDING RESTRICTION LINE (BRL) AS SHOWN.

Future Runway Protection Zone (RPZ)
Building Restriction Line
Runway Safety Area (RSA)
Runway Object Free Area (ROFA)
Runway Obstacle Free Zone (ROFZ)
FAR Part 77 Approach Surface
FAA Approach Surface
FAA Departure Surface
Future Pavement
Airport Pavement Removal
Existing Airport Pavement
Road Removal
Existing Buildings
Buildings To Be Removed
Affected Parcels
Future Land Acquisition
Existing Airport Boundary
Municipal Boundaries
Freshwater Pond
Freshwater Wetland

0 400 800 1,600 Feet

DATA SOURCE: COLUMBIA COUNTY LAND INFORMATION DEPARTMENT, WI DNR

PORTAGE WISCONSIN

TKDA

FIGURE 5-8: ALTERNATIVE 4B - CONSTRUCT NEW RUNWAY TO 5,500 FEET

PORTAGE MUNICIPAL AIRPORT (C47)

MASTER PLAN STUDY

PORTAGE, WI

RUNWAY DESIGN STANDARDS

PRIMARY RUNWAY 4/22:
- DESIGN AIRCRAFT: BUSINESS JET
- RUNWAY LENGTH: 5,500' X 75'
- RUNWAY DESIGN CODE: B-II-4000
- APPROACH VISIBILITY MINIMUMS: 3/4 MILE |1 MILE

CROSSWIND RUNWAY 18/36:
- CLOSED CROSSWIND RUNWAY

CONCEPTUAL LAYOUT FOR AIRPORT MASTER PLANNING PURPOSES ONLY

ALTERNATIVE SUMMARY

DESCRIPTION
- CONSTRUCT NEW PRIMARY RUNWAY TO 5,500 FEET
- CLOSE EXISTING RUNWAY 4/22, 18/36
- 23.0 ACRES TERMINAL/HANGAR REDEVELOPMENT SPACE

PLANNING-LEVEL COST ESTIMATE
- $102.2 MILLION

KEY BENEFITS
- MEETS PAL 4 UNCONSTRAINED AIRFIELD NEEDS
- ADDRESSES FAA SAFETY AND DESIGN STANDARDS DEFICIENCIES

KEY IMPACTS / CONSTRAINTS
- 230 ACRES LAND ACQUISITION (FEE + EASEMENT)
- 4 SINGLE-FAMILY, 1 MULTI-FAMILY RESIDENTIAL STRUCTURES AFFECTED
- SEVERAL COMMERCIAL/INDUSTRIAL BUSINESSES AFFECTED
- RELOCATE TERMINAL/HANGAR AREA

US HWY 51 / NEW PINERY RD
NORTHRIDGE PLAZA
WAL-MART
HENRY DR
ST. MARY'S CEMETERY
COLLIPP-WORDEN PARK
SILVER LAKE DR
AIRPORT ROAD
TERMINAL/HANGAR REDEVELOPMENT AREA
RUNWAY 4/22: 5,500' X 75'
RUNWAY 4/22 (REMOVED)
RUNWAY 18/36 (REMOVED)
INTERSTATE 39
TOWN OF FORT WINNEBAGO
TOWN OF LEWISTON
TOWN OF FORT WINNEBAGO
CITY OF PORTAGE
COUNTY HIGHWAY CX
COLUMBIA CORRECTIONAL INSTITUTION
CANADIAN PACIFIC RAILROAD
STATE HWY 16 / W WISCONSIN ST
TRANSMISSION LINE

DECLARED DISTANCES

RUNWAY ID	TORA	TODA	ASDA	LDA
4	5,500'	5,500'	5,500'	5,500'
22	5,500'	5,500'	5,500'	5,500'

GENERAL NOTES

1) THE PURPOSE OF THIS DRAWING IS FOR COMPARING PLANNING-LEVEL IMPACTS WITH OTHER AIRPORT MASTER PLAN CONCEPTS.
2) LAND ACQUISITION ASSUMES FEE OR EASEMENT ACQUISITION DEPENDING ON MINIMUM REQUIRED COMPATIBLE LAND USE STANDARDS.
3) FAA APPROVAL REQUIRED FOR BUILDINGS TO REMAIN WITHIN A TYPICAL BUILDING RESTRICTION LINE (BRL) AS SHOWN.

- Future Runway Protection Zone (RPZ)
- Building Restriction Line
- Runway Safety Area (RSA)
- Runway Object Free Area (ROFA)
- Runway Obstacle Free Zone (ROFZ)
- FAR Part 77 Approach Surface
- FAA Approach Surface
- FAA Departure Surface
- Future Pavement
- Airport Pavement Removal
- Existing Airport Pavement
- Road Removal
- Existing Buildings
- Buildings To Be Removed
- Affected Parcels
- Future Land Acquisition
- Existing Airport Boundary
- Municipal Boundaries
- Freshwater Pond
- Freshwater Wetland

0 400 800 1,600 Feet

PORTAGE WISCONSIN

TKDA

DATA SOURCE: COLUMBIA COUNTY LAND INFORMATION DEPARTMENT, WI DNR

Table 5-2: C47 Airfield Alternatives Impact Analysis

Category	*Existing Configuration*	Compliance	PAL 2 Needs			PAL 3 Needs		PAL 4 Needs	
		1A	2A	2B	2C	3A	3B	4A	4B
PRIMARY RUNWAY									
Features and Standards									
New Airfield Runway Alignment	*No*	No	No	No	Yes	No	Yes	No	Yes
Runway Orientation	*18 | 36*	18 | 36	18 | 36	4 | 22	3 | 21	18 | 36	4 | 22	18 | 36	4 | 22
Runway Dimensions (Length x Width)****	*3,768' x 60'*	3,288' x 60'	3,528' x 60'	3,580' x 60'	3,300' x 60'	3,840' x 75'	3,800' x 75'	5,500' x 75'	5,500' x 75'
Declared Distances	*No*	Yes	Yes	Yes	No	Yes	No	No	No
Takeoff Distances	*3,768' | 3,768'*	3,288' | 3,288'	3,528' | 3,528'	3,580' | 3,300'	3,300' | 3,300'	3,840' | 3,840'	3,800' | 3,800'	5,500' | 5,500'	5,500' | 5,500'
Landing Distances	*3,676' | 3,508'*	3,148' | 2,588'	3,388' | 3,300'	3,300' | 3,580'	3,300' | 3,300'	3,840' | 3,540'	3,800' | 3,800'	5,500' | 5,500'	5,500' | 5,500'
Instrument Approach Minimums	*1 mile | Circling*	1 mile | Visual	1 mile | 1 mile	1 mile | 1 mile	1 mile | 1 mile	1 mile | 1 mile	1 mile | 1 mile	¾ mile | 1 mile	¾ mile | 1 mile
Critical Design Aircraft Type	*Small Twin-Engine*	Small Twin-Engine	Small Twin-Engine	Small Twin-Engine	Small Twin-Engine	Small Turboprop	Small Turboprop	Business Jet	Business Jet
Runway Design Code (RDC)	*B-I(S)-5000*	B-I(S)-5000	B-I(S)-5000	B-I(S)-5000	B-I(S)-5000	B-II(S)-5000	B-II(S)-5000	B-II-4000	B-II-4000
Planning Activity Level (PAL) Forecast Activity Limit	*N/A*	PAL 2	PAL 2	PAL 2	PAL 2	PAL 3	PAL 3	PAL 4	PAL 4
Operational Performance									
Meets 20-Year Constrained Needs (PAL 2)	*No*	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Meets 10-Year Unconstrained Needs (PAL 3)	*No*	No	No	No	No	Yes	Yes	Yes	Yes
Meets 20-Year Unconstrained Needs (PAL 4)	*No*	No	No	No	No	No	No	Yes	Yes
Meets FAA Recommended Length, Distance and Width	*No*	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Achieves FAA Standard RSA, OFA, OFZ	*No*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Primary Runway Wind Coverage (10.5 knots)	*93.44%*	93.44%	93.44%	94.45%	94.25%	93.44%	94.29%	93.44%	93.38%
Clear FAA Approach over ATC Transmission Lines	*No*	Yes	Yes (Buried)	Yes	Yes	Yes (Buried)	Yes	Yes (Buried)	Yes
Clear FAA Approach over Silver Lake Drive	*No*	Yes	Yes (Realigned)	N/A	N/A	N/A (Closed)	N/A	N/A (Closed)	N/A
Clear FAA Approach over County Highway CX	*No*	Yes	Yes	Yes	N/A	Yes	N/A	N/A (Closed)	Yes
Clear FAA Approach over Interstate 39	*No*	Yes	Yes	N/A	N/A	Yes	N/A	Yes (Tunnel)	Yes
Clear FAA Approach over State Highway 16	*Yes*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clear FAA Approach over Canadian Pacific Railroad	*Yes*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clear Primary Surface	*No*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other Significant FAA Approach Obstructions	*Yes*	No	No	No	No***	No	No	No	No
Roads or Railroads to Remain in RPZ	*Yes*	Yes*	Yes*	Yes*	No	Yes**	Yes**	Yes**	Yes**
Structures to Remain In RPZ	*Yes (2)*	Yes (2)*	Yes (2)*	No	No	No	No	No	No
Accommodates Recommended Instrument Approaches	*No*	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Provides Recommended Taxiway	*No*	Yes (Partial)	Yes (Partial)	Yes (Partial)	Yes (Partial)	Yes (Partial)	Yes (Partial)	Yes (Full Parallel)	Yes (Full Parallel)
Best Planning Tenets and Other Factors									
Activity Triggers Terminal/Hangar Area Relocation	*N/A*	No	No	No	No	Yes	Yes	Yes	Yes
Triggers Burial of ATC Transmission Lines	*N/A*	No	Yes	No	No	Yes	No	Yes	No
Triggers Resident, Business or Other Relocation(s)	*N/A*	No	No	Yes (36)	Yes (4)	Yes (1)	Yes (5)	Yes (5)	Yes (25)
Results in Public Roadway Closure(s)	*N/A*	No	No	Yes (2)	Yes (1)	Yes (1)	Yes (1)	Yes (1)	Yes (7)
Triggers Interstate 39 Relocation or Tunnel	*N/A*	No	No	No	No	No	No	Yes	No
Practicality of Runway Development	*N/A*	High	Medium	Low	Medium***	Medium	Medium	Low	Low

Source: TKDA Analysis (2020)

**It is presumed FAA and WBOA would allow roads and structures that are within an RPZ to remain if runway end location does not change*

***Requires FAA approval of RPZ Alternatives Analysis*

****Assumes Armory is not impacted by runway development*

*****Alternatives revised to shift runway ends to maintain compliant ROFZ*

Table 5-2: C47 Airfield Alternatives Impact Analysis (cont'd)

Category	*Existing Configuration*	Compliance 1A	PAL 2 Needs 2A	PAL 2 Needs 2B	PAL 2 Needs 2C	PAL 3 Needs 3A	PAL 3 Needs 3B	PAL 4 Needs 4A	PAL 4 Needs 4B
CROSSWIND RUNWAY									
Features and Standards*									
New Airfield Runway Alignment	*No*	No	No	No	No	Close Runway 4-22	No	Close Runway 4-22, Runway 18-36	Close Runway 4-22
Runway Orientation	*4 | 22*	4 | 22	4 | 22	18 | 36	18 | 36		18 | 36		
Declared Distances	*No*	No	No	Yes	Yes		Yes		
Runway Dimensions (Length x Width)***	*2,559' x 40'*	2,270' x 60'	2,270 x 60'	3,288' x 60'	3,288' x 60'		3,288' x 60'		
Takeoff Distances	*2,559' | 2,559'*	2,270' | 2,270'	2,270' | 2,270'	3,288' | 3,288'	3,288' | 3,288'		3,288' | 3,288'		
Landing Distances	*2,559' | 2,559'*	2,270' | 2,270'	2,270' | 2,270'	3,148' | 2,588'	3,148' | 2,588'		3,148' | 2,588'		
Instrument Approach Minimums	*Circling | Circling*	Visual | Visual	Visual | Visual	1 mile | Visual	1 mile | Visual		1 mile | Visual		
Critical Design Aircraft	*Small Twin-Engine*	Small Twin-Engine	Small Twin-Engine	Small Twin-Engine	Small Twin-Engine		Small Twin-Engine		
Runway Design Code (RDC)/Classification	*B-I(S)-VIS*	B-I(S)-VIS	B-I(S)-VIS	B-I(S)-5000	B-I(S)-5000		B-I(S)-5000		
Planning Activity Level (PAL) Forecast Activity Limit	*N/A*	PAL 2	PAL 2	PAL 2	PAL 2	PAL 3	PAL 3	PAL 4	PAL 4
Operational Performance									
Projected Activity Meets FAA Regular Use Threshold	*No*	No	No	No	No	No	No	No	No
Meets Recommended Length, Distance, and Width	*No*	No	No	No	No	Crosswind Runway Closed to Provide Additional Terminal/Hangar Development Area	No	Crosswind Runway Closed to Provide Additional Terminal/Hangar Development Area	Crosswind Runway Closed to Provide Additional Terminal/Hangar Development Area
Achieves FAA Standard RSA, OFA, OFZ, RVZ	*No*	Yes	Yes	Yes	Yes		Yes		
Clear FAA Approach over ATC Transmission Lines	*Yes*	Yes	Yes	Yes	Yes		Yes		
Clear FAA Approach over Silver Lake Drive	*N/A*	N/A	N/A	Yes	Yes		Yes		
Clear FAA Approach over Henry Drive	*Yes*	Yes	Yes	N/A	N/A		N/A		
Clear FAA Approach over County Highway CX	*Yes*	Yes	Yes	N/A	N/A		N/A		
Clear FAA Approach over Interstate 39	*N/A*	N/A	N/A	Yes	Yes		Yes		
Clear FAA Approach over State Highway 16	*Yes*	Yes	Yes	Yes	Yes		Yes		
Clear FAA Approach over Canadian Pacific Railroad	*Yes*	Yes	Yes	Yes	Yes		Yes		
Clear Primary Surface	*Yes*	Yes	Yes	Yes	Yes		Yes		
Other Significant FAA Approach Obstructions	*Yes*	No	Yes	No	No		No		
Other FAA Approach Obstructions	*Yes*	No	Yes	No	No		No		
Roads or Railroads to Remain in RPZ	*Yes*	Yes**	Yes**	Yes**	Yes**		Yes**		
Structures to Remain In RPZ	*Yes (5)*	Yes (1)**	Yes (1)**	Yes (2)**	Yes (2)**		Yes (2)**		
Accommodates Recommended Instrument Approaches	*Yes*	No	No	Rwy 18 End Only	Rwy 18 End Only		Rwy 18 End Only		
Provides Recommended Taxiway	*No*	Yes (Turnaround)	Yes (Turnaround)	Yes (Turnaround)	Yes (Turnaround)		Yes (Turnaround)		
Best Planning Tenets and Other Factors									
Triggers Burial of ATC Transmission Lines	*N/A*	No	No	No	No	N/A	No	N/A	N/A
Triggers Resident, Business or Other Relocation(s)	*N/A*	No	No	No	No		No		
Results in Public Roadway Closure(s)	*N/A*	No	No	No	No		No		
FAA Funding Justification	*None*	No	No	No	No		No		
Practicality of Runway Development	*N/A*	High	High	High	High		High		

Source: TKDA Analysis (2020)
**Significant crosswind runway upgrades not planned in this study due to runway not meeting FAA regular use thresholds based on activity and wind coverage through the planning period*
***It is presumed FAA and WBOA would allow roads and structures that are within an RPZ to remain if runway end location does not change*
****Alternatives revised to shift runway ends to maintain compliant ROFZ*

Table 5-2: C47 Airfield Alternatives Impact Analysis (cont'd)

Category	*Existing Configuration*	Compliance	PAL 2 Needs			PAL 3 Needs		PAL 4 Needs	
		1A	2A	2B	2C	3A	3B	4A	4B
Combined Operational Performance									
Meets FAA Recommended Wind Coverage (10.5 knots)	*Yes (97.21%)*	Yes (97.21%)	Yes (97.21%)	Yes (97.21%)	Yes (96.39%)	No (93.46%)	Yes (96.53%)	No (93.46%)	No (94.37%)
Terminal/Hangar Area Development Space	*7 acres*	7 acres	7 acres	6 acres	19 acres	32 acres	16 acres	16 acres	23 acres
Expandability to Meet Terminal/Hangar Space Meets	*Limited*	Limited	Limited	Limited	Likely	Likely	Likely	Likely	Limited
Combined Best Planning Tenets and Other Factors									
Relocate Fuel Facility and Tie-Downs for Design Aircraft	*N/A*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Relocate Terminal/FBO Facility for Design Aircraft	*N/A*	No	No	No	No	Yes	Yes	Yes	Yes
Relocate Terminal/Hangar Area for Design Aircraft	*N/A*	No	No	No	No	Yes	Yes	Yes	Yes
Combined Environmental Impacts									
Land Acquisition (Fee + Easement)	*N/A*	45 acres	50 acres	75 acres	80 acres	60 acres	115 acres	215 acres	230 acres
Single-Family Residential Structures Affected	*N/A*	0 structures	0 structures	0 structures	4 structures	0 structures	4 structures	0 structures	4 structures
Multi-Family Residential Structures Affected	*N/A*	0 structures	0 structures	11 structures	0 structures	0 structures	0 structures	0 structures	1 structures
Commercial/Industrial Structures Affected	*N/A*	1 structure	1 structure	1 structure	1 structure	2 structures	1 structure	7 structures	16 structures
Aeronautical Hangars Affected	*N/A*	2 structures	2 structures	2 structures	2 structures	11 structures	2 structures	11 structures	0 structures
Other Structures Affected	*N/A*	0 structures	0 structures	2 structures	2 structures*	0 structures	5 structures	3 structures	7 structures
Wetland Disturbance	*N/A*	+/- 1 acre	+/- 1 acre	+/- 2 acres	+/- 3 acres	+/- 3 acres	+/- 2 acres	+/- 10 acres	+/- 5 acres
Community Socioeconomic Impacts	*N/A*	Low	Medium	High	Medium	Medium	Medium	High	High
Combined Fiscal Impacts									
Planning-Level Project Cost: On-Site Alternatives	*N/A*	**$4.4 million**	**$18.8 million**	**$23.3 million**	**$13.7 million***	**$26.1 million**	**$43.8 million**	**$82.6 million**	**$102.2 million**
Primary Runway Improvements	*N/A*	$3.0 million	$17.4 million	$20.2 million	$10.6 million*	$19.8 million	$34.4 million	$74.4 million	$94.0 million
Crosswind Runway Improvements	*N/A*	$1.4 million	$1.4 million	$3.1 million	$3.1 million	$0.0 million	$3.1 million	$0.0 million	$0.0 million
Terminal/Hangar Area Improvements	*N/A*	$0.0 million	$0.0 million	$0.0 million	$0.0 million	$6.3 million	$6.3 million	$8.2 million	$8.2 million
FAA Funding Support for On-Site Alternative	*N/A*	Likely	Unlikely	Unlikely	Possible*	Unlikely	Unlikely	Unlikely	Unlikely
Planning-Level Project Cost: Generic New Airport	*N/A*	**$21.3 million**	**$21.3 million**	**$21.3 million**	**$21.3 million**	**$26.6 million**	**$26.6 million**	**$44.9 million**	**$44.9 million**
Primary Runway Improvements	*N/A*	$14.7 million	$14.7 million	$14.7 million	$14.7 million	$18.5 million	$18.5 million	$34.3 million	$34.3 million
Crosswind Runway Improvements	*N/A*	$0.0 million	$0.0 million	$0.0 million	$0.0 million	$0.0 million	$0.0 million	$0.0 million	$0.0 million
Terminal/Hangar Area Improvements	*N/A*	$6.6 million	$6.6 million	$6.6 million	$6.6 million	$8.1 million	$8.1 million	$10.6 million	$10.6 million
Estimated Local Share: On-Site Alternatives	*N/A*	**$1.7 million**	**$14.0 million**	**$4.2 million**	**$3.7 million**	**$14.5 million**	**$6.8 million**	**$17.8 million**	**$7.2 million**
Estimated Local Share: Generic New Airport	*N/A*	**$3.2 million**	**$3.2 million**	**$3.2 million**	**$3.2 million**	**$4.0 million**	**$4.0 million**	**$6.8 million**	**$6.8 million**

Source: TKDA Analysis (2020)

Note: Cost estimates are conceptual for master planning purposes only. Does not include reconstruction of existing facilities. Local share is estimated.

**Assumes Armory is not impacted by runway development*

Preferred Alternative(s)

Overall Airfield Configuration

The airfield configuration alternatives were short-listed to Alternative 1A (safety/compliance), Alternative 2A (improve primary runway) and Alternative 2C (new runway alignment) for purposes of public input.

Alternative 1A results in the fewest off-airport impacts and cost to meet basic airport safety needs. Impacts to landowners surrounding the airport and local share cost are important factors for the airport sponsor to select a preferred option. The tradeoff with this alternative is that it decreases airport utility by reducing usable runway length and eliminating a runway approach.

Alternative 2A improves the existing primary runway to maintain at least 3,300 feet for takeoff and landing. This alternative increases cost significantly by requiring existing transmission lines and poles to be buried. Alternative 2C constructs a new runway alignment on the existing airport site to meet existing critical design aircraft needs, but at a significant cost.

Other alternatives were dismissed even from long-term consideration due to socioeconomic or fiscal impacts. Key impacts that resulted in dismissing other options include:

- No Build: Does not meet basic airport safety needs
- Alternative 2B: Impacts to several multi-family homes and a cemetery
- Alternative 3A: Relocation of the terminal/hangar area and closure of Silver Lake Drive
- Alternative 3B: Relocation of the terminal/hangar area and cost more than new airport
- Alternative 4A: Impacts to businesses and roadways, cost more than new airport
- Alternative 4B: Significant impacts to businesses, cost double that of new airport

After public input, the TAC and Airport Commission recommended the safety and compliance alternative (Alternative 1A) to best satisfy the aeronautical needs at the existing airport site considering operational, environmental, and fiscal impacts. Alternative 2A was dismissed because of the high local cost share to bury ATC power lines, and Alternative 2C dismissed because it results in a non-expandable/constrained site with double the local cost at 1A.

The Portage Common Council considered the Airport Commission recommendation. The Council recognizes the benefit of and additional utility of a longer primary runway length, but concedes that the additional length does not outweigh the fiscal, socioeconomic, and environmental impacts on the existing airport site at this time. They concluded Alternative 1A is not a long-term solution for the airport because it reduces its operational utility from what it is today. They agreed the existing airport site does not meet existing and potential future aviation demand needs for Portage, but also acknowledge the timeframe to construct a new airport (up to 20 years) and the critical safety deficiencies of the existing airport.

Therefore, Council recommended proceeding with a study to explore the feasibility and options for a new airport site, and to proceed with required safety and compliance projects from Alternative 1A until a decision is made on the new airport. The configuration shown in Alternative 1A would be depicted on the Airport Layout Plan for the existing airport site as an interim condition.

Crosswind Runway

The disposition of crosswind Runway 4-22 was evaluated by the airport sponsor. The crosswind runway is recommended but not a required airfield infrastructure component. Alternative 1A proposes to shorten the runway to 2,270 feet of usable length. Impacts include acquiring land, and removing terrain and natural growth obstructions. The cost of the crosswind runway makes up more than 30% of the total Alternative 1A cost. Based on user input, the airport sponsor recommends to keep Runway 4-22 in the development plan, recognizing its use and importance to the utility of the airport. Improvements to Runway 4-22 are a lower priority than those on the primary runway. The sponsor's decision is however predicated upon FAA and State funding availability for those improvements.

Terminal and Hangar Area Configuration

The alternatives analysis for the terminal and hangar (building) area reviews options to implement a plan to accommodate additional apron space and aircraft storage hangars to best meet user needs.

Preferred airfield Alternative 1A maintains and reconfigures both Runway 18-36 and Runway 4-22. The design aircraft is limited to small twin-engine aircraft classified as FAA ARC B-I/Small. The terminal/hangar area shall be compatible with the Alternative 1A airfield configuration and meet PAL 2 apron and hangar needs. PAL 2 needs identify an additional 40% of aircraft storage space and reconfigured aircraft parking areas.

Development Area Screening

An initial review of existing airport property and adjacent areas was completed to determine buildable space that could be feasible to accommodate PAL 2 terminal/hangar area needs. The development areas are referenced in **Figure 5-9**.

Existing Terminal/Hangar Area (South)

The existing area development space outside of the Runway Object Free Area (ROFA) totals around 12 acres. Constraints include Airport Road, Silver Lake Drive, and off-airport infrastructure to the west. Most of this development space is utilized for hangars, aprons, and other related infrastructure on the southern portion of the airport near the Runway 36 end. The size and shape of this area makes large-scale development somewhat challenging, however reconfiguration opportunities do exist to more efficiently utilize existing used and unused space.

Additional development space opportunities include 1.8 acres of land acquisition near Airport Road for hangar development, and approximately 3.0 acres to the west of Runway 18-36 to acquire control over existing aeronautical development. Some new hangar development opportunities are available to the north of the existing hangar development area up to the Runway 4-22 airport design surfaces such as the Runway Visibility Zone, Primary Surface and Building Restriction Line. Additional development space becomes available if Runway 4-22 is closed.

Northeast Quadrant

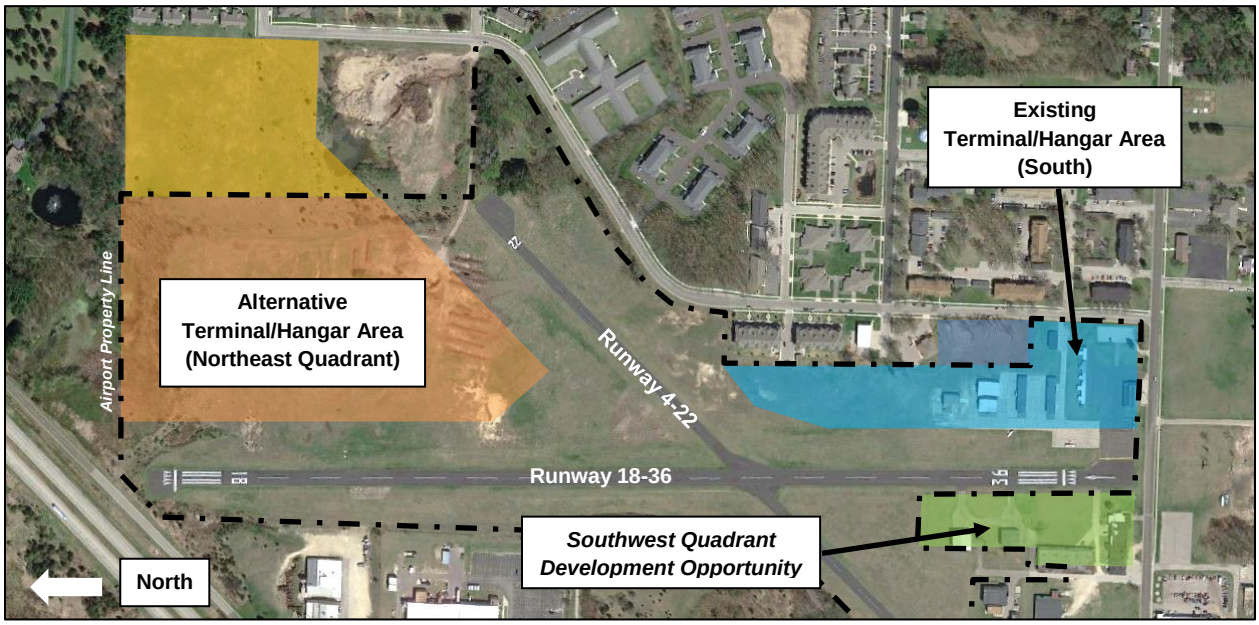
There is approximately 28 acres of open terminal/hangar development space northeast of Runway 4-22 and east of Runway 18-36 outside of ROFAs. An additional 12 acres of property is available for acquisition further to the east near Henry Drive. The site is currently has electrical and water public utilities available.

The size and shape of the land could provide a replacement terminal/hangar area while being compatible with preferred airfield Alternative 1A. The closure of crosswind Runway 4-22 also provides additional space. Relocation of the terminal/hangar area to this quadrant of the airport would require the extension of new utilities, terrain grading work, pavement and other related infrastructure. Development space appears to be sufficient to meet PAL 2 needs.

Southwest Quadrant

Significant redevelopment of areas to the west of Runway 36 end were also screened. This property contains old Mael Aircraft manufacturing buildings which have environmental monitoring commitments. The area is also home to a recently constructed city water well house. Land is owned by the city, or will become city property through a life estate. Because of the concentration of existing public utility infrastructure and potential environmental liabilities, significant development in the southwest area is dismissed from further consideration.

Figure 5-9
C47 Terminal/Hangar Development Areas



Source: TKDA

Recommendation

The recommended terminal/hangar development is to utilize the existing southern area to meet PAL 2 needs. Development in this area ensures the airport sponsor can remain connected to existing infrastructure and save on capital expenses as compared to a new development area. While the northeast site is feasible, major investment is not recommended if

a new airport site is being considered. Focused enhancements can be made in the existing area to both accommodate PAL 2 needs and meet airport design standards. For these reasons, continued development in the existing terminal/hangar area is the preferred development vision.

Recommended Development Plan

Methodology

The size and geometry of the existing terminal/hangar area limits development options. Given this challenge, options were considered to address safety, efficiency, and capacity needs. Building area development was formulated around a design based on the following design principles:

- Correct existing FAA airport design deficiencies
- Minimize major re-development to meet priority safety standards
- Minimize off-airport structure removals
- Provide ADG-I taxilanes to serve the design aircraft
- Accommodate a mix of hangar types to satisfy a variety of capacity needs
- Acquire land and provide public access to west hangar area
- Relocate aircraft tie-downs from the ROFA
- Relocate Runway 36 entrance taxiway
- Provide Runway 18-36 exit bypass taxiway
- Relocate fuel storage from the FAA RPZ
- Preserve additional commercial/FBO development space
- Install terminal area fencing
- Accommodate expanded automobile parking

After considering alternative configurations for different elements (e.g. hangars, aircraft tie-downs) within the limited development envelope, it became clear a single refined building area alternative meets FAA airport design standards and airport sponsor priorities. The preferred terminal and hangar development plan is shown graphically in **Figure 5-10**, with the development methodology described in the subsequent sections. This layout is a long-term vision for the future of the existing airport site, and may not be realized if the airport site is eventually closed.

The final recommended long-term layout includes plan refinements from the initial version. The layout is compatible with the airfield Alternative 1A. Changes were made based on additional discussions with stakeholders including the airport sponsor, WBOA and FAA. These include:

- Eliminating the proposed removal of structures to the west of Runway 36 subject to a No Hazard determination from FAA
- Acquiring land underlying the hangar area to the west of Runway 36 end
- Implementing an access taxiway to the west hangar area
- Relocating the bypass taxiway closer to be aligned with west access taxiway
- Modifying pavement removal areas to depict TDG-1A taxiway fillets
- Relocating the Runway 36 entrance taxiway location to reflect the modified runway end location

Description

Taxiway System

Modifications to the taxiway system are needed to meet FAA airport design standards, connecting Runway 18-36 to the terminal/hangar area.

The existing partial parallel taxiway setback approximately 203 feet from Runway 18-36 would be utilized. This alignment allows for ADG-I clearance from existing and proposed future hangars. Relocating the partial parallel taxiway to 150-feet from runway centerline was considered but does not provide sufficient aircraft parking space in this constrained environment.

The Runway 18-36 entrance and exit taxiways in the terminal/hangar area are proposed to be modified. A new Runway 36 entrance taxiway is proposed to connect to the runway end, along with the removal of pavement and direct access from the apron. A second Runway 18-36 exit taxiway is proposed which will serve as a bypass taxiway for operational efficiency, and provide access from the west hangar area. Direct access points from the structures west of Runway 18-36 would be removed. Proper signage and markings would be installed.

Aircraft Apron

An apron reconfiguration is needed at C47 to meet FAA design standards compatible with airfield Alternative 1A. The preferred plan provides for a total of 10 small aircraft parking positions serving ADG-I design aircraft. All parking positions would be paved; existing turf-positions would be removed.

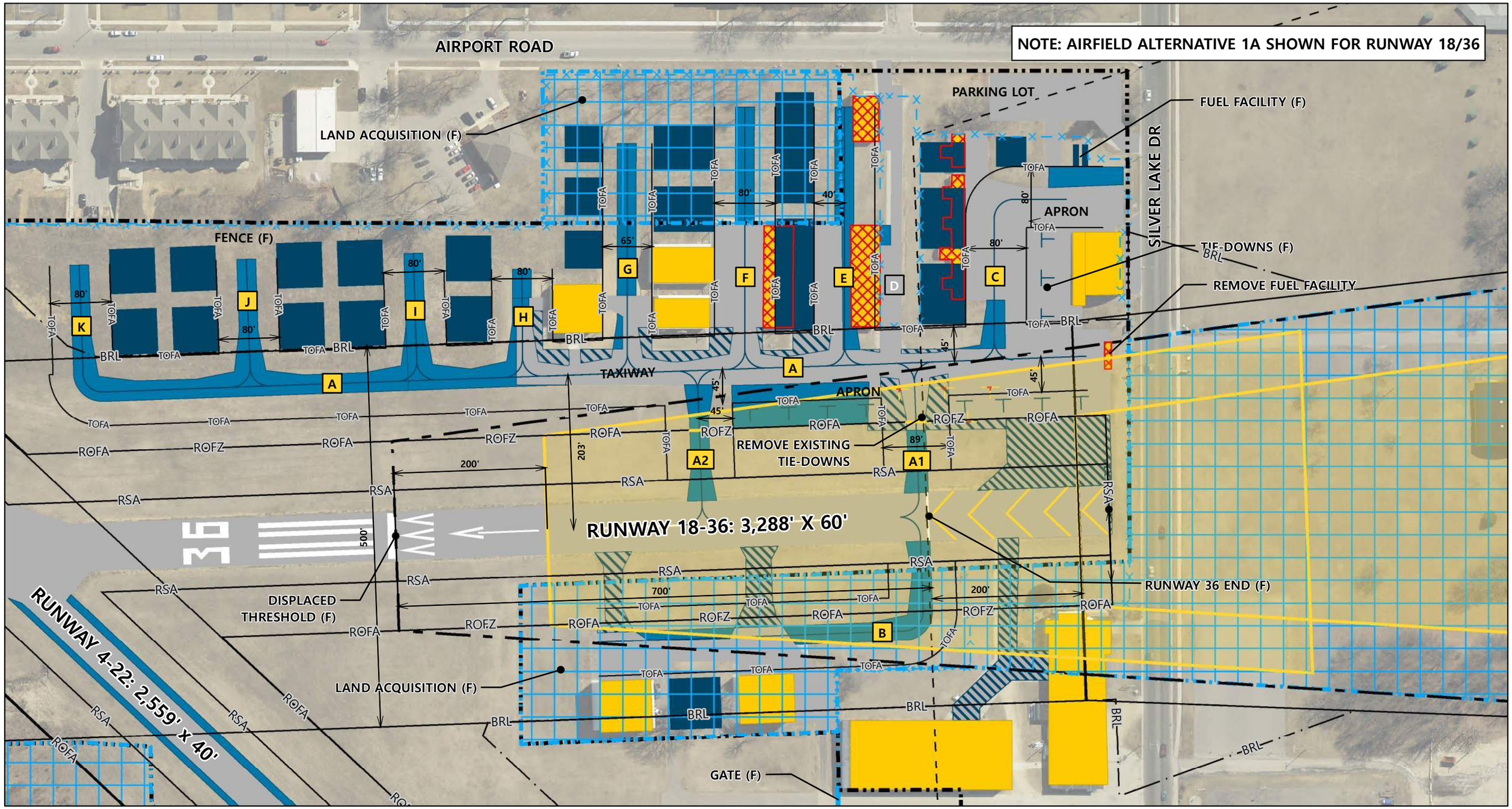
The existing aircraft parking tie-downs adjacent to Runway 18-36 are proposed to be removed and replaced outside of the ROFA. The reconfigured apron can accommodate four ADG-I aircraft parking positions west of the terminal. Aircraft parking will be clear of the ADG-I taxiway object free areas to ensure sufficient maneuvering space for aircraft. The positions can only be “back-in” style for small aircraft as there is not sufficient maneuvering space for a nested configuration.

Three aircraft parking positions are also proposed to the north of the terminal/FBO served by an ADG-I, TDG-1A taxilane to provide safe maneuvering between hangars and parked aircraft. Some additional taxilane pavement is required. One of these parking positions is located to enable “power-in” and “power-out” operations. The combination of these two aircraft parking areas totals six aircraft tie-downs meeting PAL 2 needs.

The plan also maximizes available space to provide a 1,775 SY apron expansion for four additional aircraft parking positions in between the new Runway 36 entrance and bypass taxiways. Additional positions are limited by the FAA approach surface for the 700-foot Runway 36 displaced threshold to clear a 20-foot parked aircraft tail height.

FIGURE 5-9: PREFERRED TERMINAL / HANGAR AREA REDEVELOPMENT CONCEPT (REVISED)

PORTAGE MUNICIPAL AIRPORT (C47)



DATA SOURCE: COLUMBIA COUNTY LAND INFORMATION DEPARTMENT, WI DNR

East Hangar Area

PAL 2 needs require additional aircraft storage space equivalent to about five new 60' x 60' box hangars serving ADG-I aircraft with TDG-1A taxilanes. The proposed plan provides additional aircraft storage space for a variety of uses and configurations including box, T-hangar, and FBO/commercial space. It also considers re-development of select existing hangars in poor condition to satisfy aircraft storage needs and meet FAA airport design standards.

The proposed plan maximizes development space to the north for additional box hangar development. A total of 10 hangars up to 60' x 60' in size are shown, each served by one of four ADG-I, TDG-1A taxilanes connected to the partial parallel taxiway. Hangars continue the existing layout with north or south facing doors. This area alone meets to total PAL 2 aircraft storage needs.

The plan builds upon the existing private box hangar area. Approximately 1.8 acres of land acquisition is proposed to provide future hangar development space. The hangar area would be expanded to the east with taxilane extensions serving three 50' x 50' hangars sites and two 80' x 60' hangar sites. A sub-standard taxilane between two existing hangars is proposed to remain with a 65-foot OFA and wingspan restrictions implemented.

The plan provides opportunities to replace the oldest public T-hangar buildings. These structures are proposed to be replaced with two new 147' x 51' 6-unit T-hangars. This development plan requires the EAA building to be demolished to provide taxilanes compliant with ADG-I standards.

The FBO/terminal area is predicated upon the existing structure remaining. The five single T-hangar units adjacent to the apron are proposed to be replaced by larger 60' x 80' hangar lots providing commercial business opportunities. These hangars are served by a secondary vehicular access road off Airport Road extended to accommodate public automobile parking. Public access from the road would be restricted prior to entering the air operations area.

West Hangar Area

A total of 2.8 acres of land acquisition is proposed to control the ROFA and areas underlying the newest aircraft storage hangars in west hangar area. This action would remove these facilities from having "through-the-fence" access to the airport. The proposed plan also constructs an ADG-I, TDG-1A access taxilane serving two existing and one future 70' x 60' box hangar. Existing direct access points from buildings to the runway would be removed. An access taxilane to the Runway 36 end was considered but dismissed because of the need to remove an additional building, and its configuration may create head-to-head conflicts with those aircraft desiring to taxi to the apron.

Support Facilities

Enhancements to support facilities include several improvements in and around the aircraft parking apron.

The east side of the apron provides space for a dedicated 40' x 60' Snow Removal Equipment (SRE) storage building, as well as a 1,600 SF stand-alone terminal building. The fuel facility will be relocated to the east of the FBO building, allowing the fueling operational to be removed from the future RPZ and creating a dedicated aircraft fueling space. A supporting apron expansion is

needed for the fuel facility. Grading and drainage work is also required for development in the area as terrain rises from the apron to Airport Road.

A 1,500 SY expansion of the automobile parking lot is proposed to provide additional capacity and develop a connection to the north access road. Fencing and gates would improve separation between landside and airside areas. New controlled access gates to the taxiway/hangar area and the existing apron access point are proposed.

Remaining Design Standard Deficiencies

There is one taxilane between two existing hangars that will continue to not meet FAA Taxilane Object Free Area standards. Recommended actions are described below to provide an acceptable level of safety.

- Taxilane G: This taxilane does not meet ADG-I TOFA standards. Available TOFA distance is 65 feet between the hangars. The maximum aircraft wingspan to meet acceptable level of safety is 37.5 feet per FAA Engineering Brief 78. The taxilane centerline is recommended to be marked 32.5 feet from the hangar to provide an acceptable level of safety when the taxilane is extended. New hangar tenants will be wingspan restricted.

OTHER FACILITIES

Perimeter Fencing

In Wisconsin, it is typical in Wisconsin for a Wildlife Hazard Management Plan (WHMP) to recommend an 8-foot high fence with wire top and buried skirt to discourage the intrusion of mammals into the air operations area. The fence is eligible for FAA funding because it is recommended in the WHMP. Additionally, the FAA AIP Handbook considers a 5-foot high chain link fence within 500 feet of the terminal area and a 5-foot high woven wire fence around the airport's legal boundary to be reasonable. To meet potential wildlife and perimeter security fencing needs, a 10-foot high wildlife fence ultimately recommended around the perimeter of airport property. The configuration will be depicted on the ALP considering natural, man-made barriers and airport property lines.

COMBINED PREFERRED ALTERNATIVE REVIEW

The combined preferred airfield alternative and terminal/hangar area plans underwent an additional analysis to evaluate possible additional impacts. An airspace obstruction analysis was also completed. Refinements from Alternative 1A include the following:

- Incorporate preferred terminal/hangar area development, including acquiring additional land for the west hangar area.
- Eliminate proposed building removals to the west of the airport – subject to a No Hazard Determination from FAA
- Include 9.2 acres of obstruction removals within the FAA approach surfaces.
- Revise land acquisition area to total 60.9 acres to additionally cover obstruction removal areas and the width of the FAA approach area near RPZs.

The total estimated planning-level cost for critical airfield improvements continues to be $4.4 million. This amount is broken down into $2.9 million for primary Runway 18-36 improvements, and $1.5 million for crosswind Runway 4-22 improvements.

The preferred airfield alternative depicting both the proposed airfield and terminal/hangar area development is shown in **Figure 5-11.**

New Airport Site Discussion

The airfield alternatives analysis concluded the development costs and impacts to improve the existing airport site to fully meet existing and potential future facility requirements beyond PAL 2 are unacceptable to the airport sponsor. Thus, any attempt to satisfy those requirements at its current airport location will not be an economically prudent use of resources.

The City of Portage Common Council recommended the completion airport site selection studies to explore the possibility of a replacement airport site to satisfy the existing and future unconstrained aviation demand for the Portage community. Improvements to the existing airport site would be limited to maintenance and safety enhancements. After completion of the site selection study, the City of Portage will need decide upon the long-term actions to take on the existing airport site which may include maintaining the existing airport, replace the existing airport site with a new airport (minimal improvement to existing airport), or close the current airport.

FIGURE 5-11: PREFERRED AIRFIELD ALTERNATIVE (REVISED)

PORTAGE MUNICIPAL AIRPORT (C47)

MASTER PLAN STUDY

PORTAGE, WI

RUNWAY DESIGN STANDARDS

PRIMARY RUNWAY 18/36:
- DESIGN AIRCRAFT: SMALL TWIN ENGINE
- RUNWAY DIMENSIONS: 3,288' x 60'
- FAA RUNWAY DESIGN CODE: B-I(S)-5000
- APPROACH VISIBILITY MINIMUMS: 1 MILE | VISUAL

CROSSWIND RUNWAY 4/22:
- DESIGN AIRCRAFT: SMALL TWIN ENGINE
- RUNWAY LENGTH: 2,270' X 60'
- RUNWAY DESIGN CODE: B-I(S)-VIS
- APPROACH VISIBILITY MINIMUMS: VISUAL

ALTERNATIVE SUMMARY

DESCRIPTION
- IMPROVE PRIMARY RUNWAY TO MEET SAFETY STANDARDS
- IMPROVE CROSSWIND RUNWAY TO MEET SAFETY STANDARDS

PLANNING-LEVEL COST ESTIMATE
- $4.4 MILLION

KEY BENEFITS
- ADDRESSES FAA SAFETY AND DESIGN STANDARDS DEFICIENCIES
- MINIMIZES OFF-AIRPORT IMPACTS

KEY IMPACTS / CONSTRAINTS
- 60.1 ACRES LAND ACQUISITION (FEE + EASEMENT)
- REMOVE 9.2 ACRES OF AIRSPACE OBSTRUCTIONS (TREES/TERRAIN)
- REDUCES RUNWAY OPERATIONAL UTILITY
- DOES NOT MEET PAL 2 CONSTRAINED AIRFIELD FACILITY NEEDS
- LIMITED TERMINAL/HANGAR AREA DEVELOPMENT SPACE

HENRY DR
COLLIPP-WORDEN PARK
ST. MARY'S CEMETERY
SILVER LAKE DR
AIRPORT ROAD
RUNWAY 4-22: 2,270' x 60'
RUNWAY 18/36: 3,288' X 60'
TOWN OF FORT WINNEBAGO
TOWN OF LEWISTON
TOWN OF LEWISTON
CITY OF PORTAGE
INTERSTATE 39
COUNTY HIGHWAY CX
COLUMBIA CORRECTIONAL INSTITUTION
STATE HWY 16 / W WISCONSIN ST
CANADIAN PACIFIC RAILROAD
TRANSMISSION LINE
BRL
ROFZ
ROFA
RSA

DECLARED DISTANCES

RUNWAY ID	TORA	TODA	ASDA	LDA
18	3,288'	3,288'	3,288'	3,148'
36	3,288'	3,288'	3,288'	2,588'
4	2,270'	2,270'	2,270'	2,270'
22	2,270'	2,270'	2,270'	2,270'

GENERAL NOTES

1) THE PURPOSE OF THIS DRAWING IS FOR COMPARING PLANNING-LEVEL IMPACTS WITH OTHER AIRPORT MASTER PLAN CONCEPTS.
2) LAND ACQUISITION ASSUMES FEE OR EASEMENT ACQUISITION DEPENDING ON MINIMUM REQUIRED COMPATIBLE LAND USE STANDARDS.
3) FAA APPROVAL REQUIRED FOR BUILDINGS TO REMAIN WITHIN A TYPICAL BUILDING RESTRICTION LINE (BRL) AS SHOWN.

- Future Runway Protection Zone (RPZ)
- Building Restriction Line (BRL)
- Runway Safety Area (RSA)
- Runway Object Free Area (ROFA)
- Runway Obstacle Free Zone (ROFZ)
- FAR Part 77 Approach Surface
- FAA Approach Surface
- FAA Departure Surface
- Future Pavement
- Airport Pavement Removal
- Existing Airport Pavement
- Buildings To Be Removed
- Existing Buildings
- Affected Parcels
- Future Land Acquisition
- Existing Airport Boundary
- Municipal Boundaries
- Freshwater Pond
- Freshwater Wetland
- Future Obstruction Removal

0 300 600 1,200 Feet

DATA SOURCE: COLUMBIA COUNTY LAND INFORMATION DEPARTMENT, WI DNR

PORTAGE WISCONSIN

TKDA

PREFERRED ON-SITE DEVELOPMENT STRATEGY

The Portage Municipal Airport has developed an airfield layout that meets airport design standards for its constrained activity, and a terminal/hangar area layout that is flexible to provide additional development opportunities for small ADG-I aircraft.

The preferred development strategy identified in **Table 5-3** outlines the overall development sequence for the preferred alternatives based on airport sponsor's priorities. The sponsor desires to proceed with seeking a replacement airport site. Improvements in the short-term (10 years) to the existing airport are focused on the highest priority maintenance and safety actions. Long-term improvements focus on capacity and other desired projects if the airport site remains. The implementation plan in **Chapter 6** will identify a realistic capital improvement plan based on project priorities and available funding.

Table 5-3
C47 Preferred Development Strategy

Facility Area	Short-Term 0-10 Years	Long-Term 11-20+ Years
Conditions	***Actions at existing airport while new airport site actions proceed***	***Long-term actions at existing airport if no replacement airport site proceeds***
Primary Runway and Taxiway	✈ Relocate RWY 18-36 ends ✈ Establish displaced thresholds ✈ Restripe runway ✈ Reconfigure lighting ✈ Construct Runway 36 entrance taxiway ✈ Remove RWY 36 IFR circling approach ✈ Acquire land for OFA/OFZ/RSA, approach protection and land use compatibility ✈ Remove critical airspace obstructions ✈ Reconstruct taxiway pavements ✈ Reconstruct RWY 18-36 pavements ✈ Replace RWY 18-36 lighting ✈ Install RWY 18-36 visual aids ✈ Construct RWY 18 turnaround ✈ Construct RWY 36 bypass taxiway	✈ Implement RWY 18 vertically-guided approach ✈ Remove remaining obstructions

Table 5-3
C47 Preferred Development Strategy (cont'd)

Facility Area	Short-Term 0-10 Years	Long-Term 11-20+ Years
Crosswind Runway	✈ Relocate RWY 22 end ✈ Restripe runway ✈ Restrict IFR operations ✈ Acquire land for OFA/OFZ/RSA, approach protection and land use compatibility ✈ Remove critical airspace obstructions ✈ Reconstruct RWY 4-22 pavements ✈ Widen Runway 4-22 to 60' ✈ Construct runway turnarounds	✈ Acquire land for RVZ protection ✈ Remove remaining obstructions
Terminal &T Hangar Area	✈ Reconfigure aircraft parking tie-downs ✈ Relocate AVGAS fuel facility ✈ Reconstruct apron pavements ✈ Install main apron tie-downs ✈ Reconstruct taxilane pavements ✈ Construct apron taxilane	✈ Acquire land for west hangar area ✈ Construct west hangar area taxilane ✈ Remove west direct access taxilanes ✈ Replace AVGAS fuel facility ✈ Extend hangar site taxilanes (north) ✈ Prepare hangar sites (north) ✈ Construct terminal building ✈ Expand paved aircraft parking apron ✈ Acquire land for hangar development ✈ Extend hangar taxilanes (east) ✈ Prepare hangar sites (east) ✈ Demolish public T-hangars (2), building (1) ✈ Construct 147' x 51' 6-unit T-hangars ✈ Demolish single T-hangar buildings ✈ Prepare commercial hangar sites ✈ Construct access road ✈ Expand parking lots ✈ Construct Snow Removal Equipment building
Support & Other	✈ Update Airport Layout Plan ✈ Conduct airport site selection studies	✈ Install terminal area fencing and gates ✈ Install perimeter wildlife fencing

Source: TKDA Analysis (2020)
Note: Scope and timing of airport improvements depends on available funding and actual demand

CHAPTER SIX

IMPLEMENTATION PLANS

PORTAGE MUNICIPAL AIRPORT

AIRPORT MASTER PLAN – PHASE 1

TKDA

IMPLEMENTATION PLANS

INTRODUCTION

The implementation plan provides guidance on how to carry out the preferred development recommendations identified in **Chapter 5: Alternatives Analysis**. The improvement projects needed at the Portage Municipal Airport (C47) over the planning period can be formulated based on the recommendations. Planned future airport development is based on an evaluation of facility needs for the planning period and alternatives analysis completed for the existing airport site.

This chapter includes the following sections:

- Project Sequence
- Financial
- Environmental Review
- Compatibility

BACKGROUND

Each project is sequenced to balance safety deficiencies, sponsor priorities and state/federal approval and funding. The project plan may change over time to react to changing conditions, but is flexible so that the airport can react to changes and re-prioritize projects.

The implementation plan is divided into the following development periods:

- Near-Term (2020 to 2025)
- Mid-Term (2026 to 2030)
- Long-Term / Ultimate (2031 to 2040+)

A more detailed facility implementation and financial feasibility plan is identified for the next 10 years because project needs can be more realistically anticipated based on available funding and sponsor priorities. Only a framework for projects beyond 10 years is discussed in the report.

The community's aeronautical needs cannot reasonably be met at the existing airport site. As such, the City of Portage desires to complete the highest priority safety and maintenance improvements in the near-term while focusing efforts on a replacement airport site as a long-term solution.

This implementation plan is based on completing priority safety and preservation projects over the next 10 years. The existing airport site would need to be preserved until an alternative airport site is built. An airport site selection study is the next step to evaluate potential replacement airport sites.

All planning-level project costs developed are in 2020 dollars. Final project costs are subject to change based on actual construction and project formulation needs.

Many of the projects identified are safety and preservation driven based on the current facility deficiencies and pavement condition. Changes that may occur from the forecasted airport activity may affect the timing of any capacity-driven improvements such as new hangar sites.

A logical development strategy is vital to creating a realistic implementation plan. These considerations for C47 include:

- Maintain a safe airport. Address key safety/security/standards for the existing airport site projects while providing adequate funding for other necessary improvements. Priority near-term projects include updating the Airport Layout Plan, relocating runway ends/thresholds, removing obstructions to Runway 18-36 approaches, and correcting other design deficiencies meet FAA safety standards.
- Maintain airport pavements and facilities in a functional condition while the airport operates at the current site. Priority projects in the near-term include reconstructing most airfield pavements including Runway 18-36, taxiway, apron and taxilanes. This plan assumes preserving Runway 4-22 if Federal funds are available.
- Sequence airport improvement projects considering a realistic funding plan with a mix of federal, state and local funds while considering the grant assurances.

For this implementation plan, projects fall into one of three broad categories:

- **Pavement/Equipment/Facility Maintenance & Preservation (P)** - projects required to meet an anticipated pavement and facility maintenance/replacement schedule to meet functional needs. Many of these projects require completion to maintain and operate the airport facility regardless of demand.
- **Safety/Security/Standards (S)** – projects required to meet existing or projected future FAA design standards and/or other regulatory requirements to provide an adequate level of safety for airport users and the public.
- **Demand/Capacity (D)** – projects required to accommodate increasing number/types of aircraft and passenger movements. Projects are necessary when aviation activity meets anticipated future demand levels. These projects are triggered when activity levels hit a certain threshold.

IMPLEMENTATION SUMMARY

Recommended infrastructure projects are identified in a phased development schedule. Sequencing is based on scheduled improvements, available funding and demand triggers. The actual implementation will vary depending upon federal obligation determination, sponsor priorities, financial, environmental and compatibility considerations and demand. Each project identified requires detailed planning, environmental documentation, design, and construction steps prior to its completion.

Table 6-1 summarizes the recommended development projects and sequencing over the 10-year planning period.

Table 6-1
C47 10-Year Implementation Plan Summary

Map ID	Year	Project Name	Total Cost	FAA Share	State Share	Local Share
Near-Term (0-5 Years)						
A1	*2020*	*Conduct Aeronautical Survey, Update Airport Layout Plan*	*$161,668*	*$145,501*	*$8,083*	*$8,083*
A2	2021	Conduct Airport Site Selection Studies	$500,000	$450,000	$25,000	$25,000
A3	2022	Rehabilitate (Crack Seal) and Restripe Runways 18-36 & 4-22	$100,000	$90,000	$7,500	$2,500
A4	2022	Relocate Runway 18-36 Thresholds//End Lights	$50,000	$0	$40,000	$10,000
T1	2022	Construct Taxiway A1 to New Runway 36 End, Relocate Tie-Downs	$150,000	$0	$120,000	$30,000
A5	2022	Conduct Aeronautical Survey for New Runway Thresholds/Ends	$50,000	$45,000	$2,500	$2,500
T2	2023	Relocate Fuel Facility	$80,000	$0	$64,000	$16,000
Decision Point on New Airport / Action Plan for Existing Airport Site ***Projects That Follow Identify Priority Preservation & Safety Projects at Existing Airport***						
A6	2025	Acquire Land for Runway 18-36 Approach Protection, OFA	$600,000	$0	$480,000	$120,000
A7	2025	Remove Obstructions to Runway 18-36 Approaches	$200,000	$180,000	$10,000	$10,000
T3	2025	Reconstruct Taxilanes D, E, F, G, H	$550,000	$371,250	$130,625	$48,125
T4	2025	Rehabilitate Entrance Road, Parking Lot	$210,000	$189,000	$7,875	$13,125
		Total Short-Term	**$2,651,668**	**$1,470,751**	**$895,583**	**$285,333**
Mid-Term (6-10 Years)						
A8	2026	Reconstruct Runway 18-36, Lighting, Signs	$2,700,000	$2,430,000	$135,000	$135,000
T5	2026	Construct Taxiway A3, Remove Unusable Pavement	$200,000	$180,000	$10,000	$10,000
T6	2026	Reconstruct Taxiway A	$310,000	$279,000	$15,500	$15,500
T7	2026	Reconstruct Apron, Construct Apron Taxilane C	$690,000	$621,000	$34,500	$34,500
A9	2028	Acquire Land for Runway 4-22 Approach Protection, OFA, RVZ	$500,000	$0	$400,000	$100,000
A10	2028	Remove Obstructions to Runway 4-22 Approaches, RVZ	$200,000	$180,000	$10,000	$10,000
A11	2029	Reconstruct & Widen Runway 4-22	$1,400,000	$1,260,000	$135,000	$135,000
		Total Mid-Term	**$6,000,000**	**$4,950,000**	**$675,000**	**$375,000**
		Total 10-Year Planning Period	**$8,651,668**	**$6,420,751**	**$1,570,583**	**$660,333**
		Total Preservation (P) Projects	*$5,960,000*	*$5,240,250*	*$401,000*	*$318,750*
		Total Standards (S) Projects	*$2,691,667*	*$1,180,501*	*$1,169,583*	*$341,583*
		Total Demand (D) Projects	*$0*	*$0*	*$0*	*$0*

Source: TKDA Analysis (2021)
Project Types: Pavement/Equipment/Facility Maintenance & Preservation, Safety/Security/Standards, Demand/Capacity

IMPLEMENTATION PROCESS

The airport must go through an established process to receive the federal funds to complete an airport development project. FAA requires long lead times to complete all project steps and incorporate projects into funding plans. Additional coordination is required to prepare National

Environmental Policy Act (NEPA) environmental documentation. Common steps in the project implementation process for a complex project include:

- Professional Services: Select a qualified consultant for the project planning, environmental reviews, survey, engineering design and construction administration for the project. Separate selection process for planning and engineering services.
- Five (5) Years Prior to Construction: Identify the project on the Airport Layout Plan, complete necessary airport planning studies and collect supporting documentation to demonstrate the project is justified for AIP funding, and is compatible with the Airport Layout Plan.
- Four (4) Years Prior to Construction: Update the Capital Improvement Plan (CIP) to identify the project scope, eligibility, justification, and funding. Close coordination with FAA is required.
- Three (3) Years Prior to Construction: Initiate any aeronautical surveys, non-federal coordination (reimbursable agreements) or special FAA coordination for flight procedures that may be necessary prior to construction. Solidify project funding plan and final justification with FAA.
- Two (2) Years Prior to Construction: Complete required NEPA environmental documentation and analysis for the proposed action. Prepare 25 percent project design, refine cost estimates, and prepare benefit/cost analysis as necessary. Acquire land for project and initiate airspace studies.
- One (1) Year Prior to Construction: Obtain environmental clearance and permits for the proposed action. Prepare detailed project plans and specifications including design report, airspace studies, Safety Management Systems (SMS) and construction safety/phasing plan. Finalize project schedule.
- Year of Construction: Complete final design. Solicit bid proposals from companies engaged in the project construction. Prepare grant application and accept Federal grant. Issue notice to proceed and monitor construction. Maintain FAA grant compliance and payments.
- After Construction: Submit final report and close out the AIP grant.

For complex projects requiring federal discretionary funding such as runway extensions, these steps may take up to five years prior to the issuance of an AIP grant for construction. Less complex projects using entitlements such as pavement rehabilitation will require less lead times, typically no less than three years prior to grant issuance.

PROJECT SEQUENCE

The narrative below describes the overall project sequence strategy. **Table 6-2** describes the major projects within the next 10 years shown graphically in **Figure 6-1** and **Figure 6-2.** Long-term / ultimate projects are described at the end**.**

Near-Term Projects (0-5 Years)

Near-term projects cover the next five years through the year 2025 or PAL 1. Sequencing is based on years because activity and funding can be reasonably anticipated. Projects require steps completed several years ahead of implementation, requiring a solid project and funding plan to be developed.

Projects in this phase address the highest priority safety and preservation needs to maintain a safe airport. The next project to be eligible for State and Federal funding is to **Conduct Aeronautical Survey and Update Airport Layout Plan** in 2021.

The first critical near-term safety project is to **Relocate Runway 18-36 Ends/Thresholds** in 2022 to allow for critical obstruction clearance and **Construct Taxiway A1 to new Runway 36 End** in 2022 allowing access to the new runway end. The **Relocate Fuel Facility** project removes this object from the RPZ in 2023. In 2025, **Land Acquisition for Runway 18-36 Approach Protection** and **Remove Runway 18-36 Obstructions** are completed to clear airport design surfaces from obstructions.

Priority pavement preservation projects include **Rehabilitate and Restripe Runway 18-36, 4-22** in 2022 to extend the useful life of this asset. In 2025, **Reconstruct Taxilanes** and **Rehabilitate Entrance Road & Parking Lot** projects are proposed as these pavements are in poor condition. These projects are needed to maintain basic airport pavement infrastructure and to meet FAA and State airport design standards.

Other projects include **Conduct Airport Site Selection Studies** as soon as 2021 to evaluate new airport site options, identify a preferred airport site, and obtain preliminary site approval from FAA. Additional discussion on this topic is in the Other Considerations section.

Federal entitlement and State funding is proposed for projects in the near term. State funding (as opposed to FAA) is proposed for specific projects such as Land Acquisition to avoid placing perpetual Federal grant obligations upon airport property. There are no aeronautical demand driven projects needed within the near-term planning period.

Mid-Term Projects (6-10 Years)

Mid-term projects cover the beginning of the planning period for the next six to 10 years through 2029, or PAL 2. Project sequencing is still based on years. Although the sequencing can be more fluid than the near-term, mid-term projects can still be reasonably anticipated based on project activity and funding. Projects in this phase may change sequence, however the bulk of the identified projects need to be implemented unless an unforeseen event occurs that changes the basis for the plans developed.

C47 mid-term projects include a mix of preservation and safety driven projects, many of which are for crosswind Runway 4-22. This implementation plan assumes Runway 4-22 is eligible and justified for FAA funding. If Runway 4-22 is ineligible for funding then the airport sponsor may elect to use State funds for improvements, or close the runway. These projects include **Acquire Land for Runway 4-22 Approaches, Remove Runway 4-22 Obstructions**, and **Reconstruct and Widen Runway 4-22** in 2029. These projects are needed to maintain the crosswind runway infrastructure and to meet FAA and State airport design standards.

Other safety projects include **Construct Taxiway A3 and remove Unusable Pavement** in 2026. More significant airfield work is proposed to be grouped in 2026 including **Reconstruct Runway 18-36, Lighting, Signs**, **Reconstruct Taxiway A**, **Reconstruct Apron**, and **Construct Apron Taxilane C.**

The Runway 4-22 reconstruction and widening project will require Federal discretionary or State apportionment funding in the mid-term. State funding (as opposed to FAA) is proposed for land acquisition to avoid placing perpetual Federal grant obligations upon airport property. Runway reconstruction is nationally recognized as a high priority project for FAA funding.

Long-Term Discussion (11-20+ Years)

Long-term projects cover the remainder of the planning period for the next 11 to 20 years through year 2039, or forecasted PAL 3 and 4. Demand driven project sequencing in this phase may change because of variations in aviation activity, new standards, funding programs, or even new local priorities. Long-term projects are important to consider in airport master planning so that appropriate steps, funding, and resources can be allocated beforehand. It also allows the airport to complete actions beforehand without jeopardizing long-term goals.

In the long-term most of the existing airport will meet FAA and State design standards for how the airport is configured, with pavements recently reconstructed. By this time it is presumed the airport sponsor will be proceeding with construction of a new airport site as the existing airport site cannot meet PAL 3 or PAL 4 aeronautical needs. Therefore, no long-term implementation plan is developed in this master plan. Major investments in the existing airport site such as replacing public T-hangars or constructing a new terminal are not recommended at this time.

If the existing airport site remains then a long-term implementation plan will need to be developed. It is anticipated there will be some demand-driven needs. One potential project is the extension of **Taxiway A and Construct Taxilane I** project. Taxilanes will provide access to any new aircraft storage hangars. Preservation projects may include routine pavement rehabilitation (crack seal, seal coat), as well as hangar building rehabilitation or replacement. Safety projects may include perimeter fencing and a parallel taxiway.

Long-term project priorities tend to change over time. It is important however for the airport to identify potential needs and be prepared to react accordingly. Infrastructure preservation projects will continue to be a high priority.

Table 6-2
C47 10-Year Detailed Project Implementation Plan

Map ID	Year	Project Name	Purpose & Justification	Scope	Trigger	Prerequisites/ Environmental	Funding
Near-Term (2020-2025)							
A1	2021	Conduct Aeronautical Survey, Update Airport Layout Plan (ALP)	The Airport Layout Plan is needed to reflect the conclusions of the Airport Master Plan study. An Aeronautical Survey is needed to clearly identify airspace obstructions. An FAA-approved ALP is required to secure FAA funding for future projects.	Acquire aerial imagery, conduct aeronautical survey, update ALP drawing set	Sponsor's approval of preferred alternative Airport Master Plan	Airport Master Plan (Phase 1)	$162,000 (AIP Funding)
A2	2021	Conduct Airport Site Selection Studies	The existing airport cannot satisfy existing and future aeronautical demand at its current location. A feasibility and/or site selection studies are needed to determine if a new airport location is feasible and obtain FAA approval.	Prepare airport feasibility and/or site selection studies, including conducting related field studies	Airport Master Plan, sponsor approval	Project justification	$500,000 (AIP Funding)
A3	2022	Rehabilitate (Crack Seal) and Restripe Runway 18-36 and 4-22	Project will help extend useful life of existing pavement. Projected 2021 PCI ranges from 29 to 69.	Crack repair and seal Runways 18-36 and 4-22, restripe runways	Cracking and deterioration of pavement surface	Approved ALP, environmental clearance, project design	$100,000 (AIP Funding)
A4	2022	Relocate Runway 18-36 Threshold / End Lights	Project is needed to meet several FAA design standards, including clearing the Obstacle Free Zone and FAA approach surfaces of fixed objects	Relocate runway end and threshold lights	Critical airspace obstructions	Approved ALP, environmental clearance, project design	$50,000 (State Funding)
T1	2022	Construct Taxiway A1 to New Runway 36 End, Relocate Tie-Downs	Project is needed to reconfigure the Runway 36 entrance taxiway and aircraft parking apron to meet FAA standards for the new runway end.	Construct pavements to develop Taxiway A1 and relocate apron tie-downs	Approved ALP, relocated RWY 36 threshold	Approved ALP, environmental clearance, project design	$150,000 (State Funding)
A5	2022	Conduct Aeronautical Survey for New Runway Thresholds/Ends	Project is needed to confirm clearance to the FAA approach surfaces of fixed objects	Conduct aeronautical survey, update ALP drawing set	Relocated Runway thresholds	Project design	$50,000 (AIP Funding)
T2	2023	Relocate Fuel Facility	The fuel facility needs to be relocated to meet FAA safety design standards. It is located within the RPZ and is an obstruction to the future Runway 36 entrance taxiway.	Relocate existing AVGAS fuel facility	Approved ALP, relocated RWY 36 threshold	Approved ALP, environmental clearance, project design	$80,000 (State Funding)
Decision Point on New Airport / Action Plan for Existing Airport Site ***Projects That Follow Identify Priority Preservation & Safety Projects at Existing Airport***							
A6	2025	Acquire Land for Runway 18-36 Approach Protection	FAA expects airport sponsor to control land within the RPZ and OFA. Ownership of land will ensure these areas are protected. Additional land rights are also needed to remove airspace obstructions to the FAA approach surface.	Acquire +/- 40 acres of property in fee simple or avigation easement for Runway 18-36	Approved ALP, available funding	Environmental clearance	$600,000 (State Funding)
A7	2025	Remove Obstructions to Runway 18-36 Approach	Project is needed to clear the FAA approach surface to ensure it is clear of obstructions that could be hazardous to the flying public.	Remove +/- 5 acres of natural-growth objects that penetrate the FAA approach surface	Approved ALP	Land acquisition	$200,000 (AIP Funding)

Table 6-3
C47 10-Year Detailed Project Implementation Plan (cont'd)

Map ID	Year	Project Name	Purpose & Justification	Scope	Trigger	Prerequisites/ Environmental	Funding
Near-Term (2020-2025) – cont'd							
T3	2025	Reconstruct Taxilanes D, E, F, G, H	Project is needed to provide another 20 years of design life for taxilanes to function for safe airport operations. Projected 2023 PCI is 0.	Reconstruct Taxilanes D, E, F, G, H (765' x 25')	PCI less than 55	Environmental clearance, project design	$500,000 (AIP Funding)
T4	2025	Rehabilitate Entrance Road & Parking Lot	Project is needed to provide another 20 years of design life to entrance road and parking lot. Pavement condition is poor.	Reconstruct entrance road and parking lot (1,465 SY)	Poor pavement surface condition	Environmental clearance, project design	$210,000 (AIP Funding)
Mid-Term (2026-2029)							
A8	2026	Reconstruct Runway 18-36, Lighting, Signs	Project is needed to provide another 20 years of design life for airfield pavements to function for safe airport operations. Projected 2024 PCI is 56.	Reconstruct Runway 18-36 (3,768' x 60')	Runway 18-36 PCI less than 55	Approved ALP, environmental clearance, project design	$2,700,000 (AIP Funding)
T5	2026	Construct Taxiway A3, Remove Unusable Pavement	Project is needed to provide turnaround / bypass access to Runway 18 end	Construct Taxiway A3 (360' x 25'), Remove pavement	Approved ALP, available funding	Approved ALP, environmental clearance, project design	$200,000 (State Funding)
T6	2026	Reconstruct Taxiway A	Project is needed to provide another 20 years of design life for taxiway to function for safe airport operations. Projected 2024 PCI is 0.	Reconstruct Taxiway A (525' x 25')	PCI less than 55	Environmental clearance, project design	$310,000 (AIP Funding)
T7	2026	Reconstruct Apron, Construct Apron Taxilane C	Project is needed to provide another 20 years of design life for taxilanes to function for safe airport operations. FAA airport design standards will be met. Projected 2024 PCI is 11.	Reconstruct Apron (3,700 SY) and Taxilane C (80' x 25')	PCI less than 55	Approved ALP, environmental clearance, project design	$690,000 (AIP Funding)
A9	2028	Acquire Land for Runway 4-22 Approach Protection, OFA, RVZ	FAA expects airport sponsor to control land within the RPZ, OFA and RVZ. Ownership of land will ensure these areas are protected. Additional land rights are also needed to remove airspace obstructions to the FAA approach surface.	Acquire +/- 20 acres of property in fee simple or avigation easement for Runway 4-22	Approved ALP, available funding	Environmental clearance	$500,000 (State Funding)
A10	2028	Remove Obstructions to Runway 4-22 Approaches, RVZ	Project is needed to clear the FAA approach surface to ensure it is clear of obstructions that could be hazardous to the flying public.	Remove +/- 5 acres of natural-growth objects that penetrate the FAA approach surface and RVZ	Approved ALP	Land acquisition	$200,000 (AIP Funding)
A11	2029	Reconstruct & Widen Runway 4-22	Project is needed provide another 20 years of design life for runway to function. Widening is needed to meet FAA design standards for the design aircraft. Projected 2025 PCI is 15.	Reconstruct Runway 4-22 (2,510' x 60') and turnarounds	PCI less than 55	Environmental clearance, project design	$1,400,000 (AIP Funding)

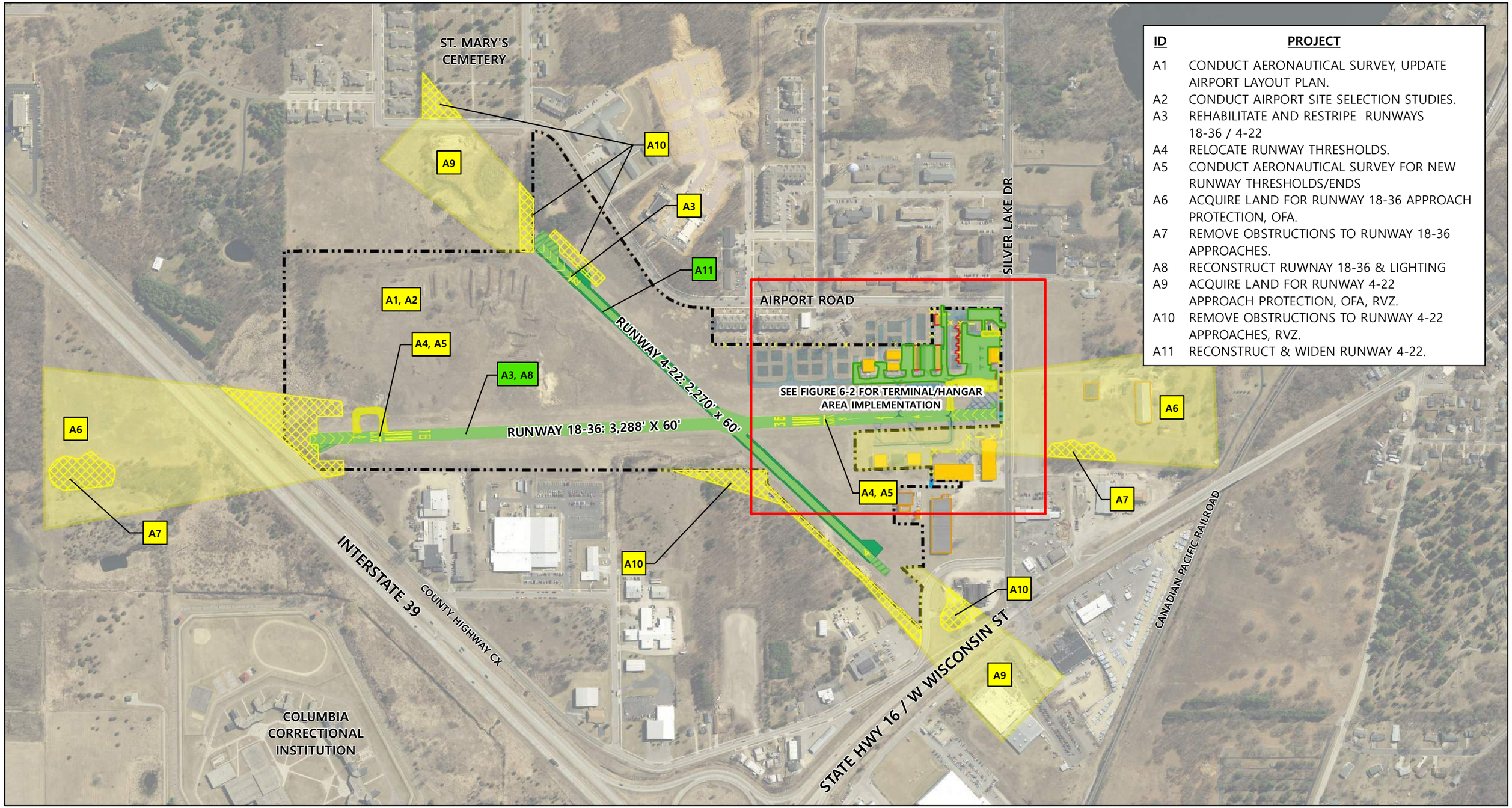
Source: TKDA Analysis (2020); Project Types: Pavement/Equipment/Facility Maintenance & Preservation, Safety/Security/Standards, Demand/Capacity

FIGURE 6-1: AIRFIELD IMPLEMENTATION PLAN (SHORT/MID-TERM)

PORTAGE MUNICIPAL AIRPORT (C47)

MASTER PLAN STUDY

PORTAGE, WI



ID	PROJECT
A1	CONDUCT AERONAUTICAL SURVEY, UPDATE AIRPORT LAYOUT PLAN.
A2	CONDUCT AIRPORT SITE SELECTION STUDIES.
A3	REHABILITATE AND RESTRIPE RUNWAYS 18-36 / 4-22
A4	RELOCATE RUNWAY THRESHOLDS.
A5	CONDUCT AERONAUTICAL SURVEY FOR NEW RUNWAY THRESHOLDS/ENDS
A6	ACQUIRE LAND FOR RUNWAY 18-36 APPROACH PROTECTION, OFA.
A7	REMOVE OBSTRUCTIONS TO RUNWAY 18-36 APPROACHES.
A8	RECONSTRUCT RUWNAY 18-36 & LIGHTING
A9	ACQUIRE LAND FOR RUNWAY 4-22 APPROACH PROTECTION, OFA, RVZ.
A10	REMOVE OBSTRUCTIONS TO RUNWAY 4-22 APPROACHES, RVZ.
A11	RECONSTRUCT & WIDEN RUNWAY 4-22.

PROJECT TYPE

- Preservation/Maintenance
- Safety/Standards
- Capacity/Demand

0 250 500 1,000 Feet

PORTAGE WISCONSIN

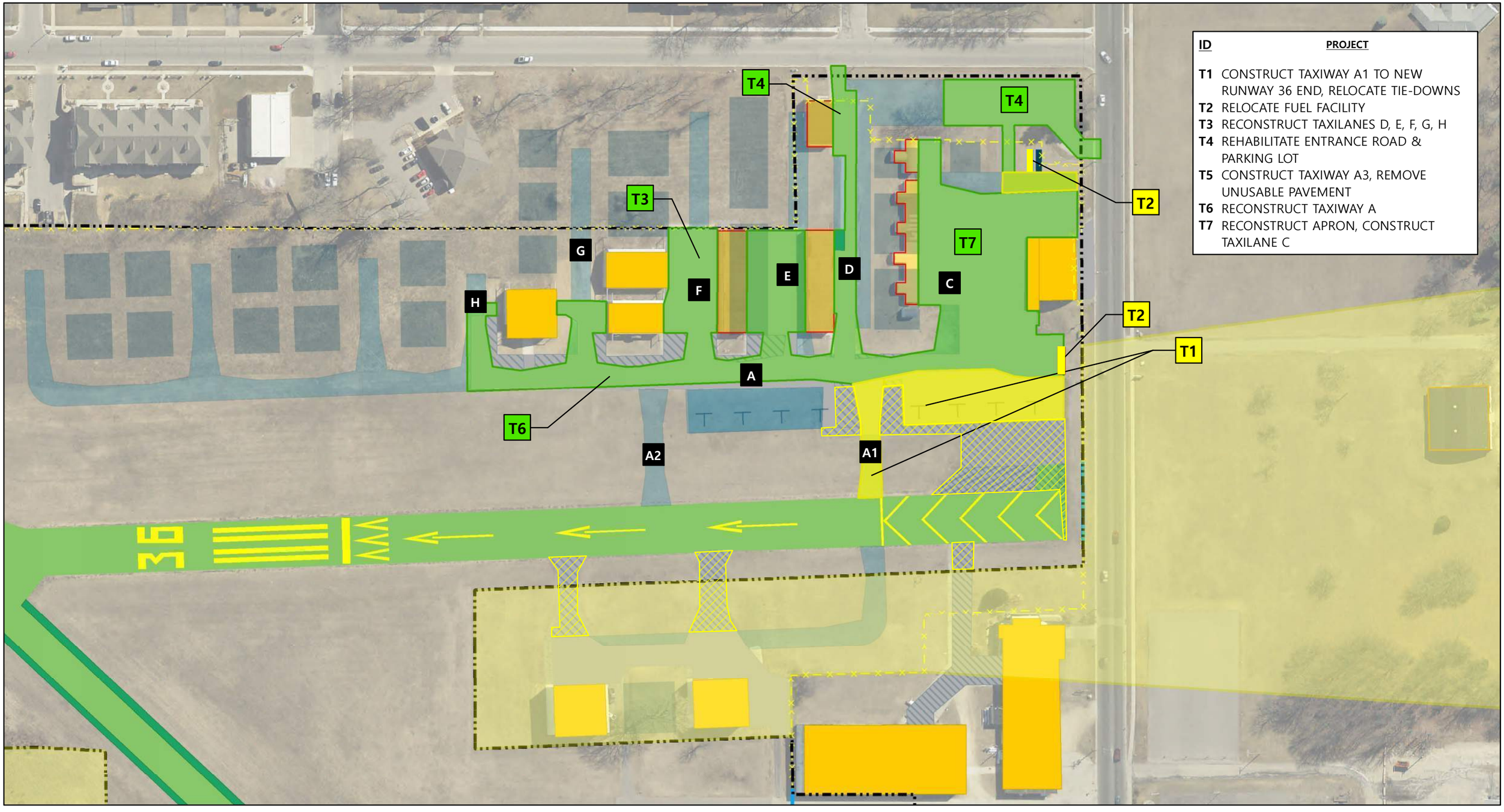
TKDA

FIGURE 6-2: TERMINAL/HANGAR AREA IMPLEMENTATION(SHORT/MID-TERM)

PORTAGE MUNICIPAL AIRPORT (C47)

MASTER PLAN STUDY

PORTAGE, WI



ID	PROJECT
T1	CONSTRUCT TAXIWAY A1 TO NEW RUNWAY 36 END, RELOCATE TIE-DOWNS
T2	RELOCATE FUEL FACILITY
T3	RECONSTRUCT TAXILANES D, E, F, G, H
T4	REHABILITATE ENTRANCE ROAD & PARKING LOT
T5	CONSTRUCT TAXIWAY A3, REMOVE UNUSABLE PAVEMENT
T6	RECONSTRUCT TAXIWAY A
T7	RECONSTRUCT APRON, CONSTRUCT TAXILANE C

PROJECT TYPE

- Preservation/Maintenance
- Safety/Standards
- Capacity/Demand

N

0 60 120 240 Feet

PORTAGE WISCONSIN

TKDA

OTHER CONSIDERATIONS

Airport Site Selection

An airport site selection study prepares the necessary analysis to identify a preliminary new airport site. A site selection study requires a completed FAA-approved feasibility study to support a replacement airport. The site selection study must include the following elements:

- Airspace determination
- Site utility evaluation
- Preliminary environmental findings
- Public hearing testimony
- Other pertinent factors

The study begins with a clear statement of need, which for Portage can be derived from the analysis completed in this Master Plan. It then evaluates airport sites considering aeronautical, environmental and financial requirements. A short-list of airport sites is developed and the Sponsor selects the recommended site. The rationale for discarding other sites and reasons for recommending the preferred site should be well documented. A public hearing is highly recommended. FAA will then provide preliminary approval of disapproval of the preferred site, which is required to receive FAA funding for a new airport site.

Work beyond the site selection study such as detailed site planning (e.g. Master Plan and ALP) and environmental studies (e.g. Environmental Assessment / Environmental Impact Statement) may not occur until the site has received preliminary approval by the FAA. Final FAA approval for a new airport site may be granted after a favorable environmental determination and an approved ALP.

This implementation plan for the existing Portage airport site may need to be revised based on the outcome of an airport site selection study.

Federal Grant Assurances

Airport sponsors must agree to certain conditions (obligations) when accepting financial assistance (grants) from FAA. The duration of the obligations depends on the type of project, useful life of the facility being developed, and other conditions.

According to FAA, the Portage Municipal Airport is obligated because it has accepted three Airport Improvement Program (AIP) grants. All the grants are beyond their useful life as of May 2020. As such, the airport must abide by Exclusive Rights, Airport Revenue, Civil Rights, and Disposal of Land grant assurances. The duration and applicability of grant assurances for airport sponsors per the FAA AIP Handbook is shown in **Exhibit 6-1**.

Exhibit 6-1
Duration and Applicability of FAA Grant Assurances

Assurances that…	Include (by assurance # if applicable)…
a. Must be met before a grant is offered	#2 Responsibility and Authority of the Sponsor #3 Sponsor Fund Availability #4 Good Title #6 Consistency with Local Plans #7 Consideration of Local Interest #8 Consultation with Users #9 Public Hearings #12 Terminal Development Prerequisites
b. Apply until the grant is closed	#1 General Federal Requirements (except for 49 CFR part 23) #10 Air and Water Quality Standards #14 Minimum Wage Rates #15 Veteran's Preference #16 Conformity to Plans and Specifications #17 Construction Inspection and Approval #18 Planning Projects #32 Engineering and Design Services #33 Foreign Market Restrictions #34 Policies, Standards, and Specifications #35 Relocation and Real Property Acquisition
c. Apply for three years after the grant is closed	#13 Accounting System, Audit, and Record Keeping Requirements #26 Reports and Inspections

Assurances that…	Include (by assurance # if applicable)…
d. Apply for the useful life of the project (not to exceed 20 years from the grant acceptance date) except in the case of a land acquisition grant, for which the useful life is indefinite and the assurance obligations do not expire.	#5 Preserving Rights and Powers #11 Pavement Preventive Maintenance (This applies to all of the airfield pavement on the airport, not just the specific pavement in the grant.) #19 Operations and Maintenance #20 Hazard Removal and Mitigation #21 Compatible Land Use #22 Economic Nondiscrimination #24 Fee and Rental Structure #27 Use by Government Aircraft #28 Land for Federal Facilities #29 Airport Layout Plan #36 Access by Intercity Buses #37 Disadvantaged Business Enterprises (See 49 CFR parts 23 and 26, since certain program requirements may extend the obligation beyond the 20 year period, while the DBE requirements for the project apply until the project is closed.) #38 Hangar Construction #39 Competitive Access
e. Last for as long as the airport is owned and operated as an airport	#23 Exclusive Rights #25 Airport Revenue #30 Civil Rights #31 Disposal of Land

The City of Portage has been sensitive to further obligating airport property because the airport may have challenges in meeting grant assurances. The following potential scenarios were evaluated to determine their effect on airport grant assurances:

- Improve Airport: Accepting Federal funds for airport improvement projects except land acquisition would extend grant obligations for up to 20 years after acceptance of an airport improvement grant, depending on the useful life of the improvement. The useful life varies but is typically 10 years for equipment or 20 years for infrastructure construction or reconstruction, 40 years for buildings, and unlimited for land. Obligations are identified in group (c) and (e) of Figure 6-1. One key assurance is to operate and maintain the airport for 20 years from the date of accepting funds for pavement reconstruction, for example.
- Acquire Land: Accepting Federal funds for land acquisition triggers grant obligations identified in group (c) and (e) of Figure 6-1 that do not expire. One key assurance is to operate and maintain the airport.
- Relocate & Replace Airport: Accepting Federal funds to relocate an airport triggers the same grant obligations as improving the airport or acquiring land. The proceeds from the sale of the existing airport property and facilities would be used to construct the new airport consistent with FAA policy. Existing grant obligations are transferred to the replacement airport.
- Close Airport: Closing an airport in the federal National Plan of Integrated Airport Systems (NPIAS) requires a formal sponsor request and FAA approval. The FAA Associate Administrator of Airports is the FAA's approving official for an airport sponsor's request to be released from its federal obligations. FAA will consider the airport closure's public benefit to civil aviation. At this time the City of Portage is not contractually obligated by previous grant agreements to operate C47 as an airport. The useful life of federally funded improvements at Portage has expired, so no funds would need to be repaid to FAA at this time. Closed airport land would not be obligated after FAA approval.

The implementation plan as prepared in this Airport Master Plan study would require the City of Portage to operate an airport for 20 years after acceptance of a grant for pavement construction or reconstruction, or year 2049. No land is proposed to be acquired with Federal funds to avoid obligating the airport indefinitely.

More information on Airport Compliance can be found in FAA Order 5190.6B, *FAA Airport Compliance Manual.*

FINANCIAL

The implementation plan considers the airport's ability to fund the projects identified in this planning study. Projects in the near-term and mid-term are discussed in more detail for realistic project sequencing based on identified needs, airport priorities and available funding. Financial

feasibility is a major consideration in developing the implementation plan and Capital Improvement Plan (CIP).

Airport capital improvement funding is derived from many sources. Funding sources are categorized into three main categories:

- Federal funding
- State funding
- Local or Private funding

A realistic project implementation plan must consider financial resources. This financing strategy identifies the plan to provide sufficient federal, state and local funding for future airport improvements. Projected funding sources are based on current legislation.

Federal Funding

Federal Airport Improvement Program (AIP) funding is proposed for most of the airport improvements proposed at C47. Accepting Federal funds triggers various grant assurances (see previous discussion).

Funding Programs

Most funding for airport development comes from the Airport Improvement Program, commonly referred to as AIP, managed by the FAA. FAA can issue grants for airport planning and development in the United States. Revenue for AIP is drawn from the Airport and Airway Trust Fund, commonly referred to as the Trust Fund. A variety of revenue sources in the aviation industry funds the Trust Fund, including a domestic ticket taxes/fees and fuel taxes.

The Airports Capital Improvement Plan (ACIP) is the basis for distributing grant funds under AIP. The ACIP is the tool to identify, prioritize, and assign funds to airports to meet FAA goals and objectives. One tool for prioritizing airport development is the National Priority System (NPS), where each project is assigned a National Priority Rating (NPR) from 0 to 100. Projects are assigned an NPR value based on the airport type, as well as the project purpose, component, and type to meet the overall development objective. Each year a threshold priority rating is identified based on availability of AIP funds. Other factors can also be considered for projects that meet goals and objectives but do not meet threshold priority ratings. More information on this system is in FAA Order 5090.5, *Formulation of the National Plan of Integrated Airport Systems (NPIAS) and the Airports Capital Improvement Plan (ACIP).*

The current AIP is authorized under the FAA Reauthorization Act of 2018 through September 30, 2023 with funding levels of $3.35 billion each year. Additional project funding may also be available through supplemental appropriations from the General Fund. This implementation plan assumes AIP funding is available per current authorization for planning purposes. A project must be eligible, reasonable and justified for AIP funds to be released for a project. In general, AIP funding is distributed in the following categories for C47.

Funding Administration

Federal AIP funding in Wisconsin is overseen and administered by the Wisconsin Department of Transportation, Bureau of Aeronautics (WBOA). The State of Wisconsin has a Block Grant Agreement with FAA. The FAA provides federal aid grants to Wisconsin in two ways:

1. Individual grants to primary commercial service airports, and
2. A block grant to the department

The department then administers the funds to construct projects at eligible non-primary airports. Wisconsin is on of ten states that receive federal financial aid through the federal block grant program. Out of a total of $57.1 million distributed to Wisconsin airports, WBOA received $30.4 million in block grant funds in 2019 to distribute to non-primary airports.

Non-Primary Entitlements

When $3.2 billion or more AIP is appropriated in a fiscal year, 20% of the funds are allocated as non-primary entitlements (NPEs). Eligible airports include those in the National Plan of Integrated Airport Systems (NPIAS) not receiving primary passenger or cargo entitlements. Airport sponsors with airport development needs receive $150,000 in NPEs annually, and must use NPE funds for eligible and justified projects within four years. The City of Portage receives $150,000 in NPEs per year and currently has an NPE balance of $750,000. The airport sponsor is owned $381,000 in future years from entitlement transfers.

State Apportionment

State apportionment are AIP funds allocated to states based on an area/population formula after NPEs are distributed. These funds are generally limited to non-primary commercial service and general aviation airports. Wisconsin received approximately $4 million in state apportionment funding in 2020. Traditionally, these funds are used to fund GA projects that have a lower NPR score such as aprons.

Discretionary

The remaining AIP funds after entitlements and administrative expenses is considered discretionary. Historically discretionary funds have been about 50 percent of the total AIP program. In 2019, $1.54 billion in discretionary grants issued nationwide and $27.7 million distributed in Wisconsin including supplemental funding. Typically, discretionary funding is used for higher priority AIP funded projects where entitlements are not sufficient to cover the total federal share.

After set asides for noise & environmental and military airport program projects, at least 75 percent of the remaining discretionary funds are used for capacity, safety, security and noise compatibility projects at primary and reliever airports. The remaining 25 percent, known as pure discretionary funds, may be used for any eligible project at any airport, as determined by the FAA. A large portion of discretionary funds is also derived from unused entitlement funds in a fiscal year converted for discretionary use.

The FAA's Small Airport Fund is a set aside amount to ensure a required amount of discretionary funding is distributed to small airports nationwide. FAA requires a minimum of two-

sevenths of 87.5% of medium and large hub airport entitlement funds be used as discretionary funding at general aviation and reliever airports.

Discretionary projects are ranked on the FAA's NPR scale per FAA Order 5090.5. The highest ranked projects ready to commence are typically funded first. Examples of high priority projects include runway rehabilitations and obstruction removal. FAA uses this ranking system as one consideration to select discretionary projects that benefit the national airspace system.

While projects may be eligible for discretionary funding, the availability of discretionary funding cannot be predicted with any degree of certainty. Assignment of discretionary funds to an AIP project depends on a variety of factors, including total funding availability, entitlement conversions, national priorities, and project justification.

Supplemental Appropriations

In March 2018, the President signed legislation that provided the FAA AIP with an additional $1 billion in discretionary grants through Federal Fiscal Year (FFY) 2020. The legislation stipulated that priority consideration shall be granted to projects at: (a) non-primary airports that are classified as Regional, Local, or Basic airports and not located within a Metropolitan Statistical Area (MSA) or Micropolitan Statistical Area (MiSA) as defined by the Office of Management and Budget; or (b) primary airports that are classified as Small or Non-hub airports. C47 is a Local airport and is located in the Madison MSA. Nearly $265 million in supplemental discretionary funds were distributed in 2019.

In March 2020, the Coronavirus Aid, Relief, and Economic Security (CARES) Act (H.R. 748, Public Law 116-136) was signed into law by the President. This allowed for $10 billion in funds to be awarded as economic relief to eligible U.S. airports affected by the prevention of, preparation for, and response to the COVID-19 pandemic. Subsequent coronavirus-related relief bills have also been passed since providing additional funding for airports.

The CARES Act and subsequent actions provide funds to increase the federal share to 100 percent for Airport Improvement Program (AIP) and supplemental discretionary grants already planned for fiscal year 2020 and 2021. Under normal circumstances, AIP grant recipients contribute a matching percentage of the project costs. Providing this additional funding and eliminating the local share will allow critical safety and capacity projects to continue as planned regardless of airport sponsors' current financial circumstances.

Under this new legislation, General aviation airports will receive additional funds based on their airport categories, such as National, Regional, Local, Basic and Unclassified to be used to help offset additional costs and reduced revenues resulting from the pandemic. C47 is eligible to receive these funds.

Federal Share of Project Funding

Federal AIP funds typically do not cover the entire cost of an airport development project. Although there are some exceptions, the current legislation limits the federal share of allowable AIP costs at 90% for most non-hub primary or smaller airports. The remaining 10% is considered the local share. In Wisconsin, the State currently provides a 5% match with all AIP funds leaving the airport sponsor with the remaining local share. The 2020 CARES Act and

subsequent legislation temporarily increases the FFY 2020 and 2021 Federal AIP share to 100%.

Proposed Funding Plan

Airport entitlement funding alone is not sufficient to meet the projected needs at the airport. While maximizing the projected entitlement funding available to C47, FAA non-primary entitlements will only fund 21% of the proposed improvements through the next 10 years. Airport entitlements will be utilized to fund AIP-eligible projects, particularly critical maintenance, safety, and capacity enhancements. Federal discretionary or State apportionment funding is anticipated to fund about 53% of the cost of airport improvement projects in the next 10 years.

A summary of total FAA eligible funding needs is outlined in **Table 6-4** with a summary of specific Federal funding needs in **Table 6-5**.

Table 6-4
FAA Eligible Funding (2021-2030)

Years	Total Cost	FAA Non-Primary Entitlement	Additional Federal Funding	Other Funding (State or Local)
Near-Term: 2021-2025	$2,651,668	$1,470,751	$0	$1,180,917
Mid-Term: 2026-2030	$6,000,000	$1,040,249	$3,909,751	$1,050,000
Total	**$8,651,668**	**$2,511,000**	**$3,909,751**	**$2,230,917**
% of Total	*100.00%*	*29.0%*	*45.2%*	*25.8%*

Source: TKDA Analysis (2020)

Federal discretionary or state apportionment funding will be needed to fund the highest priority projects at the airport. These projects cannot be completed with non-primary entitlement funds alone.

FAA Discretionary or Apportionment funding of over $3.3 million is needed in 2026 to complete Runway 18-36, Taxiway A, and apron reconstruction projects in the mid-term at C47. Additional discretionary or state apportionment funds are expected to be needed in 2029 to reconstruct and widen Runway 4-22, if the project remains eligible for AIP funds. FAA's preference is to combine entitlement and discretionary funds on high priority projects.

Table 6-5
C47 Federal Discretionary or State Apportionment Funding (2020-2029)

Year	Project	Total Cost	FAA Discretionary or Apportionment	Ability to Compete for FAA Funding
2026	Reconstruct Runway 18-36	$2,700,000	$1,870,000	High
2026	Reconstruct Taxiway A3	$200,000	$180,000	Medium
2026	Reconstruct Taxiway A	$310,000	$280,000	High
2026	Reconstruct Apron	$690,000	$621,000	Medium
2029	Reconstruct, Widen Runway 4-22	$1,400,000	$960,000	Medium
	TOTAL	**$5,300,000**	**$3,911,000**	**-**

Source: TKDA Analysis (2020)

The next airport master plan update should refine additional project funding needs.

State Funding

WBOA is responsible for assisting in the development of a system of airports to support the aviation needs of the state. WBOA matches funding to not greater than the local share on AIP funded projects for NPIAS airports. Currently the State match on AIP projects is 5%. This funding source has been factored into future AIP-funded projects at C47.

Additional funding opportunities for airport improvements that do not involve federal financial aid are also available through the WBOA. Eligible airside and landside development are funded at 80% by the WBOA, with 50% funding of some planning projects such as airport zoning. Hangar buildings are not eligible for State funding. Historically, Wisconsin has distributed over $12.6 million in airport development grants annually to airports statewide. Additional project earmarks have occurred for specific airport projects.

This funding source is recommended for lower priority or non-AIP eligible projects. In addition, State funding is recommended at Portage for land acquisition to avoid triggering additional grant assurances to airport property. **Over $1.5 million in State funding is identified in the near-term at C47**, making up about 18% of the total near-term funding needs.

Local Funding

The airport operating fund will be used in part to fund a portion of the local share of capital improvement projects. C47 collects revenue from hangar rent and fuel sales. Additional funding from the city's General Fund or other sources may be needed to accomplish the implementation plan. Budgeting for significant capital improvements is critical to allow the airport to have sufficient funds to cash flow projects and provide a local matching share. Bonds are an option for debt financing, which are backed by the creditworthiness and taxing power of the municipality.

A local funding plan is needed to fund significant upcoming near-term airport improvements. Projects will require $33,000 in 2021, $61,500 in 2022 and $191,250 in 2025 to match Federal and State grants. Total local share is estimated at 7.6% percent of the overall 10-year project capital improvement costs.

Additional funding sources include the United States Department of Agriculture (USDA). USDA offers rural development grants to communities. Funds can be used to purchase, construct, and/or improve essential community facilities, purchase equipment and pay related project expenses. The maximum share of the project is 55% for a community having a population of 12,000 and fewer.

Wisconsin Economic Development Corporation (WEDC) also offers various grant programs for communities. One such program is the Capacity Building Grant which supports local and regional economic development in Wisconsin.

Columbia County Economic Development Corporation also offers a revolving loan fund with below market rates to support economic development and job creation in the community. Other local funding can come from private donations from the business community.

In summary, there is a total local funding need of over $660,000 to provide the local match the identified airport improvements through year 2029.

Capital Improvement Plan (CIP)

The airport's CIP is the culmination of the implementation plan. This is a separate document specifically listing the planned airport projects and funding. The airport updates the official airport CIP annually, and submits the document to the State. The CIP identifies the project title, year, estimated costs, and anticipated funding shares for airport improvements. Larger projects are often divided into smaller elements that reflect how projects are approved, designed, and constructed. Funding for each project is requested through a separate project programming and grant application process. The CIP is required to receive Federal and State grant funding.

The proposed updated C47 CIP identifies over $8.6 million in airport improvements over the next 10 years. WBOA should work with the City of Portage to update the CIP accordingly.

ENVIRONMENTAL REVIEW

Introduction

FAA AC 150/5070-6B, Airport Master Plans identifies a planning-level environmental review as one of the elements of effective planning. The purpose behind this element of the airport master planning process is to help the airport sponsor thoroughly evaluate environmental impacts of airport development alternatives, and to provide information for subsequent environmental processing. Key environmental considerations for future development at C47 were identified in **Chapter 5: Alternatives Analysis** based on the existing conditions described in **Chapter 2: Airport Inventory**.

This environmental review section is not intended to fulfill the requirement of environmental review required by National Environmental Policy Act (NEPA) or provide a definitive class of action determination for the proposed improvements. The purpose of this environmental review is to provide community, airport sponsor, and regulatory awareness of the importance of minimizing the environmental impacts to this airport improvement area and to provide a general indication of the likely need for further investigation. Appropriate environmental documentation in accordance with FAA Order 5050.4B, NEPA Instructions for Airport Actions and FAA Order 1050.1F, Environmental Impacts: Policies and Procedures is required to be completed prior to commencing with project actions.

Review Categories

Every Federal action requires an environmental review per NEPA. Actions shall be thoroughly evaluated and coordinated with resource agencies during the environmental review phase. Impacts from the proposed action should be avoided whenever possible, otherwise minimized, or mitigated as a final option. Federal actions fall into one of three types of class of actions:

- **Categorical Exclusion (CATEX):** This environmental documentation is used for actions that do not normally require an Environmental Assessment (EA) or Environmental Impact Statement (EIS), because they do not individually or cumulatively have a

significant effect on the human and/or natural environment. Documentation required includes either simple documentation or the completion of a checklist with supporting documentation certifying that the action will not exceed any environmental impact thresholds.

- **Environmental Assessment (EA):** Typical actions that require an EA are those that are not categorically excluded or actions that may result in impacts to extraordinary circumstances. EA documentation includes an analysis of the proposed action, alternatives, and the anticipated impacts from the proposed action. Agency review and coordination is required. The decision document proceeded after this analysis if no significant impacts are determined is a Finding of No Significant Impact (FONSI) issued by FAA, which is typically valid for three years.
- **Environmental Impact Statement (EIS):** Actions that require an EIS include those that will have a significant impact to the quality of the human and/or natural environment. An EIS may also be triggered if an EA concludes that the project will have a significant impact. The document is published once a decision has been made on the alternative (typically the alternative that achieves the actions goals but has the least impacts) to move forward with is a Record of Decision (ROD). The EIS is valid for a period of three years.

Environmental Categories

Descriptions of potential impacts associated with the proposed Master Plan improvements are discussed by the impact categories identified in FAA Order 1050.1F. Additional consultation area is required during the environmental review phase of the project action.

Impact categories that will likely be unaffected by the proposed airport improvements identified in this study include:

- **Air Quality** – Columbia County is not classified as a non-attainment area. The improvements identified are not anticipated to cause pollutant concentrations to exceed Clean Air Act standards.
- **Climate** – The improvements identified are not anticipated to have a significant effect on greenhouse gas emissions.
- **Coastal Resources –** The airport is not located near a coastal zone.
- **Children's Environmental Health and Safety Risks** – Airport improvements do not have the potential to lead to a disproportionate health or safety risk to children.
- **Environmental Justice** – The proposed airport actions do not have the potential to lead to disproportionately high or adverse impact to low income or minority populations.
- **Farmlands** – The airport sponsor does not use airport property for agricultural production, and there are no high concentrations of prime farmlands on the airport.
- **Floodplains** – No floodplains exist within or in close proximity to the proposed airport development areas.

- **Natural Resources and Energy Supply** – The proposed airport improvements are not anticipated to have the potential to exceed available or future supplies of natural or energy resources.
- **Noise and Noise-Compatible Land Uses** – Forecasted operations on the existing airport site are not expected to exceed a potential impact threshold of 90,000 propeller-driven aircraft or 700 turbojet-driven aircraft.
- **Section 4(f)** – The proposed projects are not expected to impact the constructive use of any nearby public lands.
- **Socioeconomic** – Future on-site airport development is not anticipated to disrupt economic development, community development, or traffic patterns.
- **Visual Resources** – Airport development is not anticipated to significantly affect the visual character of the area.
- **Wild and Scenic Rivers** – There are no existing or known proposed wild and scenic river designations near the Airport.

Airport improvements have the potential to affect the environmental categories listed below.

Biological Resources

The Northern Long Eared Bat is a federally designated endangered species statewide. The presence of this mammal should be confirmed prior to any tree removal action.

There are six endangered, threatened and special concern species of plants and animals identified in Columbia County by the United States Fish and Wildlife Services (USFWS). A request to DNR to search the Wisconsin Natural Heritage Information System (NHIS) should be completed before each proposed action to determine any potential adverse effects to biological resources. Field studies should be completed as needed in areas with projects that may affect existing biological resources habitats such as new taxiways or tree removals.

Hazardous Materials, Solid Waste, Pollution Prevention

Potential impacts to consider in this category include addressing a nearby contaminated site, producing appreciably different hazardous waste than local resources can accommodate, or other related actions that adversely affect human health.

According to the Wisconsin DNR the Mael Airport Property located adjacent to the airport to the west (Lot 3) is listed as an open environmentally contaminated site (ID #111049840). Impacts include a contaminated private well, groundwater contamination, and soil contamination. Though this property is not currently owned by the airport, but it is scheduled to be granted to the City of Portage.

In addition, some land is proposed to be acquired for the airport in fee simple within the OFA near the contamination site. Completing an Environmental Site Assessment (ESA) prior to airport land acquisition is required with Federal funds and recommended otherwise. This study will review any potential environmental liabilities for the city and identify any cleanup actions.

Historical, Architectural, Archaeological and Cultural Resources

Section 106 of the National Historical Preservation Act (NHPA) needs to be addressed for each federally funded action. Airport development with Federal funds will require a literature search and field investigation to confirm no significant cultural resources exist at the airport that may be impacted by development projects. Those projects with grading components such as new pavements have the potential to disturb these resources, if they exist.

Properties 50 years or older are eligible for inclusion into the national register of historic places. The main hangar and T-hangar are believed to be over 50 years old and would require further studies to determine if these structures have any significant historic value and would be affected by new airport development. The T-hangars ultimately are identified for replacements.

No known archaeological or cultural resources studies have been completed on airport property to determine if there is a potential for impacts.

Land Use

There are several existing land uses not compatible with FAA airport design standards that may require on- or off-airport mitigation. Land needs to be acquired within the FAA Runway Object Free Area and Runway Protection Zone in the near-term to ensure FAA standards can be met. In addition, a Height Limitation Zoning Ordinance and Airport Zoning Ordinance are recommended needed to meet FAA and State land use compatibility standards to help prevent future airport-incompatible land uses. Each of these actions will have impacts to existing and future land use around the airport.

Light Emissions

The near-term Runway 18-36 reconstruction and lighting project may result in the installation of new visual and instrument lighting to serve the existing runway. Impacts are possible but not likely from Runway End Identifier Lights (REILs) to Runway 36 because they would be located at the displaced threshold more than 900 feet from the runway end and partially blocked by existing airport buildings. This project may result in impacts to proposed mixed-use development located 500 feet southeast of the Runway 36 end. Light blocking mitigation from the receptor in the form of baffles or trees may be needed to mitigate new visual impacts from the proposed lighting project.

Wetlands

The National Wetland Inventory (NWI) and Wisconsin Wetland Inventory show a complex of freshwater emergent and forested/shrub wetlands on the north portion of the airport property surrounding the Runway 18 end. The proposed Runway 18 turnaround taxiway as well as obstruction removal may be located within these areas. Permanent or temporary wetland impacts may result from project construction. A field delineation should be completed to confirm the presence of wetlands in any of the proposed project areas, as well as a jurisdictional determination.

US Army Corp of Engineers (USACE) coordination is required for wetland impacts of 0.1 acres or more. Projects related to runway construction may be reviewed by the USACE under the

Transportation General Permit if impacts are less than 0.5 acres. Impacts of 0.5 acres or more require an Individual Permit and trigger an EA. A Wisconsin DNR General Permit may also be required for wetland impacts greater than 10,000 square feet (0.23 acres). Pre-construction agency coordination is required in any environmental review process.

Surface Water & Groundwater

All construction activities will need to comply with the Wisconsin Pollutant Discharge Elimination System (WPDES) to protect surface and groundwater from the proposed action impacts. Permit(s) may be needed from Wisconsin DNR for construction storm water runoff. All analysis and documentation needed for these proposed activities need to meet EPA and State requirements. Any new fueling or deicing activities would require a WPDES permit as well. In addition, any new drainage basins need to be designed to be free of standing water within 48 hours of the design storm to meet FAA wildlife attractant standards.

NEPA Documentation & Reviews

Table 6-6 has been prepared to document the potential anticipated environmental documentation and reviews necessary to proceed with the proposed actions based on the preliminary environmental evaluation completed in this section for anticipated projects within the next 10 years. This table gives a general indication of the need for further environmental analysis for projects identified in the implementation plan. Additional environmental investigation is necessary to determine possible impacts associated with the improvement area. At the appropriate time, WBOA would decide whether, and to what extent, additional investigations need to be performed. Multiple proposed actions may be combined into a single EA. Extraordinary circumstances (e.g. adverse effect on cultural resources) may also trigger an EA. All environmental reviews must be completed prior to completing project design beyond 25%.

Table 6-6
C47 Environmental Documentation (2021-2030)

Proposed Action(s)	Anticipated Environmental Documentation	Impact Categories Requiring Additional Review
Rehabilitate Runways	Documented CATEX	*None Anticipated*
Relocate Fuel Facility	Documented CATEX	Groundwater
Acquire Land for Runway 18-36	Documented CATEX	Cultural Resources, Hazardous Materials
Remove Runway 18-36 Obstructions	Documented CATEX	Biotic Resources, Cultural Resources
Reconstruct Taxilanes	Documented CATEX	*None Anticipated*
Reconstruct Entrance Road	Documented CATEX	*None Anticipated*
Reconstruct Runway 18-36, Lighting	Documented CATEX	Cultural Resources, Light Emissions, Wetlands
Reconstruct Taxiway A	Documented CATEX	*None Anticipated*
Reconstruct Apron	Documented CATEX	*None Anticipated*
Acquire Land for Runway 4-22	Documented CATEX	Cultural Resources, Hazardous Materials
Remove Runway 4-22 Obstructions	Documented CATEX	Biotic Resources
Reconstruct & Widen Runway 4-22	Documented CATEX	*None Anticipated*
Construct Taxiway A1	Documented CATEX	*None Anticipated*

Source: TKDA Analysis (2021)

COMPATIBILITY

Overview

Airports are community assets providing significant benefits. They facilitate the movement of people, goods, and services, promote tourism and trade, stimulate business development, and support a variety of jobs.

The objective of land use planning is to guide on-airport and off-airport land use development to be compatible with airport operations. The airport directly controls on-airport compatible land uses to primarily serve aeronautical activities. The airport may not directly control off-airport land uses. Surrounding land uses compatible with airports typically include those uses that can co-exist with a nearby airport without either constraining the safe and efficient operation of the airport or exposing people working or living nearby to unacceptable levels of noise or safety hazards. Compatible land use also considers minimizing potential hazards to aircraft and the flying public. The impact of airport planning decisions extending well beyond the airport property line must be considered.

Land use planning around airports is important to airports and communities for several reasons:

- **Safety** - Compatibility is needed to maintain safety of the public on the ground and in the air. Risk should be reduced to an acceptable level. The airport must also maintain operational utility within identified safety and risk criteria.
- **Airport Utility** - Land uses around airport should provide the airport so that there are not undue restrictions placed on the airport's existing or planned future arrival and departure

procedures. Opportunities for future development identified in the Airport Master Plan and shown on the FAA-approved Airport Layout Plan should be considered.

- **Human Environment** - Balancing the human environment with airport operations is important to maintain an acceptable level of airport impacts (i.e. noise and visual exposure) with the surrounding community.
- **Economic Development** – Operational restrictions placed on the airport because of land use compatibilities have the potential to have a trickle-down effect on the community. This reduces the community's ability to accommodate the aviation needs of the public and local businesses, thus limiting economic development opportunities.

Incompatible land uses are one of the largest issues facing airports today, often resulting in conflicts between airports and their communities. They also may result in airport operational and project funding implications in certain situations. Building consistency between airport land use compatibility standards and area-wide planning is vital for maintaining compatible land use.

The objective of this section is to assist the Portage Municipal Airport in achieving airspace and land use compliance with the development plan, and provide recommendations so that the airport can continue to meet safety and compatibility criteria. This chapter should become the framework to future land use planning efforts between the City of Portage and surrounding jurisdictions.

Roles and Responsibilities

Airport Sponsor

The City of Portage as the airport sponsor is eligible to apply for and receive federal grants. Acceptance of these federal grants require the city to develop and maintain the airport compatible with FAA rules and regulations through FAA Grant Assurances (obligations). There are currently 39 grant assurances that an airport sponsor assumes as a contractual obligation with the Federal Government when the sponsor accepts federal funds for airport development. These grant assurances describe how the sponsor must operate the airport and serve the public. Wisconsin Administrative Code Trans 55 also has several conditions to receive State Aid for airport improvements.

The acceptance of Federal development grants obligate the airport to FAA grant assurances until the useful life of the project (not to exceed 20 years), and federal grants used to acquire land obligate the airport into perpetuity and do not expire. A discussion of FAA grant assurances is included previously in this chapter.

Several grant assurances require airports take appropriate action to protect airspace and restrict land uses in the immediate vicinity to those compatible with airport operations. Compatible land use control around the Portage Municipal Airport is the responsibility of the airport sponsor, the City of Portage.

Federal Aviation Administration

The FAA can provide guidance and funding to promote compatible land development around airports; however, it has no regulatory authority for controlling land uses. State and local governments are responsible for land use planning, zoning, and regulations. The FAA develops grant assurances to protect federal investments in airports, but are the responsibility of the airport sponsor to maintain. Example grant assurance include but are not limited to:

- Preserving rights and powers
- Operations and maintenance
- Compatible land use
- Hazard removal
- Airport Layout Plan
- Economic non-discrimination
- Civil rights

The FAA monitors all obligated airports to ensure they comply with the requirements of the grant assurances through its Land Use Compliance Program. If the sponsor fails to take the necessary corrective action, the FAA can legally impose penalties on the sponsor, including the loss of federal funding.

As defined by law, the FAA's authority to enforce most regulations and grant assurances is limited to within the airport boundaries. The FAA's only authority on compatible land use planning is through the grant assurances. Methods for a sponsor to affect compatible land use outside of the airport's property is through zoning, avigation easements, or fee land acquisition.

In addition, the FAA is responsible for evaluating the aeronautical effect of objects upon the navigable airspace per FAR Part 77.9. FAA's airspace determinations provide this information to project proponents. FAA does not have the authority to control land use.

State of Wisconsin

Wisconsin Statutes Chapter 114.135, *Airport and spaceport protection* states it is the duty of airport owners to prevent airspace encroachments. It allows airports to acquire land with compensation to protect navigable airspace and aerial approaches. Eminent domain proceedings may proceed to condemn land. Section Subsection 114.136, *Airport and spaceport approach protection* enables the public airport site owner to enact an ordinance regulating the use, location and height of objects around airports. Regulations can extend up to 3 miles from the airport site. Airspace can be restricted to a 50:1 slope depending on classification, and up to 150 feet above the airport.

Wisconsin State Administrative Code Chapter 55, *Conditions of State Aid for Airport Improvement* requires airports several conditions to be met to receive State Aid including:

- Good Title to Airport
- Airport Operation and Maintenance
- Maintain Clear and Safe Approaches
- Ordinances

- Surveys
- Public Access
- Legal Relations
- Airport Layout Plan
- Preserving Airport Rights and Power
- Special Conditions

Wisconsin Department of Transportation, Bureau of Aeronautics advises local governments on land use compatibility issues, as well as monitors and enforces compliance with the state's standards and related procedures.

Surrounding Jurisdictions

Local jurisdictions are responsible for developing and enforcing land use planning, zoning, and regulations. Development proposals are reviewed and approved at this local level through an established process. The local authority is responsible for enforcing multi-jurisdictional airport zoning regulations.

Recommendations

The four key elements that should be considered to achieve land use compatibility at any airport include airspace, safety, noise, and compliance. A general description of each element is provided based on criteria developed by the FAA and the State of Wisconsin, as applicable.

Airspace

Guidelines & Evaluation

Airspace compatibility includes avoiding vertical development that reduces the level of safety, increases risks of aircraft accidents, or measurably reduces the operational utility of airports. Title 14 CFR Part 77 defines obstructions to air navigation. Other airspace requirements are defined in FAA Advisory Circulars and Orders. All Part 77 obstructions are a hazard to air navigation unless an aeronautical study concludes otherwise.

FAA grant assurance obligations require sponsors to take reasonable action to prevent and remove hazards to air navigation. Wisconsin State Statues requires that airspace and approaches to airports be maintained for safe operations of aircraft.

Obstacle Action Plan

As indicated in **Chapter 2: Inventory**, there are several objects that are obstructions to existing FAR Part 77 and other FAA airspace surfaces. FAA requires unmitigated obstacles to be identified in an Obstacle Action Plan (OAP) detailing how and when each of the FAA approach and departure surfaces will be cleared and maintained.

FAA has an obligation to highlight any unresolved issues that could jeopardize safety or utility of the airport. It is the responsibility of the airport sponsor to develop and implement the OAP.

An aeronautical survey is needed to identify all airspace obstructions. An FAA airspace review will be completed for all existing obstructions to help determine mitigation actions. It is expected that many of the existing Part 77 obstructions will remain. A detailed obstruction data table will be shown on Airport Layout Plan with an OAP developed to address obstructions to air navigation. The overall obstruction removal/mitigation strategy at C47 includes:

- Conduct aeronautical survey and identify all obstructions in the Airport Layout Plan
- Submit all obstructions shown on the ALP for an FAA airspace review to determine required mitigation including removing, lowering, lighting or marking the object.
- Prepare an Obstacle Action Plan based on FAA airspace determinations
- Remove or mitigate obstructions as soon as practicable in the following order:
    1. Remove on-airport obstructions
    2. Relocate thresholds to remove man-made obstructions to the FAA approach surface
    3. Acquire off-airport land rights to remove critical obstructions
    4. Remove objects within the Runway Object Free Area (OFA)
    5. Remove remaining FAA approach surface obstructions
    6. Remove or mitigate FAA departure surface obstructions, if possible
    7. Remove or mitigate other FAR Part 77 obstructions, if possible

Recommendations

Recommendations to maintain airspace compatibility at C47 include:

- Develop and enforce an airport height limitation zoning ordinance (HLZO) or other multi-jurisdictional airspace and land use zoning ordinance to ensure no new incompatible land use around the airport.
- Prepare an Airport Layout Plan and Obstacle Action Plan
- Follow through with the Obstacle Action Plan to address existing and near-term future airspace obstructions to air navigation. Actions may include no action, lowering, lighting or marking the obstruction.

Safety

FAA design standards and regulations prescribe several zones and imaginary surfaces intended to protect aircraft and their occupants while landing or taking off. However, the safety element primarily associated with compatible land use is focused on minimizing risks to persons and property on the ground.

FAA Runway Protection Zones

To reduce the public safety risk associated with aircraft operations, communities typically use FAA airport design standards and safety compatibility guidelines developed by state

aeronautical agencies to formulate safety policies. The safety element primarily associated with compatible land use is focused on minimizing risks to the flying public, as well as persons and property on the ground. FAA has defined minimum land use standards in the form of a Runway Protection Zone (RPZ) in FAA AC 150/5300-13A Airport Design. See **Chapter 4: Facility Requirements** for definitions.

There are existing roads and structures within many of the current RPZs. The near-term future configuration (0-5 years) introduces new portions of existing roads into RPZs, which does not require further review according to BOA. The relocated Runway 36 threshold introduces the aircraft parking apron into RPZ. The existing fuel facility will be relocated outside of the new RPZ. It is possible further review to meet FAA policy would be needed for the apron; additional FAA/BOA coordination is recommended. Due to the constrained site, options to clear the RPZ were determined not to be cost effective or would dramatically reduce the airport's utility. Acquiring land rights through avigation easement or fee acquisition is strongly recommended for the airport sponsor to fully control the land uses within in the RPZ.

Wildlife Hazards

FAA is also focused on minimizing safety risks associated with wildlife near an airport. Hazardous wildlife use natural or artificial habitats on or near an airport for food, water, or cover. Wildlife near airport operations may result in an aircraft-wildlife strike. The FAA recommends that airport sponsors implement the standards and practices contained in FAA AC 150/5200-33C, Hazardous Wildlife Attractants On or Near Airports to mitigate wildlife risks. FAA recommends airport sponsors take steps to control hazardous wildlife attractants within 5,000 feet of airport serving piston-powered aircraft. Examples include but are not limited to waste disposal operations, storm water management facilities, wastewater treatment facilities, and wetland mitigation banks.

FAA encourages non-certificated airports like C47 to perform a Wildlife Hazard Site Visit (WHSV) at to assess the airport for potential wildlife hazards. FAA will determine if the airport should develop a Wildlife Hazard Management Plan (WHMP). A typical recommendation for airports in Wisconsin is to install a wildlife perimeter fence to prevent deer and other mammals from entering the airport.

Recommendations

New recommendations to maintain safety compatibility at C47 include:

- Conduct a Wildlife Hazard Site Visit
- Relocate the fuel facility to remove from the near-term RPZ
- Acquire land rights for RPZ land use protection
- Establish airport zoning ordinance to address potentially incompatible land uses
- Restrict land use development around the airport through the local zoning, plan review and permitting process to reduce the risk of wildlife strikes.

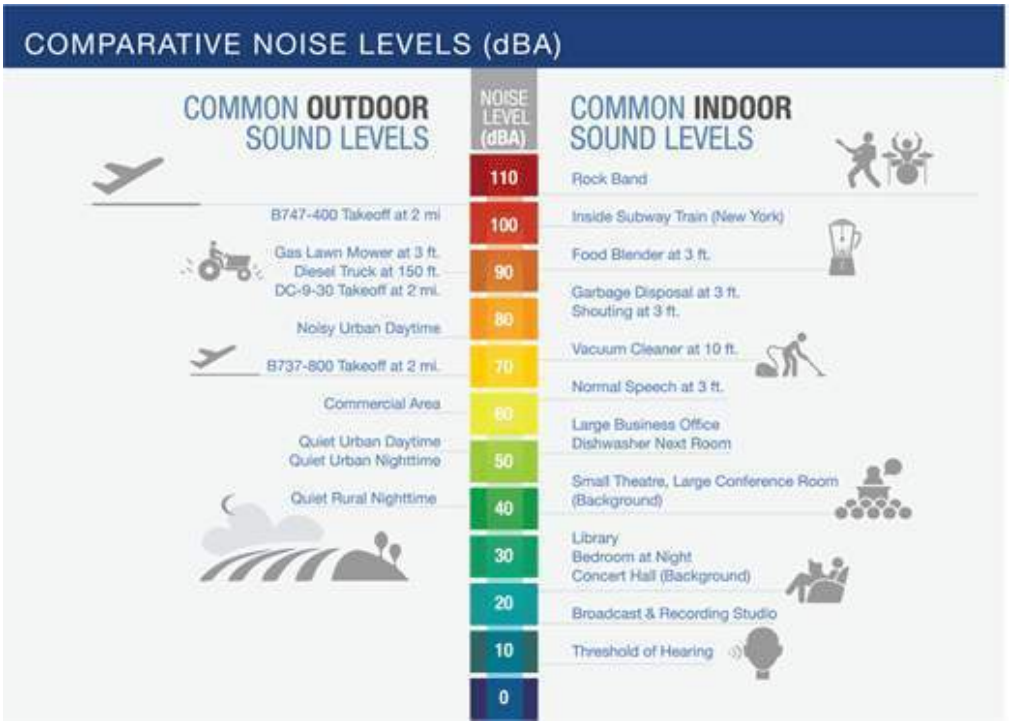
Noise

The noise element is focused on minimizing the number of people exposed to high frequency and event levels of aircraft noise. Noise emitted from aircraft can affect the well-being of persons living or working near an airport. While there are several effects of aircraft noise upon people, the most common is annoyance. Annoyance can be defined as the overall adverse reaction of people to noise. Other effects of aircraft noise include sleep disturbance and speech interference. Noise affects everyone differently.

No significant noise impacts are anticipated at C47 in the near-term future because the operations do no exceed critical FAA operational impact thresholds.

The airport sponsor should however monitor any ongoing noise complaints. One mitigation option is to establish a noise abatement procedure and/or issue a permanent NOTAM to notify pilots to avoid overflight of noise-sensitive residential properties.

Comparative Noise Levels



Source: FAA

Compliance

Airports that receive FAA funds are subject to FAA grant assurances (obligations). FAA Order 5190.6B, Airport Compliance Manual has been published to assist FAA personnel and airport sponsors to maintain compliance with grant and land obligations. Airports that do not abide by grant assurances are subject to withholding of FAA grant funding. Potential airport compliance issues at C47 related to infrastructure include non-aeronautical use of airport property and through-the-fence operations.

Non-Aeronautical Use of Airport Property

Airport property is to be used for aeronautical purposes. For an airport to develop land for non-aeronautical use, the FAA must first approve of the change in airport property use from aeronautical to non-aeronautical on a permanent or interim basis. Fair market value must be charged. All airport property is identified in the Exhibit "A"/Airport Property Map.

Apparent non-aeronautical uses of C47 airport property include a sanitary sewer lift station, sanitary sewer lines, water main lines, city water main lines, overhead power lines, and excavated material. On-airport encumbrances include utility easements and ingress/egress easements for lots to the west of Runway 36.

Through-the-fence Operations

Agreements that permit access to the airfield by aircraft based on land adjacent to, but not a part of, the airport property are commonly referred to as a "through-the-fence" operation. Through-the-fence arrangements can encumber the airport property and reduce an airport's ability to meet its federal obligations including economic non-discrimination.

There are four buildings with aircraft hangar units located outside C47 airport property that have direct connections to airport property and Runway 18-36. None of these hangars currently store airworthy aircraft to the knowledge of the airport. The land underlying these hangars is identified for acquisition in this plan.

Action Plan & Recommendations

Recommendations to address airport compliance at C47 include:

- Identify applicability of grant assurances with written correspondence from FAA/BOA.
- Identify encumbrances and non-aeronautical land uses in the updated Exhibit "A"/Airport Property Map for FAA review and approval
- Work with FAA/BOA and facility owners to address non-aeronautical land uses:
    - Lift Station: Relocate off-airport or request concurrent land use approval from FAA/BOA for non-aeronautical use of airport property.
    - Utility Lines: Request concurrent land use approval from FAA/BOA for non-aeronautical use of airport property.
    - Access Easements: Work with landowners and FAA/BOA to revise access agreements to minimize risks of non-aeronautical users accessing airport property.
    - Excavated Material: Establish lease agreement to ensure safety with aeronautical operations, and have airport obtain fair market value for material.
- Acquire land underlying two through-the-fence hangars and establish leases for aeronautical use.
- Establish through the fence agreements with users of hangars not located on airport property if aeronautical use is planned. Otherwise, remove airport access.
- Continue to control development that occurs on-airport and consult with FAA as needed to verify compliance with FAA rules and regulations.
- Work with FAA/BOA and take steps to resolve land use compliance challenges to meet FAA grant obligations.