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AIRPORT MASTER PLAN NARRATIVE REPORT

Wall Municipal Airport (6V4)

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Wall, South Dakota

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CHAPTER 1: INTRODUCTION

Purpose and Scope

The information presented in this report represents the study findings for the 2016 Wall Municipal Airport Master Plan Update prepared for the City of Wall, South Dakota, the airport owner. Airport Master Plans are prepared in accordance with Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5070-6B, *Airport Master Plans*. This project was funded in part by the FAA under grant number AIP 3-46-0069-007-2016 and the State of South Dakota.

This Airport Master Plan Update for the Wall Municipal Airport (6V4) will serve as an updated guide identifying future development necessary to accommodate existing and future aviation demands. The airport's current and forecasted safety, capacity and compatibility needs are addressed in this study. Many projects have been completed and new planning considerations have developed since the last approved Airport Layout Plan in 1988.

The scope of the study was developed by the City of Wall and Kadrmas, Lee & Jackson (KLJ) in cooperation with FAA and state officials to identify the specific needs and objectives of the airport owner. The scope includes work tasks with the purpose of documenting existing conditions, forecasting future aviation activity levels, identifying future facility requirements, formulating and evaluating development alternatives, preparing implementation plans and engaging the general public and other government agencies. Recommendations will be made for improvements that are triggered by safety requirements or demand thresholds.

The project received notice to proceed in September 2016. The baseline project data is from inventory efforts completed in October 2016. Data from 2015 was used to establish a baseline of existing airport information.

Background

The Wall Municipal Airport was activated for public use in 1946. The airport is owned by the City of Wall and is part of the FAA's national airports system. The facility has two runways; Runway 12-30 is paved at 3,500 feet in length and 60 feet in width, and turf Runway 18-36 published at 2,000 feet long and 100 feet wide. Wall currently is home to 12 locally confirmed based aircraft. The airport serves general aviation including personal, business, air ambulance and agricultural spray operations. There are approximately 3,746 annual flight operations according to FAA. The City of Wall owns 157 acres of land dedicated for airport use.

Planning Considerations

Planning considerations for an airport master plan are features, elements or events that should be evaluated because they have the potential to affect the airport facility over the long term.

Previous Master Plan

The most current Airport Layout Plan (ALP) for Wall was approved by the FAA in July 18, 1986. This project will serve as the Owner's guide identifying future development necessary to accommodate existing and future aviation demand at the Wall Municipal Airport. This project for Wall is needed due to two existing constraints on the current airport site for the existing 3,500' x 60' Runway 12-30. The first constraint is the existing Runway Protection Zone (RPZ) for Runway 30 extending over 400 feet southeast off airport and encompassing a business, fuel tanks, a church, and three roads which are all considered incompatible land uses inside an RPZ. The second constraint is property owned by Wyoming Dakota

Railroad Properties to the north and west of the airport (350 feet northwest of the Runway 12 threshold). The railroad owned property is not currently used for railroad purposes but constrains extension of the Runway 12 end. The specific objective(s) of the project include:

- Examine and Evaluate the Existing Conditions, Forecast and Facility Requirements
- Determine the ability of the current airport site to meet the needs of the community
- Determine a Preferred Layout for Hangar Development & Aerial Applicators
- Develop an Airport Layout Plan with the Preferred Alternative and meeting FAA Design Standards on the current airport site

As the most recent approve Airport Layout Plan is existing Master Plan is 30 years old. There is a need to update the Master Plan study to identify a strategy to best address aviation and community needs within today's regulatory environment. Typically, planning studies are updated every 7-10 years and address forecasted needs for the next 20 years.

Local Considerations

The airport has several local considerations that need to be addressed in order to craft a usable plan for Wall. These can be grouped into two categories; 1) Safety/Standards and 2) Demand/Capacity.

SAFETY/STANDARDS

- **Runway 30 RPZ** – The current Runway Protection Zone (RPZ) for Runway 30 contains incompatible uses. An analysis must be completed to determine the runway threshold point necessary to remove as many incompatible uses as possible while still maximizing the length of the runway.

- **Runway 12 RPZ** – The current RPZ for Runway 12 is not owned by the airport. In addition, if the Runway 12 threshold is relocated further northwest it is possible that the Runway 12 RPZ may contain incompatible uses. An analysis must be completed to determine the runway threshold point necessary to minimize the incompatible uses while still maximizing the length of the runway.

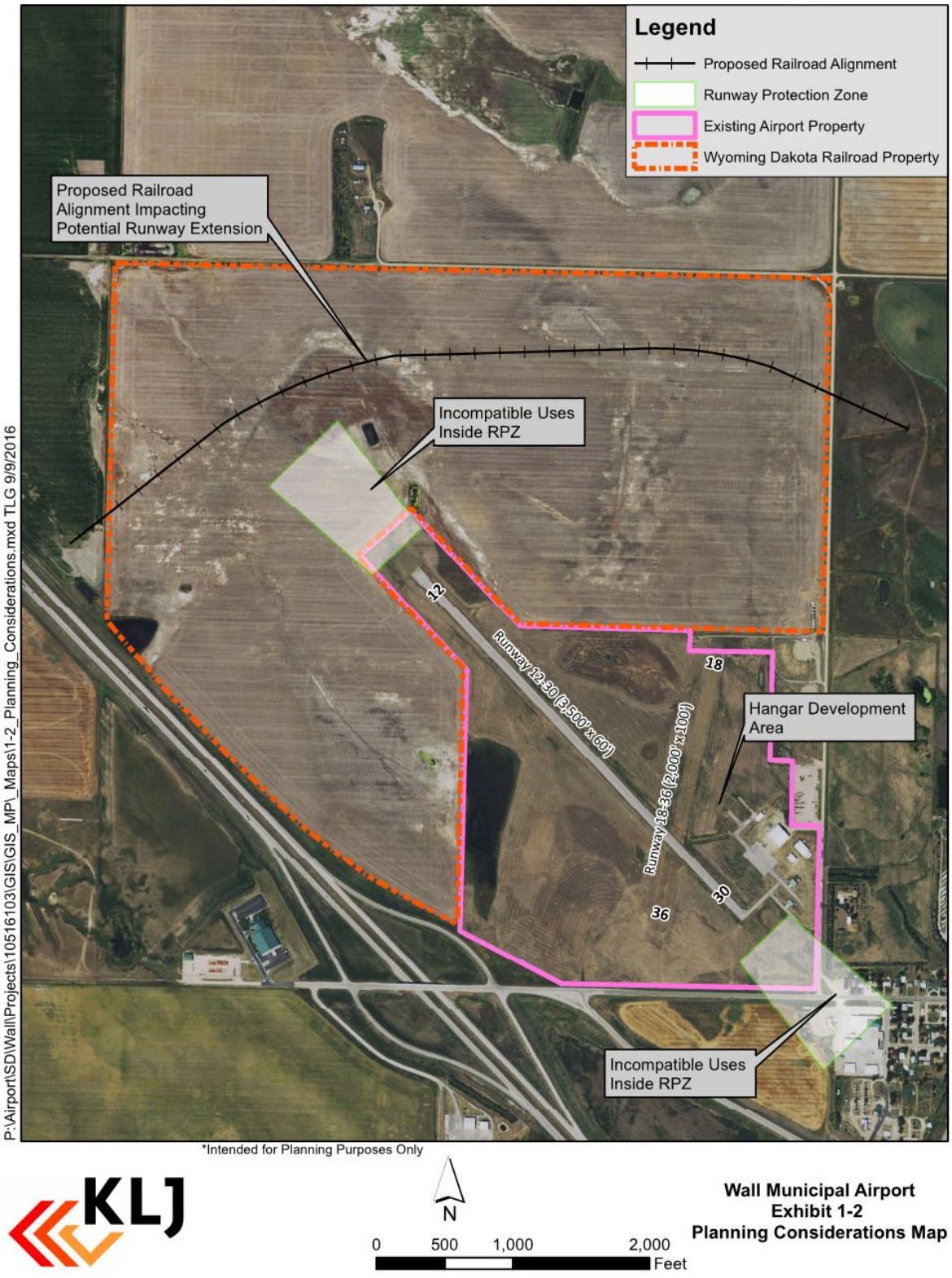
DEMAND/CAPACITY

- **Critical Design Aircraft/Runway Length** – Wall has a primary runway length of 3,500 feet. The airport has experienced operations with business aircraft and aerial applicators. These aircraft, or any changes to aircraft, supporting local businesses may trigger the need for a runway extension. The aircraft type(s) operating at Wall should be quantified to establish existing and future FAA design criteria. The runway length needs of these "critical design" aircraft should be evaluated to determine if and when an extension may be needed.

- **Runway Approaches/Navigational Aids** – The business aircraft operations may require the airport to be accessed in all-weather conditions. Improving access benefits the users but it may also require significant investment and trigger new on- and off-airport land use compatibility standards. This study should review flight operations and weather conditions to identify the need, costs and benefits of upgrading primary runway approaches and navigational aids.

- **Hangar Development** – The hangar development area is constrained between the two runways. One option may be to relocate the existing turf Runway 18-36 further to the west. A plan must be arranged to allow continued hangar development without impeding existing or future uses.

Exhibit 1-1 – Planning Considerations Map



Planning Objectives

The City of Wall has authorized an update to the Master Plan. The City of Wall contracted with KLJ to prepare an update to the Airport Master Plan to examine options for the airport to address planning considerations. These planning considerations include developing and analyzing alternatives and recommending a course of action.

Based on the background and planning considerations, the planning objectives for this study identify the methods used to meet the airport development goals outlined by the City of Wall. The key project objectives are identified as follows:

- Complete the study to current standards identified in FAA guidance tailored to the specific needs of Wall.
- Evaluate the existing social, built and natural environment including identification of critical issues that may affect the environmental clearance of future airport development.
- Update the aviation demand forecasts to reflect current and projected aviation activity.
- Identify a critical design aircraft fleet based on current local light operations.
- Perform a review of the recommended runway length(s) and approach types to accommodate current and forecasted flight operations.
- Review a comprehensive set of reasonable alternatives that meet the aeronautical needs and look to avoid impacts.
- Analyze the operational, environmental & financial impacts of each reasonable alternative and document the decision making process. Evaluate political and public acceptance. Recommend feasible preferred alternatives for the airfield and terminal area.
- Develop an integrated and phase-able long-term airport development plan that addresses the functional locations and conceptual layouts of facilities such as runways, taxiways, aprons, airport support buildings, parking and general aviation development.
- Establish a realistic project implementation schedule/phasing plan and identify triggering events for implementation, particularly the short-term capital improvement program.
- Proposed an achievable financial plan to support the implementation schedule.
- Assist the airport owner in developing stakeholder consensus on the airport development plan(s) through the execution of a public involvement program.
- Engage an Airport Planning Advisory Group (APAG) made up of local stakeholders and agency representatives to help provide direction and feedback in making planning decisions.
- Update the Exhibit A/Airport Property Map to current FAA standards.
- Complete an FAA aeronautical survey compliant with current FAA standards.

Master Plan Process

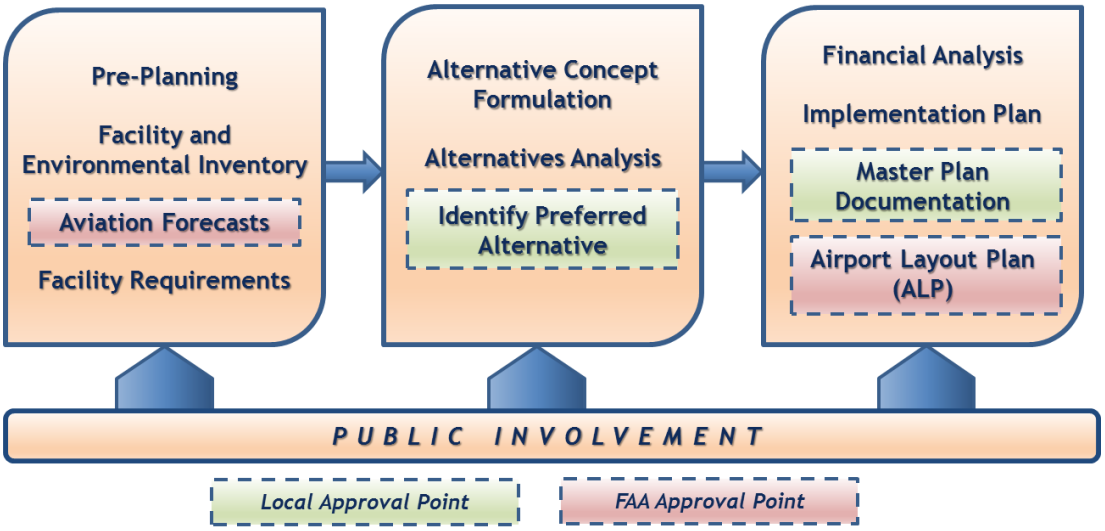
Guidelines for completing a Master Plan are set forth in FAA Advisory Circular 150/5070-6B. Each master plan study scope and level of effort is customized to fit each individual airport's needs and address critical issues.

The Airport Master Planning process involves several coordinated steps. The master plan study for Wall consists of the following elements:

- **Pre-Planning** – Airport development concerns are identified and planning objectives prepared to address these issues. An overall vision for the study is formulated that will guide the process.

- **Inventory of Existing Conditions** – Overview of airport setting and environment; infrastructure and assets which includes airside, landside and support facilities; airspace, navigational aids and airport access.
- **Forecast of Aviation Demand** – Using established forecasting methods, estimate current and project future airport activity including operations and based aircraft.
- **Demand/Capacity Analysis and Facility Requirements** – Compare the existing capacity 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 considering both on-airport and off-airport impacts consistent with the study goals and objectives. A preferred alternative is selected.
- **Environmental Overview** – Provide an overview of anticipated environmental impacts as part of the development of alternatives.
- **Implementation Plan** – Provide a comprehensive plan for implementation of the preferred alternative including project triggers, sequencing, and cost estimates.
- **Land Use Compatibility** – Complete a comprehensive review of land surrounding the airport for potential uses that are incompatible with safe airport operations and provide mitigation recommendations.
- **Airport Layout Plan** – Document the existing and planned airport facilities through a set of drawings approved by the airport sponsor, state and FAA.
- **Stakeholder and Public Involvement** – Prepare and execute a plan to engage important airport stakeholder and the public throughout the study to gather their input and address their concerns.

Figure 1-1 – Airport Master Planning Process



Source: KLJ

Study Documentation & Approvals

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

- Chapter 1 – Introduction
- Chapter 2 – Facility and Environmental Inventory
- Chapter 3 – Aviation Forecasts
- Chapter 4 – Facility Requirements
- Chapter 5 – Alternatives Analysis
- Chapter 6 – Implementation & Compatibility

Each narrative report chapter was prepared separately and distributed to the City of Wall for review. After the airport owner's review, each draft chapter findings were made available to key airport stakeholders including the State and FAA for input prior to a final review and approval by the airport owner.

In addition to the chapters, there were several appendices included which are included to provide either in depth background information on the relevant subject or provided greater study on the subject. These appendices for the Wall Municipal Airport included the following:

- Appendix A – Glossary of Terms
- Appendix B – Public Involvement (presentations and information from project meetings)
- Appendix C – Airport Classification
- Appendix D – Airport Funding
- Appendix E – Airfield Pavements
- Appendix F – Airfield Design
- Appendix G – Solid Waste Management Plan
- Appendix H – Runway Protection Zone Analysis

Following completion of the master plan study, an Executive Summary report has been prepared to concisely document the recommendations of the study.

During this study process a separate FAA Aeronautical Survey was completed. The data collected in this survey was used to prepare an electronic ALP drawing set for FAA review and approval. An updated Exhibit "A"/Airport Property Map to meet current FAA guidelines was also completed.

The Master Plan Update was adopted by the City of Wall on September 19, 2018. The ALP was submitted to the State and FAA for review and approval in October 2018.

Master Plan Format

The required and recommended contents of Airport Master Plans are detailed per FAA standards. Effective airport master plans are based on the analysis of significant amounts of data, and many airport master plans typically present not only the planning conclusions, but all data and accompanying analysis in considerable detail.

This Master Plan presents data to support the plan in a series of appendices. As the reader moves through the narrative descriptions, there are references to specific appendices to provide additional background details and information. In addition, internet hyperlinks are included to reference documents that are current as of the time of this report.

Public Involvement

Public involvement is a key component to the successful development of an Airport Master Plan study. The purpose is to encourage information sharing and feedback from airport stakeholders including the airport owner, airport users/tenants, local government officials, resource agencies, elected and appointed officials and the general public. Public involvement provides valuable input to assist the airport owner in decision making and develop consensus on study conclusions.



A Master Plan Advisory Committee (MPAC) was established to provide input throughout the life of the study. A listing of individuals who participated on the MPAC is located in **Appendix B: Public Involvement.** The purpose of the MPAC was to facilitate group discussion and feedback from different stakeholders groups, providing recommendations to the airport owner. MPAG members represented the following stakeholder groups:

- City of Wall
- Major Employers (Golden West Communications, Wall Drug, USDA and National Park Service)
- Wall Airport Users/Tenants
- South Dakota Department of Transportation: Office of Aeronautics
- Federal Aviation Administration (FAA): Dakota-Minnesota Airports District Office

MPAC members met at four points throughout the study to discuss technical elements and provide direct feedback. Members also received copies of draft study documentation for review and comment. This input assisted the City of Wall with study decision making.

A Public Open House was held during the master plan study on June 26, 2018 to present forecasts, facility requirements development alternatives, and recommendations. The Open House provided an opportunity for the airport owner and its representatives to share information on the study and solicit feedback from the public. The only significant identified issue from the public open house was the proposed location of the runway protection zone (RPZ) for Runway 31. The church on 4th street just to the east of the RPZ requested that the RPZ be shifted west to allow the church to someday expand facilities on existing church property. The requested adjustments to the Runway 31 threshold were made to accommodate this request.

See **Appendix B: Public Involvement** for other information including copies of public involvement meeting agendas, attendees, presentations and summaries.

Conclusion

This Airport Master Plan Update for the Wall Municipal Airport provides the City of Wall with a usable guidance document to assist with decision making with airport capital improvements to meet aviation demands for the foreseeable future. As with any planning study, assumptions made are subject to change due to unpredictable internal and external events. For this reason, this study should be reviewed periodically to verify project scope and triggering events are still valid to meet the airport need.

CHAPTER 2: FACILITY & ENVIRONMENTAL INVENTORY

Introduction

The Inventory chapter of the Airport Master Plan for the Wall Municipal Airport (6V4) 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 according to National Environmental Policy Act (NEPA) guidelines.

This 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 developed for the future of the airport. Background information and data is gathered from various sources and compiled into this chapter. Please refer to the various appendices referenced within this narrative for more detailed information.

This chapter provides an inventory of the following elements:

- Background
- Facility Inventory
  - Land
  - Airfield Facilities
  - Navigational & Airspace
  - General Aviation
  - Support Facilities
  - Ground Access, Circulation & Parking
  - Other
- Surrounding Land Use
- Financial Overview
- Environmental Inventory

Background

General

The Wall Municipal Airport (FAA ID: 6V4), is a non-certificated general aviation airport serving the City of Wall and surrounding areas of Pennington County in western South Dakota. The airport is owned and operated by the City of Wall. The airport is a critical community asset providing vital connectivity to the region.

The airport has two runways. Runway 12-30 is paved and lighted at 3,500 feet long and 60 feet wide capable of accommodating visual approaches. A turf Runway 18-36 is 2,000 feet long by 100 feet wide and accommodates small aircraft during “crosswind” weather conditions.

Wall is a general aviation airport providing multiple aeronautical functions including emergency response, corporate aviation, community access and agricultural support. According to the FAA records as of September 2016, the airport is home to 12 locally-confirmed based aircraft and serves 3,746 annual flight operations annually for an average of 9 each day.

Location

The City of Wall is located in western South Dakota in the eastern portion of Pennington County which is depicted in **Exhibit 2-1 - Airport Location**. Wall is located approximately 54 driving miles east of Rapid City, SD; 121 driving miles west-southwest of Pierre, SD; and 298 driving miles west of Sioux Falls, SD. The city is located along Interstate Highway 90 and South Dakota State Highway 14 which runs from east-west.

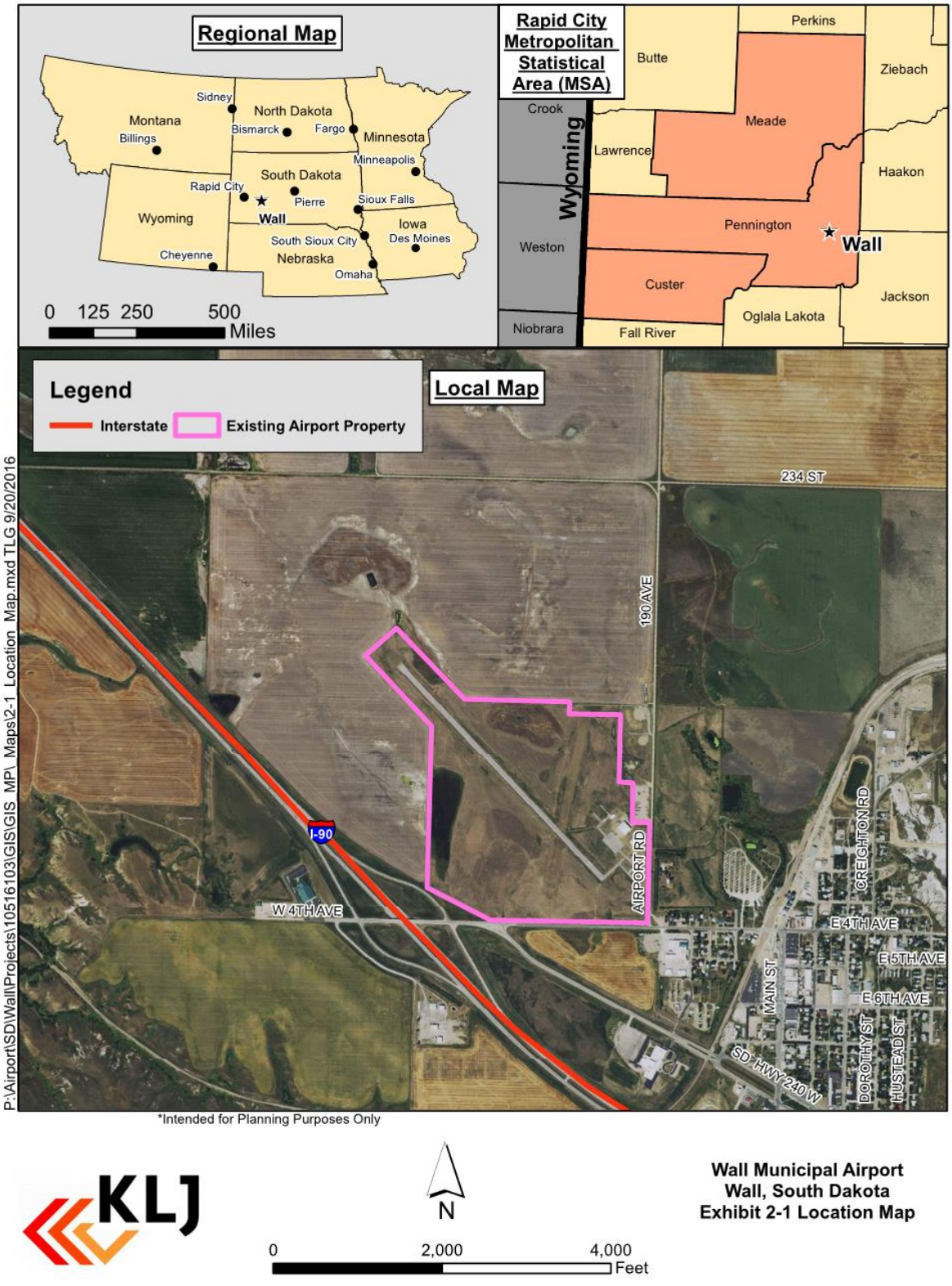
Wall Municipal Airport is located one/half mile west of the Wall central business district. 4th Avenue and Airport Road provided paved access to the airport. 4th Avenue and Airport Road are each two-lane roads providing direct access to downtown Wall.

Setting



The City of Wall, incorporated in 1908, is located 8 miles north of Badlands National Park. The city was named for the 'wall' barrier that sits south of town separating the rolling prairie from the badlands region. The airport is sited on relatively flat land at 2,813 feet above Mean Sea Level (MSL). On-airport land use is primarily grassland. The airport is surrounded by grassland and agricultural land. Residential and commercial development is in the southeast area adjacent to the airport. Terrain gradually drops by almost 15 feet from the east to the west of the airport.

Exhibit 2-1 – Airport Location



Wall Municipal Airport
Wall, South Dakota
Exhibit 2-1 Location Map

Climate

Wall is located within the northern great plains and experiences a steppe semi-arid climate with mild summers and cold winters. The weather reports from Philip, SD, which is 28 nautical miles east with similar terrain, were available with a long consistent history from 1981-2010. The mean annual temperature for Philip from 1981-2010 was 47.4 degrees Fahrenheit with annual precipitation of 17.35 inches and 33.2 inches of snowfall.

Table 2-1 – Average Weather (Philip, SD)

Month	Precipitation (in.)	Minimum Temperature (˚F)	Average Temperature (˚F)	Maximum Temperature (˚F)
January	0.30	9.5	22.1	34.7
February	0.48	12.8	25.7	38.6
March	1.27	21.8	34.7	47.7
April	1.84	32.4	46.3	60.2
May	3.03	43.9	57.2	70.4
June	2.93	53.5	67.0	80.5
July	2.03	59.9	74.6	89.3
August	1.50	58.2	73.5	88.8
September	1.49	46.9	62.3	77.6
October	1.43	33.9	48.4	63.0
November	0.62	20.8	33.9	47.1
December	0.43	10.5	23.0	35.6

Source: National Weather Service 1981-2010, Philip, SD

Socioeconomics

The City of Wall has an estimated population of 877 in 2015, **Table 2-2 Population/Demographic Summary**. Population within the Rapid City Metropolitan Statistical Area (MSA) which includes Custer, Meade and Pennington counties which include Wall is estimated to be 144,134. The Rapid City MSA is growing with a 1.37 percent annual growth rate from 2010 to 2015. The growth with the Rapid City MSA is primarily attributed to continued tourist activity and retirees settling in the Black Hills. The City of Wall, on the eastern edge of this area, has remained steady with population but has seen an increase in economic activity supporting ranching in the area and with tourism related to Wall Drug and nearby attractions such as the Badlands National Park and Minuteman Missile National Historic Site. The city has a low unemployment rate of 1.8 percent as of 2014.

Table 2-2 – Population/Demographic Summary

Year	Wall	Rapid City MSA*	South Dakota	United States
1990	838	109,825	697,101	249,622,814
2000	818	120,295	754,884	281,421,906
2010	766	135,049	814,180	309,326,225
2015	877	144,134	858,469	321,418,820
Annual Growth Rate 1990-2015	0.18%	1.09%	0.84%	1.02%
Annual Growth Rate 2010-2015	2.74%	1.31%	1.07%	0.77%
Unemployment Rate 2014	1.8%	5.9%	4.8%	9.2%
Median Household Income**	$45,781	$46,392	$50,338	$65,443

** Custer, Meade and Pennington Counties; ** 2010-14 American Community Survey*
Source: U.S. Census Bureau

Table 2-3 – Major Employers

Employer Name	Industry	Year-Round Full-Time Employees	Summer Season Total Full-Time Employees
Golden West	Communications	85	-
Wall School District	Public School	70	-
Wall Drug Store	Retail	55	200
Badlands National Park	Tourism	45	110
West River Electric	Utility	18	-
USDA Forest Service	Tourism	10	22
Pennington County	Government	10	-
First Interstate Bank	Banking	8	-
City of Wall	Government	6	-
Dakota Mill and Grain	Agricultural	5	-
Wall Regional Medical Center	Health Care	3	-

Source: Wall Economic Development Corporation – Community Profile 2016

Airport Ownership & Management

The Wall Municipal Airport is owned and operated by the City of Wall. The Mayor and City Council provide the governing oversight of the airport. The airport manager is a volunteer and maintenance of the airport is performed by a combination of the airport manager, tenants and city public works staff.

Airport History

Historic records indicate the Wall Airport was started after World War II by Charlie and Wendell Best. State records have projects dating back to 1986 which are listed in **Table 2-4 Project History**. The primary runway was originally paved in 1986 and the turf crosswind runway was originally graded by the South Dakota National Guard. Pavement rehabilitation has taken place regularly about every 7-8 years most recently with a state surface treatment project in 2016.

The most recent approved ALP was that from 1986 even though work was done in 2007 to update the ALP, it was not approved by the FAA.

Table 2-4 – Project History

Year	Grant	Description	Local	State	Federal	Total
1986	3-46-0069-01-86	Land/Easement Acquisition, ALP, Grade/Surface New Rwy, Apron & Twys	21,439	21,439	385,909	428,788
1993	3-46-0069-02-93	Rehabilitate Rwy, Apron & Twy; Signage	9,239	9,239	166,316	184,795
2001	3-46-4600-01-2001	Rehabilitate Rwy, Apron, Twy	1,212	1,212	24,240	26,664
2007	3-46-0069-03-2007	Update Airport Layout Plan	909	606	28,787	30,302
2008	3-46-0069-04-2008	Environmental; Preliminary Design for 2010 Rwy Extension	1,965	1,310	62,230	65,505
2012	3-46-0069-05-2012	Construct Snow Removal Equipment/Terminal Building	4,216	16,865	189,734	210,815
2014	3-46-0069-06-2014	Reimburse for 2012 purchase of SRE tractor/loader with bucket, snow blower, blade, rotary broom	7,640	7,640	137,511	152,791
Total			$46,620	$58,311	$994,727	$1,099,660

Source: FAA and State of South Dakota

Airport Role & Design

The FAA has established aircraft classification systems that group aircraft types based on their performance and geometric characteristics. These classification systems, described below and illustrated in **Table 2-5 – 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 *Airport Design*.

- **Aircraft Approach Category (AAC)**: a grouping of aircraft based on approach speed.
- **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.

Table 2-5 Classification Systems

Classification Systems		
Aircraft Approach Category (AAC)		
AAC	**Approach**	
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	**Wingspan (ft)**	**Tail Height (ft)**
I	< 49’	< 20’
II	49’ - < 79’	20’ - < 30’
III	79’ - < 118’	30’ - < 45’
IV	118’ - < 171’	45’ - < 60’
V	171’ - < 214’	60’ - < 66’
VI	214’ - < 262’	66’ - < 80’

Source: FAA AC 150/5300-13A

The AAC and ADG are combined into the Airport Reference Code (ARC) to indicate an airport’s highest Runway Design Code (RDC). In **Chapter 4: Facility Requirements** there will be more discussion of the FAA design classifications particularly as it relates to the Wall Municipal Airport. **Exhibit 2-2** provides examples of aircraft design codes.

Exhibit 2-2 Examples of Aircraft Design Codes (ARC)

ARC A-I/Small Aircraft		ARC A-II/Small Aircraft	
Cessna 150 Cessna 182 Piper Archer Piper Seneca		Cessna 208 Pilatus PC-12 Aero Commander Air Tractor 401B Air Tractor 502B	
ARC B-I/Small Aircraft		**ARC B-II/Small Aircraft**	
Beech Baron 58 Cessna 421 Beech King Air 100 Cessna Mustang 510		Beech King Air 90 Beech King Air 200	
ARC B-II		**ARC C-I, C-II, D-II**	
Air Tractor 802A Beech King Air 350 Cessna Citation CJ2 Swearingen Metro III		CRJ-200/700 Cessna Citation X Embraer 145 Learjet 35	

Source: KLJ Analysis, Airliners.net

Table 2-6 – Area Airports

Airport ID	State Classification	Primary Runway	FAA Asset Group	ARC	Distance (nautical miles)
Wall	Small GA	3,500' x 60'	Basic	B-I	-
Philip	Medium GA	3,998' x 75'	Unclassified	B-I	28 East
Kadoka	Basic	2,600' x 150' turf	Unclassified	A-I	34 East
Rapid City	Commercial Service	8,701' x 150'	-	C-III	35 West
Faith	Small GA	4,200' x 60'	Basic	B-I	63 North

Source: Federal Aviation Administration, State Aviation System Plan (2010)

Wall is a general aviation (GA) airport, meaning it accommodates aviation activities other than scheduled commercial air service. General aviation airports provide vital aeronautical functions serving the public interest including emergency response, critical community access, personal and business aviation, and commercial, industrial and economic activities.

Wall is one of approximately 3,300 airports nationally included in the National Plan of Integrated Airport Systems (NPIAS) by the Federal Aviation Administration (FAA). NPIAS airports link the community to the national air transportation system.

Within the GA category, there are four groups that describe the functions of each airport as identified by the FAA General Aviation ASSET 1 Study. Wall is categorized as one of 668 basic airports. Basic airports "support general aviation activities such as emergency service, charter or critical passenger service, cargo operations, flight training, and personal flying."

Appendix C: Airport Classification contains more information on this topic with **Appendix D: Airport Funding** providing additional information about the Federal funding programs available for the airport.

Airport Service Area

The Airport Service Area (ASA) defines the geographic area which serves the basic public aviation needs. These airports are identified in the federal NPIAS. The core Wall service area provides service to populations where Wall is the closest NPIAS airport. The basic Wall service area includes areas within a 30-minute drive time of Wall. Based aircraft records show 18 local aircraft have registered owners within the basic ASA. A total of 61 percent are from those with Wall addresses. **Exhibit 2-3 Surrounding Airports** depicts airports in the area from **Table 2-6** and the airport service area.

Airport Activity

General aviation makes up the vast majority of the airport activity at Wall. Flights are for various purposes including air ambulance/medical transport, agricultural spraying, business/corporate travel, personal travel, flight training, recreational and tourism.

Based Aircraft

As of September 2016, Wall is home to 12 locally-confirmed based aircraft. The FAA validates 12 based aircraft. There are no public hangars at Wall available for transient aircraft. Other private hangars are occupied. The State Aviation System Plan estimates based aircraft will grow at an annual growth rate of 1.01 percent.

Annual Operations

The FAA Terminal Area Forecast estimates there are 4,106 annual flight operations (takeoff and landings) at Wall annually, or approximately 11 operations per day on average. FAA estimates approximately 92 percent of total annual flight operations are local operations. The State Aviation System Plan also estimates 4,100 annual flight operations with a projected annual growth rate of 0.50 percent.

Table 2-7 – Airport Activity Summary

FAA Validated Aircraft	Confirmed Local Based Aircraft	FAA TAF Annual Operations
12	12	4,100

Source: Federal Aviation Administration, SDDOT Office of Aeronautics, Basedaircraft.com, KLJ Analysis

Operators

Companies and operators associated with Wall Drug, Golden West Communications, Ag Spraying, Air Medical Flights and the National Parks utilize the airport. According to Instrument Flight Rules (IFR) data from the FAA Traffic Flow Management System (TFMS), there are other air charter operators that utilize Wall on occasion.

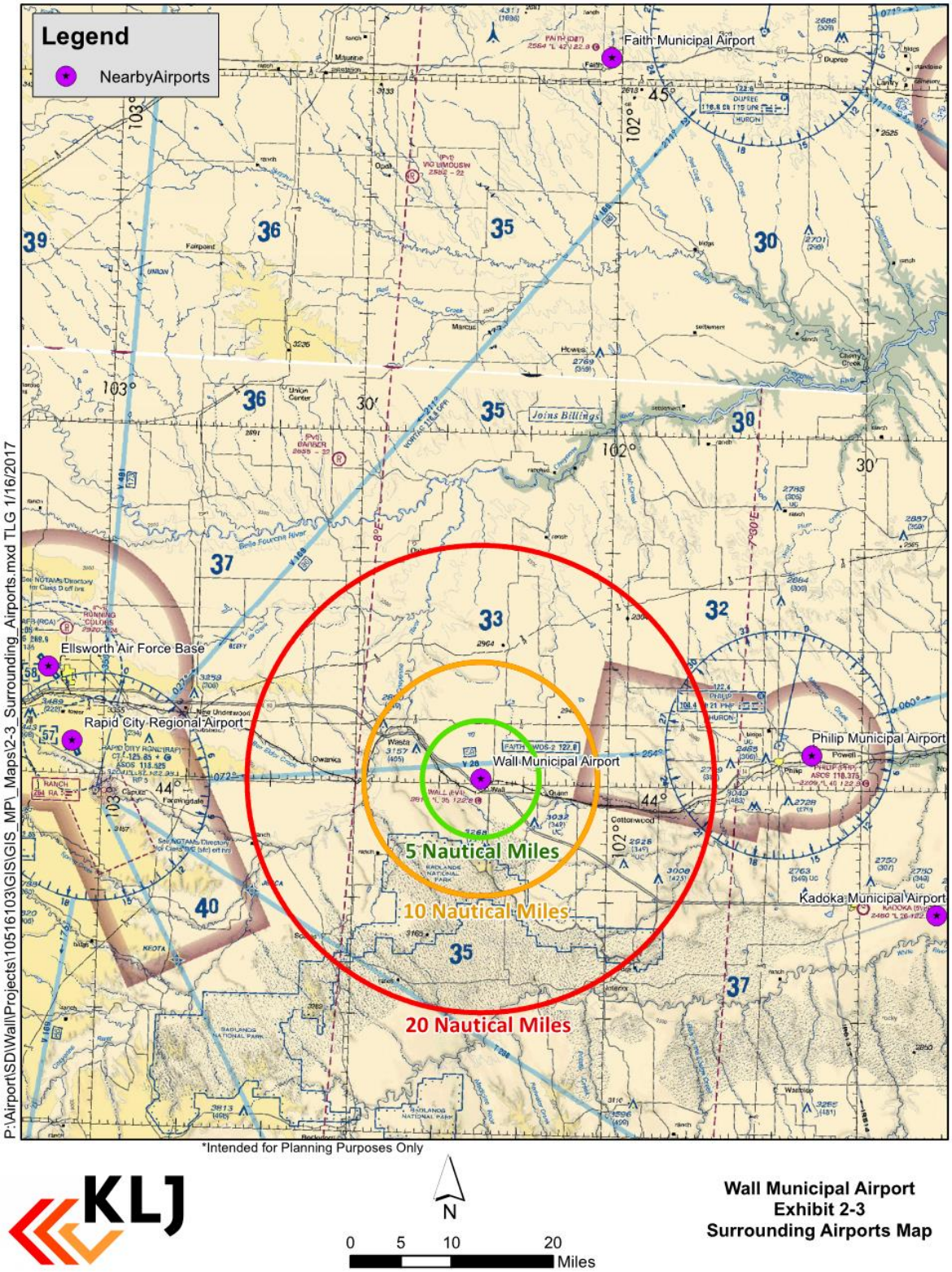
The table below summarizes the major operators from 2008-2015. See **Chapter 3: Forecasts** for more detailed information on existing and projected Wall based aircraft and aircraft operations.

Table 2-8 – Airport Operators 2008-2015

Organization/Type	Aircraft Type(s)	Average Annual Operations
Aerial Applicator	AT-502	700-800
Aerial Applicator	AT-802	300
SD Army National Guard	HH60 and UH72	400
Air Medical Flights	Bell 407	6
Other Air Charter		30

Source: SD Army National Guard, Ascend Ag, FAA Traffic Flow Management System (TFMS), City of Wall

Exhibit 2-3 Surrounding Airports



Facility Inventory

An inventory of Wall Municipal Airport facilities was performed to establish a baseline for determining required future improvements. As discussed in the following sections, Wall airport facilities are grouped into several categories: land, airfield, navigational aids (NAVAIDS)/airspace, general aviation, support, access/parking and other facilities.

Land

Airport property owned by the City of Wall is designated as aeronautical and can be leased to private entities for approved uses. The City of Wall owns approximately 157 acres of property fee simple and 33 acres in clear zone easement over non-owned properties. Airport land interests were acquired starting in 1946 with easements and additional land added in 1986. Wall had a current Exhibit "A"/Airport Property Map from 2010. As part of this Master Plan, a comprehensive update will occur to meet new FAA standards.

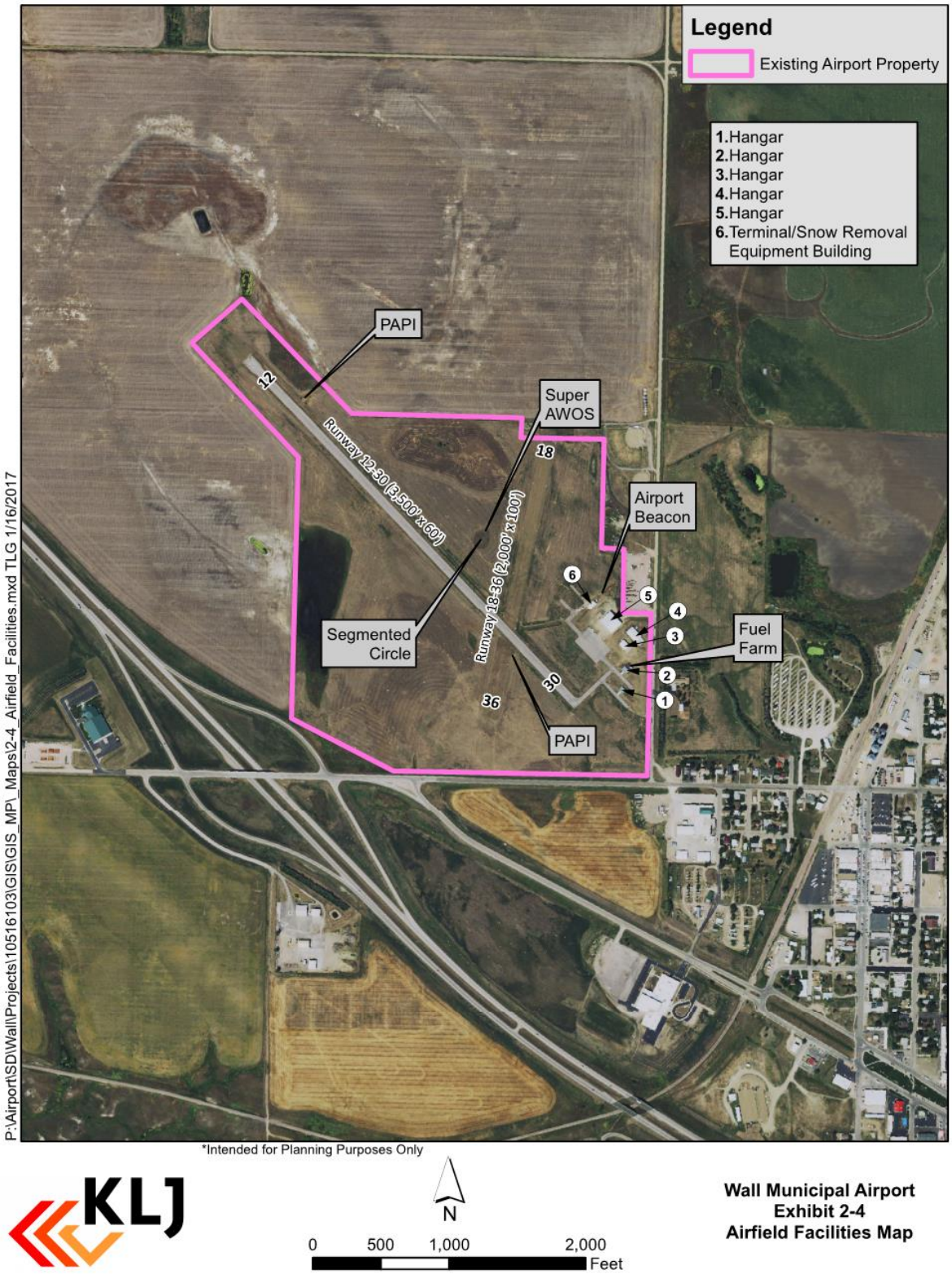
Airport land is leased to private parties for approved aeronautical uses. Examples of aeronautical uses include land to construct an aircraft storage hangar. Land leases have 20+ year terms.

Other on-airport encumbrances will be examined as a part of the Exhibit "A" effort with this Master Plan.

Airfield Facilities

Airside 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 **Exhibit 2-4: Airfield Facilities Map**. Information on design codes is contained in **Chapter 4: Facility Requirements**.

Exhibit 2-4 Airfield Facilities Map



RUNWAY 12-30

Runway 12-30, the primary runway at Wall, is surveyed at 3,500 feet long and 60 feet wide. The runway was paved in 1986. The current length was constructed to accommodate a Beechcraft King Air B-100 aircraft. The runway has a 0.37 percent surface gradient with a 13 foot increase in elevation from the northwest end to the southeast end.

The runway is designed to meet FAA Runway Design Code (RDC) B-I design standards with approach visibility minimums as low as 1 mile. Runway 12-30 does not currently have a full parallel taxiway and therefore an Approach Reference Code (APRC) is not available for this runway. The runway's dimensions and setbacks from other areas such as aircraft parking and buildings provides the operational capability to accommodate ARC B-II aircraft with approach visibility minimums as low as 1 mile. Both ends of the runway currently have visual approaches.

The runway pavement surface is asphalt with no surface friction improvements. The pavement is designed to accommodate regular use of up to 12,500-pound aircraft in a single wheel main landing gear configuration. There is no published Pavement Classification Number (PCN). This primary runway is used by the largest aircraft operating to and from Wall. When the runway was inspected, it was noted that there is a 'hump' in the pavement 1/3 from the north end which is observed as a dip then rise on the centerline. Aircraft experience the hump when they rotate for takeoff.

Runway Protection Zone Issues

Each runway at an airport includes certain protective surfaces. Most of this will be discussed in detail in **Chapter 4 - Facility Requirements**. For Runway 12-30 there is a significant constraint which is being examined as a key element of this master plan. That constraint is related to the Runway Protection Zone (RPZ) for Runway 30. Formerly known as clear zones, the RPZ is a trapezoidal-shaped area, centered on the extended runway centerline and beginning 200 feet beyond the end of the runway or area useable for landing or takeoff. The RPZ dimensions were developed through the analysis of aircraft accidents and calculated to enclose the area on the ground with the highest probability of risk due to an aircraft accident.

On September 27, 2012, the FAA issued interim guidance on land use within an RPZ. The interim guidance clarifies specific land uses that are not permissible inside the RPZ. The following land uses are considered incompatible in the RPZ:

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

The Runway 30 RPZ currently contains many of these incompatible uses. See **Exhibit 2-5 Runway 30 RPZ Issues**. As mentioned in Chapter 1, relocating the runway threshold to the northwest will be examined to minimize the incompatible uses while maintaining the greatest runway length. **Appendix H - Runway Protection Zone Analysis** will provide greater detail regarding the issues and conclusions for both the Runway 12 and 30 RPZs.

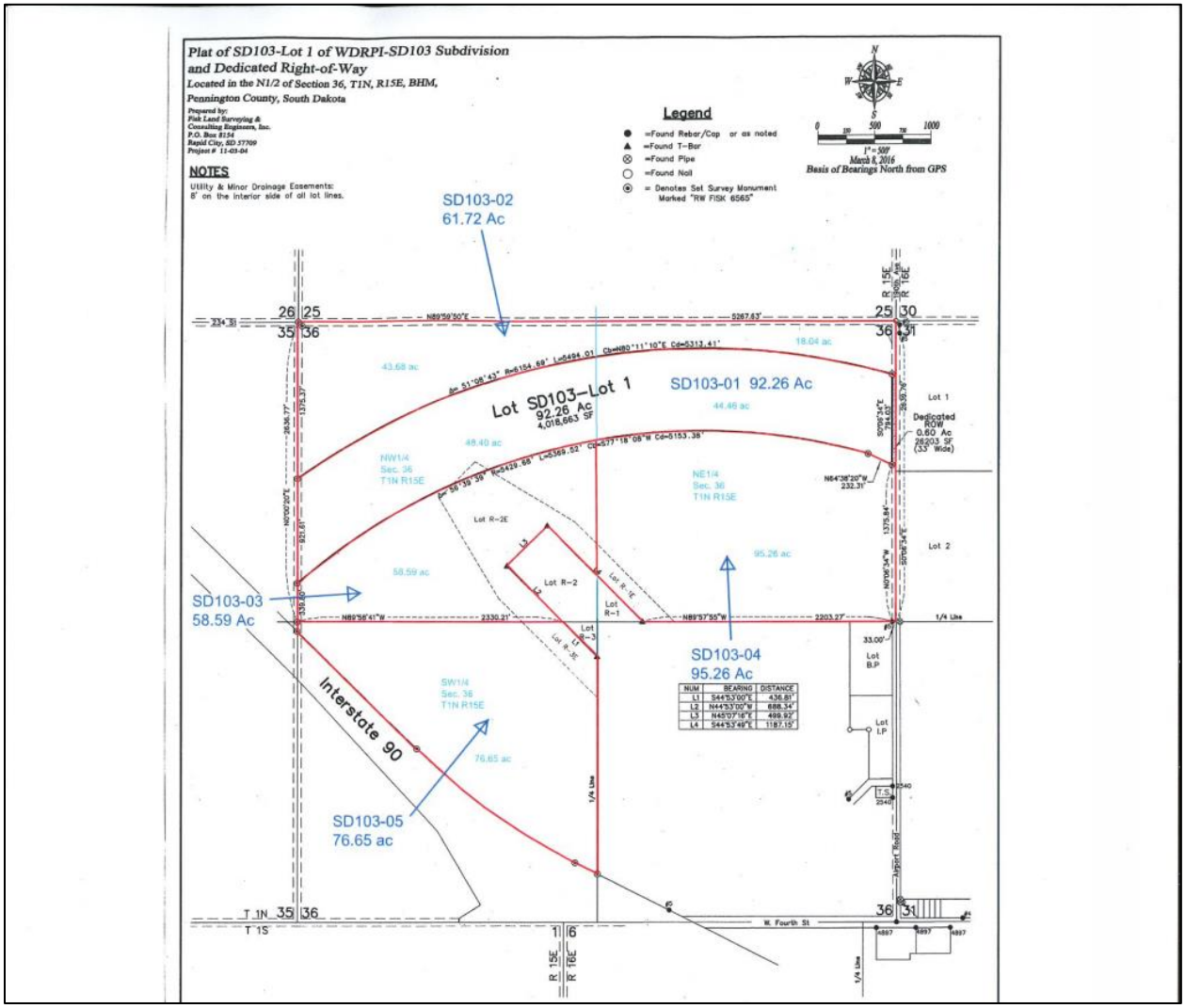
Exhibit 2-5 Runway 30 RPZ Issues



Railroad Land

While the RPZ issue is affecting the Runway 30 end, the land northwest of the airport is affecting the Runway 12 end. The land is owned by Wyoming Dakota Railroad Properties, Inc. with a potential rail line to the north of the airport. See **Figure 2-1 Railroad Property**. The property is the quarter sections north and west of airport property and are shown in the figure as SD103-01, SD103-02, SD103-03, SD103-04 and SD103-05. This new rail line in SD103-01 was examined by the railroad for the purpose of moving the rail line outside of town and adding new sidings to accommodate coal traffic from Wyoming in competition with UP and BNSF. This new rail alignment would also accommodate other long trains. There are no near-term plans to complete the rail line realignment. The railroad is however planning to retain ownership of the rail corridor SD103-01 but has recently indicated plans to sell the remaining portions of the property (SD103-02, SD103-03, SD103-04, and SD103-05).

Figure 2-1 – Railroad Property



RUNWAY 18-36

Runway 18-36 is the secondary "crosswind" grass turf runway at Wall. As of January 2016 the runway is published at 2,000 feet long and 100 feet wide. The north-south runway is oriented 68.3°/248.3° true bearing. The runway is relatively flat with a 0.06 percent overall surface gradient.

The runway is designed to meet FAA Runway Design Code (RDC) A-I, small aircraft design standards with visual-only approaches. Since Runway 18-36 does not have a parallel taxiway there is not an APRC for the runway. Pavement strength is not applicable due to the runway's turf surface. The turf surface serves as a landing strip for small aircraft during primary runway crosswind conditions, or other aircraft desiring the use of a non-paved surface. Some of these operations are conducted by aerial applicators which operate group II aircraft.

Table 2-9 – Runway Facility Summary

Component	Runway 12-30	Runway 18-36
Runway Length (feet)	3,500'	2,000'
Displaced Threshold Length	0'	0'
Runway Width (feet)	60'	100'
Runway Safety Area Width	150'	120'
Runway Safety Area Length (beyond threshold)	300'	35' to 120'
Runway Surface Material	Asphalt	Turf
Runway Surface Treatment	None	None
Single Wheel Pavement Strength	12,500 lbs.	N/A
Pavement Classification Number (PCN)	N/A	N/A

Source: Airnav.com, FAA Airport Master Record

TAXIWAYS AND TAXILANES

Wall is served by a system of taxiways and taxilanes to facilitate the movement of aircraft from the runway environment to other airport facilities including hangars and parking aprons.

- A connecting taxiway from Runway 12-30 to the apron is 25-feet wide and connects Runway 30 end with the apron and hangar area. This taxiway provides access to the fuel facility and aircraft storage hangars.
- The airport's main taxilanes are 25 feet wide with 20-foot wide taxilanes extending from the apron to the small hangar areas.

Taxilanes meet wingtip separation clearances for FAA Design Group I aircraft up to 49-foot wingspan. Taxilanes through the hangar areas meet minimum wingtip separation clearances for Design Group I aircraft up to 49-foot wingspan.

APRONS

There is one aircraft parking apron at Wall. The apron is northeast of the end of Runway 30. Apron areas serve the loading, unloading and parking needs for general aviation aircraft operators. The apron at Wall is approximately 3,800 square yards in size and made of an asphalt surface with an estimated pavement strength of 12,500 pounds. There are two (2) striped aircraft tie-downs for small aircraft parking. A fuel farm exists at the airport but there is no self-fueling and therefore no apron area for self-fueling.

A private apron connected to the main apron serves a private hangar for the purpose of conducting commercial aerial application operations. This apron has a concrete surface and is approximately 1,300 square yards in size. The apron is used for agricultural chemical loading, unloading and storage.

Table 2-10 – Apron Area Summary

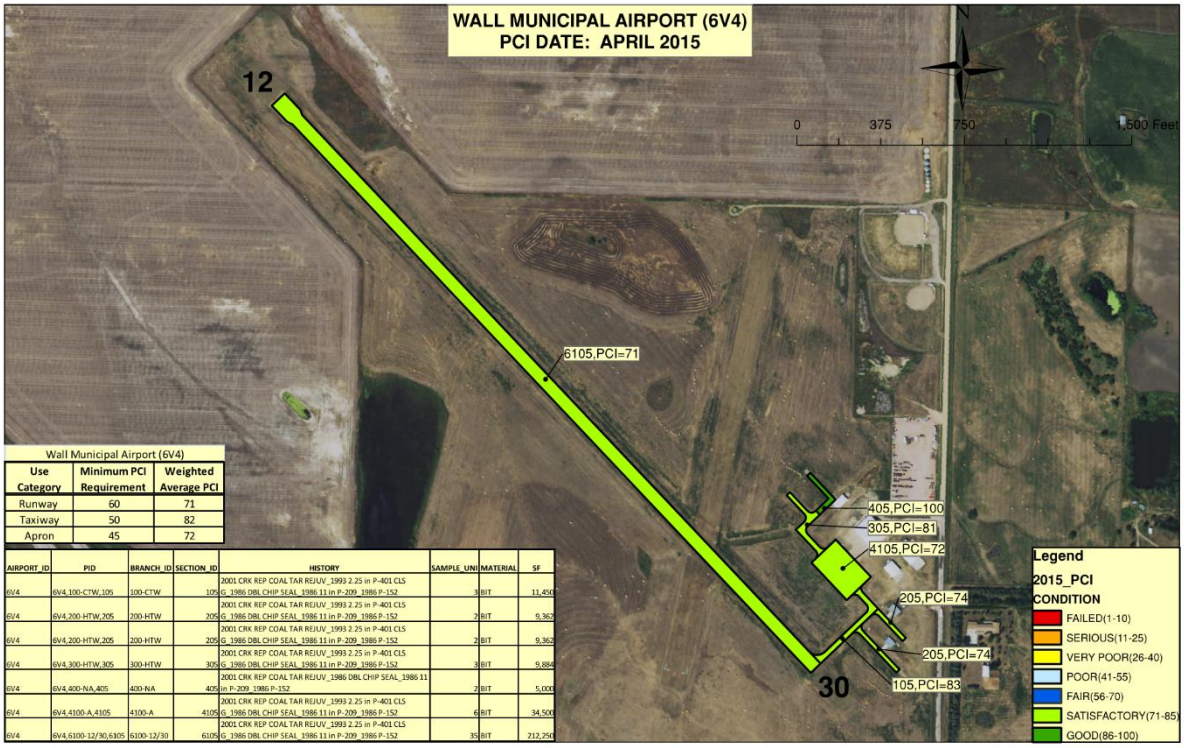
Identifier	Area (Square Yards)
Public Apron	3,800
Private	1,300
TOTAL	**5,100**

Source: Wall Pavement Management Report (2015)

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. Pavement condition is comprehensively evaluated by the State every three years and measured on a 0 to 100 scale known as the Pavement Condition Index rating. Pavement evaluation includes runway, taxiway, and apron pavements. A summary of the latest 2015 PCI rating for the runway and selected other airfield pavements follows.

Exhibit 2-6 – Pavement Condition Map



Wall Municipal Airport (6V4)

Use Category	Minimum PCI Requirement	Weighted Average PCI
Runway	60	71
Taxiway	50	82
Apron	45	72

AIRPORT_ID	PID	BRANCH_ID	SECTION_ID	HISTORY	SAMPLE_UNI	MATERIAL	SF
6V4	6V4,100-CTW,105	100-CTW	105	2001 CRK REP COAL TAR REJUV_1993 2.25 in P-401 CLS G_1986 DBL CHIP SEAL_1986 11 in P-209_1986 P-152	3	BIT	11,450
6V4	6V4,200-HTW,205	200-HTW	205	2001 CRK REP COAL TAR REJUV_1993 2.25 in P-401 CLS G_1986 DBL CHIP SEAL_1986 11 in P-209_1986 P-152	2	BIT	9,362
6V4	6V4,200-HTW,205	200-HTW	205	2001 CRK REP COAL TAR REJUV_1993 2.25 in P-401 CLS G_1986 DBL CHIP SEAL_1986 11 in P-209_1986 P-152	2	BIT	9,362
6V4	6V4,300-HTW,305	300-HTW	305	2001 CRK REP COAL TAR REJUV_1993 2.25 in P-401 CLS G_1986 DBL CHIP SEAL_1986 11 in P-209_1986 P-152	3	BIT	9,884
6V4	6V4,400-NA,405	400-NA	405	2001 CRK REP COAL TAR REJUV_1986 DBL CHIP SEAL_1986 11 in P-209_1986 P-152	2	BIT	5,000
6V4	6V4,4100-A,4105	4100-A	4105	2001 CRK REP COAL TAR REJUV_1993 2.25 in P-401 CLS G_1986 DBL CHIP SEAL_1986 11 in P-209_1986 P-152	6	BIT	34,500
6V4	6V4,6100-12/30,6105	6100-12/30	6105	2001 CRK REP COAL TAR REJUV_1993 2.25 in P-401 CLS G_1986 DBL CHIP SEAL_1986 11 in P-209_1986 P-152	35	BIT	212,250

Source: Wall Pavement Condition Report (2015)

According to the 2015 PCI all the airports pavements are in good condition.

Navigational Aids & Airspace

Navigational aids (NAVAIDs) provide visual and electronic guidance to pilots enabling the airport to safely, efficiently and effectively accommodate arriving and departing flights. Airspace is a resource that is necessary to allow flights to safely operate and maneuver in the airport environment. **Exhibit 2-4 Airfield Facilities** includes visual navigational aids and weather facilities at the airport.

VISUAL NAVIGATION AIDS

Visual aids are installed to provide airport usability during periods of darkness and/or low visibility. Pavement markings and lighting systems available at Wall are summarized in the following sections.

Identification Lighting

A white-green rotating beacon is a two-sided light used to assist pilots in the visual identification of a civilian airport. The Wall rotating airport beacon is located north of the terminal/snow removal equipment building. It operates sunset to sunrise.

Pavement Edge Lighting

Pavement edge lighting fixtures are installed off the edges of runway and taxiway pavement to help pilots identify the edge and ends of pavement to facilitate safe operations in darkness and/or low visibility environments. Runway edge lights are white (bi-directional). The runway end threshold lights (bi-directional) are green viewing down the runway at the beginning and red viewing at the end of the runway. Taxiway edge lights are blue and omni-directional.

Runway 12-30 is equipped with Low Intensity Runway Lighting (LIRL). Runway 18-36 has white cones designating the edge and ends of the runway, and does not have runway lighting. Lights are in fair condition. No taxiway edge lighting or retro-reflective blue markers are installed on the airfield.

Visual Approach Lighting

Visual approach lighting provides vertical descent guidance to pilots for a runway end. This navigational aid is used by the pilot to acquire and maintain the correct glide path for landing. The red and white lights emitted are interpreted by the pilot to indicate whether they are too high, too low, or on glidepath. Precision Approach Path Indicator Lights (PAPI) are the current FAA standard equipment installed for this purpose, however other types of equipment exist.

Runway 12 and 30 ends are equipped with a two-box PAPI installed on the left side of the runway with a 3.0 degree glidepath.

Approach Lighting System

An approach lighting system provides extended runway centerline alignment information near the runway's end for pilots to transition from instrument flight to visual flight for landing in low visibility conditions. There are several types of systems with varying configurations.

There is no approach lighting system installed for any runway end at Wall. The closest runway with an approach lighting system installed is Runway 14-32 at Rapid City Regional Airport, 35 miles to the west of Wall.

Runway End Identification Lighting

Runway End Identifier Lights (REILs) are a set of synchronized 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 system can be unidirectional toward the runway approach or omnidirectional.

There are no REILs installed at Wall.

Pilot-Controlled Lighting

Airfield lighting systems allow for pilots to control the complexity and intensity of lights.

Runway 12-30 is equipped with a pilot-controlled lighting system (PCL) to turn on the lights during the day, or to increase the intensity of runway lights above a standard low-intensity at night. The lights operate from Dusk to 22:00 local time. After 22:00, lights are able to be activated using aircraft radio on the UNICOM frequency designated for the airport.

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 instrument approach.

Runway 12-30 is equipped with visual runway markings identifying the runway designation, threshold, and centerline. No visual runway surface pavement markings exist for Runway 18-36 however white cones designate the runway edge and ends.

Taxiway markings include centerline striping to provide proper clearance from pavement edges and fixed objects. Taxiway centerline striping is in place at Wall. There are no enhanced markings in place near intersections with runways, however it is not required for this non-certificated airport.

Runway hold position markings identify the safety setback from active runways in association with airfield guidance signs at non-certificated airports. Hold position markings are installed on the taxiway 120 feet from the centerline of Runway 12-30.

Other markings include aircraft tie-downs.

Airfield Guidance Signs

Guidance signs provide location, direction, and guidance information to pilots on the ground to enhance awareness. Signs are placed around the airfield to identify runway and taxiway intersections, runway hold positions and other guidance. Mandatory signs are red and identify an intersection with a runway or critical safety zone. Other types of signs include location, direction, destination and distance remaining signs.

Unlighted mandatory signs (non-standard) are installed where taxiways meet Runway 12-30. The signs are in fair condition.

ELECTRONIC NAVIGATION AIDS

Electronic navigational aids are installed to 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. There are currently no electronic navigation aids available at Wall.

Global Positioning System (GPS)

GPS is a ground and satellite-based navigation system comprised of a network of satellites that transmit radio signals to provide triangulation to ground or air based receivers. Through this triangulation, longitude, latitude, altitude and speed can all be determined. A GPS procedure uses area navigation (RNAV) to help aircraft navigate on a horizontal course through pre-defined GPS waypoints. A series of ground-based transmitters, known as Wide Area Augmentation System (WAAS), enhances the precision of this system allowing receivers to accurately determine the position of a vehicle within a few horizontal and vertical feet of actual location. This enables precision-like approaches with vertical and horizontal guidance to a runway end. GPS, RNAV and WAAS are used by equipped aircraft for en-route and approach navigation and are widely available for navigation throughout the contiguous United States. This new technology is allowing required navigation performance (RNP) procedures to be developed with three-dimensional waypoints. Future development of Local Area Augmentation System (LAAS) may provide even higher accuracy requirements.

Wall does not currently have any GPS instrument approaches.

METEOROLOGICAL FACILITIES

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

Wind Indicator

Wind direction indicators provide immediate visual indication of the wind direction and velocity. A segmented circle provides a visual indication of the wind cone area together with runway alignment and/or traffic pattern information.

A lighted wind cone with a segmented circle providing runway centerline reference information is installed in the center of the airfield, located 320 feet north of Runway 12-30 centerline. There are no other supplemental wind cones installed.

Weather Reporting

The airport has a Super Automated Weather Observation System (AWOS) system located north of the segmented circle. The Super AWOS is owned by the airport.

The Wall Super AWOS system is capable of reporting barometric pressure, wind speed, wind gusts, wind direction, temperature, dew point, density altitude, visibility and cloud ceiling. The Super AWOS is not currently approved by the FAA. Weather information is available by telephone and aircraft radio.

METEOROLOGICAL DATA

Local weather conditions are a significant factor in the design and development of airport facilities. Temperature affects runway length, wind direction and speed affect runway orientation, and visibility and cloud ceiling conditions affect the need for runway navigational aids and lighting.

The Wall Super AWOS has been active only since 2011. Needing 20 years of data to determine average conditions, the weather averages from Philip Municipal Airport, 28 miles east with similar terrain were used from 1991-2010. During this time the average maximum temperature at Philip in the hottest month, July, has been 89.3 degrees Fahrenheit.

Prevailing winds are from the northwest, aligning with the airport's runway configuration. Crosswind or tailwind conditions can be hazardous to aircraft operations if they exceed the operational capabilities of the airplane or flight crew. The current all-weather combined wind coverage of all runways exceeds FAA minimum recommendations of 95 percent.

Table 2-11 – All-Weather Wind Coverage

Runway	Crosswind Component (Wind Speed)		
	10.5 knots	13.0 knots	16.0 knots
Runway 12-30	92.87%	96.50%	98.98%
Runway 18-36	82.16%	87.56%	93.21%
Combined*	**96.10%**	**98.48%**	**99.50%**

Source: National Climatic Data Center data from Wall Municipal Airport SuperAWOS (2011-2016)
**Combined assumes up to maximum design aircraft crosswind component for each runway*

Pilots are able to 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 a FAA Instrument Flight Riles (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 Instrument Meteorological Conditions (IMC) and require a pilot to be instrument rated. Wind coverage during IMC is evaluated to determine the ideal alignment for instrument approach to an airport's runway.

The Wall Super AWOS measures and reports cloud ceilings as stated above however historical data for cloud ceilings was not available. To analyze IMC wind coverage historical data from the Philip Municipal Airport AWOS was collected and reviewed. The current IMC wind coverage does not achieve 95 percent for the design aircraft on the primary runway.

Table 2-12 – IMC Wind Coverage

Runway	Crosswind Component (Wind Speed)		
	10.5 knots	13.0 knots	16.0 knots
Runway 12-30	83.65%	91.13%	96.94%
Runway 12 Only	45.91%	50.39%	53.54%
Runway 30 Only	46.48%	49.48%	52.15%

Source: National Climatic Data Center data from Philip Municipal Airport AWOS (2006-2015)
**Combined assumes up to maximum design aircraft crosswind component for each runway*

According to true hourly weather data the airport experiences IMC weather conditions 5.78 percent of the time. The airport has weather conditions below current visual approach weather minimums a total of 21.1 days per year. If a GPS approach were available at Wall with a 300-foot cloud ceiling and 1-mile visibility, the number of days the airport would not usable for landings would be reduced to 5.7 days.

Table 2-13 – Meteorological Analysis

Weather Condition	Percentage	Days per Year	Hours per Year
VMC	94.22%	343.9	8,254
Usable IMC	4.20%	15.3	368
Usability	**98.42%**	**359.2**	**8,622**
Below Weather Minimums*	1.58%	5.7	138
Total	***100.0%***	*365*	***8,760***

Source: National Climatic Data Center data from Philip Municipal Airport AWOS (2006-2015)
**Assumes a GPS approach with 300-foot cloud ceiling and 1-mile flight visibility for Runway 12 and 30 approaches*

COMMUNICATION FACILITIES

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

Local Area

Wall is an uncontrolled airport and is not served by a local Air Traffic Control (ATC) tower providing landing and takeoff clearances. Individual aircraft are responsible for announcing their position and stating their intentions over an air-ground CTAF, otherwise known as UNICOM. The CTAF/UNICOM frequency at Wall is 122.80 MHz. This system is typical for low activity general aviation airports such as Wall. The Super AWOS at Wall provides current weather on CTAF with three clicks of the microphone. The current weather is also available by calling 617.262.3825 or www.superawos.com

Terminal Area

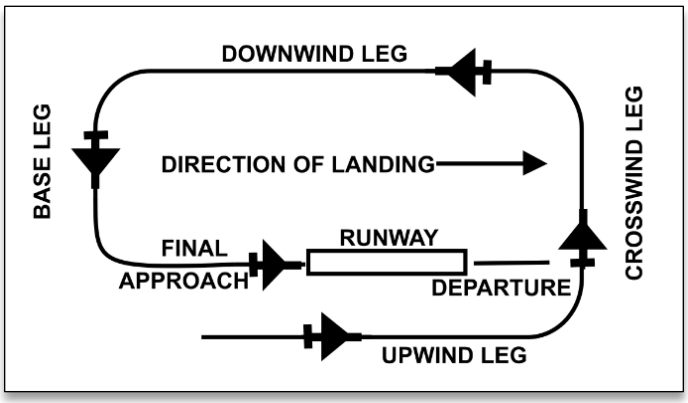
Wall is located outside of a terminal radar area providing approach and departure control services. The closest facility is in Rapid City, South Dakota 35 miles to the west. En-route, approach and departure services are provided by Denver Air Route Traffic Control Center (ARTCC) located in Longmont, Colorado.

APPROACH/DEPARTURE PROCEDURES

Aircraft operate under either Visual Flight Rules (VFR) or Instrument Flight Rules (IFR) depending on weather conditions and/or operational standards.

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.



Standard VFR Airport Traffic Pattern (Source: FAA)

The traffic pattern at Wall is a left-hand pattern, meaning pilots must make left turns throughout the traffic pattern from each leg. The standard traffic pattern altitude is 1,000 feet above ground level (AGL).

Instrument Approach Procedures

Pilots operating under IFR intending to land at Wall can only land when there are visual meteorological conditions. There are currently no Instrument Approach Procedures (IAPs) for Wall and in instrument meteorological conditions aircraft have the option of using IAPs at either Rapid City Regional Airport, 35 miles west or Philip Municipal Airport, 28 miles east. Instrument approach weather minimums are a result of the approach type, airport infrastructure and prevailing airspace obstructions.

Table 2-14 – Lowest Instrument Approach Procedures in the Area

Approach Procedure	Approach Type	Lowest Cloud Ceiling Minimum (HAT)	Lowest Visibility Minimum (n.m.)
RAP ILS RWY 32	Precision Approach	200 feet	½ mile
RAP RNAV (GPS) RWY 14	Approach with Vertical Guidance	LPV: 300 feet LNAV: 700 feet	1 mile
RAP RNAV (GPS) RWY 32	Approach with Vertical Guidance	LPV: 200 feet LNAV: 300 feet	½ mile
PHP RNAV (GPS) RWY 12	Approach with Vertical Guidance	LPV: 300 feet LNAV: 600 feet	1 mile
PHP RNAV (GPS) RWY 30	Approach with Vertical Guidance	LPV: 300 feet LNAV: 600 feet	1 mile

Source: Airnav.com
Note: HAT = Height Above Touchdown, n.m. = nautical miles (reported), VG = Vertical Guidance, NVG = Non-Vertical Guidance, LPV = Localizer Performance with Vertical Guidance, LNAV = Lateral Navigation

IFR/Obstacle Departure Procedures

Special procedures are published at airports to provide aircraft with adequate obstacle clearance. Examples include increased aircraft climb rates or recommended turns.

There are no special IFR or obstacle departure procedures reported for Wall.

AIRSPACE & SURVEILLANCE

Airspace Classification

Airspace is segregated into controlled, uncontrolled, special use or other airspace. Each airspace class has different operating rules.

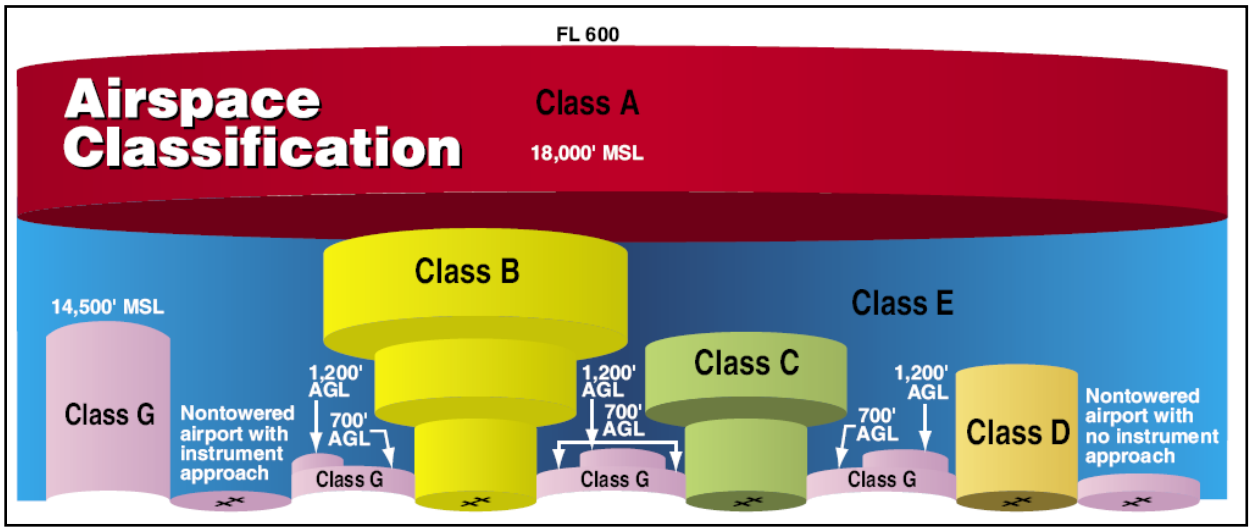
Wall is located in uncontrolled Class G Airspace with controlled Class E Airspace beginning at 700 feet above ground level. See **Figure 2-2 FAA Airspace Classifications**. No ATC clearance or radio communication is required for VFR flights in Class E or G airspace. For IFR flights, ATC clearance is required before entering controlled Class E airspace but not uncontrolled Class G. ATC services are available in Class E and G airspace subject to positive communication and radar coverage.

Ground Radar

Air Route Surveillance Radar (ARSR) facilities are owned by the FAA providing primary long-range radar to identify aircraft. Radar relies on direct line-of-sight, therefore the further the target is away from a radar site the higher altitude is required. The typical radar coverage area is 200 to 250 nautical miles.

At Wall, aircraft need to be 5000 feet above mean sea level (MSL) before they are within radar coverage for ATC. This can be a limitation for instrument approach operations.

Figure 2-2 – FAA Airspace Classifications



Source: Federal Aviation Administration (FAA) Pilot's Handbook of Aeronautical Knowledge (2016)

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 has required 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 Wall is located at the Rapid City Regional Airport in Rapid City, SD approximately 35 nautical miles west. ADS-B coverage is estimated to begin at 1,500 feet AGL at Wall.

AIRSPACE OBSTRUCTIONS

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. FAR (Federal Aviation

Regulation): Part 77 *Safe, Efficient Use, and Preservation of the Navigable Airspace*[1] establishes various airspace surfaces in the vicinity of 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.

When evaluating objects, the FAA determines whether or not 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 action include removing, lowering, or obstruction lighting an object. A general diagram of the Part 77 surfaces is shown in **Figure 2-3 FAR Part 77 Airspace**.

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. 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.
- **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.
- **Visual**: A runway intended solely for the operation of aircraft using visual approach procedures, with no straight-in instrument approach procedure published or planned.

There are two runway classifications:

- **Utility**: A runway that is constructed for and intended to be used by propeller driven aircraft of 12,500 pounds maximum gross weight and less.
- **Other-Than-Utility**: A runway that is constructed for and intended to be used by aircraft greater than 12,500 pounds maximum gross weight.

The combination of the approach type and runway classification defines the dimensional criteria for each approach. The Part 77 airspace dimensional criteria for Wall is identified in the following table.

Table 2-15 – Existing Part 77 Approach Airspace Standards

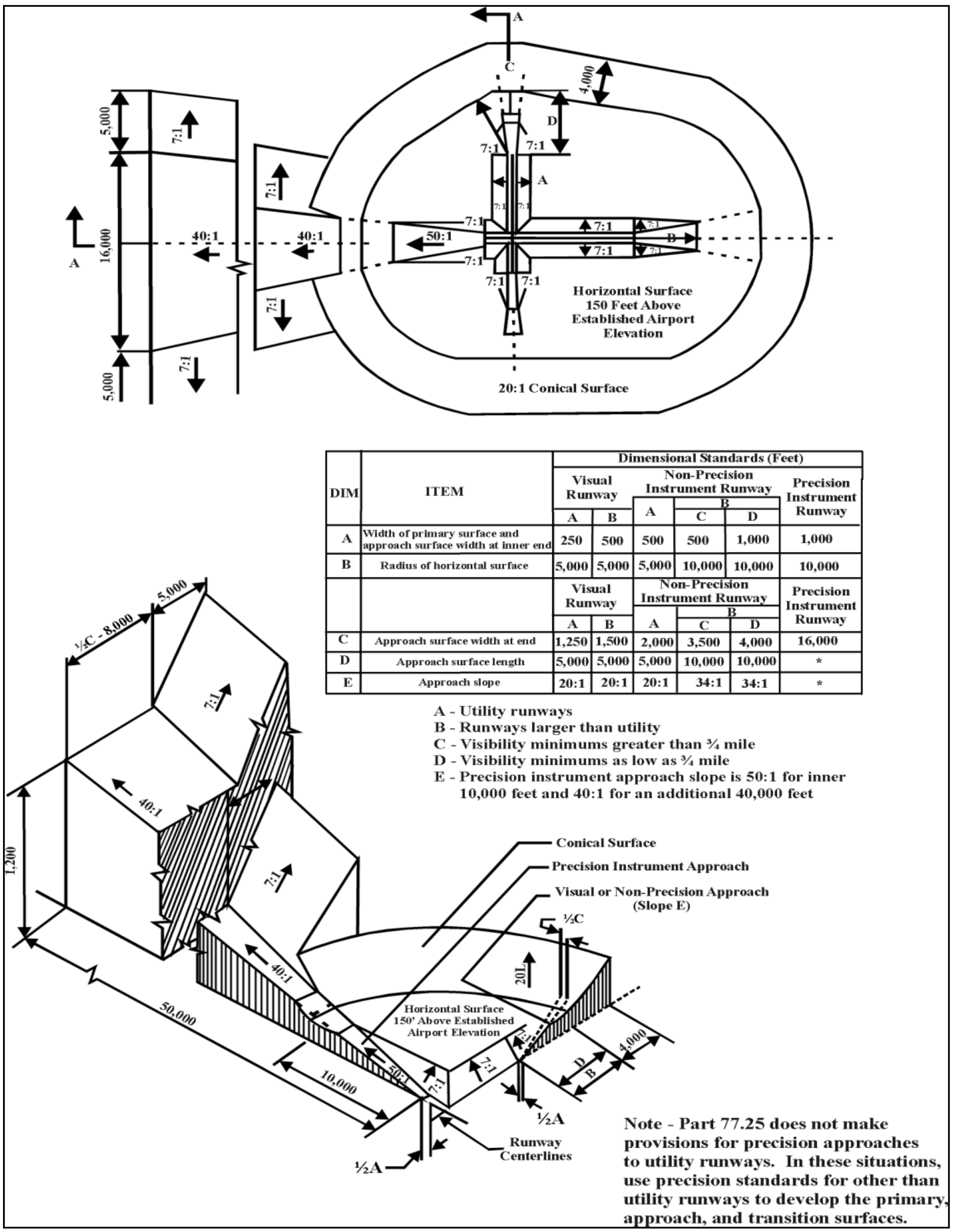
Runway End	Approach Standards	Part 77 Code	Dist. From Runway End	Inner Width*	Outer Width	Length	Slope
12	Visual Other-Than-Utility	B	200'	500'	1,500'	5,000'	20:1
30	Visual Other-Than-Utility	B	200'	500'	1,500'	5,000'	20:1
18	Visual Utility	A(V)	0'	250'	1,250'	5,000'	20:1
36	Visual Utility	A(V)	0'	250'	1,250'	5,000'	20:1

Source: FAR Part 77, FAA Airport Master Record
**Inner width is also the Primary Surface width driven by the most demanding approach to a runway.*

[1] Federal Aviation Regulations (FAR) are codified in Title 14 Code of Federal Regulations for Aeronautics and Space.

Based on Wall's most up-to-date FAA Airport Master Record, there are no critical Part 77 approach surface obstructions to any runway end at Wall. As a part of the master plan process, a more detailed obstruction analysis will be completed using data from an Aeronautical Survey. This detailed obstruction identification and mitigation disposition is identified in the Airport Layout Plan developed at the end of this planning study.

Figure 2-3 – FAR Part 77 Airspace



DIM	ITEM	Dimensional Standards (Feet)					
		Visual Runway		Non-Precision Instrument Runway			Precision Instrument Runway
		A	B	A	B: C	B: D	
A	Width of primary surface and approach surface width at inner end	250	500	500	500	1,000	1,000
B	Radius of horizontal surface	5,000	5,000	5,000	10,000	10,000	10,000
		Visual Runway		Non-Precision Instrument Runway			Precision Instrument Runway
		A	B	A	B: C	B: D	
C	Approach surface width at end	1,250	1,500	2,000	3,500	4,000	16,000
D	Approach surface length	5,000	5,000	5,000	10,000	10,000	*
E	Approach slope	20:1	20:1	20:1	34:1	34:1	*

A - Utility runways
B - Runways larger than utility
C - Visibility minimums greater than ¾ mile
D - Visibility minimums as low as ¾ mile
E - Precision instrument approach slope is 50:1 for inner 10,000 feet and 40:1 for an additional 40,000 feet

Source: Federal Aviation Administration (FAA)

General Aviation

General Aviation (GA) elements include facilities that serve aeronautical needs of the flying public beyond those needed for commercial airlines. Facilities include those necessary for the movement of passengers as well as parking, service and storage of aircraft. Examples of these facilities include the aircraft storage hangars, aircraft parking apron, GA terminal, and commercial aviation operators.

COMMERCIAL OPERATORS

Fixed Base Operators (FBOs) are commercial businesses providing 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.

There are currently no FBOs at Wall. Ascend Ag, Inc. and Cedar Butte Air, Inc. are commercial operators on the field providing aerial spraying services in central and western South Dakota. These businesses are considered SASOs. Other services available at Wall include transient hangar and tie-down aircraft storage. No aircraft fueling is provided to the public at Wall.

GA TERMINAL BUILDING

The arrival/departure (A/D) terminal building is connected to the snow removal equipment building northwest of the main general aviation aircraft parking apron. It is accessed via the main airport access road. The building is 33' x 60' in size with a total of 550 square feet for the terminal office area. The building was constructed in 2012.

The A/D building serves multiple functions for inbound and outbound general aviation passengers and pilots. Services provided include a weather briefing computer, telephone, restrooms, and waiting area. The remainder of the building houses the airports maintenance equipment.

AIRCRAFT STORAGE HANGARS

Wall has 12 based aircraft at the airport. All aircraft are stored in aircraft storage hangars. Hangar facilities consist of large conventional hangars (greater than 10,000 square feet) and small conventional hangars (10,000 square feet or less). The hangar area is concentrated in the southeast portion of the airport.

There are four (4) small hangars and one (1) large hangar. The large hangar, number 5 is located adjacent to the main apron. Hangars 1 and 2 are located on taxilanes. Hangars 3 and 4 are accessed by a turf taxilane.

Table 2-16 – Aircraft Storage Hangars

Facility Number	Facility Type	Use	Width x Depth	Area
1	Small Conventional Hangar	Private	41' x 32'	1,312 SF
2	Small Conventional Hangar	Private	48' x 36'	1,728 SF
3	Small Conventional Hangar	Private	62' x 95'	5,890 SF
4	Small Conventional Hangar	Private	48' x 55'	2,640 SF
5	Large Conventional Hangar	SASO	120' x 100'	12,000 SF
			Large Conventional Hangars	**12,000 SF**
			Small Conventional Hangars	**11,570 SF**
			TOTAL	**23,570 SF**

Source: Google Earth Imagery (2016), KLJ Analysis
NOTE: Areas estimated by KLJ based on imagery to include total building space.

Support Facilities

Support facilities are necessary to facilitate the day-to-day maintenance and operation of the airport. A map depicting these facilities is shown in **Exhibit 2-7: Terminal Area Facilities Map**.

AIRPORT ADMINISTRATION

There are no separate airport administration facilities at Wall. The A/D building contains workspace and storage for field personnel and equipment. The day-to-day administration takes place at the Wall City Hall located in downtown Wall. Volunteers are responsible for the airport management and administration.

The A/D building includes space for the airport's maintenance equipment. The City's Public Works department is responsible for regular maintenance and upkeep of the airport including snow removal and mowing. A list of equipment owned by the City of Wall dedicated for the airport is listed below:

- 2010 New Holland Tractor with loader, Sweepster broom (8'), three-point blade, and Snocrete blower (Excellent Condition; FAA/State/City funded)

FUELING FACILITIES

The Wall fuel facility is located behind Hangar 2. The facility includes a 15,000 gallon above ground storage tank for Jet-A fuel and three above ground storage tanks (1 x 2,000, and 2 x 1,000 gallon) for 100LL Avgas aviation fuel. There are an additional 3,000 gallons of 100LL Avgas in three 1,000 gallon tanks located elsewhere on the airport. All fuel tanks at the airport are privately owned. No self-service fueling is available.

FENCING & SECURITY

The Wall airport is surrounded by a four-foot high barbed wire fence. Manual pedestrian and vehicle gates are located in the hangar area.

Ground Access & Parking

These facilities provide vital connectivity within the airport facility and from the airport to the surrounding community.

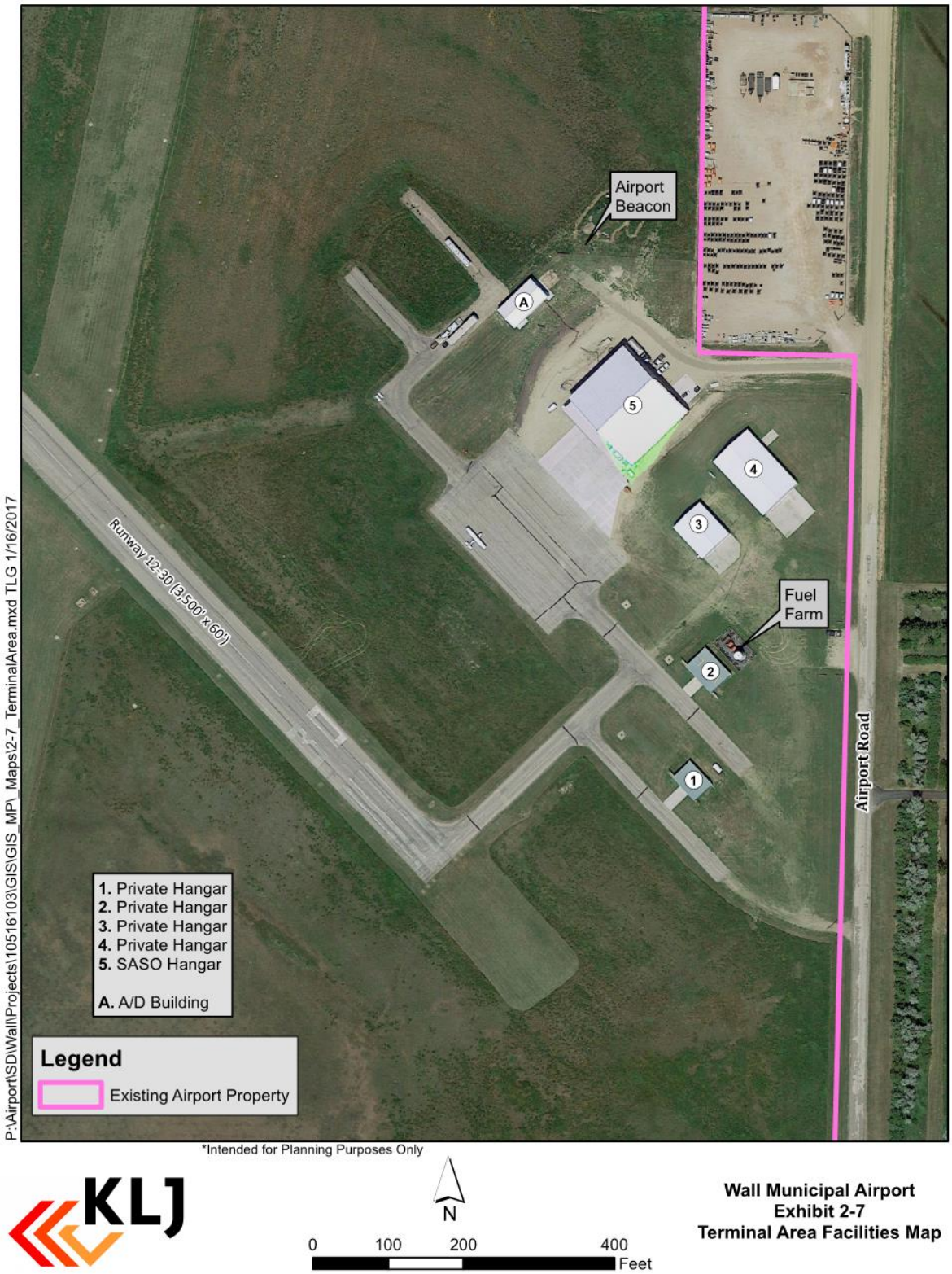
GROUND ACCESS & PARKING

Public airport access is provided by Airport Road (109th Avenue), a north-south paved county road. This road connects with West 4th Avenue on the southwest side of airport property to provide access to the Wall central business district. An unpaved 500' access road Airport Road and is located within airport property. It provides public access from Airport Road to unpaved parking around the hangars and A/D Building. There is also a parking area directly on the west side of Airport Road for vehicle parking with a walk through gate to access hangars 1, 2, 3 and 4. There are no on-airport perimeter roadways.

PUBLIC TRANSPORTATION

There is no public transportation system in Wall.

Exhibit 2-7 – Terminal Area Facilities Map



Other

UTILITIES

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

- **Stormwater:** Stormwater on the airport is managed by an above-ground system of ditches and culverts. Stormwater runoff typically leaches on airport property or flows into nearby road and highway ditches.
- **Power:** Electric service is provided to the airport via underground cable from West River Electric Coop. Underground power lines distribute electricity throughout the airport.
- **Water:** Water is provided by City of Wall.
- **Sanitary:** Sanitary sewage is handled by septic tanks and leach fields for each building at the airport.
- **Telecommunications:** Telephone and internet service is provided by Golden West Communications.
- **Natural Gas:** There is no natural gas provided to the airport site.
- **Heating & Cooling:** Heating and cooling of the A/D building is provided by electric heat and air conditioning. The new SASO hangar uses geo-thermal heat and cooling.
- **Other:** There are no aircraft deicing activities or facilities on the airport.

AIRPORT COMPLIANCE

The City of Wall dedicates airport property for aeronautical use. Any use of airport property should be evaluated for compatibility with the airport's planned development and FAA grant assurances. Noted non-aeronautical land uses and encumbrances to airport property are described below:

- **Agricultural Production:** Land outside of critical airfield areas can be used for compatible agricultural production. There are no current agreements for agricultural uses in these areas. If this were pursued the agriculture activity would need to be compatible with FAA setback requirements. Utilizing airport property for agricultural production is a standard practice at other airports and no further action is required at this time.
    - **Tree Farm:** For several years, the city has provided a small portion of airport property for the East Pennington Soil Conservation District to start trees. The trees are grown on this property but not allowed to grow above 5 feet. Even though the trees are not allowed to grow higher, the location of these trees inside the Runway 30 approach is recommended to be relocated to another area of airport property where no potential hazard would be created.
    - **Pipelines:** No pipelines currently exist across airport property except for utility distribution systems.
    - **Leases:** There are no non-aeronautical leases for use of airport property.

Airport compliance issues including status of FAA approval and steps for airport to achieve compliance with FAA grant assurances per FAA Order 5190.6B, *FAA Airport Compliance Manual* is identified in **Chapter 4: Facility Requirements**.

Surrounding Land Use

Background

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 for airports include:

- FAA airspace standards for airport safety and operational capability.
- FAA land use compatibility near runway ends associated with the Runway Protection Zone (RPZ) for the safety of people and property on the ground.
- State or local airport land use standards, if applicable.
- FAA wildlife hazard mitigation plans for aircraft operational safety.
- FAA land use compatibility within designated day-night average sound level (DNL) noise exposure contours to avoid significant impacts to activities on the ground.

This section provides an overview of existing land uses and plans. Surrounding land uses are depicted graphically in **Exhibit 2-8: Land Use Map.**

Existing Land Uses

Wall is located to the west of the Wall city limits in Pennington County. Airport property is within a portion of Section 36 of South Dakota Township 1 North, Range 15 East.

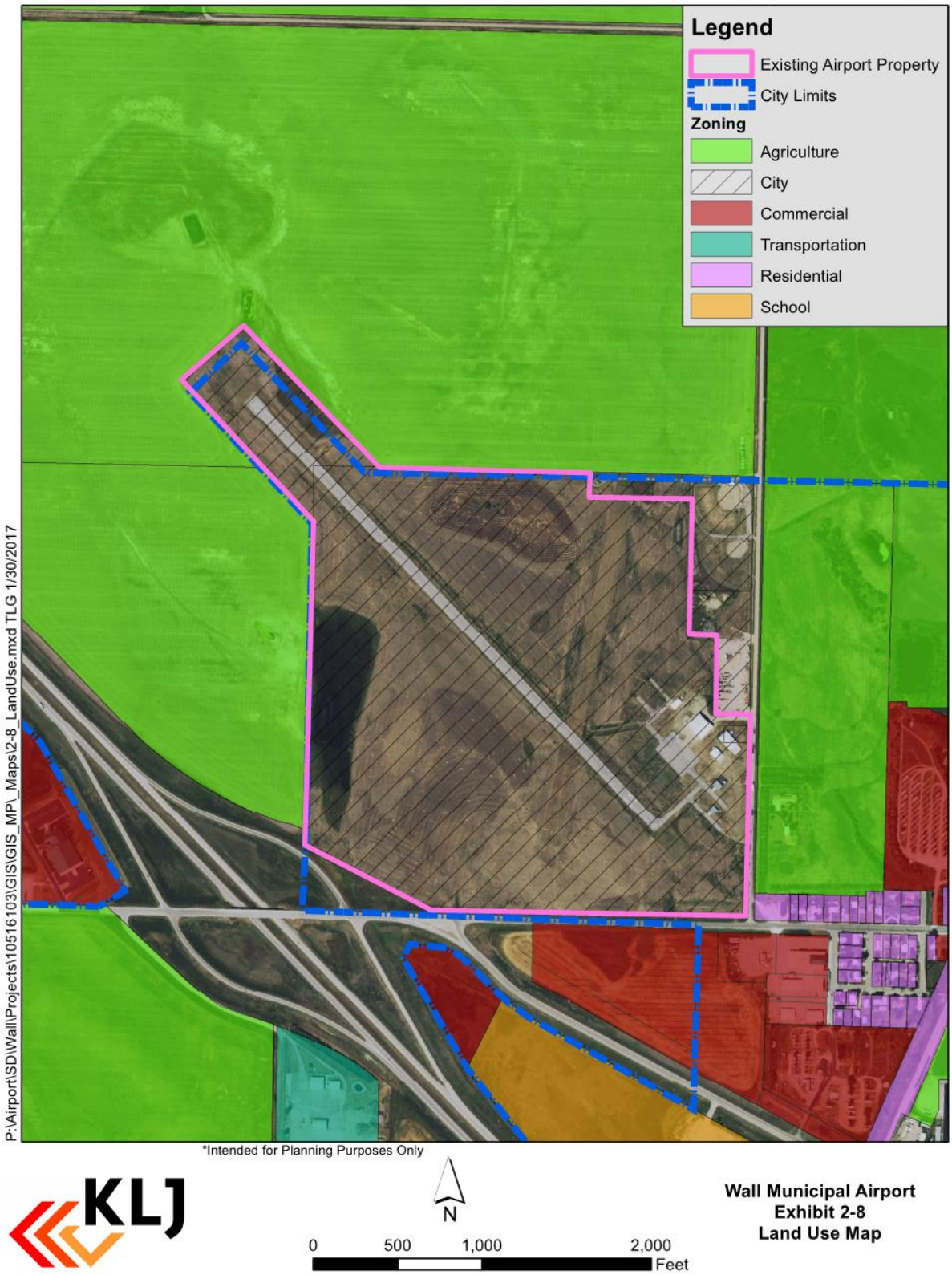
There is a resident to the east of Airport Road. Along West 4th Avenue there are residences, a church and a Golden West Communications office/service facility. Some of the residences, the church and a port of the Golden West facility are inside the existing Runway 30 RPZ. There are also several above ground fuel tanks inside the RPZ. The fuel tanks are owned and operated by Crown Oil.

On the east side of the airport there are also baseball fields and a wire storage yard used by Golden West Communications. All this land is owned by the City of Wall.

Potential SDSU Research Facility

During the time of gathering inventory information it appeared that one potential use of land to the west and north of the airport may be used in the future for a South Dakota State University (SDSU) Agricultural Research Facility. As noted before, the railroad which currently owns the land is interesting in selling portions of this land, see Figure 2-1. If the SDSU facility were implemented it was determined it would not be significantly different from the current agricultural uses existing north and west of the airport. Officials from the state and railroad have expressed an interest in working with the airport to assure that the airport can function without operational limitation as well as supporting the interests of SDSU and railroad.

Exhibit 2-8 – Land Use Map



Airport Zoning

The City of Wall has zoning jurisdiction over the airport. There are no specific zoning ordinances related to the airport.

Financial Overview

The City of Wall is responsible for supporting the maintenance, operations and capital improvements at Wall. A cursory review of the airport's financial structure was completed. The financial overview is important in considering the sponsor's ability to fund future capital improvements.

General aviation airports rely on FAA and State grants to support its capital expenditures. Opportunities to maximize airport revenue and reduce expenses is an on-going effort pursued by airport management.

Expenses & Revenues

OPERATING

The City of Wall collected operating revenues and incurred operating expenses in 2015 and 2016 for the Wall Municipal Airport. Airport revenues and expenses were as follows:

Revenues	2015	2016
Land Rent	$ 2,246	$ 651
Total	$ 2,246	$ 651
Expenses	**2015**	**2016**
Maintenance Supplies	$ 630	$ 508
Utilities	1,252	1,551
Insurance	1,312	570
Other	1,716	1,324
Total	$ 4,910	$ 3,953

The only revenue the airport currently has if from land lease agreements for hangars. The airport does receive revenue from the State and FAA for project expenses but these are out of the ordinary and are offset by capital expenses which fluctuate from year to year. The airport currently charges $.05 per square foot per year as a land lease rate for hangars.

The airport incurs expenses for supplies, electricity and other routine items. Like revenues, the capital expenses are not included in this operating information since the capital needs fluctuate from year to year.

CAPITAL IMPROVEMENTS

Revenues and expenses related to capital improvements occur on an infrequent basis and are therefore addressed separately from the operating revenues and expenses. In addition to federal and state funds used for capital improvements, there is usually a need to provide some level of local funding as a match for projects. This local funding is either derived from airport operating revenues or from periodic contributions from the municipality's general funds. The City of Wall provides these matching dollars from general funds as necessary.

Environmental Inventory

Introduction

This section provides an overview of environmental conditions and issues at Wall Municipal Airport and the immediate vicinity. 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 for proposed airport developments 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.

For purposes of this study area, key environmental resources are described in the following sections. **Exhibit 2-9: Environmental Overview Map** provides a graphical depiction of the existing environmental conditions within a 1-mile radius of the airport, as described in this section.

Environmental Features

BIOLOGICAL RESOURCES

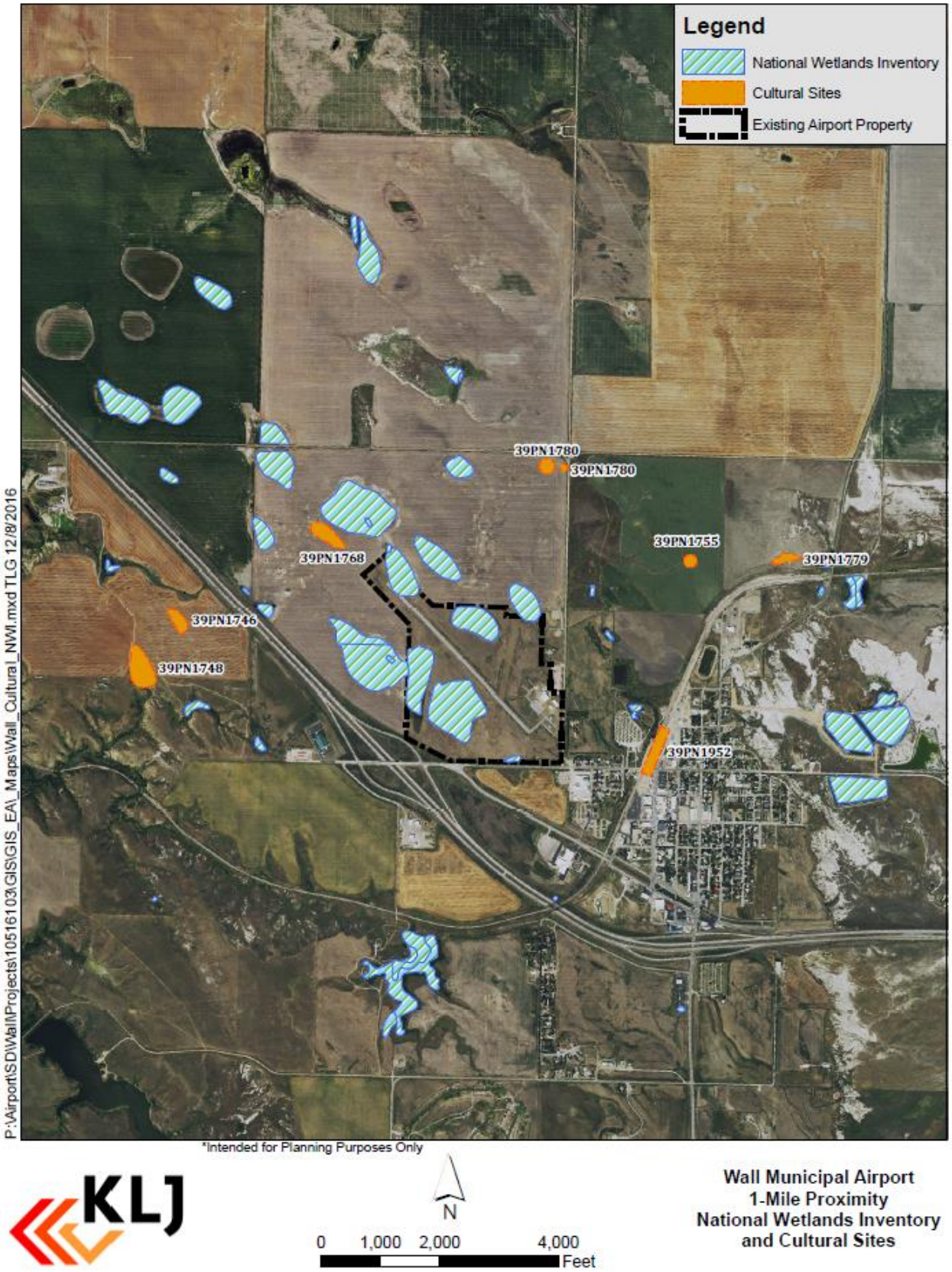
Biological resources include flora and fauna that are present in an area. Wall Municipal Airport is located in the Northwestern Great Plains Ecoregion according to US Geological Survey. Native grasslands include western wheatgrass, needlegrass, blue grama, and buffalo grass which have been largely replaced by spring wheat and alfalfa over most of the ecoregion. Agriculture is limited by erratic precipitation patterns and limited opportunities for irrigation.

Throughout the Great Plains Ecoregion, the predominant crop is spring wheat with smaller amounts barley, oats, sunflowers, alfalfa, and soybeans. Crops around the Airport include wheat, sunflowers, corn, millet, milo, safflower and alfalfa.

The following is not a complete list of fauna that could be present in the area; it represents the species most likely to be encountered. Waterfowl such as mallards and Canada goose are present in the surrounding area due to numerous wetlands in the area. Mammals such as the mule deer, antelope, Bighorn Sheep, cattle and buffalo are also known to be in the area.

The US Fish & Wildlife Service (USFWS) Information for Planning and Conservation (IPaC) website indicated that 6 endangered or threatened species occur in Pennington County, SD. These include three endangered species: the Whooping crane, the Least tern and the Black-footed ferret; and three threatened species: the Rufa red knot, the Northern long-eared bat, and the Leedy's roseroot. In accordance with Section 7 of the Endangered Species Act, consultation with USFWS to determine the potential for occurrences of federally-listed threatened and endangered species in the project area would be necessary. Prior to project implementation, further analysis is required to identify the potential for fish, wildlife and plant impacts as a result of the project.

Exhibit 2-9 - Environmental Overview Map



DEPARTMENT SECTION 4(F) AND SECTION 6(F)

Section 4(f) of the Department of Transportation Act of 1966, as codified in the 49 U.S.C. § 303, provides that the Secretary shall not approve any program or project which requires 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 as determined by the officials having jurisdiction thereof, unless: (1) there is no feasible or prudent alternative to the use of such land, and (2) such program or project includes all possible planning to minimize harm resulting from the use.

There are no known publicly owned lands from parks, recreation areas, or refuge areas within the immediate vicinity of the Airport. Wall Community Golf Course is located about 1.1 miles to the south of Wall Municipal Airport. Approximately 6.30 miles south of the Airport is the Badlands National Park. Baseball fields are located just east of Runway 18-36, but are City owned and therefore not a 4(f) property. Proposed improvements are not anticipated to impact existing publicly owned lands from parks, recreation areas, refuge areas, but could possibly impact historic sites within the vicinity of the airport; therefore, further analysis is required. Please refer to the ***Historical, Architectural, Archeological, and Cultural Resources*** section for more information.

Section 6(f) from the Land & Water Conservation Fund Act provides that the Secretary shall not approve any program or project which requires the use of state and local parks, lakes, trails, beaches, and conservation lands, unless: (1) if the request complies with Section 4(f), (2) information is provided that is needed to make findings required under Section 6(f), and (3) coordination is carried out with the NPS and the state agency responsible for the Section 6(f) property [(2)]. Grant funds were received for recreational developments in 1972, construction of a softball field in 1979, and a pool renovation in 1982. Proposed improvements are not anticipated to impact existing Section 6(f) properties, therefore, no further analysis is required.

HAZARDOUS MATERIALS, SOLID WASTE, AND POLLUTION PREVENTION

Hazardous Materials

There is one contaminated area located approximately 0.7 miles southeast of the airport at the Corner Pantry formerly owned by Amoco Oil. This is based on a review of the Environmental Protection Agency database regarding underground storage tanks, listings for superfund sites, and sites covered under the Resource Conservation and Recovery Act. Prior to acquisition of new land to be owned in fee title by an airport sponsor, FAA recommends that an Environmental Due Diligence Audit (EDDA) be performed. An EDDA includes a more detailed review of an area, relative to NEPA-level review, for the possible presence of environmental contamination.

Solid Waste

The airport has not produced significant amounts of solid waste including garbage, refuse or sludge as compared to the broader community. FAA requires a Solid Waste Management Plan to be developed as part of this Airport Master Plan study. A Solid Waste study is located in **Appendix G: Recycling & Solid Waste Plan**.

Pollution Prevention

The Airport does not currently have a formal pollution prevention plan.

HISTORICAL, ARCHITECTURAL, ARCHEOLOGICAL, AND CULTURAL RESOURCES

A file search was completed by the South Dakota State Historical Preservation Office (SHPO). There are no archaeological sites or historic structures registered on the National Register of Historic Places

[2] 1050.1F Desk Reference - December 2016

(NRHP) within a one-mile radius of the Wall Municipal Airport. Site number 39PN1768 located to the north of Runway 12/30 could possibly be disturbed during potential construction operations. In 2008 a Class III Cultural Resource Inventory was completed and found site 39PN1768 to be "Not Eligible." There is one unevaluated find approximately .34 miles east of the airport. Please see cultural site number 39PN1952 located on **Exhibit 2-9: Environmental Overview Map**. There is potential that undiscovered cultural features exist on and around the Airport. Additional research, including a field survey, may be necessary to adequately assess the area's potential to contain historic properties.

Before a project that involves land disturbance is implemented, an analysis to identify the potential for cultural resources would need to be conducted for the project area. Coordination with the SHPO and tribal members is necessary for projects involving land disturbance. Although site 39PN1768 was listed as not eligible, it was listed as being Native American artifact scatter, so tribal consultation is required. Additionally, any project affecting buildings that have the potential to be listed in the National Register of Historic places would require coordination with SHPO.

Structures that are more than 50 years old and are eligible for inclusion on the NRHP. Further review is required to determine if these structures have significant historical, cultural or architectural characteristics. Considering the airport was constructed in the mid-1940s, the original airport structures would be more than 50 years old.

Projects that involve ground surface disturbance in areas not previously disturbed by the construction of the Airport will also need to be surveyed by a qualified Archeologist and a determination of affect to historic properties would need to be obtained from the SHPO. Resolutions of any adverse effects would need to be coordinated with the SHPO. Further review regarding potential cultural sites historic properties will be required at the environmental documentation phase.

FARMLAND

Impacts to farmlands considered to be prime, unique or statewide or locally important need to be considered under NEPA. The Farmland Protection Policy Act (FPPA) of 1981 provides protection to prime and unique farmlands. The Act defines prime farmland as land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops, and is also available for these uses. Unique farmland is farmland that is used for production of specific high value food, feed, and fiber crops. Statewide farmland is of statewide importance for the production of food, feed, fiber, forage, and oil seed crops, and is determined by state agencies. Locally important farmland is where the production of food, feed, fiber, forage, and oilseed crops, are not identified as having national or statewide importance but identified by local agencies as important.

A search of the USDA Natural Resources Conservation Service (NRCS) web soil survey identified farmlands within 1 mile of the airport that are classified as prime farmland if irrigated and farmland of statewide importance. Please see **Exhibit 2-10: Farmland Classification Map**. Further consultation with NRCS is required in a project environmental review stage to calculate the Farmland Conversion Impact Rating to determine if impacts would be significant.

LAND USE

Compatible land uses are those that typically are not influenced by normal airport operations. The compatibility of existing land uses in the vicinity of an airport is usually associated with the extent of noise impacts occurring from airport property and safety concerns. Incompatible land uses are typically items such as fuel storage facilities, areas of public assembly, tree rows, high density residential areas, and areas that have the potential to attract hazardous wildlife. In general, Wall Municipal Airport is surrounded by prairie, railroad property, golf courses, water features, open spaces, agriculture and human development.

Wildlife Hazards

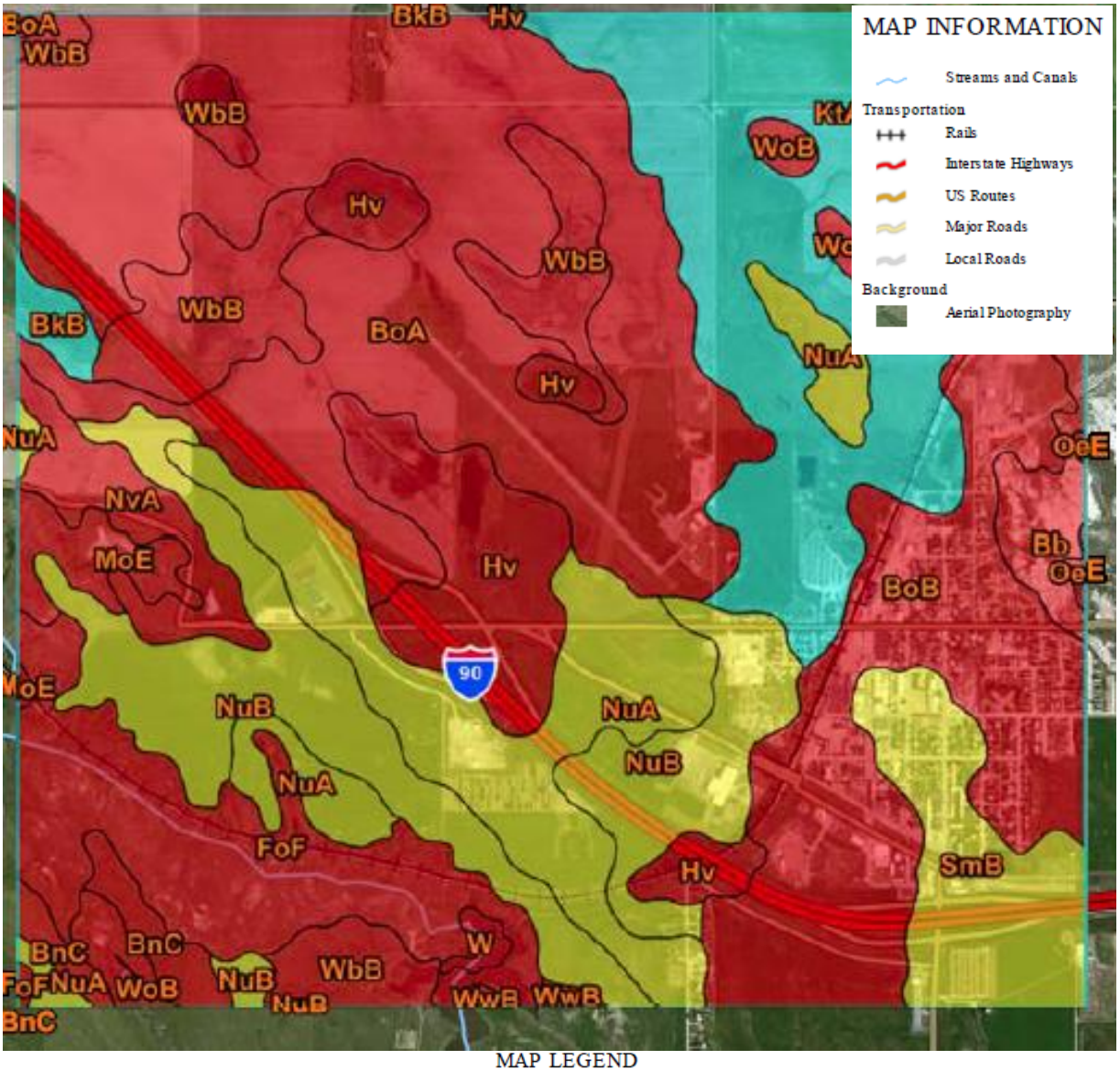
FAA has implemented procedures and guidelines to mitigate wildlife damages to aircraft and aviation operations. Wildlife collisions have increased over the past two decades and reporting has increased awareness of hazards to human health, safety and financial losses.

Potential wildlife hazards in the area include a variety of wetlands, area cropland, and grasses. A Wildlife Hazard Assessment (WHA) may be required to identify daily and seasonal wildlife activity and provide recommendations for mitigating wildlife hazards at Wall Municipal Airport.

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

Social impacts from a project depend on how that project affects the character, habits, and economic conditions of the people living within the affected area of the project. The project's effects on business, employment, transportation, utilities, etc. are factors that affect the social climate of a community. Any action that would either adversely or beneficially affect the factors stated above would be considered as having some type of social impact on the residents of a particular community. Off-airport actions include the acquisition of land use and airspace avigation easements and potential future obstruction mitigation. The proposed improvements involve land acquisition, and land currently zoned agricultural would be rezoned for the airport. Further analysis is required. For more information on Land Use on and near the Airport please refer to ***Surrounding Land Use***.

Exhibit 2-10 – Farmland Classification Map



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Soil Rating Lines
- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Soil Rating Points
- Not prime farmland
- All areas are prime farmland
- Prime farmland if drained
- Prime farmland if protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated
- Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if irrigated and drained
- Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
- Prime farmland if subsoiled, completely removing the root inhibiting soil layer
- Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
- Prime farmland if irrigated and reclaimed of excess salts and sodium
- Farmland of statewide importance
- Farmland of local importance
- Farmland of unique importance
- Not rated or not available

Water Features

Farmland Classification— Summary by Map Unit — Custer and Pennington Counties Area, Prairie Parts, South Dakota (SD606)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
Bb	Badland	Not prime farmland	118.5	2.6%
BkB	Blackpipe silty clay loam, 2 to 6 percent slopes	Farmland of statewide importance	91.3	2.0%
BlB	Blackpipe clay loam, 2 to 6 percent slopes	Farmland of statewide importance	1.0	0.0%
BnC	Blackpipe-Norrest complex, 6 to 12 percent slopes	Not prime farmland	72.3	1.6%
BoA	Blackpipe-Wortman complex, 0 to 3 percent slopes	Not prime farmland	1,033.6	22.6%
BoB	Blackpipe-Wortman complex, 2 to 6 percent slopes	Not prime farmland	361.1	7.9%
DmA	Denby silty clay, 0 to 3 percent slopes	Not prime farmland	17.5	0.4%
FaE	Fairburn clay loam, 9 to 40 percent slopes	Not prime farmland	0.4	0.0%
FoF	Fairburn-Orella-Badland complex, 15 to 45 percent slopes	Not prime farmland	264.0	5.8%
HsB	Hisle-Blickspots complex, 0 to 6 percent slopes	Not prime farmland	19.5	0.4%
Hv	Haven silt loam, 0 to 1 percent slopes	Not prime farmland	177.3	3.9%
IrB	Interior, occasionally flooded-Cedarpass-Denby complex, 0 to 6 percent slopes	Not prime farmland	25.5	0.6%
KtA	Kyle clay, 0 to 1 percent slopes	Farmland of statewide importance	603.1	13.2%
LaB	Larvie clay, 0 to 4 percent slopes	Not prime farmland	12.6	0.3%
M-W	Miscellaneous water	Not prime farmland	28.1	0.6%
MoE	Midway silty clay loam, 15 to 40 percent slopes	Not prime farmland	188.6	4.1%
NuA	Nunn loam, 0 to 2 percent slopes	Prime farmland if irrigated	326.2	7.1%
NuB	Nunn loam, 2 to 6 percent slopes	Prime farmland if irrigated	376.1	8.2%

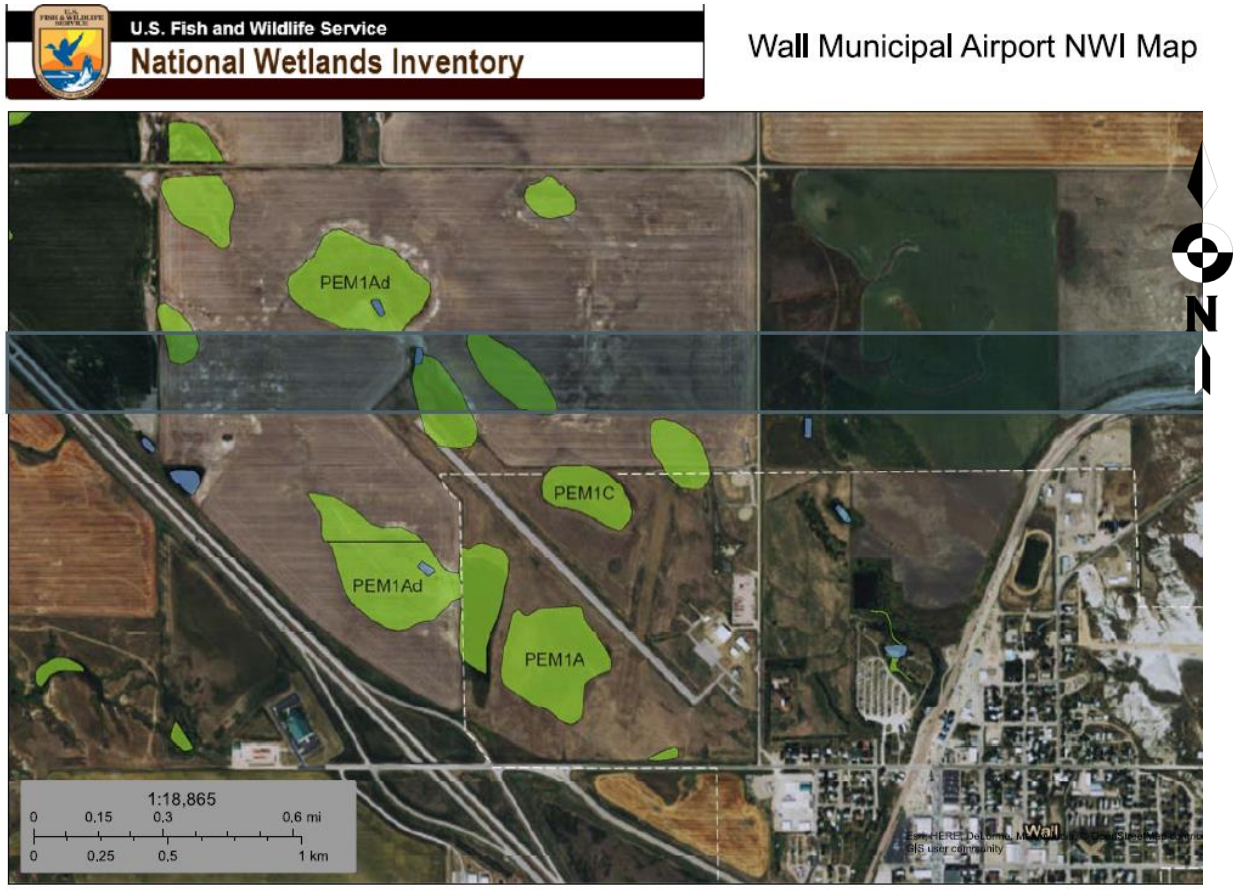
WATER RESOURCES – WETLANDS

Wetlands are defined in Executive Order 11990, Protection of Wetlands, as those areas that are inundated by surface or groundwater with a frequency to support, and under normal circumstances does or would support, a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Three parameters that define a wetland as outlined in the US Army Corps of Engineers Wetland Delineation Manual are hydric soils, hydrophytic vegetation, and hydrology.

There are wetlands in the National Wetland Inventory (NWI) located on the Airport property. Please refer to **Exhibit 2-11 National Wetland Inventory Map**. All wetlands would require delineation to clearly identify their boundaries. In addition to maintaining water quality in rivers and recharging groundwater among other positive benefits, wetlands may have the potential to attract wildlife that can be hazardous to aircraft using the Airport. The following exhibits depicts the NWI wetlands.

Projects with wetland impacts greater than one half acre of wetlands require a U.S Army Corps of Engineers (USACE) general permit and must be reviewed in an EA to complete the NEPA documentation process. Extension of Runway 12/30 to the north would impact wetlands located east of the runway. A wetland delineation and coordination with applicable resource agencies will be necessary prior to project implementation to further analyze the impacts the proposed improvements would have on wetlands. Further analysis is required for future projects.

Exhibit 2-11 – National Wetland Inventory Map



Source: U.S. Fish and Wildlife Service

WATER RESOURCES – SURFACE AND GROUND WATERS

The Federal Water Pollution Control Act, as amended by the Clean Water Act of 1977, provides the authority to establish water quality standards, control discharges into surface and subsurface waters, develop waste treatment management plans and practices, issue permits for discharges (Section 402) and for dredged or fill material (Section 404).

Airport activities can affect water quality. This is mainly due to stormwater runoff from paved areas. Providing treatment for stormwater runoff from runway, taxiway and apron areas through the use of best management practices and grassed swale areas would minimize potential impacts to water quality. Stormwater management will be of particular emphasis with the additional of large expanses of pavements for projects such as expanded aircraft parking/de-icing aprons.

The flat topography at Wall Municipal Airport creates many drainage challenges. Rather than runoff away from the airport, water naturally wants to pond or pool in low areas creating marshy areas or wetlands. This can lead to problems with localized flooding and could possibly attract wildlife that could pose a risk to aircraft using the airport. Drainage at Wall Municipal Airport generally flows from east to west and discharges into Bull Creek, approximately 1 mile west of the airport.

A General Permit for Storm Water Discharges Associated with Construction Activities may be required from the SD DENR for the proposed improvements if the area of disturbance exceeds one acre. Permit

requirements would need to be reviewed during the environmental documentation phase. Further coordination with the SD DENR may be needed for airport development projects.

Environmental Consequences Not Relevant to the Proposed Improvements

AIR QUALITY CLASSIFICATION

Areas identified by EPA as non-attainment areas may require additional analysis if one (1) or more of the six Ambient Air Quality Standards are exceeded. Wall Municipal Airport is not located in a Clean Air Act non-attainment or maintenance area.

The emission inventories at the Airport are at low operation levels and are not likely to produce pollutant discharges high enough to cause degradation to the existing air quality. FAA Air Quality Handbook recommends an air quality analysis if the airport is either a commercial service airport with greater than 1.3 million annual passengers or more than 180,000 general aviation annual operations. The forecasted operations at the Wall Municipal Airport are beneath these levels thus an air quality analysis is not required.

Temporary increases in emissions due to construction will be mitigated through the use of Best Management Practices (BMP's).

CLIMATE

Although there are no federal standards for aviation-related Green House Gas (GHG) emissions, it is well-established that GHG emissions can affect climate. The Council on Environmental Quality (CEQ) has indicated that climate should be considered in NEPA analyses. As noted by CEQ, however, "it is not currently useful for the NEPA analysis to attempt to link specific climatological changes, or the environmental impacts thereof, to the particular project or emissions; as such direct linkage is difficult to isolate and to understand."

With respect to GHG emissions, aviation activity at Wall Municipal Airport represents a small percentage of U.S. and global emissions; therefore, no further review is required.

COASTAL RESOURCES

Coastal Resources include Coastal Barriers and Coastal Zone Management. Coastal Barriers include islands that protect the mainland from storm or hurricane-driven winds or waves by providing a buffer to the shoreline. Coastal Barriers protect fish, wildlife, human life, and property along coasts and shorelines. Facilities are not recommended to be built within the Coastal Barrier Resource System (CBRS). Coastal Zone Management includes development provisions actions to protect major shorelines and associated recreational, historical, cultural, and aesthetic values. The project area is not located in a coastal zone as defined in the Coastal Zone Management Act of 1972. No further analysis is required.

NATURAL RESOURCES AND ENERGY SUPPLY

Impacts on energy supplies and natural resources are related to changes of stationary facilities, such as airfield lighting or terminal building heating and expansion, as well as any increase of fuel consumption by aircraft or ground vehicles. Proposed improvements at Wall Municipal Airport would require additional energy, but is not anticipated to cause significant impacts to energy supplies or natural resources. No further analysis is required.

NOISE AND NOISE-COMPATIBLE LAND USE

Noise emitted from aircraft can significantly affect the well-being of people living or working near an airport. The FAA requires noise studies for certain projects. If a project involves Airplane Design Groups I and II and has forecasted operations of less than 90,000 annual propeller operations or 700 annual adjusted jet operations, then no further noise analysis is required. Wall Municipal does not exceed these thresholds; therefore, a noise analysis will not be required.

VISUAL EFFECTS

The aesthetic value of an area is influenced by its landscape and the viewer's response to the view, scenic resource, or man-made feature. The extent of potential visual contrast/compatibility effects with adjacent landforms and land uses are addressed from the vantage point of those looking to an airport from outside the system.

FLOODPLAINS

Floodplains constitute lands situated along rivers and their tributaries that are subject to periodic flooding on the average interval of 100 years or less. Wall Municipal Airport is not located within a 100-year floodplain; therefore, no further analysis is required.

WILD AND SCENIC RIVERS

No direct or indirect impacts to wild scenic rivers are anticipated with the proposed improvements. No further analysis is required.

Conclusion

The information collected and documented in this Inventory chapter provides a baseline foundation to update the Wall Municipal Airport long-range plan. This information will feed into future sections to determine how facilities will meet the projected airport needs based on aviation activity forecasts.

CHAPTER 3: AVIATION ACTIVITY FORECASTS

Introduction

The Aviation Activity Forecasts chapter of the Airport Master Plan Study analyzes current and future airport activity at the Wall Municipal Airport. Forecasting provides an airport with a general idea of the magnitude of growth, as well as fluctuations in activity anticipated over the 20-year forecast period. They assist the airport sponsor in determining existing and planned future facility needs based on airport activity level estimates and projections. Forecasts attempt to develop a realistic estimate of future changes.

Forecasting efforts are based on a "snapshot" of existing aviation trends and socioeconomic climate. As such, forecasting tends to be a dynamic element of airport master planning. When conditions change dramatically, forecasts should be reviewed and updated accordingly to reflect the changed environment.

Wall Municipal Airport has experienced a slight, yet steady increase in aircraft operations due to the increase in agricultural spraying activity. The airport has also noticed a slight decline in itinerant traffic the last five years as IFR traffic has moved to nearby airports due to no availability of instrument approaches at Wall.

The forecasts developed for Wall Municipal Airport will be important to allow the airport sponsor to adequately plan, size, and sequence development of future facilities to meet activity levels. Federal Aviation Administration (FAA) funding for development at airports, however, is demand-based from actual activity and forecasts out five years.

To thoroughly analyze and develop a probable aviation forecast, a technical review has been completed using several methods to help quantify the potential aviation activity over the next 20 years. This chapter includes aviation activity forecasts for the following primary elements:

- Based Aircraft
- General Aviation
- Military
- Critical Design Aircraft
- Annual Instrument Approaches
- Peak Activity

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 by projecting airport user activity levels.

Forecasts developed for airport master plans and/or federal grants must be approved by the 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. A headquarters review is not required for this airport based on activity levels. Approval for this forecast can occur at the FAA local (Bismarck, ND) or regional (Chicago, IL) level.

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*
5. *Provide an adequate justification for the airport planning and development*

The TAF model used for this report is from the 2016 FAA TAF published in January 2017.

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:

1. Fiscal year 2015 has been used as the baseline for existing data and applied to most of the aviation forecast projections.
2. The most recent 2015 estimates and future projections of population, employment and income trends have been utilized.
3. The forecast period is 20 years encompassing years 2016 through 2035.
4. The Airport Service Area includes areas within a 30-minute drive time of the Wall Municipal Airport. Most of this area falls within the eastern portion of Pennington County.

The forecasts prepared for the airport assume an unconstrained scenario where facilities are available for use to meet demand. Any constrained forecasts prepared will be noted throughout the document. Time periods include short-term (5-year), mid-term (10-year) and long-term (20-year) resulting in forecasts for year 2020, 2025 and 2035. Forecasts may be developed using a composite of methodologies over the planning period.

Planning Activity Levels

Because aviation activity fluctuates due to unforeseen industry changes, the forecasts developed in this section will be separated into Planning Activity Levels (PALs) in future chapters to identify activity demand triggers for future facility improvements. By planning airport development around PALs, phases of construction/airfield development are based on triggering events and not necessarily based on a specific timeframe. Phases of airfield development are implemented based on activity demand and not a year. Due to the variability of forecasting and changing demand, this method is a more realistic way of planning demand-driven development for an airport.

Forecasting Methods

Various methodologies are used to develop aviation forecasts. Forecasts should not be considered predictions of the future but rather an educated projection of future activity. Some of the following forecasting methods were applied for this analysis, including trend extensions, market share analysis, regression analysis, socioeconomic methodologies, 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).

REGRESSION ANALYSIS

Regression analysis is a statistical technique for estimating the relationships among variables. It identifies correlations between known independent variables (e.g., socioeconomic, or demographic estimates and projections) and dependent variables (e.g., passenger enplanements). A correlation (R-squared) value of 95 percent and above indicates a strong correlation between the independent and dependent variables.

PROFESSIONAL JUDGMENT

Judgmental methods are educated estimations of future events based on the industry knowledge, experience, and intuition of the forecaster. This method permits the inclusion of a broad range of relevant information into the forecasting process, and is usually used to refine the results of the other methods.

Socioeconomic Forecasts

Socioeconomic information within the airport service area can provide insight into factors that affect aviation activity at an airport. Commonly evaluated metrics include population and employment. Historic trends, current data and forecast estimates are evaluated in this section to identify socioeconomic trends that may affect aviation activity forecasts at Wall Municipal Airport. Growth rates are used as a method to compare the airport service area to other regional, statewide, and national trends. It should be noted the Pennington County data from Woods and Poole[1] was utilized for local data as most projections were not provided for the City of Wall.

Population

Population is a basic indicator of the number of people who may utilize the airport. As noted in the Inventory, the City of Wall is located on the eastern edge of Pennington County and has held a steady population with minor fluctuations. The City of Wall has an estimated population of 877 in 2015 based on data from the U.S. Census Bureau. Pennington County, which also encompasses the Rapid City Metropolitan Statistical Area (MSA), was reported to have a population of 109,453 in 2015. This MSA has seen an annual growth rate of 1.18% since 1990. Future population growth data predicts Pennington

[1] Woods & Poole Economics Inc. is used due to their provision of consistent and comparable annual economic forecasting to the national, state, county and metro area level extending approximately 35 years forward.

County will see an increased growth rate of roughly 1.13% through the planning period. These numbers show a slightly higher growth rate than the state of South Dakota, which is projected to have a 0.81% growth rate through 2035.

Table 3-1 – Population Projections

Metric	2015	2020	2025	2035	CAGR
Population					
Pennington County	109,453	116,107	123,035	137,006	1.13%
South Dakota	859,733	896,656	896,656	1,009,446	0.81%
United States	321,545,081	336,690,447	352,566,429	384,634,547	0.90%

Source: Woods & Poole Economics, CAGR = Compounded Annual Growth Rate

Employment

As noted in the Inventory, Pennington County has a strong tourism-based economy. The City of Wall is home to Wall Drug and located near the Badlands National Park and the Minuteman Missile Historic Sites. **Table 2-3** in the Inventory Chapter lists the major employers in the City of Wall. The top five industries providing jobs in Pennington County include:

1. Health Care and Social Assistance → 9,612 Jobs (14.29% of total)
2. Retail Trade → 9,207 Jobs
3. Accommodation & Food Services → 7,717 Jobs
4. State & Local Government → 6,365 Jobs
5. Construction → 4,285 Jobs

Historically, Retail along with Accommodation and Food Service Industries have seen employment increase over 1 percent annually. Health Care employment has also grown over 2 percent annually and is the largest industry in the region. Total employment projections are below.

Table 3-2 – Total Employment Projections

Metric	2015	2020	2025	2035	CAGR
Total Employment					
Pennington County	67.269	72,104	76,623	84,614	1.15%
South Dakota	594,705	643,085	689,730	777,335	1.35%
United States	188,866,185	203,418,448	217,670,718	244,922,886	1.31%

Source: Woods & Poole Economics. CAGR = Compounded Annual Growth Rate

Woods & Poole data forecasts total employment in Pennington County will continue to grow over 1 percent annually.

Based Aircraft

A based aircraft is an operational and airworthy aircraft claiming an airport as its home for most the year. FAA identifies a based aircraft to be a single-engine, multi-engine, jet, or helicopter aircraft. Ultralight and other aircraft are not counted for FAA records. Based aircraft drives the need for aircraft storage space at an airport.

Activity & Trends

The proposed based aircraft forecast involves a few key elements, with the first one being the FAA's TAF projections through 2035. The FAA's projections indicate a total of 12 based aircraft through the planning period indicating no growth. This is a typical FAA "no-growth" forecast for a general aviation airport the size of Wall.

Historically per the FAA TAF, Wall has experienced a 3.66% average annual growth rate of based aircraft from 2000 to 2015. During this time, based aircraft grew from 7 to 12.

With the relatively small number of based aircraft at an airport like Wall, an increase in one or two aircraft makes a significant increase in annual growth rates. Annual growth rates are not used as the sole basis for forecasts.

The South Dakota State Aviation System Plan (SASP) concluded that the total number of based aircraft in the state of South Dakota is to increase at a rate of 1.0 percent annually through the 20 year planning period. The reported based aircraft at Wall in the SASP was 9 in 2010, and estimated to grow to 11 based aircraft by 2030. The projected annual growth rate for Wall was 1.01 percent over the planning period to 2030.

Wall Municipal Airport has 12 validated based aircraft on the airfield according to the FAA's National Based Aircraft Inventory records last edited in December 2016. The Airport Master Record (FAA Form 5010) also reports 12 based aircraft. The 12 validated based aircraft will be the established baseline for the forecast.

Forecast

Local industry trends were evaluated when preparing this forecast of based aircraft at Wall Municipal Airport. It is estimated that based aircraft will grow at Wall for several reasons:

- The basic forecast increase in the employment and population within the airport service area supports additional aviation growth. Historically in South Dakota, from 2005 to 2015, based aircraft has grown at a slightly higher rate (1.25%) than population (1.04%). This correlation suggests based aircraft would increase based on the 0.81% forecast population growth rate for South Dakota.
- Historically, the airport has seen an additional based aircraft every three years on average from 2010-2015.
- Agricultural spraying activity has seen steady growth historically and there is still potential growth opportunity in the future.

Based on population growth expected in the airport service area, and historical based aircraft growth rates at the airport, the SASP forecasted growth rate for based aircraft at Wall was determined to be reasonable for the planning period.

Adjusting the baseline for the additional 2 validated based aircraft, the preferred forecast continued the growth rate projection of the SASP through 2035 with points between the 5 year increments smoothed. This forecast estimates that by 2035 there will be 14 based aircraft on the airfield. The baseline adjustment to 12 based aircraft changed the calculated annual growth rate to 0.78 percent even though both the preferred forecast and the SASP saw 2 additional based aircraft over the planning period.

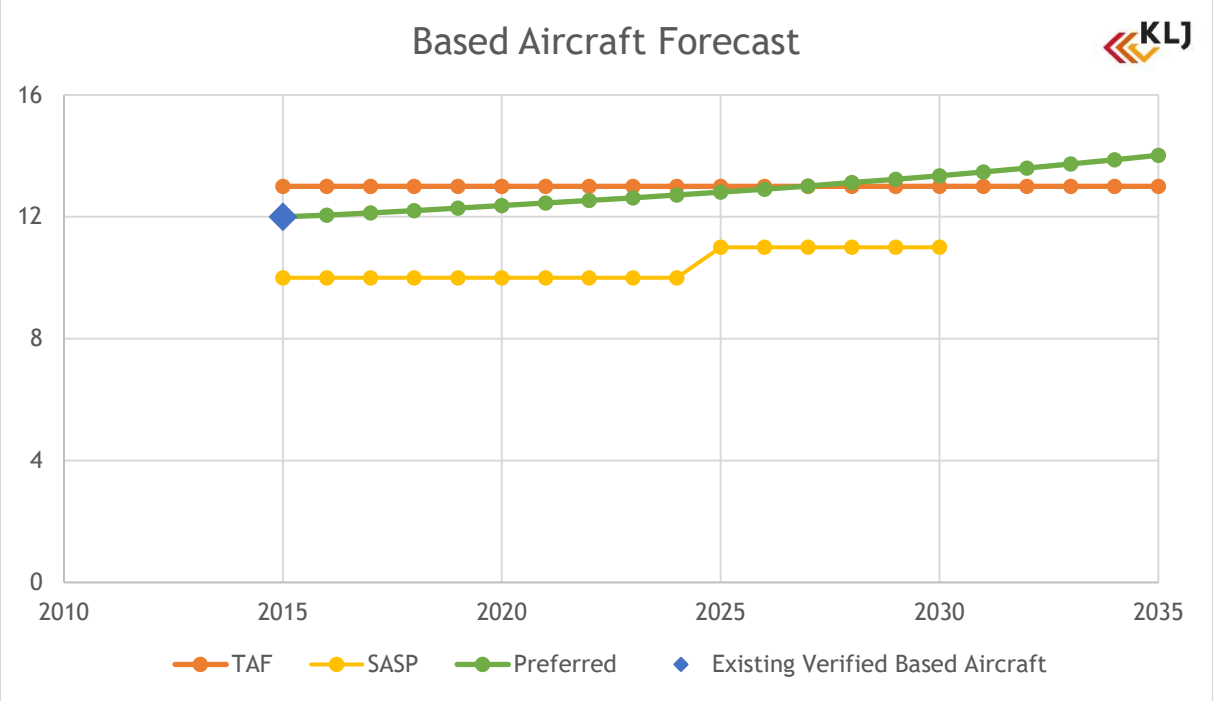
All based aircraft are currently single engine aircraft and are expected to remain only single-engine aircraft through the planning period. **Table 3-3** summarizes the based aircraft forecast for Wall.

Table 3-3– Based Aircraft Forecast

Metric	2015	2020	2025	2030	2035	CAGR
Single-Engine*	12	12	13	13	14	*0.78%*
Multi-Engine*	0	0	0	0	0	-
Jet	0	0	0	0	0	-
Helicopter	0	0	0	0	0	-
FAA Based Aircraft**	**12**	**12**	**13**	**13**	**14**	***0.78%***
Ultralight/Other	0	0	0	0	0	-
Total Based Aircraft	**12**	**12**	**13**	**13**	**14**	***0.78%***

Source: KLJ Analysis. CAGR = Compounded Annual Growth Rate
**Includes both piston and turboprop driven aircraft for FAA reporting purposes.*
***FAA Based Aircraft does not include ultralight/other.*

Figure 3-1 – Based Aircraft Forecast



Source: KLJ Analysis, FAA Terminal Area Forecast (January 2016), South Dakota State Aviation System Plan (2010)

General Aviation Operations

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. Itinerant[2] operations are performed by a landing aircraft arriving from outside the airport area or a departing aircraft that leaves the airport area.

Commercial aviation consists of civil aviation that involves operating an aircraft for hire to transport passengers or cargo. General Aviation (GA) operations are non-commercial operations.

[2] Aerial Applicator operations are included as itinerant since their activity is not flight training, even though it is sometimes within a 20-mile radius.

Airport Activity & Trends

NATIONAL

The 2016 FAA Aerospace Forecasts reported total aviation operations at towered airports dropped in 2015 by 0.3 percent from the previous year. More specifically, there was roughly a 0.1 percent increase in local operations and a 0.6 percent decrease in itinerant operations.

Since 2001, total general aviation hours flown have declined by 14 percent. The FAA TAF estimates that the total national civil local and itinerant operations will increase respectively by 0.40 and 0.43 percent annually through the 20-year planning period. The FAA Aerospace Forecasts predicts total general aviation hours flown will increase by 1.2 percent annually, mostly in turboprop, turbojet, rotorcraft, experimental and sport aircraft types.

REGIONAL & STATE

The FAA TAF for the Great Lakes Region reported in 2015 itinerant operations rose 0.09 annually and local operations were about even from the previous year. During the planning period, itinerant operations are forecast to increase 0.43 percent and local operations will increase 0.40 percent annually. The breakdown of GA Operations in the region is 48% Itinerant and 52% Local.

GA operations were also evaluated as a part of the South Dakota SASP completed in 2010. In the report, aircraft operations were categorized only by total GA and not broken down by local or itinerant operations. Baseline data in 2008 reported 634,135 GA operations. It was concluded in the analysis that GA operations in South Dakota would grow at a rate of 0.50 percent annually to 707,678 by year 2030.

LOCAL

The FAA TAF for Wall reported 3,746 annual total operations for 2015. This was down from 5,300 prior to 2008 but has remained relatively steady the following years. As with many other smaller GA airports, the FAA TAF does not show growth over the forecasting period. Over 90 percent of the operations are classified by the TAF as local. The Airport Master Record reported 3,406 operations in 2015.

Table 3-4 – FAA TAF Historical GA Operations

TAF	1995	2000	2005	2010	2015	CAGR
National	77,180,523	87,074,021	81,125,555	71,230,624	68,334,308	-0.61%
Great Lakes Region	13,653,460	15,243,320	13,905,638	12,017,138	10,996,232	-1.08%
South Dakota	445,139	531,045	562,904	542,618	387,203	*-0.69%*
Wall	3,500	3,500	4,100	4,000	3,740	*0.33%*

Source: FAA Terminal Area Forecast, CAGR = Compounded Annual Growth Rate

The 2010 SASP reported operations as 4,040 in 2010 when released and projected 4,142 for 2015 growing at 0.50 percent per year on average. The SASP did not break out operations into local and itinerant, rather it showed the total operations.

Table 3-5– South Dakota SASP Operations Forecast

SASP	2010	2015	2020	2025	2030	CAGR
South Dakota	634,136[3]	656,666	673,248	-	707,678	0.50%[4]
Wall	4,040	4,142	4,247	4,354	4,464	0.50%

Source: South Dakota State Aviation System Plan (2010), CAGR = Compounded Annual Growth Rate

[3] 2008 (Base Year) Operations

[4] Calculated from Base Year (2008) through 2030

Wall Municipal Airport supports a variety of GA activity which includes air ambulance/medical transport, agricultural spraying, business/corporate travel, and tourism. GA operations has remained steady with the exception of agricultural spraying operations which has seen steady growth in recent history. A 12,000 Sq. ft. private hangar was recently constructed adjacent to the main apron that houses four aerial applicator aircraft.

Baseline

A satisfactory method for determining baseline operations at a non-towered airport is described in the Model for Estimating General Aviation Operations at Non-Towered Airports available on the FAA website. This model considers population numbers within a 25-mile radius from the airport and both population and based aircraft totals within 100-mile radius. Equation 13 from this Operations Estimating Model allows the Comparison of Tower Counts and State Estimates for Small Towered GA and Non-Towered Airports and was therefore used in the analysis for Wall. The Equation 13 model produced 3,849 total operations for 2015. This validates that the FAA TAF and SASP are within an appropriate range for operations. The total operations of 3,746 from the FAA TAF was used as the baseline operations for this forecast.

Forecast

FAA Order 5090.3C, *Field Formulation of the National Plan of Integrated Airport Systems (NPIAS)* notes a satisfactory procedure to forecast annual operations is to use annual operations per based aircraft (OPBA) metric. A general guideline is 250 OPBA for rural general aviation airports with little itinerant traffic, 350 OPBA for busier general aviation airports with more itinerant traffic, and 450 OPBA for busy reliever airports. An OPBA of 312 for Wall was developed by dividing the baseline operations of 3,746 by the 12 validated based aircraft.

The preferred operations forecast estimates that the 312 OPBA will remain constant though the planning period. Following the guidance in FAA Order 5090.3C method discussed above, the total operations are forecasted to follow the growth rate of the based aircraft from the South Dakota statewide TAF. The South Dakota statewide TAF reports based aircraft throughout the state at 1,226 in 2015 and rising to 1,377 by 2035 with an annual growth rate of 0.58%. When applied to the baseline operations of 3,746 this forecast predicts aircraft operations will be 4,208 by 2035.

To determine the number of local and itinerant operations, a “top-down” approach was utilized taking the total number of operations forecasted and dividing by established percentages of each category. The percentages are based on known operational data, observations from airport users, and professional judgement.

The FAA TAF for Wall broke down the makeup of operations by 92.55 percent local and 7.45 percent itinerant. This was deemed unrealistic because agricultural spraying operations that were reported by the applicators make up almost 1,200 operations. Based on discussions with the airport and its users it was determined that a 60% itinerant and 40% local activity would be an appropriate breakdown.

It is assumed that if an instrument approach were established more itinerant traffic will utilize the airport. Therefore, the ratio was adjusted over the planning period to increase the percentage of itinerant operations to 65%.

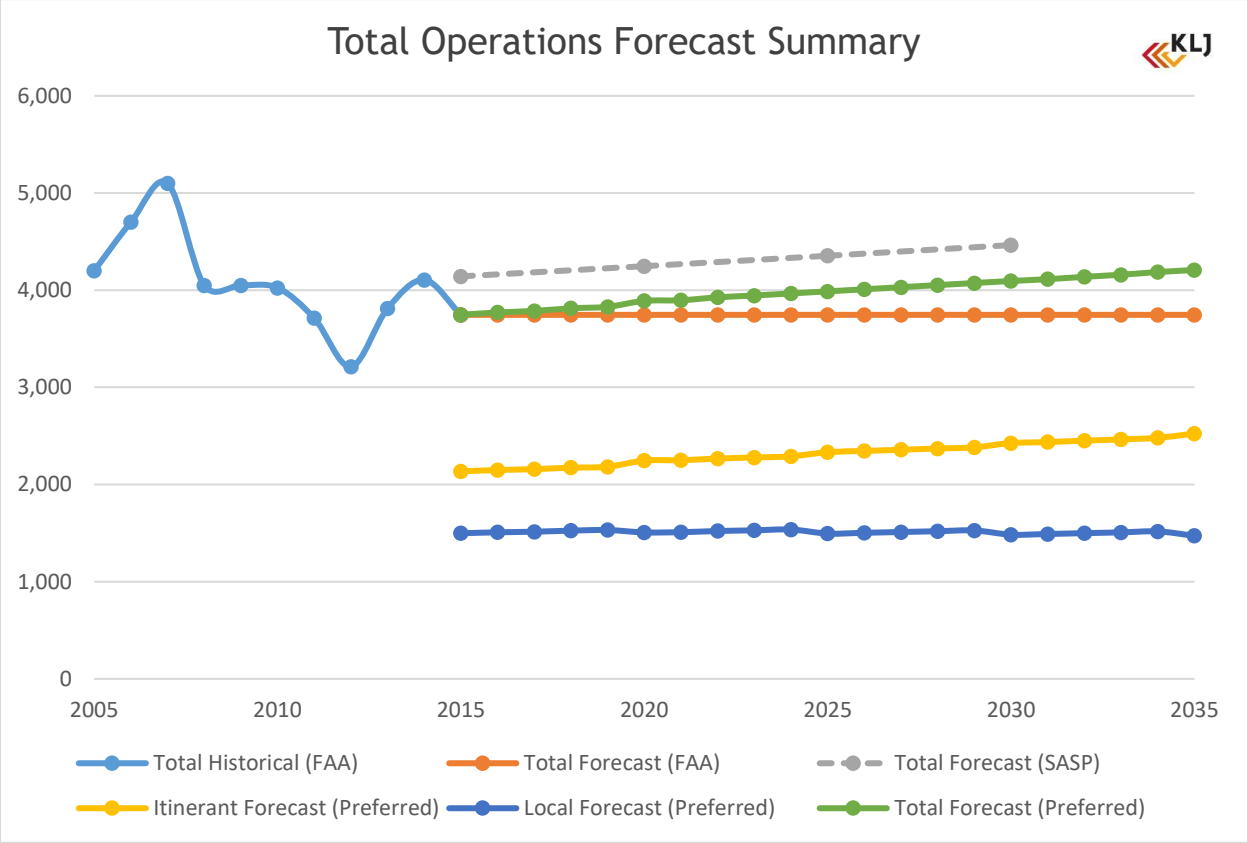
Commercial Operations

Air Taxi consists of civil aviation that involves operating an aircraft for hire to transport passengers or cargo. An example is air medical transport flights. The TAF reports six Air Taxi operations in calendar year 2015 and, similarly to total operations, remains unchanged through 2035.

Air Taxi operations typically operate under Instrument Flight Rules (IFR). An analysis of the FAA's Traffic Flow Management Systems (TFMS) IFR data of Wall was conducted. TFMS data revealed Wall had about 25-40 filed IFR operations annually over the past 5 years. If the weather is above IFR minimums, then pilots can operate under Visual Flight Rules (VFR) to land at Wall without the use of an instrument approach. The airport also indicated there are some business users who operate out of Rapid City Regional Airport and Phillip Airport (PHP) that could be captured if instrument approaches were established.

One percent of total operations was applied for Air Taxi operations for 37 operations in 2015. It is assumed that if an instrument approach were established more Air Taxi itinerant traffic would utilize the airport and so the ratio was adjusted over the planning period to increase the percentage to 2 percent by the 2035.

Figure 3-2– Total Operations Forecast Summary



Source: KLJ Analysis

Military

Military activity at Wall comprises of helicopter operations from the South Dakota Army National Guard based at the Rapid City Regional Airport. Conversations with the SDANG revealed that the operations are usually routine training missions practicing traffic pattern approaches. The rotorcraft occasionally land or touchdown. On average the SDANG conducts about 6 approaches per week at Wall utilizing the Sikorsky HH-60 and Eurocopter UH-72.

There has historically been no local or itinerant military operations reported in the FAA TAF and is not projected for the future. The SASP also does not report Military operations. Based on conversations with the Airport and SDANG it was assumed that 25% of approaches resulted in a landing and counted as an operation. The baseline of operations was selected at 2 percent of total operations which is 75 annually.

Military operations are expected to continue in the HH60 and UH72 helicopters. The SDANG advised that if instrument procedures are implemented they will likely increase operations, which are training in nature, to take advantage of the instrument procedures as a training element. Therefore, Wall military operations are forecast to rise to 3 percent of total operations by 2035 which is 126 annually.

Table 3-6 – Military Operations Forecast Summary

Metric	2015	2020	2025	2030	2035	CAGR
Local Military Operations	0	0	0	0	0	*N/A*
Itinerant Military Operations	75	88	100	113	126	*2.64%*
Total Operations	75	88	100	113	126	*2.64%*

Source: KLJ Analysis, CAGR = Compounded Annual Growth Rate

Operations Summary

The total annual operations forecast for Wall Municipal Airport is summarized in the following table, including a breakdown between types of operations.

Table 3-7– Total Operations Forecast Summary

Metric	2015	2020	2025	2030	2035	CAGR
Commercial Operations	37	49	60	72	84	*4.13%*
GA Itinerant Operations	2,135	2,246	2,333	2,426	2,525	*0.84%*
Civil Local Operations	1,499	1,507	1,495	1,484	1,473	-0.09%
Military Operations	75	88	100	113	126	*2.64%*
Total Operations	3,746	3,890	3,988	4,095	4,208	***0.58%***
Total Itinerant	2,248	2,383	2,492	2,610	2,735	*0.99%*
Total Local	1,499	1,507	1,495	1,484	1,473	*-0.09%*
Itinerant Share	60.00%	61.20%	62.50%	63.75%	65.00%	*0.40%*
Local Share	40.00%	38.75%	37.50%	36.25%	35.00%	*-0.67%*

Source: KLJ Analysis, CAGR = Compounded Annual Growth Rate

Fleet Mix

The overall airport operations fleet mix combines commercial and general aviation operations using estimated percentages of aircraft types. FAA TFMC data was used to help determine an overall aircraft fleet mix. This data is only a sample of IFR operations. VFR operations at Wall are typically conducted in single engine piston and turboprop aircraft. Modifications have been made based on available local data, local user projections, broader industry trends and professional judgement to account for anticipated future user fleet mix changes. The Wall fleet mix is not expected to change significantly over time. The overall estimated fleet mix share breakdown is identified in **Table 3-8**.

Table 3-8 – Fleet Mix Share Breakdown

Metric	2015	2020	2025	2030	2035	CAGR
Single-Engine Piston	63.50%	63.00%	62.25%	61.75%	61.25%	-0.18%
Multi-Engine Piston	3.25%	3.50%	3.75%	4.00%	4.25%	1.35%
Turboprop[5]	28.00%	28.00%	28.00%	28.00%	28.00%	0.00%
Turbojet	0.25%	0.25%	0.50%	0.50%	0.50%	3.53%
Helicopter	2.00%	2.25%	2.50%	2.75%	3.00%	2.05%
Ultralight/Other	3.00%	3.00%	3.00%	3.00%	3.00%	0.00%

Source: KLJ Analysis, CAGR = Compounded Annual Growth Rate

The fleet mix share percentages are multiplied by the total annual operations forecast to yield a fleet mix operational forecast.

Table 3-9– Total Operations Fleet Mix Forecast

Metric	2015	2020	2025	2030	2035	CAGR
Single-Engine Piston	2,379	2,451	2,482	2,529	2,577	*0.40%*
Multi-Engine Piston	122	136	150	164	179	*1.94%*
Turboprop[6]	1,049	1,089	1,117	1,147	1,178	*0.58%*
Turbojet	9	10	20	20	21	*4.13%*
Helicopter	75	88	100	113	126	*2.64%*
Ultralight/Other	112	117	120	123	126	*0.58%*
Total Operations	**3,746**	**3,890**	**3,988**	**4,095**	**4,208**	**0.58%**

Source: KLJ Analysis

Critical Design Aircraft

The critical design aircraft is identified as the most demanding aircraft or family of aircraft to regularly use the airport. "Regular" use is defined by the FAA as at least 500 annual itinerant operations. This is the minimum necessary for improvements to be justified for FAA funding.

The largest based aircraft on the airfield belong to the agriculture spraying entities. Their fleet is made up of the Air Tractor AT-502B and the AT-401. An Air Tractor AT-802A also is contracted by the local aerial applicator but not based at the airport. The annual itinerant operations of the agricultural spraying fleet is estimated at 1,200 according to reports from the applicators. Operational data from 2015 is shown below in **Table 3-10**.

A review of the FAA Traffic Flow Management System (TFMS) data was also completed to aid in determining the design aircraft. At Wall, a fleet mix including turboprop and small jet aircraft were the largest aircraft types to operate to the airport. Historical IFR operations data is shown below in **Table 3-10**.

[5] Including single-engine turboprops such as Aerial Applicators using the Air Tractor 502 and 802.
[6] Including single-engine turboprops such as Aerial Applicators using the Air Tractor 502 and 802.

Existing

The overall existing critical design airplane is an Air Tractor AT-502B single-engine turboprop airplane. This airplane has an FAA Airport Reference Code (ARC) of A-II made up of FAA Aircraft Approach Category (AAC) A and Airplane Design Group (ADG) II. The design aircraft has a wingspan of 52 feet with an approach speed of 76.7 knots (1.3 times stall speed with full flaps).

The design aircraft has a Cockpit to Main Gear (CMG) distance of 6.25 feet and the Main Gear Width (MGW) is 10.25 feet placing the aircraft within Taxiway Design Group (TDG) is 1A.

The design aircraft has a maximum takeoff weight of up to 9,400 pounds and is considered a "small" airplane. The AT-502B aircraft alone had 726 operations at Wall in 2015, indicating "regular" use. This type of airplane makes up a portion of the fleet for Ascend Ag Inc. and is used for agricultural spraying during the summer months.

There are other airplanes of FAA Approach Category A or Design Group II that makeup this family of critical design aircraft including the Air Tractor AT-401 single-piston (ARC A-II, Small), Pilatus PC-12 single-turboprop (ARC A-II, Small), and Cessna Caravan single-turboprop (ARC A-II, Small).

There are also documented operations in aircraft exceeding the current critical design aircraft family criteria. Larger aircraft such as the Beechcraft King Air B200 (ARC B-II, Small), Cessna Citation Mustang twin-turbojet (ARC B-I, Small), Air Tractor AT-802A single-turboprop (ARC B-II), and the Sikorsky HH-60 rotorcraft (22,000 lbs.) occasionally use the Wall Municipal Airport. These aircraft generally have a maximum takeoff weight of up to 16,000 pounds with the rotorcraft up to 22,000 pounds.

Table 3-10– Existing Critical Design Aircraft

Aircraft Type	2015 Operations	FAA AAC	FAA ADG	FAA TDG	MTOW
Air Tractor AT-502B	726	A	II	1-A	9,400 lbs.
Air Tractor AT-802A	241	B	II	1-A	16,000 lbs.
Air Tractor AT-401	150	A	II	1-A	9,170 lbs.

Source: KLJ Analysis, Ascend Ag Inc., City of Wall. AAC = Aircraft Approach Category, ADG = Airplane Design Group, TDG = Taxiway Design Group, MTOW = Maximum Takeoff Weight
Design Aircraft shown in Green

Table 3-11– Historical Wall IFR Operations - Design Aircraft Family

Aircraft Type	2010-2015 IFR Operations	FAA AAC	FAA ADG	FAA TDG	MTOW
Beechcraft King Air B200	8	B	II	2	12,500 lbs.
Cessna Citation Mustang (C510)	34	B	I	1-A	8,645 lbs.
Cessna Golden Eagle C421	8	B	I	2	7,450 lbs.
Piper Navajo Chieftain PA-31	8	B	1	1-A	7,000 lbs.
Beechcraft King Air 300	2	B	II	2	14,000 lbs.
Beechcraft King Air 90C	9	B	II	1	10,100 lbs.
Socata TBM 700	2	A	I	1-A	6,579 lbs.
Beechcraft 60 Duke	13	B	I	1-A	6,775 lbs.

Source: KLJ Analysis, FAA Traffic Flow Management System (TFMS) Data at Wall (January 2010 - December 2015). IFR = Instrument Flight Rules, AAC = Aircraft Approach Category, ADG = Airplane Design Group, TDG = Taxiway Design Group, MTOW = Maximum Takeoff Weight

Figure 3-3 – Existing Critical Design Aircraft Family

Air Tractor 502B (ARC A-II, Small)



Air Tractor 802A (ARC B-II)



Beechcraft King Air B200 (ARC B-II, Small)



Eurocopter UH-72



Sikorsky HH-60



Cessna 510 Mustang (ARC B-I, Small)



Photography Source: Airliners.net

Future

All critical aircraft operations should be monitored very closely as changes in based aircraft fleet and business operations may change airport use, aircraft type and operational frequency.

The design aircraft identified is the most critical family of aircraft to utilize the airport, however particular portions of the airport may be limited to smaller design aircraft. These aircraft-specific standards will be evaluated in the Facility Requirements chapter.

National aviation industry trends show long-term growth in turboprops and turbojet aircraft operations. Industry trends in agricultural spray operations are seeing a transition to larger single-engine turboprop aircraft.

Critical aircraft operators were contacted as part of this forecasting effort to determine future airport use and fleet mix. Ascend Ag Inc. said the company plans to replace an AT-502B with a larger AT-802A within the next five years. Currently Ascend Ag. Inc. is contracting with another operator to bring in an AT-802A to meet demand which in 2015 was 241 operations. It is expected the operations being flown by the contractor and the estimated 250 operations flown by the AT-502B that is being replaced will be conducted by the new AT-802A. When the aircraft transitions to the AT-802A there will be an estimated 550 annual operations in the AT-802A, indicating "regular" use, and making it the expected future critical design aircraft.

The design aircraft forecast for Wall Municipal Airport shows the adjustment of operations from the AT-502B to the AT-802A in 2020. The growth rate for the critical design aircraft operations matches the overall airport growth rate.

Table 3-12– Wall Critical Design Aircraft Forecast

Representative Aircraft	Design	2015	2020	2025	2030	2035	CAGR
Air Tractor AT-502B	A-II/S	726	519	532	546	562	*-1.27%*
Air Tractor AT-802A	B-II	241	571	585	601	618	*4.82%*
Air Tractor AT-401	A-II/S	150	156	160	164	168	*0.58%*

Source: KLJ Analysis, CAGR = Compounded Annual Growth Rate,
Critical aircraft operations exceeding FAA regular use threshold for the airport are shown in Green
S = Small Aircraft (12,500 lbs. or less)

The design aircraft is expected to change from an A-II, Small (TDG 1A) aircraft to a B-II, Large (TDG 1A) aircraft within the next five years based on the data collected in this forecasting effort.

Annual Instrument Approaches

Annual instrument approaches (AIAs) are defined as an approach to an airport conducted in actual instrument meteorological conditions when an instrument approach is required. For purposes of this definition, an approach is initiated when the observed visibility is less than 3 miles or the cloud ceiling is less than the final approach fix.

At Wall Municipal Airport there are no established instrument approach procedures. In discussion with airport staff, there is a desire to develop an instrument approach. The SDANG also indicated it would utilize instrument approaches if established. The airport also indicated there are some business users who operate out of Rapid City Regional Airport and Phillip Airport (PHP) that could be captured if instrument approaches were established. Over the past 5 years, FAA's TFMS data shows an average of 25-40 IFR flight plans filed to and from Wall.

The intent of the AIA forecast is to illustrate expected utilization of an instrument approach if established. The RNAV (GPS) Approach to Runway 30 at PHP was used to approximate a final approach fix altitude of 1,600' above ground level.

To determine AIAs, the number of itinerant operations are totaled from the forecasts and compared to annual operations. Using nationwide tower operations at GA airports, approximately 15 percent of flights are operating on an IFR flight plan. All fixed-wing commercial operations operate under IFR. Military rotorcraft approaches were included as they intend to use this service. The number of AIA's in the future is expected to grow as itinerant traffic increases and more instrument-rated pilots equip aircraft to utilize approaches with new GPS technology. Local weather conditions show a total of 8.12% of the hourly weather observations are in conditions that would require an instrument approach to be performed.

Table 3-13 – Expected Annual Instrument Approach Forecast

Metric	2015	2020	2025	2030	2035	CAGR
Annual Operations	3,746	3,890	3,988	4,095	4,208	0.58%
Itinerant Operations	2,135	2,246	2,333	2,426	2,525	0.84%
Itinerant (Excluding Aerial Applicators)[7]	937	1,002	1,057	1,116	1,178	1.15%
% IFR Itinerant Operations[8]	15.00%	15.50%	16.00%	16.50%	17.00%	0.63%
Commercial Itinerant Operations	37	49	60	72	84	4.13%
Military Approaches	300	311	319	328	337	0.58%
IFR Itinerant Operations	478	515	548	583	621	1.32%
IFR Approaches	239	258	274	292	311	1.32%
Instrument Approach Weather	8.12%					-
Annual Instrument Approaches[9]	19	21	22	24	25	1.32%
AIA as Percent of Itinerant	0.89%	0.91%	0.93%	0.95%	0.97%	0.40%

Source: National Climatic Data Center, KLJ Analysis. CAGR = Compounded Annual Growth Rate

It is difficult to accurately forecast the number of new instrument approaches flown if a procedure were published. The establishment of an instrument approach will enable on-demand flights to begin to utilize the Wall Municipal Airport during weather conditions that require an IFR flight plan. Pilots must divert to other area airports if the weather conditions do not allow a landing.

Air Taxi operators would particularly benefit from a new instrument approach. A published approach increases the likelihood an operator can successfully complete a flight to Wall Municipal Airport.

One example of on-demand Air Taxi operator is critical-care air ambulance. The closest Level I trauma center to Wall is in Denver, CO, approximately 290 nautical miles to the southwest. Transport time of more than 6 hours by vehicle is cut to a flight time of 90 minutes. Air ambulance operations will provide a critical public safety link that benefits the entire area. Maximizing that utility of the airport access to the airport is vital for public safety.

Peak Activity

Peak demand periods help quantify aviation activity during busy periods. Time 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.

- **Peak Month:** The calendar month when peak operations occur
- **Design Day**: The average day in a peak month (peak month / 30)
- **Busy Day**: The busy day of a typical week in a peak month (Design Day + 15 percent)

[7] Aerial applicators typically operate under VFR.
[8] Percentage of Itinerant Operations (Excluding Aerial Applicators) that would likely operate under IFR.
[9] No available instrument approach procedures (IAP) at time of report. Figures are expected if IAP were established.

- **Design Hour**: The peak hour within the design day (15 percent of Busy Day)

At northern-tier airports such as Wall Municipal, much of the aviation activity is based on seasonal weather conditions. Airport activity is typically concentrated during the summer or early fall months. Peak activity is more pronounced at Wall due to a condensed agricultural-spray season, as well as seasonal tourism traffic. Peak period activity allows the airport to plan for facilities to meet peak period activity demands.

At towered airports, activity is easily measured because personnel are constantly monitoring aviation traffic. However, at non-towered airports like Wall, planners must find other ways to gather aviation activity information. As such, fuel purchases were used to estimate peak operation periods.

Airport Operations

PEAK MONTH

The peak month of GA operations was determined by reviewing records of bulk fuel shipments purchased by tenants[10]. Records were available for years 2008-2013 and showed type of fuel and quantity purchased. In the absence of operations counts, this method provides historic patterns of airport operations activity to aid in identifying the peak month.

The peak month was estimated to have approximately 20 percent of the annual general aviation operations.

Table 3-14– Historic Peak Monthly Fuel Sales

Year	Peak Month	Gallons (Peak Month)	Total Gallons (Annual)	% of Total
2008	March	2,800	12,237	22.88%
2009	April	5,350	13,016	41.10%
2010	June	8,001	11,901	67.23%
2011	June	22,997	43,584	52.76%
2012	February	7,501	21,198	35.39%
2013	June	8,003	27,588	29.01%

Source: City of Wall, KLJ Analysis

In general, peak fuel purchases at Wall have historically occurred in late spring to early summer months. Jet-A fuel purchases in the most recent years of data have exceeded 100LL purchases. This information supports the facts that the current fleet mix relies heavily on turbine-aircraft for aerial applicator operations.

It should be noted that fuel purchases can be a good indicator of peak operational periods at an airport, but is not perfect. Bulk fuel purchases show the intervals of fuel demand. Fuel orders are normally placed when the storage tank is low which may lag behind the periods of aircraft activity. It also does not guarantee capture of local operations, or aircraft that already have the necessary fuel to complete their flights/missions.

Table 3-15 – Peak Month Operations Forecast

Metric	2015	2020	2025	2030	2035	CAGR
Annual Operations	3,746	3,890	3,988	4,095	4,208	0.58%
Peak Month (20%)	749	778	798	819	842	0.58%

Source: KLJ Analysis, CAGR = Compounded Annual Growth Rate

[10] Fuel is not publicly available at the airport. Fuel deliveries are only for a few existing tenants who make up most of the airport's activity.

DESIGN/BUSY DAY

The design day represents the average day in the peak month. The busy day accounts for a peaking activity during a time of concentrated activity such as early evening or weekends for airports with recreational traffic. The busy day consists of an average day with an added 15 percent factor.

For a non-towered GA airport, there are no airport operation counts to fully quantify airport activity. To determine the busy day general industry criteria is used. The table below identifies the forecast design day and busy day operations at Wall Municipal Airport.

Table 3-16 – Design Day Operations Forecast

Metric	2015	2020	2025	2030	2035	CAGR
Peak Month	749	778	798	819	842	0.58%
Design Day	25.0	25.9	26.6	27.3	28.1	0.58%
Busy Day (Design Day + 15%)	28.7	29.8	30.6	31.4	32.3	0.58%

Source: KLJ Analysis, CAGR = Compounded Annual Growth Rate

DESIGN HOUR

The design hour is based on the average hourly operations during a design day with an additional factor for concentrated activity. Again, there is little data available to quantify actual design hour activity. General industry methodologies are used.

To determine the design hour, the design day operations are averaged over a 12 hour period, then increased by 15 percent. Using this methodology, the design hour operations forecast is then developed and identified in the table below.

Table 3-17– Design Hour Operations Forecast

Metric	2015	2020	2025	2030	2035	CAGR
Design Day	28.7	29.8	30.6	31.4	32.3	0.58%
Design Hour	2.8	2.9	2.9	3.0	3.1	0.58%

Source: KLJ Analysis, CAGR = Compounded Annual Growth Rate

Forecast Comparison with FAA TAF

Proposed aviation activity forecasts must be reviewed and approved by FAA. A forecast is consistent with the FAA TAF if the proposed activity is within a certain tolerance of the official TAF forecast. If the proposed forecast is inconsistent with the TAF, then differences must be resolved for the forecast to be adopted by the FAA. Key activity measures that are reviewed include based aircraft and total operations. The 2016 FAA TAF issued January 2017 is used for comparison.

Based Aircraft

Existing based aircraft was confirmed at 12. Based aircraft is projected to increase at a steady pace throughout the planning period based on the SASP. The FAA TAF projects no based aircraft growth into the future. Based on local, regional, and national aviation and economic outlooks, it does not appear aviation demand at Wall will remain completely flat-lined for the planning period. The table below compares the proposed aviation forecast with the FAA's TAF forecast.

The airport's proposed forecast of based aircraft **is consistent** with the FAA's TAF for the next 10 years.

Total Operations

Total airport operations is primarily made up of general aviation traffic, with occasional air taxi and military traffic. The baseline for total operations was taken from the FAA TAF. GA operations are projected to increase at a steady rate through the planning period based on the State TAF forecasts. The FAA TAF projects no operations growth into the future. The table below compares the proposed aviation forecast with the FAA's TAF forecast.

The airport's proposed total operations forecast **is consistent** with the FAA's TAF for the next 10 years.

Table 3-18 – Comparing Airport Forecast to FAA TAF

Metric	Year	Airport Forecast	2016 FAA TAF	AF/TAF % Difference
Based Aircraft				
Base Year	2015	12	12	0.00%
Base Year + 5 Years	2020	12	12	3.05%
Base Year + 10 Years	2025	13	12	6.73%
Base Year + 15 Years	2030	13	12	11.22%
Base Year + 20 Years	2035	14	12	16.83%
Growth Rate		*0.78%*	*0.00%*	
Total Operations				
Base Year	2015	3,746	3,746	0.01%
Base Year + 5 Years	2020	3,890	3,746	3.84%
Base Year + 10 Years	2025	3,988	3,746	6.46%
Base Year + 15 Years	2030	4,095	3,746	9.31%
Base Year + 20 Years	2035	4,208	3,746	12.33%
Growth Rate		0.58%	0.00%	

Source: KLJ Analysis, FAA Terminal Area Forecast (January 2017)
Green cells indicate Airport Forecast is within the FAA's TAF tolerance

Recommendations include FAA review and approval of the proposed forecast, and submission of the forecast to update the airport's TAF in 2015 and beyond.

Forecast Summary

Table 3-19 – Aviation Activity Forecast Summary

	Activity Levels					Average Annual Compound Growth Rates			
Forecast Levels	2015	2020	2025	2030	2035	0-5 Years	0-10 Years	0-15 Years	0-20 Years
Operations									
Itinerant									
Air Carrier	0	0	0	0	0	-	-	-	-
Commuter/Air Taxi	37	49	60	72	84	5.35%	4.79%	4.42%	4.13%
Total Commercial Operations	37	49	60	72	84	5.35%	4.79%	4.42%	4.13%
General Aviation	2,135	2,246	2,333	2,426	2,525	1.02%	0.89%	0.85%	0.84%
Military	75	88	100	113	126	3.16%	2.90%	2.75%	2.64%
Total Itinerant Operations	2,248	2,383	2,492	2,610	2,735	1.17%	1.04%	1.00%	0.99%
Local									
Civil	1,499	1,507	1,495	1,484	1,473	0.12%	-0.02%	-0.06%	-0.09%
Military	0	0	0	0	0	-	-	-	-
Total Local Operations	1,499	1,507	1,495	1,484	1,473	0.12%	-0.02%	-0.06%	-0.09%
TOTAL OPERATIONS	3,746	3,890	3,988	4,095	4,208	0.76%	0.63%	0.59%	0.58%
Annual Instrument Approaches	19	21	22	24	25	1.52%	1.38%	1.34%	1.32%
Peak Hour Operations	2.8	2.9	2.9	3.0	3.1	0.76%	0.63%	0.59%	0.58%
Based Aircraft									
Single Engine	12	12	13	13	14	0.60%	0.65%	0.71%	0.78%
Multi Engine	0	0	0	0	0	-	-	-	-
Turbojet	0	0	0	0	0	-	-	-	-
Helicopter	0	0	0	0	0	-	-	-	-
Other	0	0	0	0	0	-	-	-	-
TOTAL BASED AIRCRAFT	12	12	13	13	14	0.60%	0.65%	0.71%	0.78%

Source: KLJ Analysis. Note: Some figures are rounded

Forecast Approval

The proposed aviation forecasts identified in this chapter were approved by FAA on March 15, 2017 for use in this master planning effort. See approval letter as follows.

U.S. Department
of Transportation
Federal Aviation Administration

Dakota-Minnesota Airports District Office
Bismarck Office
2301 University Drive, Building 23B
Bismarck, ND 58504

Dakota-Minnesota Airports District Office
Minneapolis Office
6020 28th Avenue South, Suite 102
Minneapolis, MN 55450

March 15, 2017

The Honorable Dave Hahn
Mayor
Wall Municipal Airport
PO Box 314
Wall, SD 57790-0314

Wall Municipal Airport
Wall, South Dakota
Approval of Master Plan Forecasts

Dear Mayor Hahn;

The aviation forecast contained in the most recent draft Master Plan prepared by KLJ dated March 2017 is approved. This approval recognizes the based aircraft of 12 with a 20 year forecast of 14. The FAA concurs with the future design critical aircraft of a group B-II large, with a TDG of 1A, which is an Air Tractor AT802A. The operations data from Table 3-18 (attached) is consistent with the FAA Terminal Area Forecast and approved for use for the remainder of your current master planning efforts.

If you have any questions, comments or concerns, please contact Sandy DePottey in our office at 612-253-4642.

Sincerely,

Laurie L. Suttmeier
Deputy Manager, Bismarck Office

Cc: KLJ via email
SDDOT via email

Table 3-12 – Comparing Airport Forecast to FAA TAF

Metric	Year	Airport Forecast	2016 FAA TAF	AF/TAF % Difference
Based Aircraft				
Base Year	2015	12	12	0.00%
Base Year + 5 Years	2020	12	12	3.05%
Base Year + 10 Years	2025	13	12	6.73%
Base Year + 15 Years	2030	13	12	11.22%
Base Year + 20 Years	2035	14	12	16.83%
	Growth Rate	*0.78%*	*0.00%*	
Total Operations				
Base Year	2015	3,746	3,746	0.01%
Base Year + 5 Years	2020	3,890	3,746	3.84%
Base Year + 10 Years	2025	3,988	3,746	6.46%
Base Year + 15 Years	2030	4,095	3,746	9.31%
Base Year + 20 Years	2035	4,208	3,746	12.33%
	Growth Rate	0.58%	0.00%	

Source: KLJ Analysis, FAA Terminal Area Forecast (January 2017)
Green cells indicate Airport Forecast is within the FAA's TAF tolerance

CHAPTER 4: FACILITY REQUIREMENTS

Introduction

This chapter of the Airport Master Plan analyzes the existing and anticipated future facility needs at the Wall Municipal Airport (6V4). The report is divided into sections that assess the needs of primary airport elements including airside, general aviation, support and landside facilities.

Airside requirements are those necessary for the operation of aircraft. Landside requirements are those necessary to support airport, aircraft and passenger operations. Proposed airport needs are based on a review of existing conditions, capacity levels, activity demand forecasts and airport design standards using FAA guidance and industry standards. This chapter identifies existing facility deficiencies along with facility needs to meet demand through the planning period. The level of review completed is sufficient to identify major elements that should be addressed in this comprehensive airport plan.

This chapter provides a review of the facility needs for the following airport infrastructure categories:

- Airside Facilities
- General Aviation
- Landside Facilities
- Support Facilities

Specific alternatives that propose solutions to address facility needs are evaluated in **Chapter 5: Alternatives Analysis**.

Background

Through coordination with the airport sponsor/airport stakeholders in conjunction with a forecast showing steady growth, there are key areas in the facility requirements chapter that require emphasis in the future development plans of Wall. These include:

- Runway Length
- Runway 30 RPZ
- Establishing an Instrument Approach
- Evaluate Public Fueling System

This chapter will explain facility needs at Wall with recommendations based on specific activity-levels or time periods.

Planning Activity Levels (PALs)

There are various airport activity measures used to determine airport facility requirements at general aviation airports including based aircraft, critical design aircraft, and annual operations. Airport activity can be sensitive to industry changes, national and local economic conditions. This results in difficulty in identifying a specific calendar year for associated demand-driven improvements.

For this Master Plan study, Planning Activity Levels (PAL) are used to identify demand thresholds for many 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 allow improvements to be deferred. The demand forecasts developed in this study correspond to anticipated calendar years to each PAL (2020, 2025, 2030, 2035) from the preferred aviation forecasts as seen in **Table 4-1**.

Table 4-1 – Planning Activity Levels (PALs)

Metric	Base	PAL 1	PAL 2	PAL 3	PAL 4
Activity Metrics					
Total Annual Operations	3,746	3,890	3,988	4,095	4,208
Peak Month Operations	749	778	798	819	3,244
Busy Day Operations	28.7	29.8	30.6	31.4	32.3
Design Hour Operations	2.8	2.9	2.9	3.0	3.1
Total Based Aircraft	12	12	13	13	14

Source: KLJ Analysis

Airside Facilities

Airfield Design Standards

Guidance on FAA airport design standards is found in FAA AC 150/5300-13A, *Airport Design (Change 1)*. 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.

CRITICAL DESIGN AIRCRAFT

Aircraft characteristics relate directly to the design standards of an airport. Planning airport improvements requires the selection of one or more "critical design aircraft." The critical design aircraft is the most demanding aircraft fleet operating or forecast to operate at the airport on a regular basis. FAA design standards for an airport are determined by a coding system that relates the physical and operational characteristics of the design aircraft to the airfield design geometry.

It is not the usual practice to base the airport design on an aircraft that uses the airport infrequently. Projects are eligible for FAA funding if they are needed for the critical design aircraft. The minimum threshold is 500 annual itinerant operations. See discussion further in this chapter regarding the critical design aircraft 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 (see **Figure 4-1**) 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.

- **Aircraft Approach Category (AAC):** a grouping of aircraft based on approach reference speed, typically 1.3 times the stall speed. Approach speed affects 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 affects 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 affects taxiway/taxilane pavement width and fillet design at intersections.
- **Approach Visibility Minimums:** relates to the visibility minimums expressed by Runway Visual Range (RVR) values in feet. This is the minimum distance pilots must be able to see the runway to execute an approach to land. 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.

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 AAC and ADG of the aircraft that the entire 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 particular runway. RDC provides the information needed to determine the design standards that apply.

RUNWAY REFERENCE CODE (RRC)

RRC is a code signifying the current operational capabilities of each specific runway end and adjacent parallel taxiway. RRC is 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.

Figure 4-1 – Airfield Classification Systems

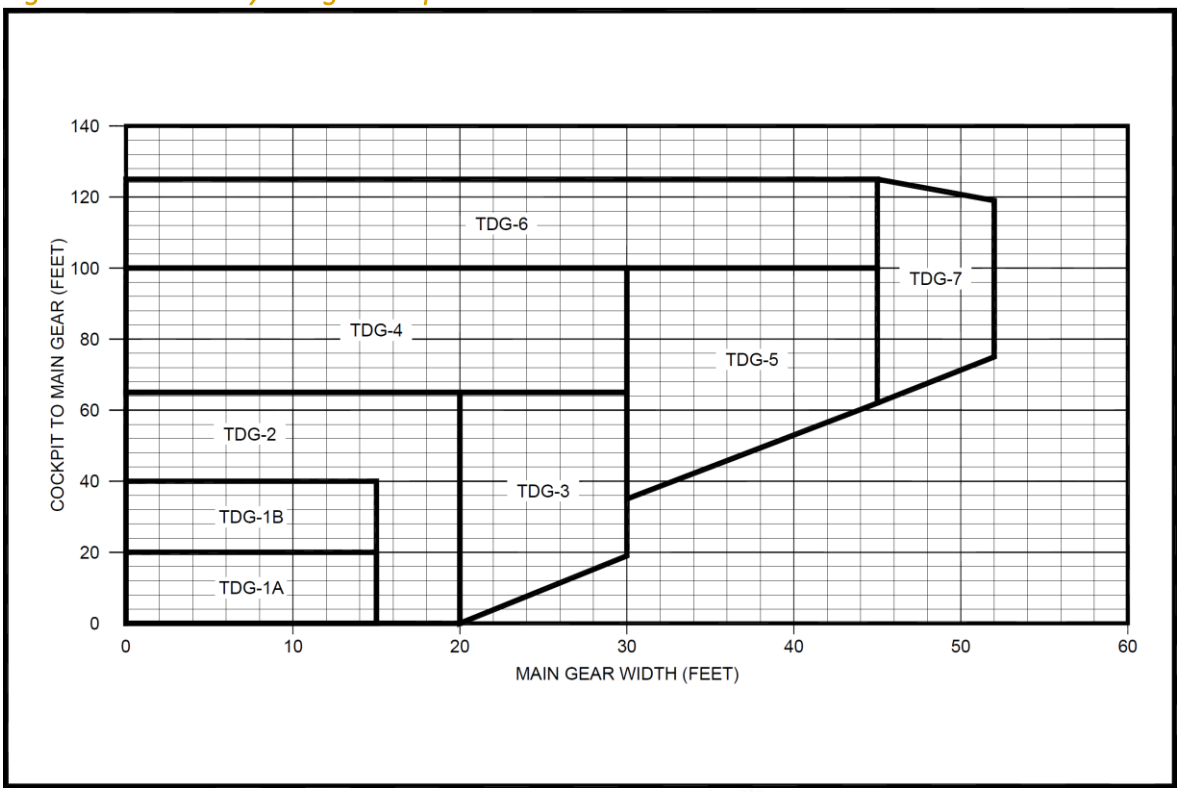
Aircraft Approach Category (AAC)		
AAC	**Approach Speed**	
A	Approach speed less than 91 knots	
B	Approach speed 91 knots or more but less than 121 knots	
C	Approach speed 121 knots or more but less than 141 knots	
D	Approach speed 141 knots or more but less than 166 knots	
E	Approach speed 166 knots 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’
IV	66’ - < 80’	214’ - < 262’
Approach Visibility Minimums		
RVR (ft.)*	**Instrument Flight Visibility Category (statue mile)**	
N/A (VIS)	Visual (V)	
5000	Not lower than 1 mile (NPA)	
4000	Lower than 1 mile but not lower than ¾ mile (APV)	
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 - Change 1, Airport Design; *RVR values are not exact equivalents*
APV = Approach with Vertical Guidance, PA = Precision Approach

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. 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. See Figure **4-2** for TDG standards.

Figure 4-2 – Taxiway Design Group



ITEM	DIM (See Figure 4-6)	TDG							
		1A	1B	2	3	4	5	6	7
Taxiway Width	W	25 ft (7.5 m)	25 ft (7.5 m)	35 ft (10.5 m)	50 ft (15 m)	50 ft (15 m)	75 ft (23 m)	75 ft (23 m)	82 ft (25 m)
Taxiway Edge Safety Margin	TESM	5 ft (1.5 m)	5 ft (1.5 m)	7.5 ft (2 m)	10 ft (3 m)	10 ft (3 m)	15 ft (4.6m)	15 ft (4.6m)	15 ft (4.6m)
Taxiway Shoulder Width		10 ft (3 m)	10 ft (3 m)	15 ft (3 m)	20 ft (6 m)	20 ft (6 m)	30 ft (9 m)	30 ft (9 m)	40 ft (12 m)
Taxiway/Taxilane Centerline to Parallel Taxiway/Taxilane Centerline w/ 180 Degree Turn	J	See Table 4-14							
TAXIWAY FILLET DIMENSIONS		Table 4-3	Table 4-4	Table 4-5	Table 4-6	Table 4-7	Table 4-8	Table 4-9	Table 4-10

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

AIRCRAFT CLASSIFICATION NUMBER (ACN)

ACN values are used for pavement design. ACN is a number that expresses the relative effect of an aircraft at a given configuration on a pavement structure for a specified standard subgrade strength. The ACN value for each aircraft is calculated by the aircraft manufacturer based on tire pressure and other factors. The method complies with the FAA standard for measuring the reporting pavement strength on runways with pavement strengths greater than 12,500 pounds is defined in FAA AC 150/5335-5, *Standard Method of Reporting Airport Pavement Strength*.

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 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, the addition of an additional 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 an instrument procedures and related navigational aids to runways to maximize airport 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 Design Aircraft

The critical design aircraft types must be identified to determine the appropriate airport design standards to incorporate into airport planning. The existing and future critical design aircraft characteristics at Wall Municipal Airport (6V4) are summarized in the following sections.

OPERATIONAL BREAKDOWN

The overall existing critical design airplane at Wall is an Air Tractor AT-502B turboprop with an Airport Reference Code (ARC) A-II, Taxiway Design Group (TDG) 1-A classification and a maximum takeoff weight of 9,400 pounds. Aviation demand forecasts show the future design airplane will evolve to an Air Tractor AT-802A turboprop with a maximum takeoff weight of 16,000 pounds. The tabulation of forecast design aircraft operations is shown in **Table 4-2.**

Table 4-2 – Critical Design Aircraft Operations

Metric	Base	PAL 1	PAL 2	PAL 3	PAL 4
Aircraft Approach Category (AAC)					
Aircraft Approach Category A	**876**	**675**	**692**	**710**	**730**
Aircraft Approach Category B	241	**571**	**585**	**601**	**618**
Airplane Design Group (ADG)					
Airplane Design Group II	**1117**	**1246**	**1277**	**1311**	**1348**
Taxiway Design Group (TDG)					
Taxiway Design Group 1-A	**1117**	**1246**	**1277**	**1311**	**1348**
Maximum Takeoff Weight					
≤12,500 pounds (Small Aircraft)	**876**	**675**	**692**	**710**	**730**
>12,500 pounds (Large Aircraft)	241	**571**	**585**	**601**	**618**
Crosswind Runway					
AAC A/B, ADG-I (Crosswind)	51	52	53	54	55
Overall Design Aircraft					
AAC-ADG-TDG	A-II-1A	B-II-1A	B-II-1A	B-II-1A	B-II-1A
Weight Classification	Small	Large	Large	Large	Large

Source: KLJ Analysis. Representative aircraft only. Green highlight depicts substantial use of the design aircraft category.

For the crosswind runway, a minimum of 500 operations must be shown to support FAA funding. The current all-weather primary runway wind coverage is 2.13 percent short of the 95 percent coverage recommended by FAA for ARC A-I and ARC B-I aircraft. However, aviation demand forecasts show that ARC A-I and B-I aircraft needing the crosswind runway 18-36 will not achieve 500 annual operations by PAL 4. The wind coverage needs exists but funding improvements to the crosswind runway will be challenging.

Figure 4-3 – Example ARC Aircraft

ARC A-I/Small Aircraft		ARC A-II/Small Aircraft	
Cessna 150 **Cessna 182** Piper Archer Piper Seneca Ayres Thrush 600		Cessna 208 **Pilatus PC-12** Air Tractor 502B	
ARC B-I/Small Aircraft		**ARC B-II/Small Aircraft**	
Beech Baron 58 **Cessna 421** Beech King Air 100		Beech King Air 90 **Beech King Air 200**	
ARC B-II		**ARC C-I, C-II**	
Beech King Air 350 Cessna Citation XLS Swearingen Metro III **Air Tractor 802A**		**Cessna Citation X** Learjet 35/55	

Source: KLJ Analysis, Wikipedia.org, Airliners.net, Planespotters.net

SUMMARY

The existing design airplane characteristics for each runway are described in **Table 4-3**.

Table 4-3 – Existing Airfield Design Aircraft Summary

Design Characteristics	Runway 12-30	Runway 18-36
Aircraft Make/Model	Air Tractor AT-502B	Beech Bonanza 35
Airplane Approach Category	A	A
Airplane Design Group	II	I
Taxiway Design Group	1A	1A
Wingspan	52’ 0”	33’ 6”
Length	33’ 2”	26’ 5”
Tail Height	10’ 3”	7’ 7”
Cockpit to Main Gear	6’ 3”	N/A
Main Gear Width	10’ 7”	N/A
Approach Speed (1.3 x Stall)	77 knots	70 knots
Maximum Takeoff Weight	9,400 pounds	3,400 pounds
Landing Gear Configuration	Single Wheel	Single Wheel
Aircraft Classification Number	N/A	N/A

Source: Air Tractor, Beechcraft, KLJ Analysis

The future & ultimate design aircraft for Runway 12-30 is forecast to exceed triggering thresholds if Ascend Ag Inc. transitions one of their AT-502B turboprop aircraft to the AT-802A turboprop aircraft. The future & ultimate design aircraft for Runway 18-36 remains the same as the existing design aircraft.

Table 4-4 – Future & Ultimate Airfield Design Aircraft Summary

Design Characteristics	Runway 12-30	Runway 18-36
Aircraft Make/Model	Air Tractor AT-802A	Beech Bonanza 35
Airplane Approach Category	B	A
Airplane Design Group	II	I
Taxiway Design Group	1A	1A
Wingspan	59' 3"	33' 6"
Length	36' 0"	26' 5"
Tail Height	11' 2"	7' 7"
Cockpit to Main Gear	6' 10"	N/A
Main Gear Width	10' 0"	N/A
Approach Speed (1.3 x Stall)	103 knots	70 knots
Maximum Takeoff Weight	16,000 pounds	3,400 pounds
Landing Gear Configuration	Single Wheel	Single Wheel
Aircraft Classification Number	8	N/A

Source: Air Tractor, Beechcraft, KLJ Analysis
Blue shading represents characteristics that are more critical than the existing configuration

Meteorological Considerations

Meteorological conditions that affect the facility requirements of an airport include but are not limited to wind direction, wind speed, cloud ceiling, visibility and temperature. True hourly metrological data was obtained from two different sources; Wall SuperAWOS containing observations from 2011-2016 available from Potomac-Aviation and Philip Automated Surface Observing System (ASOS) facility containing 2006-2015 available from the National Climatic Data Center (NCDC). Periodic "special" weather observations within each hour were removed. This method provides comprehensive average weather trends at an airport without skewing conditions toward IFR where multiple observations are taken each hour due to changing conditions.

Wind coverage and weather conditions are evaluated based on the two different flight rules, Visual Flight Rules (VFR) and Instrument Flight Rules (IFR). Visual Meteorological Conditions (VMC) are encountered when the visibility is 3 nautical miles or greater, and the cloud ceiling height is 1,000 feet or greater. Conditions less than these weather minimums are considered Instrument Meteorological Conditions (IMC) requiring all flights to be operated under IFR.

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 limited crosswind conditions. 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. This is known as a "95 percent wind coverage" standard. Each aircraft's AAC-ADG combination corresponds to a maximum crosswind wind speed component.



Small Aircraft Crosswind Landing Diagram (faasafety.gov)

Even when the 95 percent wind coverage standard is achieved for the design airplane or airplane design group, cases arise where certain airplanes with lower crosswind capabilities are unable to utilize the primary runway. The maximum crosswind component for different aircraft sizes and speeds are shown in **Table 4-5**.

Table 4-5 – FAA Wind Coverage Standards

AAC-ADG	Maximum Crosswind Component	Applicable Runway(s)
A-I & B-I	10.5 knots	Runway 18-36
A-II & B-II	13.0 knots	Runway 12-30
A-III, B-III, C-I through D-III	16.0 knots	--
A-IV through D-VI	20.0 knots	--

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

Wind coverage for the airport is separated into all-weather and IMC. An all-weather analysis helps determine runway orientation and use. Local weather patterns commonly change in IMC. An IMC review helps determine the runway configuration for establishing instrument approaches.

The Wall SuperAWOS was installed in the summer of 2011 and had just over 5 years of data available (June 29th,2011 through August 29th, 2016). The data was compared to nearby weather observation stations which had 10 years or more of data. These stations were the Pinnacles (ID: PINS2) Remote Automated Weather Station (RAWS) located 8 miles to the south and the Philip Airport ASOS located 28 miles to east. Similarities in the site geography and data correlation between the three stations supported the use of the smaller dataset from the SuperAWOS on Wall's airfield for the all-weather as this was most representative of wind conditions at the Wall Airport. The all-weather wind analysis for Wall is summarized in **Table 4-6**.

Table 4-6 – All-Weather Wind Analysis

Runway	AAC-ADG	Crosswind Component (Wind Speed)		
		10.5 knots	13.0 knots	16.0 knots
Runway 12-30	B-II	92.87%	96.50%	98.98%
Runway 18-36	A-I	82.16%	87.56%	93.21%
Combined	-	**96.10%**	**98.48%**	**99.50%**

Source: Potomac-Aviation data from Wall Municipal Airport SuperAWOS (2011-2016)
Green highlight depicts wind coverage exceeding 95 percent standard

For all-weather conditions, the B-II design aircraft crosswind component (13 knots) is accommodated on Runway 12-30 during all-weather conditions with airfield wind coverage exceeding 95 percent. For A-I and B-I small aircraft, the primary runway wind coverage is below 95 percent indicating their need for a crosswind runway. Annual operations of aircraft that need a crosswind runway will need to meet the regular use threshold to facilitate FAA funding participation for runway improvements. The combination of Runway 12-30 and Runway 18-36 provides adequate wind coverage (10.5 knots) exceeding 95 percent. **The current runway configuration meets FAA standards for all-weather wind coverage.**

Wall's crosswind Runway 18-36 has length constraints which will be discussed later in the chapter. For this reason, and because Runway 18-36 is a turf runway with lesser cost, wind analysis was completed for a different alignment. The Runway 3-21 alignment was chosen to determine if wind coverage would be sufficient. **Table 4-7 All-Weather Wind Analysis for Change in Crosswind Runway** shows that this Runway 3-21 alignment would be just as good if not better than Runway 18-36. Later in the chapter the option of the two alignments will be vetted further as it relates to runway length and standards.

Table 4-7 – All-Weather Wind Analysis for Change in Crosswind Runway

Runway	AAC-ADG	Crosswind Component (Wind Speed)		
		10.5 knots	13.0 knots	16.0 knots
Runway 12-30	B-II	92.87%	96.50%	98.98%
Runway 3-21	A-I	80.81%	86.57%	92.48%
Combined	-	**96.66%**	**98.78%**	**99.60%**

Source: Potomac-Aviation data from Wall Municipal Airport SuperAWOS (2011-2016)
Green highlight depicts wind coverage exceeding 95 percent standard

The data from the Wall SuperAWOS was unable to be used for the IMC wind analysis as it did not contain sky cover or ceiling height so IMC conditions could not accurately be identified. Instead the Philip Airport ASOS containing 10 years (2006-2015) of hourly weather observations was used for the IMC wind analysis.

Table 4-8 summarizes the IMC wind coverage for Runway 12/30 and by each runway end.

Table 4-8 – IMC Wind Analysis

Runway	Crosswind Component (Wind Speed)		
	10.5 knots	13.0 knots	16.0 knots
Runway 12-30	83.65%	91.13%	96.94%
Runway 12 End	45.91%	50.39%	53.54%
Runway 30 End	46.48%	49.48%	52.15%

Source: National Climatic Data Center data from Philip Airport ASOS (2006-2015; hourly)
Green highlight depicts wind coverage exceeding 95 percent standard

While there are currently no instrument approaches into Wall, the airport desires to accommodate IFR traffic in the future. Wind coverage to Runway 12-30 however does not meet the recommended 95% levels for the design aircraft during IMC. To improve IMC wind coverage, Runway 18-36 would require an instrument approach procedure. Improving Runway 18-36 to meet 95 percent IMC wind coverage is an eligible improvement for FAA funding, however justification of the funding would be very difficult and is not a priority improvement for the Airport Sponsor.

When analyzed by runway end as shown above, Runway 30 is the preferred end for aircraft requiring 10.5 knot crosswind with Runway 12 being the preferred end for greater crosswind components during IMC. The difference between runway ends is marginal with a wind coverage spread of less than 1.5% across all crosswind components analyzed.

WEATHER CONDITIONS

When IMC weather conditions occur, aircraft must operate under IFR and utilize instrument approach procedures to land. IMC conditions drive the need for instrument approach procedures with sufficient weather minimums to enhance airport utilization.

At Wall Municipal Airport there are no established instrument approach procedures. The intent of this analysis is to determine the expected additional utility of the airport if an instrument approach were established. A non-precesion, RNAV(GPS), approach with 300-foot ceiling and 1-mile visibility weather minimums was used for this analysis.

Weather conditions are broken down into occurrence percentages based on flight rules and instrument approach minimums in **Table 4-9**.

Table 4-9 – Meteorological Analysis

Weather Condition	Percentage	Days per Year	Hours per Year
VMC	94.22%	343.90	8253.67
Usable IMC*	4.20%	15.33	367.92
Usability	**98.42%**	**359.23**	**8621.59**
Below Weather Minimums*	1.58%	5.77	138.41
Total	**100.00%**	**365.00**	**8760.00**

Source: National Climatic Data Center data from Philip Airport ASOS (2006-2015; hourly)
**Assumes a GPS approach with 300 foot ceilings and 1 mile visibility minimums*

Based on cloud ceiling and visibility observations, Wall can be accessed 94.22% of the time during visual flight conditions. This equates to approximately 506 hours per year or the equivalent of 21.1 days annually where the airport cannot operate.

Providing an instrument approach would increase airport utilization by allowing access to the airport during poor weather conditions. Approach minimums of 300-foot cloud ceiling and 1-mile visibility would provide 4.20% of additional airport utility or 368 total hours per year.

Lowering approach weather minimums however requires additional airfield infrastructure and safety areas of varying degrees. Further coordination with FAA is required to conduct a feasibility study for the lowest weather minimums to runway ends. **It is recommended Wall Municipal Airport explore accommodating a future GPS non-precision approach (1 mile) to Runway 12 and Runway 30.**

Infrastructure and navigational aid standards for improvements are outlined further in this chapter. Options for improvements will be evaluated in **Chapter 5: Alternatives Analysis**.

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. Delay occurs when operations exceed the available capacity at an airport. Airports should plan to provide capacity enhancements well in advance 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*. The airfield capacity for Wall focused on Annual Service Volume (ASV) which is the reasonable (practical) estimate of an airport's annual capacity accounting for differences in runway use, aircraft mix, weather conditions, etc. that would be encountered over a year's time.

ASV is calculated based on the weighted hourly capacity multiplied by hourly and daily demand ratios. The ratio of the total operations to an airport's ASV determines if and when an airport should plan for capacity improvements to increase overall capacity. The ASV for Wall is calculated based on hourly capacity and other assumptions at 26,700 operations. See **Table 4-10** below.

Table 4-10 – Annual Service Volume (ASV)

Metric	Base	PAL 1	PAL 2	PAL 3	PAL 4
Annual Operations	3,746	3,890	3,988	4,095	4,208
Average Busy Day	28.7	25.9	26.6	27.3	28.1
Average Design Hour	2.8	2.9	2.9	3.0	3.1
Annual Service Volume	26,700	26,700	26,700	26,700	26,700
Capacity Level	**14.02%**	**14.56%**	**14.94%**	**15.34%**	**15.76%**

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

Wall does not approach the threshold of 60 percent which would trigger planning for capacity improvements. As a result, **there are no foreseen airfield capacity issues at Wall.**

Runways

Wall Municipal Airport has two general aviation runways. Runway 12-30 is the primary runway at 3,500 feet long and 60 feet wide. Runway 18-36 is used by small general aviation aircraft during crosswind conditions. This runway is a turf surface, 1,980 feet long and 100 feet wide. Both runways are designed for visual approaches.

RUNWAY DESIGN CODE

The design aircraft and instrument approach minimums drive the RDC designation for each runway. The RDC for Runway 12-30 is currently A-I(S)-VIS for small aircraft. The runway has a published pavement strength for small aircraft less than 12,500 pounds, although occasionally aircraft over 12,500 pounds use the runway. Because the existing design aircraft is an ARC A/II(S) the Runway 16-34 RDC is recommended to change to A-II(S)-VIS.

The future Runway 12-30 RDC would be B-II-VIS to accommodate regular use of large aircraft. If instrument approaches are established to not lower than 1-mile, then the RDC would also change to B/II/5000. The ultimate RDC would remain at B-II-5000 for visibility as low as 1-mile.

The RDC for Runway 18-36 is A-I(S)-VIS accommodating small aircraft exclusively. The runway RDC for the future design aircraft would remain as A-I(S)-VIS.

RUNWAY REFERENCE CODES

The existing operational capabilities of the runway is identified based on a taxiway separation distance. Runway 12-30 does not currently have a full parallel taxiway and therefore an Approach Reference Code (APRC) and Departure Reference Code (DPRC) are not available for this runway. To meet the future RDC (1-mile visibility) a runway to parallel taxiway distance needs to be at least 240 feet. A setback of 240 feet is recommended to be preserved for ultimate parallel taxiway development. An APRC and DPRC for Runway 18-36 is also not published because there is no parallel taxiway.

DESIGN STANDARDS

Basic Safety 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 and RRC 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 located in the RSA to serve their function. The RSA should also be capable to supporting airport equipment and the occasional passage of aircraft.
- **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 located in the OFA for air navigation or aircraft ground maneuvering purposes.
- **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.

Other basic design standards include runway surface 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. Deficiencies are detailed in the Deficiencies to Design Standard section.

Other Design Standards

Runways must meet line-of-sight requirements. Along individual runways, a point 5 feet above the runway must be mutually visible with any other point 5 feet above the runway centerline. For intersecting runways, Runway Visibility Zone (RVZ) standards require a clear visible 5-foot high line-of-sight to enhance safety amongst airport users when runways intersect. This is applicable at Wall as Runway 12/30 and Runway 18/36 intersect. There are penetrations within the existing RVZ and line of sight is not clear due to terrain and runway gradient. It is recommended to grade and remove penetrations when the runway is improved.

LAND USE CONTROL

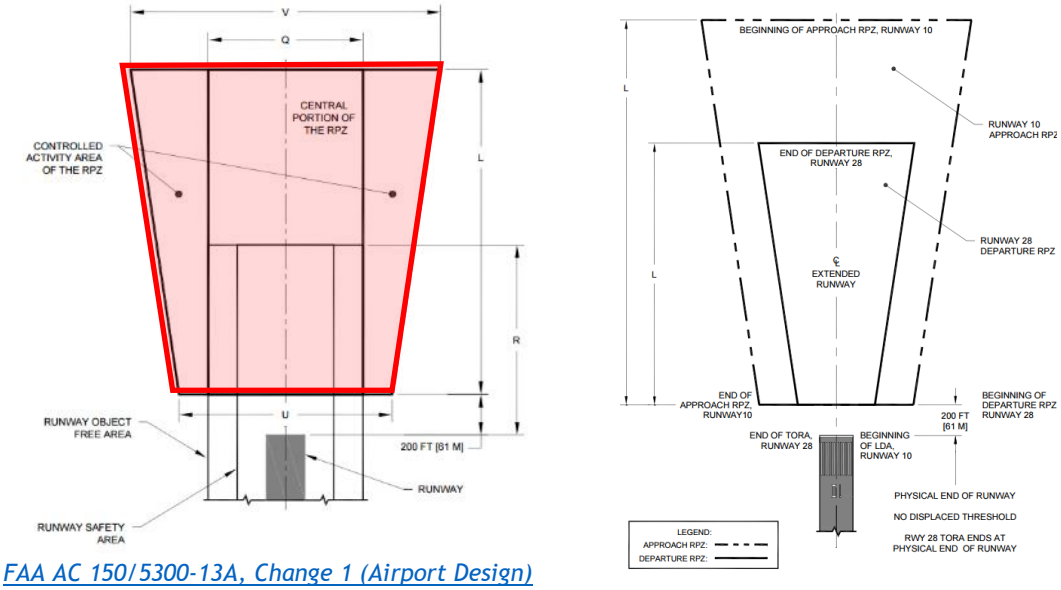
Runway Protection Zone

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.
- **Departures RPZ:** Departure RPZ extends 200 feet from the runway end or claimed Takeoff Runway Available (TORA).
- **Central Portion:** Land within the RPZ centered on runway centerline with a width matching the width of the ROFA.
- **Controlled Activity Area:** Land within 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, at a minimum, maintain the RPZ clear of all facilities supporting incompatible activities. It is desirable to clear all above-ground objects from the RPZ. **Figure 4-4** graphically depicts the characteristics of an RPZ.

Figure 4-4 – FAA Runway Protection Zone



Source: FAA AC 150/5300-13A, Change 1 (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 as a result 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
- **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 following roadways and other significant man-made land uses are within the existing approach/departure RPZs at Wall:

- **Runway 30:** Airport Road is 520 feet from the runway threshold and traverses 380 feet of the RPZ. 4th Street is 525 feet from the runway threshold and traverses 890 feet of the RPZ. Golden West Communications office complex is partially within the RPZ. Two homes and the Evangelical Free Bible Church are each within the RPZ. Eight above-ground fuel tanks are in the RPZ. The Average Daily Traffic count is 659[1] vehicles per day.

Because of the significant number of incompatible land uses within the Runway 30 RPZ, a detailed RPZ analysis for Runway 30 is being completed as a part of this Master Plan. That detailed study can be found in **Appendix H: Runway Protection Zone Analysis**. The other RPZs appear to have acceptable land uses at the present time.

Land Acquisition

According to FAA, off-airport development has 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 acquisition allows the airport to protect airspace and land use areas from possible intrusions. Acquiring all land is generally not feasible, and is usually supplemented by local zoning and easements to mitigate potential incompatible land uses and potential obstacle conflicts.

FAA encourages the airport sponsor to own the following land for existing and planned airport configuration:

- Airport Infrastructure
- Runway and Taxiway Object Free Areas
- Runway Protection Zones
- Building Restriction Line
- Navigational Aid Critical Areas
- Airspace Protection

[1] Traffic count from SD DOT is 992 vehicles per day in 2012 at 4th Avenue and Myrtle Street (3 blocks east of Airport). Traffic figure was adjusted for Residents and Business activity between Myrtle Street and the airport.

Identified land acquisition areas to help meet current/future needs include acquiring land use control for a proposed extension to Runway 12 and within the Runway 18 and 36 RPZs. Land required for future development will be identified in **Chapter 5: Alternatives Analysis**.

Airport Zoning

FAA recommends airport sponsors protect airport land use and airspace through local zoning. Owners of public airports are encouraged to enact airport overlay zoning to protect airspace and surrounding land use for public safety. 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 restrict land uses

The procedural steps to enact an airport zoning ordinance are outlined in Chapter 50-10 of the South Dakota Codified Laws. Wall is located within city limits of Wall surrounded by Pennington County.

Wall does not have any enacted airport zoning but acquired avigation easements in 1986 for the clear zones that existed at the time. There is a city zoning height restriction requirement for objects 24 feet above ground level and it is required that any such request be reviewed by the governing body. There is however no further guidance related to protecting approach surfaces at the airport from height hazards.

RUNWAY LENGTH

Sufficient runway length is important for the airport to maintain operational capability. It allows an aircraft operator to adequately serve their destinations. Restrictions on runway length may lead to reduced weight on a flight, 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 magnitude 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.

As of the date this Master Plan study was initiated, FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design* is the current guidance for determining runway lengths at airports. A detailed analysis using the methods outlined in the Advisory Circular including FAA runway length charts and aircraft performance data is in **Appendix F: Airfield Design**.

Design Aircraft

The current overall design aircraft is an Air Tractor AT-502B (ARC A-II/Small) single-engine turboprop airplane with a maximum takeoff weight of 9,400 pounds and a single seat. The most frequent operator of this aircraft at Wall is Ascend Ag Inc. with over 500 operations annually. This aircraft is used as an aerial applicator for agricultural spraying.

In the future, Ascend Ag. Inc expects to replace an AT-502B with the AT-802A (ARC B-II) turboprop airplane. This airplane is considered a “large airplane” with a maximum takeoff weight of 16,000 pounds and a single seat. This aircraft is expected to exceed the 500-annual operations threshold at

Wall when the airplane is acquired. Currently this aircraft is being operated infrequently out of Wall on a contractual basis to meet seasonal demand.

Another aircraft of consideration for runway length calculations is the Cessna Citation Mustang (C510). From 2010 through 2015 the C510 conducted 34 operations at Wall. The number of annual operations of the C510 are expected to remain below 500 through PAL4 and will not be the design aircraft through the planning period but should be considered for future development flexibility.

The current and future design aircraft using the crosswind runway are small general aviation airplanes classified as ARC A-I or B-I, approach speeds greater than 50 knots, weighing up to 12,500 pounds and with fewer than 10 passenger seats. An example aircraft is a Beechcraft Bonanza based at Wall.

Existing FAA Design Standards

A runway length analysis was performed using the FAA's current methodology found in FAA AC 150/5325-4B. The design approach identifies a recommended runway length based on a family grouping of design aircraft. Calculations were also completed using airplane flight manuals for specific aircraft.

Table 4-11 – FAA AC 150/5345-4B Runway Length Requirements – Primary Runway

Airport and Runway Data	
Airport Elevation	2,813 feet
Mean Daily Maximum Temperature of Hottest Month	89.3°F
Maximum Difference in Runway Centerline Elevation	13 feet (+130 feet)
Runway Condition	Dry Runways
Aircraft Classification	**Recommended Runway Length**
Small airplanes 12,500 pounds or less	
10 or more passenger seats	4,710 feet
Less than 10 passenger seats at 100 percent of fleet	4,880 feet
Less than 10 passenger seats at 95 percent of fleet	**4,340 feet**
Large airplanes greater than 12,500 lbs. up to 60,000 lbs.	
100 percent of fleet at 90 percent useful load	9,330 feet
100 percent of fleet at 60 percent useful load	6,890 feet
75 percent of fleet at 90 percent useful load	7,940 feet
75 percent of fleet at 60 percent useful load	**5,530 feet**
Specific Aircraft	
Air Tractor AT-502B	**4,180 feet**
Air Tractor AT-802A	**6,230 feet**
Cessna Citation Mustang (Dry)	5,680 feet

Source: FAA AC 150/5325-4B, Runway Length Requirements for Airport Design
Note: Runway length requirements estimated based on charts for airport planning purposes only.
***Green** highlighted text depicts applicable requirements.*

FAA Design Standards Analysis

The first thing in evaluating runway length is determining the length required for most of the aircraft operating at Wall which is made up of small airplanes, less than 12,500 pounds with fewer than 10 passenger seats. The guidance in AC 150/5325-4B splits the small fleet into two classifications according to "percent of fleet" that is accommodated. The fleet mix classification must be selected based on the geographic characteristics of a community and airport activity rather than specific aircraft. The geographic characteristics of Wall warrant a 95 percent of fleet classification. A runway length of **4,340 feet (4,400 feet)** is recommended to accommodate 95 percent of fleet of small aircraft.

The 100 percent of fleet calculation accounts for the most demanding operations for small airplanes up to 12,500 pounds and less than 10 passenger seats. FAA's recommended runway length for 100 percent

of fleet is **4,880 feet (4,900 feet).** However, according to FAA criteria, the 100 percent of fleet classification is typically reserved for airports on the fringe of a metropolitan area.

The existing critical design aircraft for Wall is a single-engine turboprop (AT-502B) that is less than 12,500 pounds. FAA indicates that small turboprop powered airplanes are only considered in the runway length chart for 10 or more passenger seats. FAA's recommended runway length of **4,710 feet (4,700 feet)** accommodates this class of small turboprop powered aircraft.

The guidance in AC 150/5325-4B provides a recommended runway length for aircraft greater than 12,500 pounds and less than 60,000 pounds that represents the turbojet powered aircraft fleet. The future design aircraft, Air Tractor AT-802A, is greater than 12,500 pounds but is a turboprop powered airplane and will be best evaluated individually in the next section below. The guidance for this weight class of aircraft is broken out into two "percentage of fleet" classification, namely 75 percent and 100 percent, which represent the percentage of aircraft in the national fleet. The percent of fleet classification is selected based on the best representation to the group of aircraft being evaluated. To accommodate 75% of the fleet with 60% load factor of the business jet fleet (less than 60,000 lbs.), a runway length of **5,530 feet (5,600 feet)** is recommended.

Specific Aircraft Performance Analysis

FAA also allows airport designers to determine the recommended runway length from airplane flight manuals for the airplanes to be accommodated by the airport in lieu of the runway length curves. These were reviewed for the Air Tractor AT-502B, Air Tractor AT-802A, Cessna Citation Mustang and Beechcraft Bonanza V35. The takeoff performance charts from the airplane flight manuals can be found in **Appendix F: Airport Design**.

Air Tractor AT-502B

The Air Tractor AT-502B is the existing design aircraft at Wall. Less than 12,500 pounds, the AT-502B is considered a small turboprop powered airplane. The *Takeoff Performance (Length of Takeoff Run Over 50-foot Obstacle)* chart was utilized from the airplane flight manual. An adjustment to the takeoff length of 130 feet was added to account for the 13-foot change in runway gradient. No adjustment was made for wet or slippery runway as this is not allowed for turboprop powered aircraft. A runway length of **4,180 feet (4,200 feet)** is recommended to accommodate unrestricted operations of the Air Tractor AT-502B.

Air Tractor AT-802A

The identified future design aircraft is the Air Tractor AT-802A. This aircraft is considered "Large" with a maximum takeoff weight of 16,000 pounds. The *Takeoff Distance (Over 50-foot Obstacle)* chart was utilized from the airplane flight manual. An adjustment to the takeoff length of 130 feet was added to account for the 13-foot change in runway gradient. No adjustment was made for wet or slippery runway as this is not allowed for turboprop powered aircraft. A runway length of **6,230 feet (6,300 feet)** is recommended to accommodate unrestricted operations of the Air Tractor AT-802A.

Table 4-12 summarizes the required takeoff distance for weight-limited operations of the AT-802A at different takeoff weights. The current runway length (3,500 feet) limits the AT-802A to approximately 12,200 pounds during an 89.3°F degree day. This limits the payload to 5,400 pounds out of a maximum useful load is 9,200 pounds (58 percent). Payload includes passengers, fuel and agricultural spray chemicals.

Table 4-12 – Air Tractor AT-802A Runway Length Requirements

Empty Weight	Mission Payload	Takeoff Weight	Runway Length
6,800 lbs.	9,200 lbs. (100%)	16,000 lbs. (MTOW)	6,230 feet
6,800 lbs.	8,200 lbs. (89%)	15,000 lbs.	5,450 feet
6,800 lbs.	7,200 lbs. (78%)	14,000 lbs.	4,690 feet
6,800 lbs.	6,800 lbs. (74%)	13,600 lbs.	4,330 feet
6,800 lbs.	6,200 lbs. (67%)	13,000 lbs.	3,930 feet
6,800 lbs.	5,700 lbs. (62%)	12,500 lbs.	3,700 feet
6,800 lbs.	5,400 lbs. (58%)	*12,200 lbs.*	*3,500 feet (Existing)*

Source: Air Tractor AT-802 Airplane Flight Manual, KLJ Analysis
MTOW = Maximum Takeoff Weight
NOTE: Runway requirements assume distance to clear 50-foot obstacle, 89.3°F, no wind, 2,813' MSL elevation, paved and dry runway.

Cessna Citation Mustang (C510)

The Cessna Citation Mustang (C510) has a history of occasional operations at Wall. Less than 12,500 pounds, the C510 is considered a small turbojet powered airplane. The *Takeoff Field Length (Over 35-foot Screen Height)* table was utilized from the airplane flight manual. An adjustment to the takeoff length of 130 feet was added to account for the 13-foot change in runway gradient. No adjustment was made for wet or slippery runway as this is only allowed for landing operations for turbojet powered aircraft. A runway length of **5,680 feet (5,700 feet)** is recommended to accommodate the Cessna Citation Mustang during dry runway conditions.

Beechcraft Bonanza V35

The Beechcraft Bonanza V35 is identified as the design aircraft for the turf crosswind runway (Runway 18-36). This is a small single-engine aircraft (ARC A-I) has a maximum takeoff weight of 3,400 pounds. The *Normal Takeoff* table was utilized from the pilot's operating handbook for performance data. A runway length of 2,600 feet is needed for a paved runway. When the FAA's recommended factor of 1.2 is added, a runway length of **3,120 feet (3,100 feet)** is recommended to accommodate the Beechcraft Bonanza V35 on a turf runway.

Other Considerations

Wall Municipal Airport experiences land use constraints at its property borders with incompatible land uses in the Runway Protection Zone (RPZ) on the south-east corner and the railroad corridor bordering the north-west corner. **Figure 2-1** and **Exhibit 2-5** in **Chapter 2** depict these constraints.

The maximum distance available for the existing Runway 30 threshold to the edge of the railroad corridor is 4,430 feet. While the railroad is not planning construction of a line at this time, it intends to retain control of the land. Easements and long-term leases are a possible consideration for protection of airspace while safety surfaces and infrastructure would remain off railroad property.

According to FAA AC 150/5300-13A, Change 1, the FAA recommended minimum runway length of 3,200 feet exists for runways accommodating circling and non-precision instrument approaches with visibility minimums as low as ¾ mile. No instrument approaches currently exist at Wall; however the existing runway length exceeds the minimum length required to establish a non-precision approach.

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

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

The RPZ southeast of the Runway 30 threshold contains incompatible land uses which are described in **Chapter 2: Inventory**. Displacing the runway thresholds and utilizing declared distances should be considered to mitigate incompatible land use issues.

Crosswind Runway

FAA recommends crosswind runways have a length capable of accommodating the lower crosswind capable aircraft expected to use this runway. These are small aircraft with approach speeds of greater than 50 knots. This equates to a recommended runway length of 4,340 feet. Due to the nature of turf runways, the landing, takeoff, and accelerate-stop distances are longer than for paved runways. FAA recommends that distances be increased by a factor of 1.2, which equates to a recommended turf runway length of 5,200 feet.

Table 4-13 – FAA AC 150/5345-4B Runway Length Requirements – Crosswind Runway

Airport and Runway Data		
Airport Elevation	2,813 feet	
Mean Daily Maximum Temperature of Hottest Month	89.3°F	
Runway Condition	Dry Runways (Turf)	
Aircraft Classification	**Recommended Runway Length**	
Small airplanes 12,500 pounds or less		
Approach speeds less than 30 kts.	460 feet	
Approach speeds 30 kts. or more but less than 50 kts.	1,230 feet	
Specific Aircraft	**Ground Run**	**Clear 50-ft Obst**
Cessna 182	1,167 feet	2,272 feet
American Champion Citabria	530 feet	970 feet
Piper Cherokee Six	2,040 feet	3,130 feet
Beechcraft Bonanza V35	1,840 feet	3,120 feet
Cessna 172H	1,320 feet	2,450 feet
Aviat Husky A-1B	472 feet	1,180 feet

Source: FAA AC 150/5325-4B, Runway Length Requirements for Airport Design, Various Aircraft Flight Manuals
Note: Runway length requirements estimated based on charts for airport planning purposes only. Per FAA AC 150/5300-13A aircraft takeoff distances multiplied by 1.2 for turf runway surfaces.

Aircraft that are most susceptible to crosswinds are typically the smallest aircraft of the fleet, and require less than 4,340 feet of runway. The based aircraft fleet mix that would need the crosswind runway are ARC A-I and B-I small single engine aircraft was reviewed, with a Beechcraft Bonanza V35 identified as the design aircraft. The recommended runway length for this aircraft at Wall is 2,600 feet for a paved runway, and **3,120 feet (3,100 feet)** for a turf runway.

The existing crosswind runway faces land use and property constraints that limits the ability to extend the runway beyond the existing length of 1,980 feet. The existing length does not meet the runway length needs of the small aircraft with approach speeds greater than 50 knots nor the critical design aircraft. The takeoff distances of aircraft based on the airfield that utilize the crosswind runway are summarized in **Table 4-13**. When evaluating the ground roll performance, several aircraft are able to operate on the existing length. In discussion with users of the crosswind runway, they have indicated the existing length has been sufficient to meet their needs. The existing turf crosswind runway at Wall is recommended to remain at a length of 1,980 feet.

To achieve a longer runway length within existing property, a new crosswind runway alignment of 030°/210° was evaluated. The factors controlling the runway length in this alignment were; obstacle clearances with the Interstate overpass to the southwest, RPZ compatible land uses to the south west, and RPZ compatible land uses to the north east. With these constraints, the runway length appears to be the same as existing or marginally improved. Significant impacts to inventoried wetlands and earthwork would also be expected. No further evaluation of this alignment is recommended.

Runway Length Summary

The existing Primary Runway length of 3,500 feet is insufficient to accommodate the existing design airplane unrestricted on Runway 12-30. The recommended primary runway length is **4,430 feet** by PAL 1 which will need to be able to accommodate the weight-limited (approximately 14,000 lbs.) operations of the future design aircraft. While the unrestricted operations of the Air Tractor AT-802A is 6,300 feet, the land use constraints of the railroad and RPZ, limits the runway length to a maximum of 4,430 feet. In recognition of this, the recommended ultimate runway length is to remain at **4,430 feet**.

The turf crosswind runway length needed is 3,100 feet based on critical design aircraft performance. The length of Runway 18-36 is recommended to remain at **1,980 feet**. This decision considers existing surrounding land use constraints, significant implementation impacts for any runway extension/realignment, as well as crosswind runway users indicating the existing length is sufficient.

Table 4-14 – Recommended Runway Lengths

Aircraft Type/Operation	Planning Period(s)	Recommended Runway Length
Small Aircraft < 10 passenger seats	Existing	**4,400 feet***
Air Tractor AT-802A (14,000 lbs.)	PAL 1 (Future)	**4,430 feet***
Air Tractor AT-802A (14,000 lbs.)	PAL 2-4+ (Ultimate)	**4,430 feet***
Various – Turf Crosswind Runway	Existing to PAL 4	**1,980 feet (Turf)***

Source: FAA AC 150/5325-4B, KLJ Analysis
Note: Runway length requirements estimated based on charts for airport planning purposes only. MTOW = Maximum Takeoff Weight
**Based on FAA standards and aircraft performance needs considering surrounding land use constraints.*

PAVEMENT STRENGTH

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

The new 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. There is no PCN published for the runways at Wall. A PCN determination is required at non-certificated airports when the runway pavement is reconstructed.

The existing design aircraft for pavement strength calculations is the Air Tractor AT-502B with a maximum gross takeoff weight of 9,400 pounds and an Aircraft Classification Number (ACN) of 7.9 based on a D subgrade strength (CBR 4.0). The future design aircraft for pavement strength calculations is the Air Tractor AT-802A with maximum gross takeoff weight of 16,000 pounds and an ACN of 7.9 based on a D subgrade strength (CBR 4.0). The National Guard in Rapid City occasionally operates the Sikorsky HH-60 at Wall with a ACN of 10.3 based on a D subgrade strength (CBR 4.0) and a weight of 22,000 pounds.

The current weight capacity for Runway 12-30 is published at 12,500 lbs. in single wheel configuration. A technical review of the existing pavement revealed a PCN of 9/F/D/X/T and a single wheel weight capacity of 22,500 lbs. Refer to **Appendix E – Airfield Pavements** for additional information on PCN calculations. **The runway strength appears to be sufficient to meet existing needs.** As the critical design aircraft changes in the future the runway will need to accommodate the greater weights from the larger aircraft. **It is recommended Runway 12-30 maintain a weight capacity of 22,500 lbs. (single wheel) and a PCN of 8 to meet future and ultimate need.** Runway 18-36 currently meets existing and future needs.

Table 4-15 – Pavement Strength Requirements

Runway	Existing Published		Future & Ultimate Need	
	Capacity	PCN	Capacity	PCN
Runway 12-30	12,500 lbs. - SW	N/A	22,500 lbs. - SW	8/F/D/X/T
Runway 18-36	N/A	N/A	N/A	N/A

Source: Wall Airport Master Record (FAA Form 5010-1), KLJ Analysis
SW = Single Wheel

RUNWAY WIDTH

Runway width is driven by the RDC and approach visibility minimums for each runway as identified in FAA AC 150/5300-13A. Runway 12-30 currently has a width of 60 feet which meets the design standard for its existing RDC of A/I(Small)/VIS. The existing critical design aircraft however is an ARC A/II(Small) which requires a wider runway of 75 feet. The existing runway width is insufficient to meet the needs of the existing critical design aircraft (see **Tables 4-20 and 4-21 – Summary Tables**). A width of 75 feet is recommended for Runway 12-30 to meet existing design standards. The future design standards for Runway 12-30 would maintain the 75-foot width. Turf Runway 18-36 has a width of 100 feet which satisfies the existing and future design standards.

PAVEMENT SURFACE

Runway 12-30 is currently a bituminous asphalt surface without any surface treatment. Runway grooving improves aircraft stopping performance in wet or contaminated runway conditions. Runway grooving is recommended when the design aircraft becomes a turbojet. FAA AC 150/5320-12C considers this to be high priority safety work. Runway 18-36 is currently a turf surface. A paved surface is optional, however local pilots prefer the turf surface for their operations in smaller or agricultural-spray aircraft. Runway 18-36 is planned to remain as a turf surface.

PAVEMENT CONDITION

The typical useful life of a bituminous 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 work. In general, pavement maintenance is conducted through the state maintenance programs sponsored by the South Dakota Department of Transportation's Office of Air, Rail & Transit.

Bituminous Runway 12-30 has a Pavement Condition Index (PCI) rating of 71 as of 2015. The pavement was originally installed as a double chip-seal in 1986 followed by a 2.25" overlay in 1993 and a rejuvenator in 2001. A surface treatment was also done in 2016. Runway 16/34 does not require any major rehabilitation work in the next five years however major rehabilitation should be planned within the next 10 years. When the runway was inspected, it was noted that there is a 'hump' in the pavement 1/3 from the north end which is observed as a dip then rise on the centerline. Aircraft experience the hump when they rotate for takeoff. Major maintenance of the pavement areas will be factored into the Implementation Plan in Chapter 6.

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 number is the compass heading as viewed by the aircraft on centerline of the runway. A compass heading such as 183° is rounded to 180° and the last number is dropped making a runway end number as 18.

The 2016 magnetic declination at Wall is 7° 5' east, changing 0° 6' west per year as the location of the magnetic north pole moves over time. **Runway 12-30 should be re-designated in the future to 13-31.** Runway 18-36 is appropriately designated and can remain the same through the planning period. Any change to runway designation will require close coordination with the FAA as it requires the update of national aeronautical publications, procedures and signage. It is advisable to change the designation of the runway prior to establishing any instrument approaches procedures.

Table 4-16 – Runway Designation Requirements

Runway Designation	Existing Magnetic Bearing (2015)	Future Magnetic Bearing (2035)	Recommended Future Designation
Runway 12/30	128.03°/308.04°	130.03°/310.04°	13/31
Runway 18/36	183.71°/03.71°	185.71°/05.71°	Same

Source: National Oceanic and Atmospheric Association (NOAA), KLJ Analysis

Instrument Procedures

Instrument Approach Procedures (IAPs) to a runway end are used by landing aircraft to navigate to the airport during Instrument Meteorological Conditions (IMC) when the cloud ceiling is 1,000 feet of less and/or visibility is 3 miles or less. Establishing approaches with the lowest possible weather minimums allow the airport to maximize its operational utility. This is a result of the approach type, airport infrastructure and prevailing airspace obstructions. 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).

INSTRUMENT CAPABILITIES TO RUNWAY 12-30

Wall does not have established IAPs to any runway ends. During IMC aircraft have the option of using IAPs at either Rapid City Regional Airport, 35 miles west, or Philip Municipal Airport, 28 miles east. The airport is interested in establishing IAPs to accommodate aircraft operations during poor weather which would increase airport utility. This is important to the community businesses and tourism segments to capture the business users currently utilizing Rapid City and Philip Airport. In discussions with the airport sponsor, the desire is to achieve an RNAV(GPS) capable of vertical guidance (APV) with a 1 mile visibility and 300-foot ceiling minimums.

The next development step is ensuring future design surfaces are satisfied and required infrastructure needs are met. A review of the basic airport design standards when establishing IAPs was completed. An APV procedure with visibility minimums of no lower than 1 mile triggers the following requirements assuming future design standards (B-II):

- The beginning of the FAA airport design approach surface is shifted to 200 feet before the threshold, inner width is widened to 400 feet, outer width is widened to 3,800 feet, and length is extended to 10,000 feet. The slope of the surface remains the same at 20:1 (20 horizontal feet for each 1 vertical foot).
- The 14 CFR Part 77 Primary Surface expands from 250 feet to 500 feet wide centered on runway centerline. New development that penetrates this or its related 7:1 transitional surface is not allowed.

- The 14 CFR Part 77 Approach Surface inner width is widened to 500 feet matching the Primary Surface, and outer width is increased to 3,500 feet. Length of the Approach Surface is extended to 10,000 feet at a shallower slope of 34:1 (34 horizontal feet for each 1 vertical foot).
- The 14 CFR Part 77 Horizontal Surface radius is widened to 10,000 feet from the runway at a plane 150 feet above the runway surface.
- An FAA approved weather observation system may be needed to achieve 1 mile visibility minimums.
- Runway End Identifier Lights (REIL) may be needed to maximize utility. The equipment provides rapid and positive identification of the approach end of the runway.
- Typical lowest cloud ceiling is 300 feet depending on obstructions.

A current aeronautical survey will need to be submitted to the FAA and approved prior to requesting an IAP. The decision to upgrade Runway 12-30 to accommodate an instrument approach and meet the additional infrastructure needs will be evaluated in the **Chapter 5: Alternatives Analysis**.

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 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, publish operational restrictions).

As of the time of this report, an obstruction analysis is underway to identify obstructions to Part 77 and other airspace surfaces utilizing Aeronautical Survey data collected in April 2017. **There are no known airspace penetrations to the existing FAA airport design runway approach (threshold siting) surfaces.** There may be obstacles that penetrate other airspace surfaces that require further study. The full results of this analysis will be identified in the Airport Layout Plan (ALP) drawing set. An Obstacle Action Plan in accordance with 2015 FAA guidance will be developed from these results and identified in the ALP.

AREA AIRSPACE

The existing Class G airspace is considered sufficient to support existing visual operations. If instrument approach procedures are established for the primary runway, the controlled airspace (Class E) is typically lowered closer to the airport surface to maintain communication and separation during IMC. This same airspace classification exists at Philip (PHP) which has a 1-mile visibility RNAV(GPS) instrument approach. Coordination with the FAA is recommended to evaluate airspace classification when beginning to establish instrument approach procedures.

PART 77 CIVIL AIRPORT IMAGINARY SURFACES

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 these "imaginary" three-dimensional airspace surfaces and become obstructions. 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. The slope of an airspace surface is defined as the horizontal distance traveled for every one vertical foot (i.e. 50:1).

Of note are the primary surfaces which should be kept clear of non-essential objects above the runway centerline elevation. The approach surface extends upward and outward from the runway at a slope defined as the horizontal distance traveled for every one vertical foot. The following **Table 4-17** depicts the existing, future and ultimate approach airspace surfaces for Wall:

Table 4-17– Part 77 Approach Airspace Requirements

Runway End	Approach Standards	Part 77 Code	Inner Width*	Outer Width	Length	Slope
Existing						
12, 30, 18 & 36	Visual Utility	A(V)	250’	1,250’	5,000’	20:1
Future & Ultimate						
12, 30	Non-Precision Other-Than-Utility As low as 1 mile	C	500’	3,500	10,000’	34:1
18, 36	Visual Utility	A(V)	250’	1,250’	5,000’	20:1

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

New development must be kept below the Part 77 airspace surface elevation. Airspace surfaces must clear public roads 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. Any existing, future or ultimate Part 77 obstructions located around Wall will be identified on the ALP for further action.

RUNWAY 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 FAA AC 150/5300-13A, Change 1. These surfaces are intended to be similar to the more complex surfaces identified in Terminal Instrument Procedures (TERPS). 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 instrument departures. It begins at the end of the takeoff distance available and extends upward and outward at a 40:1 slope. No new penetrations are allowed unless an FAA study has been completed and a determination of no hazard has been issued. 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. Per **Table 4-18**, the following approach/departure surface standards apply:

Table 4-18 – Approach Surface Requirements

Runway End(s)	Table 3-2 Row	Description	Slope
Existing			
12, 30, 18 & 36	2	Approach end of runways expected to serve small airplanes with approach speeds of 50 knots or more (visual, day/night)	20:1
Future and Ultimate			
12, 30	4	Approach end of runways expected to support instrument approaches having visibility greater than or equal to ¾ mile	20:1
12, 30	7	Departure ends of runways with instrument approaches	40:1
18, 36	2	Approach end of runways expected to serve small airplanes with approach speeds of 50 knots or more (visual, day/night)	20:1

Source: FAA AC 150/5300-13A, Change 1 including edits from Engineering Brief No. 99, KLJ Analysis
Note: Most critical row(s) shown. Only changes from existing shown in future.

There are no existing departure surfaces at Wall. Runway ends 12 and 30 would be available for instrument departures in the future and would then require departure surfaces. If established the Runway 12 departure surface would have existing structures in the hangar area to the north penetrate the surface. Additionally, future development would be restricted within the surface. All existing FAA approach surfaces are clear of obstructions.

Airspace surface obstructions and mitigation options for future runway configurations will be evaluated in **Chapter 5: Alternatives Analysis**. Mitigation options generally include obstruction removal, lighting/marking, declared distances and/or adjustment of the visual guidance slope indicator angle. Other long-term options include reconfiguring the runway or modifying design standards. New development should be clear of airspace surfaces.

VISUAL AID SURFACES

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, a 31.29:1 sloped surface must be clear. The specific airspace standards for this and for approach lighting systems are defined in FAA Order 6850.2B. **There are no known obstructions to visual aid surfaces at Wall.**

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 location, activity and usage type.

AREA NAVIGATION

The FAA is updating the nation's air transportation infrastructure through the Next Generation Air Transportation System (NextGen) program. New procedures and technology are to be implemented to improve the efficiency and safety of the national air transportation system. By 2020, all aircraft in controlled airspace must be equipped with Automatic Dependent Surveillance-Broadcast (ADS-B) equipment, forming the foundation by moving from group radar and navigation aids to precise tracking using satellite signals. As aircraft are required to be equipped with ADS-B, a trend in future aviation operations suggests satellite-based equipment will become the new normal for pilots.

For area navigation (RNAV), satellite-based NAVAIDs will primarily be used for air navigation with ground-based NAVAIDs used for secondary purposes. Wide Area Augmentation System (WAAS) provides the framework for satellite-based navigation and approach procedures.

Wall should plan for the use of satellite-based area navigation by establishing RNAV approaches rather than rely on ground-based NAVAIDs such as the VOR. FAA states about 97 percent of the general aviation fleet that routinely flies under IFR has WAAS receivers installed. The ground based NAVAIDs are currently in transition to be decommissioned by FAA.

RUNWAY APPROACH

Other 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 6750.16D, *Siting Criteria for Instrument Landing Systems* and FAA Order 6850.2B, *Visual Guidance Lighting Systems* defines the standards for establishing these systems.

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 and a Visual Approach Slope Indicator (VASI) are two typical VGSI systems. They are installed on runway ends to enhance visual vertical guidance to the runway

end. PAPI systems, a newer technology, consist of a single row of two to four lights. The two-light system is for non-jet runways and the four-light system is for jet-capable runways.

Wall currently has a 2-box PAPI system installed on the left side of Runway 12 and 30 ends. The airport has indicated the current system is older with parts being more difficult to acquire. In the future, Wall should replace the existing system on Runway 12 and 30 with a newer 2-box PAPI when the runway is reconstructed or the system reaches the end of its useful life. All PAPIs should meet obstacle clearance requirements.

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. Additionally, these are typically installed on runways that are surrounded by a preponderance of other lights or if the runway lacks contrast with surrounding terrain. These are not installed with an approach lighting system. REILs can be either unidirectional or omnidirectional.

There are no REILs currently installed at Wall. **It is recommended a REIL be installed for Runway 12 and/or 30 end when a GPS approach is established in the future**.

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 airport beacon's line of sight at Wall is obstructed by the recent hangar development to the south. A new location with adequate line of sight should be analyzed and identified. The older age of the existing system makes replacement parts difficult to obtain. **A replacement beacon is recommended in the future. Decussions with airport have indicated they prefer a tilt-down pole for maintenance.**

Runway Lighting

Runway edge lights are placed off the edge 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 according to the intensity of light they produce including high intensity (HIRL), medium intensity (MIRL) and low intensity (LIRL).

The existing LIRL for Runway 12-30 is required for visual runways at small airports and meets the standards for existing needs. MIRL is required for runways with established non-precision approaches. Upgrading the runway edge lighting to **MIRL is recommended when the runway is reconstructed or when establishing instrument approach procedures for Runway 12-30**. HIRL is only required for runways with precision instrument approaches which is not planned at Wall. Lighting is optional but not required on turf Runway 18-36.

Taxiway Lighting

Taxiway edge lighting delineates the taxiway and apron edges. The FAA standard taxiway edge lighting system is Medium Intensity Taxiway Lights (MITL). Retro reflective markers are recommended for all taxiway as a lower-cost method to provide visual guidance at night.

No taxiway edge lighting or retro-reflective blue markers are installed on the airfield. **It is recommended that MITLs be installed at a minimum along the taxiway connectors to facilitate turning movements for night operations. A MITL system for the apron is a guideline but is optional. Reflectors should be installed where MITLs are not installed.**

Lighting Activation

Lighting is pilot controlled through the Common Traffic Advisory Frequency (CTAF). The existing system is in good working order and there are no known issues with how airfield lighting is activated at Wall. However, the older age of the system makes replacement parts difficult to obtain. The lighting controls are currently placed on an electrical service pole and should be placed in a lighting vault in the future. A replacement system is recommended when the airfield lighting is upgraded or replaced.

AIRFIELD SIGNAGE

Airfield signage is essential for the safe and efficient operation of aircraft and ground vehicles on the airport movement area. Common signs include mandatory instruction signs, location signs, boundary signs, direction/destination signs, information signs and distance remaining signs. General aviation airports such as Wall must have mandatory instruction signs placed at holding positions for taxiway/runway intersections.

Lighted signs assist in identification and improved situational awareness during low visibility conditions. Airports that have instrument approaches are encouraged to install lighted signs as aircraft operations occur during times of reduced visibility. It is recommended to upgrade to lighted mandatory signs when IAPs are established at Wall.

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 minimum required runway markings for a standard runway are as follows:

- Visual (landing designator, centerline)
- Non-Precision (landing designator, centerline, threshold)
- Precision (landing designator, centerline, threshold, aiming point, touchdown zone, edge)

Runway 12-30 should continue to have visual markings maintained, with an upgrade to non-precision markings completed if instrument approach procedures are established. There are edge cones used on the edge of Runway 18-36 which are spaced over 300 feet apart while recommended spacing is 200 feet maximum. Also, the cones at the end are set inside the runway at the threshold reducing the runway length by 10 feet on each end. The edge cones for Runway 18-36 should be reconfigured to a 200-foot maximum spacing with end markings set outside the runway.

Figure 4-5 – Recommended Turf Runway Cone Placement



Source: KLJ Analysis

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. Taxiway/taxilane centerline markings should be used throughout to define a safe centerline with object clearance. Taxiway/taxilane edge markings should be used to delineate the taxiway edge from the shoulder, apron or some other contiguous paved surface. Wall should continue to maintain its taxiway/taxilane centerline markings to delineate areas where clearance meets FAA wingtip object clearance standards.

Holding Position

Holding position markings are a visual reference to prevent aircraft and vehicles from entering critical areas such as an active runway environment. These markings consist on yellow bars and dashes on a black background. The airport meets required setbacks. **Increasing the setback to 200 feet for Runway 12-30 is needed when the runway is built to accommodate larger aircraft (greater than 12,500 pounds).**

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

Weather observing systems are recommended to be kept clear of agricultural operations within 100 feet, clear of objects 15 feet below the sensor height within 500 feet, and clear of objects greater than 10 feet above the sensor within 1,000 feet. The airport has a Super Automated Weather Observation System (AWOS) located north of the segmented circle meets the separation standards. The SuperAWOS is owned by the airport and weather information is available by phone and aircraft radio.

The SuperAWOS is not currently approved by the FAA. Unless the SuperAWOS is certified or replaced, operational capabilities for instrument approaches will be restricted with higher visibility and ceiling heights. Replacement of the weather observation system with an FAA approved system, AWOS-II or higher, is recommended when establishing instrument approach procedures.

Wind Cone(s)

Wind cones allow pilots to instantly obtain real-time wind direction and speed information, which allows them to make decisions for aircraft operations during takeoff or landing. The wind cone should be located in a central visible location and lighted for night operations. A 100-foot diameter segmented circle enhances visibility and provide visual references to aid in landing operations. Wall has an existing primary lighted wind cone and segmented circle north of Runway 12-30.

COMMUNICATIONS & ATC

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. Wall will continue to be an uncontrolled airport with radar coverage available starting at approximately 5,000 feet above ground level. Coverage with ATC is expected to be enhanced to 1,500 feet above ground level with the establishment of satellite-based ADS-B infrastructure over time. No airport action is necessary at this time.

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, Change 1.

SYSTEM DESIGN

FAA has placed a renewed emphasis on taxiway design in their updated airport design standards. Fundamental elements help develop an 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 particular 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. The surface should be suitable to support equipment during dry conditions
- **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 located in the OFA for aircraft ground maneuvering purposes.

The following table describes the specific FAA taxiway design standards based on various Airplane Design Group (ADG) and Taxiway Design Group (TDG) classifications for the identified design aircraft at Wall:

Table 4-19 – FAA Taxiway Design Standards Matrix (ADG)

Design Standard	Actual	Facility Requirements	
		Existing	Future/Ultimate
Taxiway Airplane Design Group (ADG)	**I**	**II**	**II**
Taxiway Design Group (TDG)	**1A**	**1A**	**1A**
Taxiway Width	25 feet	25 feet	25 feet
Taxiway Safety Area	79 feet	79 feet	79 feet
Taxiway Object Free Area	106 feet	131 feet	131 feet
Taxiway Centerline to Fixed or Movable Object	44 & 53 feet	65.5 feet	65.5 feet
Taxilane Airplane Design Group (ADG)	I	I	I
Taxilane Width	20-25 feet	25 feet	25 feet
Taxilane Object Free Area	60-79 feet	79 feet	79 feet
Taxilane Centerline to Fixed or Movable Object	30-39.5 feet	39.5 feet	39.5 feet

Source: FAA AC 150/5300-13A, Change 1, KLJ Analysis
*NOTE: Actual evaluates areas served by overall design aircraft type. RED indicates a known deficiency to existing minimum design standards. *Areas serving exclusively small aircraft should be designed to ADG-I standards. The existing and future overall airport design aircraft requires ADG-II standards to be met.*

The existing taxiway system serving Runway 12-30 is 25 feet wide. These meet current and future overall TDG-1A design standards, however do not meet the current and future ADG-II design standards. The existing apron taxilane meets current and future TDG-1A design standards but does not meet existing ADG-I or ADG-II design standards. Taxilanes from the apron to the small hangar area are 20-foot wide and do not meet existing or future TDG-1A/ADG-I design standards.

FAA taxiway fillet geometric design standards changed in 2012 with FAA AC 150/5300-13A. These standards should be examined and incorporated as necessary at Wall during taxiway reconstruction or new construction.

ENTRANCE TAXIWAYS AND TURN-AROUNDS

Entrance taxiways provide access to the runway ends for departures. These taxiways should always be oriented 90 degrees to runway centerline to enhance visibility of runway operations. The outer edge of an entrance taxiway must be curved. Each entrance taxiway should have its own taxiway designator. Wall has one taxiway the connects the apron and hangar area to the Runway 30 end. No taxiway designators have been established. This configuration requires plane departing Runway 12 or arriving Runway 30 to do a turnaround and back-taxi on the runway which reduces the time the runway is available for other aircraft.

Turn-around taxiways provide aircraft an area to clear the runway and hold for arriving/departing aircraft as well as direction reversal. They are usually located at the other end of the runway from the entrance taxiway at airports with one taxiway connection. They can reduce runway occupancy time and achieve an efficient flow of traffic. Wall does not currently have turn-around taxiways. It is recommended a turn-around taxiway be considered for the Runway 12 end for aircraft needing to conduct back-taxiing operations.

PAVEMENT CONDITION & STRENGTH

In general, pavement maintenance is conducted through the state maintenance programs sponsored by the South Dakota Department of Transportation's Office of Air, Rail & Transit. Major rehabilitation/reconstruction is completed by general contractors. The taxiway pavements at Wall are generally in good shape but do not have substantial strength. Bituminous taxiways have a 2015 PCI rating ranging from 74 to 83 with a weighted average of 82 for all taxiways. The pavement was originally installed as a double chip-seal in 1986 followed by a 2.25 inch overlay in 1993 and a rejuvenator in 2001. A surface treatment was also done in 2016. Major maintenance of the pavement areas will be factored into the Implementation Plan in Chapter 6. Reconstructed taxiways serving ADG-II airplanes should be constructed to accommodate regular use of the future design aircraft (16,000 pounds) whenever possible.

Airside Data Summary

The following tables provide summary data of the facility requirements and recommendations associated with each of the runways at the Wall Municipal Airport through the planning period(s) identified in this Master Plan study

Table 4-20 – Runway 12-30 Data Table

Design Standard	Actual Condition	Facility Requirement or Recommendation		
		Existing	Future	Ultimate
Runway Identification	12-30	13-31	13-31	13-31
Runway Classification	Utility	Utility	Other-Than-Utility	Other-Than-Utility
Aircraft Classification	Small Aircraft	Small Aircraft	Large Aircraft	Large Aircraft
Runway Design Code (RDC)	A/B-I/VIS	A/B-II/VIS	B-II/5000	B-II/5000
Approach Reference Code (APRC)	N/A	N/A	B-II	B-II/5000
Departure Reference Code (DPRC)	N/A	N/A	B-II	B-II
Pavement Strength (Wheel Loading)	22.5(S)	12.5(S)	22.5(S)	22.5(S)
Pavement Strength (PCN)	9	9	8	8
Pavement Surface Type	Asphalt	Asphalt	Asphalt	Asphalt
Pavement Surface Treatment	None	None	None	None
Effective Runway Gradient	0.37%	2.0% Max.	2.0% Max.	2.0% Max.
Line of Sight Requirements Met	No	Yes	Yes	Yes
Percent Wind Coverage (per RDC)	92.87%	96.50%	96.50%	96.50%
Runway Length	3,500 feet	4,430 feet	4,430 feet	4,430 feet
Take Off Run Available (TORA)	3,500 feet	3,900’ / 4,430’	3,900’ / 4,430’	3,900’ / 4,430’
Take Off Distance Available (TODA)	3,500 feet	3,900’ / 4,430’	3,900’ / 4,430’	3,900’ / 4,430’
Accelerate Stop Distance (ASDA)	3,500 feet	4,430’ / 4,430’	4,430’ / 4,430’	4,430’ / 4,430’
Landing Distance Available (LDA)	3,500 feet	4,430’ / 3,900’	4,430’ / 3,900’	4,430’ / 3,900’
Runway Width	60 feet	75 feet	75 feet	75 feet
Displaced Threshold	0 feet	0 feet	530 feet	530 feet
Shoulder Width*	0 feet	10 feet	10 feet	10 feet
Blast Pad Width**	0 feet	95 feet	95 feet	95 feet
Blast Pad Length**	0 feet	150 feet	150 feet	150 feet
Runway Safety Area (RSA) Width	120 feet	150 feet	300 feet	300 feet
RSA Length Past Departure End	240 feet	300 feet	600 feet	600 feet
RSA Length Prior to Threshold	240 feet	300 feet	600 feet	600 feet
Runway Lighting Type	LIRL	LIRL	MIRL	MIRL
Approach RPZ Start from Runway	Buildings, Road in RPZ (30)	200 feet	200 feet	200 feet
Approach RPZ Length		1,000 feet	1,000 feet	1,000 feet
Approach RPZ Inner Width		250 feet	500 feet	500 feet
Approach RPZ Outer Width		450 feet	700 feet	700 feet
Departure RPZ Start from Runway	Buildings, Road in RPZ (30)	200 feet	200 feet	200 feet
Departure RPZ Length		1,000 feet	1,000 feet	1,000 feet
Departure RPZ Inner Width		250 feet	500 feet	500 feet
Departure RPZ Outer Width		450 feet	700 feet	700 feet
Runway Marking Type	Visual	Visual	Non-Precision	Non-Precision
14 CFR Part 77 Approach Category	20:1	20:1	34:1	34:1
Approach Type	Visual	Visual	Non-Precision	Non-Precision
Visibility Minimums	N/A	N/A	1 Mile	1 Mile
Type of Aeronautical Survey Req’d	VGA	NVGA	VGA	VGA

Design Standard	Actual Condition	Facility Requirement or Recommendation		
		Existing	Future	Ultimate
Runway Departure Surface	No	No	Yes	Yes
ROFA Width	250 feet	500 feet	500 feet	500 feet
ROFA Length Past Departure End	240 feet	300 feet	300 feet	300 feet
ROFA Length Prior to Threshold	240 feet	300 feet	300 feet	300 feet
ROFZ Length Past Runway	200 feet	200 feet	200 feet	200 feet
ROFZ Width	250 feet	250 feet	400 feet	400 feet
Inner Approach OFZ	N/A	N/A	N/A	N/A
Inner Transitional OFZ	N/A	N/A	N/A	N/A
Precision ROFZ Length	N/A	N/A	N/A	N/A
Precision ROFZ Width	N/A	N/A	N/A	N/A
Threshold Siting Surface (TSS) Type	2	2	4	4
TSS Start from Runway End	0 feet	0 feet	200 feet	200 feet
TSS Length	2,250'/ 2,750'	2,250'/ 2,750'	10,000'	10,000 feet
TSS Inner Width	250 feet	250 feet	400 feet	400 feet
TSS Outer Width	700 feet	700 feet	3,800 feet	3,800 feet
TSS Slope	20:1	20:1	20:1	20:1
Visual and Instrument NAVAIDs	PAPI	PAPI	PAPI, REIL	PAPI, REIL
Runway and Taxiway Separation***	N/A	240 feet	300 feet	300 feet
Runway and Parking Separation	312 feet	250 feet	250 feet	250 feet
Runway and Hold Line Separation	125 feet	125 feet	200 feet	200 feet
Taxiway Design Group (TDG)	1-A	1-A	1-A	1-A
Taxiway and Taxilane Width	25 feet	25 feet	25 feet	25 feet
Taxiway and Taxilane Safety Area	49 feet	79 feet	79 feet	79 feet
Taxiway Object Free Area	89 feet	131 feet	131 feet	131 feet
Taxilane Object Free Area	60-79 feet	79 feet	79 feet	79 feet
Taxiway and Taxilane Separation	N/A	105 feet	105 feet	105 feet
Taxiway and Taxilane Lighting	None	None	MITL/ Reflectors	MITL/ Reflectors

Note: RED indicates a known deficiency to existing minimum design standards
**Not required for ADG-II runways, **Recommended for runways with regular jet traffic, ***Separation is recommended at 300' for B-II aircraft to allow sufficient space for an aircraft to turn from the parallel taxiway and stop at the hold line without either being turned at an angle or blocking the taxiway behind the aircraft.*
Source: FAA AC 150/5300-13A – Change 1, Airport Design, KLJ Analysis

Table 4-21 – Runway 18-36 Data Table

Design Standard	Actual Condition	Facility Requirement or Recommendation	
		Existing/Future	Ultimate
Runway Identification	18-36	18-36	18-36
Runway Classification	Utility	Utility	Utility
Aircraft Classification	Small Aircraft	Small Aircraft	Small Aircraft
Runway Design Code (RDC)	A or B/I/VIS	A or B/I/VIS	A or B/I/VIS
Pavement Surface Type	Turf	Turf	Turf
Line of Sight Requirements Met	Yes	Yes	Yes
Percent Wind Coverage (per RDC)	82.16%	82.16%	82.16%
Runway Length	1,980 feet	1,980 feet	1,980 feet
Runway Width	100 feet	60 feet (Turf)[2]	60 feet (Turf)[2]
Displaced Threshold	0 feet	0 feet	0 feet
Runway Safety Area (RSA) Width	120 feet	120 feet	120 feet
RSA Length Past Departure End	35-120 feet	240 feet	240 feet
RSA Length Prior to Threshold	35-120 feet	240 feet	240 feet
Runway Lighting Type	None/Cones	None/Cones	None/Cones
Approach RPZ Start from Runway	Road in RPZ (18,36)	200 feet	200 feet
Approach RPZ Length		1,000 feet	1,000 feet
Approach RPZ Inner Width		250 feet	250 feet
Approach RPZ Outer Width		450 feet	450 feet
Departure RPZ Start from Runway	Road in RPZ (18,36)	200 feet	200 feet
Departure RPZ Length		1,000 feet	1,000 feet
Departure RPZ Inner Width		250 feet	250 feet
Departure RPZ Outer Width		450 feet	450 feet
Runway Marking Type	None	None	None
14 CFR Part 77 Approach Category	20:1	20:1	20:1
Approach Type	Visual	Visual	Visual
ROFA Width	250 feet	250 feet	250 feet
ROFA Length Past Departure End	100-240 feet	240 feet	240 feet
ROFA Length Prior to Threshold	240 feet	240 feet	240 feet
ROFZ Length Past Runway	100-200 feet	200 feet	200 feet
ROFZ Width	250 feet	250 feet	250 feet
Threshold Siting Surface (TSS) Type	2	2	2
Visual and Instrument NAVAIDs	None	None	None
Runway and Taxiway Separation	N/A	150 feet	150 feet
Runway and Parking Separation	310 feet	125 feet	125 feet
Runway and Hold Line Separation	125 feet	125 feet	125 feet

Note: RED indicates a known deficiency to existing minimum design standards
Source: FAA AC 150/5300-13A – Change 1, Airport Design, KLJ Analysis

[2] Airport Sponsor and local pilots prefer turf runway width of 100 feet.

General Aviation

Background

General Aviation (GA) includes all civil aviation activities except for commercial service. Providing necessary facilities and access for general aviation users at Wall will continue to be important for the vitality of the Wall community. Based aircraft is projected to grow by 16 percent with operations growing by 12 percent through PAL 4. Facilities should be planned to provide flexibility for growth including a Specialized Aviation Service Operator (SASO) business providing aeronautical services from Wall. General aviation facilities evaluated in this section include aircraft storage hangars, aircraft parking apron and arrival/departure 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 Great Plains 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 at Wall are stored in aircraft storage hangars. 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 Wall based aircraft forecasts estimate up to 14 based aircraft through the planning period (PAL 4) consisting of single-engine aircraft. It important to note that single-engine aircraft are typically Group I design codes but about 30% of these single-engine aircraft at Wall are Aerial Applicators and are Group II design codes.

BASED AIRCRAFT

All existing based aircraft are currently stored in approximately 23,570 SF of hangar space using a variety of conventional hangars. Areas available for hangar development do exist but will require taxilane/apron improvements to be ready for hangar construction.

In an effort to quantify estimated future hangar space needs, assumptions were made on aircraft type and the space required to house each type. The assumptions for hangar size are as follows:

- Single-Engine Piston & Turbine/Other: (1,950 SF)
- Multi-Engine/Turboprop: (2,250 SF)
- Turbojet: (3,575 SF)
- Helicopter: (2,025 SF)
- Additional 15 percent for general aeronautical storage and supplies

Using these assumptions with based aircraft forecasts, a projected need for based aircraft storage is determined. Results are summarized in **Table 4-22**. The assumptions above do not consider the existing aircraft hangar storage size, but rather a recommended size based on typical aircraft size in each category and includes contingency space for maneuverability and tool/equipment storage in the hangar as well. Based on 2015 based aircraft numbers, there is an estimated 2,143 SF of hangar space per based aircraft currently.

Table 4-22 – Based Aircraft Storage Requirements

Category	*Existing*	Base	PAL 1	PAL 2	PAL 3	PAL 4
Based Aircraft Storage Space (SF)						
Single-Engine Piston	-	23,400	23,400	25,400	25,200	27,300
Multi-Engine/Turboprop	-	-	-	-	-	-
Turbojet	-	-	-	-	-	-
Helicopter	-	-	-	-	-	-
Maintenance/Storage	-	3,500	3,500	3,800	3,800	4,100
Aircraft Storage Space	***23,570***	**26,900**	**26,900**	**29,200**	**31,400**	**31,400**
Capacity/Deficiency	-	***(3,330)***	***(3,330)***	***(5,630)***	***(5,630)***	***(7,830)***

Source: KLJ Analysis

Based on the assumptions above there is an existing deficiency in available hangar space at Wall. The most notable area is for maintenance/storage space which most individuals at the airport accommodate within their existing hangar space. There is not a hangar area otherwise dedicated for maintenance. Please also note that there are currently two older hangars that should be removed during the planning period accounting for a total of 3,040 sf. Including the hangars to be removed, between PAL 1 and PAL 4, over 10,000 SF of additional hangar space should be planned in order to accommodate the anticipated based aircraft demand. This is a 33 percent increase of hangar space expected through PAL 4. Please note the majority of this new space is recommended to be developed based on actual demand and not prior to a tenant being secured.

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.

There is no specific individual or company that handles storing of transient aircraft at Wall and no hangar area dedicated to this type of transient need.

It is recommended the airport consider a conventional hangar for transient space. The needs at Wall are for intermittent transient aircraft serving the businesses in Wall and for tourist activity in the area. The addition of a conventional hangar at the airport should be weighed with the other priorities and resources available to the community. **Table 4-23** summarizes the transient aircraft storage space needs anticipated within the planning period which is for single and multi-engine aircraft.

Table 4-23 – Transient Aircraft Storage Requirements

Category	*Existing*	Base	PAL 1	PAL 2	PAL 3	PAL 4
Transient Aircraft Storage Space (SF)						
Conventional Hangar	***0***	**4,425**	**4,425**	**4,425**	**4,425**	**8,000**
Capacity/Deficiency	-	***(4,425)***	***(4,425)***	***(4,425)***	***(4,425)***	***(8,000)***

Source: KLJ Analysis

Aircraft Parking Apron

GA aircraft parking is utilized by transient or based aircraft. With all the based aircraft at Wall stored in hangars, the aircraft parking necessary is for transient aircraft requiring parking for a few minutes to a few days. Itinerant aircraft will require either covered aircraft storage (based or transient) or apron parking space.

AIRCRAFT DEMAND

The apron size is driven by the number and size of maneuvering and parked aircraft. The purpose of this analysis is to determine the triggering point for additional general aviation apron space using the aviation activity demand forecasts. Assumptions include:

- Use of annual itinerant operations fleet mix based on the aviation forecasts.
- Average busy day (0.592 percent of annual operations), assumes larger itinerant aircraft operate on a non-peaking schedule year-round.
- 25 percent of small single-engine, multi-engine, helicopter and other aircraft types will require apron space at the same time upon arrival.
- 50 percent of turboprop and turbojet landings will require apron space at the same time upon arrival.
- Remainder of arriving aircraft will require a transient or based aircraft hangar for staging.

Apron size is driven by the size of the design airplane and size of the aircraft parking positions required. A standard tie-down position accommodates one small aircraft. Larger aircraft occupy additional space and can be accommodated with a nested tie-down configuration. The following factors are used according to ACRP Report 113, *Guidebook on General Aviation Facility Planning*:

- Single-Engine: 1.10[3]
- Multi-Engine/Other: 1.00
- Helicopter: 2.00
- Large Multi-Engine/Turboprop: 2.50
- Turbojet: 3.00

The apron requires the capacity to accommodate the based aerial applicators and accommodate other itinerant activity. The expected number of aircraft through the planning period and equivalent tie-down positions is summarized in **Table 4-24**.

Table 4-24 – Aircraft Parking Requirements

Category	*Existing*	Base	PAL 1	PAL 2	PAL 3	PAL 4
Aircraft Parking Positions						
Itinerant Operations	-	1,707	1,780	1,839	1,895	1,954
Average Busy Day Arrivals	-	14	14	15	15	16
Total Parked Aircraft	-	3.8	3.9	4.1	4.2	4.4
Equivalent Tie-Downs	***5***	**7**	**7**	**7**	**7**	**7**
Capacity/Deficiency	**-**	**2**	**2**	**2**	**2**	**2**

Source: KLJ Analysis

SIZE & CONFIGURATION

Apron size must accommodate both the required aircraft parking positions and maneuvering standards based on FAA Airplane Design Group (ADG) standards. Aircraft maneuvering at Wall is required to accommodate safety setbacks for FAA ADG-II wingspan aircraft for the apron area. The apron does not meet the respective setback requirements as outlined in AC 150/5300-13A, Change 1.

The effective existing apron sizes were reviewed. The usable apron size has been adjusted to 3,700 SY to account for the entry/exit for conventional hangars.

[3] The ACRP Report recommends 1.00 factor for Single Engine but for Wall this was adjusted to 1.10 since 30% of the single engine activity at Wall is with Aerial Applicators which are Aircraft Design Group II and therefore much wider than most single engine aircraft.

The apron layout may need to be changed as the taxiway entry point changes. There is currently a single-entry point to the apron on the southeast edge of the apron at the center. If a parallel taxiway is constructed for Runway 12-30, the taxilane will be on the southwestern edge of the apron and extend the full length of the apron. Aircraft tie-down layouts may vary then from a tail southwest arrangement to a tail southeast arrangement.

The apron space calculations in **Table 4-25** are based on equivalent tie-down configuration. Based on this assessment, the existing apron will need to be expanded within the planning period.

Table 4-25 – Transient Apron Size Requirements

Category	*Existing*	Base	PAL 1	PAL 2	PAL 3	PAL 4
Apron Area (SY)						
Equivalent Tie-Downs	*5*	7	7	7	7	7
Transient Apron Area	*3,700*	4,620	4,620	4,620	4,620	4,620
Capacity/Deficiency	-	**980**	**980**	**980**	**980**	**980**

Source: KLJ Analysis

PAVEMENT CONDITION & STRENGTH

In general, pavement maintenance is conducted through the state maintenance programs sponsored by the South Dakota Department of Transportation's Office of Air, Rail & Transit. Major rehabilitation/reconstruction is completed by general contractors. The apron and taxilane pavement at Wall is in generally good shape but does not have substantial strength. The pavement was originally installed as a double chip-seal in 1986 followed by a 2.25" overlay in 1993 and a rejuvenator in 2001. A surface treatment was also done in 2016. Major maintenance of the pavement areas will be factored into the Implementation Plan in Chapter 6.

GA Terminal Building

The size of the GA terminal building is based on the number of passengers and types of services. Although additional facilities can be provided, at a minimum the terminal building serving general aviation needs should include the following services:

- Passenger Waiting Area
- Restrooms
- Vending
- Pilots Lounge/Flight Planning
- Mechanical room
- Storage Room
- Circulation

The terminal building should be located adjacent to the transient aircraft parking apron with good visibility to the airfield, and also be in close approximately to the automobile parking and waiting area. In most cases the terminal building is located within or in close proximity to a Fixed Base Operator (FBO) providing aeronautical services. The terminal area at Wall was constructed in 2012 as a part of a Snow Removal Equipment/Terminal facility. It is estimated there is 550 SF of terminal space usable for passengers.

The estimated planning-level size of the 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 GA terminal. Calculations are summarized in **Table 4-26**.

Table 4-26 – GA Terminal Building Size Requirements

Category	*Existing*	Base	PAL 1	PAL 2	PAL 3	PAL 4
GA Terminal Building Size (SF)						
Peak Hour GA Operations	-	2.8	2.9	2.9	3.0	3.1
Number of Passengers	-	7.0	7.2	7.2	7.5	7.7
Total Building Size	*550*	**700**	**720**	**720**	**750**	**770**
Capacity/Deficiency	**-**	***150***	***170***	***170***	***200***	***220***

Source: KLJ Analysis

The existing terminal is located inside the Snow Removal Equipment building and is slightly smaller than what is needed to meet the existing and projected GA itinerant passenger needs.

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 a primary access road. To achieve this, access points should be secured to the apron, hangar area and any field access points to reduce undesired automobile access. The number of hangar access points should be limited to reduce the possibility of vehicle/aircraft incidents which improves safety. Fuel delivery trucks should have access to tanks without entering airside operations areas. Access roads should be paved to reduce the likelihood of foreign object debris (FOD) on the airside areas where it may become a hazard to aircraft.

The public airport access is provided via a gravel road from Airport Road. This road should be paved at some point with strength sufficient for fuel tankers and plow trucks. The alignment of the access road should continue to provide public access to each building and airside entry points. A pedestrian entry point should be added off of this airport road to get to Hangars 3 and 4 on the airfield in addition to the Terminal (Building 6) and Hangar 5 which currently have pedestrian access.

Apron access is just east of the Terminal (Building 6) with a gate.

It is important to point out that the location of the fences and pedestrian gates should provide the ability to get into each hangar and the terminal without having to enter the airfield perimeter fence. In this manner the buildings become a part of the perimeter fence and a person can enter the building on the landside as a public entry point and on the airside as a secured entry point with the building itself serving as the gateway.

An unpaved road provides driving access to a well-house adjacent to the threshold of Runway 18. There is no fencing on the north side of the airfield to restrict access by vehicles, pedestrians or livestock. This roadway is addressed as it relates to the safety areas around Runway 18-36.

AUTOMOBILE PARKING

Automobile parking at general aviation airports should accommodate landside access needed to serve aeronautical facilities. Facilities requiring automobile parking include the arrival/departure 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.

All parking at Wall is in unpaved areas adjacent to the Terminal (Building 6) and hangar 5. Access to the east hangars (1, 2, 3 and 4) at the airport is from a gravel parking lot off of Airport Road. Persons walk from the parking lot must cross the grass and hangar aprons to get to each hangar. This access is not currently secured, but fences and gates are in place to not allow livestock onto the airport. Paving the parking areas when the road is paved would be helpful and parking should be added from the airport access road to hangars 3 and 4.

Public Transportation

There is little local demand for public transportation for users of Wall. There is also not a courtesy car provided. Because the airport is so close to downtown, many pilots and passengers will walk down the street to visit downtown and walk back to the airport. Pilots and passengers that fly into the airport would have interest in visiting the Badlands and the Minuteman Missile National Monument but using a courtesy car for these long trips would not be feasible.

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

Wall Municipal Airport is owned and operated by the City of Wall. Airport administration is by city staff and volunteers located off-airport. This arrangement is expected to continue and be sufficient. No manager's office is located in the terminal building and is not expected to be needed.

Airport Maintenance & Snow Removal

The City of Wall has a snow removal equipment building at the airport to store the airports one articulating tractor. The equipment is used in a limited fashion to control snow but primarily the City will plow snow at the airport with trucks from the City after roads are completed.

Snow and ice control equipment typically required includes a carrier vehicle (i.e. dump truck or tractor), snow plows, spreaders, sweepers, and blowers. 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 continue to 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.

In regards to snow removal equipment, the New Holland 5070 Tractor does not have sufficient PTO capacity (rated at 96 hp) to drive the Snocrete 954A Blower (requiring 175-275 hp). Because of runway lighting and signs, a snow blower is an essential element for snow removal at airports even with only a few inches of accumulation. The airport should look at either changing the blower or changing the tractor to achieve a workable unit. It is also recommended the airport look at the other needs such as a front mounted snow blade and consider whether the PTO mounted broom is necessary.

Fueling Facilities

The City of Wall does not own any fuel storage at the airport. All tanks at the airport are privately owned and operated with no fuel dispensed for the general public. Fuel stored at the airport does include 100 octane low lead (AVGAS) and jet fuel (JET-A). All tanks at the airport are above ground tanks.

Fuel at any airport is an important service that should be available for transient aircraft. The availability of fuel is a primary factor that a pilot must consider when planning where to fly. With no

publicly available fuel this limits transient activity. **A public self-fueling facility is recommended to be installed within the planning period.** Locations for a facility will be identified in **Chapter 5: Alternatives Analysis**.

Fencing, Security & Wildlife

Security is an important consideration when operating a safe airport. Transportation Security Administration (TSA) published a *Security Guidelines for General Aviation Airports* document in 2004 providing recommended airport design guidelines.

Using the TSA's Airport Characteristics Measurement Tool, Wall received a score of 8 out of 55 indicating a lower security risk. A score between 0 and 14 indicates Wall has a lower security risk using location, based aircraft, runways and operations. TSA suggested security enhancements include signs, documented security procedures, positive passenger/cargo/baggage identification, aircraft security, community watch program and contact list.

The first line of security protection infrastructure is a perimeter fence. Perimeter fencing is not a requirement for non-certificated airports such as Wall. Its installation would help prevent unauthorized persons from entering the airfield. A minimum 6-foot high fence topped with barbed wire is generally recommended at a minimum for security. Airfield access points should be minimized, however those that are needed should be controlled. Ideally, automated controlled access gates would be installed at the apron and hangar area. Locked field gates would be installed at other airfield access points.

Controlling wildlife on or near the airport helps mitigate existing and prevent the creation of potential new hazards to aircraft. The airport can take steps to help increase safety of the airfield first through completion of a Wildlife Hazard Assessment. The assessment will determine the need for measures such as a wildlife fence which would be a minimum of 10-feet high. This assessment and project is eligible for FAA funds to discourage unauthorized access to the airfield by people, vehicle or wildlife.

Utilities

The airport is not currently connected to public water, sanitary sewer or natural gas utilities. The City of Wall provides water. Sanitary sewer is provided through septic tanks and/or with leach fields near the buildings. Heating is provided by electricity, propane tanks or geothermal. No changes are recommended or foreseen to be needed within the planning period.

Other

Other Aeronautical/Non-Aeronautical Development

Other aeronautical development includes aviation-related businesses. Examples include aircraft maintenance, repair and overhaul (MRO) facilities or other businesses that require direct access to the airfield. Considerations for developing property for these uses include adequate airfield access, parcel size, landside roadway access/parking and utilities. This type of development should be protected if sufficient available land exists. Wall does not currently anticipate demand for any facilities like this within the planning period.

There are no specific recommendations for non-aeronautical use in this Master Plan, however the airport should continue to explore and market opportunities in areas not needed for aeronautical use. Non-aeronautical development areas must be shown on the ALP and approved by FAA.

Deficiencies to Design Standards

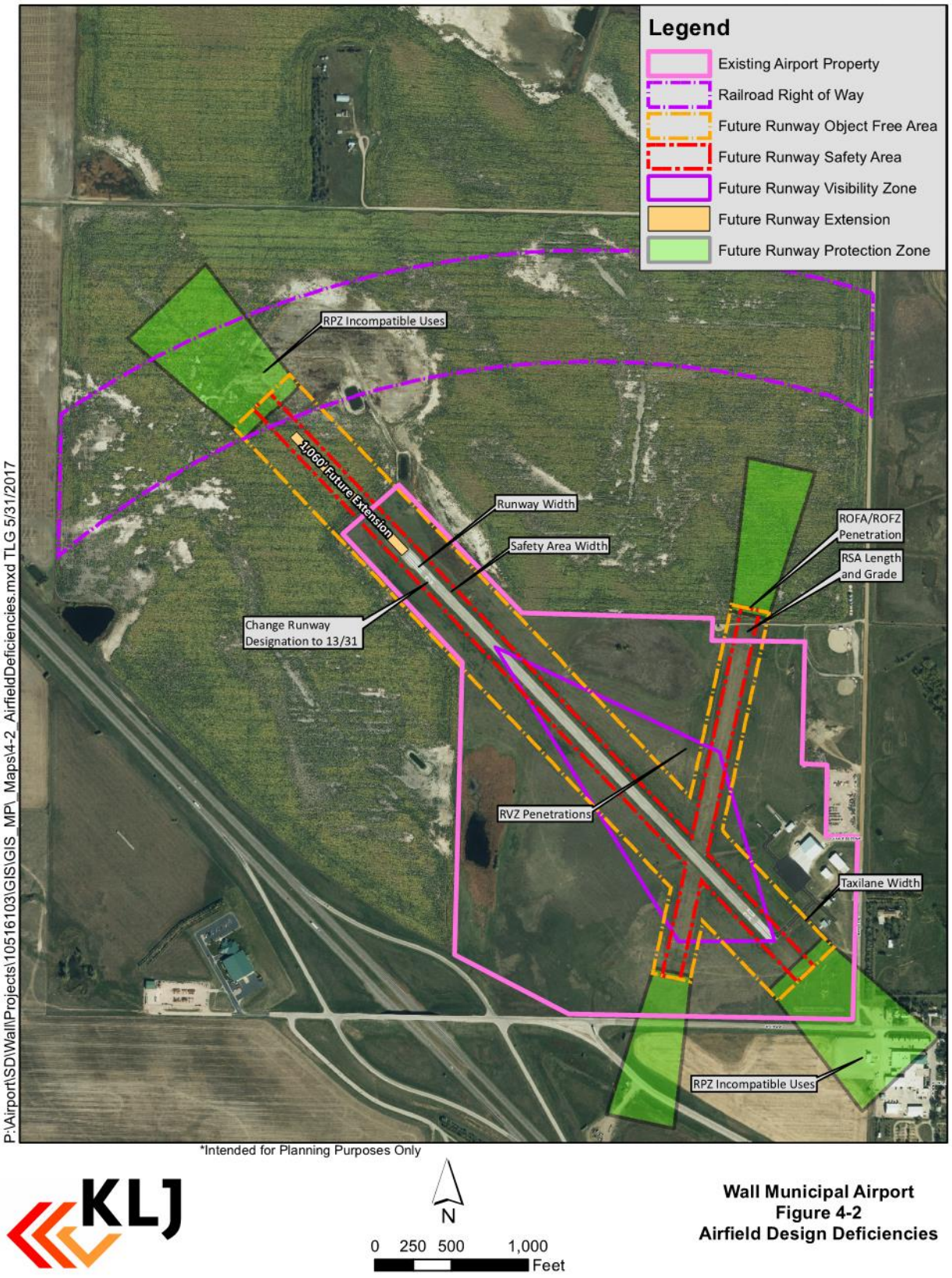
Deficiencies to the existing airfield design standards include:

- **Runway 12-30 Width**
  Deficiency: The runway pavement width is 60 where ADG-II requires a width of 75 feet.
- **Runway 12-30 Safety Area Grading (Terrain)**
  Deficiency: RSA width and grade appears to be out of tolerance at multiple points along north edge of the runway. The area must be clear, graded to the proper slope, and free of objects.
- **Runway 18-36 Object Free Area Penetrations (Terrain, Road, Fence)**
  Deficiency: A road, fence and terrain appear to penetrate the ROFA on Runway 18 end. Above-ground objects protruding above the nearest point of the RSA should be cleared.
- **Runway 18-36 Safety Area Grade (Terrain, Road)**
  Deficiency: RSA grade appears to be out of tolerance on Runway 18 and 36 end. Unpaved vehicle road to well-house runs through RSA. The area must be clear and graded, and free of objects.
- **Runway 18-36 Obstacle Free Zone Penetrations (Terrain, Road, Fence)**
  Deficiency: A road, fence and terrain appear to penetrate the ROFZ on Runway 18 end. Objects, including aircraft and vehicles, must be kept clear of the ROFZ during aircraft operations.
- **Runway Visibility Zone**
  Deficiency: Terrain penetrates the existing RVZ and disrupts line of sight between runways.
- **Taxiway Object Free Area**
  Deficiency: The taxiway object free area is preserved for ADG-I (89 feet) where the ADG-II standards (131 feet) need to be met.
- **Taxilane Width**
  Deficiency: The taxilanes in front of hangars #1 and #2 are 20 feet in pavement width where 25 feet is required.
- **Runway 12-30 Designation**
  Deficiency: The existing magnetic bearing is 128.03°/308.04° moving towards 130.03°/310.04°durig the planning period. Runway designation should change to Runway 13-31.
- **Runway Protection Zone**
  Deficiency: Current RPZ is grandfathered. Changes in the approach will require RPZ's to meet the new standard which will result in incompatible uses in the RPZ.

Any existing deficiencies to airport design standards would need to be noted in the ALP and a Modification to Design Standards requested from FAA if they are to remain.

Exhibit 4-1 depicts the airfield design standards, deficiencies, and key facility needs to meet the future layout demands.

Exhibit 4-1 – Airfield Deficiencies



Summary

This chapter identifies safety, capacity and development needs for the Wall Municipal Airport based on forecasted activity levels. These recommendations provide the basis for formulating development alternatives in **Chapter 5: Alternatives Analysis** to adequate address recommended improvements. The following list summarizes the facility recommendations. **Figure 4-1** graphically depicts key facility needs.

Airside Facilities

- Overall critical design aircraft is expected to evolve from an ARC A-II (Small), TDG-1A airplane to an ARC B-II, TDG-1A airplane in the future.
- Recommended long-term primary Runway 12/30 length is 4,700 feet with a pavement strength of 16,000 pounds (ACN: 8/F/D/X/T) to accommodate B-II aircraft (Air Tractor 802).
- Recommended long-term crosswind Runway 18/36 length remain at 1,980 feet.
- Instrument Approach procedures are recommended to be explored for Runway 12 and 30, to increase airport utility.
- To improve operational flow and reduce runway occupancy time, installing a turn-around taxiway at Runway 12 end is recommended.
- Grade Runway 18-36 Safety Area to meet grade and dimensions
- Remove obstacles from Runway 18-36 ROFA and ROFZ.
- Address incompatible land uses within the Runway 30 RPZ. A detailed RPZ analysis is being completed as a part of this Master Plan.

General Aviation Facilities

- An additional 10,000 square feet of aircraft storage space (24 percent) should be planned to meet PAL 4 forecasted based aircraft and fleet mix demand.
- Demand for transient aircraft storage is expected to increase to 8,000 square feet to by PAL 4.
- Apron space is expected to expand by 980 square yards to accommodate parked aircraft demand through PAL 4.

Landside Facilities

- Pave Airport entry road and add paved parking for Hangars 3, 4, 5 and the Terminal.
- Install perimeter fencing in the hangar area.

Support & Other Facilities

- Self-Fueling Tanks are recommended.
- Wildlife Hazard Assessment is recommended.
- The airfield electrical system should be converted to medium intensity with equipment moved into the vault and a new beacon installed.

CHAPTER 5: ALTERNATIVES ANALYSIS

Introduction

This chapter of the Airport Master Plan discusses airport development alternatives considered in the planning process for the Wall Municipal Airport (6V4). The objective of this chapter is to clearly document the recommended airport development that meets the needs of airport users as well as the strategic vision of the City of Wall.

Alternatives evaluated for this study are based on demand factors and facility needs identified in previous study chapters. Alternatives to accommodate airport demands are identified and evaluated for impacts. Alternatives presented in this chapter also have flexibility to react to unforeseen future conditions. Key evaluation criteria is used to analyze potential impacts of each alternative in order to aid the airport in selecting a preferred alternative(s).

Airfield alternatives are the main functional facility elements that were analyzed first. Airfield elements in the study include Primary Runway 12-30, Crosswind Runway 18-36, and ultimate taxiways for the runways. One important note is that the airfield alternatives were primarily dependent on a Runway Protection Zone (RPZ) Analysis completed for Runway 30. The RPZ Analysis covered 8 different alternatives for Runway 12-30 and is detailed in **Appendix H – RPZ Analysis**. The Airfield alternatives section in this chapter will only provide an overview of the RPZ Analysis and the selected alternative. The remainder of this chapter will cover Terminal alternatives that were evaluated after the airfield alternatives. The terminal alternatives focus on taxilanes, aprons, hangar development, and other facilities.

A Preferred Development Strategy based on the selected alternative(s) is summarized at the conclusion of the analysis. 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 Plan**.

Background

The overall guiding principle is to plan an airport facility that adequately serves aviation users, community needs and is flexible to industry changes. Airport development at 6V4 is primarily driven by the need to accommodate on-demand aircraft operations in support of local businesses. These aircraft types will require access to the airport in increasingly larger and faster aircraft types. Additional hangar development space is also needed for future based aircraft. Alternatives must meet FAA design criteria and be implementable with the existing infrastructure and environment.

Each functional area of the airport has specific needs and constraints that affect the formulation of realistic, implementable development options. The most significant facility planning needs and assumptions are summarized in the following table based on Planning Activity Levels (PAL).

Table 5-1 – Facility Needs & Assumptions

Facility Element	Planning Needs & Assumptions
Primary Runway & Taxiway Design	• Runway length of 4,430 feet by PAL 1 • ARC A/B-II/Large Aircraft FAA design standards by PAL 1 • Non-precision instrument approach (1-mile visibility) by PAL 2 • Ultimate configuration with full parallel taxiway
Crosswind Runway Design	• Visual approaches to turf crosswind runway • Turf runway length from 1,980 feet to 2,000 feet • ARC A/B-I FAA design standards
Runway Protection Zone (RPZ)	• Acquire land within the RPZ • Avoid introducing incompatible land uses into RPZs (i.e. roads, structures)
FAA Airspace Standards	• Clear FAR Part 77 Primary and Approach surfaces • Mitigate remaining FAR Part 77 airspace obstructions • Avoid new airspace obstructions to FAA Departure Surface (40:1 slope)
Terminal/Apron/Hangar Area	• ADG-II, TDG-2 FAA design standards for most demanding aircraft • ADG-I aircraft tie-downs • Remove hangar(s) to allow runway and taxiway construction • Pave existing hangar turf taxilanes • Parking for itinerant helicopter • Development space for Group I and II hangars for storage • Development space for Group II hangars for SASO/FBO use
Support/Landside Facilities	• Self-Fueling area for Aviation Gasoline fuel facilities • Paved access road(s) with controlled access gate(s) • Perimeter wildlife fence

Source: KLJ Analysis

Alternatives 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 identify a recommended development plan. The process includes these steps:

1. **Identify** the functional airport elements that will 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. Include a "no action" alternative for comparative purposes.

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 final results.

3. **Select** preferred alternative(s) that best meet the needs of the airport based on the benefits and impacts. The primary alternative should be 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 will discuss the alternatives evaluation process for 6V4. The preferred alternative(s) are shaded in green in this report. Functional development phases are identified by Planning Activity Levels (PAL). All costs are planning-level non-engineering estimates in 2018 dollars.

Review & Approval

The alternatives evaluation process is the most a collaborative portion of the master plan study. The alternatives were reviewed and refined through meetings with agency representatives and the study's Master Plan Advisory Committee (MPAC). The preferred alternative was selected by the MPAC on May 1, 2018 and presented to the general public for review and comment at a public open house held on June 28, 2018. The recommended alternative was presented and approved by the City of Wall on September 19, 2018.

Evaluation Criteria

Evaluation criteria is developed to determine the relative strength and weaknesses of the alternatives. FAA Advisory Circular (AC) 150/5070-6B, *Airport Master Plans* identifies criteria that would be examined in any alternatives evaluation. Using this guidance and local considerations, airport-specific criteria has been formulated. 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 include:

- **Capacity** to meet forecasted activity demands within and beyond the planning horizon
- **Capability** to meet FAA design standards to safely accommodate the critical design aircraft
- **Efficiency** to accommodate alternative elements as a combined airport system

Best Planning Tenets and Other Factors

This factor involves determining the relative strengths and weaknesses of the alternatives. The following tenants are typically reviewed:

- 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 appropriate local, regional and state transportation and other plans
- Technically feasible, constructible and implementable
- Socially and politically feasible
- Satisfies airport user needs

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 are likely trigger impacts to comply with the National Environmental Policy Act (NEPA), or if additional alternatives need to be considered. The following environmental resource categories applicable to this study include:

- Biological Resources
- Department of Transportation Section 4(f)
- Farmlands

- Floodplains
- Hazardous Materials, Pollution Prevention, and Solid Waste
- Historical and Cultural Resources
- Land Use
- Noise and Noise Compatible Land Use
- Socioeconomic Impacts and Environmental Justice
- Surface and Ground Water
- Wetlands

Fiscal Factors

A fiscal analysis is necessary to determine if the alternative fits within the financial resources of the airport. Preparing rough 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
- Ability to Fund Local Share

Primary Runway 12-30 & Taxiway

Options

Since the primary element of consideration for Runway 12-30 was related to the RPZ Analysis, a summary of the main alternatives and selected alternative are provided as follows. The complete analysis and all alternatives considered can be found in **Appendix H – RPZ Analysis**.

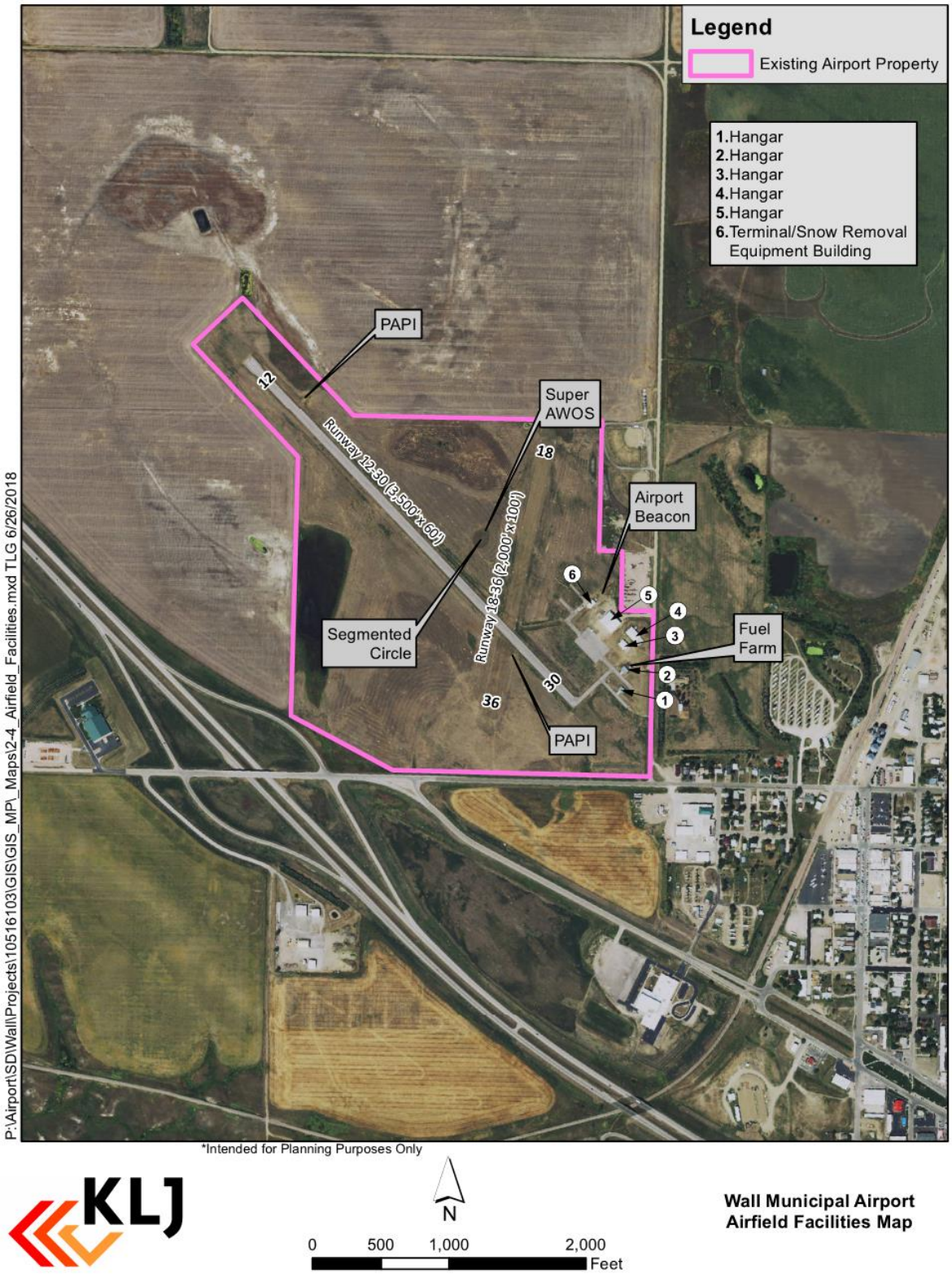
- No Build – continue to use existing 3,500’ x 60’ Runway 12-30
- Option 1 – Extend and Expand Runway 12-30 to 4280’ x 75’ (4,280’ landing)
- Option 2 – New Runway 12-30 at 4,150’ x 75’ constructed west of existing runway
- Option 4 – Extend and Expand Runway 12-30 to 4,430’ x 75’ (3,900’ landing)
- Option 6 – Extend and Expand Runway 12-30 to 4,430’ x 75’ (3,500’ landing)

Existing airfield baseline conditions are shown in **Exhibit 5-1**.

No Build

The “No Build” option alternative would keep Runway 12-30 in its existing configuration. The runway dimensions would remain at 3,500’ x 60’. This configuration would continue to meet ARC B-I/Small Aircraft standards with aircraft weights up to 12,500 pounds. The approaches would remain visual only. The RPZ for Runway 30 would continue to include 230 linear feet of Airport Road, 540 linear feet of 4th Avenue, the Evangelical Free Church, 8 above ground fuel tanks, and 20,000 sf of the Golden West Communications offices and warehouse. None of the additional airside needs would be met.

Exhibit 5-1 – Existing Conditions Airfield



Option 1 - Extend Runway 12 and No Change to Runway 30

Airfield Construction

- Construct 780 foot runway extension northwest of Runway 12 existing threshold
- Runway 75' x 4280'

Uses Inside the Runway 30 RPZ

- 400 feet of Airport Road and 930 feet of 4th Avenue
- Evangelical Free Church (approximately 2,500 square feet) and gravel parking lot
- Two complete single family homes
- 10% of one single family home
- Eight above ground fuel tanks
- 20,000 square feet of Golden West Communications offices and parking

Off Airport Construction

- None

Estimated Cost – Total = $4.25 m

- Reconstruct and Extend Runway 12 (40.7 acres -- 27.5 fee & 13.2 easement)
- Runway 30 (2 acres easement)

Advantages:

- No loss of runway length
- No cost to make changes
- No change in Runway 12 departure surface and therefore no impact to airport hangars

Disadvantages:

- All incompatible uses stay inside the expanded RPZ

Option 2 - Relocate Runway 12-30 300' to the Southwest

Airfield Construction

- Relocate Runway 12-30 300 feet southwest of the existing runway
- Existing Runway 12-30 becomes a 35' full parallel taxiway (ultimate only)
- Runway 75' x 4150'

Uses Inside the Runway 30 RPZ

- 30 feet of Airport Road and 860 feet of 4th Avenue

Off Airport Construction

- None

Estimated Cost – Total = $9.15 m

- New Runway 12-30 (59.2 acres -- 45.7 fee & 13.5 easement)
- Converting old runway into a partial parallel taxiway would be an additional $1.6 m

Advantages:

- Current Runway 12-30 becomes a full parallel taxiway
- Runway 12 departure surface moves 300 feet southwest and minimal impact to airport hangars
- Only 4th Avenue remains inside RPZ

Disadvantages:

- Wetlands southwest of current Runway
- Substantial fill work will be needed to bring ground elevation up to current runway and crosswind elevation
- Cultural area impacted on Runway 12 end

Option 4 - Displace Runway 30 Landing Threshold 380' Northwest

Airfield Construction

- Construct 780 foot runway extension northwest of Runway 12 existing threshold
- Displace Runway 30 landing threshold 380 feet northwest
- Extend Runway 30 threshold 150 feet southeast
- Runway 75' x 4430' with 530' displacement

Uses Inside the Runway 30 RPZ

- No incompatible land uses except for 450 feet of Airport Road, 460 feet of 4th Avenue, and 400 sq. yards of gravel Church parking lot

Off Airport Construction

- None

Estimated Cost – Total = $4.59 m

- Reconstruct and Extend Runway 12 (40.7 acres -- 27.5 fee & 13.2 easement)
- Extend and Displace Runway 30

Advantages:

- No buildings inside the RPZ
- Takeoff length of 4430' is available
- Landing length is 3900'

Disadvantages:

- Change in Runway 12 Departure Surface affects 3 hangars at the airport and development areas to the east
- Two roads and a Church parking lot remain in the RPZ

Option 6 - Displace Runway 30 Threshold 780' Northwest

Airfield Construction

- Construct 780 foot runway extension northwest of Runway 12 existing threshold
- Displace Runway 30 landing threshold 780 feet northwest
- Extend Runway 30 threshold 150 feet southeast
- Runway 75' x 4430' with 930' displacement

Uses Inside the Runway 30 RPZ

- No incompatible land uses

Off Airport Construction

- None

Estimated Cost – Total = $4.44 m

- Reconstruct and Extend Runway 12 (40.7 acres -- 27.5 fee & 13.2 easement)
- Extend and Displace Runway 30

Advantages:

- No incompatible land uses inside RPZ, including roads
- Takeoff length of 4430' available for Runway 30

Disadvantages:

- Change in Runway 12 Departure Surface affects all 5 hangars at the airport and development areas to the east
- Only 3500' available for takeoff on Runway 12
- Only 3500' available for landing on Runway 30

Exhibit 5-2 – RPZ Options 1 and 2

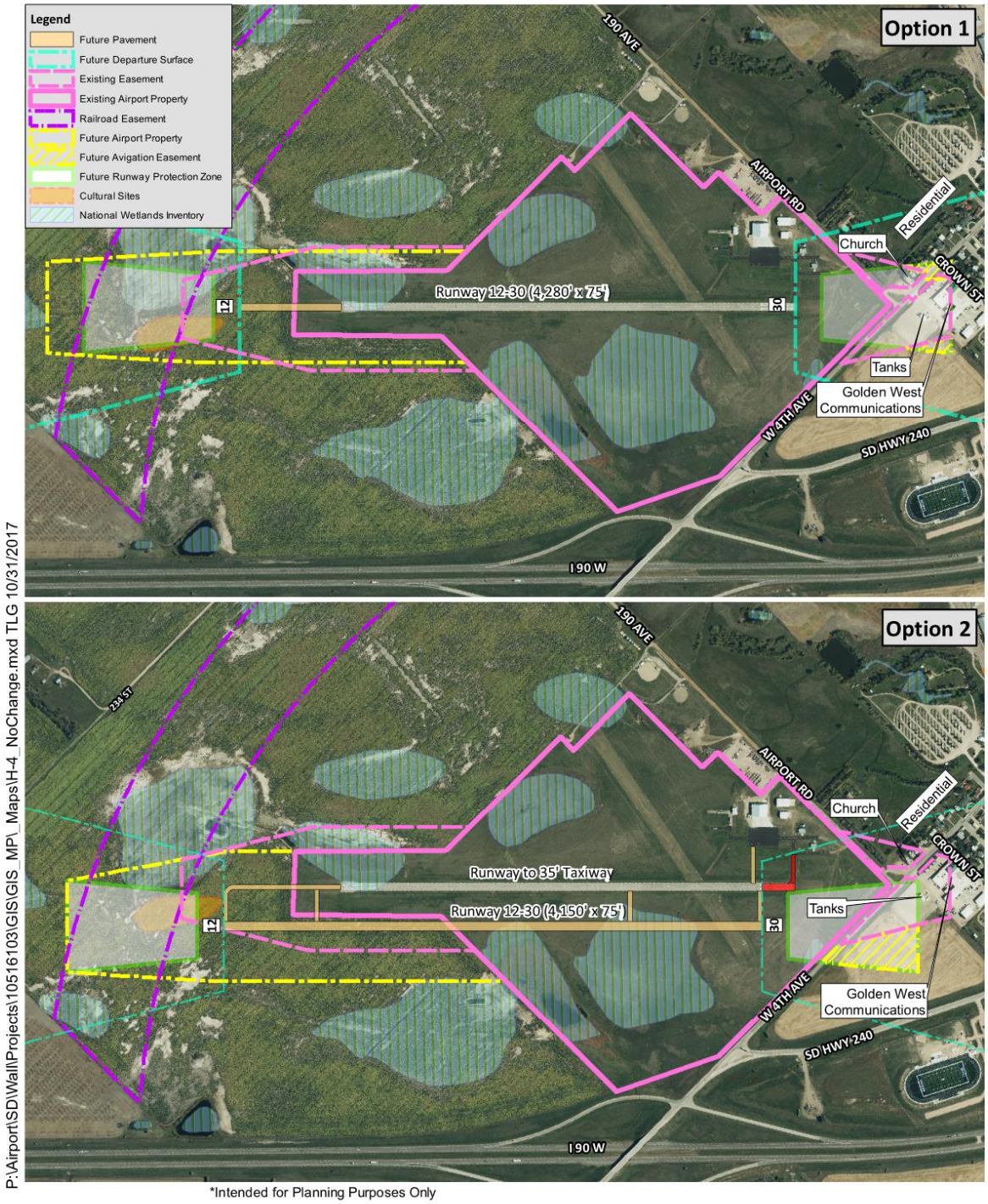


Exhibit 5-3 – RPZ Options 4 and 6

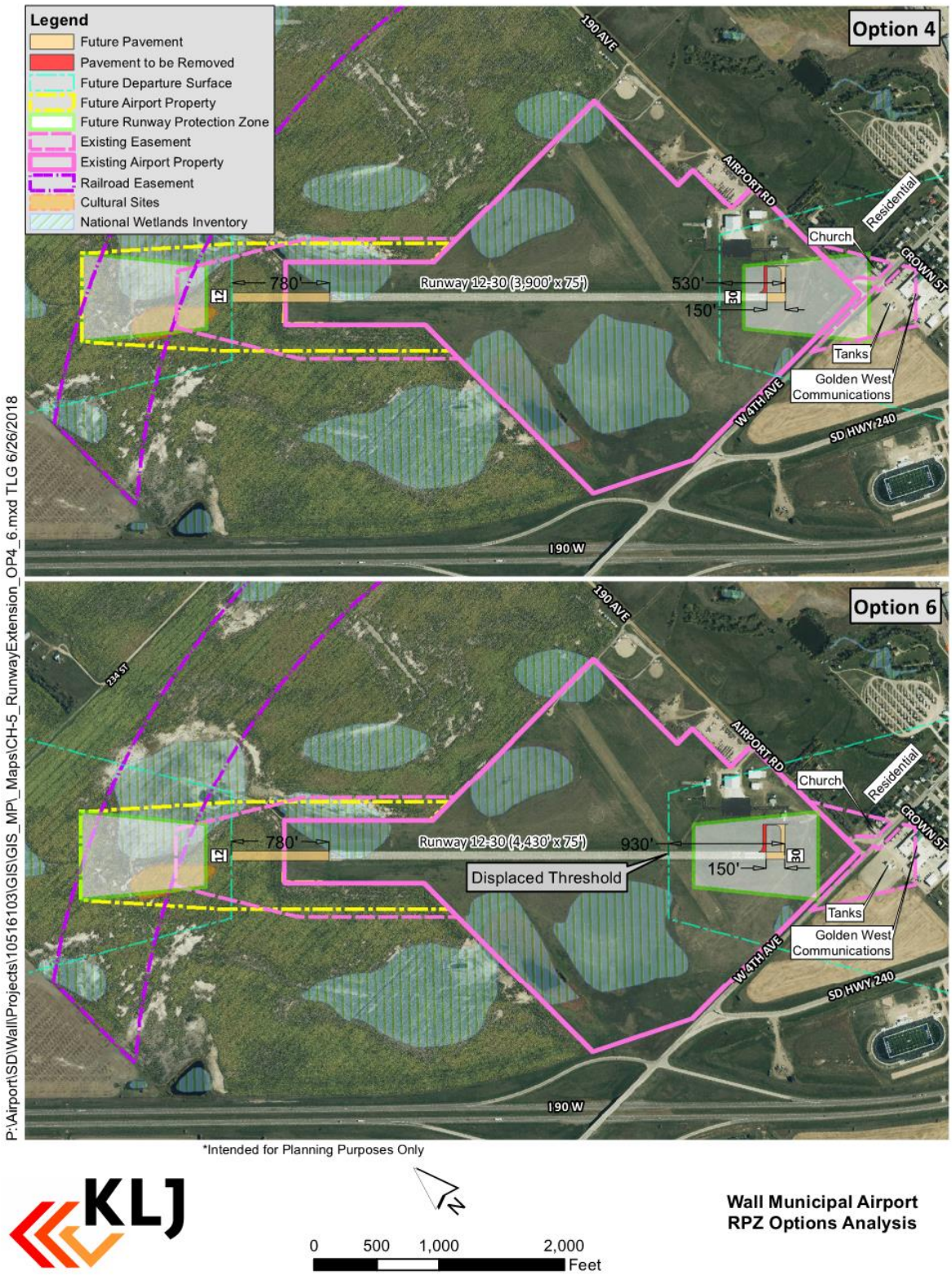


Table 5-2 – Runway 12-30 Options

Category	No Build	Option 1	Option 2 (Recommended)	Option 4 (Recommended)	Option 6
Key Alternative Features					
Runway Development Code (RDC)	B-I-Visual	B-II-5000	B-II-5000	B-II-5000	B-II-5000
Runway Dimensions	3,500' x 60'	4,280' x 75'	4,150' x 75'	4,430' x 75'	4,430' x 75'
Runway Extension	None	780' Northwest	New Runway	780' Northwest & 150' Southeast	780' Northwest & 150' Southeast
Runway Displacement	0'	0'	0'	Rwy 31 by 530'	Rwy 31 by 930'
TORA 13/31	3,500' / 3,500'	4,280' / 4,280'	4,150' / 4,150'	3,900' / 4,430'	3,500' / 4,430'
TODA 13/31	3,500' / 3,500'	4,280' / 4,280'	4,150' / 4,150'	3,900' / 4,430'	3,500' / 4,430'
ASDA 13/31	3,500' / 3,500'	4,280' / 4,280'	4,150' / 4,150'	4,430' / 4,430'	4,430' / 4,430'
LDA 13/31	3,500' / 3,500'	4,280' / 4,280'	4,150' / 4,150'	4,430' / 3,900'	4,430' / 3,500'
Runway Approach Capability (both ends)	Visual	Non-Precision (1 mile)	Non-Precision (1 mile)	Non-Precision (1 mile)	Non-Precision (1 mile)
Operational Performance					
Capacity to Meet Forecast Demand	No	Yes	Yes	Yes	Yes
Capability to Meet FAA Design Standards	No	No	Yes	Yes	Yes
Best Planning Tenets and Other Factors					
Airfield Configuration Efficiency & Safety	No New Issues	No New Issues	No New Issues	No New Issues	No New Issues
FAA RPZ Land Use Compatibility	230' of Airport Road; 540' of 4th Avenue; 1 Church; 8 fuel tanks; and 20,000 sf office	400' of Airport Road; 930' of 4th Avenue; 1 Church; 3 residences; 8 fuel tanks; and 20,000 sf office	30' of Airport Road and 860' of 4th Avenue	450' of Airport Road and 460' of 4th Avenue	Clear RPZ
Clear FAR Part 77 Approach Surface	Yes	Yes	Yes	Yes	Yes
Terminal/Hangar Area Impacts	No New Impacts	No New Impacts	No New Impacts	2 Hangars in departure surface	All 5 hangars in departure surface
Environmental					
Wetland/Floodplain Impacts	No Significant Impacts	No Significant Impacts	Yes	No Significant Impacts	No Significant Impacts
Socioeconomic/Farm (Land Required)	None	43 acres	59.2 acres	40.7 acres	40.7 acres
Fiscal Factors					
Estimated Cost	0	$4.25 m	$9.15 m	$4.59 m	$4.44 m
Recommendation					
Preferred Alternative	**NO**	**NO**	**YES**	**YES (Selected)**	**NO**

Preferred Alternative

The alternatives that were recommended included Options 2 and 4. Each of these would not have any occupied buildings inside the RPZ and would have the maximum amount of runway available for landing and for takeoff. The Federal Aviation Administration (FAA) reviewed Appendix H – RPZ Analysis and based on this review, approved Option 4 as the option that best meets the objectives while providing for the safety of individuals on the ground within the RPZ.

Option 4 was carried forward as the airfield alternative as the terminal/hangar area alternatives were evaluated.

Terminal/Hangar Area

Alternatives

The development concepts in the terminal/hangar area evaluate options for the various infrastructure elements. **Exhibit 5-4** depicts the existing conditions of the terminal area. There are significant constraints to new buildings and parked aircraft areas as a result of the FAA Departure Surface airspace restrictions as a result of the preferred airfield layout. Several concepts were considered and discussed with the Airport Sponsor following the August 1, 2017 Master Plan Advisory Committee (MPAC) meeting and in a teleconference on April 19, 2018. The following Alternatives were formulated and provided for the MPAC consideration.

- Alternative 1 – FBO/SASO and Group I T-Hangars
- Alternative 2 – Group I T-Hangar
- Alternative 3 – Group I Storage Hangars
- Alternative 4 – FBO/SASO and Group I T-Hangars and Group II Storage Hangars
- Alternative 5 – FBO/SASO and Group II Storage Hangars

The following key elements were considered as the alternatives were reviewed:

FBO/SASO Hangars – one FBO/SASO hangar exists at the airport currently. Making space for at least one additional FBO/SASO hangar was determined to be important with the alternative layout.

Storage Hangars – because of the preferred airfield layout, there will be two storage hangars impacted by the airfield. Making space available for these Group I (up to 49' wingspan) storage hangars with flexibility for Group II hangars (49'-79' wingspan) was determined to be important for the terminal/hangar area layout.

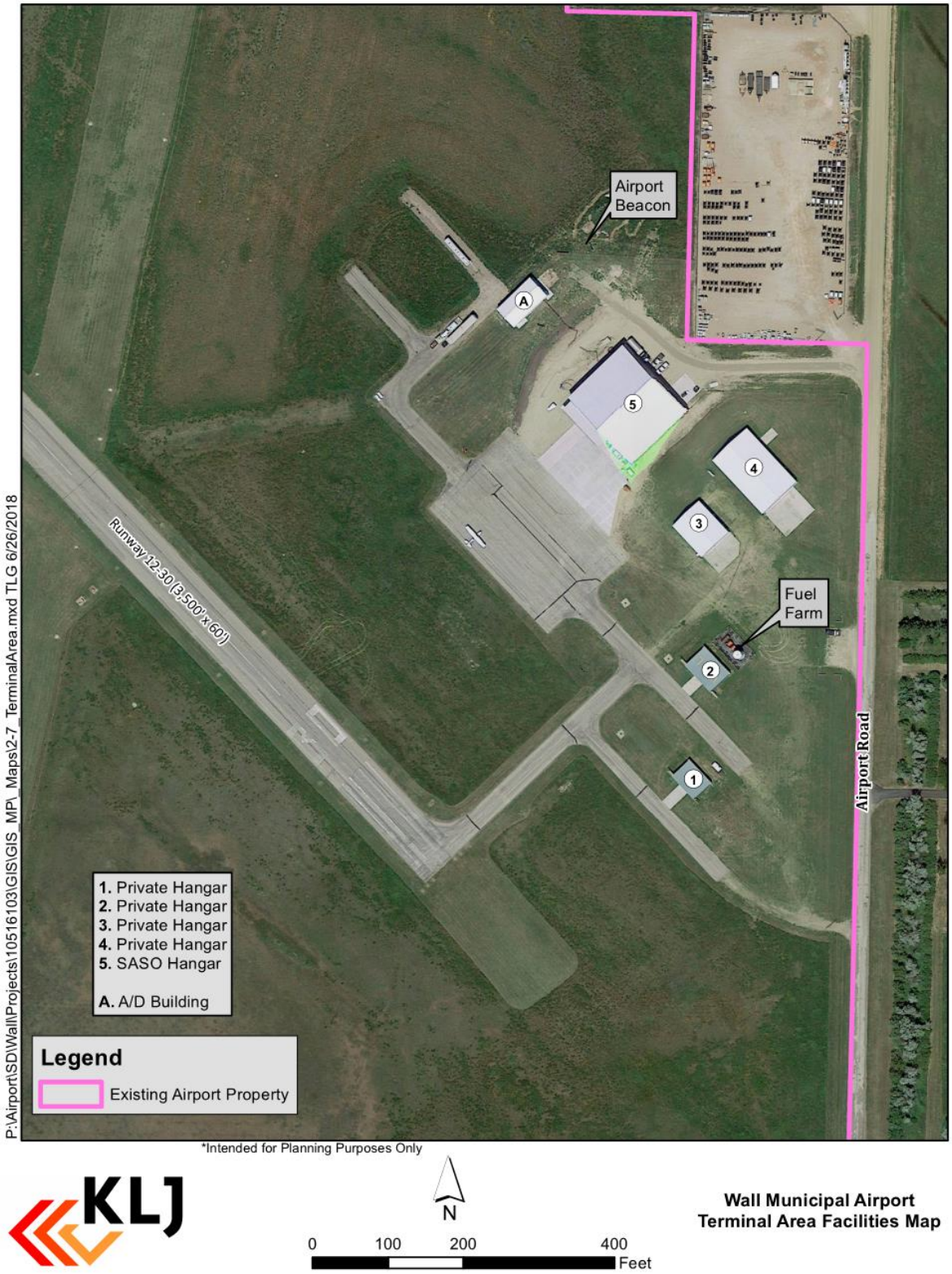
Access Road/Parking – since the existing access road and parking are not currently paved, different layouts were examined to determine if there was a better arrangement for the access road and parking in anticipation of paving in the long-term future.

Helicopters – medical transports are conducted by helicopter to/from the airport and determining a location for helicopter parking in the terminal/hangar area would be beneficial.

Self-Fueling – no self-fueling or public fueling is currently available at the airport but identifying a location for the future was determined to be important for the terminal/hangar area.

The alternatives are described in the following pages and a comparison is provided in **Table 5-2**.

Exhibit 5-4 – Terminal Area Existing Conditions

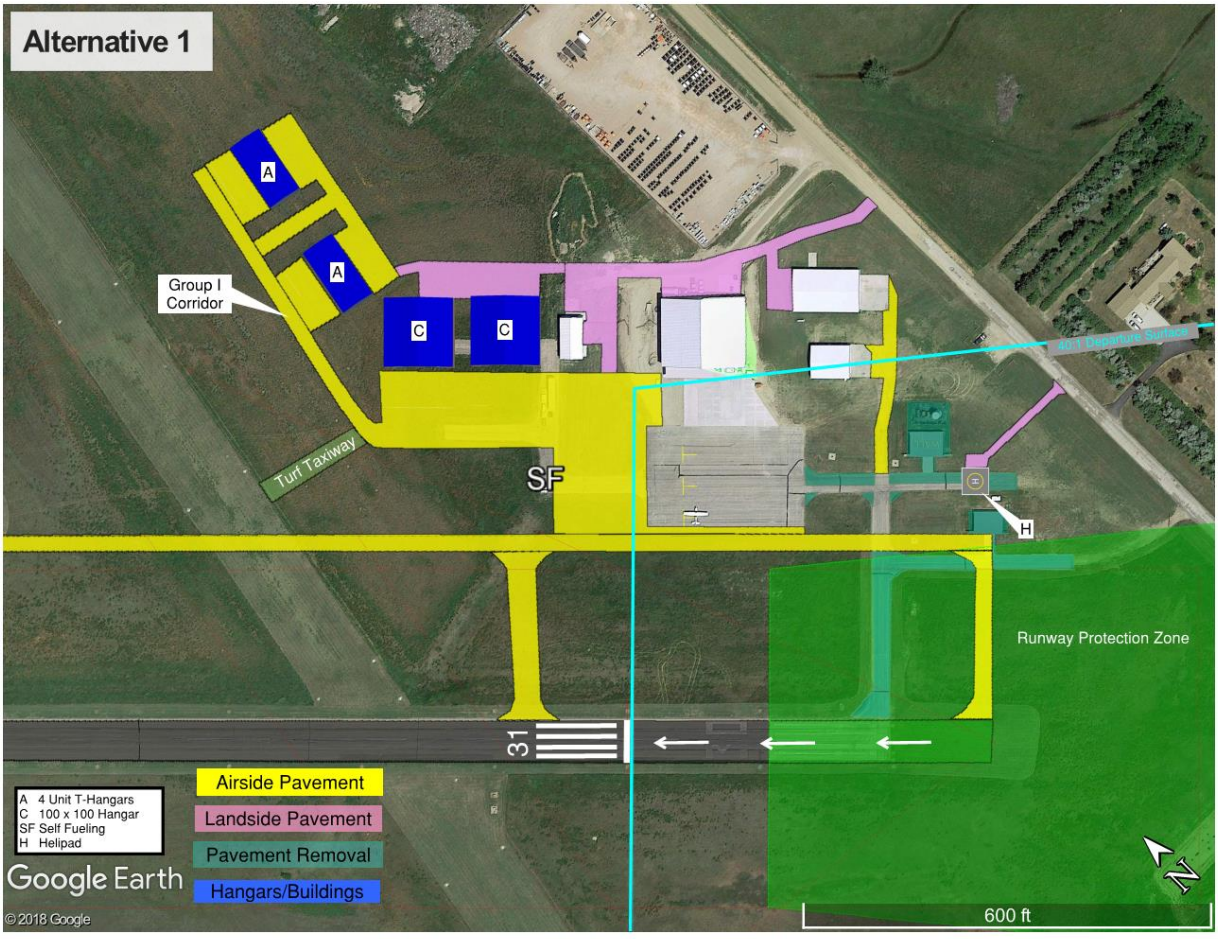


Alternative 1 - FBO/SASO and Group I T-Hangars

See **Exhibit 5-5** below.

- FBO/SASO Hangars – this alternative includes space for Two 100' x 100' FBO/SASO Hangars with access directly to the main apron and parking on the landside.
- Storage Hangars – this alternative includes a Group I corridor parallel to Runway 18-36 and connected to Two 4-Unit T-Hangars for Group I aircraft. No corridor or hangars are identified for Group II storage.
- Access Road/Parking – The access road would be aligned slightly south of the existing access and parking areas would be provided for Hangars 4, 5 and the proposed FBO/SASO Hangars and the Terminal building. An access road would also be provided from Airport Road to a helicopter takeoff/landing area (TLOF) on the east edge of the airport.
- Helicopters – a TLOF position would be added on the east end of the existing taxilane.
- Self-Fueling – self-fueling would be added south of the Terminal Building.

Exhibit 5-5 – Alternative 1

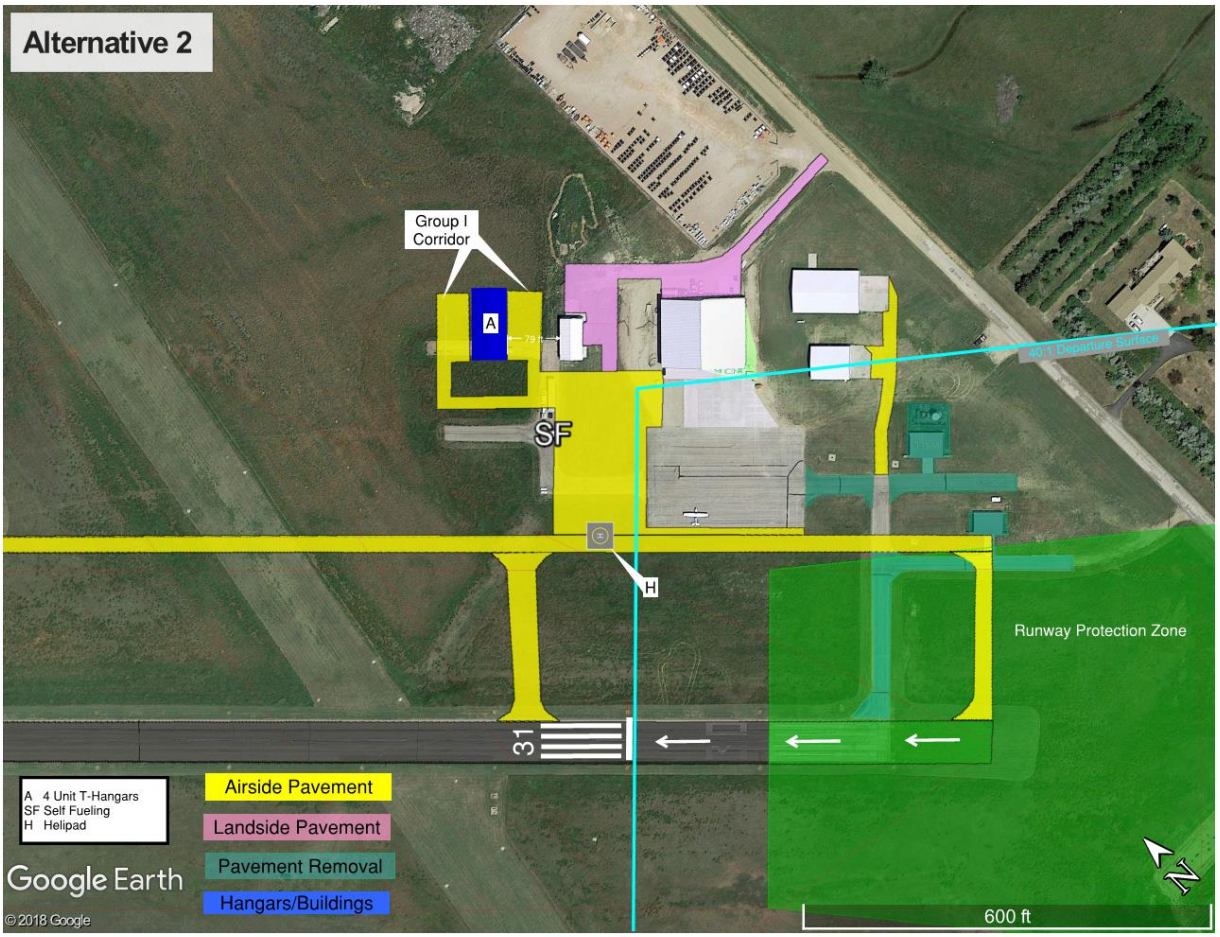


Alternative 2 - Group I T-Hangar

See **Exhibit 5-6** below.

- FBO/SASO Hangars – this alternative does not have any space for FBO/SASO Hangars. The only area that could be used for FBO/SASO adjacent to the apron would be used for Group I Hangars.
- Storage Hangars – this alternative includes One 4-Unit T-Hangar for Group I Aircraft directly west of the current Terminal building. No corridor or hangars are identified for Group II storage.
- Access Road/Parking – The access road would be the same as it is currently with parking only by Hangar 4 and the Terminal building.
- Helicopters – a TLOF position would be added on the south edge of the new apron area.
- Self-Fueling – self-fueling would be added south of the Terminal Building.

Exhibit 5-6 – Alternative 2

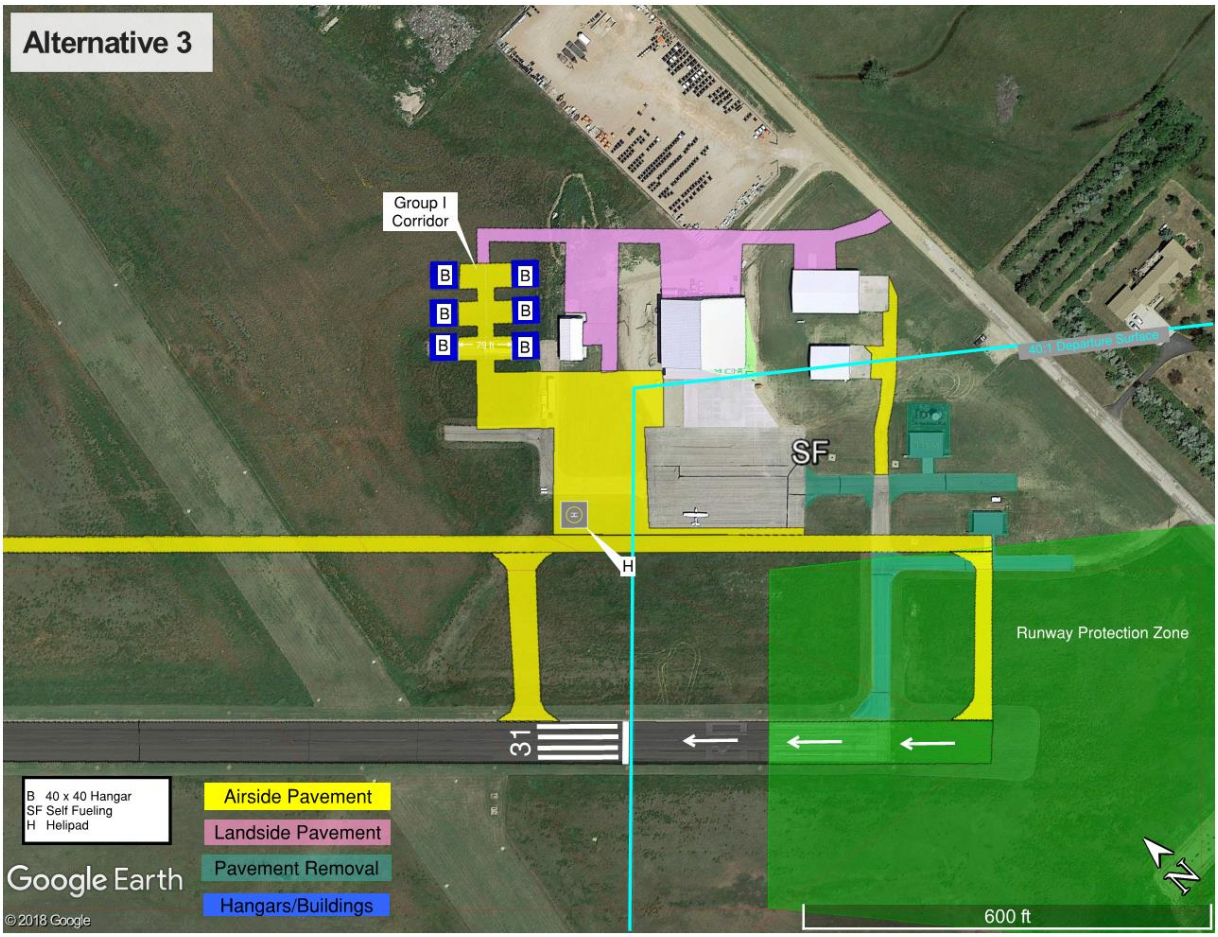


Alternative 3 - Group I Storage Hangars

See **Exhibit 5-7** below.

- FBO/SASO Hangars – this alternative does not have any space for FBO/SASO Hangars. The only area that could be used for FBO/SASO adjacent to the apron would be used for Group I Hangars.
- Storage Hangars – this alternative includes a single Group I corridor directly west of the Terminal building for Six Group I storage hangars. No corridor or hangars are identified for Group II storage.
- Access Road/Parking – The access road would be aligned slightly south of the existing access and parking areas would be provided for Hangars 4, 5 and the Terminal.
- Helicopters – a TLOF position would be added on the south edge of the new apron area.
- Self-Fueling – self-fueling would be added southeast of the existing SASO Hangar.

Exhibit 5-7 – Alternative 3

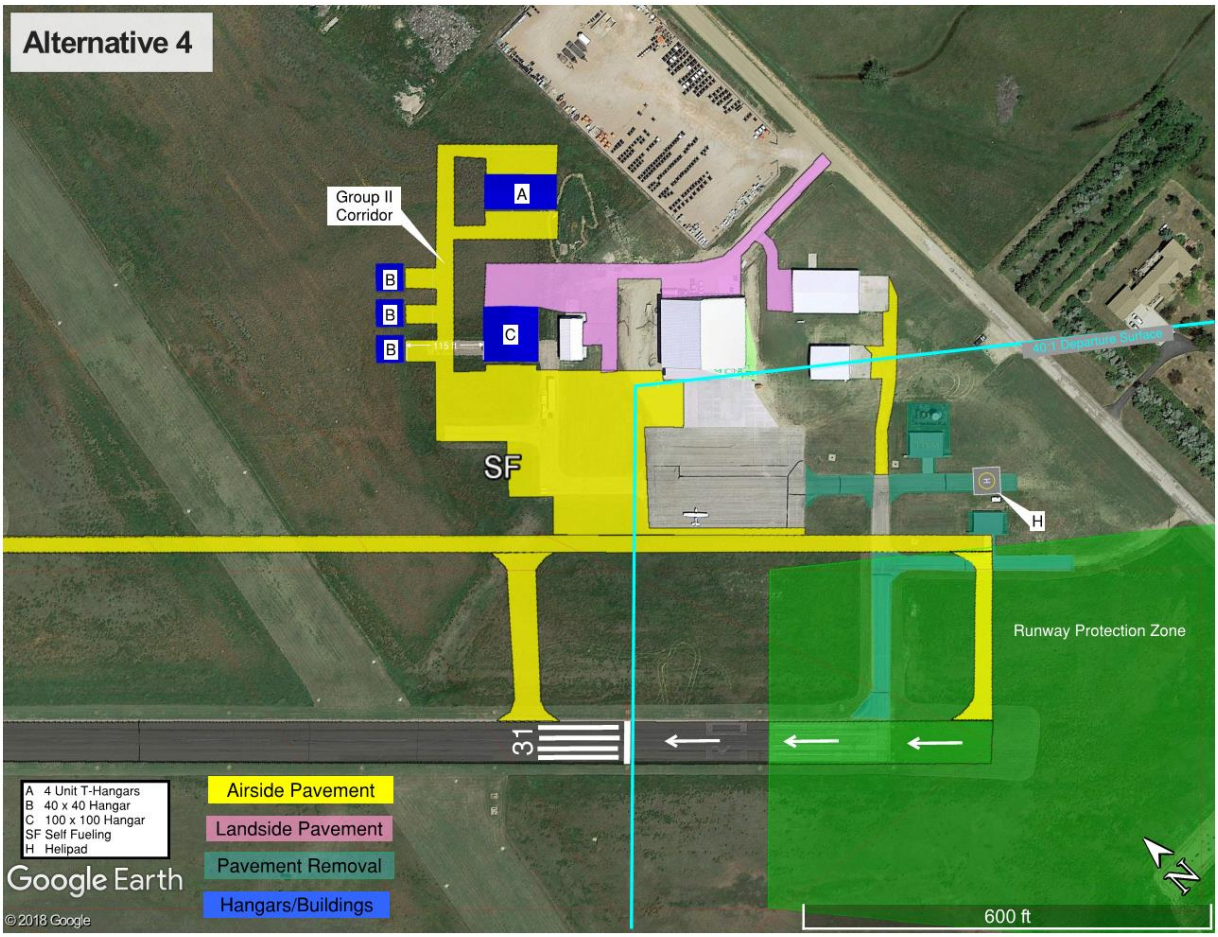


Alternative 4 - FBO/SASO and Group I T-Hangars and Group II Storage Hangars

See **Exhibit 5-8** below.

- FBO/SASO Hangars – this alternative includes space for One 100' x 100' FBO/SASO Hangars with access directly to the main apron and parking on the landside.
- Storage Hangars – this alternative includes a Group II corridor parallel to Runway 12-30 and connected to Three Storage hangars up to Group II and One 4-Unit T-Hangar for Group I aircraft.
- Access Road/Parking – The access road would be the same as it is currently with parking by Hangar 4, 5, and the proposed FBO/SASO Hangar and the Terminal building.
- Helicopters – a TLOF position would be added on the east end of the existing taxilane.
- Self-Fueling – self-fueling would be added south of the Terminal Building.

Exhibit 5-8 – Alternative 4



Alternative 5 - FBO/SASO and Group II Storage Hangars

See **Exhibit 5-9** below.

- FBO/SASO Hangars – this alternative includes space for One 100' x 100' FBO/SASO Hangars with access directly to the main apron and parking on the landside.
- Storage Hangars – this alternative includes a Group II corridor parallel to Runway 18-36 and connected to Six Storage hangars for up to Group II aircraft.
- Access Road/Parking – The access road would be aligned slightly south of the existing access and parking areas would be provided for Hangars 4, 5 and the proposed FBO/SASO Hangar and the Terminal building.
- Helicopters – a TLOF position would be added on the east end of the existing taxilane.
- Self-Fueling – self-fueling would be added southeast of the existing SASO Hangar.

Exhibit 5-9 – Alternative 5

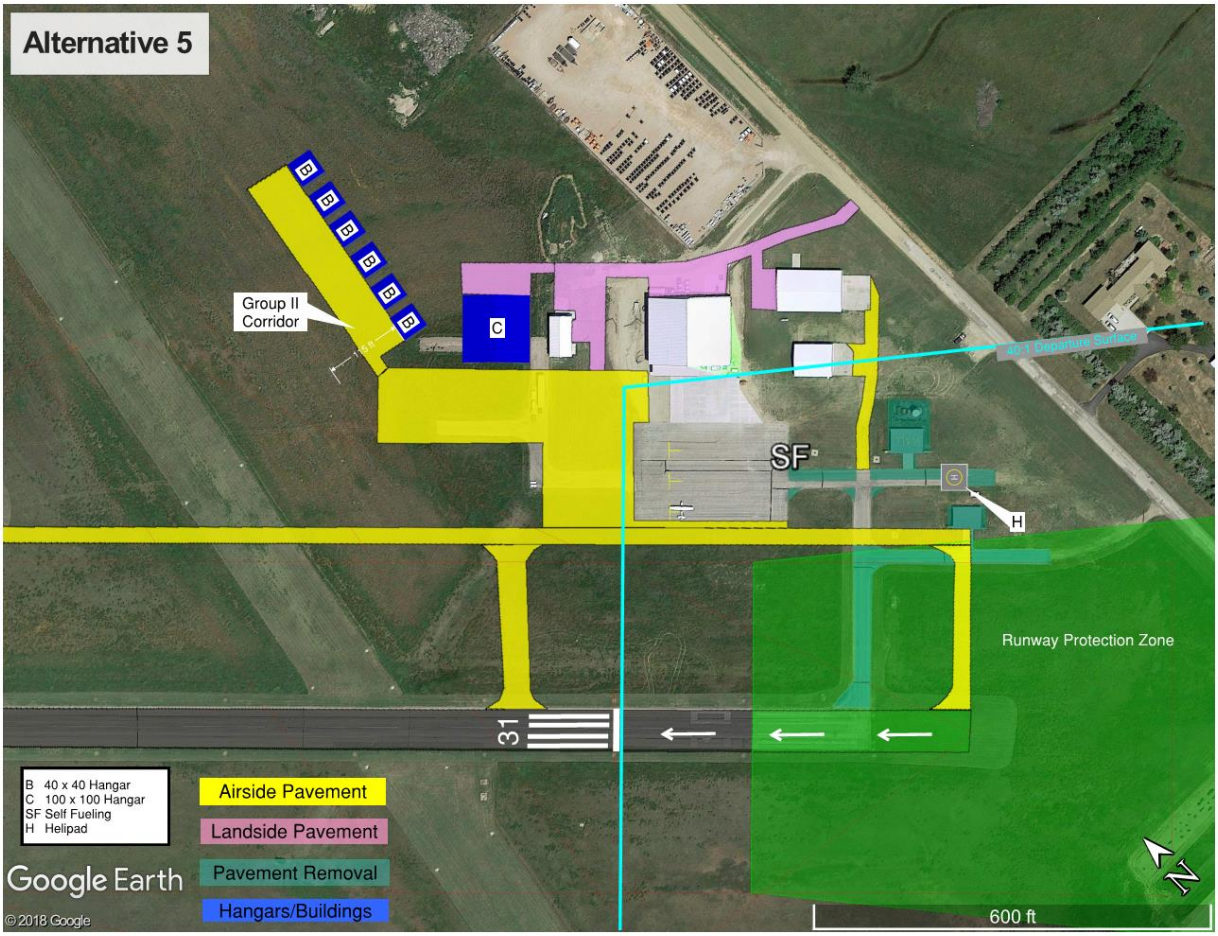


Table 5-3 Comparison of Terminal/Hangar Area Alternatives

Category	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Key Alternative Features					
FBO/SASO Hangar	2 Hangars	0	0	1 Hangar	1 Hangar
Group II Hangars	None	None	None	3 50x50 Hangars	3 50x50 Hangars
Group I Hangars	2 4-Unit T-Hangars	1 4-Unit T-Hangar	6 40x40 Hangars	1 4-Unit T-Hangar	None
Alignment of North Hangars with Crosswind	Yes	-	-	No	Yes
Aircraft Parking Space / Tie-Downs	3,500 sy	3,500 sy	3,800 sy	4.600 sy	4,400 sy
Entry Road/Parking	Entry south of current road. Parking by all large hangars and terminal. Entry to Helipad	Entry at current location. Parking by existing SASO hangar and terminal.	Entry south of current road. Parking by all large hangars and terminal.	Entry at current location. Parking by all large hangars and terminal.	Entry south of current road. Parking by all large hangars and terminal.
Helipad Location	East at end of existing taxilane	South of Terminal at south edge of Apron on future taxiway	South of Terminal at south edge of Apron	East at end of existing taxilane	East at end of existing taxilane
Self-Fueling Location	South of Terminal	South of Terminal	South of SASO Hangar	South of Terminal	South of SASO Hangar
Operational Performance					
Group I	No	Yes	Yes	Yes	No
Group II	No	No	No	Yes	Yes
FBO/SASO demands	Yes	No	No	Yes	Yes
Auto Parking/Access for Large Hangars	Yes	Partial	Yes	Yes	Yes
Functional Location for Self- Fueling	Yes	Yes	No	Yes	No
Functional Location for Hellipad	Too far from Terminal	Impedes future Taxiway	Best location from Terminal	Too far from Terminal	Too far from Terminal
Efficiency to Accommodate Other Airport Plans	Yes	No	No	Yes	Yes
Best Planning Tenets and Other Factors					
Group II Access for Hangars	No	No	No	Yes	Yes
Helicopter Functionality	No	No	Yes	No	No
Long-Term Development Flexibility	Allows Hangar Alignment with Crosswind to maximize area for development	Eliminates FBO/SASO development on Main Apron	Eliminates FBO/SASO development on Main Apron	Aligns north hangar development with primary runway and therefore limits space for development	Allows Hangar Alignment with Crosswind to maximize area for development
Environmental					
Environmental Elements	No significant impacts from Baseline Information gathered	No significant impacts from Baseline Information gathered	No significant impacts from Baseline Information gathered	No significant impacts from Baseline Information gathered	No significant impacts from Baseline Information gathered
Fiscal Factors					
Minimal cost for initial hangar development	850 lf of taxilane plus 1 T-Hangar	490 lf of taxilane plus 1 T-Hangar	350 lf of taxilane plus Private Hangars	230 lf of taxilane plus Private Hangars	460 lf of taxilane plus Private Hangars
Airport Funded Hangar Development	Required	Required	Not Required	Optional	Not Required
Recommendation					
Preferred Alternative?	**NO**	**NO**	**NO**	**NO**	**YES**

Feedback on Alternatives

There were a variety of attendees at the MPAC meeting on May 1, 2018. Following a presentation on the project status and alternatives, the following feedback was provided:

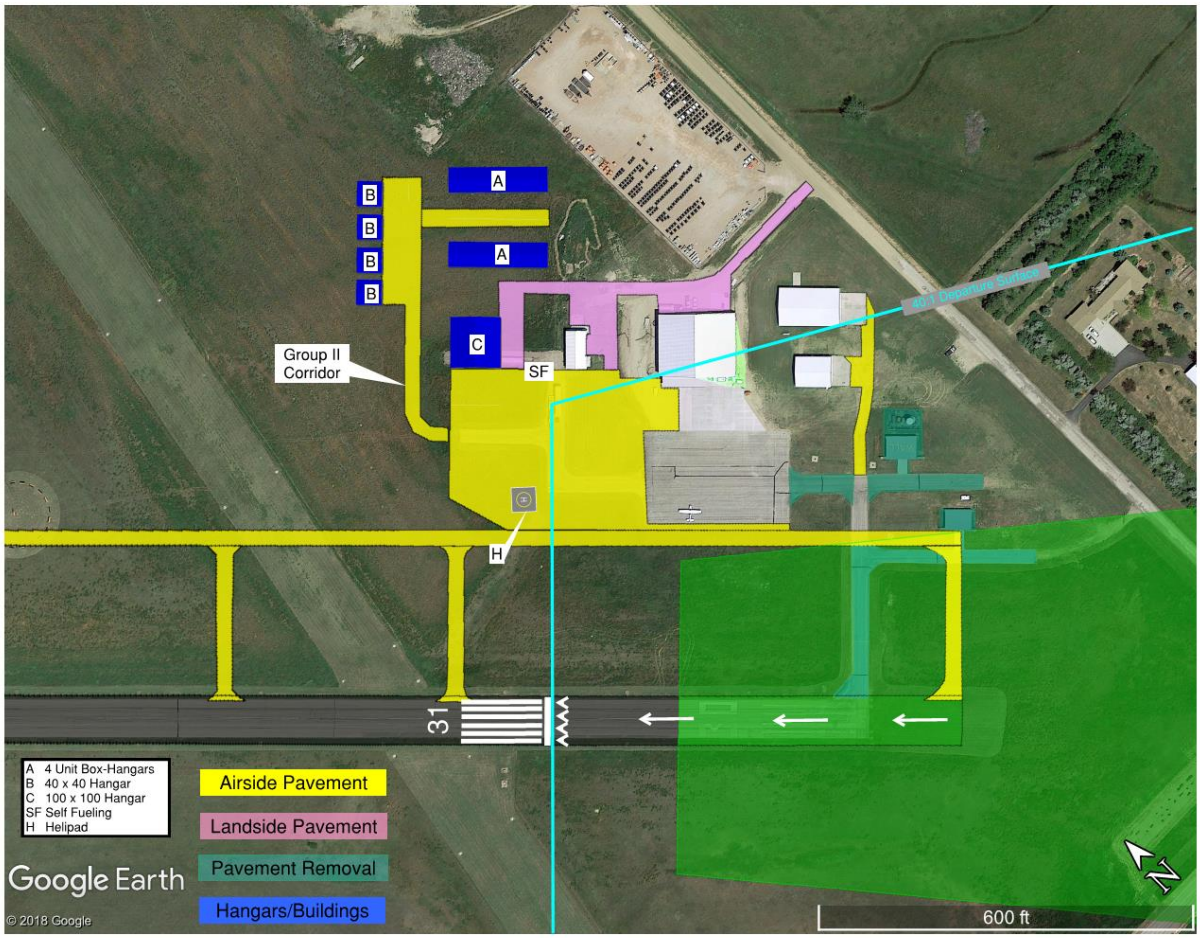
- The access road and parking arrangement in Alternative 2 was preferred because it did not change the current alignment and did not add parking to Hangar 4.
- FBO/SASO Hangar is needed west of the Terminal for either transient storage or FBO/SASO.
- Self-fueling should not be located on the east side of the apron because it would negatively impact the existing SASO's aerial applicator operation from Hangar 5.
- Small Group I hangars are needed north of the FBO/SASO hangar area.
- Funding and/or minimizing expenses needs to be considered early for the hangars impacted by the airfield development.
- Helicopter parking needs to be closer to the terminal so that flight crews and ambulance crews can make use of the terminal during inclement weather.
- Self-Fueling should be located west of the Terminal between the Terminal and proposed FBO/SASO Hangar.
- FAA noted that a separate TLOF for helicopters is not needed for airports since the takeoff and landing is done using the existing runways.

Preferred Alternative

The preferred terminal/hangar area development alternative is **Alternative 4** with a number of specific modifications. The rationale behind selecting this alternative was the ability to provide more flexible space development along prime apron in the terminal area without sacrificing significant operational capability. The key modifications are as follows:

- FBO/SASO Hangars – no change from Alternative 4.
- Storage Hangars – add an area for Group I Box-Hangars.
- Access Road/Parking – access road on existing alignment and remove parking by Hangar 4.
- Helicopters – a helicopter parking position south of the Terminal.
- Self-Fueling – self-fueling between the Terminal and proposed FBO/SASO Hangar.

Exhibit 5-10 – Preferred Terminal/Hangar Area Alternative



Recommended Development

In the process of finalizing the preferred airfield alternative, the runway length was adjusted based on precise property information confirmed late in the project. The revised length is factored in below and changes from 4,430' to 4,418' in total length. The recommended development for all the components of the airport is as follows:

- Extend and Expand Runway 12-30 to 4,418' x 75' and renumber as Runway 13-31
- Install partial parallel taxiway to Runway 31, turnaround for Runway 13 and reserve space for ultimate full parallel taxiway
- Grading for Runway 18-36 to comply with FAA standards (Runway Safety Area, Object Free Area and line of sight), remark and grade for 2,000' x 100' turf, including relocation of City of Wall Well Building access road outside the safety surfaces, and add turf taxiway connector at the midpoint of the runway
- Acquire land in fee simple and easement for the Runway 13-31 extension and Runway 18-36 including Object Free Area, Building Restriction line, and RPZ
- Preserve space for FBO/SASO Hangar west of Terminal
- Preserve space for Self-Fueling between Terminal and proposed FBO/SASO Hangar
- Construct Group II taxilane corridor west and then north of the existing apron for Group II and Group I hangar development as demand dictates
- Layout tiedowns so that space is provided for helicopter parking south of the Terminal

This plan will help the airport preserve development flexibility to react to unforeseen changes in demand.

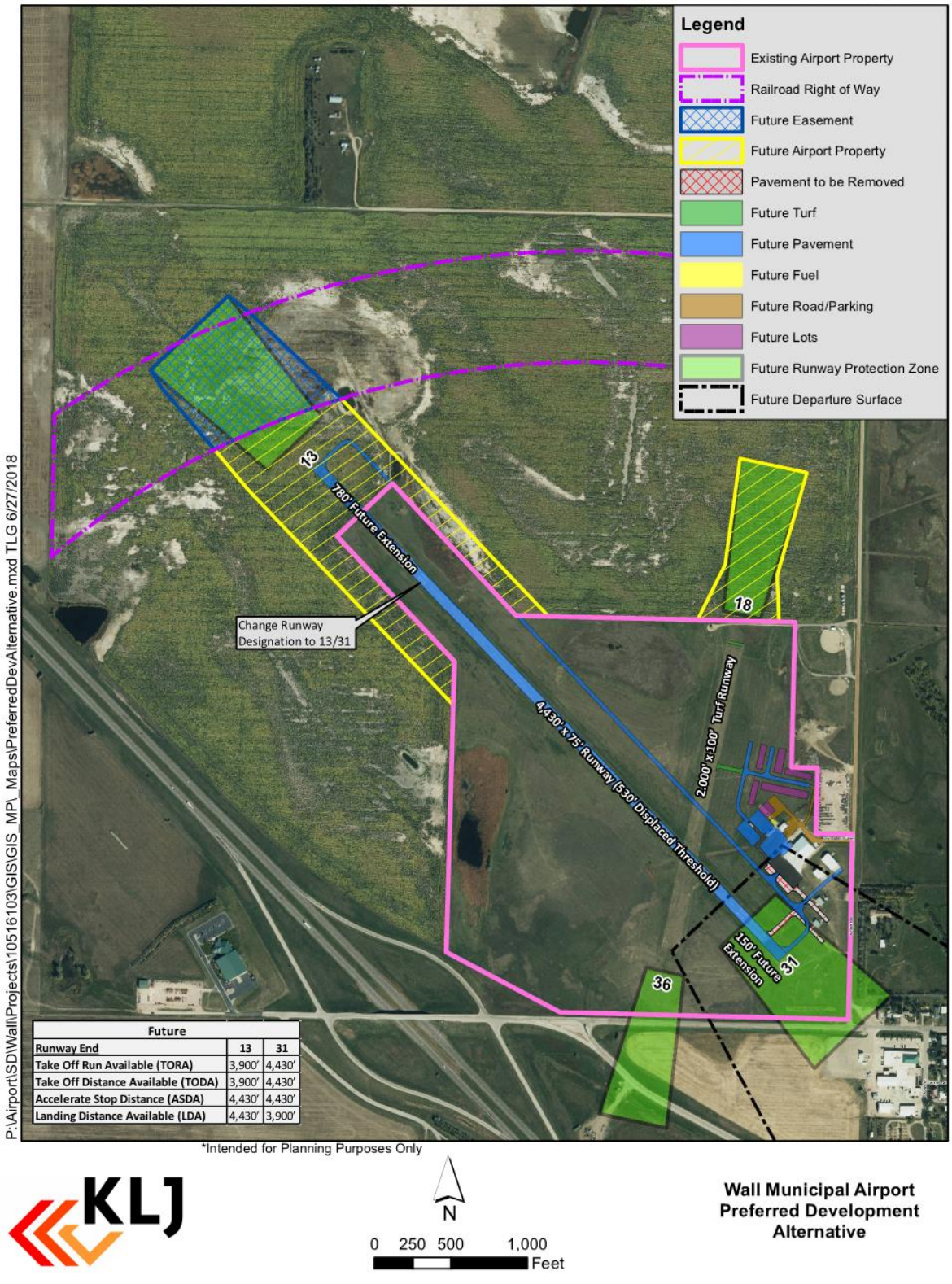
Preferred Development Strategy

Table 5-4 – Preferred Development Strategy

	Near-Term 0-5 Years PAL 1	Future 6-10 Years PAL 2	Long-Term 11-20 Years PAL 3 & 4	Ultimate 20+ Years Beyond PAL 4
Runway 13-31 & Taxiway	• Acquire Land for Runway 13 Extension and RPZ • Extend and Expand Runway 13-31 to 4,418' x 75'	• Instrument Approach Procedures for Runway 13 and 31	• Full Parallel Taxiway	• *None*
Runway 18-36	• Acquire Land for OFA and RPZ	• Improve Safety Surfaces	• *None*	• *None*
Terminal & Hangar Area	• Relocate and Remove Hangars • Taxilane Construction	• Expand Apron • Construct Fuel Facility • Add Hangars (demand)	• Add Hangars (demand)	• Add Hangars (demand)
Landside	• *None*	• Pave access road and parking lots	• *None*	• *None*
Support & Other	• Wildlife Hazard Assessment • Replace Snowblower	• Construct Wildlife Control Fence	• *None*	• *None*

Source: KLJ Analysis
NOTE: Scope and timing of airport improvements depends on demand threshold being met.

Exhibit 5-11 – Preferred Development Alternative



CHAPTER 6: IMPLEMENTATION & COMPATIBILITY

Introduction

The implementation and compatibility plan provides guidance on how to carry out the preferred development recommendations identified in **Chapter 5: Alternatives Analysis**. Based on the preferred development plan, the improvement projects needed at the Wall Municipal Airport (6V4) over the planning period can be formulated. This chapter includes the following sections:

- Project Sequence
- Financial
- Environmental Review
- Compatibility

Background

Each project is sequenced to balance demand, schedule, other projects, environmental/agency approval, funding, and financial constraints. The project plan may change over time to react to changing conditions, but is flexible so that the airport can react to change and re-prioritize projects based on actual demand.

A more detailed implementation and financial plan is identified for near-term projects (i.e. 1-10 years), because needs are more realistically anticipated based on available funding and actual demand. There is more uncertainty in project funding, demand, and local project importance in the long-term. When reaching that point, airport planning documents should be updated.

All planning-level project costs developed are in 2018 dollars. Final project costs are subject to change based on actual construction and project formulation.

Implementing a Project

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 federal 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 (steps may be shorter or longer based on complexity):

Professional Services: Select a qualified consultant for the project planning, environmental reviews, survey, engineering design, and construction administration for the project. The FAA recommends a distinct selection process for both 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, navigational aid agreements (reimbursable agreements) or special FAA coordination for flight procedures which 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 30 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 funding pre-application, 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.

Many of the projects identified are demand-driven based on the Planning Activity Levels (PALs) from the approved aviation forecasts. The implementation timing is estimated from the FAA-approved activity forecasts. Changes in airport activity may affect the timing of demand-driven improvements.

Based on the PALs and other regular pavement and safety needs, some airport development capacity projects may not able to be sequenced to meet PALs within a realistic funding plan. These projects are initiated within a few years of their PAL demand trigger to account for anticipated available funding.

Project Sequence

Significant individual projects are described in this section along with information about the project purpose, scope, and triggering events. The recommended project phasing at Wall is based on anticipated needs and available funding. This information provides guidance to the airport sponsor and funding agencies on future implementation steps.

Near-Term Projects (0-10 Years)

Near-term projects cover the beginning of the planning period for the next ten years through 2027, generally corresponding to the forecasted Planning Activity Level (PAL) 1 and 2. Projects in this phase address the highest priority needs justified for funding. Significant near-term projects are further described in **Table 6-1: Near-Term Projects.**

Table 6-1 - Near-Term Projects

Year	Project	Scope		Estimated Cost		
2018-2021	Expand Runway 13/31[1]	Prelim	EA, Land Acquisition, Hangar Relocation, Phased Design	$4.8 m	Trigger	Current Demand Dictates
			Reconstruct Runway 13/31 (4,418' x 75') to B-II-5000 standards; Connector Taxiway		Justification	Runway length and width justified by critical design aircraft expected in operation within 5 years.
2021	Runway 18/36 Safety Surfaces	Prelim	EA, Land Acquisition, Design	$0.5 m	Trigger	FAA Standards
			Relocate service road, improve RSA, OFA, OFZ, and line of sight to standards; Reinstall Runway cones to 2000' x 100'		Justification	Current FAA standards are not met for the turf Runway 18-36
2020-2027	Terminal Area Improvements	Prelim	CATEX, Design	$0.9 m	Trigger	Demand
			Hangar Taxilanes, Replace Storage Hangars, Replace SuperAWOS with AWOS III, Self-Fueling, Pave Access Road & Parking		Justification	Improve terminal area and access to the airport
2024	Wildlife Fence	Prelim	Wildlife Hazard Assessment	$0.5 m	Trigger	Hazard Assessment
			10' High perimeter fence for Wildlife		Justification	Maintain safe airfield environment

Source: KLJ Analysis

[1] Existing Runway 12/30 will be re-designated as Runway 13/31 when expanded due to movement in the magnetic declination.

Long-Term Projects (10+ years)

Long-term projects cover the remainder of the planning period for the next 11 to 20 years through year 2037 or forecasted PAL 3 and 4. Projects are identified based on forecasted project activity and funding. The project sequencing for demand driven projects in this phase may change because of changes in aviation activity, new standards, funding, 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. It also allows the ability for the airport to react to changes in airport activity. Significant long-term projects are further described in **Table 6-2: Long-Term Projects**.

Table 6-2 - Long-Term Projects

Year	Project	Scope		Estimated Cost		
2030	Expand Apron	Prelim	EA, Design	$0.5 m	Trigger	Apron Space Demand
			Add 6,700 sy of apron		Justification	Portions of apron within departure surface.
2032-2036	Add Hangars	Prelim	CATEX, Business Plan, Design	$0.9 m	Trigger	Demand
			Construct Hangars (revenue producing project)		Justification	Justified use of Non-Primary Entitlement funds

Source: KLJ Analysis

Capital Improvement Plan

The CIP is a key element in the implementation plan. The CIP identifies the project title, year, estimated costs, and anticipated funding for airport improvements. Larger projects are often divided into smaller elements that reflect how projects are approved, designed, and constructed. Each project is requested through the CIP project programming and grant application process. The CIP is updated and submitted to the FAA annually to program Federal and State grant funding. The proposed updated Wall CIP identifies over $7 million in airport improvements over the next 10 years see **Table 6-3 Capital Improvement Plan**.

Table 6-3 – Capital Improvement Plan

Year	Project	Scope	Estimated Cost	FAA Funds	State Funds	Local Funds	Other
Near-Term (2018-2027)							
2019	Runway 13/31 Ph 1	Environmental Assessment Runway 13/31 and Runway 18/36	$150,000	$135,000	$7,500	$7,500	
2019	Snow Removal Equipment	Replace Blower	75,000	67,500	3,750	3,750	
2020	Runway 13/31 Ph 2	Land Acquisition Rwy 13 & Rwy 18	192,000	172,800	9,600	9,600	
2020	Runway 13/31 Ph 3	Design Runway 13/31 4,418' x 75'	345,000	310,500	17,250	17,250	
2020	Taxiway & Taxilane Ph 1	Design Taxiway 830' x 25' & Taxilane 680' x 25'	60,000	54,000	3,000	3,000	
2020	Hangar	Replace Hangar	80,000				80,000
2021	Runway 13/31 Ph 4	Construct Runway 13/31	4,032,000	3,628,800	201,600	201,600	
2021	Taxiway & Taxilane Ph 2	Construction of Taxiway & Taxilane	610,000	549,000	30,500	30,500	
2021	Runway 18-36	Design/Construct - Grading Runway	406,000	365,400	20,300	20,300	
2021	Wildlife Hazard	Wildlife Hazard Assessment	50,000	45,000	2,500	2,500	
2023	AWOS III	Replace AWOS III	180,000	162,000	9,000	9,000	
2023	Pavement Rehabilitation	Apron Rehab	10,000	9,000	500	500	
2024	Wildlife Hazard	Perimeter Fence 14,800 lf	545,000	490,500	27,250	27,250	
2026	Fuel System	New Self Fueling System	180,000	162,000	9,000	9,000	
2027	Access Road/Parking	Pave road and parking	180,000	162,000	9,000	9,000	
		Sub-Total	**$7,095,000**	**$6,313,500**	**$350,750**	**$350,750**	**$80,000**
Long-Term (2028-2037)							
2029	Pavement Rehabilitation	Runway 13-31 Rehab	75,000	67,500	3,750	3,750	
2030	GA Apron	6700 sy Apron Expansion	541,000	486,900	27,050	27,050	
2032	Hangars	4 Unit T-Hangar	340,000	306,000	17,000	17,000	
2036	FBO/SASO Hangar	8,000 sf Hangar	550,000	495,000	27,500	27,500	
2036	Parallel Taxiway Ph 1	Design Taxiway 3,500' x 25'	106,000	95,400	5,300	5,300	
2037	Parallel Taxiway Ph 2	Construct Taxiway 3,500' x 25'	1,370,000	1,233,000	68,500	68,500	
		Sub-Total	**$2,982,000**	**$2,683,800**	**$149,100**	**$149,100**	
		TOTAL	**$10,077,000**	**$8,997,300**	**$499,850**	**$499,850**	**$80,000**

Source: KLJ Analysis

Financial

The implementation plan considers the airport's ability to fund the projects identified in this planning study. Projects in the short-term and mid-term are evaluated 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 funding for projects is derived from many sources. Funding sources can be categorized into three main categories:

- Federal funding
- State funding
- Local or Private funding

Detailed information about these funding programs can be found in **Appendix D - Airport Funding**. A realistic project implementation plan must consider financial resources. The financing strategy for the Wall Municipal Airport provides sufficient federal, state and local funding for future airport improvements. Projected funding sources are based on 2017 legislation.

Federal Funding

Federal Airport Improvement Program (AIP) funding provides financing for most airport improvements proposed at the Wall Municipal Airport. Entitlement funding alone is not sufficient to meet the projected needs at the airport. While maximizing the projected entitlement funding available to Wall, FAA non-primary entitlements will only finance a small amount of the proposed improvements through the 20-year period. Entitlements will be utilized to fund AIP-eligible projects, particularly critical maintenance, safety, and capacity enhancements. Discretionary funding is anticipated to fund about 65 percent of the cost of airport improvement projects through the next 10 years. A summary of Federal funding needs is outlined in **Table 6-4** with a summary of Discretionary funding needs in **Table 6-5**.

Table 6-4 – Total Funding

Phase	Cost	FAA Entitlement	FAA Discretionary	State	Local	Other
Near-Term (2018-2027)	7,095,000	1,800,000	4,639,500	350,750	350,750	80,000
Long-Term (2028+)	2,982,000	1,500,000	1,057,800	149,100	149,100	
TOTAL	**$10,077,000**	**$3,300,000**	**$5,697,300**	**$498,350**	**$498,350**	**$80,000**

Source: KLJ Analysis

Federal discretionary funding will be needed to fund the highest priority projects at the airport, including the Runway 13-31 Extension/Expansion and the Wildlife Fence in the short-term. These projects cannot be completed with entitlement funds alone. Discretionary funding will be needed in 2021 and 2024 to complete these projects. These funds will be from either Discretionary or State Apportionment funds. FAA's preference is to combine entitlement and discretionary funds on high priority projects. No additional discretionary funds are expected to be needed until 2037. The next Master Plan update should refine long-term discretionary project funding needs.

Table 6-5 – Federal Discretionary Funding

Year	Project	Cost	FAA Entitlement	FAA Discretionary	State	Local
2021	Runway 13/31-18/36	5,098,000	160,200	4,428,000	254,900	254,900
2024	Wildlife Fence	545,000	279,000	211,500	27,250	27,250
2037	Parallel Taxiway	1,370,000	175,200	1,057,800	68,500	68,500
	Total:	**$7,013,000**	**$614,400**	**$5,697,300**	**$350,650**	**$350,650**

Source: KLJ Analysis

State Funding

State funding will primarily be used to provide a match for Federal AIP funding. This is expected to be just under $500,000 in the planning period based on a 5% match from the State. The City of Wall should stay apprised of the State's funding programs and funding levels to determine the impact of that funding on the projects planned for the Wall Municipal Airport.

Local Funding

A local match will be needed for the AIP funded projects at the Wall Municipal Airport. This requirement will be at least 5% of the project cost but could vary some depending on project eligibility and the structure of the State and Federal funding programs.

One unique project item the City of Wall will face in the near future, is the funding for relocating hangars. There are two hangars identified for removal, but since these are privately owned and on land leases from the airport, the replacement of these hangars is not eligible for the use of AIP funding.

Is Reversion Right for You?

This question is posed quite often. Why should an airport expect a tenant to build a facility on the airport then revert ownership of that facility after the term of a lease expires? The underlying question is, "Does the airport owner have a compelling need to control the airport?"

The primary issue that drives this discussion is that an airport and its associated facilities (runways, taxiways, aprons, etc.) are constructed on a finite piece of public property. With limited access and ability to expand, is it in the public's interest to allow tenants to control the use of that finite property into perpetuity?

Reversion solves this potential issue and maintains the public's ability to control the airport by allowing the airport to redevelop portions of the airport after a notable period of time (usually 30 – 40 years). An airport may choose to redevelop for a variety of reasons, including conformity with current design standards, repurposing areas for changing demands, or renovation or upgrading existing structures. Airports are quite unique in that even though there are large amounts of acreage for an airport, there are only certain areas that have the proper access to both the airside and landside to make a facility functional. Airports generally have broad impacts on communities ranging from improved medical services to stimulation of economic develop and as such, often have millions of public dollars spent to make these areas as functional as possible for all airport users.

The general argument against reversion is that it stifles tenant's ability to maximize the value of their investment, and as such, may prevent the airport from getting development that will allow it to be as self-sustaining as possible.

These arguments have been greatly simplified for this discussion, but this decision is one that each airport owner should consider carefully to determine what is best for them to meet demand and comply with grant conditions and local, state, and federal laws.

There are two options the City should consider related to existing and future hangar projects. These are either land lease or airport funded hangars.

Land Lease is a common method for allowing hangar construction. This is where a tenant will lease a tract of airport land which is connected to the airfield and public access. The tenant will construct a facility at their own expense and pay a land lease rate to the airport through a term of the lease sufficient for the tenant to amortize their investment. An important element to consider is reversion of the improved property to the Airport following the initial term of the lease. The reason to consider reversion is addressed in more detail in this section and would be instituted equally for any person and varies only based on the level of investment made into the facility. A guideline for setting the initial lease term with reversion is a 10-year term is allowed for every $25 to $35 per square foot of

investment with lower rates provide to those who are providing services at the airport and higher rates to those just storing personal/company aircraft but not providing aviation services. A depreciation schedule for a facility can also be used to determine the proper term. These are not absolute rules but are tools to use to determine the lease term. Here is an example of the calculation of lease term.

$$\frac{\$400{,}000\ investment}{5{,}000\ sf\ hangar} = \$80\ per\ SF \qquad \frac{\$80\ per\ SF}{\$35\ per\ 10\ Years} = 22\ years$$

Please note that, a person constructing a facility will often be interested in leasing the improved property after the original lease term expires. This is often done by negotiations to establish a new rental rate that is commensurate with the improved value of the property. Assuring that individuals are paying the improved value of the property, puts the proper economic incentive in place so that the airports finite property is used to the best of its ability.

Airport Funded Hangars is the other option for the airport to maintain control and provide facilities for aircraft storage. Providing airport funding depends first on whether the airport has the funds to construct a hangar and second on the confidence the airport has in being able to lease the facility at a sufficient rental rate. The FAA allows airports to use non-primary entitlements for revenue producing facilities, such as hangars, but only if all other airport needs for federal funding have been met and no other projects are foreseen in the next three years.

Table 6-6 – Hangar Funding Options

	Land Lease
Pros	Only private funds at risk, No public funds at risk
Cons	Individual hangars use more space than group hangars
Typical Uses	Individual Hangars, Specialized Facilities, Large Investments, Businesses
	Airport Funding
Pros	Can use Non-Primary Entitlement funds Airport maintains control immediately
Cons	Requires up front public funds Public money at risk if there are no tenants
Typical Uses	Small Hangars, Group Hangars such as T-Hangars

Ownership of Hangars - Whether Land Lease or Airport funding is used to construct hangars, the hangars will still at some point become property of the airport as a result of reversion. When the hangar is not owned by the airport, the hangar is subject to property taxes as an improvement to the property. Since airports are public entities, the property and improvements owned by airports are not subject to property taxes. An advantage to the tenant of reversion is not paying property taxes. An option is to revert the property sooner than a land lease term with the tenant transferring ownership early but still paying minor/major maintenance for the facility.

Environmental

Introduction

FAA AC 150/5070-6C, *Airport Master Plans* identifies a planning-level environmental review as one of the elements of effective planning. The purpose behind this element of the 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 Wall were identified in **Chapter 5: Alternatives Analysis** based on the existing conditions described in **Chapter 2: Facility & Environmental 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 section is to provide the community and airport sponsor the regulatory awareness of the importance of minimizing the environmental impacts of airport improvements 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.

Environmental Impact Summary

The Environmental Review Summary identified in **Table 6-7** summarizes the potential environmental impacts identified in the prior sections of this Chapter. This table is intended to give a general indication of the likely need for further environmental analysis. Additional environmental investigation is necessary to determine possible impacts associated with the improvement area.

At the appropriate time, the FAA would decide whether, and to what extent, any additional investigation would be performed. Based on findings of this environmental review, it is estimated that further environmental analysis is required for the proposed improvements.

Table 6-7 – Environmental Review Summary

NEPA Impact Category	Further Analysis Required
Air Quality	NO
Biological Resources	YES
Climate	NO
Coastal Resources	NO
Department of Transportation Act Section 4(f)	YES
Farmlands	YES
Floodplains	YES
Hazardous Materials, Pollution Prevention, and Solid Waste	YES
Historical and Cultural Resources	YES
Land Use	YES
Natural Resources and Energy Supply	NO
Noise and Noise-Compatible Land Use	YES
Socioeconomic Impacts and Environmental Justice	YES
Surface and Ground Water	YES
Visual Impacts	NO
Wetlands	YES
Wild and Scenic Rivers	NO

Source: KLJ Analysis, FAA Order 1050.1F, Environmental Impacts: Policies and Procedures

NEPA Environmental Review Process

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 should be avoided whenever possible, 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 extraordinary circumstances such as impacts to wetlands, historical properties, or floodplains. EA documentation required here includes a condensed or comprehensive environmental analysis of the proposed action and alternatives, and the anticipated impacts from the proposed action. Agency review and coordination of the proposed action and impacts 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. This document provides in-depth impact and cumulative analyses of all proposed alternatives. The document 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.

NEPA Documentation

Based on the preliminary environmental evaluation completed in this section and the anticipated 10-year projects in the implementation plan, **Table 6-8** has been prepared to document the anticipated environmental documentation necessary to proceed with the proposed actions. The ultimate decision on what documentation may be required for each proposed action will be determined by the FAA. All environmental reviews must be completed prior to initiating project design beyond 25 percent.

Table 6-8 – Environmental Documentation

Proposed Action(s)	Anticipated Environmental Documentation
Acquire Land for Runway 13 and Runway 18	Environmental Assessment*
Runway 13-31 Extension/Expansion	Environmental Assessment*
Wildlife Fence	Environmental Assessment
Regrade Crosswind Runway 18-36	Environmental Assessment
Construct Taxiways & Taxilanes	Simple CATEX
Construct Access Road/Parking Lot	Documented CATEX
Reconstruct/Construct Apron	Simple CATEX
Construct Fuel Facility	Documented CATEX
Remove Obstructions (Trim Trees)	Documented CATEX
Hangars	Simple CATEX
Airport Pavement Maintenance	Simple CATEX

*Source: KLJ Analysis; * Level III Cultural Resources Inventory and Aquatic Resource Delineation will be included*

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 does 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 general and flying public. 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 that there are no 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 grant project funding implications in certain situations. Building consistency between the recommendations in this study with 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 Wall Municipal Airport in identifying land use standards compatible 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 Airport, City of Wall, and Pennington County.

Roles and Responsibilities

AIRPORT SPONSOR

As the airport sponsor, the City of Wall, applies and receives federal grants. 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 which 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 needs of the flying public. Grant assurances 20 and 21 pertain to compatible land use around airports.

> **20. Hazard Removal and Mitigation.** It will take appropriate action to assure that such terminal airspace as is required to protect instrument and visual operations to the airport (including established minimum flight altitudes) will be adequately cleared and protected by removing, lowering, relocating, marking, or lighting or otherwise mitigating existing airport hazards and by preventing the establishment or creation of future airport hazards.
>
> **21. Compatible Land Use.** It will take appropriate action, to the extent reasonable, including the adoption of zoning laws, to restrict the use of land adjacent to or in the immediate vicinity of the airport to activities and purposes compatible with normal airport operations, including landing and takeoff of aircraft. In addition, if the project is for noise compatibility program implementation, it will not cause or permit any change in land use, within its jurisdiction, that will reduce its compatibility, with respect to the airport, of the noise compatibility program measures upon which Federal funds have been expended.

FAA 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 for the Wall Municipal Airport is the responsibility of the airport sponsor, the City of Wall.

FEDERAL AVIATION ADMINISTRATION

The FAA provides 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 grant assurances are a compliance mechanism to protect federal investments which stimulates diligence on the part of airport sponsors.

The FAA monitors all obligated airports to ensure they comply with the requirements of the grant assurances through its 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 airport sponsors must adhere to in order to obtain federal funding for airport improvements. In most cases, the most practical and cost-effective method for a sponsor to affect compatible land use outside of the airport's property is through zoning or easements rather than through land acquisition.

STATE OF SOUTH DAKOTA

South Dakota Codified Laws allow counties and cities of the state to enter into joint planning and zoning agreements. Municipalities may also exercise zoning powers within three miles of their corporate limits subject to county approval. There are no minimum land use development and airspace standards around airports. Additional State regulations and laws in place under Chapter 50-9 concern structures affecting aviation in South Dakota. Under Chapter 50-9-1, South Dakota Aeronautics Commission approval is required for any new or altered structure greater than 200 feet above the terrain, and for any new or altered structure within a 100:1 slope from the runway at a public airport with a runway length of 3,200 feet or greater.

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 enforces multi-jurisdictional airport zoning regulations for proposed development. For the Wall Municipal Airport, surrounding jurisdictions affected by the airport include the City of Wall and Pennington County.

Recommendations

Four key elements should be considered to achieve land use compatibility at any airport.

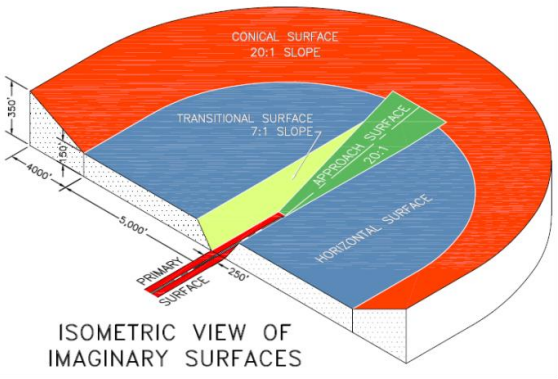
- Airspace
- Safety
- Noise
- Compliance

A general description of each element is provided based on criteria developed by the FAA and the State of South Dakota, if 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. 14 CFR Part 77, *Objects Affecting Navigable Airspace* 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.



ISOMETRIC VIEW OF IMAGINARY SURFACES

It is important to acknowledge that the FAA's role is limited to evaluating the aeronautical effects of proposed structures; the FAA has no legal authority to stop the construction of any proposed structure. However, FAA grant assurance obligations require sponsors to take reasonable action to prevent and remove hazards to air navigation.



The City of Wall has Zoning in place codified as Title 17 of the city code but there are no specific elements of the zoning related to the airport. The City does have avigation easements to protect the existing runway.

Recommendations

Recommendations to maintain airspace compatibility at Wall include:

- Identify any need for Zoning to protect the airport beyond avigation easements.
- Acquire avigation easements necessary to protect the future utility of Runway 13/31 and existing utility of Runway 18/36.
- Consider provisions in building codes to require FAA Form 7460-1 *Notice of Proposed Construction* to be submitted and reviewed by the Airport as part of the local building permit approval process.
- Follow through with clearing of obstructions identified in Airport Layout Plan.

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 compatible land use safety element is primarily 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*. This Master Plan has addressed the Runway Protection Zones in a manner acceptable to the FAA. This is addressed in detail in Appendix H – Runway Protection Zone Analysis.

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 150/5200-33, *Hazardous Wildlife Attractants On or Near Airports* to mitigate wildlife risks. A Wildlife Hazard Assessment (WHA) and Wildlife Hazard Management Plan (WHMP) is identified in the CIP. A deer-proof perimeter fence is also included in the CIP.

Recommendations

Recommendations to maintain safety compatibility at Wall include:

- Complete the WHA and WHMP.
- Enact the operational and project improvements recommended from the WHMP.

COMPLIANCE

Airports that receive FAA funds are subject to FAA grant assurances (obligations). Airport sponsors must adhere to these assurances 20 years from when the last FAA grant is accepted. Land identified for use as an airport is also subject to conditions. Currently, there are 39 grant assurances identified by FAA. FAA has published Order 5190.6B *Airport Compliance Manual* 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. Common airport compliance issues include non-aeronautical use of airport property, land releases, 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. All airport property is identified in the Exhibit "A"/Airport Property Map.

Non-aeronautical uses of airport property are only agricultural production.

Recommendations

Recommendations to address airport compliance at WALL include:

- Assure that revenue from airport land stays with the airport funds and is not income to any other City funds.

CHAPTER 7: AIRPORT LAYOUT PLAN

Background and Purpose

This Chapter presents the Airport Layout Plan (ALP) and associated drawings for the Wall Municipal Airport (6V4). The ALP drawing set graphically depicts the development of the airport proposed over the 20-year planning period and beyond. The ALP drawings reflect the culmination of the master planning process evaluating aviation demand, airside and landside facility needs, and options for development of airside and landside facilities. The preferred development plan is shown on the ALP drawings located at the end of this chapter. The rationale for preferred development and the public involvement process is documented in **Chapter 5: Alternatives Analysis**.

The ALP is intended to serve as the framework for future development and growth. All airport development must be done in accordance with an FAA-approved ALP. Proposed development must be shown on an approved ALP to be eligible for FAA Airport Improvement Program (AIP) grant funding. Projects must be justified based on safety, security, capacity, planning, environmental and infrastructure needs meeting FAA standards within the next five years to be eligible for AIP funding. Proper environmental approval must also be completed before proceeding to project implementation. More information is available in FAA Order 5100.38, AIP Handbook.

The ALP drawing set reflects airport design standards in accordance with the following documents:

- FAA AC 150/5070-6B, *Airport Master Plans* (Change 2)
- FAA AC 150/5300-13A, *Airport Design* (Change 1)
- FAA ARP SOP No. 2.00, Airport Layout Plan Review Checklist (October 2013)
- FAA ARP SOP No. 3.00, Exhibit 'A' Airport Property Map Review Checklist (October 2013)

These drawings will be submitted to the FAA and North Dakota Aeronautics Commission for their review and comment. FAA approval of the ALP indicates that the existing facilities and proposed development depicted on the ALP conforms to the FAA airport design standards in effect at the time of the approval. Approval indicates the FAA finds the proposed development to be safe and efficient.

The airport has an FAA grant assurance obligation to keep the ALP document current. Periodic "as-built" updates should be completed during the closeout of projects to update existing conditions. The Master Plan and accompanying ALP drawing set should be updated every 7 to 10 years at a commercial service airport to evaluate aviation needs and the development plans, or as needs change.

ALP Drawing Set

The ALP drawing set contains several sheets depicting the existing facilities, planned development, and other pertinent information concerning the airport. The following sections describe the specific elements found on each sheet with the ALP drawing set, along with significant changes from the previously approved Wall ALP (2010). Wall ALP drawings in this planning study include:

- Sheet 1: Title Sheet
- Sheet 2: Airport Data Sheet
- Sheet 3: Airport Layout Plan (Existing)
- Sheet 4: Airport Layout Plan (Ultimate)
- Sheet 5: Terminal Area Drawing
- Sheet 6: Inner Portion of the Approach Surface – Runway 12 (13) End (Existing & Ultimate)
- Sheet 7: Inner Portion of the Approach Surface – Runway 30 End (Existing)
- Sheet 8: Inner Portion of the Approach Surface – Runway 31 End (Ultimate)

- Sheet 9: 31 End Obstruction Area Details (1 of 2)
- Sheet 10: 31 End Obstruction Area Details (2 of 2)
- Sheet 11: Inner Portion of the Approach Surface – Runway 18-36
- Sheet 12: Part 77 Airspace Plan (Ultimate)
- Sheet 13: Runway Departure Surface
- Sheet 14: Land Use Plan
- Sheet Ex A1: Exhibit 'A' Airport Property Map
- Sheet Ex A2: Exhibit 'A' Airport Property Inventory Tables

Sheet 1: Title Sheet

The title sheet is an index to the ALP drawing set. It also provides pertinent information such as the airport sponsor, airport name, grant number the project is funded through, location and vicinity maps, revision numbers and the date the plan was completed.

Sheet 2: Airport Data Sheet

The data sheet provides technical information on airport facilities and design standards for the existing and future airport configurations. Elements include an airport data table and runway data table.

The data tables for this ALP depict existing and ultimate development for the airport. There are no existing or recommended modifications to standards for the ALP.

Sheets 3 & 4: Airport Layout Plan

The Airport Layout Drawing is a graphical depiction of the airport facilities and design standards. Existing conditions and future development phases are distinguished. The major development on the drawings include the following:

- Reclassify Runway 12-30 from B-II(Small)-Vis to B-II-5000
- Renumber Runway 12-30 to 13-31
- Expand Runway 12-30 to 4,418' x 75' as Runway 13-31
- Non-Precision approaches on Runways 13 and 31

Sheet 5: Terminal Area

The Terminal Area Plan drawing provides a large-scale view of areas with significant terminal facility development, so that features such as aprons, buildings, hangars, and parking lots are easily discernable. Dimensions are included to clearly depict clearance from objects.

Sheets 6 through 11: Inner Portion of the Approach Surface Drawings

This drawing provides plan and profile views of the portions of approach surfaces that are typically to a point on the approach slope 100 feet above the runway threshold elevation. Several approach surfaces are shown including FAR Part 77, FAA threshold siting, and glidepath qualification surface approach surfaces.

Roadways and railroads assume a standard mobile vehicle per Part 77 criteria. Standards include 10 feet for private roads, 15 feet for public roads, 17 feet for interstate highways and 25 feet for railroads. These heights are added to the ground elevation.

Sheet 12: Part 77 Airspace Plan

This drawing shows the FAR Part 77 Imaginary Surfaces for the ultimate layout of the Airport. The Part 77 surfaces are the basis for identifying obstructions to the airspace around an airport. The FAA determines if any of the obstructions to Part 77 surfaces are hazards to air navigation.

Part 77 defines five distinct surfaces, each with a different size and shape. The dimensions of these surfaces are based on the type of runway and the type of approach ultimately planned for the Airport. The imaginary surfaces are defined below.

Primary Surface - The primary surface is rectangular, is centered on the runway, extends 200 feet beyond a paved runway, and has a width that varies based on airport-specific criteria. The elevation of the primary surface corresponds to the elevation of the nearest point of the runway centerline.

The width of the existing primary surface of Runway 12-30 is 250 feet, which will expand in the future to 500 feet when an approach not lower than ¾ mile is implemented. The width of the Runway 18-36 primary surface remains at 250 feet for a visual utility runway.

Approach Surface - Each runway end has an approach surface. The approach surface is centered on the extended runway centerline, starts at the end of the primary surface, and has a width equal to that of the primary surface. Approach surfaces slope upward and outward from the runway ends.

The ultimate planned approach surfaces at the Airport reflect a non-precision instrument approach (1 mile) for Runway 13 and 31. The approach surface to has an inner width of 500 feet, extends outward 10,000 feet to an outer width of 3,500 feet, and rises at a slope of 34:1.

The approach surface to Runway 18-36 will remain visual utility, with an inner approach surface width of 250 feet, extending outward 5,000 feet to an outer width of 1,250 feet, and rises at a slope of 20:1.

Transitional Surface - The transitional surface is a sloping 7:1 surface that extends outward and upward at right angles to the runway centerline from the sides of the primary surface and from the sides of the approach surfaces.

Horizontal Surface - The horizontal surface is a flat, elliptical surface at 2,693' AMSL, which is an elevation 150 feet above the established airport elevation. The extent of the horizontal surface is determined by swinging arcs of a 10,000-foot radius from the center of each end of the primary surface for other-than-utility runways.

Conical Surface - The conical surface extends outward and upward from the horizontal surface at a slope of 20:1 for a horizontal distance of 4,000 feet. The conical surface rises to a maximum elevation of 3163' AMSL.

The obstacle data is based on an aeronautical survey performed in September and December 2016 as part of this study.

Sheet 13: Runway Departure Surface

The Runway Departure Surface Drawing depicts the plan and profile views of runways with instrument departure procedures. Each departure surface at the Airport begins at the departure end of the runway at a width of 1,000 feet, extends outward 10,200 feet to an outer width of 6,466 feet, and slopes up at 40:1.

The departure surface applies to the ultimate runway end locations for Runway 13-31. Runway 18-36 is exempt as it is not designated for instrument departures. In general, no new vertical development penetrating the FAA departure surface is allowed. There are several FAA Departure Surface obstruction points with action recommended of adding obstruction lights.

Sheet 14: Land Use Plan

The Airport Land Use Drawing depicts both on- and off-airport land uses and zoning in the area around the airport. Land uses around airports should be compatible with airport operations. The airport should enact zoning to control land uses from incompatibility activities. Examples of land use compatibility issues at airports include:

- Aircraft Noise
- Nearby Lighting
- Glare, Smoke, and Dust Emissions
- Wildlife Attractions and Landfills
- Airspace Obstructions
- Electromagnetic Interference
- Concentrations of People
- Structures Near Runway Ends

Sheets Ex A1 & Ex A2: Airport Property Map / Exhibit 'A'

These sheets serve as an Airport Property Map and Exhibit 'A'. The Exhibit 'A' is a snapshot of the inventory of parcels that make up dedicated airport property. The Exhibit 'A' provides boundary information on airport property interests and encumbrances upon airport property. Detailed information is provided on airport property interests, released, or sold property, recorded or unrecorded encumbrances. All land shown on an Exhibit 'A' constitutes the airport property federally obligated for compliance. The airport property map builds upon the Exhibit 'A' information by depicting property to be acquired to support the future and ultimate development of the airport. The property map and tables are depicted on separate sheets for clarity. A separate booklet has been prepared containing property documentation.

The existing Airport encompasses 157.01 acres owned in fee and 33.45 acres of property controlled through clear zone easements. It is currently proposed that an additional 46.2 acres in fee and 21.51 acres in easement are needed to accommodate the ultimate build-out of the Airport. Ultimate property acquisition is shown to cover aeronautical expansion, FAA Runway Protection Zone, Building Restriction Line, and navigational aid protection areas.

APPENDIX A: GLOSSARY OF TERMS

Introduction

Combing the extremely technical language of airports and aviation with the bureaucratic language of government organizations can create a myriad of unusual words and term. In addition, this combination of technical language and "governmentese" often results in many short-hand phrases or acronyms. This appendix discusses many of the terms used throughout the master plan as well as many of the acronyms used.

Glossary of Terms

ABOVE GROUND LEVEL (AGL): The elevation of a point or surface above the ground.

ACCELERATE-STOP DISTANCE AVAILABLE (ASDA): See declared distances.

ADVISORY CIRCULAR: External publications issued by the FAA consisting of non-regulatory material providing for the recommendations relative to a policy, guidance, and information relative to a specific aviation subject. However, the recommendations in these publications are considered mandatory requirements for airports that have received federal grants.

AIR CARRIER: An operator which: (1) performs at least five round trips per week between two or more points and publishes flight schedules which specify the times, days of the week, and places between which such flights are performed; or (2) transports mail by air pursuant to a current contract with the U.S. Postal Service. Certified in accordance with Federal Aviation Regulation (FAR) Parts 121 and 127.

AIRCRAFT OPERATION: The landing, takeoff, or touch-and-go procedure by an aircraft on a runway at an airport.

AIRCRAFT OPERATIONS AREA (AOA): A restricted and secure area on the airport property designed to protect all aspects related to aircraft operations.

AIRCRAFT OWNERS AND PILOTS ASSOCIATION (AOPA): A private organization serving the interests and needs of general aviation pilots and aircraft owners.

AIRCRAFT APPROACH CATEGORY (AAC): A grouping of aircraft based on 1.3 times the stall speed in their landing configuration at their maximum certificated landing weight. The categories are as follows:

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

AIRCRAFT RESCUE AND FIRE FIGHTING (ARFF): A service and facility located at an airport that provides emergency vehicles, extinguishing agents, and personnel responsible for minimizing the impacts of an aircraft accident or incident.

AIRFIELD: The portion of an airport which contains the facilities necessary for the operation of aircraft.

AIRLINE HUB: A categorization of commercial service airports or group of commercial service airports in a metropolitan or urban area based upon the proportion of annual national enplanements existing at the airport or airports. The categories are large hub, medium hub, small

hub, or non-hub. It forms the basis for the apportionment of entitlement funds.

AIRPLANE DESIGN GROUP (ADG): A grouping of aircraft based upon wingspan. The groups are as follows:

- Group I: Up to but not including 49 feet.
- Group II: 49 feet up to but not including 79 feet.
- Group III: 79 feet up to but not including 118 feet.
- Group IV: 118 feet up to but not including 171 feet.
- Group V: 171 feet up to but not including 214 feet.
- Group VI: 214 feet or greater.

AIRPORT AUTHORITY: A quasi-governmental public organization responsible for setting the policies governing the management and operation of an airport or system of airports under its jurisdiction.

AIRPORT BEACON: A navigational aid located at an airport which displays a rotating light beam to identify the type of airport.

AIRPORT CAPITAL IMPROVEMENT PLAN (ACIP): The planning program used by the Federal Aviation Administration to identify, prioritize, and distribute funds for airport development and the needs of the National Airspace System to meet specified national goals and objectives.

AIRPORT ELEVATION: The highest point on the runway system at an airport expressed in feet above mean sea level (MSL).

Airport Improvement Program (AIP): A program created under the Airport and Airway Improvement Act of 1982 to provide funding for airport planning and development.

AIRPORT LAYOUT PLAN (ALP): The drawing of the airport showing boundaries and proposed additions to all areas owned or controlled by the sponsor for airport purposes, the location and nature of existing and proposed airport facilities and structures, and the location on the airport of existing and proposed non-aviation areas and improvements thereto.

AIRPORT MASTER PLAN: A long-range plan for the development of an airport, including descriptions of the data and analyses on which the plan is based.

AIRPORT MOVEMENT AREA SAFETY SYSTEM (AMASS): A system that provides automated alerts and warnings of potential runway incursions or other hazardous aircraft movement events.

AIRPORT OBSTRUCTION CHART: A scaled drawing depicting the Federal Aviation Regulation (FAR) Part 77 surfaces, a representation of objects that penetrate these surfaces, runway, taxiway, and ramp areas, navigational aids, buildings, roads and other details in the vicinity of an airport.

AIRPORT REFERENCE CODE (ARC): A coding system used to relate airport design criteria to the operational (Aircraft Approach Category) to the physical characteristics (Airplane Design Group) of the airplanes intended to operate at the airport.

AIRPORT REFERENCE POINT (ARP): The latitude and longitude of the approximate center of the airport.

AIRPORT SPONSOR: The entity that is legally responsible for the management and operation of an airport, including the fulfillment of the requirements of laws and regulations related thereto.

AIRPORT SURFACE DETECTION EQUIPMENT (ASDE): A radar system that provides air traffic controllers with a visual representation of the movement of aircraft and other vehicles on the ground on the airfield at an airport.

AIRPORT SURVEILLANCE RADAR (ASR): The primary radar located at an airport or in an air traffic control terminal area that receives a signal at an antenna and transmits the signal to air traffic control display equipment defining the location of aircraft in the air. The signal provides only the azimuth and range of aircraft from the location of the antenna.

AIRPORT TRAFFIC CONTROL TOWER (ATCT): A central operations facility in the terminal air traffic control system, consisting of a tower, including an associated instrument flight rule (IFR) room if radar equipped, using air/ground

communications and/or radar, visual signaling and other devices to provide safe and expeditious movement of terminal air traffic.

AIRPORTS GEOGRAPHIC INFORMATION SYSTEM (AIRPORTS GIS or AGIS): Used by the FAA to collect airport and aeronautical data to support NextGen. AGIS provides standards for surveying and data collection to assist the FAA in the development of instrument approaches as well as providing the basis for electronic ALPs (eALP).

AIR ROUTE TRAFFIC CONTROL CENTER (ARTCC): A facility established to provide air traffic control service to aircraft operating on an IFR flight plan within controlled airspace and principally during the enroute phase of flight.

AIRSIDE: The portion of an airport that contains the facilities necessary for the operation of aircraft.

AIRSPACE: The volume of space above the surface of the ground that is provided for the operation of aircraft.

AIR TAXI: An air carrier certificated in accordance with FAR Part 121 and FAR Part 135 and authorized to provide, on demand, public transportation of persons and property by aircraft. Generally operates small aircraft "for hire" for specific trips.

AIR TRAFFIC CONTROL (ATC): A service operated by an appropriate organization for the purpose of providing for the safe, orderly, and expeditious flow of air traffic.

AIR TRANSPORT ASSOCIATION OF AMERICA (ATA): An organization consisting of the principal U.S. airlines that represents the interests of the airline industry on major aviation issues before federal, state, and local government bodies. It promotes air transportation safety by coordinating industry and governmental safety programs and it serves as a focal point for industry efforts to standardize practices and enhance the efficiency of the air transportation system.

ALERT AREA: See special-use airspace.

ALTITUDE: The vertical distance measured in feet above mean sea level or above ground level.

APPROACH LIGHTING SYSTEM (ALS): An airport lighting facility which provides visual guidance to landing aircraft by radiating light beams by which the pilot aligns the aircraft with the extended centerline of the runway on his final approach and landing.

APPROACH MINIMUMS: The altitude below which an aircraft may not descend while on an IFR approach unless the pilot has the runway in sight.

APPROACH SURFACE: An imaginary obstruction limiting surface defined in FAR Part 77 which is longitudinally centered on an extended runway centerline and extends outward and upward from the primary surface at each end of a runway at a designated slope and distance based upon the type of available or planned approach by aircraft to a runway.

APRON: A specified portion of the airfield used for passenger, cargo or freight loading and unloading, aircraft parking, and the refueling, maintenance and servicing of aircraft.

AREA NAVIGATION (RNAV): The air navigation procedure that provides the capability to establish and maintain a flight path on an arbitrary course that remains within the coverage area of navigational sources being used.

AUTOMATED TERMINAL INFORMATION SERVICE (ATIS): The continuous broadcast of recorded non-control information at towered airports. Information typically includes wind speed, direction, and runway in use.

AUTOMATED SURFACE OBSERVATION SYSTEM (ASOS): A reporting system that provides frequent airport ground surface weather observation data through digitized voice broadcasts and printed reports.

AUTOMATED WEATHER OBSERVATION STATION (AWOS): Equipment used to automatically record weather conditions (i.e. cloud height, visibility, wind speed and direction, temperature, dew point, etc.)

AUTOMATIC DEPENDENT SURVEILLANCE – BROADCAST (ADS-B): A major component of the FAA's NextGen system, where aircraft equipped with GPS receivers can transmit their location and

altitude to other nearby aircraft and to air traffic control.

AUTOMATIC DIRECTION FINDER (ADF): An aircraft radio navigation system which senses and indicates the direction to a non-directional radio beacon (NDB) ground transmitter.

AVIGATION EASEMENT: A contractual right or a property interest in land over which a right of unobstructed flight in the airspace is established.

AZIMUTH: Horizontal direction expressed as the angular distance between true north and the direction of a fixed point (as the observer's heading).

BASE LEG: A flight path at right angles to the landing runway off its approach end. The base leg normally extends from the down-wind leg to the intersection of the extended runway centerline. See "traffic pattern."

BASED AIRCRAFT: The total number of active general aviation aircraft that use or may be expected to use a specific airport as a home base.

BEARING: The horizontal direction to or from any point, usually measured clockwise from true north or magnetic north.

BLAST FENCE: A barrier used to divert or dissipate jet blast or propeller wash.

BLAST PAD: A prepared surface adjacent to the end of a runway for the purpose of eliminating the erosion of the ground surface by the wind forces produced by airplanes at the initiation of takeoff operations.

BUILDING RESTRICTION LINE (BRL): A line on an airport layout plan beyond which airport buildings must not be position in order to limit their proximity to aircraft movement areas.

CAPITAL IMPROVEMENT PLAN (CIP): A program for the design and construction of airport improvements necessary to accommodate the operational and passenger levels of the airport.

CARGO SERVICE AIRPORT: An airport served by aircraft providing air transportation of property only, including mail, with an annual aggregate landed weight of at least 100,000,000 pounds.

CATEGORY I ILS: An Instrument Landing System (ILS) that provides acceptable guidance information to an aircraft from the coverage limits of the ILS to the point at which the localizer course line intersects the glide path at a decision height of 100 feet above the horizontal plane containing the runway threshold.

CATEGORY II ILS: An ILS that provides acceptable guidance information to an aircraft from the coverage limits of the ILS to the point at which the localizer course line intersects the glide path at a decision height of 50 feet above the horizontal plane containing the runway threshold.

CATEGORY III ILS: An ILS that provides acceptable guidance information to a pilot from the coverage limits of the ILS with no decision height specified above the horizontal plane containing the runway threshold.

CEILING: The height above the ground surface to the location of the lowest layer of clouds which is reported as either broken or overcast.

CIRCLING APPROACH: A maneuver initiated by the pilot to align the aircraft with the runway for landing when flying a predetermined circling instrument approach under IFR.

CLASS A AIRSPACE: See Controlled Airspace

CLASS B AIRSPACE: See Controlled Airspace.

CLASS C AIRSPACE: See Controlled Airspace.

CLASS D AIRSPACE: See Controlled Airspace.

CLASS E AIRSPACE: See Controlled Airspace.

CLASS G AIRSPACE: See Controlled Airspace.

CLEAR ZONE: See Runway Protection Zone.

COMMERCIAL SERVICE AIRPORT: A public airport providing scheduled passenger service that enplanes at least 2,500 annual passengers.

COMMON TRAFFIC ADVISORY FREQUENCY (CTAF): A radio frequency identified in the appropriate aeronautical chart which is designated for the purpose of transmitting airport advisory information and procedures while operating to or from an uncontrolled airport.

COMPASS LOCATOR (LOM): A low power, low/medium frequency radio-beacon installed in conjunction with the instrument landing system at one or two of the marker sites.

CONICAL SURFACE: An imaginary obstruction-limiting surface defined in FAR Part 77 that extends from the edge of the horizontal surface outward and upward at a slope of 20 to 1 for a horizontal distance of 4,000 feet.

CONTROLLED AIRPORT: An airport that has an operating airport traffic control tower.

CONTROLLED AIRSPACE: Airspace of defined dimensions within which air traffic control services are provided to instrument flight rules (IFR) and visual flight rules (VFR) flights in accordance with the airspace classification. Controlled airspace in the United States is designated as follows:

• **CLASS A**: Generally, the airspace from 18,000 feet mean sea level (MSL) up to but not including flight level FL600. All persons must operate their aircraft under IFR.

• **CLASS B**: Generally, the airspace from the surface to 10,000 feet MSL surrounding the nation's busiest airports. The configuration of Class B airspace is unique to each airport, but typically consists of two or more layers of air space and is designed to contain all published instrument approach procedures to the airport. An air traffic control clearance is required for all aircraft to operate in the area.

• **CLASS C**: Generally, the airspace from the surface to 4,000 feet above the airport elevation (charted as MSL) surrounding those airports that have an operational control tower and radar approach control and are served by a qualifying number of IFR operations or passenger enplanements. Although individually tailored for each airport, Class C airspace typically consists of a surface area with a five nautical mile (nm) radius and an outer area with a 10 nautical mile radius that extends from 1,200 feet to 4,000 feet above the airport elevation. Two-way radio communication is required for all aircraft.

• **CLASS D**: Generally, that airspace from the surface to 2,500 feet above the airport elevation (charted as MSL) surrounding those airports that have an operational control tower. Class D airspace is individually tailored and configured to encompass published instrument approach procedures. Unless otherwise authorized, all persons must establish two-way radio communication.

• **CLASS E**: Generally, controlled airspace that is not classified as Class A, B, C, or D. Class E airspace extends upward from either the surface or a designated altitude to the overlying or adjacent controlled airspace. When designated as a surface area, the airspace will be configured to contain all instrument procedures. Class E airspace encompasses all Victor Airways. Only aircraft following instrument flight rules are required to establish two-way radio communication with air traffic control.

• **CLASS G**: Generally, that airspace not classified as Class A, B, C, D, or E. Class G airspace is uncontrolled for all aircraft. Class G airspace extends from the surface to the overlying Class E airspace.

CONTROLLED FIRING AREA: See special-use airspace

CROSSWIND: A wind that is not parallel to a runway centerline or to the intended flight path of an aircraft.

CROSSWIND COMPONENT: The component of wind that is at a right angle to the runway centerline or the intended flight path of an aircraft.

CROSSWIND LEG: A flight path at right angles to the landing runway off its upwind end. See "traffic pattern."

DECIBEL: A unit of noise representing a level relative to a reference of a sound pressure of 20 micronewtons per square meter.

DECISION HEIGHT: The height above the end of the runway surface at which a decision must be made by a pilot during the ILS or Precision Approach Radar approach to either continue the approach or to execute a missed approach.

DECLARED DISTANCES: The distances declared available for the airplane's takeoff runway, takeoff distance, accelerate-stop distance, and landing distance requirements. The distances are:

- **TAKEOFF RUNWAY AVAILABLE (TORA)**: The runway length declared available and suitable for the ground run of an airplane taking off;

- **TAKEOFF DISTANCE AVAILABLE (TODA)**: The TORA plus the length of any remaining runway and/or clearway beyond the far end of the TORA;

- **ACCELERATE-STOP DISTANCE AVAILABLE (ASDA)**: The runway plus stopway length declared available for the acceleration and deceleration of an aircraft aborting a takeoff; and

- **LANDING DISTANCE AVAILABLE (LDA)**: The runway length declared available and suitable for landing.

DEPARTMENT OF TRANSPORTATION (DOT): The cabinet-level federal government organization consisting of modal operating agencies, such as the Federal Aviation Administration, which was established to promote the coordination of federal transportation programs and to act as a focal point for research and development efforts in transportation.

DISCRETIONARY FUNDS: Federal grant funds that may be appropriated to an airport based upon designation by the Secretary of Transportation or Congress to meet a specified national priority such as enhancing capacity, safety, and security, or mitigating noise.

DISPLACED THRESHOLD: A threshold that is located at a point on the runway other than the designated beginning of the runway.

DISTANCE MEASURING EQUIPMENT (DME): Equipment (airborne and ground) used to measure, in nautical miles, the slant range distance of an aircraft from the DME navigational aid.

DNL: The 24-hour average sound level, in A-weighted decibels, obtained after the addition of ten decibels to sound levels for the periods between 10 PM and 7 AM as averaged over a span of one year. It is the FAA standard metric for determining the cumulative exposure of individuals to noise.

DOWNWIND LEG: A flight path parallel to the landing runway in the direction opposite to landing. The downwind leg normally extends between the crosswind leg and the base leg. Also see "traffic pattern."

EASEMENT: The legal right of one party to use a portion of the total rights in real estate owned by another party. This may include the right of passage over, on, or below the property; certain air rights above the property, including view rights; and the rights to any specified form of development or activity, as well as any other legal rights in the property that may be specified in the easement document.

ELEVATION: The vertical distance measured in feet above mean sea level.

ENROUTE: The portion of a flight between departure and arrival terminal areas.

ENPLANED PASSENGERS: The total number of revenue passengers boarding aircraft, including originating, stop-over, and transfer passengers, in scheduled and non-scheduled services.

ENPLANEMENT: The boarding of a passenger, cargo, freight, or mail on an aircraft at an airport.

ENTITLEMENT: Federal funds for which a commercial service airport may be eligible based upon its annual passenger enplanements.

ENVIRONMENTAL ASSESSMENT (EA): An environmental analysis performed pursuant to the National Environmental Policy Act to determine whether an action would significantly affect the environment and thus require a more detailed environmental impact statement.

ENVIRONMENTAL AUDIT: An assessment of the current status of a party's compliance with applicable environmental requirements of an authority's environmental compliance policies, practices, and controls.

ENVIRONMENTAL IMPACT STATEMENT (EIS): A document required of federal agencies by the National Environmental Policy Act for major projects or legislative proposals affecting the environment. It is a tool for decision-making describing the positive and negative effects of a proposed action and citing alternative actions.

ESSENTIAL AIR SERVICE (EAS): A federal program which guarantees air carrier service to selected small cities by providing subsidies as needed to prevent these cities from losing such service.

FEDERAL AVIATION REGULATIONS (FAR): The general and permanent rules established by the executive departments and agencies of the Federal Government for aviation, which are published in the Federal Register. These are the aviation subset of the Code of Federal Regulations.

FINAL APPROACH: A flight path in the direction of landing along the extended runway centerline. The final approach normally extends from the base leg to the runway. See "traffic pattern."

FINDING OF NO SIGNIFICANT IMPACT (FONSI): A public document prepared by a Federal agency that presents the rationale why a proposed action will not have a significant effect on the environment and for which an environmental impact statement will not be prepared.

FIXED BASE OPERATOR (FBO): A provider of services to users of an airport. Such services include, but are not limited to, aircraft storage, fueling, flight training, repair, and maintenance.

FLIGHT LEVEL: A designation for altitude within controlled airspace.

FLIGHT SERVICE STATION (FSS): An operations facility in the national flight advisory system which utilizes data interchange facilities for the collection and dissemination of Notices to Airmen, weather, and administrative data and which provides pre-flight and in-flight advisory services to pilots through air and ground based communication facilities.

FRANGIBLE NAVAID: A navigational aid which retains its structural integrity and stiffness up to a designated maximum load, but on impact from a greater load, breaks, distorts, or yields in such a manner as to present the minimum hazard to aircraft.

GENERAL AVIATION: That portion of civil aviation which encompasses all facets of aviation except commercial or military aircraft.

GLIDESLOPE (GS): An electronic component of an ILS system that emits signals which provide vertical guidance by reference to airborne instruments during instrument approaches Provides vertical guidance for aircraft during approach and landing.

GLOBAL POSITIONING SYSTEM (GPS): A system of 24 satellites used as reference points to enable navigators equipped with GPS receivers to determine their latitude, longitude, and altitude.

GROUND ACCESS: The transportation system on and around the airport that provides access to and from the airport by ground transportation vehicles for passengers, employees, cargo freight, and airport services.

HELIPAD: A designated area for the takeoff, landing, and parking of helicopters.

HIGH INTENSITY RUNWAY LIGHTS (HIRL): The highest classification in terms of intensity or brightness for lights designated for use in delineating the sides of a runway.

HIGH-SPEED EXIT TAXIWAY: A long radius taxiway designed to expedite aircraft turning off the runway after landing (at speeds up to 60 knots), thus reducing runway occupancy time.

HORIZONTAL SURFACE: An imaginary obstruction-limiting surface defined in FAR Part 77 that is specified as a portion of a horizontal plane surrounding a runway located 150 feet above the established airport elevation. The specific horizontal dimensions of this surface are a function of the

types of approaches existing or planned for the runway.

INSTRUMENT APPROACH: An approach to an airport with the intent to land by an aircraft in accordance with an IFR flight plan when visibility is less than three miles and/or when the ceiling is at or below the minimum initial approach altitude.

INSTRUMENT APPROACH PROCEDURE (IAP): A series of predetermined maneuvers for the orderly transfer of an aircraft under instrument flight conditions from the beginning of the initial approach to a landing, or to a point from which a landing may be made visually.

INSTRUMENT FLIGHT RULES (IFR): Procedures for the conduct of flight in weather conditions below Visual Flight Rules weather minimums. The term IFR is often also used to define weather conditions and the type of flight plan under which an aircraft is operating.

INSTRUMENT LANDING SYSTEM (ILS): A precision instrument approach system which normally consists of the following electronic components and visual aids:

1. Localizer.
2. Glide Slope
3. Outer Marker
4. Middle Marker
5. Approach lights

INSTRUMENT METEOROLOGICAL CONDITIONS (IMC): Meteorological conditions expressed in terms of specific visibility and ceiling conditions that are less than the minimums specified for visual meteorological conditions.

ITINERANT OPERATIONS: Arrivals and departures by aircraft to or from an area greater than 20 miles from the airport.

KNOTS: A unit of speed used in navigation that is equivalent to the number of nautical miles traveled in one hour.

LAND AND HOLD SHORT OPERATIONS (LAHSO): An air traffic control procedure intended to increase airport capacity without compromising safety that allows pilots to land and hold short of an intersecting runway, an intersecting taxiway, or some other designated point on a runway.

LANDSIDE: The portion of an airport that provides the facilities necessary for the processing of passengers, cargo, freight, and ground transportation vehicles.

LANDING DISTANCE AVAILABLE (LDA): See declared distances.

LARGE AIRPLANE: An airplane that has a maximum certified takeoff weight in excess of 12,500 pounds.

LOCAL AREA AUGMENTATION SYSTEM (LAAS): A differential GPS system that provides localized measurement correction signals to the basic GPS signals to improve navigational accuracy, integrity, continuity, and availability.

LOCAL OPERATIONS: Aircraft operations performed by aircraft that are based at the airport and that operate in the local traffic pattern or within sight of the airport, that are known to be departing for or arriving from flights in local practice areas within a prescribed distance from the airport, or that execute simulated instrument approaches at the airport.

LOCAL TRAFFIC: Aircraft operating in the traffic pattern or within sight of the tower, or aircraft known to be departing or arriving from the local practice areas, or aircraft executing practice instrument approach procedures. Typically, this includes touch-and-go training operations.

LOCALIZER (LOC): The component of an ILS which provides course guidance to the runway.

LOCALIZER TYPE DIRECTIONAL AID (LDA): A facility of comparable utility and accuracy to a localizer, but is not part of a complete ILS and is not aligned with the runway.

LOCALIZER PERFORMANCE WITH VERTICAL GUIDANCE (LPV): A Global Positioning System (GPS) runway instrument approach procedure providing horizontal and vertical guidance. Accuracy levels are 16 meters horizontally and 20 meters vertically.

LOW INTENSITY RUNWAY LIGHTS (LIRL): The lowest classification in terms of intensity or

brightness for lights designated for use in delineating the sides of a runway.

MEDIUM INTENSITY RUNWAY LIGHTS MIRL: The middle classification in terms of intensity or brightness for lights designated for use in delineating the sides of a runway.

MICROWAVE LANDING SYSTEM (MLS): An instrument approach and landing system that provides precision guidance in azimuth, elevation, and distance measurement.

MILITARY OPERATIONS: Aircraft operations that are performed in military aircraft.

MILITARY OPERATIONS AREA (MOA): See special-use airspace.

MILITARY TRAINING ROUTE: An air route depicted on aeronautical charts for the conduct of military flight training at speeds above 250 knots.

MISSED APPROACH COURSE (MAC): The flight route to be followed if, after an instrument approach, a landing is not affected, and occurring normally:

1. When the aircraft has descended to the decision height and has not established visual contact; or
2. When directed by air traffic control to pull up or to go around again.

MOVEMENT AREA: The runways, taxiways, and other areas of an airport which are utilized for taxiing/hover taxiing, air taxiing, takeoff, and landing of aircraft, exclusive of loading ramps and parking areas. At those airports with an airport traffic control tower, air traffic control clearance is required for entry onto the movement area.

NATIONAL AIRSPACE SYSTEM (NAS): The network of air traffic control facilities, air traffic control areas, and navigational facilities through the U.S.

NATIONAL PLAN OF INTEGRATED AIRPORT SYSTEMS (NPIAS): The national airport system plan developed by the Secretary of Transportation on a biannual basis for the development of public use airports to meet national air transportation needs.

NATIONAL TRANSPORTATION SAFETY BOARD (NTSB): A federal government organization established to investigate and determine the probable cause of transportation accidents, to recommend equipment and procedures to enhance transportation safety, and to review on appeal the suspension or revocation of any certificates or licenses issued by the Secretary of Transportation.

NAUTICAL MILE: A unit of length used in navigation which is equivalent to the distance spanned by one minute of arc in latitude, that is, 1,852 meters or 6,076 feet. It is equivalent to approximately 1.15 statute mile.

NAVIGATIONAL AID (NAVAID): A term used to describe any electrical or visual air navigational aids, lights, signs, and associated supporting equipment (e.g., PAPI, VASI, ILS, etc.).

NEXT GENERATION AIR TRANSPORTATION SYSTEM (NextGen): An umbrella term for the FAA's ongoing transformation for the National Airspace System from a ground-based system of air traffic control to a satellite-based system of air traffic management.

NOISE CONTOUR: A continuous line on a map of the airport vicinity connecting all points of the same noise exposure level.

NON-DIRECTIONAL BEACON (NDB): A beacon transmitting nondirectional signals whereby the pilot of an aircraft equipped with direction finding equipment can determine his or her bearing to and from the radio beacon and home on, or track to, the station. When the radio beacon is installed in conjunction with the Instrument Landing System marker, it is normally called a Compass Locator.

NON-PRECISION APPROACH PROCEDURE: A standard instrument approach procedure in which horizontal but no vertical course guidance is provided, such as VOR, TACAN, NDB, or LOC.

NOTICE TO AIRMEN (NOTAM): A notice containing information concerning the establishment, condition, or change in any component of or hazard in the National Airspace System, the timely knowledge of which is considered essential to personnel concerned with flight operations.

OBJECT FREE AREA (OFA): An area on the ground centered on a runway, taxiway, or taxilane centerline provided to enhance the safety of aircraft operations by having the area free of objects, except for objects that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes.

OBSTACLE FREE ZONE (OFZ): The airspace below 150 feet above the established airport elevation and along the runway and extended runway centerline that is required to be kept clear of all objects, except for frangible visual NAVAIDs that need to be located in the OFZ because of their function, in order to provide clearance for aircraft landing or taking off from the runway, and for missed approaches.

OPERATION: A take-off or a landing.

OUTER MARKER (OM): An ILS navigation facility in the terminal area navigation system located four to seven miles from the runway edge on the extended centerline, indicating to the pilot that he/she is passing over the facility and can begin final approach.

PILOT CONTROLLED LIGHTING: Runway lighting systems at an airport that are controlled by activating the microphone of a pilot on a specified radio frequency.

PRECISION APPROACH: A standard instrument approach procedure which provides runway alignment and glide slope (descent) information. It is categorized as follows:

- **CATEGORY I (CAT I):** A precision approach which provides for approaches with a decision height of not less than 200 feet and visibility not less than 1/2 mile or Runway Visual Range (RVR) 2400 (RVR 1800) with operative touchdown zone and runway centerline lights.
- **CATEGORY II (CAT II):** A precision approach which provides for approaches with a decision height of not less than 100 feet and visibility not less than 1200 feet RVR.
- **CATEGORY III (CAT III):** A precision approach which provides for approaches with minima less than Category II.

PRECISION APPROACH PATH INDICATOR (PAPI): A lighting system providing visual approach slope guidance to aircraft during a landing approach. It is similar to a VASI but provides a sharper transition between the colored indicator lights.

PRECISION APPROACH RADAR (PAR): A radar facility in the terminal air traffic control system used to detect and display with a high degree of accuracy the direction, range, and elevation of an aircraft on the final approach to a runway.

PRECISION OBJECT FREE AREA (POFA): An area centered on the extended runway centerline, beginning at the runway threshold and extending behind the runway threshold that is 200 feet long by 800 feet wide. The POFA is a clearing standard which requires the POFA to be kept clear of above ground objects protruding above the runway safety area edge elevation (except for frangible NAVAIDS). The POFA applies to all new authorized instrument approach procedures with less than 3/4 mile visibility.

PRIMARY AIRPORT: A commercial service airport that enplanes at least 10,000 annual passengers.

PRIMARY SURFACE: An imaginary obstruction limiting surface defined in FAR Part 77 that is specified as a rectangular surface longitudinally centered about a runway. The specific dimensions of this surface are a function of the types of approaches existing or planned for the runway.

PROHIBITED AREA: See special-use airspace.

PVC: Poor visibility and ceiling. Used in determining Annual Service Volume. PVC conditions exist when the cloud ceiling is less than 500 feet and visibility is less than one mile.

RADIAL: A navigational signal generated by a Very High Frequency Omni-directional Range (VOR) station that is measured as an azimuth from the station.

REGRESSION ANALYSIS: A statistical technique that seeks to identify and quantify the relationships between factors associated with a forecast.

REMOTE COMMUNICATIONS OUTLET (RCO): An unstaffed transmitter receiver/facility remotely controlled by air traffic personnel. RCOs serve flight service stations (FSSs).

RCOs were established to provide ground-to-ground communications between air traffic control specialists and pilots at satellite airports for delivering enroute clearances, issuing departure authorizations, and acknowledging instrument flight rules cancellations or departure/landing times.

REMOTE TRANSMITTER/RECEIVER (RTR): See remote communications outlet. RTRs serve ATCTs.

RELIEVER AIRPORT: An airport that serves general aviation aircraft which might otherwise use a congested air-carrier airport.

REQUIRED NAVIGATION PERFORMANCE (RNP): A type of performance-based navigation that allow an aircraft to fly a specific path between two 3D-defined points, fundamentally similar to RNAV. An RNP specification requires on-board navigation performance monitoring and alerting; an RNAV specification does not.

RESTRICTED AREA: See special-use airspace.

RNAV: Area navigation: airborne equipment which permits flights over determined tracks within prescribed accuracy tolerances with-out the need to over-fly ground-based navigation facilities. Used enroute and for approaches to an airport.

RUNWAY: A defined rectangular area on an airport prepared for aircraft landing and takeoff. Runways are normally numbered in relation to their magnetic direction, rounded off to the nearest 10 degrees. For example, a runway with a magnetic heading of 180 would be designated Runway 18. The runway heading on the opposite end of the runway is 180 degrees from that runway end. For example, the opposite runway heading for Runway 18 would be Runway 36 (magnetic heading of 360). Aircraft can takeoff or land from either end of a runway, depending upon wind direction.

RUNWAY ALIGNMENT INDICATOR LIGHT (RAIL): A series of high intensity sequentially flashing lights installed on the extended centerline of the runway usually in conjunction with an approach lighting system.

RUNWAY END IDENTIFIER LIGHTS (REIL): Two synchronized flashing lights, one on each side of the runway threshold, which provide rapid and positive identification of the approach end of a particular runway.

RUNWAY GRADIENT: The average slope, measured in percent, between the two ends of a runway.

RUNWAY PROTECTION ZONE (RPZ): An area off the runway end to enhance the protection of people and property on the ground. The RPZ is trapezoidal in shape. Its dimensions are determined by the aircraft approach speed and runway approach type and minima.

RUNWAY SAFETY AREA (RSA): A defined surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway.

RUNWAY VISIBILITY ZONE (RVZ): An area on the airport to be kept clear of permanent objects so that there is an unobstructed line-of-site from any point five feet above the runway centerline to any point five feet above an intersecting runway centerline.

RUNWAY VISUAL RANGE (RVR): An electronically-derived value, in feet, representing the horizontal distance a pilot can see down the runway from the runway end.

SPECIALIZED AVIATION SERVICE OPERATOR (SASO): Sometime known as single-service providers or special FBOs, a SASO is a commercial service provider on an airport typically providing a single specialized aeronautical service and typically do not meet the minimum standards for a full service fixed based operator (FBO).

SCOPE: The document that identifies and defines the tasks, emphasis, and level of effort associated with a project or study.

SEGMENTED CIRCLE: A system of visual indicators designed to provide traffic pattern Information at airports without operating control towers.

SHOULDER: An area adjacent to the edge of paved runways, taxiways, or aprons providing a transition between the pavement and the adjacent

surface; support for aircraft running off the pavement; enhanced drainage; and blast protection.

SLANT-RANGE DISTANCE: The straight line distance between an aircraft and a point on the ground.

SMALL AIRPLANE: An airplane that has a maximum certified takeoff weight of up to 12,500 pounds.

SPECIAL-USE AIRSPACE: Airspace of defined dimensions identified by a surface area wherein activities must be confined because of their nature and/or wherein limitations may be imposed upon aircraft operations that are not a part of those activities. Special-use airspace classifications include:

- ALERT AREA: Airspace which may contain a high volume of pilot training activities or an unusual type of aerial activity, neither of which is hazardous to aircraft.
- CONTROLLED FIRING AREA: Airspace wherein activities are conducted under conditions so controlled as to eliminate hazards to nonparticipating aircraft and to ensure the safety of persons or property on the ground.
- MILITARY OPERATIONS AREA (MOA): Designated airspace with defined vertical and lateral dimensions established outside Class A airspace to separate/segregate certain military activities from instrument flight rule (IFR) traffic and to identify for visual flight rule (VFR) traffic where these activities are conducted.
- PROHIBITED AREA: Designated airspace within which the flight of aircraft is prohibited.
- RESTRICTED AREA: Airspace designated under Federal Aviation Regulation (FAR) 73, within which the flight of aircraft, while not wholly prohibited, is subject to restriction. Most restricted areas are designated joint use. When not in use by the using agency, IFR/VFR operations can be authorized by the controlling air traffic control facility.
- WARNING AREA: Airspace which may contain hazards to nonparticipating aircraft.

STANDARD INSTRUMENT DEPARTURE (SID): A preplanned coded air traffic control IFR departure routing, preprinted for pilot use in graphic and textual form only.

STANDARD TERMINAL ARRIVAL (STAR): A pre-planned coded air traffic control IFR arrival routing, preprinted for pilot use in graphic and textual or textual form only.

STOP-AND-GO: A procedure wherein an air craft will land, make a complete stop on the runway, and then commence a takeoff from that point. A stop-and-go is recorded as two operations: one operation for the landing and one operation for the takeoff.

STOPWAY: An area beyond the end of a takeoff runway that is designed to support an aircraft during an aborted takeoff without causing structural damage to the aircraft. It is not to be used for takeoff, landing, or taxiing by aircraft.

STRAIGHT-IN LANDING/APPROACH: A landing made on a runway aligned within 30 degrees of the final approach course following completion of an instrument approach.

TACTICAL AIR NAVIGATION (TACAN): An ultra-high frequency electronic air navigation system which provides suitably-equipped aircraft a continuous indication of bearing and distance to the TACAN station.

TAKEOFF RUNWAY AVAILABLE (TORA): See declared distances.

TAKEOFF DISTANCE AVAILABLE (TODA): See declared distances.

TAXILANE: The portion of the aircraft parking area used for access between taxiways and aircraft parking positions.

TAXIWAY: A defined path established for the taxiing of aircraft from one part of an airport to another.

TAXIWAY SAFETY AREA (TSA): A defined surface alongside the taxiway prepared or suitable for reducing the risk of damage to an airplane unintentionally departing the taxiway.

TERMINAL INSTRUMENT PROCEDURES: Published flight procedures for conducting instrument approaches to runways under instrument meteorological conditions

TERMINAL RADAR APPROACH CONTROL (TRACON): An element of the air traffic control system responsible for monitoring the enroute and terminal segment of air traffic in the airspace surrounding airports with moderate to high levels of air traffic.

TETRAHEDRON: A device used as a landing direction indicator. The small end of the tetrahedron points in the direction of landing.

THRESHOLD: The beginning of that portion of the runway available for landing. In some instances the landing threshold may be displaced.

TOUCH-AND-GO: An operation by an aircraft that lands and departs on a runway without stopping or exiting the runway. A touch-and-go is recorded as two operations: one operation for the landing and one operation for the takeoff.

TOUCHDOWN: The point at which a landing aircraft makes contact with the runway surface.

TOUCHDOWN ZONE (TDZ): The first 3,000 feet of the runway beginning at the threshold.

TOUCHDOWN ZONE ELEVATION (TDZE): The highest elevation in the touchdown zone.

TOUCHDOWN ZONE (TDZ) LIGHTING: Two rows of transverse light bars located symmetrically about the runway centerline normally at 100-foot intervals. The basic system extends 3,000 feet along the runway.

TRAFFIC PATTERN: The traffic flow that is prescribed for aircraft landing at or taking off from an airport. The components of a typical traffic pattern are the upwind leg, crosswind leg, downwind leg, base leg, and final approach.

UNCONTROLLED AIRPORT: An airport without an airport traffic control tower at which the control of Visual Flight Rules traffic is not exercised.

UNCONTROLLED AIRSPACE: Airspace within which aircraft are not subject to air traffic control.

UNIVERSAL COMMUNICATION (UNICOM): A non-government communication facility which may provide airport information at certain airports. Locations and frequencies of UNICOM's are shown on aeronautical charts and publications.

UPWIND LEG: A flight path parallel to the landing runway in the direction of landing. See "traffic pattern."

VECTOR: A heading issued to an aircraft to provide navigational guidance by radar.

VERY HIGH FREQUENCY OMNIDIRECTIONAL RANGE STATION (VOR): A ground-based electronic navigation aid transmitting very high frequency navigation signals, 360 degrees in azimuth, oriented from magnetic north. Used as the basis for navigation in the national air-space system. The VOR periodically identifies itself by Morse Code and may have an additional voice identification feature.

VERY HIGH FREQUENCY OMNIDIRECTIONAL RANGE STATION/TACTICAL AIR NAVIGATION (VORTAC): A navigation aid providing VOR azimuth, TACAN azimuth, and TACAN distance-measuring equipment (DME) at one site.

VICTOR AIRWAY: A control area or portion thereof established in the form of a corridor, the centerline of which is defined by radio navigational aids.

VISUAL APPROACH: An approach wherein an aircraft on an IFR flight plan, operating in VFR conditions under the control of an air traffic control facility and having an air traffic control authorization, may proceed to the airport of destination in VFR conditions.

VISUAL APPROACH SLOPE INDICATOR (VASI): An airport lighting facility providing vertical visual approach slope guidance to aircraft during approach to landing by radiating a directional pattern of high intensity red and white focused light beams which indicate to the pilot that he is on path if he sees red/white, above path if white/white, and below path if red/red. Some airports serving large aircraft have three-bar VASI's which provide two visual guide paths to the same runway.

VISUAL FLIGHT RULES (VFR): Rules that govern the procedures for conducting flight under visual conditions. The term VFR is also used in the United States to indicate weather conditions that are equal to or greater than minimum VFR requirements. In addition, it is used by pilots and controllers to indicate type of flight plan.

VISUAL METEOROLOGICAL CONDITIONS: Meteorological conditions expressed in terms of specific visibility and ceiling conditions which are equal to or greater than the threshold values for instrument meteorological conditions.

VOR: See "Very High Frequency Omnidirectional Range Station."

VORTAC: See "Very High Frequency Omnidirectional Range Station/Tactical Air Navigation."

WARNING AREA: See special-use airspace.

WIDE AREA AUGMENTATION SYSTEM (WAAS): An enhancement of the Global Positioning System that includes integrity broadcasts, differential corrections, and additional ranging signals for the purpose of providing the accuracy, integrity, availability, and continuity required to support all phases of flight.

Acronyms and Abbreviations

AC: advisory circular

ADF: automatic direction finder

ADG: airplane design group

ADS-B: automatic dependent surveillance - broadcast

AFSS: automated flight service station

AGL: above ground level

AGIS: Airports Geographic Information System

AIP: Airport Improvement Program

AIR-21: Wendell H. Ford Aviation Investment and Reform Act for the 21st Century

ALS: approach lighting system

ALSF-1: standard 2,400-foot high intensity approach lighting system with sequenced flashers (CAT I configuration)

ALSF-2: standard 2,400-foot high intensity approach lighting system with sequenced flashers (CAT II configuration)

APV: instrument approach procedure with vertical guidance

ARC: airport reference code

ARFF: aircraft rescue and firefighting

ARP: airport reference point

ARTCC: air route traffic control center

ASDA: accelerate-stop distance available

ASR: airport surveillance radar

ASOS: automated surface observation station

ATCT: airport traffic control tower

ATIS: automated terminal information service

AVGAS: aviation gasoline - typically 100 low lead (100LL)

AWOS: automated weather observation station

BRL: building restriction line

CFR: Code of Federal Regulations

CIP: capital improvement program

DME: distance measuring equipment

DNL: day-night noise level

DWL: runway weight bearing capacity for aircraft with dual-wheel type landing gear

DTWL: runway weight bearing capacity of aircraft with dual-tandem type landing gear

FAA: Federal Aviation Administration

FAR: Federal Aviation Regulation

FBO: fixed base operator

FY: fiscal year

GPS: global positioning system

GS: glide slope

HIRL: high intensity runway edge lighting

IFR: instrument flight rules (FAR Part 91)

ILS: instrument landing system

IM: inner marker

LAAS: local area augmentation system

LAHSO: land and hold short operations

LDA: localizer type directional aid

LDA: landing distance available

LIRL: low intensity runway edge lighting

LMM: compass locator at middle marker

LOC: ILS localizer

LOM: compass locator at ILS outer marker

LPV: localizer performance with vertical guidance

MALS: medium intensity approach lighting system

MALSR: medium intensity approach lighting system with runway alignment indicator lights

MIRL: medium intensity runway edge lighting

MITL: medium intensity taxiway edge lighting

MLS: microwave landing system

MM: middle marker

MOA: military operations area

MSL: mean sea level

NAVAID: navigational aid

NDB: nondirectional radio beacon

NextGen: next generation air transportation system

NM: nautical mile (6,076 .1 feet)

NPES: National Pollutant Discharge Elimination System

NPIAS: National Plan of Integrated Airport Systems

NPRM: notice of proposed rulemaking

ODALS: omnidirectional approach lighting system

OFA: object free area

OFZ: obstacle free zone

OM: outer marker

PAC: planning advisory committee

PAPI: precision approach path indicator

PFC: porous friction course

PFC: passenger facility charge

PCL: pilot-controlled lighting

PIW: public information workshop

PLASI: pulsating visual approach slope indicator

POFA: precision object free area

PVASI: pulsating/steady visual approach slope indicator

PVC: Poor visibility and ceiling.

RCO: remote communications outlet

REIL: runway end identifier lighting

RNAV: area navigation

RNP: required navigation performance

RPZ: runway protection zone

RSA: runway safety area

RTR: remote transmitter/receiver

RVR: runway visibility range

RVZ: runway visibility zone

SALS: short approach lighting system

SASO: specialized aviation service operator

SASP: state aviation system plan

SEL: sound exposure level

SID: standard instrument departure

SM: statute mile (5,280 feet)

SRE: snow removal equipment

SSALF: simplified short approach lighting system with sequenced flashers

SSALR: simplified short approach lighting system with runway alignment indicator lights

STAR: standard terminal arrival route

SWL: runway weight bearing capacity for aircraft with single-wheel type landing gear

STWL: runway weight bearing capacity for aircraft with single-wheel tandem type landing gear

TACAN: tactical air navigational aid

TDZ: touchdown zone

TDZE: touchdown zone elevation

TAF: Federal Aviation Administration (FAA) Terminal Area Forecast

TODA: takeoff distance available

TORA: takeoff runway available

TRACON: terminal radar approach control

VASI: visual approach slope indicator

VFR: visual flight rules (FAR Part 91)

VHF: very high frequency

VOR: very high frequency omni-directional range

VORTAC: VOR and TACAN collocated

WAAS: wide area augmentation system

APPENDIX B: PUBLIC INVOLVEMENT

Introduction

The City of Wall, the sponsor for Wall Municipal Airport, understands the importance of public involvement in the Master Plan Update process. As a part of the scope of this project opportunities were designed for stakeholders to provide input.

In addition to the formal consideration of the master plan by the city, the airport saw that the public should have an opportunity to comment on decisions about actions that could affect their lives. This public involvement included a public open house and regular interaction with a stakeholder group. The airport appreciates the fact that public involvement improved the decision making process and is thankful to all those who took time to respond. As a result of the public participation process, the airport master plan offers a valuable path for developing Wall Municipal Airport.

Stakeholders

As part of the planning process the following groups/people were contacted for their insight into the Wall Municipal Airport Master Plan Update:

1. Airport Tenants
    a. Dave Hahn – Airport Manager
    b. Preston Johnson – Ascend Aviation
2. Local Government
    a. Mayor/Golden West – Marty Huether
    b. Council Member/Wall Drug – Rick Hustead
    c. Finance Officer – Carolynn Anderson
    d. Fire Department – John Kitterman
3. Local Civic Groups
    a. Wall Economic Development – Cheyenne McGriff
    b. Wall Drug/Chamber – Jackie Kusser
    c. Wall Economic Development – Rick Johnson
    d. Minuteman Missile National Historic Site – Eric Leonard

Key Issues (or Public Involvement Goals)

This planning effort included typical elements of airport master plans from reviewing existing conditions to forecasts to alternative development but also focused on key issues identified in the scoping meeting. These issues were as follows:

1. Examine justification of a primary runway length.
2. Examine existing incompatible land use inside the current and potential future Runway Protection Zone for Runway 30.

During the scoping meeting, the airport identified that they would like to include a broad spectrum of participants into a Master Plan Advisory Committee (MPAC) to build support for the airport and potential projects.

Table C-1 Public Outreach Efforts

Public Outreach Efforts for Wall Municipal Airport		
Date Outreach Occurred	**Type of Public Information Process**	**Information Conveyed**
11-09-2016	MPAC Meeting	Kickoff Meeting
03-23-2017	MPAC Meeting	Forecast and Inventory Findings
08-01-2017	MPAC Meeting	Facility Requirements Findings & Runway Protection Zone Alternatives
05-01-2018	MPAC Meeting	Runway Protection Zone decision by FAA & Terminal Area Alternatives
06-28-2018	Public Open House	Master Plan Process, Forecasts, Alternatives, Preferred Alternative
09-19-2018	Presentation to City Council	Master Plan Process, Forecasts, Runway Protection Zone decision, Preferred Alternative

Source: KLJ

Public Involvement Documents, References & Links

The following is a summary of the documents prepared. Copies of the documents are included in following in this appendix.

MPAC Kickoff Meeting – November 2016

MPAC Forecast/Inventory Meeting – March 2017

MPAC Facility Requirements Meeting – August 2017

MPAC Alternatives Meeting – May 2018

Public Open House – June 2018

City Council Presentation – September 2018

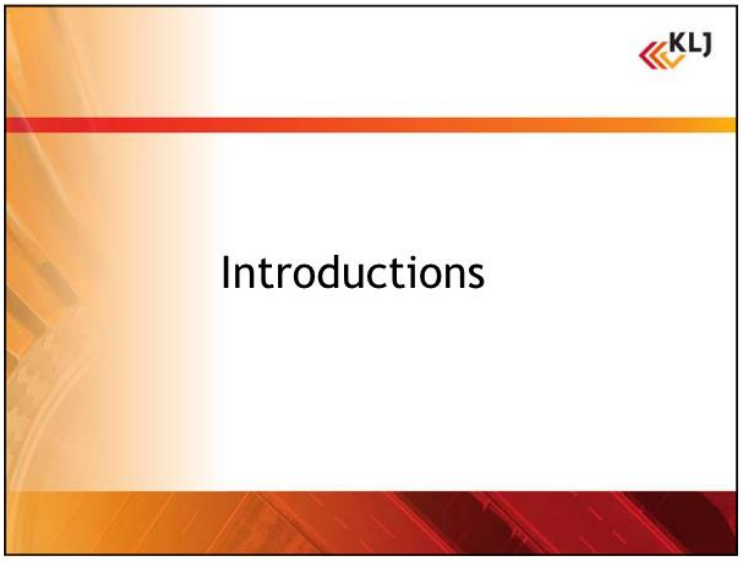
11/9/2016

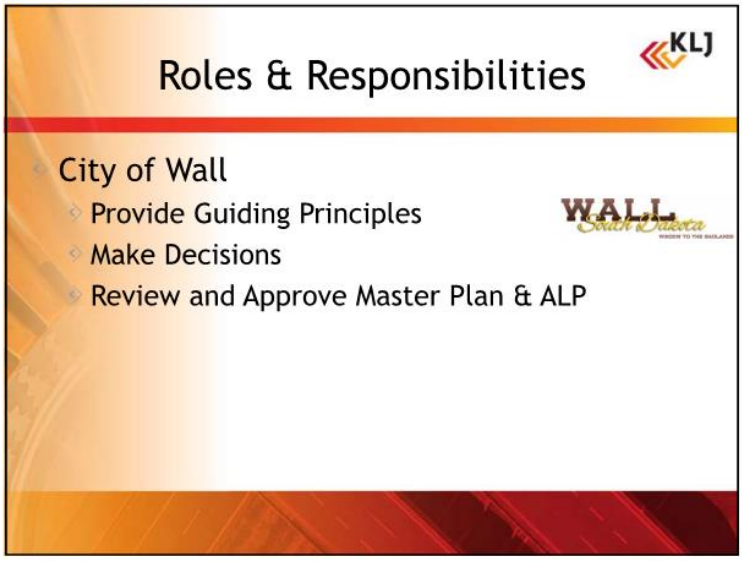

KLJ
Wall Municipal Airport
Master Plan Study
Master Plan Advisory Committee - Kick-Off Meeting
Wall City Offices
November 9th, 2016


KLJ
Agenda
Introductions
Roles & Responsibilities
Airport Master Plans
Planning Considerations
Existing Conditions
Public Involvement

1

11/9/2016

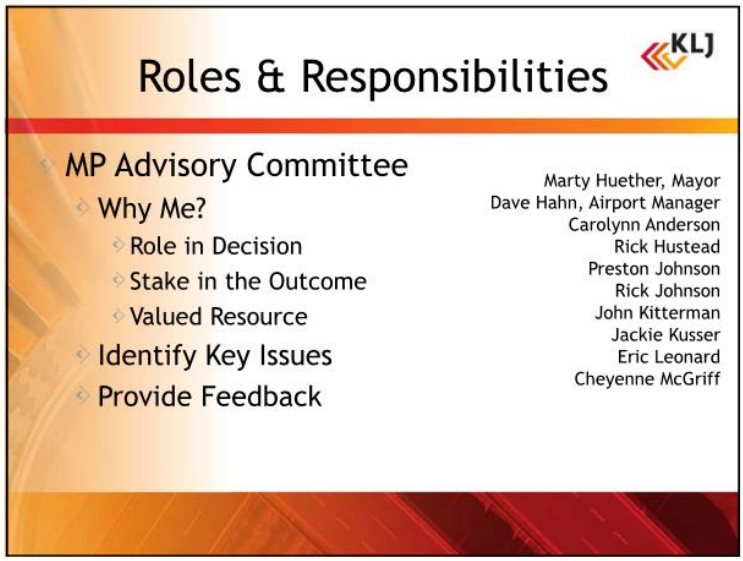

KLJ
Introductions


KLJ
Roles & Responsibilities
City of Wall
Provide Guiding Principles
Make Decisions
Review and Approve Master Plan & ALP
WALL
South Dakota

2

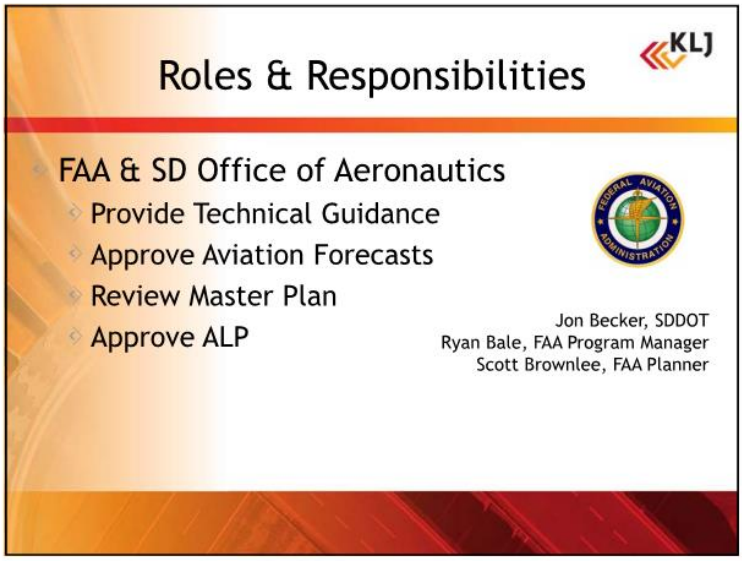
11/9/2016

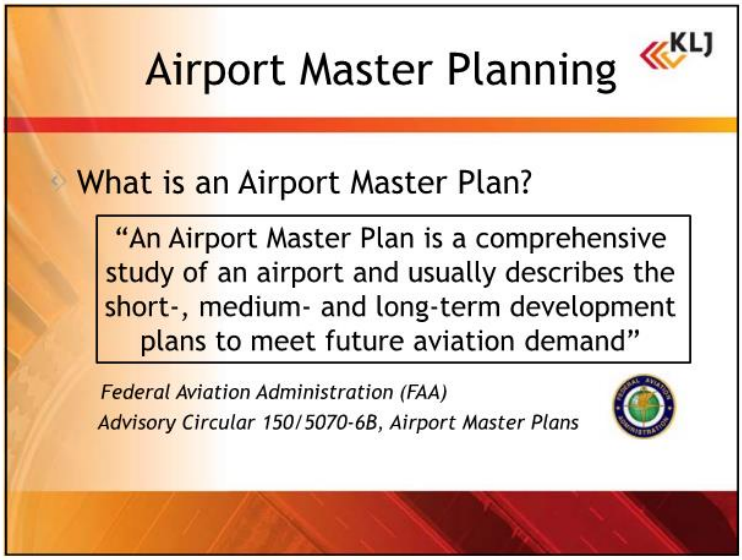

Roles & Responsibilities
KLJ
KLJ Planning Team
Manage Study
Complete Technical Work
Provide Analysis
RAPID CITY
Rod Senn, Client Manager
605 721 5553
rod.senn@kljeng.com
BISMARCK
Tom Schauer, Planning Division Leader
701 250 5944
tom.schauer@kljeng.com
RAPID CITY
Kent Penney, Lead Planner
605 721 5553
kent.penney@kljeng.com
ST. PAUL
Andrew Zielike, Planner
651 925 7737
andrew.zielike@kljeng.com


Roles & Responsibilities
KLJ
MP Advisory Committee
Why Me?
Role in Decision
Stake in the Outcome
Valued Resource
Identify Key Issues
Provide Feedback
Marty Huether, Mayor
Dave Hahn, Airport Manager
Carolynn Anderson
Rick Hustead
Preston Johnson
Rick Johnson
John Kitterman
Jackie Kusser
Eric Leonard
Cheyenne McGriff

3

11/9/2016


Roles & Responsibilities
KLJ
FAA & SD Office of Aeronautics
Provide Technical Guidance
Approve Aviation Forecasts
Review Master Plan
Approve ALP
Jon Becker, SDDOT
Ryan Bale, FAA Program Manager
Scott Brownlee, FAA Planner


Airport Master Planning
KLJ
What is an Airport Master Plan?
"An Airport Master Plan is a comprehensive study of an airport and usually describes the short-, medium- and long-term development plans to meet future aviation demand"
Federal Aviation Administration (FAA)
Advisory Circular 150/5070-6B, Airport Master Plans

4

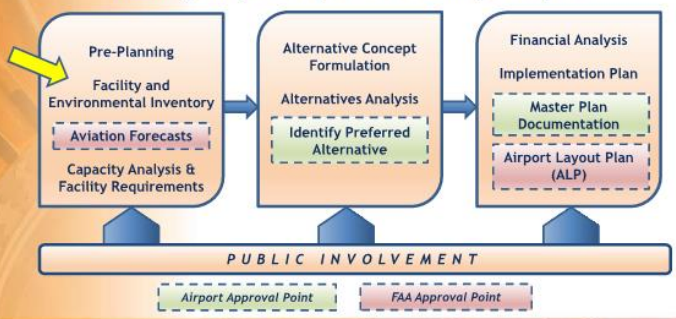
11/9/2016

Airport Master Planning

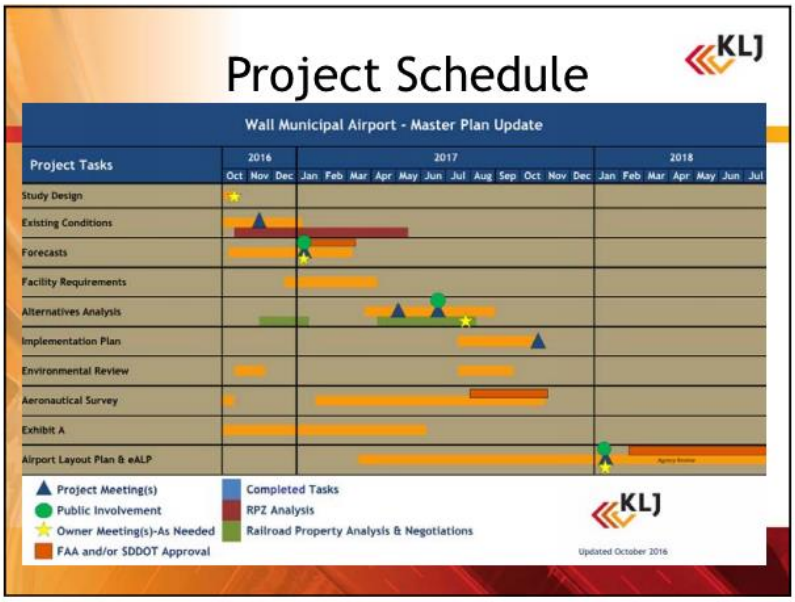
- "Road Map" for meeting aviation demands
- Preserves flexibility to respond to future
- Allows airport to cost-effectively keep pace with aviation growth
- Considers environmental and socioeconomic impact of development
- Why is a Master Plan Update needed now?
  - Last Airport Layout Plan approved in 1986
  - Local Planning Considerations
  - FAA Design and Planning requirements

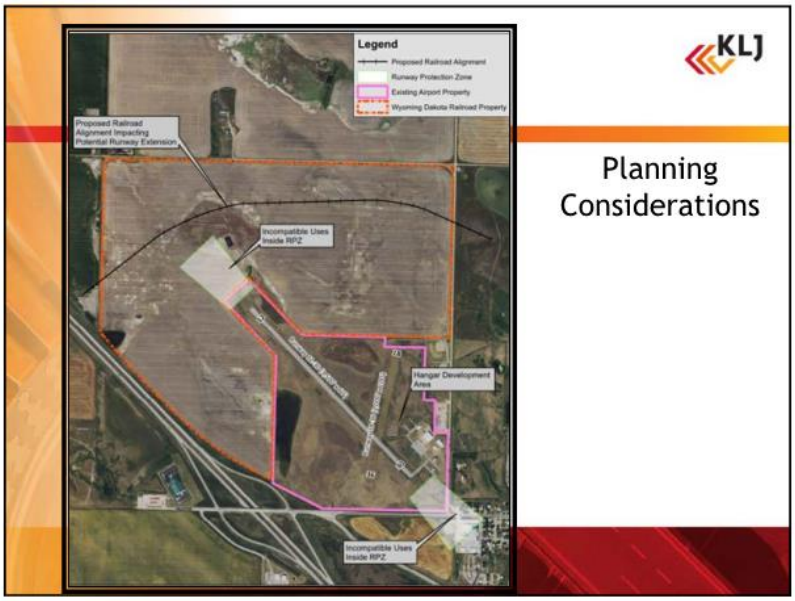
Airport Master Planning

Planning the future of the Wall Municipal Airport

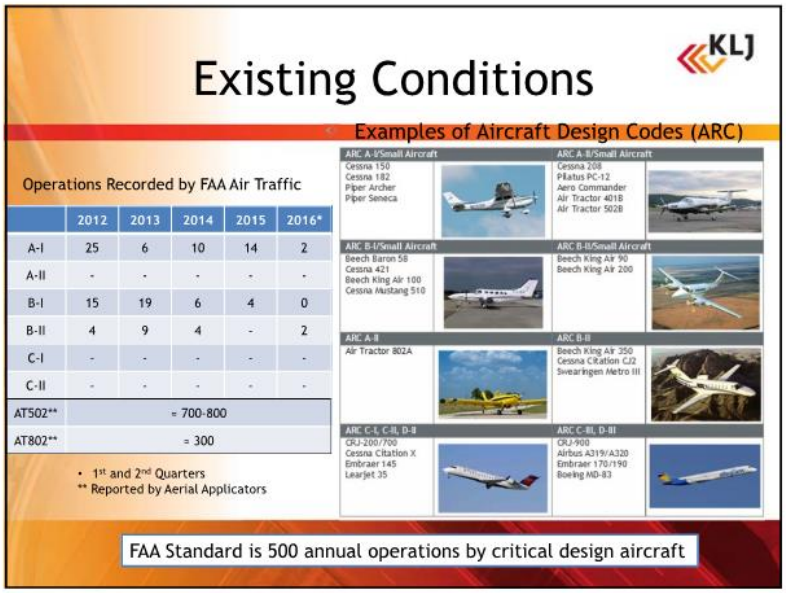


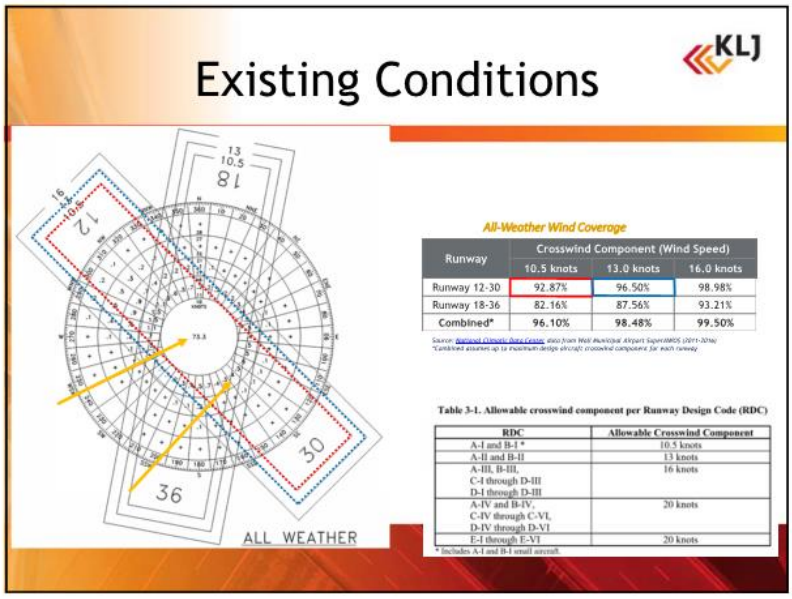
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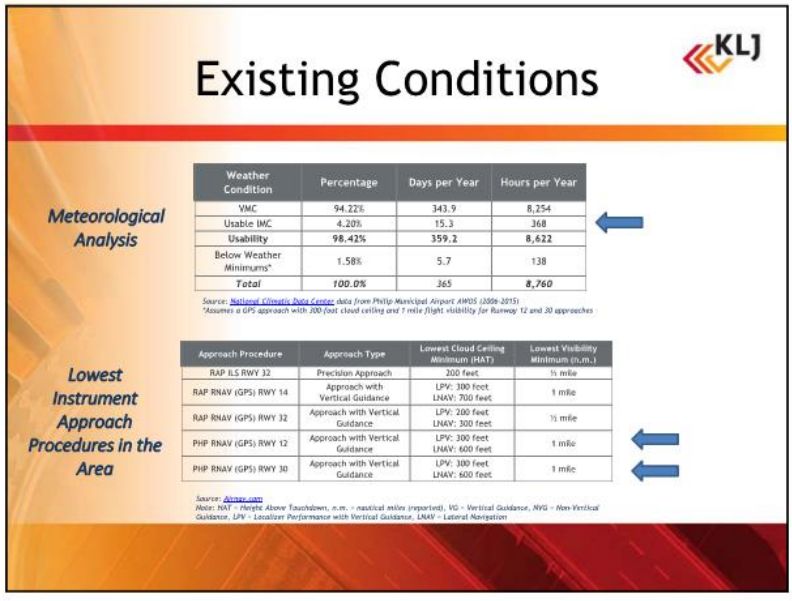

Project Schedule
KLJ
Wall Municipal Airport - Master Plan Update
Project Tasks
2016
2017
2018
Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul
Study Design
Existing Conditions
Forecasts
Facility Requirements
Alternatives Analysis
Implementation Plan
Environmental Review
Aeronautical Survey
Exhibit A
Airport Layout Plan & eALP
Project Meeting(s)
Public Involvement
Owner Meeting(s)-As Needed
FAA and/or SDDOT Approval
Completed Tasks
RPZ Analysis
Railroad Property Analysis & Negotiations
KLJ
Updated October 2016


Legend
Proposed Railroad Alignment
Runway Protection Zone
Existing Airport Property
Wyoming Dakota Railroad Property
Proposed Railroad Alignment Impacting Potential Runway Extension
Incompatible Uses Inside RPZ
Hangar Development Area
Incompatible Uses Inside RPZ
KLJ
Planning Considerations


Existing Conditions
KLJ
Runway 30 - Runway Protection Zone
Legend
A/B-1 Small (Visual Approach)
B-II (1 Mile Approach)
Church
Homes
Roads
Fuel Tanks
Offices
Google earth


Existing Conditions
KLJ
Examples of Aircraft Design Codes (ARC)
Operations Recorded by FAA Air Traffic
2012 2013 2014 2015 2016*
A-I 25 6 10 14 2
A-II - - - - -
B-I 15 19 6 4 0
B-II 4 9 4 - 2
C-I - - - - -
C-II - - - - -
AT502** ≈ 700-800
AT802** ≈ 300
• 1st and 2nd Quarters
** Reported by Aerial Applicators
ARC A-I/Small Aircraft
Cessna 150
Cessna 182
Piper Archer
Piper Seneca
ARC A-II/Small Aircraft
Cessna 208
Pilatus PC-12
Aero Commander
Air Tractor 401B
Air Tractor 502B
ARC B-I/Small Aircraft
Beech Baron 58
Cessna 421
Beech King Air 100
Cessna Mustang 510
ARC B-II/Small Aircraft
Beech King Air 90
Beech King Air 200
ARC A-II
Air Tractor 802A
ARC B-III
Beech King Air 350
Cessna Citation CJ2
Swearingen Metro III
ARC C-I, C-II, D-II
CRJ-200/700
Cessna Citation X
Embraer 145
Learjet 35
ARC C-III, D-III
CRJ-900
Airbus A319/A320
Embraer 170/190
Boeing MD-83
FAA Standard is 500 annual operations by critical design aircraft


Existing Conditions
KLJ
13
10.5
18
16
12
10.5
30
36
ALL WEATHER
All-Weather Wind Coverage
Runway
Crosswind Component (Wind Speed)
10.5 knots
13.0 knots
16.0 knots
Runway 12-30
92.87%
96.50%
98.98%
Runway 18-36
82.16%
87.56%
93.21%
Combined*
96.10%
98.48%
99.50%
Table 3-1. Allowable crosswind component per Runway Design Code (RDC)
RDC
Allowable Crosswind Component
A-I and B-I *
10.5 knots
A-II and B-II
13 knots
A-III, B-III, C-I through D-III D-I through D-III
16 knots
A-IV and B-IV, C-IV through C-VI, D-IV through D-VI
20 knots
E-I through E-VI
20 knots


Existing Conditions
KLJ
Meteorological Analysis
Weather Condition
Percentage
Days per Year
Hours per Year
VMC
94.22%
343.9
8,254
Usable IMC
4.20%
15.3
368
Usability
98.42%
359.2
8,622
Below Weather Minimums*
1.58%
5.7
138
Total
100.0%
365
8,760
Lowest Instrument Approach Procedures in the Area
Approach Procedure
Approach Type
Lowest Cloud Ceiling Minimum (HAT)
Lowest Visibility Minimum (n.m.)
RAP ILS RWY 32
Precision Approach
200 feet
½ mile
RAP RNAV (GPS) RWY 14
Approach with Vertical Guidance
LPV: 300 feet LNAV: 700 feet
1 mile
RAP RNAV (GPS) RWY 32
Approach with Vertical Guidance
LPV: 200 feet LNAV: 300 feet
½ mile
PHP RNAV (GPS) RWY 12
Approach with Vertical Guidance
LPV: 300 feet LNAV: 600 feet
1 mile
PHP RNAV (GPS) RWY 30
Approach with Vertical Guidance
LPV: 300 feet LNAV: 600 feet
1 mile

11/9/2016

Facility Requirements

- Runway Length ?
  - Critical Design Aircraft
  - 500 Operations per year

Public Involvement

- Promote information sharing
- Collect feedback before major decisions are made
- Develop community "buy-in"



- *City Council Meetings*
- *Public Open House Meetings*
  - *Forecasts & Facility Requirements*
  - *Development Alternatives*
- *Website*

9

11/9/2016

Next Steps

- Existing Conditions & Environmental Inventory (Jan. 2017)
- Aviation Activity Forecasts (Jan. 2017)

Questions & Answers



10

11/9/2016


WALL
South Dakota
WINDOW TO THE BADLANDS
KLJ
Thank You!
Kent Penney
Lead Planner
605 939 5794 m
kent.penney@kljeng.com


Airport Master Planning
KLJ
2010 Airport Layout Plan (ALP)

11

WALL South Dakota
WINDOW TO THE BADLANDS

Wall Municipal Airport Master Plan
Master Plan Advisory Committee - Kick-Off
November 9, 2016 -- 3:30 p.m. - 4:30 p.m.

KLJ

ATTENDANCE LIST

Name:	Organization/Business:	Phone:	Email:
Kent Penney	KLJ	605.939.5794	Kent.penney@kljeng.com
Scott Brownlee	FAA	701-323-7383	Scott.Brownlee@faa.gov
Rod Senn	KLJ	605-721-5553	rod.senn@kljeng.com
Preston Johnson	Ascend Ag	605 515 1321	pj@gwtc.net
Dave Hahn	Airport Manager	605-279-2666	davehahn@gwtc.net
Cheyenne McGriff	Wall Economic Development	605-279-2658	walledd@gwtc.net
Carolynn Anderson	City of Wall Finance Officer	605-279-2663	wallcity@gwtc.net
John Kittleman	City of Wall - Wall VFD	605-515-3129	JTK@gwtc.net
Marty Huether	City of Wall Mayor	605-279-2663	marty huether@gmail.com
ECIC LEONARD	NATIONAL PARK SERVICE	605-433-5552	ECIC_LEONARD@NPS.GOV

Airport Master Plan
Kickoff Meeting Summary
Wall Municipal Airport
November 9, 2016

Background

A kickoff meeting was held with the Master Plan Advisory Committee (MPAC) on November 9, 2016. Prior to this meeting, a meeting was held on October 21st with the Mayor and Airport Manager to arrange the composition of the MPAC.

Throughout the development of the master plan the MPAC will be asked to provide input on the draft documents. The general public will have opportunities to provide input through public meetings or contacting the project team.

Attendees	Not in Attendance
Scott Brownlee, FAA	Rick Hustead, City Council
Preston Johnson, Ascend Ag	Rick Johnson, Yardley & Co. Inc.
Dave Hahn, Airport Manager	Jackie Kusser, Wall Drug
Cheyenne McGriff, Wall Economic Development	Ryan Bale, FAA
Carolynn Anderson, Wall Finance Officer	Jon Becker, SDDOT
John Kitterman, Wall Fire Chief	Andrew Zielike, KLJ
Marty Huether, Wall Mayor	
Eric Leonard, National Park Service	
Kent Penney, KLJ	
Rod Senn, KLJ	

Discussion

The following key items were discussed at the kickoff meeting.

- Roles and responsibilities of the City, Planning Team, Master Plan Advisory Committee, FAA and SD DOT
- Airport Master Planning Process and Timeline
- Planning Considerations for Wall including RPZ for Runway 30, areas for hangar development and impact of potential rail corridor on airport development
- Existing Activity
- Existing Wind and Weather conditions
- Next Steps

Items brought up by the MPAC included verification of aviation activity and a request that the potential to maximize the takeoff length for Runway 30 even if the full length is not available for Runway 12.

NATIONAL PERSPECTIVE
REGIONAL EXPERTISE
TRUSTED ADVISOR

03/23/2017


KLJ
Wall Municipal Airport
Master Plan Study
Master Plan Advisory Committee - Existing Conditions/Forecast Meeting
Wall City Offices
March 23, 2017


KLJ
Agenda
Introductions
Airport Master Plans
Existing Conditions
Forecasts
Facility Requirements

1

03/23/2017

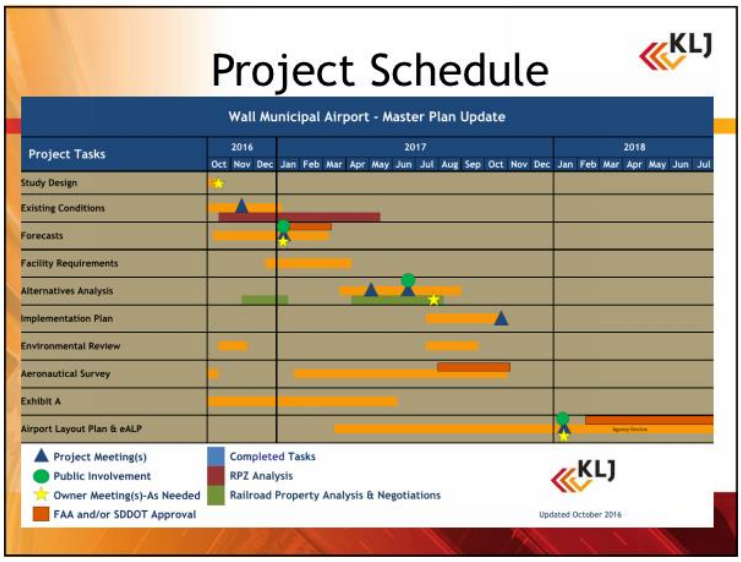

Introductions
KLJ
Wall MPAC
Marty Huether, Mayor
Dave Hahn
Preston Johnson
Cheyenne McGriff
John Kitterman
Rick Hustead
Rick Johnson
Jackie Kusser
Eric Leonard
Carolynn Anderson
KLJ
Kent Penney (Rapid City)
Andrew Zielike (St. Paul)
FAA
Sandy DePottey (Minneapolis)
Ryan Bale (Bismarck)
SDDOT
Jack Dokken
Jon Becker


Airport Master Planning
KLJ
"Road Map" for meeting aviation demands
Preserves flexibility to respond to future
Allows airport to cost-effectively keep pace with aviation growth
Considers environmental and socioeconomic impact of development
Why is a Master Plan Update needed now?
Last Airport Layout Plan approved in 1986
Local Planning Considerations
FAA Design and Planning requirements

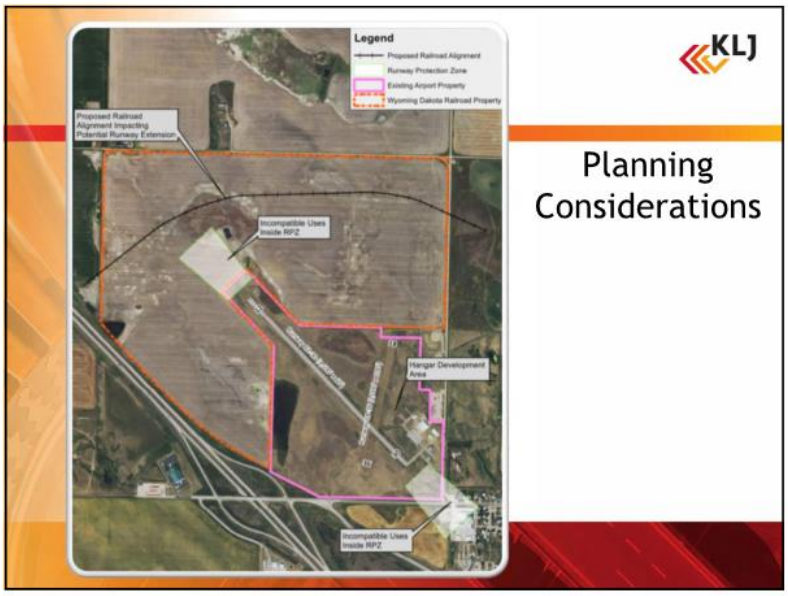
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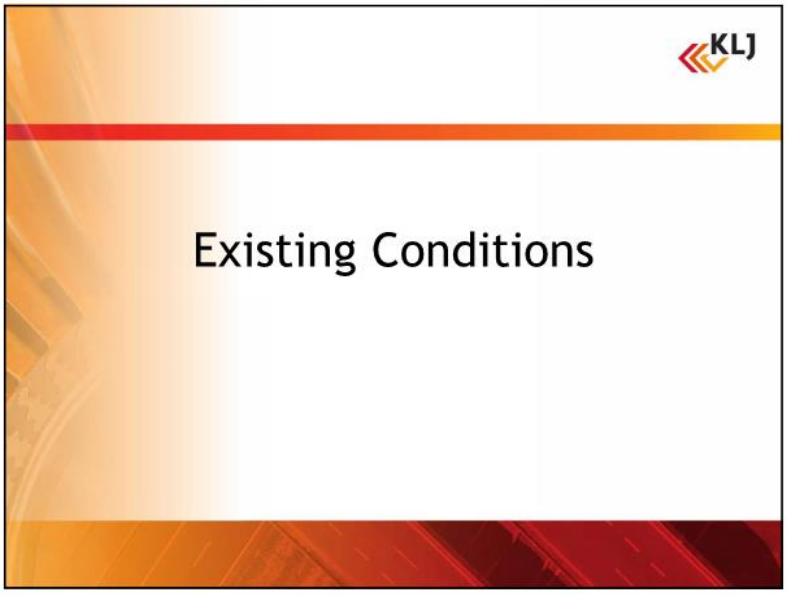
03/23/2017


Airport Master Planning
KLJ
Planning the future of the Wall Municipal Airport
Pre-Planning
Facility and Environmental Inventory
Aviation Forecasts
Capacity Analysis & Facility Requirements
Alternative Concept Formulation
Alternatives Analysis
Identify Preferred Alternative
Financial Analysis
Implementation Plan
Master Plan Documentation
Airport Layout Plan (ALP)
PUBLIC INVOLVEMENT
Airport Approval Point
FAA Approval Point

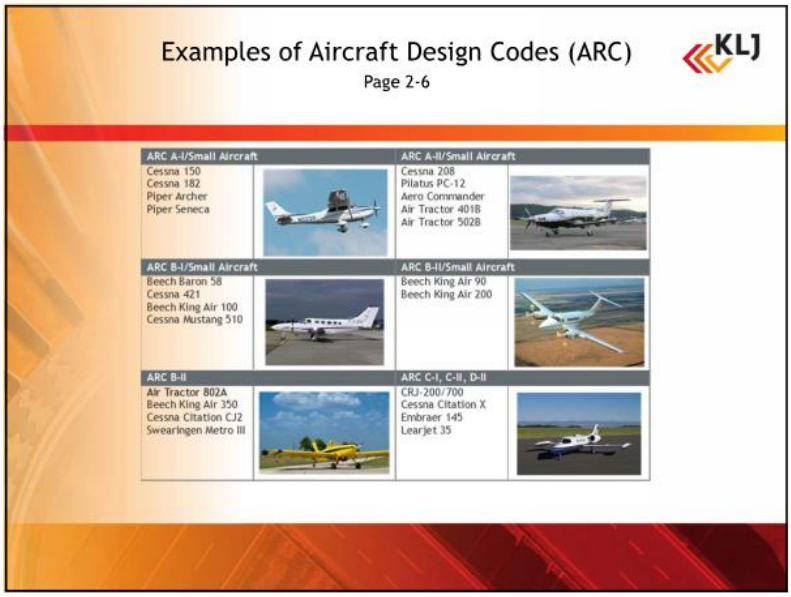

Project Schedule
KLJ
Wall Municipal Airport - Master Plan Update
Project Tasks
2016
2017
2018
Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul
Study Design
Existing Conditions
Forecasts
Facility Requirements
Alternatives Analysis
Implementation Plan
Environmental Review
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Airport Layout Plan & eALP
Project Meeting(s)
Public Involvement
Owner Meeting(s)-As Needed
FAA and/or SDDOT Approval
Completed Tasks
RPZ Analysis
Railroad Property Analysis & Negotiations
KLJ
Updated October 2016

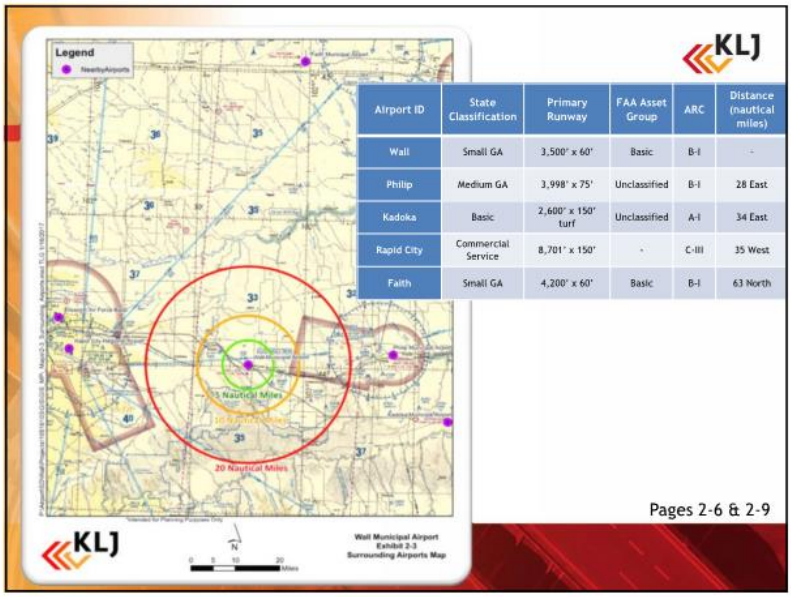
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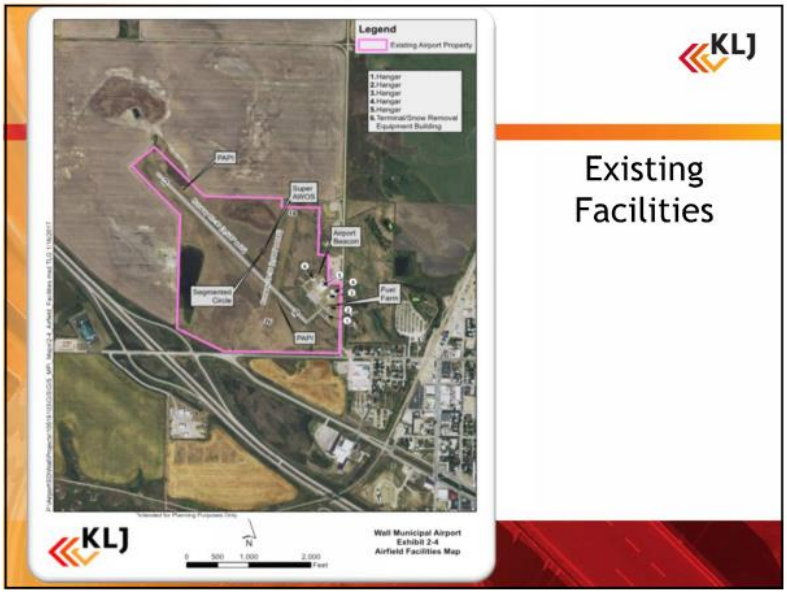

KLJ
Legend
Proposed Railroad Alignment
Runway Protection Zone
Existing Airport Property
Wyoming Dakota Railroad Property
Proposed Railroad Alignment Impacting Potential Runway Extension
Incompatible Uses Inside RPZ
Hangar Development Area
Incompatible Uses Inside RPZ
Planning Considerations

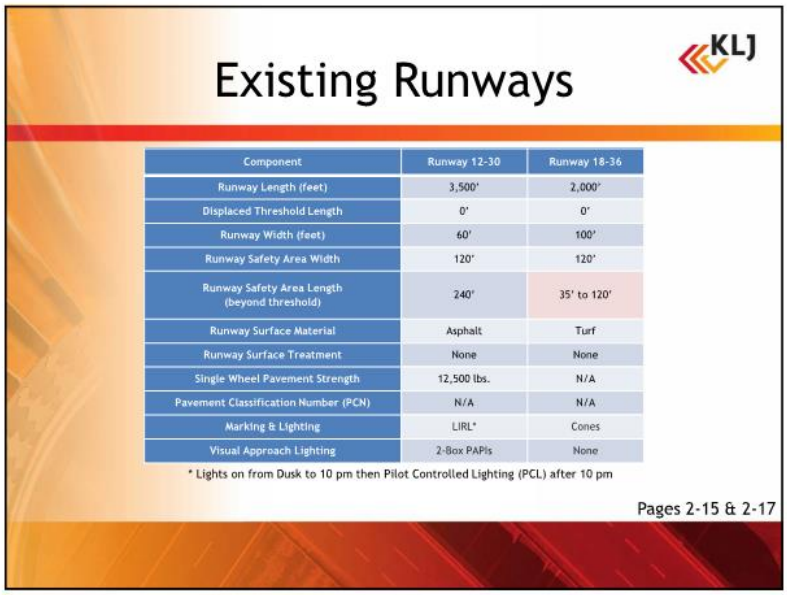

KLJ
Existing Conditions

4


Examples of Aircraft Design Codes (ARC)
Page 2-6
KLJ
ARC A-I/Small Aircraft
Cessna 150
Cessna 182
Piper Archer
Piper Seneca
ARC A-II/Small Aircraft
Cessna 208
Pilatus PC-12
Aero Commander
Air Tractor 401B
Air Tractor 502B
ARC B-I/Small Aircraft
Beech Baron 58
Cessna 421
Beech King Air 100
Cessna Mustang 510
ARC B-II/Small Aircraft
Beech King Air 90
Beech King Air 200
ARC B-II
Air Tractor 802A
Beech King Air 350
Cessna Citation CJ2
Swearingen Metro III
ARC C-I, C-II, D-II
CRJ-200/700
Cessna Citation X
Embraer 145
Learjet 35


KLJ
Legend
NearbyAirports
15 Nautical Miles
20 Nautical Miles
Wall Municipal Airport
Exhibit 2-3
Surrounding Airports Map
Airport ID
State Classification
Primary Runway
FAA Asset Group
ARC
Distance (nautical miles)
Wall
Small GA
3,500' x 60'
Basic
B-I
-
Philip
Medium GA
3,998' x 75'
Unclassified
B-I
28 East
Kadoka
Basic
2,600' x 150' turf
Unclassified
A-I
34 East
Rapid City
Commercial Service
8,701' x 150'
-
C-III
35 West
Faith
Small GA
4,200' x 60'
Basic
B-I
63 North
Pages 2-6 & 2-9



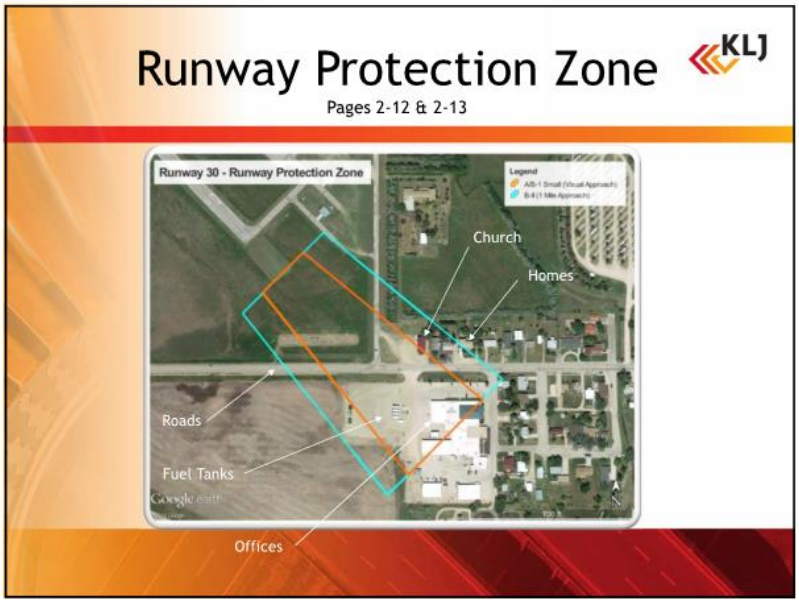


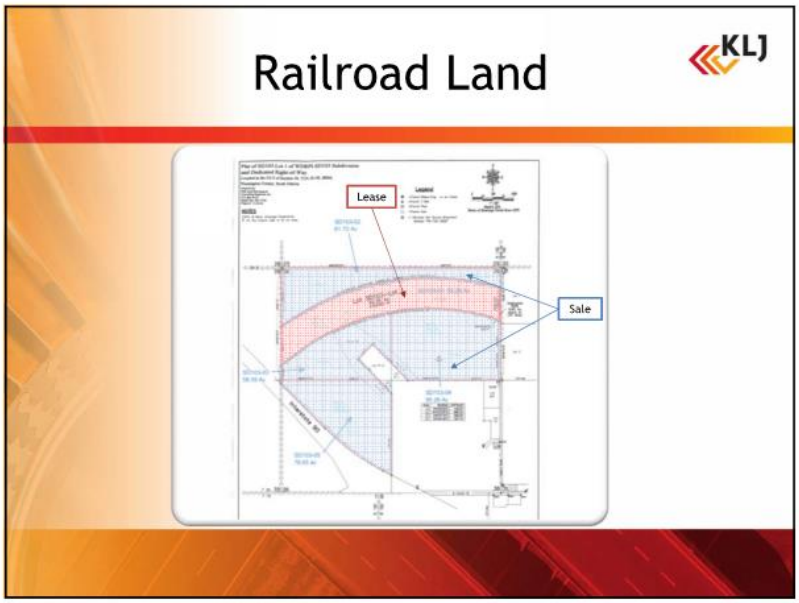
Existing Runways

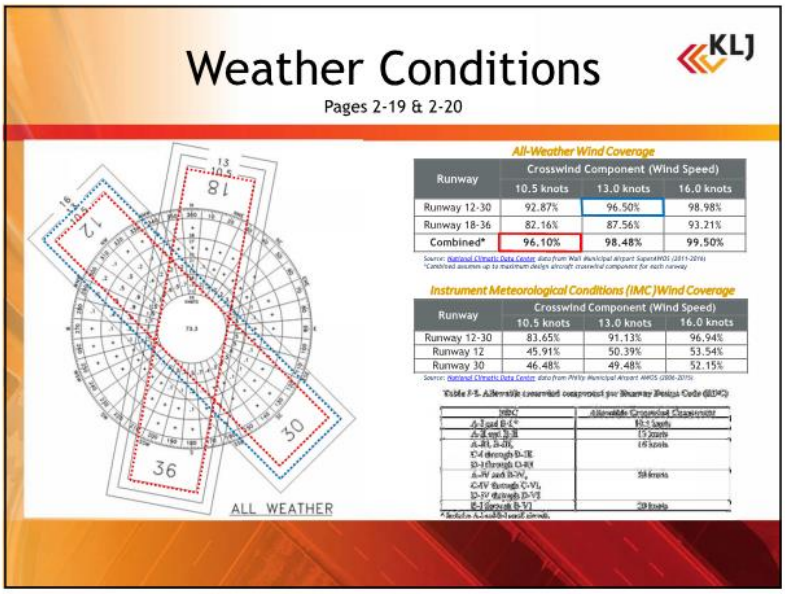
Component	Runway 12-30	Runway 18-36
Runway Length (feet)	3,500'	2,000'
Displaced Threshold Length	0'	0'
Runway Width (feet)	60'	100'
Runway Safety Area Width	120'	120'
Runway Safety Area Length (beyond threshold)	240'	35' to 120'
Runway Surface Material	Asphalt	Turf
Runway Surface Treatment	None	None
Single Wheel Pavement Strength	12,500 lbs.	N/A
Pavement Classification Number (PCN)	N/A	N/A
Marking & Lighting	LIRL*	Cones
Visual Approach Lighting	2-Box PAPIs	None

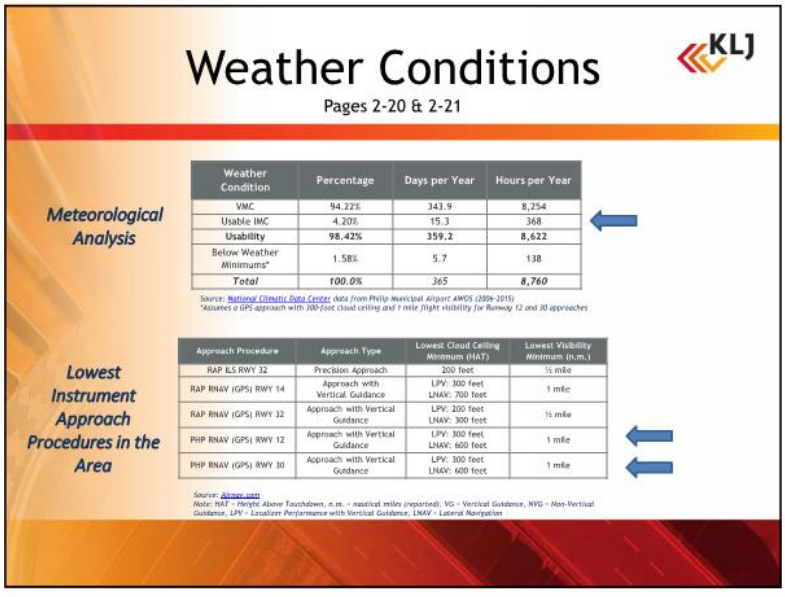
* Lights on from Dusk to 10 pm then Pilot Controlled Lighting (PCL) after 10 pm

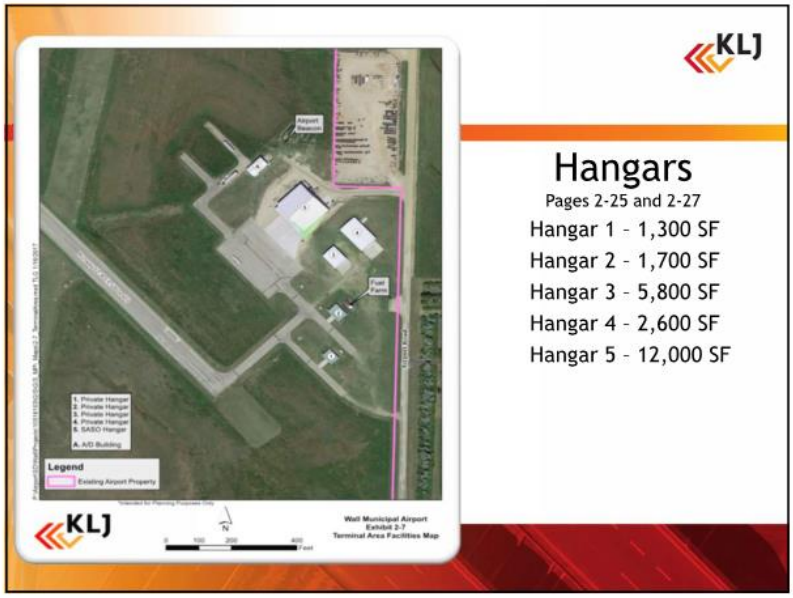
Pages 2-15 & 2-17


Runway Protection Zone
KLJ
Pages 2-12 & 2-13
Runway 30 - Runway Protection Zone
Church
Homes
Roads
Fuel Tanks
Offices


Railroad Land
KLJ
Lease
Sale


Weather Conditions
Pages 2-19 & 2-20
KLJ
13
31
12
30
36
ALL WEATHER
All-Weather Wind Coverage
Runway
Crosswind Component (Wind Speed)
10.5 knots
13.0 knots
16.0 knots
Runway 12-30 92.87% 96.50% 98.98%
Runway 18-36 82.16% 87.56% 93.21%
Combined* 96.10% 98.48% 99.50%
Instrument Meteorological Conditions (IMC) Wind Coverage
Runway
Crosswind Component (Wind Speed)
10.5 knots
13.0 knots
16.0 knots
Runway 12-30 83.65% 91.13% 96.94%
Runway 12 45.91% 50.39% 53.54%
Runway 30 46.48% 49.48% 52.15%


Weather Conditions
Pages 2-20 & 2-21
KLJ
Meteorological Analysis
Weather Condition
Percentage
Days per Year
Hours per Year
VMC 94.22% 343.9 8,254
Usable IMC 4.20% 15.3 368
Usability 98.42% 359.2 8,622
Below Weather Minimums* 1.58% 5.7 138
Total 100.0% 365 8,760
Lowest Instrument Approach Procedures in the Area
Approach Procedure
Approach Type
Lowest Cloud Ceiling Minimum (HAT)
Lowest Visibility Minimum (n.m.)
RAP ILS RWY 32 Precision Approach 200 feet ½ mile
RAP RNAV (GPS) RWY 14 Approach with Vertical Guidance LPV: 300 feet LNAV: 700 feet 1 mile
RAP RNAV (GPS) RWY 32 Approach with Vertical Guidance LPV: 200 feet LNAV: 300 feet ½ mile
PHP RNAV (GPS) RWY 12 Approach with Vertical Guidance LPV: 300 feet LNAV: 600 feet 1 mile
PHP RNAV (GPS) RWY 30 Approach with Vertical Guidance LPV: 300 feet LNAV: 600 feet 1 mile


KLJ
Hangars
Pages 2-25 and 2-27
Hangar 1 - 1,300 SF
Hangar 2 - 1,700 SF
Hangar 3 - 5,800 SF
Hangar 4 - 2,600 SF
Hangar 5 - 12,000 SF
Legend
Existing Airport Property
Wall Municipal Airport
Exhibit 2-7
Terminal Area Facilities Map

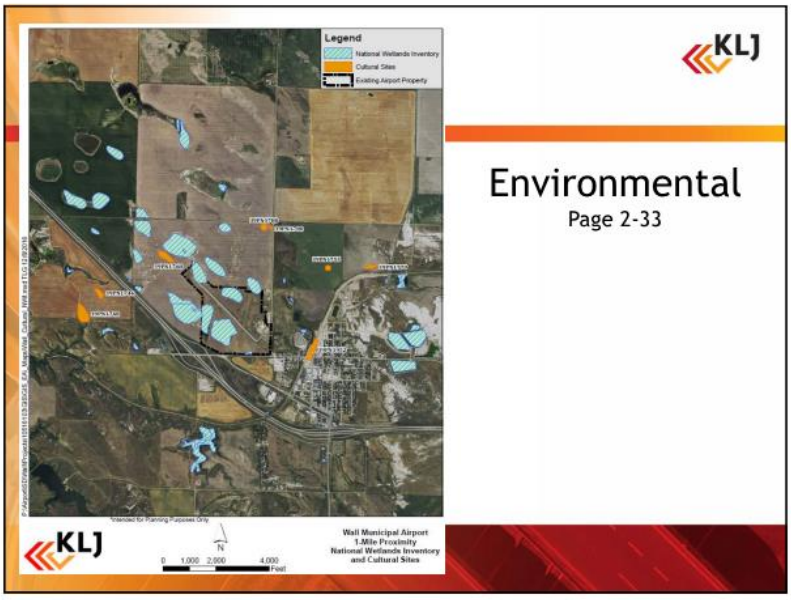

KLJ
Support Facilities
Pages 2-26 to 2-27
Fueling
Private Only
Terminal/SRE Building
No paved access
Access & Parking
Access for 3 & 4 limited
Legend
Existing Airport Property
Wall Municipal Airport
Exhibit 2-7
Terminal Area Facilities Map

Typical Hangar Attributes

Typical Aircraft Hangar Attributes

	T-Hangars	Small Storage Less than 6,000 sf	Large Storage More than 6,000 sf	FBO/SASO
Photo Examples				
Dedicated Apron	None	None	Equal to depth of hangar	Equal to depth of hangar (plus apron for services)
Airport Apron Access	No	No	No	Yes
Setbacks from Taxilanes	Yes - for Design Group (I or II)	Yes - for Design Group (I or II)	Yes plus Apron - for Design Group (II+)	Yes plus Apron - for Design Group (II+)
Airside Taxi Route	Yes - for Design Group (I or II)	Yes - for Design Group (I or II)	Yes - for Design Group (II+)	Yes - for Design Group (II+)
Public Road Access/Parking	No	Yes or No *	Yes*	Yes*

* Any business/corporate hangar located on an airport should have public road access and parking for customers/passengers. Particularly those customers/passengers who are not trained in driving on an airport.



Forecasts

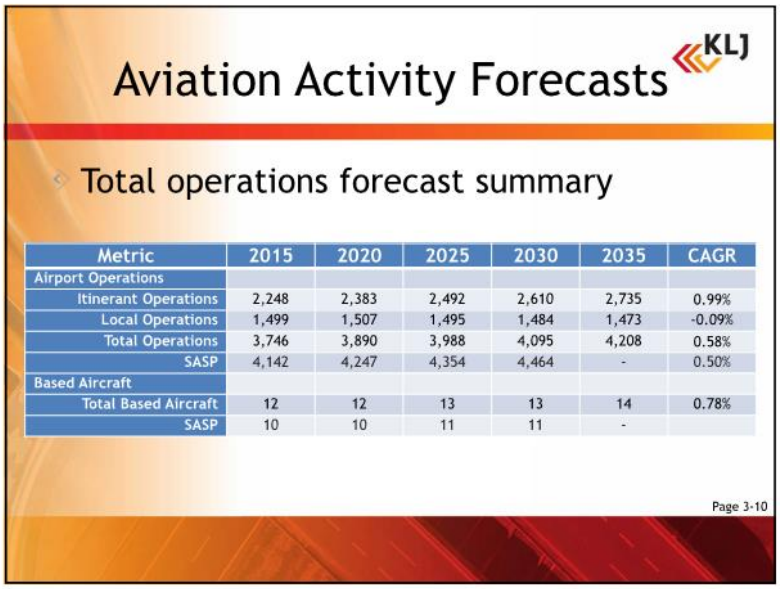
Aviation Activity Forecasts

- Airport Traffic Operations
- Measure Aviation Demand
- Critical Design Aircraft
- Drives Airport Facility Needs
- 20-Year Forecast
- FAA Approval Required



11





Metric	2015	2020	2025	2030	2035	CAGR
Airport Operations						
Itinerant Operations	2,248	2,383	2,492	2,610	2,735	0.99%
Local Operations	1,499	1,507	1,495	1,484	1,473	-0.09%
Total Operations	3,746	3,890	3,988	4,095	4,208	0.58%
SASP	4,142	4,247	4,354	4,464	-	0.50%
Based Aircraft						
Total Based Aircraft	12	12	13	13	14	0.78%
SASP	10	10	11	11	-	

Aviation Activity Forecasts

- Fleet mix of annual operations

Metric	2015	2020	2025	2030	2035	CAGR
Single-Engine Piston	2,379	2,451	2,482	2,529	2,577	0.40%
Multi-Engine Piston	122	136	150	164	179	1.94%
Turboprop[1]	1,049	1,089	1,117	1,147	1,178	0.58%
Turbojet	9	10	20	20	21	4.13%
Helicopter	75	88	100	113	126	2.64%
Ultralight/Other	112	117	120	123	126	0.58%
Total Operations	3,746	3,890	3,988	4,095	4,208	0.58%

[1] Including single-engine turboprops such as Aerial Applicators using the Air Tractor 502 and 802.

Page 3-11

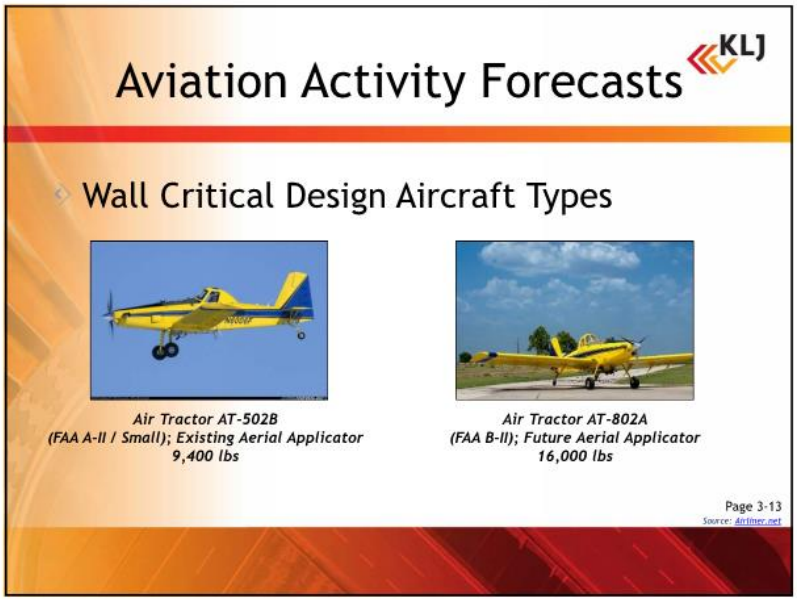
Aviation Activity Forecasts

Representative Aircraft	Design	2015	2020	2025	2030	2035	CAGR
Air Tractor AT-502B	A-II/Small	726	519	532	546	562	-1.27%
Air Tractor AT-802A	B-II	241	571	585	601	618	4.82%
Air Tractor AT-401	A-II/Small	150	156	160	164	168	0.58%
Total B-II Aircraft		241	571	585	601	618	

Small Aircraft = 12,500 pounds or less

Minimum 500 annual operations to qualify as "Design Aircraft"

Page 3-14


Aviation Activity Forecasts
KLJ
Wall Critical Design Aircraft Types
Air Tractor AT-502B
(FAA A-II / Small); Existing Aerial Applicator
9,400 lbs
Air Tractor AT-802A
(FAA B-II); Future Aerial Applicator
16,000 lbs
Page 3-13
Source: Airliner.net


Aviation Activity Forecasts
KLJ
Beechcraft King Air 200
FAA B-II / Small
Eurocopter UH-72
Sikorsky HH-60
Cessna Citation Mustang
FAA B-I / Small
Page 3-13
Source: Airliner.net

Aviation Activity Forecasts

- FAA TAF Comparison
  - Consistent with TAF if forecasts differ by less than 10 percent in the 5-year forecast and 15% percent in the 10-year period

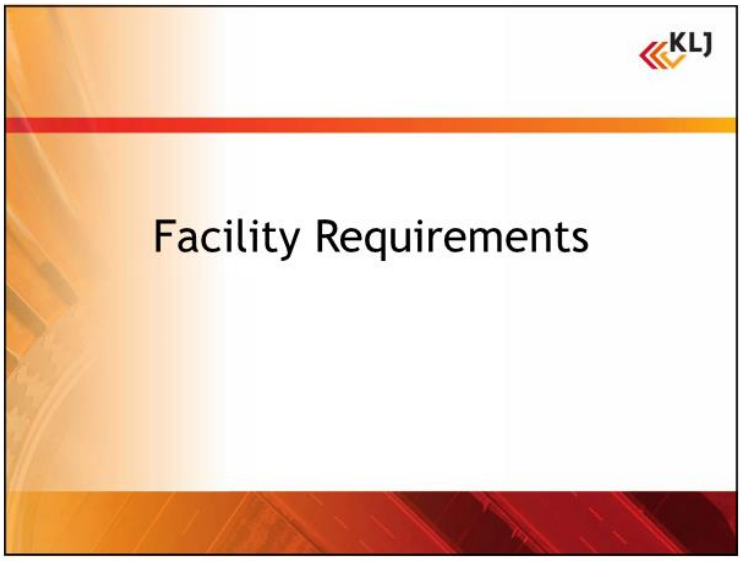
Metric	Year	Airport Forecast	2016 FAA TAF	AF/TAF % Difference
Based Aircraft				
Base Year	2015	12	12	0.00%
Base Year + 5 Years	2020	12	12	3.05%
Base Year + 10 Years	2025	13	12	6.73%
Base Year + 15 Years	2030	13	12	11.22%
Base Year + 20 Years	2035	14	12	16.83%
Growth Rate		0.78%	0.00%	
Total Operations				
Base Year	2015	3,746	3,746	0.01%
Base Year + 5 Years	2020	3,890	3,746	3.84%
Base Year + 10 Years	2025	3,988	3,746	6.46%
Base Year + 15 Years	2030	4,095	3,746	9.31%
Base Year + 20 Years	2035	4,208	3,746	12.33%
Growth Rate		0.58%	0.00%	

Page 3-18

FAA Forecast Approval

- Forecast Approved based on Draft Chapter Submitted
- Approved Critical Design Aircraft
  - Air Tractor 802A
  - Runway Design Code to change from
    - A/B-I(S)-Visual
    - to A/B-II-5000

03/23/2017


KLJ
Facility Requirements


Facility Requirements
KLJ
Runway Length
Critical Design Aircraft
Existing: Air Tractor AT-502B [A-II (Small)]1
Future: Air Tractor AT-802A [B-II]
500 Operations per year
1Runway is currently an A/B-I (Small) - Vis

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Facility Requirements

Design Standard	Actual Existing	Requirements	
		Existing	Future
Runway Design Code (RDC)	A/B-I(S)-Vis	A/B-II(S)-Vis	A/B-II-5000
Pavement Strength (Wheel Loading)	12,500 lbs SW	12,500 lbs SW	20,000 lbs SW
Runway Width	60 feet	75 feet	75 feet
Runway Safety Area (RSA) Width	120 feet	150 feet	150 feet
RSA beyond Runway End	240 feet	300 feet	300 feet
Object Free Area (OFA) Width	250 feet	500 feet	500 feet
OFA beyond Runway End	240 feet	300 feet	300 feet
Object Free Zone (OFZ) Width	250 feet	250 feet	400 feet
OFZ beyond Runway End	200 feet	200 feet	200 feet
Runway Protection Zone (RPZ) Inner Width, Outer Width, Length	250, 450, 1,000	250, 450, 1,000	500, 700, 1,000
Hold Position from Centerline	125 feet	125 feet	200 feet
Aircraft Parking Area from Centerline	310 feet	250 feet	250 feet

Significant Improvement Element

Facility Requirements

- Runway Length

Airport and Runway Data	
Airport Elevation	2,813 feet
Mean Daily Maximum Temperature of Hottest Month	89.3°F
Maximum Difference in Runway Centerline Elevation	13 feet (+130 feet)
Runway Condition	Dry Runways
Aircraft Classification	Recommended Runway Length
Small airplanes 12,500 pounds or less	
10 or more passenger seats	4,710 feet
Less than 10 passenger seats at 100 percent of fleet	4,880 feet
Less than 10 passenger seats at 95 percent of fleet	4,340 feet
Large airplanes greater than 12,500 lbs. up to 60,000 lbs.	
100 percent of fleet at 90 percent useful load	9,330 feet
100 percent of fleet at 60 percent useful load	6,890 feet
75 percent of fleet at 90 percent useful load	7,940 feet
75 percent of fleet at 60 percent useful load	5,530 feet
Specific Aircraft	
Air Tractor AT-502B	4,180 feet
Air Tractor AT-802A	6,230 feet
Cessna Citation Mustang (Dry)	5,680 feet

Facility Requirements

Recommended Runway Length

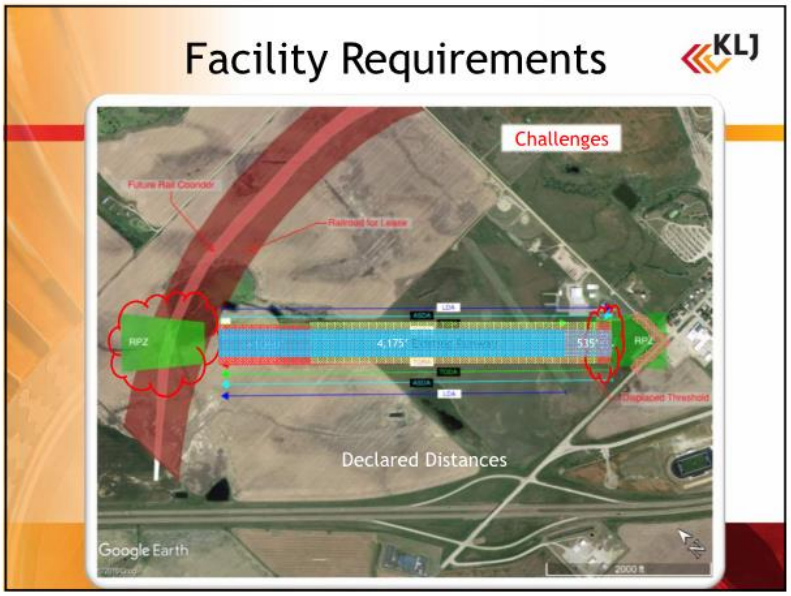
Aircraft Type/Operation	Planning Period(s)	Recommended Runway Length
Air Tractor AT-502B	Existing	3,500 feet (Existing)
Air Tractor AT-502B	Through PAL 1	4,300 feet
Air Tractor AT-802A	PAL 1-2 (Future)	4,700 feet*
Air Tractor AT-802A	PAL 3-4+ (Ultimate)	4,700 feet*
Various - Crosswind Runway	Existing to PAL 4	2,000 feet (Turf)

Facility Requirements – Declared Distances

- Takeoff Run Available (TORA) - runway roll
- Takeoff Distance Available (TODA) - to climb 35 foot above ground level
- Accelerate Stop Distance Available (ASDA) - accelerate and stop an aborted takeoff
- Landing Distance Available (LDA)

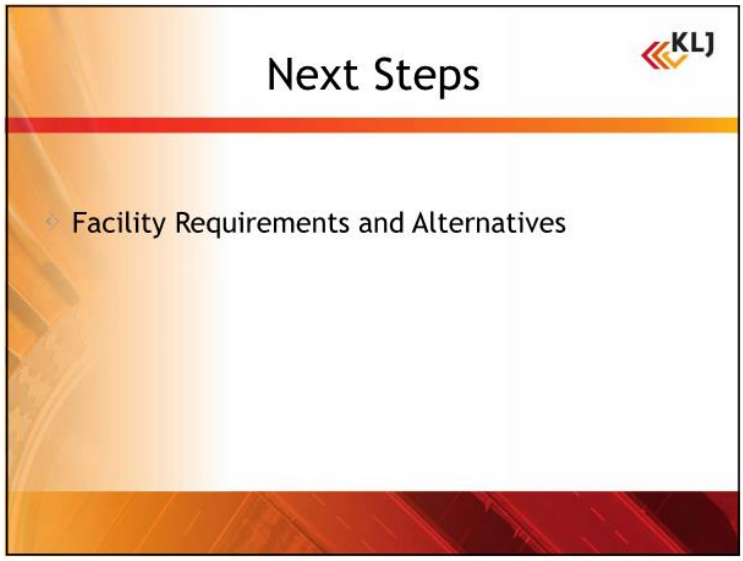
DT = Displaced Threshold
RWY = Runway
SWY = Stopway
CWY = Clearway (sloping imaginary surface)




Facility Requirements
KLJ
Challenges
Future Rail Coorridor
Railroad for Lease
RPZ
4,175'
515'
RPZ
Displaced Threshold
Declared Distances
Google Earth


KLJ
Questions & Comments

03/23/2017


Next Steps
KLJ
Facility Requirements and Alternatives


WALL
South Dakota
KLJ
Thank You!
Kent Penney
Lead Planner
605 939 5794 m
kent.penney@kljeng.com
Andrew Zielike
Planner
651 925 7737 m
andrew.zielike@kljeng.com

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WALL South Dakota
WINDOW TO THE BADLANDS

Wall Municipal Airport Master Plan
Master Plan Advisory Committee - Kick-Off
March 23, 2017 -- 1:00 p.m. - 2:30 p.m.

KLJ

ATTENDANCE LIST

Name:	Organization/Business:	Phone:	Email:
Marty Huether	Wall Mayor	605-685-3021	marty huether @ gmail.com
ERIC LEONARD	superintendent, minuteman missile [illegible]	605 433-5552	eric_leonard@nps.gov
Preston Johnson	Ascend Ag Inc	605 515 1321	pj@gwtc.net
David Zoll Hotel		605-390-2091	37Hotel@rap.midco.net
Cheyenne McGriff	Wall Economic Development	605-279-2658	walleddc@gwtc.net
John Kitterman		605-515-3129	jtk@gwtc.net
Jodie Kusser	Wall Drug / Wall Chamber	605-431-0929	wdbase@gwtc.net
Rick Hustead	Wall City Council / Wall Drug	605 441-9669	rhustead@gwtc.net
Dave Hahn	Wall Airport Manager	605-279-2666	davehahn@gwtc.net
Carolynn Anderson	Finance Officer	605-279-2663	wallcity@gwtc.net
By Phone Sandy DePottey	FAA - Planner (Minneapolis)		
Ryan Bale	FAA - Program Manager (Bismarck)		
Jon Becker	SD DOT		
Jack Dokken	SD DOT		
KLJ Kent Penney	KLJ - Planner (Rapid City)		
Andrew Zielike	KLJ - Planner (St. Paul)		

Airport Master Plan
Inventory & Forecast Meeting Summary
Wall Municipal Airport
March 23, 2017

Background

A meeting was held with the Master Plan Advisory Committee (MPAC) on March 23, 2017 to review the Inventory and Forecast chapters. Prior to this meeting, KLJ distributed *Chapter 1: Introduction*, *Chapter 2: Inventory*, and *Chapter 3: Forecast* to the MPAC. This was the second meeting of the MPAC with the first kickoff meeting being held on November 9th.

Throughout the development of the master plan the MPAC will be asked to provide input on the draft documents. The general public will have opportunities to provide input through public meetings or contacting the project team.

Attendees	Not in Attendance
Marty Huether, Mayor/Golden West Comm	Rick Johnson, Yardley & Co.
Eric Leonard, National Park Service	Rod Senn, KLJ
Preston Johnson, Ascend Ag	
Dave Jedlicka, Aircraft Owner	
Cheyenne McGriff, Wall Economic Development	
John Kitterman, Wall Fire Chief	
Jackie Kusser, Wall Chamber/Wall Drug	
Rick Hustead, City Council/Wall Drug	
Dave Hahn, Airport Manager	
Carolynn Anderson, Wall Finance Officer	
Kent Penney, KLJ	
Andrew Zielike, KLJ	
Sandy DePottey, FAA	
Ryan Bale, FAA	
Jon Becker, SDDOT	
Jack Dokken, SDDOT	

Discussion

The following key items were discussed at the meeting.

1. **Study Status Update**
   a. Kent Penney provided a brief overview and refresher of what an Airport Master Plan (AMP) is and where the airport is in the process.
   b. Currently at Inventory and Aviation Activity Forecast phase of the study.
      i. Facility Requirements and Alternatives will be the next phase.
   c. Kent Penney recapped the planning Considerations of the study which include;
      i. RPZ for Runway 30
      ii. Rail road corridor

NATIONAL PERSPECTIVE
REGIONAL EXPERTISE
TRUSTED ADVISOR

iii. Hanger development area

2. **Inventory**
   a. Existing Runways
      i. Primary Runway 12/30 (paved) is 3,500 feet long by 60 feet wide.
      ii. Crosswind Runway 18/36 (turf) is 2,000 feet long by 100 feet wide.
      iii. Existing Airport Reference Code is B-1 Small Aircraft with visual approach
      iv. End Runway Safety Area for Runway 18 is insufficient length. Currently 35 feet with standards requiring 120 feet.
      v. Wind coverage for Runway 12/30 is 92.87% at 10.5 knot crosswind component.
         1. Crosswind runway brings combined wind coverage to 96.10%
   b. Runway 30 Runway Protection Zone
      i. Intended to provide protection to persons and property on the surface.
      ii. Currently contains incompatible land uses such as an office building, church, fuel tanks, and roads.
      iii. Improvements made to the runway will require the RPZ incompatible land uses to be resolved.
      iv. Future Runway Design Code would widen RPZ dimensions to include 3 additional residential structures.
   c. Railroad Corridor
      i. Canadian Pacific owns land North and West of the airfield for a planned railroad line.
         1. Progress on the railroad line is currently halted with no action planned in the future. Canadian Pacific intends to hold onto land for corridor but sell remaining property surrounding corridor.
         2. Following meeting it was discovered that the railroad may sell the corridor and protect interests through easements.
   d. Support Facilities
      i. SuperAWOS provides weather observations to pilots. It is no longer certified by the FAA.
         1. Replacement should be considered if instrument approach is developed.
      ii. Fuel is currently not publicly available. Existing fuel facilities and storage are privately owned.
      iii. No access road or parking available for Arrival/Departure building
      iv. No direct vehicle access to east hangars
   e. Environmental
      i. Cultural Site identified northwest of Runway 12 threshold.
         1. Determined "Not Eligible" during Class III Inventory

3. **Aviation Activity Forecast**
   a. Forecast developed for 20-year planning period to analyze airport demand and identify needs. Forecast are approved by FAA
   b. Based Aircraft
      i. There are 12 based aircraft verified (basedaircraft.com) on the airfield as of February, 2017
      ii. Following the SD State Aviation System Plan it is anticipated based aircraft will grow to 14 by 2035
   c. Design Aircraft

NATIONAL PERSPECTIVE
REGIONAL EXPERTISE
TRUSTED ADVISOR

i. The existing Critical Design Aircraft is an Air Tractor AT-502B (A-II-Small) with over 500 annual total operations.
ii. The future Critical Design Aircraft is an Air Tractor AT-802A (B-II)

d. Total Operations
   i. Baseline operations of 3,746 was established based from estimated operations from the Terminal Area Forecast
   ii. Utilizing the based aircraft growth rate (.58% CAGR) of SD it is anticipated total operations will grow to 4,208.

e. TAF Comparison
   i. For local FAA office approval, the forecast for total operations and based aircraft must not differentiate more than 10% in 5 years and 15% in the next 10 years.
   ii. The forecasts for based aircraft and total operations are consistent with the TAF

f. Approval
   i. The FAA approved the forecast on March 15th, 2017

g. Comments
   i. Dave Hahn asked if the modest numbers would hurt the airport.
      1. Kent said that the forecast are feasible projections that establish activity levels.
      2. Facility Requirements will identify the needs and preserve the space to develop as demands arise.

4. Facility Requirements

a. Runways
   i. Design Standards
      1. Existing critical design aircraft (A-II-Small) is more demanding than existing Runway Design Code (A/B-I-Small). Airplane Design Group II standard is 75-foot wide runway pavement and existing runway is 60 feet wide.
      2. Future Runway Design code will be A/B-II-5000. This will require the following significant improvements.
         a. Pavement strength increase to 20,000 lbs.
         b. Runway width of 75 feet
         c. Holding Position moved from 125 feet to 200 feet from centerline
   ii. Runway Length
      1. Airfield elevation, temperature, runway gradient are factors that affect runway length requirements. Wall has an elevation of 2,813 feet with the mean maximum temperature of 89.3 degrees in July. Runway 12/30 has a 13-foot difference in elevation from end to end.
      2. FAA runway length tables recommend a length of 4,340 feet for Small Aircraft with less than 10 seats.
      3. Specific Aircraft at MTOW
         a. AT-502B requires 4,180 feet
         b. AT-802A requires 6,230 feet
   iii. Comments
      1. Preston asked if the bypass taxiway was necessary
         a. Kent said there are a few options but a bypass allows landing aircraft can exit the runway without conflict with aircraft waiting to depart.

b. Dave Hahn asked if a larger turnaround at Runway 30 end would be feasible. Kent said KLJ will evaluate.

2. Marty asked about conversations with Air National Guard and what needs they expressed.
   a. Kent said the ANG would utilize instrument approaches if they were available and would land and taxi more frequently if pavement strength could handle the 22,000 lbs. rotorcraft.

b. Declared Distances
   i. Runway Protection Zone on Runway 30 end and railroad corridor on the Runway 12 end constricts future runway extensions. Approximately 4,700 feet would be possible using declared distance.
   ii. Declared distances are published lengths available for takeoff and landing operations.
      1. Runway 30 threshold would be displaced to remove RPZ from incompatible uses.
      2. An extension of pavement to the northwest ending at the railroad corridor and a 150-foot extension of pavement to the southeast for takeoff on Runway 30.
      3. Preston said that the FAA should consider the additional runway length as a safety issue and a priority

c. Railroad Land
   i. The extension of runway 12/30 and the end runway safety area of Runway 18 would warrant purchasing land from the railroad.
      1. Marty said the city should consider acquiring a larger section of the railroad land and leasing to SDSU
      2. Kent said for FAA reimbursement pavement and certain surfaces would determine land purchasing to be funded.
      3. on the North RR land
   ii. Preston asked if the crosswind runway would be able to be shift south to bring the safety area outside the railroad land.
      1. KLJ will evaluate how far south the crosswind runway can go.

d. Other
   i. Marty asked how the study incorporates the needs of other entities that haven't historically used the airport but the community would like to attract. Would support letters be beneficial?
      1. Support letters would be helpful for targeting specific improvements or needs.
      2. The master plan study will look at preserving space for uses that once demand is realized can be developed.

Next Steps

1. KLJ will develop the Facility Requirements and Alternatives Chapters
2. KLJ MPAC meeting will be set for June, 2017

NATIONAL PERSPECTIVE
REGIONAL EXPERTISE
TRUSTED ADVISOR


KLJ
Wall Municipal Airport
Master Plan Study
Master Plan Advisory Committee
Facility Requirements Meeting
Wall City Offices
August 1, 2017

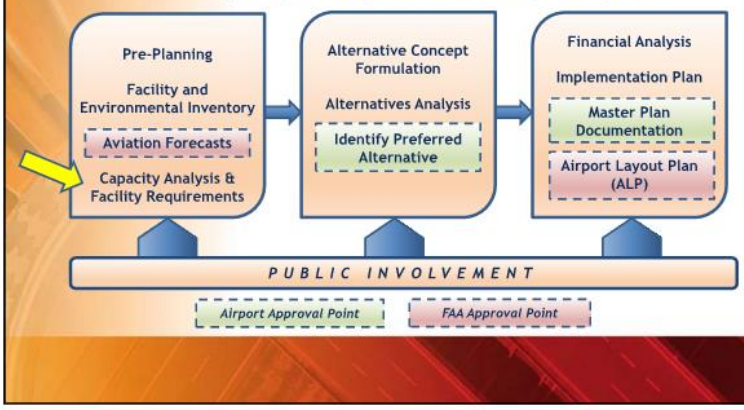

KLJ
Agenda
Introductions
Facility Requirements
Runway Protection Zone (RPZ) Analysis
Property

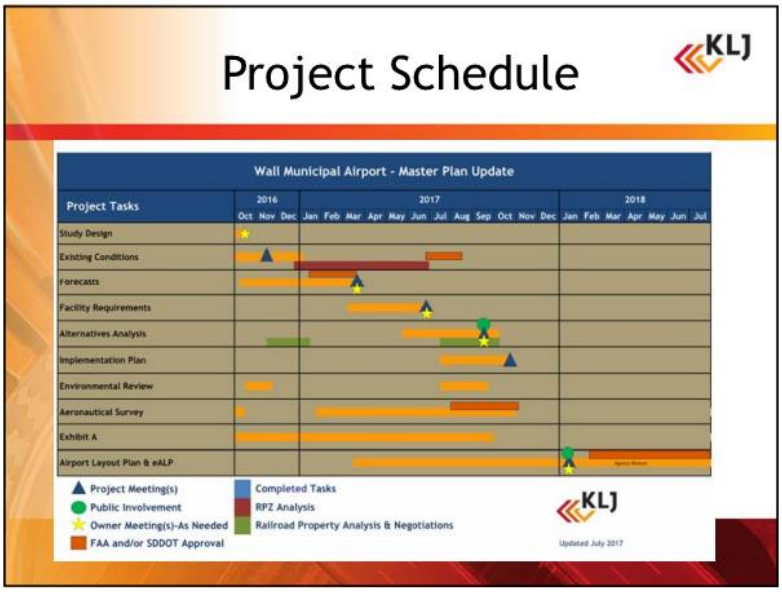
Introductions

- Wall MPAC
  - Marty Huether, Mayor
  - Dave Hahn
  - Preston Johnson
  - Cheyenne McGriff
  - John Kitterman
  - Rick Hustead
  - Rick Johnson
  - Jackie Kusser
  - Eric Leonard
  - Carolynn Anderson
- KLJ
  - Kent Penney (Rapid City)
  - Andrew Zielike (St. Paul)
- FAA
  - Sandy DePottey (Minneapolis)
  - Brian Shuck (Bismarck)
- SDDOT
  - Jack Dokken
  - Jon Becker

Airport Master Planning

Planning the future of the Wall Municipal Airport




Project Schedule
KLJ
Wall Municipal Airport - Master Plan Update
Project Tasks
2016
2017
2018
Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul
Study Design
Existing Conditions
Forecasts
Facility Requirements
Alternatives Analysis
Implementation Plan
Environmental Review
Aeronautical Survey
Exhibit A
Airport Layout Plan & eALP
Project Meeting(s)
Public Involvement
Owner Meeting(s)-As Needed
FAA and/or SDDOT Approval
Completed Tasks
RPZ Analysis
Railroad Property Analysis & Negotiations
KLJ
Updated July 2017


KLJ
Facility Requirements

3

Examples of Aircraft Design Codes (ARC)

Page 4-6

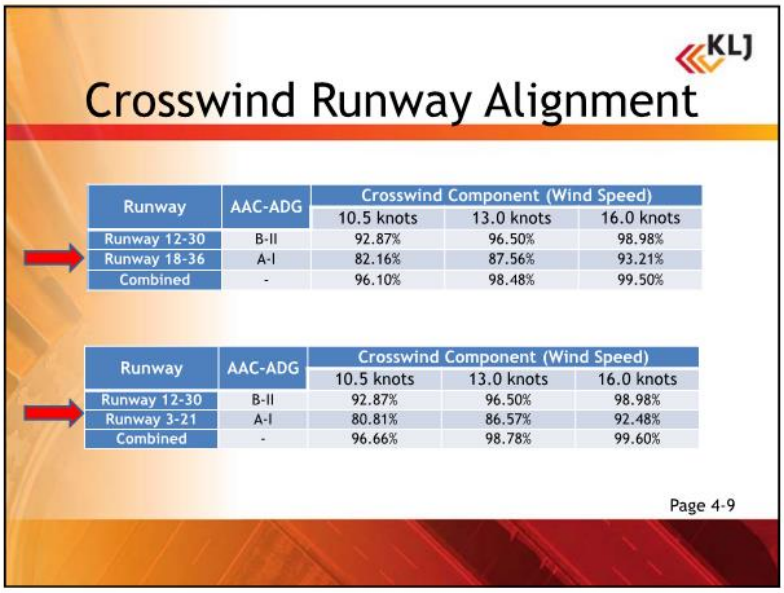
ARC A-I/Small Aircraft		ARC A-II/Small Aircraft	
Cessna 150 **Cessna 182** Piper Archer Piper Seneca Ayres Thrush 600		Cessna 208 **Pilatus PC-12** Air Tractor 502B	
ARC B-I/Small Aircraft		**ARC B-II/Small Aircraft**	
Beech Baron 58 **Cessna 421** Beech King Air 100		Beech King Air 90 **Beech King Air 200**	
ARC B-II		**ARC C-I, C-II**	
Beech King Air 350 Cessna Citation XLS Swearingen Metro III **Air Tractor 802A**		**Cessna Citation X** Learjet 35/55	

Source: Wikipedia.org, Airliners.net, Planespotters.net

Runway Design Aircraft

Design Characteristics	Runway 12-30	Runway 18-36
Aircraft Make/Model	Air Tractor AT-802A	Beech Bonanza 35
Airplane Approach Category	B	A
Airplane Design Group	II	I
Taxiway Design Group	1A	1A
Wingspan	59' 3"	33' 6"
Length	36' 0"	26' 5"
Tail Height	11' 2"	7' 7"
Cockpit to Main Gear	6' 10"	N/A
Main Gear Width	10' 0"	N/A
Approach Speed (1.3 x Stall)	103 knots	70 knots
Maximum Takeoff Weight	16,000 pounds	3,400 pounds
Landing Gear Configuration	Single Wheel	Single Wheel
Aircraft Classification Number	8/F/D/X/T	N/A

Page 4-7

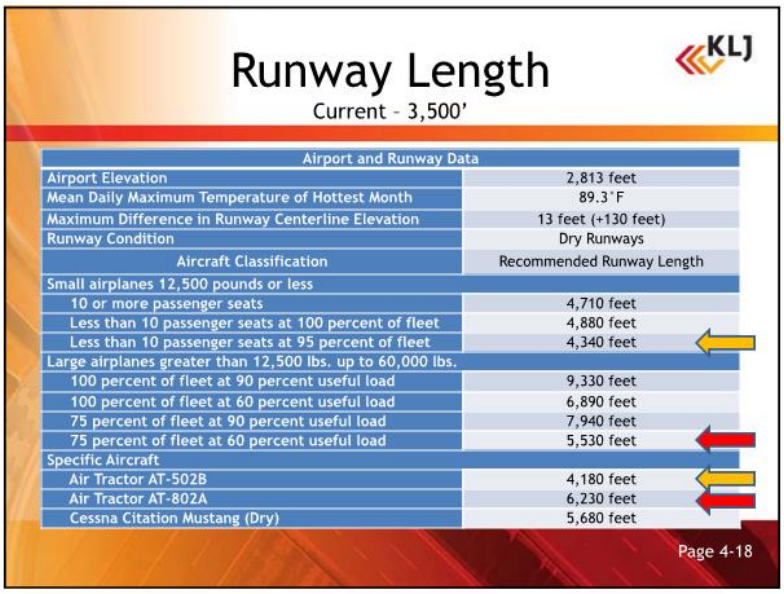


Crosswind Runway Alignment

Runway	AAC-ADG	Crosswind Component (Wind Speed)		
		10.5 knots	13.0 knots	16.0 knots
Runway 12-30	B-II	92.87%	96.50%	98.98%
Runway 18-36	A-I	82.16%	87.56%	93.21%
Combined	-	96.10%	98.48%	99.50%

Runway	AAC-ADG	Crosswind Component (Wind Speed)		
		10.5 knots	13.0 knots	16.0 knots
Runway 12-30	B-II	92.87%	96.50%	98.98%
Runway 3-21	A-I	80.81%	86.57%	92.48%
Combined	-	96.66%	98.78%	99.60%

Page 4-9



Runway Length

Current - 3,500'

Airport and Runway Data	
Airport Elevation	2,813 feet
Mean Daily Maximum Temperature of Hottest Month	89.3°F
Maximum Difference in Runway Centerline Elevation	13 feet (+130 feet)
Runway Condition	Dry Runways
Aircraft Classification	Recommended Runway Length
Small airplanes 12,500 pounds or less	
10 or more passenger seats	4,710 feet
Less than 10 passenger seats at 100 percent of fleet	4,880 feet
Less than 10 passenger seats at 95 percent of fleet	4,340 feet
Large airplanes greater than 12,500 lbs. up to 60,000 lbs.	
100 percent of fleet at 90 percent useful load	9,330 feet
100 percent of fleet at 60 percent useful load	6,890 feet
75 percent of fleet at 90 percent useful load	7,940 feet
75 percent of fleet at 60 percent useful load	5,530 feet
Specific Aircraft	
Air Tractor AT-502B	4,180 feet
Air Tractor AT-802A	6,230 feet
Cessna Citation Mustang (Dry)	5,680 feet

Page 4-18

Runway Length

Air Tractor 802

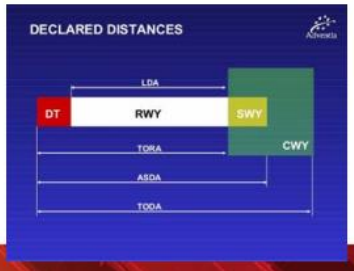
Empty Weight	Mission Payload	Takeoff Weight	Runway Length
6,800 lbs.	9,200 lbs. (100%)	16,000 lbs. (MTOW)	6,230 feet
6,800 lbs.	8,200 lbs. (89%)	15,000 lbs.	5,450 feet
6,800 lbs.	7,200 lbs. (78%)	14,000 lbs.	4,690 feet
6,800 lbs.	6,800 lbs. (74%)	13,600 lbs.	4,330 feet
6,800 lbs.	6,200 lbs. (67%)	13,000 lbs.	3,930 feet
6,800 lbs.	5,700 lbs. (62%)	12,500 lbs.	3,700 feet
6,800 lbs.	5,400 lbs. (58%)	12,200 lbs.	3,500 feet (Existing)

Page 4-19

Facility Requirements – Declared Distances

- Takeoff Run Available (TORA) - runway roll
- Takeoff Distance Available (TODA) - to climb 35 foot above ground level
- Accelerate Stop Distance Available (ASDA) - accelerate and stop an aborted takeoff
- Landing Distance Available (LDA)

DT = Displaced Threshold
RWY = Runway
SWY = Stopway
CWY = Clearway (sloping imaginary surface)



Runway Length - Crosswind

Current - 1980'

Airport and Runway Data		
Airport Elevation	2,813 feet	
Mean Daily Maximum Temperature of Hottest Month	89.3°F	
Runway Condition	Dry Runways (Turf)	
Aircraft Classification	Recommended Runway Length	
Small airplanes 12,500 pounds or less		
Approach speeds less than 30 kts.	460 feet	
Approach speeds 30 kts. or more but less than 50 kts.	1,230 feet	
Specific Aircraft	Ground Run	Clear 50-ft Obst
Cessna 182	1,167 feet	2,272 feet
American Champion Citabria	530 feet	970 feet
Piper Cherokee Six	2,040 feet	3,130 feet
Beechcraft Bonanza V35	1,840 feet	3,120 feet
Cessna 172H	1,320 feet	2,450 feet
Aviat Husky A-1B	472 feet	1,180 feet

Page 4-21

Other Issues

Runway Designation	Existing Magnetic Bearing (2015)	Future Magnetic Bearing (2035)	Recommended Future Designation
Runway 12/30	128.03°/308.04°	130.03°/310.04°	13/31
Runway 18/36	183.71°/03.71°	185.71°/05.71°	Same

Runway Designation

Page 4-24



Turf Runway Markings Page 4-30

- 200' spacing
- Outside Runway Edge
- Enough Existing Cones
- Grading needed first
- Will add 20' to Runway Length

Taxiway /Taxilane Standards

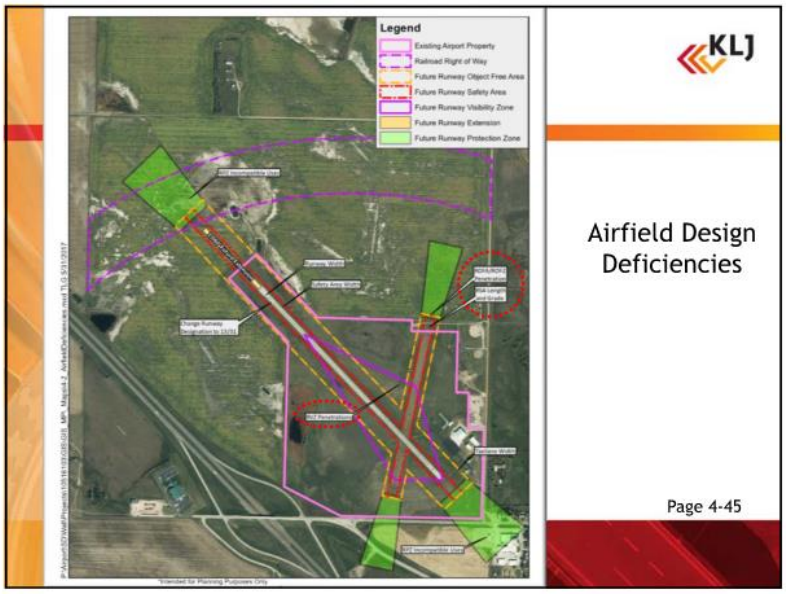
Page 4-32

Design Standard	Actual	Facility Requirements	
		Existing	Future/Ultimate
Taxiway Airplane Design Group (ADG)	I	II	II
Taxiway Design Group (TDG)	1A	1A	1A
Taxiway Width	25 feet	25 feet	25 feet
Taxiway Safety Area	79 feet	79 feet	79 feet
Taxiway Object Free Area	106 feet	131 feet	131 feet
Taxiway Centerline to Fixed or Movable Object	44 & 53 feet	65.5 feet	65.5 feet
Taxilane Airplane Design Group (ADG)	I	I	I
Taxilane Width	20-25 feet	25 feet	25 feet
Taxilane Object Free Area	60-79 feet	79 feet	79 feet
Taxilane Centerline to Fixed or Movable Object	30-39.5 feet	39.5 feet	39.5 feet

Runway Issues

Pages 4-34 to 36

- Primary Runway
  - Width 60’ to 75’
  - Safety Area Width 120’ to 300’
  - Runway Protection Zone (Road, Buildings)
- Crosswind Runway
  - Safety Area Length 35’ to 240’ from End
  - Runway Protection Zone (Road)
  - Object Free Area 100’ to 240’ from End
  - Obstacle Free Zone 100’ to 200’ from End



Airfield Design Deficiencies

Page 4-45

Aircraft Storage

Page 4-38

- Existing - 23,750 sf
- Based Aircraft Needs (PAL 4)
  - 31,400 sf including 4,100 sf for maintenance
- Transient Aircraft Needs (PAL 4)
  - 8,000 sf
- Needs expected to be met as demand occurs
- Transient needs will require proactive effort

Aircraft Tie-Downs

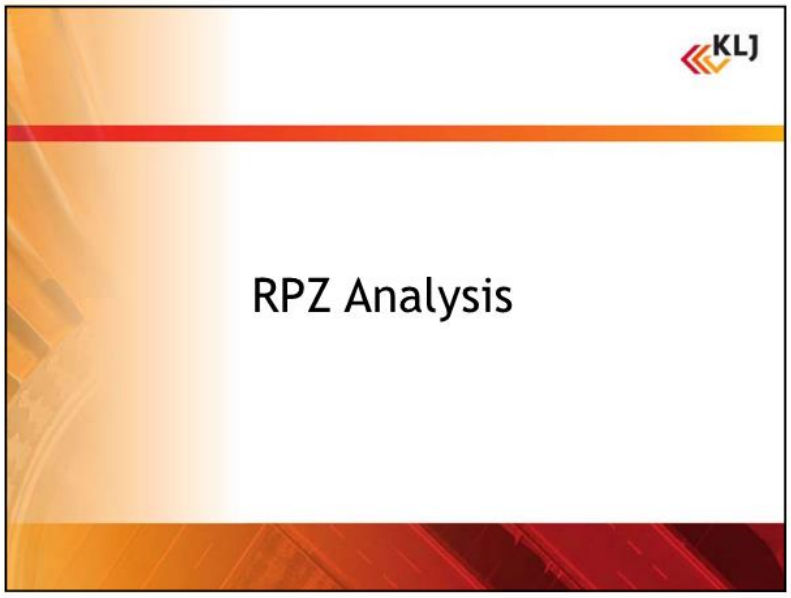
Pages 4-39 to 40

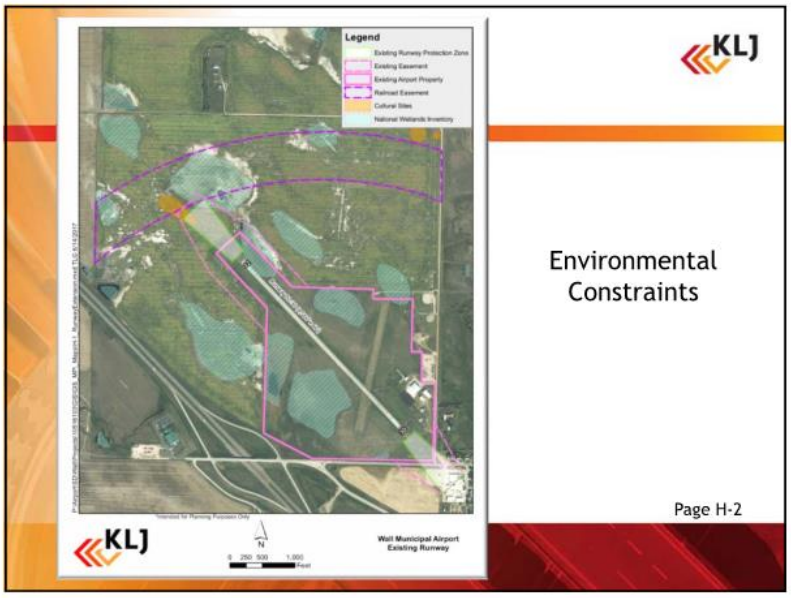
- Existing Tie-Downs - 5 (3,700 sy)
- Demand (PAL 4) - 7 (4,620 sy)

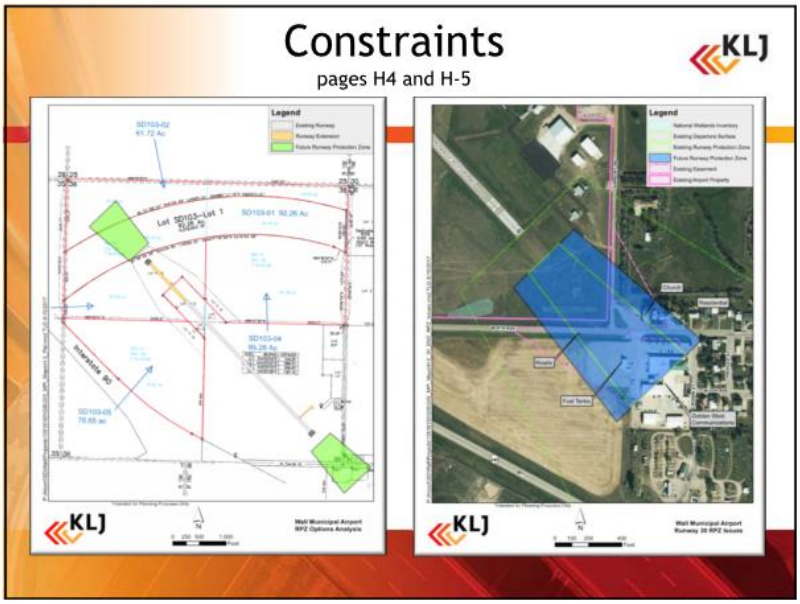
Terminal/Hangar Area

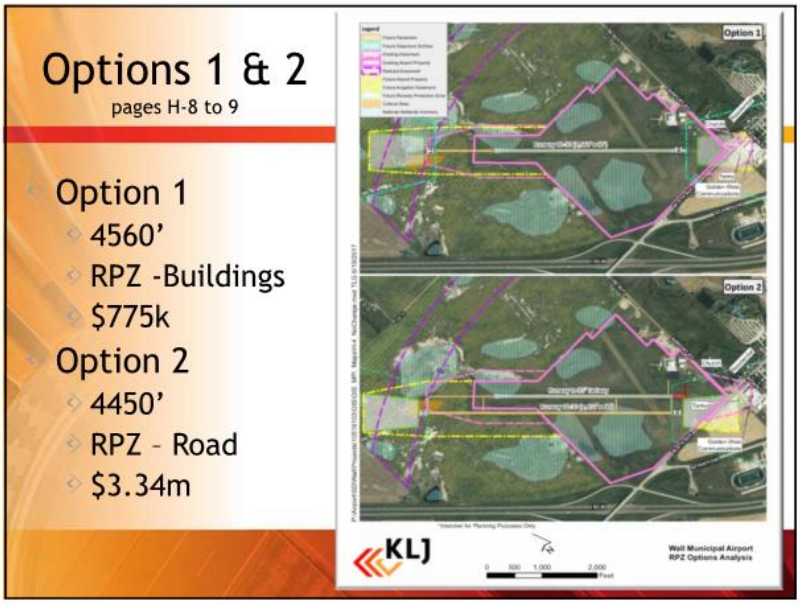
- Terminal
  - Adequate Size and Location
- Ground Access/Parking
  - Access Road and Parking for Hangars 3 and 4
- SRE Equipment
  - Current Blower-oversized, Broom, 3 point Blade
  - Need Push Plow, possibly trade Blower
- Fueling Facilities
  - Need Publicly Available Self-Fueling

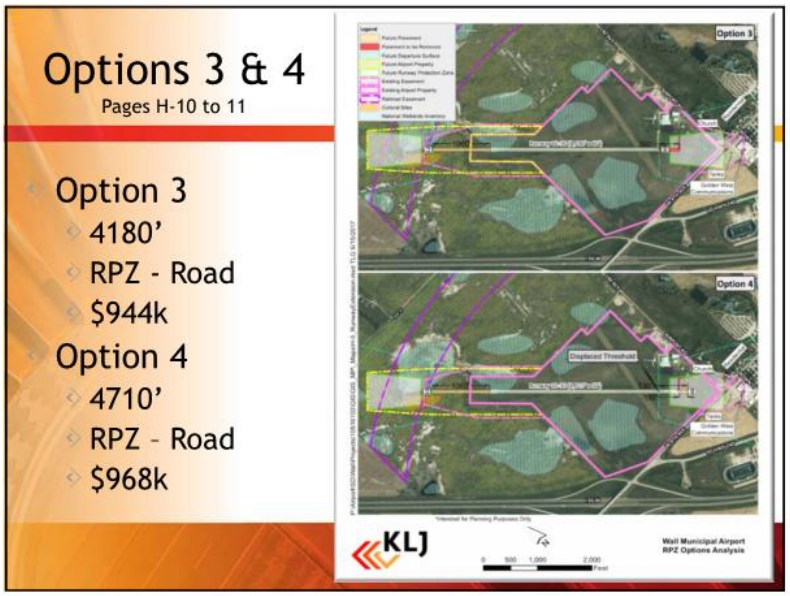


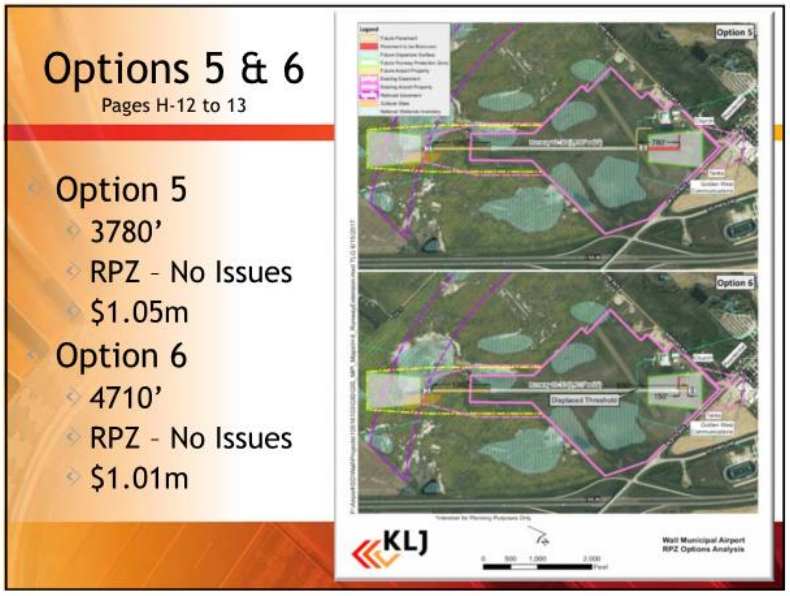

KLJ
RPZ Analysis


Legend
KLJ
Environmental Constraints
Page H-2
KLJ
Wall Municipal Airport
Existing Runway


Constraints
pages H4 and H-5
KLJ
Legend
KLJ
Wall Municipal Airport
RPZ Options Analysis
Legend
KLJ
Wall Municipal Airport
Runway 36 RPZ Issues


Options 1 & 2
pages H-8 to 9
Option 1
4560'
RPZ -Buildings
$775k
Option 2
4450'
RPZ - Road
$3.34m
Option 1
Option 2
KLJ
Wall Municipal Airport
RPZ Options Analysis

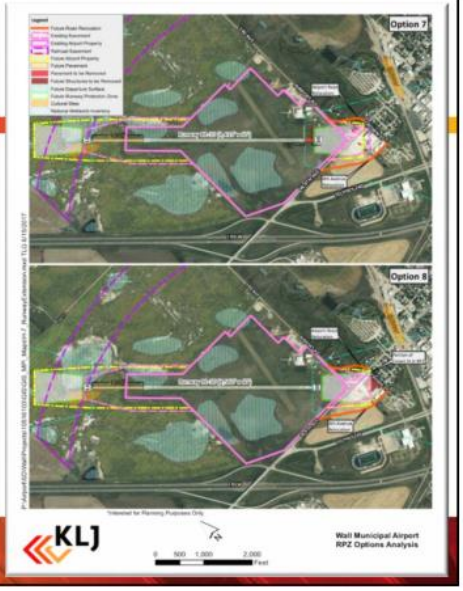

Options 3 & 4
Pages H-10 to 11
Option 3
4180'
RPZ - Road
$944k
Option 4
4710'
RPZ - Road
$968k
Option 3
Option 4
Displaced Threshold
KLJ
Wall Municipal Airport
RPZ Options Analysis


Options 5 & 6
Pages H-12 to 13
Option 5
3780'
RPZ - No Issues
$1.05m
Option 6
4710'
RPZ - No Issues
$1.01m
Option 5
Option 6
Displaced Threshold
KLJ
Wall Municipal Airport
RPZ Options Analysis

Options 7 & 8

Pages H-14 to 16

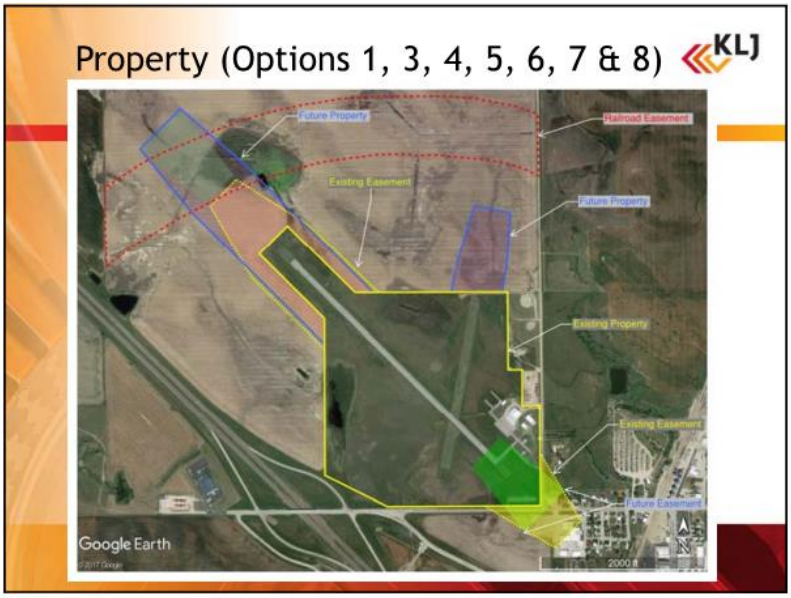
- Option 7
  - 4410'
  - RPZ - No Issues
  - $5.2m
- Option 8
  - 4560'
  - RPZ - No Issues
  - $17.81m

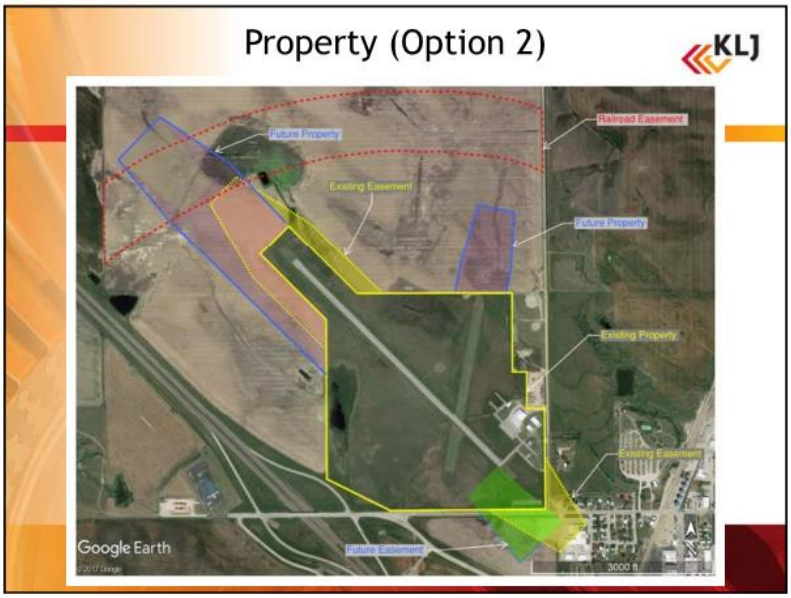


Accident Probability Option 4

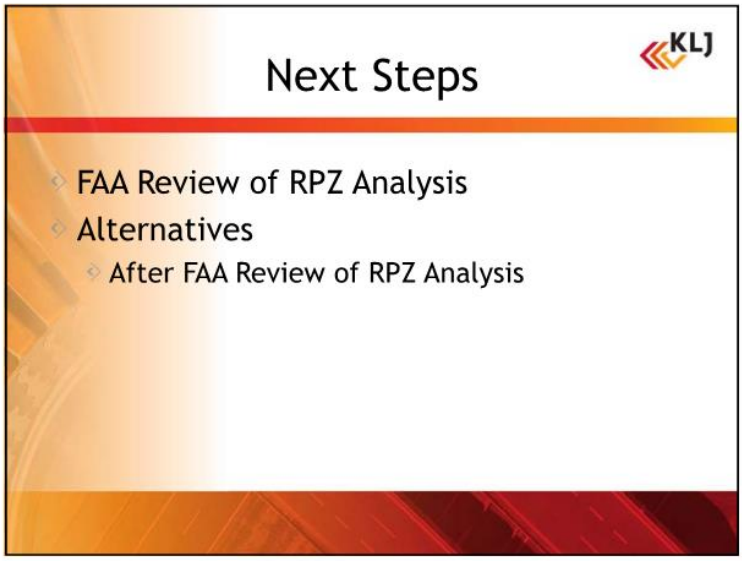
Pages H-17 to 18

	2015	2020	2025	2030	2035
Probability of Aircraft Accident with Car on 4th Avenue RPZ	0.00000083%	0.00000086%	0.00000086%	0.00000089%	0.00000092%
Probability of Aircraft Accident with Car on Airport Road RPZ	0.000000015%	0.000000017%	0.000000018%	0.000000020%	0.000000022%
Probability of Aircraft Accident with Person in Parking Lot RPZ	4.746E -17%	5.188E-17%	6.252E-17%	6.751E-17%	7.411E-17%
Total Probability of Aircraft Accident in All RPZ Subject Areas	2.240E-09%	2.438E-09%	2.607E-09%	2.821E-09%	3.042E-09%
Odds of Incident (:1)	322,204,794	295,235,086	281,238,755	255,634,708	233,439,283


Property (Options 1, 3, 4, 5, 6, 7 & 8)
KLJ
Future Property
Railroad Easement
Existing Easement
Future Property
Existing Property
Existing Easement
Future Easement
Google Earth
2000 ft


Property (Option 2)
KLJ
Future Property
Railroad Easement
Existing Easement
Future Property
Existing Property
Existing Easement
Google Earth
Future Easement
3000 ft

08/01/2017


KLJ
Next Steps
FAA Review of RPZ Analysis
Alternatives
After FAA Review of RPZ Analysis


KLJ
Thank You!
Kent Penney
Lead Planner
605 939 5794 m
kent.penney@kljeng.com
Andrew Zielike
Planner
651 925 7737 m
andrew.zielike@kljeng.com

16

WALL South Dakota
WINDOW TO THE BADLANDS

Wall Municipal Airport Master Plan
Master Plan Advisory Committee
August 1, 2017 -- 1:30 p.m. - 2:30 p.m.

KLJ

ATTENDANCE LIST

Name:	Organization/Business:	Phone:	Email:
Dave Hahn	Airport	605-279-2666	davehahn@gwtc.net
Kent Penney	KLJ	605.939.5794	kent.penney@kljeng.com
Jackie Kuiper	Chamber	605-431-0929	wdbase@gwtc.net
Carolynn Anderson	City	605-279-2663	wallcity@gwtc.net
Cheyenne McGriff	City-Economic Development	605-279-2658	walledd@gwtc.net
ERIC LEONARD	National park service - NPS	605-433-5552	eric_leonard@nps.gov
Preston Johnson	Ascend Ag Inc	605 515 1321	pj@gwtc.net
Rick Hustead	Wall City Council	605 441-9669	rhustead@gwtc.net
Sandy DePottey	FAA - Minneapolis		
Brian Shuck	FAA - Bismarck		
Jon Becker	SD DOT		
Tom Koch	SD DOT		
Andrew Zielke	KLJ		

Go-to-Meeting

Airport Master Plan
Facility Requirements Meeting Summary
Wall Municipal Airport
August 1, 2017

Background

A meeting was held with the Master Plan Advisory Committee (MPAC) on August 1, 2017 to review the Facility Requirements chapter and the Runway Protection Zone (RPZ) analysis. Prior to the meeting KLJ distributed *Chapter 4: Facility Requirements*, *Appendix F: Airfield Design*, and Appendix H: *RPZ Analysis* to the MPAC. This was the third meeting of the MPAC. The second meeting on March 23rd.

Throughout the development of the master plan, the MPAC will be asked to provide input on the draft documents. The general public will have opportunities to provide input through public meetings or contacting the project team.

Attendees	Not in Attendance
Dave Hahn, Airport Manager	Marty Huether, Mayor/Golden West Comm
Carolynn Anderson, Wall Finance Officer	Rod Senn, KLJ
Cheyenne McGriff, Wall Economic Development	Rick Johnson, Yardley & Co.
Jackie Kusser, Wall Chamber/Wall Drug	John Kitterman, Wall Fire Chief
Rick Hustead, City Council/Wall Drug	
Eric Leonard, National Park Service	
Preston Johnson, Ascend Ag	
Sandy DePottey, FAA (telecon)	
Brian Schuck, FAA (telecon)	
Jon Becker, SDDOT (telecon)	
Tom Koch, SDDOT (telecon)	
Kent Penney, KLJ	
Andrew Zielike, KLJ (telecon)	

Discussion

The following key items were discussed at the meeting.

1. **Study Status Update**
    a. Kent Penney provided a brief overview and refresher of what an Airport Master Plan (AMP) is and where the airport is in the process.
    b. The project is currently at Facility Requirements phase of the study.
        i. Alternatives will be the next phase following FAA feedback on the RPZ Analysis.

2. **Design Aircraft**
    a. Primary Runway 12/30 existing Critical Design Aircraft is an Air Tractor AT-502B (A-II-Small) with over 500 annual total operations. The future Critical Design Aircraft is an Air Tractor AT-802A (B-II).
    b. Crosswind Runway 18/36 Critical Design Aircraft is a Beechcraft Bonanza 35 (A-I-Small)

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3. **Airside Facilities**
    a. Runway Length
        i. Primary Runway 12/30
            1. *Less than 10 passenger seats at 95% of fleet* - an existing runway length of 4,340 feet is recommended.
            2. *Specific Aircraft* - when future design aircraft (AT-802A) meets the regular use threshold a runway length of 6,230 feet is recommended.
                a. Due to land-use constraints, the future recommended runway length is 4,710 feet.
                b. This would provide the AT-802A with a 78% mission payload during hot summer days.
            3. Sandy noted that it should be clearly stated that the 4,710 feet was taken from specific aircraft and reduced by land constraints. Coincidentally the *greater than 10 passenger seats fleet* produces the same runway length but Sandy noted this aircraft category is generally non-existent and should not be used.
        ii. Crosswind Runway 18/36
            1. *Less than 10 passenger seats at 95% of fleet* - with a 1.2 multiplier for turf runway surfaces the recommended runway length is 5,200 feet.
            2. *Specific Aircraft* - with design aircraft of Beech Bonanza recommended runway length of 3,100 feet
            3. *Specific Aircraft* - reviewing ground run takeoff performance of based aircraft fleet the most demanding aircraft is Cherokee Six with 2,040 feet.
            4. Due to land use constrains, significant implementation impacts for extension/realignment, and satisfied airport users the recommended runway length is to remain at 1,980 feet.
    b. Runway Design Standards
        i. Primary Runway 12/30
            1. Runway width is 60 feet which does not meet ADG-II standards which require 75 feet. Recommend widening to 75 feet during next reconstruction project.
                a. Dave Hahn asked if there was sufficient room for the wider pavement and Safety Area. Kent said a substantial amount of earthwork will be needed for reconstruction.
                b. Dave questioned if these widths were recommended or required. Sandy stated the FAA funding will require that design standards be met for the runway.
            2. When Runway 12/30 upgrades to an RDC of B/II/5000 the Existing Safety Area width of 120 feet will need to be widened to 300 feet.
            3. Runway 30 RPZ has roads, buildings, houses, fuel tanks, and parking lots within its boundary which are incompatible land uses.
            4. The magnetic bearing of the primary runway is currently 128.03°/308.04° moving to 130.03°/310.04° by 2035. It is recommended to change runway 12/30 designation to 13/31.
                a. Dave Hahn asked when the airport needs to update the markings. Kent said when the runway reconstruction begins it would be appropriate to change the designation. It should be done prior to any instrument approaches being established.

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REGIONAL EXPERTISE
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5. Following the meeting, Sandy DePottey had discussed with Andrew Zielike that the FAA would want to see the airport have sufficient control of the RSA. The RSA should not extend into the Railroad Easement or the airport should have sufficient control of the RSA.

ii. Crosswind Runway 18/36
   1. Safety Area, Object Free Area and Obstacle Free Zone have deficiencies with well house road and fence on the north perimeter
      a. Sandy DePottey questioned if the Safety Area width met standards. Kent responded that the topography data has yet to come back but it is believed that the Safety Area standards are not being met on both the width and length due to grade and terrain.
      b. KLJ will update the Facility Requirements chapter with the RSA information following review of the topography data.
   2. Runway marking cones are placed inside the runway at both thresholds reducing the length usable length to 1,980'. Recommend placing cones outside the edge of the runway at the thresholds to achieve 2,000' runway length.
   3. Runway 36 RPZ has 4th Street running through it which is an incompatible land use.

c. Taxiway Design Standards
   i. Taxiway and Taxilane OFA penetrations exist in the terminal area. Recommend removing penetrations.

d. Crosswind Runway Orientation
   i. To address RPZ impacts and potential runway length extensions, new alignments for the crosswind runway were reviewed comparing the current 180°/360° with an orientation of 30°/210°.
   ii. Combined wind coverage for 10.5 knots with the 3/21 alignment improved slightly from 96.10% to 96.66%.
   iii. Marginal improvements in length, potential of significant environmental impacts, and difficult funding justification lead to the dismissal of realignment.

4. **Support Facilities**
   a. Aircraft Storage (Hangars)
      i. Existing hangar storage is 23,750 square feet.
      ii. By PAL 4 based aircraft needs are expected to be 31,400 sq. ft. (includes 4,100 sq. ft. for maintenance) and transient aircraft needs are 8,000 sq. ft.
      iii. Needs are expected to be met as demand occurs
   b. Existing tie-downs locations are 5 (3,700 sq. yds.) with PAL 4 expected needs being 7 (4,620 sq. yds.)
   c. Arrival and Departure Facility is of adequate size and location to meet needs through the planning period.
   d. Ground Access and parking needed for Hangars 3 and 4.
   e. Fueling systems on the airport are privately owned and generally not available for public use. A publicly available self-fueling system is recommended.
5. **RPZ Analysis**
   a. Constraints

i. RPZ encompassing roads, church, residences, commercial building, and fuel farm on Runway 30 end. Also, the future railroad corridor on the Runway 12 end constricts future runway extensions.
ii. Environmental considerations including wetlands and cultural sites are present around the runway environment and property. Consideration should be given to potential impacts and further analysis needed to determine severity of potential impacts.
1. Rick Hustead asked if the wetlands are federally protected. Kent said they would be further evaluated in the EA to determine if they need to be avoided or mitigated.

b. Runway 30 RPZ Alternatives
i. Option 1 - Runway 30 threshold stays as it exists and Runway 12 threshold extended 1,060 feet.
ii. Option 2 - Construct new Runway 12-30 300 feet to the southwest and current runway becomes a parallel taxiway.
iii. Option 3 - Relocate Runway 30 threshold 380 feet northwest and extend Runway 12 threshold 1,060 feet.
iv. Option 4 - Displace Runway 30 landing threshold 380 feet northwest, extend Runway 30 150 feet for takeoff threshold and extend Runway 12 threshold 1,060 feet.
v. Option 5 - Relocate Runway 30 threshold 780 feet northwest and extend Runway 12 threshold 1,060 feet.
vi. Option 6 - Displace Runway 30 landing threshold 780 feet northwest, extend Runway 30 150 feet for takeoff threshold and extend Runway 12 threshold 1,060 feet.
vii. Option 7 - Relocate Runway 30 threshold 150 feet northwest, extend Runway 12 threshold 1,060 feet, and relocate Airport Road and 4th Avenue, Church, three homes and fuel farm.
viii. Option 8 - Leave Runway 30 threshold, extend Runway 12 threshold 1,060 feet, and relocate Airport Road and 4th Avenue, Church, four homes, fuel farm and Golden West Communications.

c. Dave Hahn asked what the FAA looks for in the RPZ analysis. Sandy said the intent of the RPZ is the protection of people and property on the ground. The analysis will evaluate the risks, alternatives to mitigate risks, the runway length available, and the costs associated with each action.
d. Dave Hahn asked what the timeframe is for the RPZ analysis. Sandy said it is a case by case basis.
e. KLJ recommends Option 4 as the preferred alternative for the RPZ Analysis. The MPAC concurred with Option 4 as the preferred alternative.
i. Kent and Sandy recommend using a runway length of 4,340 feet when submitting the RPZ analysis as the number of operations currently meet regular use. When the AT-802 operations meet the regular use threshold in the future make the adjustment to 4,710 feet at that time.

6. **Future Property**
a. Potential property acquisitions and easements required were reviewed. This included property for the Runway 12-30 options and property for controlling interests for Runway 18/36.
i. Rick Hustead noted the railroad will want to hold on to an easement.

Next Steps

1. Submit Appendix H: RPZ Analysis to FAA for review
2. KLJ will develop the Alternatives Analysis chapter following feedback on RPZ Analysis
3. KLJ will set up next MPAC meeting based on the completion of alternatives. This is estimated to be in the winter of 2017-18

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REGIONAL EXPERTISE
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KLJ
Wall Municipal Airport
Master Plan Study
Master Plan Advisory Committee
Alternatives Meeting
Wall City Offices
May 1, 2018

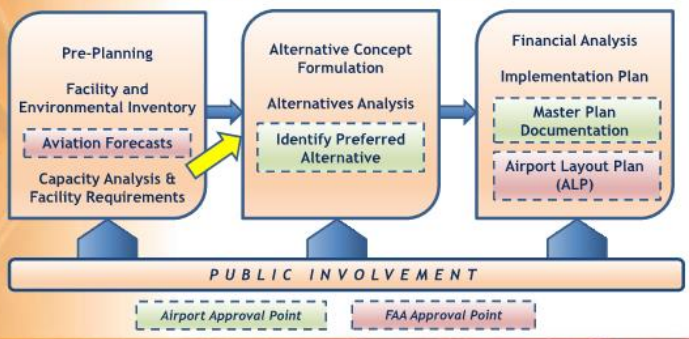

KLJ
Agenda
Introductions
Facility Requirements
Runway Protection Zone (RPZ) Analysis
Alternatives
Next Steps

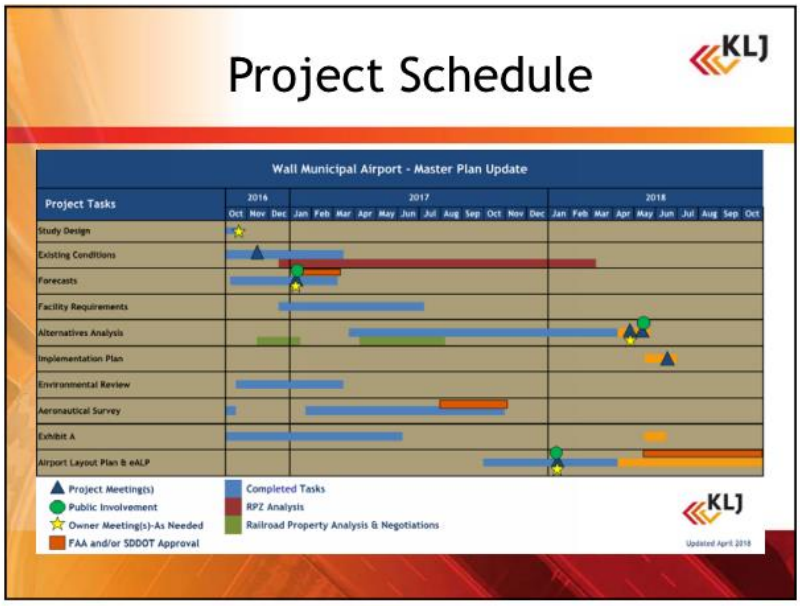
Introductions

- Wall MPAC
  - Marty Huether, Mayor
  - Dave Hahn
  - Preston Johnson
  - Cheyenne McGriff
  - John Kitterman
  - Rick Hustead
  - Rick Johnson
  - Jackie Kusser
  - Eric Leonard
  - Carolynn Anderson
- KLJ
  - Kent Penney (Rapid City)
  - Andrew Zielike (St. Paul)
- FAA
  - Sandy DePottey (Minneapolis)
  - Brian Shuck (Bismarck)
- SDDOT
  - Jack Dokken
  - Jon Becker

Airport Master Planning

Planning the future of the Wall Municipal Airport




Project Schedule
KLJ
Wall Municipal Airport - Master Plan Update
Project Tasks
2016
2017
2018
Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct
Study Design
Existing Conditions
Forecasts
Facility Requirements
Alternatives Analysis
Implementation Plan
Environmental Review
Aeronautical Survey
Exhibit A
Airport Layout Plan & eALP
Project Meeting(s)
Public Involvement
Owner Meeting(s)-As Needed
FAA and/or SDDOT Approval
Completed Tasks
RPZ Analysis
Railroad Property Analysis & Negotiations
KLJ
Updated April 2018


KLJ
Facility Requirements

Examples of Aircraft Design Codes (ARC)

ARC A-I/Small Aircraft		ARC A-II/Small Aircraft	
Cessna 150 **Cessna 182** Piper Archer Piper Seneca Ayres Thrush 600		Cessna 208 **Pilatus PC-12** Air Tractor 502B	
ARC B-I/Small Aircraft		**ARC B-II/Small Aircraft**	
Beech Baron 58 **Cessna 421** Beech King Air 100		Beech King Air 90 **Beech King Air 200**	
ARC B-II		**ARC C-I, C-II**	
Beech King Air 350 Cessna Citation XLS Swearingen Metro III **Air Tractor 802A**		**Cessna Citation X** Learjet 35/55	

Source: Wikipedia.org, Airliners.net, Planespotters.net

Runway Design Aircraft

Design Characteristics	Runway 12-30	Runway 18-36
Aircraft Make/Model	Air Tractor AT-802A	Beech Bonanza 35
Airplane Approach Category	B	A
Airplane Design Group	II	I
Taxiway Design Group	1A	1A
Wingspan	59' 3"	33' 6"
Length	36' 0"	26' 5"
Tail Height	11' 2"	7' 7"
Cockpit to Main Gear	6' 10"	N/A
Main Gear Width	10' 0"	N/A
Approach Speed (1.3 x Stall)	103 knots	70 knots
Maximum Takeoff Weight	16,000 pounds	3,400 pounds
Landing Gear Configuration	Single Wheel	Single Wheel
Aircraft Classification Number	8/F/D/X/T	N/A

Facility Requirements – Declared Distances

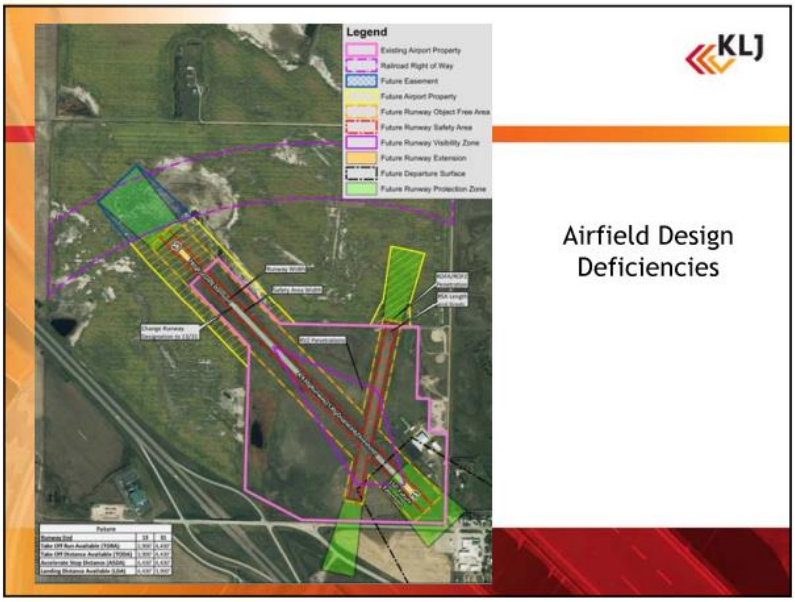
- Takeoff Run Available (TORA) - runway roll
- Takeoff Distance Available (TODA) - to climb 35 foot above ground level
- Accelerate Stop Distance Available (ASDA) - accelerate and stop an aborted takeoff
- Landing Distance Available (LDA)

DT = Displaced Threshold
RWY = Runway
SWY = Stopway
CWY = Clearway (sloping imaginary surface)



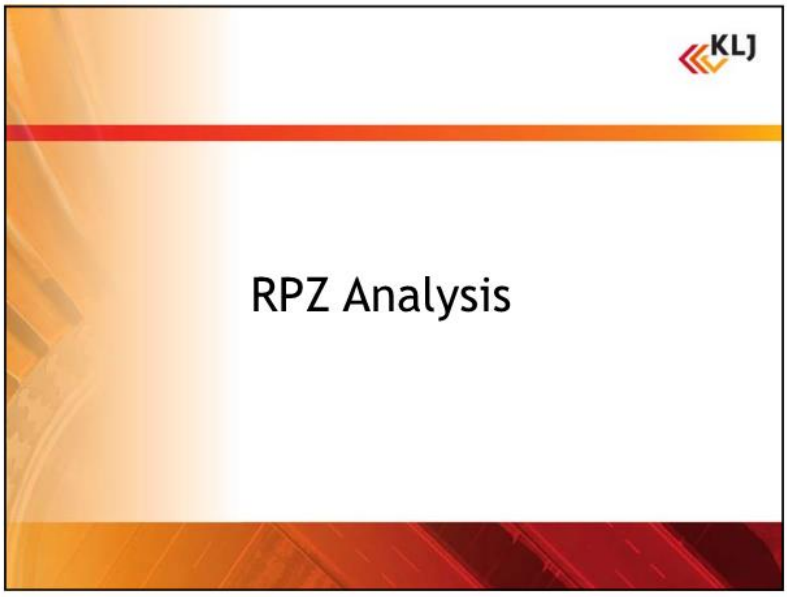
Runway Issues

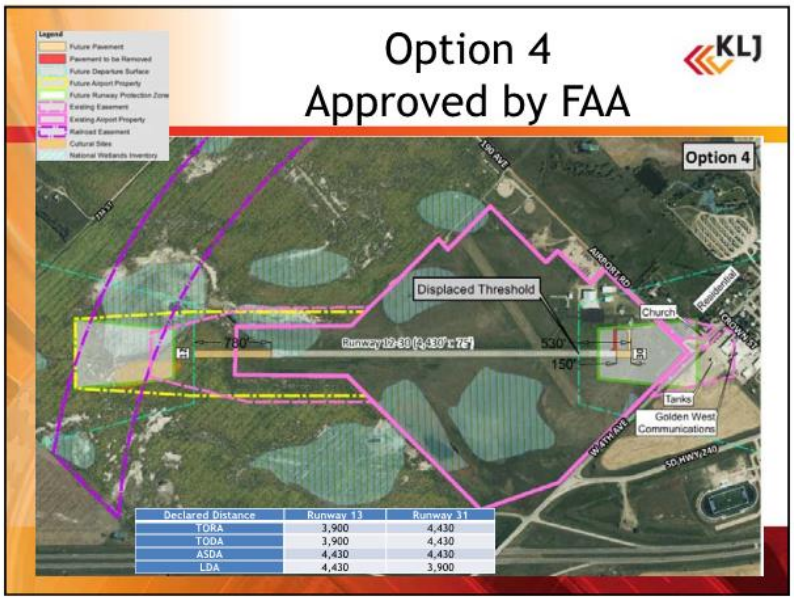
- Primary Runway
  - Width 60’ to 75’
  - Safety Area Width 120’ to 300’
  - Runway Protection Zone (Road, Buildings)
- Crosswind Runway
  - Safety Area Length 35’ to 240’ from End
  - Runway Protection Zone (Road)
  - Object Free Area 100’ to 240’ from End
  - Obstacle Free Zone 100’ to 200’ from End


Legend
Existing Airport Property
Railroad Right of Way
Future Easement
Future Airport Property
Future Runway Object Free Area
Future Runway Safety Area
Future Runway Visibility Zone
Future Runway Extension
Future Departure Surface
Future Runway Protection Zone
KLJ
Airfield Design Deficiencies


KLJ
Terminal/Hangar Area
Terminal
Adequate Size and Location
Ground Access/Parking
Access Road and Parking for Hangars 3 and 4
SRE Equipment
Current Blower-oversized, Broom, 3 point Blade
Need Push Plow, possibly trade Blower
Fueling Facilities
Need Publicly Available Self-Fueling


KLJ
Airport Beacon
Fuel Farm
1. Private Hangar
2. Private Hangar
3. Private Hangar
4. Private Hangar
5. SASO Hangar
A. A/D Building
Legend
Existing Airport Property


KLJ
RPZ Analysis


Option 4
Approved by FAA
KLJ
Option 4
Displaced Threshold
Church
Residential
Tanks
Golden West Communications
780'
530'
150'
Declared Distance | Runway 13 | Runway 31
TORA | 3,900 | 4,430
TODA | 3,900 | 4,430
ASDA | 4,430 | 4,430
LDA | 4,430 | 3,900


KLJ
Alternatives

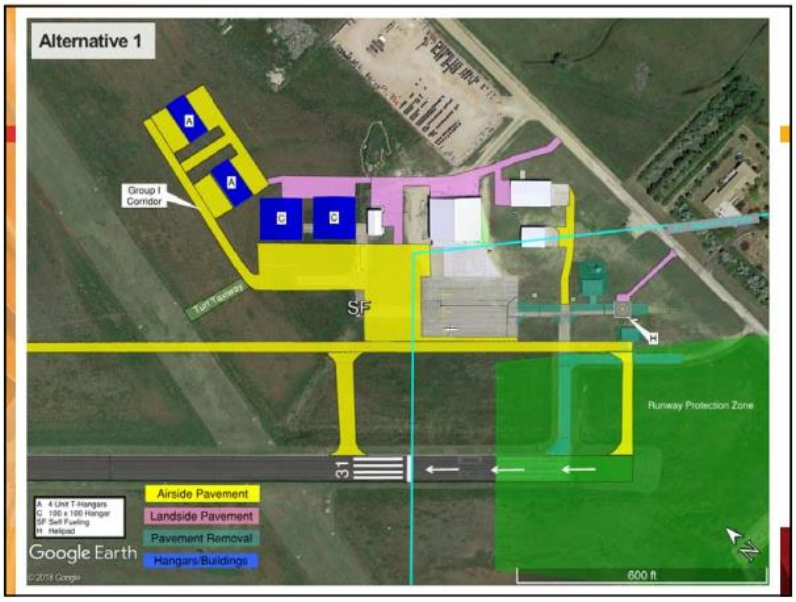
Terminal / Hangar Area

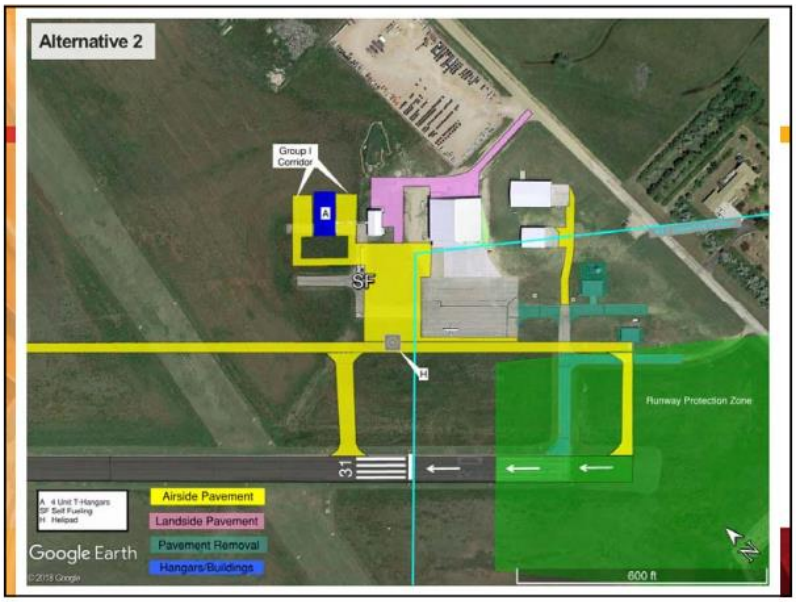
- Taxilanes - Group I, Group II
- Self Fueling
- Storage Hangars
- Hangars for Business
- Impact of Departure Surface
- Access Roads/Parking

Typical Aircraft Hangar Attributes

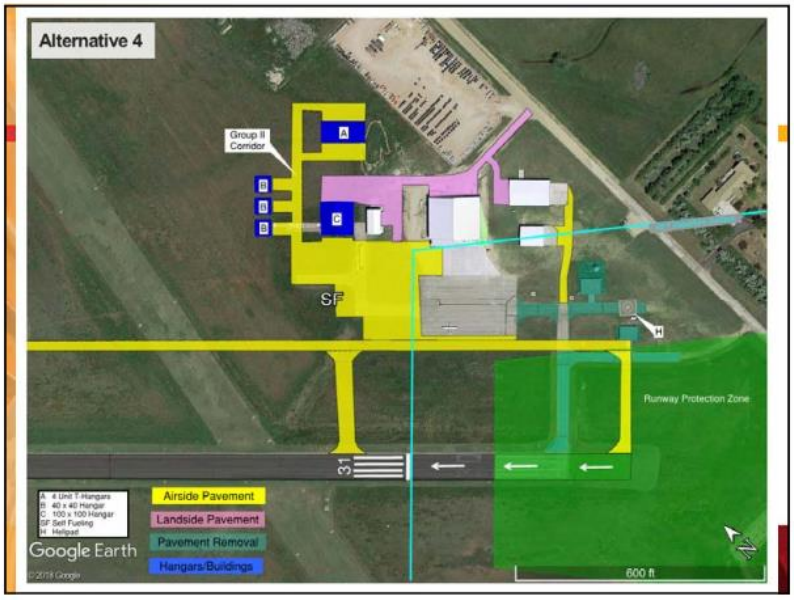
	T-Hangars	Small Storage Less than 6,000 sf	Large Storage More than 6,000 sf	FBO/SASO
Photo Examples				
Dedicated Apron	None	None	Equal to depth of hangar	Equal to depth of hangar (plus apron for services)
Airport Apron Access	No	No	No	Yes
Setbacks from Taxilanes	Yes - for Design Group (I or II)	Yes - for Design Group (I or II)	Yes plus Apron - for Design Group (II+)	Yes plus Apron - for Design Group (II+)
Airside Taxi Route	Yes - for Design Group (I or II)	Yes - for Design Group (I or II)	Yes - for Design Group (II+)	Yes - for Design Group (II+)
Public Road Access/Parking	No	Yes or No *	Yes*	Yes*

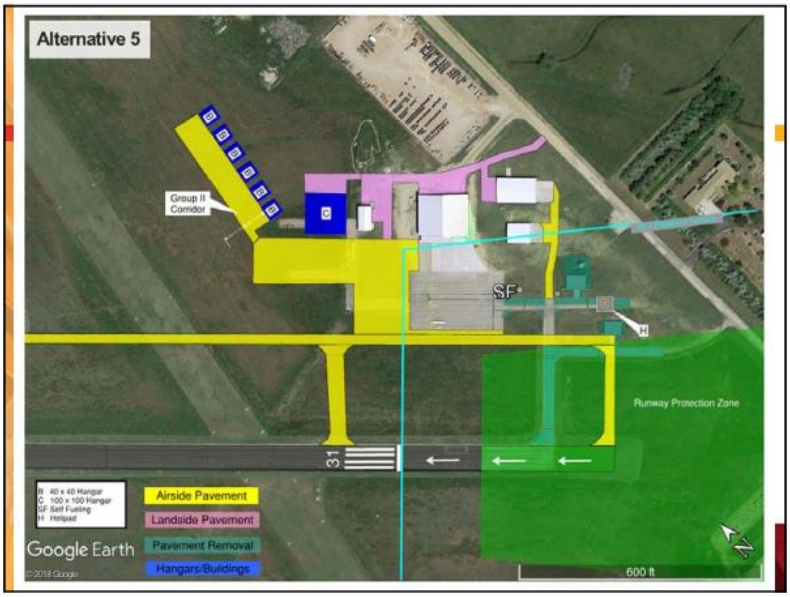
* Any business/corporate hangar located on an airport should have public road access and parking for customers/passengers. Particularly those customers/passengers who are not trained in driving on an airport.

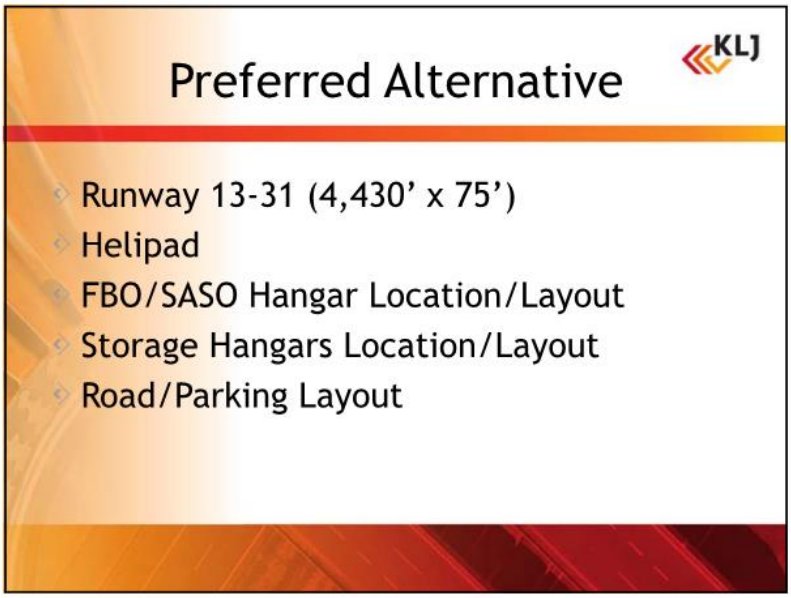

Alternative 1
Group I Corridor
SF
Runway Protection Zone
31
Airside Pavement
Landside Pavement
Pavement Removal
Hangars/Buildings
Google Earth
600 ft

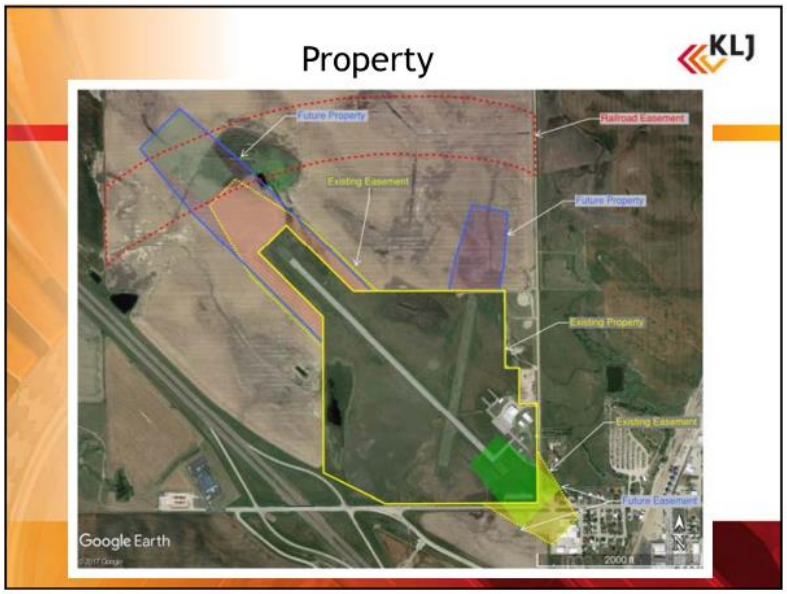

Alternative 2
Group I Corridor
SF
Runway Protection Zone
31
Airside Pavement
Landside Pavement
Pavement Removal
Hangars/Buildings
Google Earth
600 ft


Alternative 3
Group I Corridor
SF
Runway Protection Zone
31
Airside Pavement
Landside Pavement
Pavement Removal
Hangars/Buildings
Google Earth
600 ft


Alternative 4
Group II Corridor
SF
Runway Protection Zone
31
Airside Pavement
Landside Pavement
Pavement Removal
Hangars/Buildings
Google Earth
600 ft


Alternative 5
Group II Corridor
SF
Runway Protection Zone
31
Airside Pavement
Landside Pavement
Pavement Removal
Hangars/Buildings
Google Earth
600 ft


Preferred Alternative
KLJ
Runway 13-31 (4,430' x 75')
Helipad
FBO/SASO Hangar Location/Layout
Storage Hangars Location/Layout
Road/Parking Layout


Property
KLJ
Future Property
Railroad Easement
Existing Easement
Future Property
Existing Property
Existing Easement
Future Easement
Google Earth
2000 ft


Next Steps
KLJ
Implementation Plan
Environmental Assessment
Land Acquisition
Runway 13-31 - 4,430'x75'
Runway 18-36 - Expand Safety Surfaces
Design/Construction
Runways/Lighting

13


KLJ
Questions & Comments


WALL
South Dakota
WINDOW TO THE BADLANDS
KLJ
Thank You!
Kent Penney
Lead Planner
605 939 5794 m
kent.penney@kljeng.com
Andrew Zielike
Planner
651 925 7737 m
andrew.zielike@kljeng.com

WALL South Dakota
WINDOW TO THE BADLANDS

Wall Municipal Airport Master Plan
Master Plan Advisory Committee
May 1, 2018 -- 1:30 p.m. - 2:30 p.m.

KLJ

ATTENDANCE LIST

Name:	Organization/Business:	Phone:	Email:
Rick Johnson	farmer/pilot	386-2375	rjohnson@gwtc.net
Preston Johnson	Ascend Ag Inc	515-1321	pj@gwtc.net
Dave Jedlicka	Pilot	605-390-2091	37hotel@Rap.M.dco.NeT
Rick Hustead	City Council	605 441-9669	rhustead@gwtc.net
Eric Leonard	NPS	605 433 5552	eric_leonard@nps.gov
Cheyenne McGriff	Wall Economic Development	605-279-2658	walleddc@gwtc.net
Carolyn Anderson	Finance Officer - City of Wall	605-279-2663	wallcity@gwtc.net
Kent Penney			
Sandy McPottey			
Brian Schnuck			
Jon Becker			
Andrew Zielke			

Airport Master Plan
Alternatives Meeting Summary
Wall Municipal Airport
May 1, 2018

Background

A meeting was held with the Master Plan Advisory Committee (MPAC) on May 1, 2018 to review the Alternatives for the airport. Prior to the meeting KLJ distributed the alternatives and airfield design deficiencies exhibits to the MPAC. This was the fourth meeting of the MPAC. The previous meetings were November 21, 2016; March 23, 2017; and August 1, 2017. Throughout the development of the master plan, the MPAC has been asked to provide input on the draft documents.

Attendees	Not in Attendance
Carolynn Anderson, Wall Finance Officer	Marty Huether, Mayor/Golden West Comm
Cheyenne McGriff, Wall Economic Development	Dave Hahn, Airport Manager
Rick Johnson, Yardley & Co.	Rod Senn, KLJ
Rick Hustead, City Council/Wall Drug	John Kitterman, Wall Fire Chief
Eric Leonard, National Park Service	Jackie Kusser, Wall Chamber/Wall Drug
Preston Johnson, Ascend Ag	
Sandy DePottey, FAA (telecon)	
Brian Schuck, FAA (telecon)	
Jon Becker, SDDOT (telecon)	
Kent Penney, KLJ	
Andrew Zielike, KLJ (telecon)	

Discussion

The following key items were discussed at the meeting.

1. **Study Status Update**
    a. Kent Penney provided a brief overview and refresher of what an Airport Master Plan (AMP) is and where the airport is in the process.
    b. An RPZ analysis has been completed and was accepted by the FAA in March 2018
    c. The project is currently at the Alternatives phase of the study.
2. **Design Aircraft**
    a. Primary Runway 12/30 existing Critical Design Aircraft is an Air Tractor AT-502B (A-II-Small) with over 500 annual total operations. The future Critical Design Aircraft is an Air Tractor AT-802A (B-II).
    b. Crosswind Runway 18/36 Critical Design Aircraft is a Beechcraft Bonanza 35 (A-I-Small)
3. **Facility Requirements**
    a. Primary Runway 12/30 designation change to 13/31
    b. Primary Runway 13/31 4,430' x 75'
    c. Crosswind Runway 18/36 1,980' x 100' turf

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4. **RPZ Analysis**
    a. Eight different options were provided to the FAA to address the Runway Protection Zone issues for the southeast end of the primary runway
    b. The FAA approved option 4 (recommended option) which displaces Runway 30 landing threshold 380 feet northwest, extends Runway 30 150 feet to the southeast for takeoff threshold and extends Runway 12 threshold 780 feet to the northwest.
5. **Alternatives**
    a. Kent provided an overview of the issues to consider including aircraft design groups, sizes of hangars, types of hangar use, access, and the new departure surface.
    b. Alternatives were presented and discussed. Highlights of the hangar and facility attributes of these alternatives are provided below.
        Alternative 1 - 2 large hangars, 2 4-unit T-Hangars, Group I taxilane, helipad east, access road realigned, self-fueling west, large hangars aligned with primary runway, small hangars aligned with crosswind runway
        Alternative 2 - 1 4-unit T-Hangar, Group I taxilane, helipad west, no change to access road, self-fueling west, all hangars aligned with primary runway
        Alternative 3 - 6 small hangars, Group I taxilane, helipad west, access road realigned, self-fueling east, all hangars aligned with primary runway
        Alternative 4 - 1 large hangar, 3 small hangars, 1 4-unit T-Hangar, Group II taxilane, self-fueling west, helipad east, all hangars aligned with primary runway
        Alternative 5 - 1 large hangar, 6 small hangars, Group II taxilane, self-fueling west, helipad east, large hangar aligned with primary runway and small hangars aligned with crosswind runway
    c. Comments to Alternatives
        i. Leaving the access road where it exists was preferred
        ii. There were concerns about whether the departure surface required the removal of existing hangars. Kent responded that because of the departure surface, it is recommended to not add any hangars within the area of the departure surface.
        iii. A helipad located to the east would place it far away from the terminal building and therefore crews would not be able to easily use the terminal
        iv. There were questions about funding the hangar elements of the projects. Kent shared that the FAA allows funding for hangars but only after airside needs are met. Also, since the existing hangars in the departure surface are beyond their useful life and privately owned, there would be little to no funding for relocating or replacing the hangars.
        v. There were comments regarding the distance of the self-fueling area to the terminal area where power and communications exists. It was preferred to place fueling next to the terminal building.
        vi. The FAA commented that they do not necessarily place helipads on airports. Helicopters come in on the runways and then hover taxi to parking positions.

d. Preferred Alternative
   i. Leave the access road where it is located
   ii. Place a large hangar west of the terminal and aligned with primary runway
   iii. Place a self-fueling areas west of the terminal between the terminal and large hangar
   iv. Align small hangars with crosswind runway
   v. Remove one small hangar and add a Group I taxilane extending east from the small hangar area to allow for Group I hangars or T-Hangars
   vi. Place helicopter parking near terminal
   vii. Look at implementation options related to relocating/replacing existing hangars

Next Steps

1. KLJ will arrange a public open house to share the master plan findings and preferred alternative
2. KLJ will develop the Airport Layout Plan based on the preferred alternative
3. KLJ will develop an Alternatives chapter capturing the process of reviewing and selecting a preferred alternative
4. KLJ will prepare an Implementation chapter

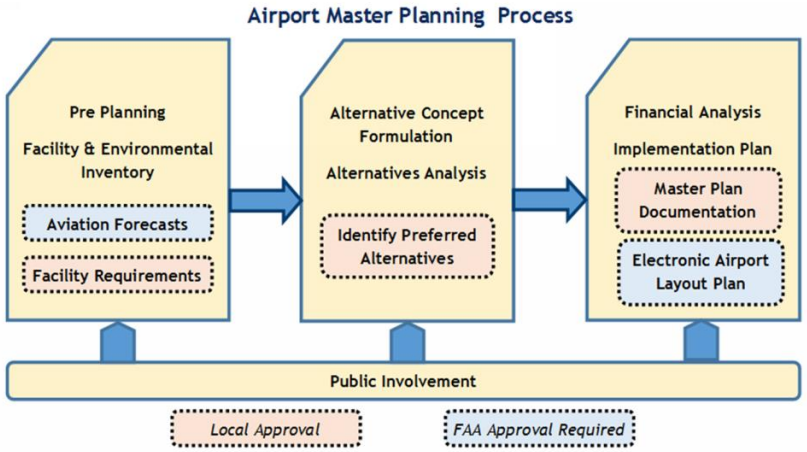
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Airport Master Plan Process

What is an Airport Master Plan?

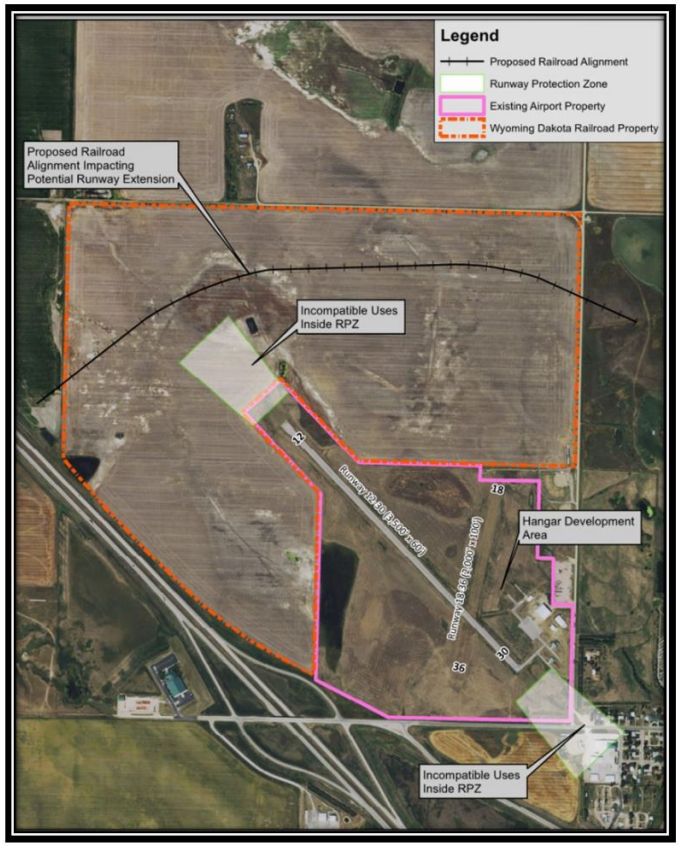
An Airport Master Plan is a comprehensive study of an airport and usually describes the short-, medium- and long-term development plans to meet future aviation demand"

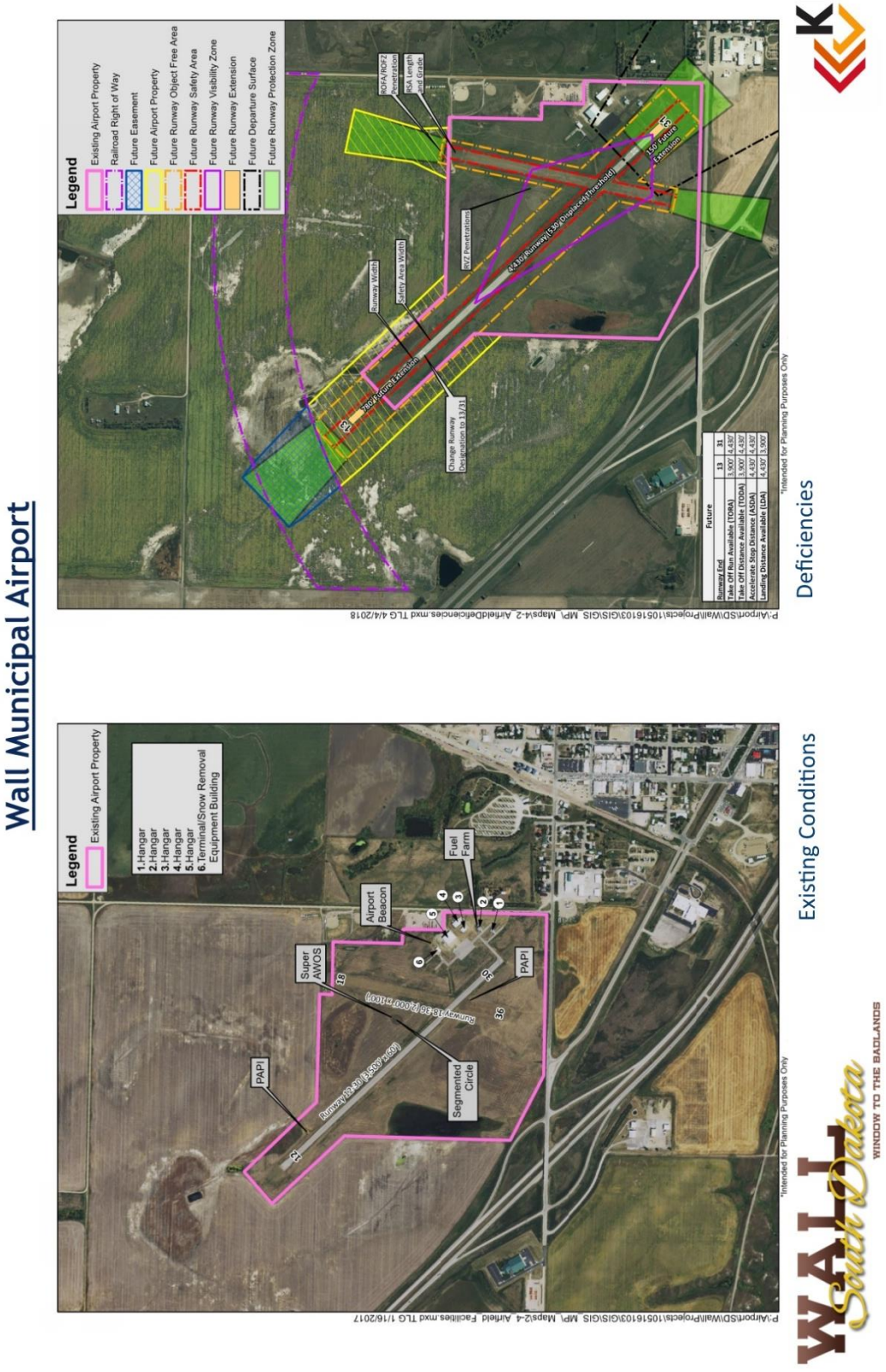
Federal Aviation Administration (FAA)
Advisory Circular 150/5070-6B, Airport Master Plans



Were there Issues we were specifically looking for?

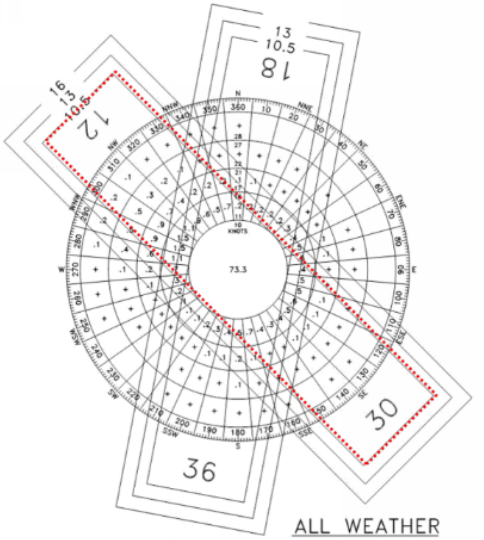
With any master plan process, there are specific issues that we take into consideration. The items in the diagram to the right were some of the issues reviewed in this process.




Wall Municipal Airport
Existing Conditions
Deficiencies
Legend
Existing Airport Property
1.Hangar
2.Hangar
3.Hangar
4.Hangar
5.Hangar
6.Terminal/Snow Removal Equipment Building
Fuel Farm
Airport Beacon
Super AWOS
PAPI
PAPI
Segmented Circle
Runway 13-31 (7,000' x 100')
Runway 18-36 (5,850' x 60')
Railroad Right of Way
Future Easement
Future Airport Property
Future Runway Object Free Area
Future Runway Safety Area
Future Runway Visibility Zone
Future Runway Extension
Future Departure Surface
Future Runway Protection Zone
Runway Width
Safety Area Width
Change Runway Designation to 13/31
Pro/Approach Extension
RPZ Penetrations
Runway 13-31 (5,430' Displaced Threshold)
150' Runway Extension
FAR 77 Penetration
RSA Length and Grade
Future
Runway End
13
31
Take Off Run Available (TORA)
3,900'
4,430'
Take Off Distance Available (TODA)
3,900'
4,430'
Accelerate Stop Distance (ASDA)
4,430'
4,430'
Landing Distance Available (LDA)
4,430'
3,900'
*Intended for Planning Purposes Only
P:\Airport\SD\Wall\Projects\105161031GIS\GIS_MP_Maps\4-2_AirfieldDeficiencies.mxd TLG 4/4/2018
P:\Airport\SD\Wall\Projects\105161031GIS\GIS_MP_Maps\2-4_Airfield_Facilities.mxd TLG 1/16/2017
WALL South Dakota
WINDOW TO THE BADLANDS

Existing Weather Conditions

All Weather Wind Coverage



All-Weather Conditions			
6V4 SuperAWOS (2011-2016) via Potomac Aviation (44,691 Observations)			
	10.5 Knots	13 Knots	16 Knots
Runway 12-30	92.87%	96.50%	98.98%
Runway 18-36	82.16%	87.56%	93.21%
Combined	96.10%	98.48%	99.50%

IFR Weather Wind Coverage

Instrument Flight Rules (IFR) Weather Conditions			
PHP ASOS (2006-2015) via NCDC (5,102 Observations)			
	10.5 Knots	13 Knots	16 Knots
Runway 12-30	83.65%	91.13%	96.94%
Runway 18-36	75.66%	83.76%	92.30%
Combined	92.17%	97.43%	99.34%
Runway 12 Only	45.91%	50.39%	53.54%
Runway 30 Only	46.48%	49.48%	52.15%

Instrument Approach Improvement Potential

Runway End	Approach Type	Proposed Minimums	Existing VMC Coverage	Usable IMC*			Total Coverage
				Coverage	Days per Year	Hours Per Year	
12	RNAV	300 feet, 1 mile	94.22% (343.9 days)	4.2%	15.3	368	98.42% (359.2 days)
30	RNAV	300 feet, 1 mile					

Source: PHP ASOS (2006-2015), KLJ Analysis
RNAV = GPS based instrument procedure; IMC = Instrument Meteorological Conditions
**IMC not lower than 300 feet cloud ceiling and 1 mile visibility*

FAA objective is 95% wind coverage within each respective aircraft crosswind component

Table 3-1. Allowable crosswind component per Runway Design Code (RDC)

RDC	Allowable Crosswind Component
A-I and B-I *	10.5 knots
A-II and B-II	13 knots
A-III, B-III, C-I through D-III D-I through D-III	16 knots
A-IV and B-IV, C-IV through C-VI, D-IV through D-VI	20 knots
E-I through E-VI	20 knots

* Includes A-I and B-I small aircraft.

Aviation Activity and Critical Design Aircraft

Existing Aircraft using the Airport

These are the most demanding types of aircraft that are using Wall

Air Tractor 502B (ARC A-II, Small)



Cessna 510 Mustang (ARC B-I, Small)



Eurocopter UH-72 Kiowa



Air Tractor 802B (ARC B-II)



Beechcraft King Air B200 (ARC B-II, Small)



Sikorsky HH-60 Blackhawk



Critical Design Aircraft

- The critical design aircraft is a single aircraft or a family or similar aircraft with the most demanding operational characteristics.
- These aircraft are the basis for airport design standards.

EXISTING



FUTURE



Air Tractor 502	
Wingspan:	52' 0"
Overall Length:	33' 2"
Maximum Weight (lbs.):	9,400
FAA Airplane Reference Code:	A-II
FAA Taxiway Design Group:	1-A
2015 Operations @6V4:	726
Forecast 2035 Operations @ 6V4:	562

Air Tractor 802	
Wingspan:	59' 3"
Overall Length:	36' 0"
Maximum Weight (lbs.):	16,000
FAA Airplane Reference Code:	B-II
FAA Taxiway Design Group:	1-A
2015 Operations @ 6V4:	241
Forecast 2035 Operations @ 6V4:	618

Wall Aviation Activity Forecasts Overview

	2015 (Existing)	2020 (Short-Term)	2025 (Mid-Term)	2035 (Long-Term)	*Compound Annual Growth Rate*
Annual Operations	3,746	3,890	3,988	4,208	*0.58%*
Based Aircraft	12	12	13	14	*0.78%*

What are "Forecasts"?

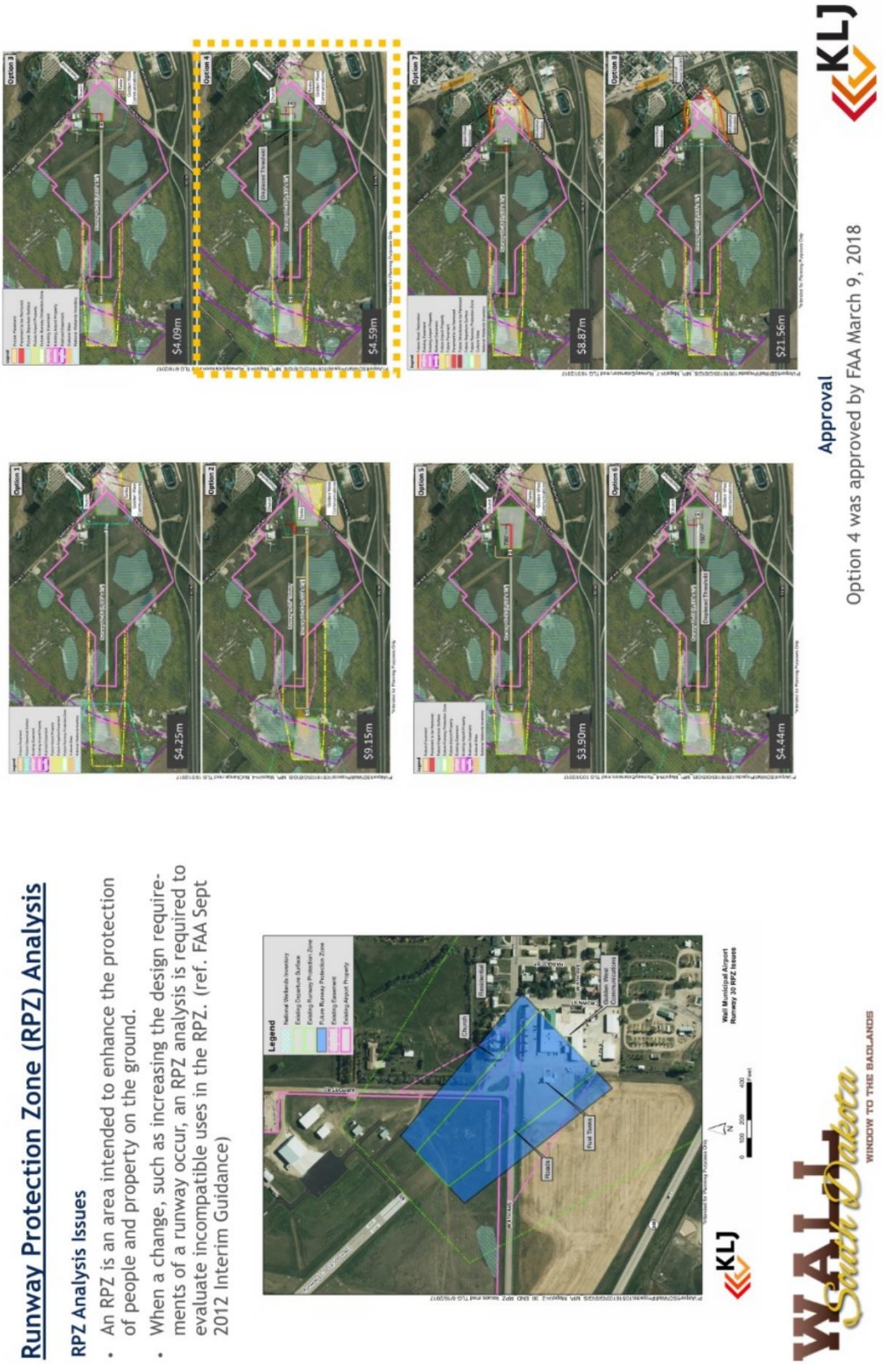
- Forecasts of future levels of aviation activity are the basis for effective decisions in airport planning.
- Forecasts should be realistic and based on the latest available data at the time.

Approval

Forecasts and Critical Design Aircraft approved by FAA on March 15, 2017

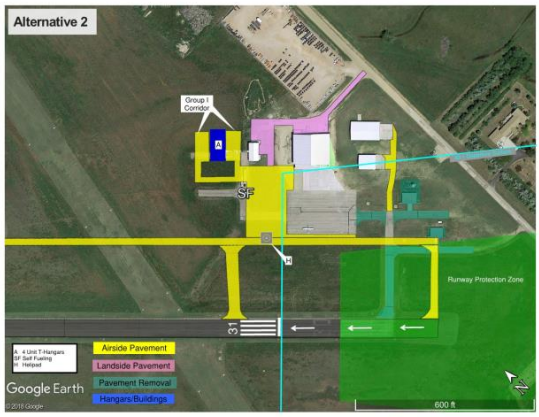
WALL South Dakota
WINDOW TO THE BADLANDS

KLJ

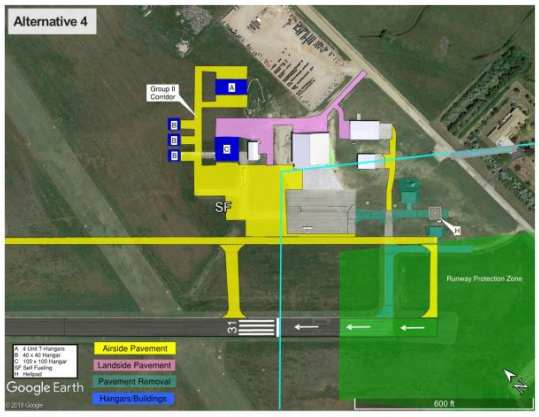

Option 3
$4.09m
Option 4
$4.59m
Option 7
$8.87m
Option 8
$21.56m
Option 1
$4.25m
Option 2
$9.15m
Option 5
$3.90m
Option 6
$4.44m
Approval
Option 4 was approved by FAA March 9, 2018
KLJ
Runway Protection Zone (RPZ) Analysis
RPZ Analysis Issues
An RPZ is an area intended to enhance the protection of people and property on the ground.
When a change, such as increasing the design requirements of a runway occur, an RPZ analysis is required to evaluate incompatible uses in the RPZ. (ref. FAA Sept 2012 Interim Guidance)
Legend
Wall Municipal Airport
Runway 30 RPZ Issues
KLJ
WALL
South Dakota
WINDOW TO THE BADLANDS

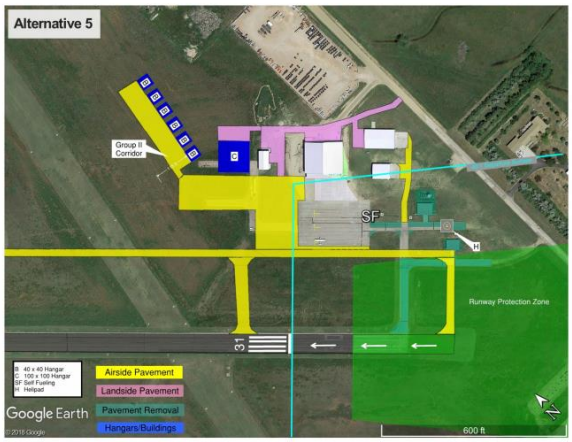
Terminal Area Alternatives

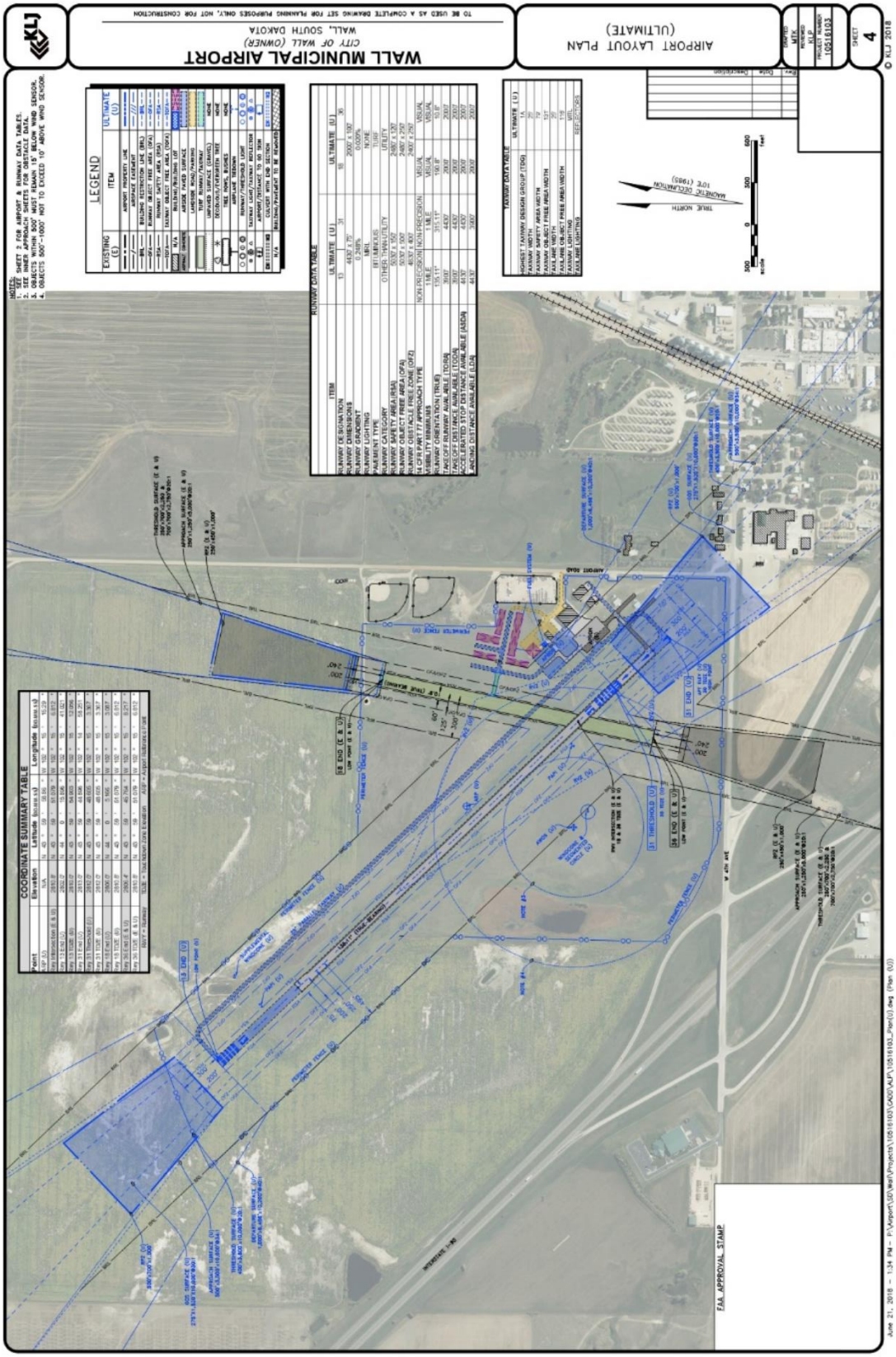


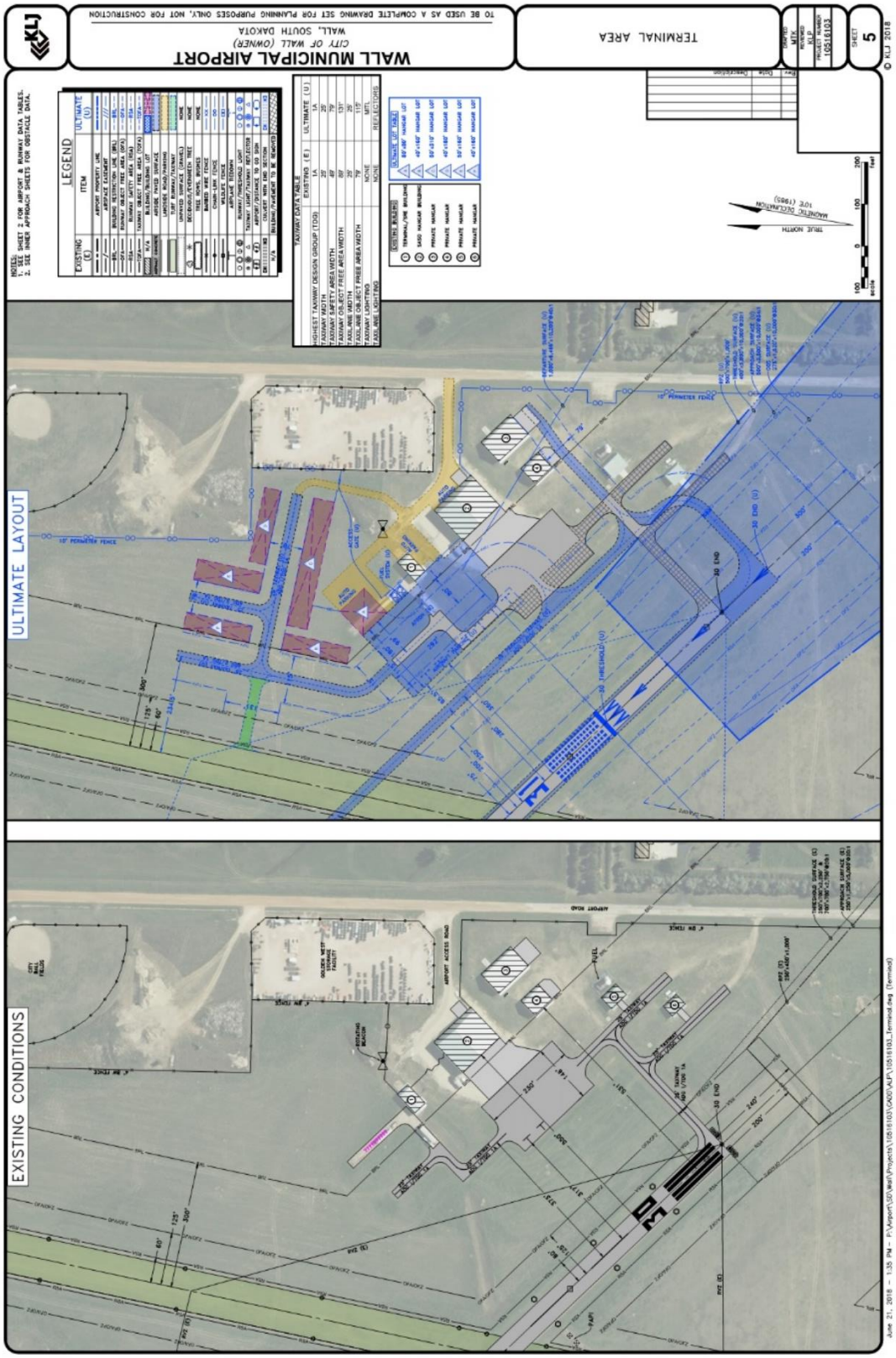









WALL MUNICIPAL AIRPORT
CITY OF WALL (OWNER)
WALL, SOUTH DAKOTA
AIRPORT LAYOUT PLAN
(ULTIMATE)
LEGEND
RUNWAY DATA TABLE
TAXIWAY DATA TABLE
COORDINATE SUMMARY TABLE
FAA APPROVAL STAMP


WALL MUNICIPAL AIRPORT
CITY OF WALL (OWNER)
WALL, SOUTH DAKOTA
TERMINAL AREA
ULTIMATE LAYOUT
EXISTING CONDITIONS

WALL South Dakota
WINDOW TO THE BADLANDS

Wall Municipal Airport Master Plan
Public Open House
June 28, 2018 -- 4:00 p.m. - 6:00 p.m.

KLJ

ATTENDANCE LIST

Name:	Organization/Business:	Phone:	Email:
Kent Penney	KLJ	605. 721. 5553	Kent. penney @ kljeng.com
Chris Clark	Evangelical Free church	605. 279. 2567	evfreebibkchurch @ gmail. com
Rick Hustead	Wall CC/WallDrug	605-441-7669	rhustead@gwtc.net
Dave Hahn	Airport Manager	605-279-2666	davehahn@gwtc.net
Preston Johnson	Ascend Ag Inc	605-515-1321	pj@gwtc.net
Aaron Weeldreyer	Ascend Ag	605-999-7008	aaronweeldreyer@gmail.com
Dick Johnson	West River Electric	605 279-2135	dick.johnson@westriver.coop
Marty Huether	City of Wall	605-685-3021	martyhuether@gmail.com

Wall Municipal Airport (6V4)
Airport Master Plan Update & Airport Layout Plan

Airport Master Planning (AMP)
An Airport Master Plan is a comprehensive study of an airport and usually describes the short-, medium-, and long term development plans to meet future aviation demand. The Master Plan includes an Electronic Airport Layout Plan (eALP) which is required for an airport to be considered for federal project funding.

Critical Design Aircraft
The critical design aircraft is a single aircraft or a family or similar aircraft with the most demanding operational characteristics. These aircraft are the basis for airport design standards.

EXISTING



FUTURE



Air Tractor 502	
Wingspan:	52’ 0”
Overall Length:	33’ 2”
Maximum Weight (lbs.):	9,400
FAA Airplane Reference Code:	A-II
FAA Taxiway Design Group:	1-A
2015 Operations @6V4:	726
Forecast 2035 Operations @ 6V4:	562

Air Tractor 802	
Wingspan:	59’ 3”
Overall Length:	36’ 0”
Maximum Weight (lbs.):	16,000
FAA Airplane Reference Code:	B-II
FAA Taxiway Design Group:	1-A
2015 Operations @ 6V4:	241
Forecast 2035 Operations @ 6V4:	618

All-Weather Wind Coverage			
6V4 SuperAWOS (2011-2016) via Potomac Aviation (44,691 Observations)			
	10.5 Knots	13 Knots	16 Knots
Runway 12-30	92.87%	96.50%	98.98%
Runway 18-36	82.16%	87.56%	93.21%
Combined	96.10%	98.48%	99.50%

WALL South Dakota WINDOW TO THE BADLANDS

Public Open House Briefing—June 2018

KLJ

Airport Facility Requirements

Airfield

- Primary Runway
  - Change from 12/30 to 13/31
  - RDC B-II I-Mile Approach Visibility
  - Increase from 3500' x 60' to 4430' x 75'
  - Declared Distances for Takeoff and Landing
  - Land for Extension
- Crosswind Runway
  - 18/36 improve Safety Surfaces
  - RDC A-I (small) Visual
  - Remain 2000'x100' Turf
  - Land for OFA and RPZ

Terminal/Hangar Area

- Aircraft Storage Space – Up to 16,000 sf needed for based aircraft and transient aircraft as demand dictates
- Aircraft Parking Space –Up to 4,600 sy needed outside of Future Runway 13 Departure Surface
- Paving for Access road and parking near large hangars
- Replace Snowblower
- Location for Self-Fueling
- Location for Helicopter Parking

Implementation Steps

- Aircraft Storage Space – Up to 16,000 sf needed for based aircraft and transient aircraft as demand dictates
- Aircraft Parking Space –Up to 4,600 sy needed outside of Future Runway 13 Departure Surface
- Paving for Access road and parking near large hangars
- Replace Snowblower
- Location for Self-Fueling
- Location for Helicopter Parking

WALL South Dakota WINDOW TO THE BADLANDS

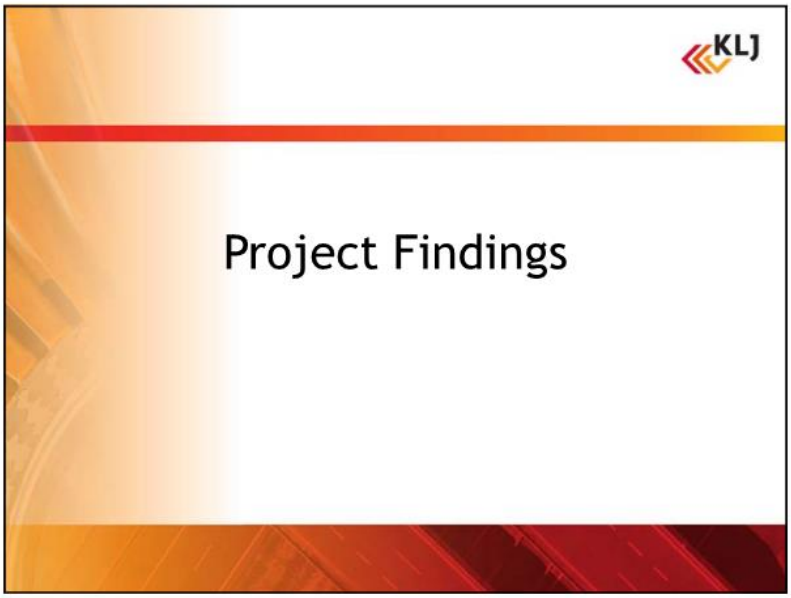
Public Open House Briefing—June 2018

KLJ


KLJ
Wall Municipal Airport
Master Plan Study
City Council
Project Status, Findings and Recommendation
Wall City Offices
September 19, 2018


KLJ
People Involved
Wall MPAC
Marty Huether, Mayor
Dave Hahn
Preston Johnson
Cheyenne McGriff
John Kitterman
Rick Hustead
Rick Johnson
Jackie Kusser
Eric Leonard
Carolynn Anderson
KLJ
Kent Penney (Rapid City)
Andrew Zielike (St. Paul)
FAA
Sandy DePottey (Minneapolis)
Brian Shuck (Bismarck)
SDDOT
Jack Dokken
Jon Becker


Airport Master Planning
KLJ
Planning the future of the Wall Municipal Airport
Pre-Planning
Facility and Environmental Inventory
Aviation Forecasts
Capacity Analysis & Facility Requirements
Alternative Concept Formulation
Alternatives Analysis
Identify Preferred Alternative
Financial Analysis
Implementation Plan
Master Plan Documentation
Airport Layout Plan (ALP)
PUBLIC INVOLVEMENT
Airport Approval Point
FAA Approval Point


KLJ
Project Findings

Runway Design Aircraft

Design Characteristics	Runway 12-30	Runway 18-36
Aircraft Make/Model	Air Tractor AT-802A	Beech Bonanza 35
Airplane Approach Category	B	A
Airplane Design Group	II	I
Taxiway Design Group	1A	1A
Wingspan	59' 3"	33' 6"
Length	36' 0"	26' 5"
Tail Height	11' 2"	7' 7"
Cockpit to Main Gear	6' 10"	N/A
Main Gear Width	10' 0"	N/A
Approach Speed (1.3 x Stall)	103 knots	70 knots
Maximum Takeoff Weight	16,000 pounds	3,400 pounds
Landing Gear Configuration	Single Wheel	Single Wheel
Aircraft Classification Number	8/F/D/X/T	N/A

Examples of Aircraft Design Codes (ARC)

ARC A-I/Small Aircraft
Cessna 150
Cessna 182
Piper Archer
Piper Seneca
Ayres Thrush 600



ARC A-II/Small Aircraft
Cessna 208
Pilatus PC-12
Air Tractor 502B



ARC B-I/Small Aircraft
Beech Baron 58
Cessna 421
Beech King Air 100



ARC B-II/Small Aircraft
Beech King Air 90
Beech King Air 200



ARC B-II
Beech King Air 350
Cessna Citation XLS
Swearingen Metro III
Air Tractor 802A



ARC C-I, C-II
Cessna Citation X
Learjet 35/55



Source: Wikipedia.org, Airliners.net, Planespotters.net

Runway Issues

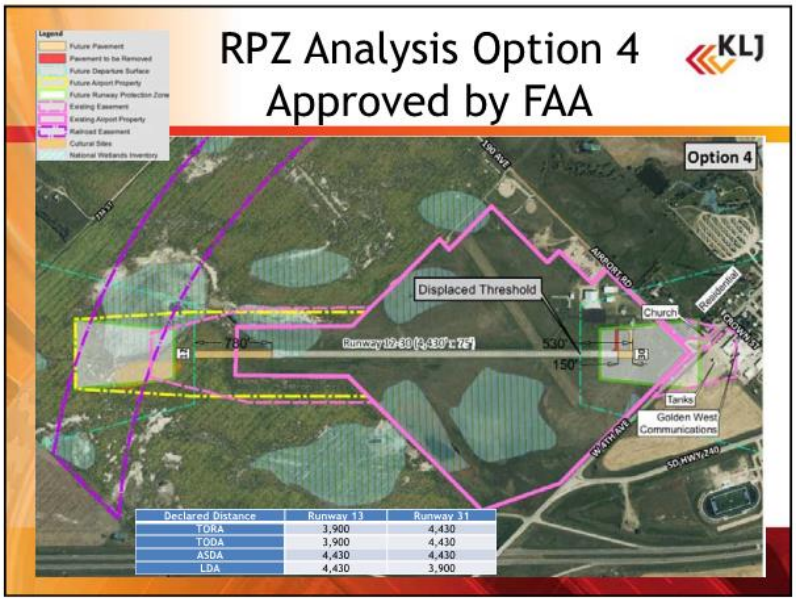
- Primary Runway
  - Width 60' to 75'
  - Safety Area Width 120' to 300'
  - Runway Protection Zone (Road, Buildings)
- Crosswind Runway
  - Safety Area Length 35' to 240' from End
  - Runway Protection Zone (Road)
  - Object Free Area 100' to 240' from End
  - Obstacle Free Zone 100' to 200' from End

Facility Requirements – Declared Distances

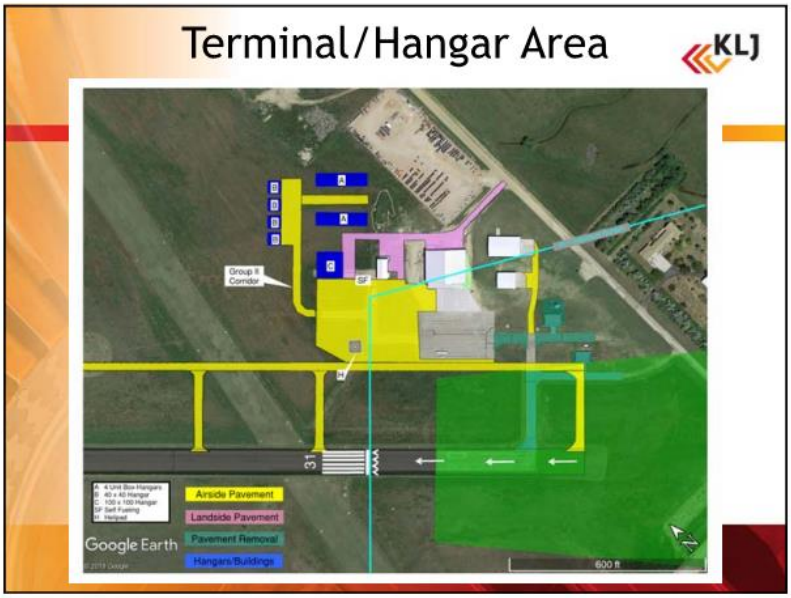
- Takeoff Run Available (TORA) - runway roll
- Takeoff Distance Available (TODA) - to climb 35 foot above ground level
- Accelerate Stop Distance Available (ASDA) - accelerate and stop an aborted takeoff
- Landing Distance Available (LDA)

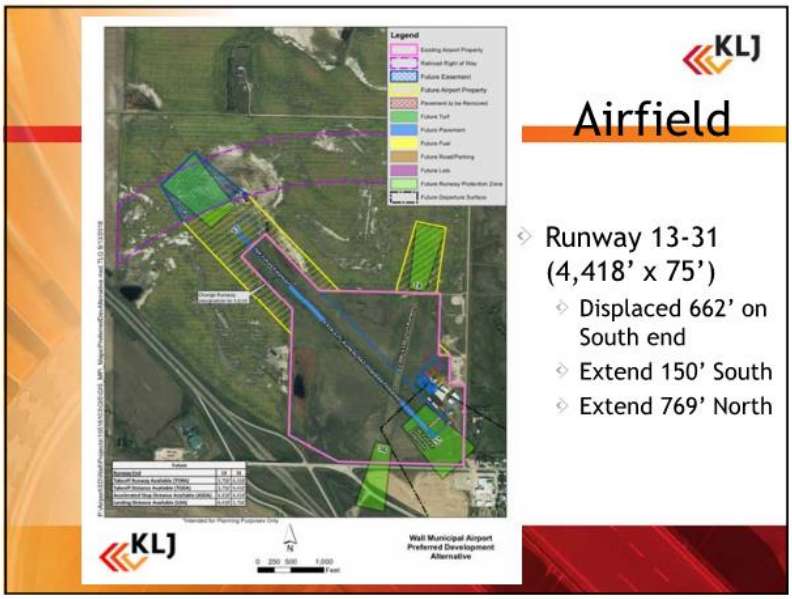
DT = Displaced Threshold
RWY = Runway
SWY = Stopway
CWY = Clearway (sloping imaginary surface)

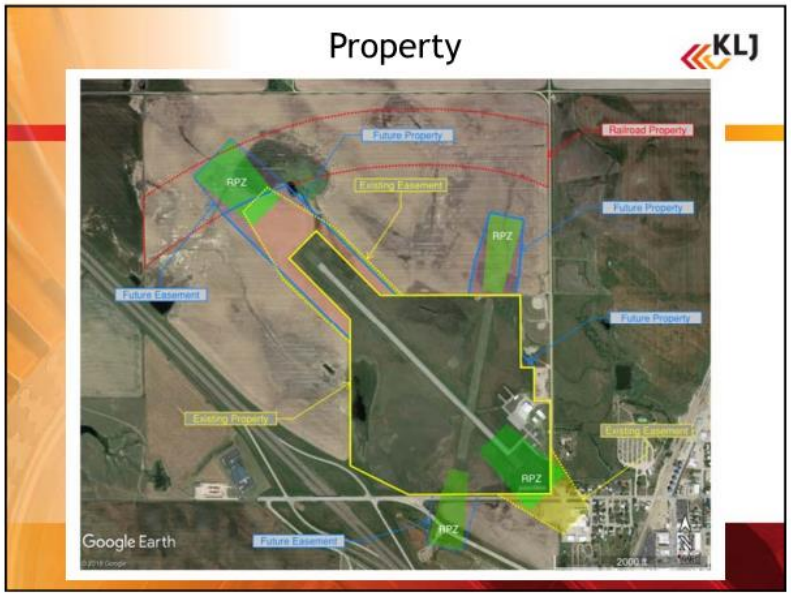



RPZ Analysis Option 4
Approved by FAA
KLJ
Option 4
Displaced Threshold
Church
Residential
Tanks
Golden West Communications
Runway 13-31 (4,430' x 75')
780'
530'
150'
Declared Distance | Runway 13 | Runway 31
TORA | 3,900 | 4,430
TODA | 3,900 | 4,430
ASDA | 4,430 | 4,430
LDA | 4,430 | 3,900


KLJ
Terminal/
Hangar Area
Taxilanes - Group I, Group II
Self Fueling
Storage Hangars
Hangars for Business
Impact of Departure Surface
Access Roads/Parking
SRE Equipment
Current Blower-oversized, Broom, 3 point Blade
Need Push Plow, possibly trade Blower
Legend
Existing Airport Property


Terminal/Hangar Area
KLJ
Group II Corridor
31
Airside Pavement
Landside Pavement
Pavement Removal
Hangars/Buildings
Google Earth
600 ft

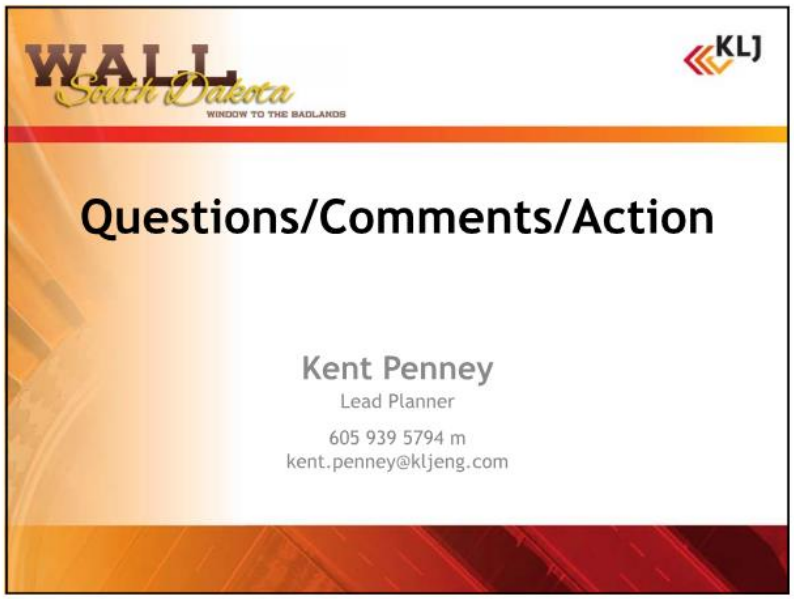

KLJ
Airfield
Runway 13-31 (4,418' x 75')
Displaced 662' on South end
Extend 150' South
Extend 769' North
Legend
KLJ
Wall Municipal Airport Preferred Development Alternative





Year	Project	Scope	Estimated Cost	FAA Funds	State Funds	Local Funds	Other
Near-Term (2018-2027)							
2019	Runway 13/31 Ph 1	Environmental Assessment Runway 13/31 and Runway 18/36	$150,000	$135,000	$7,500	$7,500	
2019	Snow Removal Equipment	Replace Blower	75,000	67,500	3,750	3,750	
2020	Runway 13/31 Ph 2	Land Acquisition Rwy 13 & Rwy 18	192,000	172,800	9,600	9,600	
2020	Runway 13/31 Ph 3	Design Runway 13/31 4,418' x 75'	345,000	310,500	17,250	17,250	
2020	Taxiway & Taxilane Ph 1	Design Taxiway 830' x 25' & Taxilane 680' x 25'	60,000	54,000	3,000	3,000	
2020	Hangar	Replace Hangar	80,000				80,000
2021	Runway 13/31 Ph 4	Construct Runway 13/31	4,032,000	3,628,800	201,600	201,600	
2021	Taxiway & Taxilane Ph 2	Construction of Taxiway & Taxilane	610,000	549,000	30,500	30,500	
2021	Runway 18-36	Design/Construct - Grading Runway	406,000	365,400	20,300	20,300	
2021	Wildlife Hazard	Wildlife Hazard Assessment	50,000	45,000	2,500	2,500	
2023	AWOS III	Replace AWOS III	180,000	162,000	9,000	9,000	
2023	Pavement Rehabilitation	Apron Rehab	10,000	9,000	500	500	
2024	Wildlife Hazard	Perimeter Fence 14,800 lf	545,000	490,500	27,250	27,250	
2026	Fuel System	New Self Fueling System	180,000	162,000	9,000	9,000	
2027	Access Road/Parking	Pave road and parking	180,000	162,000	9,000	9,000	
		Sub-Total	$7,095,000	$6,313,500	$350,750	$350,750	$80,000
Long Term Projects (Apron Expansion, Hangars, Parallel Taxiway)							
		Long-Term (2028-2037)	$2,982,000	$2,683,800	$149,100	$149,100	
		Total	$10,077,000	$8,997,300	$499,850	$499,850	$80,000


KLJ
Next Steps
City Approval of Airport Layout Plan
Environmental Assessment
Land Acquisition
Runway 13-31 - 4,418'x75'
Runway 18-36 - Expand Safety Surfaces
Design/Construction
Runways/Lighting


KLJ
WALL
South Dakota
WINDOW TO THE BADLANDS
Questions/Comments/Action
Kent Penney
Lead Planner
605 939 5794 m
kent.penney@kljeng.com

APPENDIX C: AIRPORT CLASSIFICATION

Introduction

Airports are given different classifications or designations, depending on the source. This appendix discusses the various sources or systems used nationally, regionally, or locally to classify an airport. The primary systems used to classify an airport include:

a. FAA National Plan of Integrated Airport Systems (NPIAS)
b. Regional or State Aviation System Plans (SASP)
c. FAA General Aviation Airport Report (ASSET)

National Plan of Integrated Airport Systems

The Airport and Airway Improvement Act of 1982 directed the Secretary of Transportation to prepare, publish, and biannually revise a national system plan – the National Plan of Integrated Airport Systems (NPIAS) – for the development of public-use airports in the United States. This requirement can be found in Public Law 49 United States Code § 47103. The NPIAS is a system that emphasizes system planning and development to meet current and future aviation needs. It includes the development considered necessary to provide a safe, efficient, and integrated airport system to meet the needs of civil aviation, national defense, and the United States Postal Service. It takes into account the relationship of each airport to the rest of the transportation system in a particular area, the forecast of technological developments in aeronautics, and the development forecast in other modes of transportation.

To be eligible for funding under the Airport Improvement Program (AIP), an airport must be included in the NPIAS. The FAA determines whether an airport can be included in the NPIAS and the requirements for inclusion in the NPIAS are defined by law and FAA policy. As general criteria, the airport must be a publicly-owned, public-use airport serving civil aviation (privately-owned, public use airports may be included under certain circumstances) with an eligible sponsor, must have at least 10 based aircraft, and must be located at least 20 miles from another NPIAS airport.

Although it is not a factor in determining an airport's classification in the NPIAS, it is important to note that, after an airport is included in the NPIAS and accepts a federal grant for AIP funds, the airport sponsor is contractually obligated to meet the terms and conditions of the AIP grant. These terms and conditions, typically called grant assurances, are established by federal law and define the requirements a sponsor must comply with in the safe and efficient operation and maintenance of the airport. The current grant assurance information can be found at www.faa.gov/airports/aip/grant_assurances.

NPIAS Airport Classification

The public law that created the NPIAS plan defines airports by categories of airport activities. Those categories are defined as Commercial Service, Reliever or General Aviation.

Commercial *Service*

Commercial Service airports are defined as publicly owned airports that have at least 2,500 passenger boardings each calendar year and receive scheduled passenger service. Commercial service airports are further categorized based on the number of annual passenger boardings. Primary airports have more than 10,000 passenger boardings each year and Nonprimary Commercial Service airports have at least 2,500 but no more than 10,000 passenger boardings each year. In 2013, there were 392 Primary airports and 114 Nonprimary Commercial Service airports.

Because of the wide range of passenger boardings in the United States, primary commercial service airports are further categorized by the percentage of total passenger boardings in the United States. The categories are Large, Medium, Small and Non Hub airports. The passenger boardings are typically above 8 million for Large Hub, 2 to 8 million for Medium Hub, 350,000 to 2 million for Small Hub and 10,000 to 350,000 for Non-Hub. In 2013, there were 30 Large hubs, 33 Medium hubs, 71 Small hubs and 258 Non-Hubs

Reliever

Reliever airports are general aviation airports designated by the FAA to relieve congestion at a commercial service airport and to provide more general aviation access to the overall community. The current FAA criteria for reliever airports includes more than 75,000 annual operations, a runway greater than 5,000 feet, a precision instrument landing procedure, more than 100 based aircraft, and relieving an airport with 20,000 hours of annual delays of commercial passenger aircraft operations.

General Aviation

Most airports that are not considered commercial service airports fall into this category. Although some general aviation airports do have scheduled passenger service, those with fewer than 2,500 annual boardings are not classified as commercial service airports. The following section provides greater details on the categorization of general aviation airports based on the FAA's ASSET 1 and 2 Studies from 2012 and 2014 respectively.

General Aviation Airports: A National Asset

This report, commonly known as the ASSET 1 Study, documented an 18-month study of the nearly 3000 general aviation (GA) airports, heliports, and seaplane bases identified in the FAA's National Plan of Integrated Airport Systems (NPIAS). The in-depth analysis highlighted the pivotal role GA airports play in our society, economy, and the aviation system. The study also aligned the GA airports into four categories – national, regional, local, and basic – based on their existing activity levels. The categories are a tool to help the FAA and state aeronautical agencies make more consistent planning decisions for the nation's GA airports. They reflect the current aviation activity at GA airports, such as the number and type of based aircraft, the number of passenger boardings, and the number of flights.

During the initial study, the FAA found that almost 500 GA airports did not clearly fit into the four defined categories. As a result, the FAA initiated a second phase of the study in 2013 to define a category for those airports, as well as reassign airports to different categories, based on updated information. That study, known as the ASSET 2 study, assigned 212 previously unclassified airports to one of the four categories.

National Airports

These 84 GA airports are located in metropolitan areas near major business centers and support flying throughout the nation and the world. Currently located within 31 states, they account for 13 percent of total flying at the studied airports and 35 percent of all flights that filed flight plans at the airports in the four categories. These 84 airports support operations by the most sophisticated aircraft in the GA fleet. Many flights are by jet aircraft, including corporate and fractional ownership operations and air taxi services. These airports also provide pilots with an alternative to busy primary commercial service airports. There are no heliports or seaplane bases in this category.

The criteria used to define the National category is 5,000+ instrument operations, 11+ based jets, 20+ international flights, or 500+ interstate departures: or 10,000+ enplanements and at least 1+ charter enplanement by a large certificated air carrier: or 500+ million pounds of landed cargo weight.

Regional Airports

The 468 airports in the Regional Airport category are located in metropolitan areas and serve relatively large populations. These airports support interstate and some long distance (cross country) flying with more sophisticated aircraft. 49 states, with the exception of Hawaii, currently have Regional airports. These airports account for 37 percent of total flying at the studied GA airports and 42 percent of flying with flight plans. There is a substantial amount of charter (air taxi), jet flying, and rotorcraft at regional airports. There are no heliports or seaplane bases in this category.

The criteria used to define the Regional category is in a Metropolitan Statistical Area (Metro or Micro) and 10+ domestic flights over 500 miles, 1,000+ instrument operations, 1+ based jet, or 100+ based aircraft; or the airport is located in a metropolitan or micropolitan statistical area, and the airport meets the definition of commercial service.

Local Airports

The 1,263 airports in the Local category are the backbone of the general aviation system, with at least one Local airport in every state. They are typically located near larger population centers but are not necessarily in metropolitan or micropolitan areas. Local airports account for 42 percent of the general aviation airports eligible for Federal funding. They also account for approximately 38 percent of the total flying at the studied GA airports and 17 percent of flying with flight plans. Most of the flying is by piston aircraft in support of business and personal needs. In addition, these airports typically have flight training, emergency services, and charter service, and the flying tends to be within a state or immediate region. There are no heliports, but there are 4 seaplane bases in the category.

The criteria used to define the Local category is 10+ instrument operations and 15+ based aircraft; or 2,500+ passenger enplanements.

Basic Airports

The 852 airports in the Basic category are often able to fulfill their role with a single runway, helipads, seaplane area, and limited infrastructure. 43 states have Basic airports and these airports fulfill the role of a community airport providing a means for private GA flying and linking the community to the national airport system. Basic airports account for approximately 7 percent of the total flying at GA airports and 2 percent of flying with flight plans. Most of the flying is self-piloted for business and

personal reasons using propeller-driven aircraft. A fair amount of air charter (taxi) services is provided at these airports. There are also 3 heliports and 20 seaplane bases in this category.

The criteria used to define the Basic category is 10+ based aircraft; or 4+based helicopters; or the airport is located 30+ miles from the nearest NPIAS airport; or the airport is identified and used by the US Forest Service, US Marshals, US Customs and Border Protection (designated, international, or landing rights), or US Postal Service (air stops), or has Essential Air Service; or the airport is a new or replacement facility activated after January 1, 2001; and publicly or privately owned and designated as a reliever with at least 90 based aircraft.

Unclassified General Aviation Airports

There are 281 airports that did not fit into one of the four categories. Most of these airports have been in the NPIAS for decades and may have seen an erosion of based aircraft and activity (because of population or economic shifts or recession) or may have no based aircraft. 54 of these airports are privately owned and were originally included in the national system as relievers for commercial service airports, but no longer meet the entry criteria. Others may be seasonal airports, military airfields recently converted to general aviation use, or airports used to access important state airports with related national interests.

These airports account for approximately 6 percent of total flying at the studied GA airports and 2 percent of flying with flight plans. However, none are commercial service airports and none received scheduled air service through the Essential Air Service program.

FAA Asset Study Results for South Dakota Airports

The following **Table D-1** provides a summary of the ASSET categories and the numbers of these airports in South Dakota.

Table C-1 FAA ASSET 2 Study

Category	Description	U.S.	South Dakota
National	Supports the national and state system by providing communities with access to national and international markets in multiple states throughout the U.S.	84	0
Regional	Supports regional economies by connecting communities to statewide and interstate markets	468	2
Local	Supplements local communities by providing access primarily to intrastate and some interstate markets	1,263	11
Basic	Support general aviation activities such as emergency service, charter or critical passenger service, cargo operations, flight training and personal flying	852	35
Unclassified	Not otherwise classified	281	6
	Total	**2,948**	**54**

Source: FAA ASSET 2 Study March 2014

Wall Municipal Airport ASSET Classification

Wall Municipal Airport is classified as a basic airport in the current ASSET report. The airport meets the local criteria because it has 12 based aircraft (based on the FAA Master Record).

State Aviation System Plan

An integrated State airport system plan is the representation of facilities required to meet immediate and future needs as well as achieve overall goals of the State. It recommends the general role, location, and characteristics of new airports or the nature of expansion for existing ones. In order for an airport to be considered for inclusion in the NPIAS, it must first be included in the State's Aviation System Plan (SASP). Each SASP may use different terms or definitions for the role of an airport within the state, and those roles are defined below.

South Dakota State Aviation System Plan

Airports in South Dakota are organized in a variety of roles based on the users they serve and support. South Dakota airports are classified in one of five categories, each with a unique set of characteristics and Airport Reference Code (ARC). See **Appendix F - Airfield Design** for information on ARC codes. The airport classification categories are described in **Table C-2,** specific details for each category are listed in **Table C-3**, and the map in **Exhibit C-1** shows all airport categories in the South Dakota State Aviation System Plan.

Wall Municipal Airport is classified as a small general aviation airport in the current South Dakota State Aviation System Plan.

Table C-2 South Dakota SASP Roles

Role	Description	No. of Airports
Commercial Service	Supports some level of scheduled commercial airline service in addition to a full range of general aviation aircraft.	6
Large General Aviation	Supports all general aviation aircraft and corporate aviation activity. These airports' primary users are business related and serve a large geographic region or experience high levels of general aviation activity.	6
Medium General Aviation	Support most twin and single engine aircraft and may have occasional business jet activity. Support a regional transportation need.	17
Small General Aviation	Support primarily single-engine, general aviation aircraft, but are capable of accommodating smaller twin-engine general aviation aircraft. Support local transportation needs and special use aviation activities.	26
Basic General Aviation	Support primarily single-engine, general aviation aircraft, special use aviation activities, and access to remote areas or provide emergency service access.	17
	Total	**72**

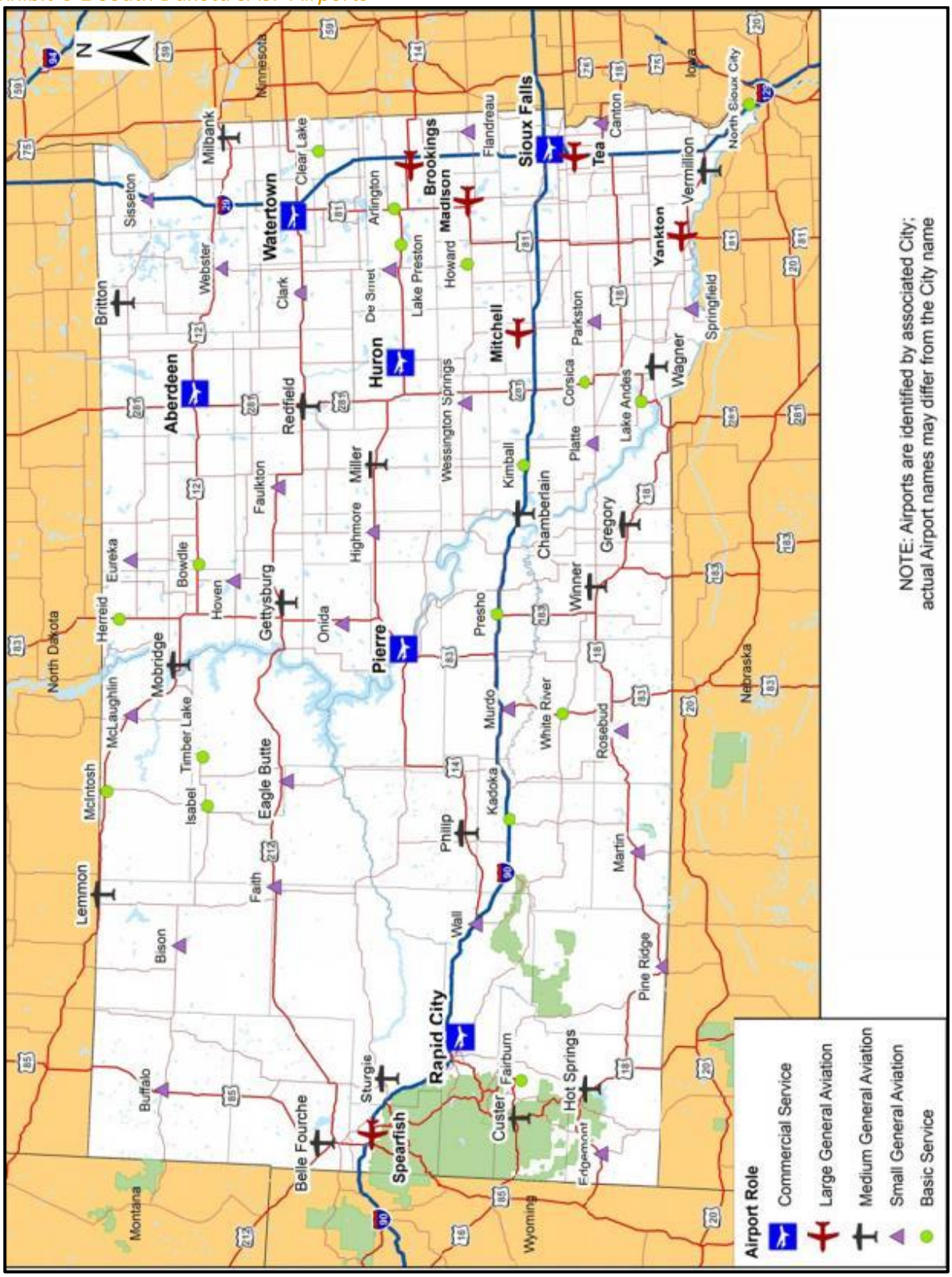
Source: South Dakota State Aviation System Plan - 2010

Table C-3 South Dakota SASP Role Details

Role	Runway (minimum)	Approach	Weather	Services	Fuel	ARC
Commercial Service	6,500' +	Precision	Yes	Major	JetA/100LL	C-II
Large GA	5,000'	Non-Precision	Yes	Minor	JetA/100LL	C-I
Medium GA	4,200'	Non-Precision	Yes	On-Call	100LL	B-II
Small GA	3,000'	Visual	No	No	No	B-I
Basic GA	No Minimum	Visual	No	No	No	A-I

Source: South Dakota State Aviation System Plan - 2010

Exhibit C-1 South Dakota SASP Airports



Source: South Dakota State Aviation System Plan - 2010

APPENDIX D: AIRPORT FUNDING

Introduction

Airport funding is derived from many sources. This appendix discusses the various sources available to the airport sponsor. Funding sources can be categorized into three main categories:

a. Federal funding
b. State funding
c. Local or Private funding

Federal Funding

Most funding for airport development comes from federal government programs. Currently the most predominant program is the Airport Improvement Program, commonly referred to AIP, managed by the Federal Aviation Administration. This section describes the program, the guidance and procedures for obtaining AIP grants, and the AIP funding history for the Wall Municipal Airport.

Federal Funding Legislation

The Federal Aviation Administration (FAA) is allowed to issue grants for airport planning and development in the United States under Public Law 49 United States Code (USC) § 47104(a). The FAA normally needs two separate legislative actions in order to be able to issue grants and operate the Airport Improvement Program (AIP) grant program: an authorization and an appropriation.

a. **Authorization.** The authorization legislation has numerous titles but is often referred to as the FAA Reauthorization and may be passed by Congress for varying lengths of time. The authorization sets yearly limits on the AIP funding levels and gives the FAA contract authority to issue grants. The AIP is currently operating under the FAA Modernization and Reform Act of 2012 (Public Law 112-95), and this law has authorized $3,350,000,000 for each of the fiscal years 2012 through 2015 for airport planning and airport development, airport noise compatibility planning and carrying out noise compatibility programs.

b. **Appropriation.** Congress establishes an annual appropriation that allows the FAA to incur obligations and make payments for specific purposes. Although the FAA reauthorization typically establishes an annual authorized funding level for the AIP program, Congress may use the appropriation law to adjust the authorized AIP funding level for the current year.

Airport and Airway Trust Fund (Source of AIP)

It is important to note that AIP funds are not drawn from the government's General Fund, which consists primarily of tax payments from all sources. Instead, revenue for AIP is drawn from the Airport and Airway Trust Fund, commonly referred to as the Trust Fund. The Trust Fund is funded by a variety of revenue sources in the aviation industry, including a domestic ticket tax, a domestic passenger flight segment fee, a departure tax for flights to Hawaii and Alaska, a passenger ticket tax at rural airports, international departure and arrival taxes, frequent flyer taxes, domestic freight and mail tax, a commercial aviation fuel tax and a general aviation fuel tax

Categories of AIP Funding

The authorization and appropriation legislation determine the amount of AIP funding available in a given period. Once that amount is established, a complex set of formulas and categories, defined by the FAA authorization law, determines how much funding is available in each airport category. In general, AIP funding is distributed as Entitlements, State Apportionment or Discretionary.

Entitlements

While most entitlement funds are distributed to airports based on airline passenger service these same AIP funds are used for general aviation airports as well. The entitlement funds for individual airports and fall into several categories.

PASSENGER ENTITLEMENTS

These funds are available to airports with scheduled passenger service and enplaning more than 10,000 passengers per year. Passenger entitlements are calculated based on a regressive scale using passenger enplanements. The annual minimum is $650,000 and the annual maximum is $22 million per airport. By a special provision in the authorization, when $3,200,000,000 or more AIP is appropriated in the fiscal year, the entitlement calculation increases and the annual minimum becomes $1 million, and the maximum becomes $26 million per airport.

CARGO ENTITLEMENTS

Airports receiving cargo shipments may be eligible for cargo entitlements. The amount of entitlements are based on the distribution of 3.5 percent of the total AIP available for grants, divided on a pro-rata basis according to an airport's share of total US landed cargo weight.

NON-PRIMARY ENTITLEMENTS

By a special provision in the authorization, when $3,200,000,000 or more AIP is appropriated in the fiscal year, airports not receiving passenger entitlements will receive non-primary entitlements. These entitlements are the lesser of $150,000 or 20 percent of an airport's 5-year development costs listed in the biennial National Plan of Integrated Airport Systems (NPIAS) report to Congress.

State Apportionment

These funds are available for eligible airport development projects within a state. Normally, 18.5 percent of the total AIP funds available for grants is apportioned for airports based on an area/population formula. When the amount of AIP funds available in a fiscal year are $3,200,000,000 or more, 20 percent of the total AIP funds is allocated to non-primary entitlements with the remaining funds distributed by state based on an area/population formula. These funds are generally limited to commercial service non-primary and general aviation airports.

Discretionary

These are the remaining appropriated funds after the other types of funds have been established. A portion of the discretionary funds are directed toward specific, or "set-aside," programs, such as noise-related projects or the Military Airport Program. Of the remaining discretionary funds, 75 percent are to be used for enhancing capacity, safety, security and noise compatibility planning and programs. The remaining 25 percent, known as pure discretionary funds, may be used for any eligible project at any airport, as determined by the FAA.

As a general rule, pure discretionary funds typically account for less than four percent of the available AIP funds. However, as the program proceeds throughout the fiscal year, some airport sponsors, who have decided not to proceed with an AIP project during the year, will choose to "waive" their entitlements for that year. Those funds are then converted to discretionary funds, creating an additional amount of discretionary funds to be used throughout the country for eligible projects.

Federal Share of Project Funding

Federal AIP funds typically do not cover the entire cost of an airport development project. First, the project costs must be eligible for federal funding under current legislation. Then, the costs must be allowable, i.e., reasonable and justified. Once costs have been determined to be allowable, the federal share of allowable costs is limited to a fixed percentage of the total costs. Although there are some exceptions, the current legislation limits the federal share of allowable AIP costs at 90 percent for most non-hub primary or smaller airports. The remaining 10 percent is considered the local share and is the sponsor's responsibility.

Types of AIP Funding Available for Wall Municipal Airport

By law, only public-use airports in the NPIAS are eligible for AIP funding. These airports are classified into various categories based on their usage and level of passenger enplanements, and those categories determine the type of funding eligibility for the airport. See **Appendix C Airport Classification** for more information. Wall is currently categorized as a General Aviation airport and is further identified in the Basic group according to the FAA's ASSET report. This provides a specific allocation of $150,000 annually to the airport. This is a small amount which, using only the annual amount, is not sufficient for most projects. The money can be carried over for up to three years and combined for a four-year total for a $600,000 project.

In addition to Non-primary Entitlement, the most practical funding source for Wall will be state apportionment and discretionary funding. However, as stated earlier, the assignment of discretionary funds is determined by the FAA, and extensive coordination with the FAA is required to determine the availability of discretionary funding for specific projects. From 2010 through 2014, South Dakota airports received $61.6 million in discretionary AIP funding, but there is no guarantee of future funding at that level. In-depth discussions with FAA representatives are necessary to determine the potential availability of discretionary funding for an AIP-funded project.

Federal Funding History for Wall Municipal Airport

Between 1986 and 2014, the airport has received almost $1 million in federal airport development funds under various programs. **Table D-1** gives a brief history of the grants for projects at Wall.

Table D-1: Airport Improvement Program Funding

Year	Grant	Description	Local	State	Federal	Total
1986	3-46-0069-01-86	Land/Easement Acquisition, ALP, Grade/Surface New Rwy, Apron & Twys	21,439	21,439	385,909	428,788
1993	3-46-0069-02-93	Rehabilitate Rwy, Apron & Twy; Signage	9,239	9,239	166,316	184,795
2001	3-46-4600-01-2001	Rehabilitate Rwy, Apron, Twy	1,212	1,212	24,240	26,664
2007	3-46-0069-03-2007	Update Airport Layout Plan	909	606	28,787	30,302
2008	3-46-0069-04-2008	Environmental; Preliminary Design for 2010 Rwy Extension	1,965	1,310	62,230	65,505
2012	3-46-0069-05-2012	Construct Snow Removal Equipment/Terminal Building	4,216	16,865	189,734	210,815
2014	3-46-0069-06-2014	Reimburse for 2012 purchase of SRE tractor/loader with bucket, snow blower, blade, rotary broom	7,640	7,640	137,511	152,791
Total			$46,620	$58,311	$994,727	$1,099,660

Source: FAA and State of South Dakota

The Federal AIP Grant Process

Once AIP funding has been identified, the airport sponsor must go through an established process to receive the federal funds and apply them towards an airport development project. The following paragraphs summarize the various steps of the process. However, depending on the specific details of the planned project or the sponsor's status, additional steps may be required. The current version of FAA Order 5100.38 will contain a more detailed explanation of all requirements and processes. In addition, coordination with the Airports District Office (ADO) is strongly encouraged to ensure there is no confusion.

Basic Grant Steps

While there are numerous steps in the FAA AIP grant process, all AIP grants proceed through the same basic steps.



Pre-Grant Actions

Pre-grant actions include a number of actions that must be taken before an AIP-eligible project is ready to be considered for inclusion in a grant. The most critical action is the need for early and extensive coordination between the sponsor and the FAA. The majority of the sponsor's interface with the FAA is at the local level with the appropriate ADO.

Sponsors develop a Capital Improvement Plan (CIP), typically based on the airport's 20-year development plan. This CIP is submitted to the ADO, where it is reviewed to identify the projects that meet all of the applicable requirements. The ADO enters those projects into an automated AIP system, which is then used to create a five-year NPIAS report, outlining the projects that are eligible for AIP funding. From that data, the

FAA creates an Airports Capital Improvement Plan (ACIP) to identify the projects that may be funded with AIP over the next three years. Inclusion of a project in the ACIP represents the initial FAA concurrence with the project. However, it is important to note that inclusion of the project in the NPIAS or the ACIP is not a guarantee of funding, nor is the value of the project considered a final determination by the FAA.

The ADO will typically notify the sponsor of the favorable potential for receiving federal funding in the upcoming fiscal years. However, it is not a commitment nor a guarantee of funds; rather, it is simply a notice that funding for the project appears favorable and the sponsor should consider initiating those actions that require long lead times in order to avoid delays in the grant process. In addition, the sponsor must develop a realistic project schedule, setting realistic sponsor deadlines for key steps in the grant process and coordinate this schedule with the ADO. Depending on the project, there may be additional steps required, but the common key steps in the grant process schedule include:

- Submission of environmental review documents
- Selection of sponsor's engineer
- Completion of final plans and specifications
- Submission of an airspace study
- Submission of a construction safety phasing plan
- Completion of safety management system (SMS) coordination
- Submission of disadvantaged business enterprise (DBE) plan
- Completion of necessary land acquisition
- Notice of intent to use entitlement funds (as established in annual Federal Register Notices)
- Advertisement for bids
- Acceptance of grant offer
- Award of contract

In addition to completion of the schedule and coordination with the ADO, the ADO will take a number of actions, including verification of sponsor eligibility, verification that all project requirements will be met and verification the sponsor's Airport Layout Plan (ALP) is current. As required by the Department of Transportation (DOT) Office of Inspector General, the FAA, as an element of its risk-based oversight system, will also verify that a sponsor risk assessment has been completed, a risk level has been assigned, and the risk level is still current. The ADO will also review the sponsor's grant history, focusing on open grants, to ensure the sponsor can comply with the requirement to carry out and complete AIP-funded projects without unreasonable delay.

Grant Programming

Once the pre-grant actions have been completed, there are three major steps before the grant application can be processed:

- Grant Programming
- Congressional Notification
- Sponsor Notification

A grant is "programmed" when the ADO takes the action to create a proposed grant in the automated AIP system. These proposed grants are typically based on estimated costs, either from the sponsor's CIP or as submitted by the sponsor. The grant is then reviewed at various levels with the FAA Office of Airports. If the grant is approved, it then enters into the congressional notification process.

After the FAA Office of Airports approves the grant, it is forwarded to the FAA's Office of Government and Industry Affairs (AGI). After AGI reviews the grant, it is forwarded to the DOT Office of the Secretary (OST). OST will review the grant, a process that varies with the type and amount of funding as well as current

legislative requirements, and notify the appropriate congressional office that the grant can be publicly announced. OST will notify FAA when this process is complete, but the FAA can share specific information about the grant only after the OST notification has been received.

After the congressional notification process is complete, the FAA posts the grant on the official FAA Office of Airports website. This is considered formal notification that the ADO has authority to issue the grant, but a sponsor is typically notified in writing through a Tentative Allocation letter.

Grant Application, Offer and Acceptance

After the sponsor has been notified that they will receive a grant, the following steps must be completed:

- Grant Application Package Submittal
- Grant Application Review
- Fund Reservation
- Grant Offer
- Grant Acceptance

Before the ADO can issue a grant, the sponsor must submit a complete and correct grant application. This application package must include an Application for Federal Assistance (Standard Form 424), an Application for Development Projects (FAA Form 5100-100 or equivalent) and other documentation (narratives, sketches, photographs, etc.) as requested by the ADO.

The ADO will then review the application package for accuracy and completeness, with the level of review depending on the complexity of the project, the amount of the grant, the size of the airport and past experience with the sponsor. After the ADO completes their review, they will coordinate with the FAA's accounting service to officially reserve the grant funds.

The ADO then prepares a formal grant offer package. This package typically includes a grant cover letter, the actual grant agreement, special conditions, grant assurances, sponsor certifications and current FAA advisory circulars.

The grant cover letter highlights important grant information, such as when the grant document needs to be returned. The grant agreement, when fully signed and executed, is a binding agreement obligating the sponsor and the FAA to the terms and conditions of the agreement. Special conditions highlight extra steps the sponsor must take as part of accepting the grant offer and are included in the actual grant agreement. Grant assurances are a very important part of the grant agreement, since these assurances are obligations that the sponsor agrees to when they accept an AIP grant and the assurances require the sponsor maintain and operate their facilities safely, efficiently and in accordance with specified conditions. Sponsor certifications are sponsor statements that they have met or will meet the specific requirements of certain elements of the process. Finally, the grant offer package contains a list of the current FAA Advisory Circulars (AC) that set out the applicable policies, standards and specifications that sponsors must follow in an AIP-funded project.

Grant Acceptance

If the sponsor agrees with the grant offer, they must take certain steps to finalize the offer. The grant agreement cannot be altered by the sponsor and must be signed by an authorized representative of the sponsor. The agreement must then be signed by the sponsor's attorney, confirming that the sponsor is legally able to enter into the contract with the US government. After the grant has been executed, a specified number of copies must be returned to the ADO. Until the ADO receives an original signed agreement and enters it into the FAA's system, no funds can be drawn from the grant allocation.

Grant Payments

Once the grant agreement has been fully executed and returned to the ADO, the sponsor may begin requesting payments from the FAA. It is important to note a number of requirements in the payment process.

- All grant payment requests must be processed through the currently approved DOT grant payment system.
- Payment requests must be submitted at least annually, unless more frequent submissions are requested by the ADO. The sponsor may submit payment requests more frequently as costs are incurred.
- Payment requests must be based on costs already paid by the sponsor. Advance payments must be approved by the ADO.
- The last 10 percent of the federal share of the grant must be withheld until the ADO receives the final grant closeout report.
- The sponsor must retain all of the documentation supporting the grant payment for the required time period and must make this information available on request.

Grant Amendments

Under certain circumstances, a grant agreement can be amended. Only the ADO can change a grant agreement and amendments are the process used to implement such changes. In general, a grant agreement can be changed (amended) with certain limitations for the following reasons:

- To increase or decrease the grant amount. Grants for planning projects cannot be increased. In addition, amendments to increase the grant are limited to a maximum of 15 percent.
- To clarify the project description.
- To add, delete or modify a project.

Coordinate with the ADO to determine requirements for grant amendments.

Grant Closeouts

After the project has been completed, the final step in the process is to complete all of the administrative actions to close out the grant. This step is particularly important to the sponsor, since the FAA is required to withhold the last 10 percent of the federal share of the grant amount until the closeout report has been submitted to the ADO. The basic steps of the process are:

- Physically complete all projects in the grant.
- Complete all grant administrative and financial requirements
- Complete the closeout process

A project is physically complete when all work funded by the grant has been satisfactorily completed in accordance with all specifications or requirements. Before the ADO can process the closeout, they must receive the appropriate documentation demonstrating that the grant project requirements have met, the sponsor has met all of the grant requirements and all project costs are properly documented.

After the ADO has received all required documentation and verified that all requirements have been met, they will prepare a FAA Final Project Report. The ADO will then send written notification to the sponsor of the final payment amount. After the final payment has been made, the ADO will coordinate with other FAA offices to close the grant. When all these actions have been completed, the ADO will notify the sponsor in writing that the grant is physically and financially complete and the grant is officially closed.

Post-Grant Actions

Once the FAA has officially closed the grant, the sponsor still has additional grant actions it must follow.

- The sponsor is required by law to retain all grant-related documentation for three years. If there is litigation, the sponsor must retain the documentation until the issue is resolved or three years, whichever is later.
- The grant assurances and special conditions remain as an obligation the sponsor must comply with. Most grant assurances and special conditions are in effect for 20 years after the grant was signed. Some assurances or special conditions are in effect for the life of the equipment or facility, while other obligations remain in effect for perpetuity.
- If a sponsor expends more than $500,000 in federal funds (all federal funds, not just AIP) in a fiscal year, it must comply with the Office of Management and Budget (OMB) single audit requirements. Unless the sponsor is an independent airport authority, this requirement applies to the airport's governing organization, i.e., city, county, state, etc.
- If the sponsor desires to dispose of equipment or land acquired with AIP funds, it must have FAA approval.

NOTE: *As stated before, the above discussions on the AIP grant process are a summary of current program guidance. It does not include all the details and program requirements available. A more detailed description of all of the elements of the AIP grant process can be found in the current version of FAA Order 5100.38, Airport Improvement Program Handbook. In addition, sponsors are strongly encouraged to consult their local ADO for the latest policy and guidance.*

State Funding

State governments typically have a variety of funding programs available for airport development. The most predominant programs use of funds from a variety of sources, such as aviation fuel taxes or aircraft registration fees, to provide funding for a portion of an airport sponsor's local share of a federally-funded airport development project. This section describes the program and a history of the state funding for Wall Municipal Airport.

South Dakota State Aviation Funding

State funding for airport development is managed by the South Dakota Department of Transportation's Office of Aeronautics, under the direction of the South Dakota Aeronautics Commission. This funding, held in the South Dakota Aeronautics Fund, comes primarily from aviation fuel taxes and aircraft registration fees.

Airports may apply for funds to cover up to 50 percent of the local share for federal AIP-funded projects. Airports are also allocated a portion of the aviation fuel taxes collected from fuel sales on their airport and may request those funds for airport development projects. Contact the SDDOT Office of Aeronautics for application procedures and more information.

The funding history through state funds is included in **Table D-1** with all of the federal funding.

Local Funding

While most funding for airport development is derived from federal or state sources, portions of most capital projects as well as the majority of airport operating expenses must be funded through local sources. Ideally, the airport generates sufficient revenue to meet those costs. However, for many smaller airports, airport expenses and funding requirements typically exceed available airport revenue and the airport must rely on other funding sources.

From a financial standpoint, the airport must seek to be as 'self-sustaining' as possible. This is one of the grant obligations for using federal funds and regardless, is a prudent approach to take. General Aviation airports have a few primary sources of revenue. These revenues are based on either land, buildings, services/use fees or public funding sources.

Land

Airports, by their nature require large amounts of land. This land is primarily dedicated to airport functions and so far as its use does not hinder the function of the airport, the land can be used for revenue production. Airports lease land to individuals or companies to construct buildings at the airport to store and service aircraft. Airports also lease land for the construction of buildings and improvements that are not used for aviation purposes and these are known as non-aeronautical leases. For general aviation airports, a common type of land lease is for agricultural purposes. Agricultural leases can be for crops, haying, livestock or a combination. The terms of all of these leases must comply with FAA grant assurances and can serve as an important element of the airports overall revenue.

Buildings

For airports to fully function, buildings such as terminals and hangars are needed at the airport to allow for the storage and servicing of aircraft. Buildings can be constructed initially through a land lease or using other airport revenue sources. For those buildings constructed through a land lease, it is important for the airport to consider the long-term reversion of the property improvements to the ownership of the airport. The reason for this is that any property improvement has a certain amount of useful life. After that period of useful life has been fulfilled the airport must recognize that the land lease tenant has fully recovered the cost of the improvements. If the airport were to continue to allow the tenant to use the improvements at a land lease rate it would be granting the tenant a substantial financial benefit at a significant long term cost to the airport.

The issue of reversion is one that is not as complicated as it seems. To see this more clearly here are two storylines to better explain it. In the first, an airport allows a tenant to construct a hangar on land leased for 25[1] years, (25 years in this example allows for the full amortization of the improvements) and then the airport extends or executes a new lease after the initial 25-year period for another 10 years at substantially the same land lease rate. In the second storyline, the airport allows the same tenant to construct a hangar on land leased for 25 years and at the end of 25 years the tenant does not extend the lease and abandons the hangar for one reason or another. The airport then seeks a new tenant for the hangar and seeks someone to pay not only for the land that will be leased but adds to that the value of the improvements. This of course is a substantial increase in rental rate and if the new lease is for 10 years would recoup much more money than the first storyline that was presented. The issues of reversion are essentially the recognition that the initial land lease should only function as a land lease until the value of the improvements are amortized. After that initial period, unless other significant improvements are made to extend the useful life of the building, the airport should begin leasing the property as improved rather than vacant land.

The issue of reversion being covered, income from buildings can be a significant portion of an airport's revenue stream. To be as 'self-sustaining' as possible, airports can go a long way toward financial sufficiency if the airport maximizes the rental income from improvements made on the airport.

[1] *South Dakota State Law restricts airport leases to no more than 25 years. SDLC 50-7-3.*

Services and Use Fees

Some airports provide services directly to aircraft owners such as fueling, ground handling, hangaring etc. For those airports that do, this service has a large cost but also large amounts of revenue if managed in a business-like manner. Even if an airport does not provide services directly to aircraft owners the airport can establish some usage based fees such as fuel flowage fees, tie downs fees, landing fees or others. These serve as a means to cover operating expenses and helps diversify income beyond just leases so that the direct beneficiary, the aircraft owner is paying rather than just the tenant leasing land or improvements.

Public Funding

The sponsor of the airport, usually a city, county or special district often has the ability to raise revenues from the general public through various forms of taxation. Providing funding to the airport for operating or capital expenses requires the airport sponsor to weigh the different services it provides to the community including the airport and decide how much if any of this public revenue will be provided to the airport.

A specific type of public funding is bonded indebtedness which can be used for capital improvements. The bonded indebtedness can be any of the following:

1) ***General obligation bonds*** are backed by the creditworthiness and taxing power of the municipality operating the airport. They usually bear low interest rates because of their high degree of security. However, state laws may limit a municipality's overall debt, and competition from other community financing requirements may preclude their use for an airport project. Some states have an exemption from the debt limitation rule for general obligation bonds because they are used for a revenue producing enterprise.

2) ***Revenue bonds*** pledge the revenues of an airport sponsor to the repayment of debt service. These are the most common source of funding at larger commercial service airports. Revenue bonds are popular because they do not burden the taxpayer or affect the bonding capacity of the municipality. However, their use is limited to airports with a sufficient operating surplus to cover the debt service. Projected Net Revenues must exceed debt service requirements by at least 1.25 times and up to 2.0 times, depending on the strength of the bond issuer and the underlying assumptions with respect to the market risk for the bonds. Interest rates are dependent on the coverage ratio, but in any case will be higher than for general obligation bonds. Other factors that may affect the interest rates on revenue bonds are the strength of the local passenger market and the financial condition of the airlines serving the market.

3) ***Special facility revenue bonds*** are normally issued by the airport sponsor for the construction of a facility for a third party and backed by the revenues generated from that facility. This method of funding can be used for such facilities as maintenance hangars, airline reservation centers, terminal buildings, and air cargo terminals.

4) ***Industrial development bonds*** can be issued by states, local government, or an airport authority to fund the construction of an airport industrial park or other facilities that may attract business and increase non-aeronautical leasing revenues at the airport.

Wall Municipal Airport Funding for Capital Projects

The local funding for capital projects at Wall has typically come from local tax dollars from the City of Wall. The airport is able to cover some of the airports operating expenses from revenues such as land leases but there is often not enough revenue to also cover the local portion of capital projects. This is typical for an airport the size of Wall.

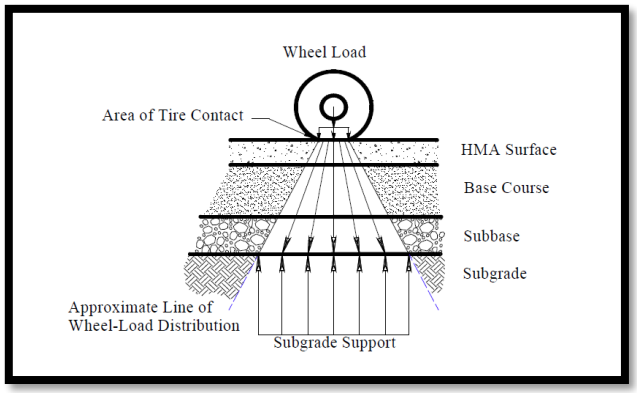
APPENDIX E: AIRFIELD PAVEMENTS

Introduction

Pavement is one of the most important aspects of an airport. If an airport has failing pavement (runway, taxiway, or apron), aircraft operations will suffer and can affect aircraft safety. When considering pavement design, construction, and maintenance, certain elements need to be considered in order to develop pavement surfaces. Some of these elements include but are not limited to the design aircraft that serves the airport, economic factors, weather conditions, the location of the airport, and personal preference of the owner/operator. This section highlights general knowledge of airfield pavements and things to consider when viewing the pavement at your airport.

Pavement Types

There are two main types of pavement on an airfield. These are Hot-Mix Asphalt (HMA) and Portland Cement Concrete (PCC). HMA is the only type of airfield pavement at Black Hills Airport – Clyde Ice Field. HMA is a flexible-type of pavement, and distributes aircraft weight through the layers below the asphalt surface (See exhibit). When constructed, the HMA surface is in a smooth state. This is a result of the application method of rolling the surface for proper compaction.



Source: Advisory Circular 150/5380-6b

HMA has FAA specifications and design criteria and is typically referred to as "P-401". P-401 is an FAA specifications that contains requirements for the materials used in the pavement such as aggregate, bituminous material, or any admixtures. These specifications also contain requirements for construction, quality control, and quality assurance. For further detail, refer to FAA Advisory Circular 150/5370-10G, Standards for Specifying Construction of Airports.

Surface Texturing

Because HMA initially has a smooth surface when constructed, it is important to look at methods that increase the friction of the surface. This can be completed by grooving. Grooving tends to be the most common type of surface treatment, and is typically constructed by cutting transverse grooves, 1 ½ inches apart, and ¼ inch deep the entire length of the runway after the pavement has set. These saw-cut grooves help with water runoff and reduce the risk of aircraft hydroplaning.

Other methods to increase surface friction for HMA consist of Porous Friction Course (PFC), Chip Seals, and Aggregate Slurry Seals. The ultimate goal in this process is to give the aircraft greater friction and better maneuverability during adverse weather conditions.

Pavement Strength

Pavement strength is driven by multiple factors. Initially, the airport needs to determine the design aircraft that will be using the airport. The design aircraft can be determined by one single-most demanding aircraft, or a mix of the most demanding aircraft that drive similar standards. By identifying the design aircraft, the airport can determine the pavement strength needed for the pavement surfaces on the airfield. See Appendix F Airfield Design for more information on the design aircraft.

After determining the design aircraft, the FAA has identified a standard method to report pavement strength at an airport. In the aviation world, there are two types of pavement strength classification; Utility and Other-Than-Utility. Utility pavements are capable of handling aircraft of up to 12,500 pounds maximum gross weight, while Other-Than-Utility pavements are capable of handling aircraft greater than 12,500 pounds.

If the design aircraft is 12,500 pounds or less, the pavement strength reporting remains fairly simple and straight forward. However, if the design aircraft is determined to have a maximum gross weight of greater than 12,500 pounds, the ACN-PCN[1] method is used to determine what the pavement is capable of supporting. ACN is the number that expresses the relative effect of an aircraft at a given configuration on a pavement structure for a specified subgrade strength, while PCN is a number that expresses the load-carrying capacity of a pavement for unrestricted operations. The ACN-PCN method of determining pavement strength does have some drawbacks. It is only intended to report relative pavement strength (so airport operators can evaluate acceptable operations of aircraft), but it is not intended for pavement design or pavement evaluation.

Table E-1: PCN Reporting Format

PCN #	Pavement Type	Subgrade Strength			Tire Pressure (psi)	Method of Determination
			Flexible (CBR)	Rigid (k-value)		
Numerical Value	R - Rigid	A - High	≥ 13	≥ 442	W - no limit	T - Technical Study
		B - Medium	>8 & < 13	> 221 & < 442	X - 182-254	
	F - Flexible	C - Low	>4 & ≤ 8	>92 & ≤ 221	Y - 74-181	U - Using Aircraft
		D - Ultralow	≤ 4	≤ 92	Z - 0-73	
Expressed as follows:						
### / R or F / A, B, C or D / W, X, Y or Z / T or U						

Source: FAA Advisory Circular 150/5335-5C Standardized Method of Reporting Airport Pavement Strength.

Table E-2: PCN for Wall Municipal Airport

Pavement	Pavement Classification Number (PCN)	
	Existing	Ultimate
Runway 12 - 30	9/F/D/X/T[2]	8/F/D/X/T[3]

Source: KLJ Analysis

[1] A method of reporting pavement strength initiated by the International Civil Aviation Organization (ICAO) and adopted by the U.S. The instructions for determining the ACN/PCN are in FAA Advisory Circular 150/5335-5C *Standardized Method of Reporting Airport Pavement Strength.*

[2] The calculations are based on annual departures by a mixture of aircraft including: Single Wheel (SW) 2,000 lbs (2,600 departures), SW 5,000 lbs (200 departures), SW 10,000 lbs (800 departures), SW 15,000 lbs (400 departures) and Single Wheel 20,000 lbs (100 departures).

[3] The calculations are based on annual departures by a mixture of aircraft including: Single Wheel (SW) 2,000 lbs (2,700 departures), SW 5,000 lbs (200 departures), SW 10,000 lbs (700 departures), SW 15,000 lbs (800 departures) and SW 20,000 lbs (500 departures).

Markings

Pavement marking is an important aspect of pavement development. Not only does it give the pilot vital information on where they are located on the airfield, but it also can affect the surface friction of the pavement.

More specifically for runway markings, there are two types of paint applications; striated or solid. Striated markings are stripe-like patterns, while solid runway pavement markings do not have any spacing. Pavement heats quicker than paint and, as a result, any exposed pavement will melt any frozen contaminants quicker than what is on a painted surface. By striating the pavement, gaps of exposed pavement can help melt frozen contaminants quicker than if the pavement marking was solid. This increases friction and helps aircraft stop more consistently along the runway. As a result, striated pavement markings are more relevant in northern-climates, where weather contaminants can accumulate and freeze on runway surfaces. Furthermore, striated markings are only used for runway markings, as aircraft are operating at a higher speed. Wall has solid runway markings which are in good condition.

Maintenance

Maintenance is necessary throughout the useful life of the pavement. Moreover, per FAA Grant Assurance #11, federally-funded airports are required to implement a Pavement Preventative Maintenance program. This program assures an effective airport pavement maintenance-management program that will be used throughout the useful life of any pavement constructed, reconstructed, or repaired with federal funds. Pavement distress may include cracking, joint seal damage, disintegration, distortion, or loss of skid resistance. All of these distresses affect the aircraft's ability to maneuver around the airport safely. Moreover, these distresses can cause FOD (Foreign Object Debris) to accumulate on the pavement surface which can damage aircraft and compromise safety.

Pavement maintenance can either be contracted out, or serviced by operations/maintenance personnel on the airfield. Some pavement maintenance methodologies include, but are not limited to, patching, crack seals, mill and overlays, rejuvenators, spall-repairs, or slurry seals. Sometimes fabrics are added to HMA pavements, either during initial construction or as a pavement maintenance method (sometimes called pre-pave fabric), and add resistance to typical HMA pavement wear. Typical repair methods for flexible pavement (HMA) can include any of the above, but rigid pavement (PCC) typically is repaired by crack sealing. In the event that pavement has failed or reached the end of its useful life, a complete reconstruction is necessary.

To monitor the distress of pavement at airports, Pavement Condition Index (PCI) Reports are completed periodically. These reports can sometimes be completed on a state-wide basis, and are typically updated every three years. PCI reports tell the airport owner how distressed their pavement is based on a percentage value from 100 to 0. With this information, airport owners can plan for the financial needs of pavement management accordingly. **Exhibit E-1** is the most current PCI report for the Wall Municipal Airport. On-site inspection of the pavements does not appear to support the findings of the PCI report, specifically the north taixlane area. It is recommended that the PCI report be verified with actual pavement conditions.



North Taxilane Section 305 (refer to Exhibit E-1) facing north west

Exhibit E-1 Pavement Condition Index Report 2015



Wall Municipal Airport (6V4)

Use Category	Minimum PCI Requirement	Weighted Average PCI
Runway	60	71
Taxiway	50	82
Apron	45	72

AIRPORT_ID	PID	BRANCH_ID	SECTION_ID	HISTORY	SAMPLE_UNI	MATERIAL	SF
6V4	6V4,100-CTW,105	100-CTW	105	2001 CRK REP COAL TAR REJUV_1993 2.25 in P-401 CLS G_1986 DBL CHIP SEAL_1986 11 in P-209_1986 P-152	3	BIT	11,450
6V4	6V4,200-HTW,205	200-HTW	205	2001 CRK REP COAL TAR REJUV_1993 2.25 in P-401 CLS G_1986 DBL CHIP SEAL_1986 11 in P-209_1986 P-152	2	BIT	9,362
6V4	6V4,200-HTW,205	200-HTW	205	2001 CRK REP COAL TAR REJUV_1993 2.25 in P-401 CLS G_1986 DBL CHIP SEAL_1986 11 in P-209_1986 P-152	2	BIT	9,362
6V4	6V4,300-HTW,305	300-HTW	305	2001 CRK REP COAL TAR REJUV_1993 2.25 in P-401 CLS G_1986 DBL CHIP SEAL_1986 11 in P-209_1986 P-152	3	BIT	9,884
6V4	6V4,400-NA,405	400-NA	405	2001 CRK REP COAL TAR REJUV_1986 DBL CHIP SEAL_1986 11 in P-209_1986 P-152	2	BIT	5,000
6V4	6V4,4100-A,4105	4100-A	4105	2001 CRK REP COAL TAR REJUV_1993 2.25 in P-401 CLS G_1986 DBL CHIP SEAL_1986 11 in P-209_1986 P-152	6	BIT	34,500
6V4	6V4,6100-12/30,6105	6100-12/30	6105	2001 CRK REP COAL TAR REJUV_1993 2.25 in P-401 CLS G_1986 DBL CHIP SEAL_1986 11 in P-209_1986 P-152	35	BIT	212,250

Source: South Dakota Department of Transportation - Office of Aeronautics

Runway Pavement Data

Table E-3 Runway Pavement 12 - 30

Criteria	Existing	Future	Ultimate
Length	3,500’	4,710’	4,710’
Width	60’	75’	75’
Type	Asphalt	Asphalt	Asphalt
Strength	22,500 (SW)[4]	22,500 (SW)	22,500 (SW)
PCI Value	71	71	71
RDC	A-I	B-II	B-II

Source: South Dakota Department of Transportation - Office of Aeronautics; KLJ Analysis
Refer to Section 6105 of Exhibit E-1: Pavement Condition Index Report 2015

Construction Details

Runway 12-30 is constructed with two and one-half inches of P-401 bituminous pavement over eleven inches of P-209 aggregate base and P-152 scarified and recompacted subgrade. For additional construction details and maintenance refer to the history section on **Exhibit E-1 Pavement Condition Index Report 2015**.

Existing Issues

Runway 12-30 is in satisfactory condition per the PCI report. Onsite inspection revealed a gradual hump in the pavement near the centerline approximately 1000 feet south east of Runway 12 threshold. Pavement markings are in good condition.

Taxiway Pavement Data

Table E-4 Taxiway Pavement

Criteria	Existing	Future	Ultimate
Width	25’	25’	25’
Type	Asphalt	Asphalt	Asphalt
Strength	22,500 (SW)[4]	22,500 (SW)	22,500 (SW)
PCI Value	82 (74 to 83)	82	82

Source: South Dakota Department of Transportation - Office of Aeronautics; KLJ Analysis
Refer to Section 105 of Exhibit E-1: Pavement Condition Index Report 2015

Table E-5 Taxilane Pavement

Criteria	Existing	Future	Ultimate
Width	20’ - 25’	25’	25’
Type	Asphalt	Asphalt	Asphalt
Strength	12,500 (SW)	12,500 (SW)	12,500 (SW)
PCI Value	82 (74 to 83)	82	82

Source: South Dakota Department of Transportation - Office of Aeronautics; KLJ Analysis
Refer to Sections 405, 305 and 205 of Exhibit E-1: Pavement Condition Index Report 2015

[4] Published at 12,500 lbs. (SW), however strength analysis revealed existing pavement is capable of 22,500 lbs. (SW)

Construction Details

The taxiway and taxilanes are constructed with two and one-half inches of P-401 bituminous pavement over eleven inches of P-209 aggregate base and P-152 scarified and recompacted subgrade. For additional construction details and maintenance refer to the history section on **Exhibit E-1 Pavement Condition Index Report 2015**.



North Taxilane Section 405 (refer to Exhibit E-1) facing south west

Existing Issues

The taxiway has no significant issues. The south two taxilanes are generally satisfactory while the remaining north taxilanes are poor with numerous areas of spalling pavement failure.

Apron Pavement Data

Table E-6 Apron Pavement

Criteria	Existing	Future	Ultimate
Dimensions	3,700 sy	4,620 sy	4,620 sy
Type	Asphalt	Asphalt	Asphalt
Strength	22,500 (SW)[4]	22,500 (SW)	22,500 (SW)
# Tiedowns	5	7	7
PCI Value	72	72	72

Source: South Dakota Department of Transportation - Office of Aeronautics; KLJ Analysis
Refer to Section 4105 of Exhibit E-1: Pavement Condition Index Report 2015

Construction Details

The apron is constructed with two and one-half inches of P-401 bituminous pavement over eleven inches of P-209 aggregate base and P-152 scarified and recompacted subgrade. For additional construction details and maintenance refer to the history section on **Exhibit E-1 Pavement Condition Index Report 2015**.

Existing Issues

The main apron has no significant issues and is generally satisfactory.

APPENDIX F: AIRFIELD DESIGN REQUIREMENTS

Introduction

This Appendix discusses runway and taxiway design standards and runway length requirements.

Design Standards

Guidance on airport design standards is found in FAA Advisory Circular 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

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 operating or forecast to operate at the airport on a regular basis, which is typically considered 500 annual operations. The design aircraft may be a single aircraft, or a grouping of aircraft.

The first consideration should be the safe operation of aircraft that regularly use the airport. According to FAA AC 150/5300-13A, any operation of an aircraft that exceeds design criteria of the airport may result in either an unsafe operation or a lesser safety margin unless air traffic control (ATC) Standard Operating Procedures (SOPs) are in place for those operations. However, the AC also states that it is not the usual practice to base the airport design on an aircraft that uses the airport infrequently, and it is appropriate and necessary to develop ATC SOPs to accommodate faster and/or larger aircraft that use the airport occasionally.[1] The FAA typically only provides funding for the airport to be designed to existing and forecasted critical aircraft that are expected to exceed 500 annual operations.

Airport and Runway Classifications

The FAA has established aircraft classification systems that group aircraft types based on their performance and geometric characteristics. These classification systems, described below and illustrated in **Table F-1** and **Exhibit F-1**, 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 *Airport Design*.

- **Aircraft Approach Category (AAC)**: a grouping of aircraft based on approach speed.
- **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.
- **Approach Visibility Minimums**: relates to the visibility minimums expressed by Runway Visual Range (RVR) values in feet of 1200, 1600, 2400, 4000, and 5000 (corresponding to lower than 1/4 mile, lower than 1/2 mile but not lower than 1/4 mile, lower than 3/4 mile but not lower than 1/2 mile, lower than 1 mile but not lower than 3/4 mile, and not lower than 1 mile, respectively).

[1] FAA Advisory Circular 150/5300-13A, *Airport Design*

- **Taxiway Design Group (TDG):** A classification of airplanes based on outer to outer Main Gear Width (MGW) and Cockpit to Main Gear (CMG) distance.

Table F-1 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’
IV	66’ - < 80’	214’ - < 262’
Approach Visibility Minimums		
RVR (ft.)*	**Instrument Flight Visibility Category (statue mile)**	
N/A (VIS)	Visual (V)	
5000	Not lower than 1 mile (NPA)	
4000	Lower than 1 mile but not lower than ¾ mile (APV)	
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 - Change 1, Airport Design; *RVR values are not exact equivalents*
APV = Approach with Vertical Guidance, PA = Precision Approach

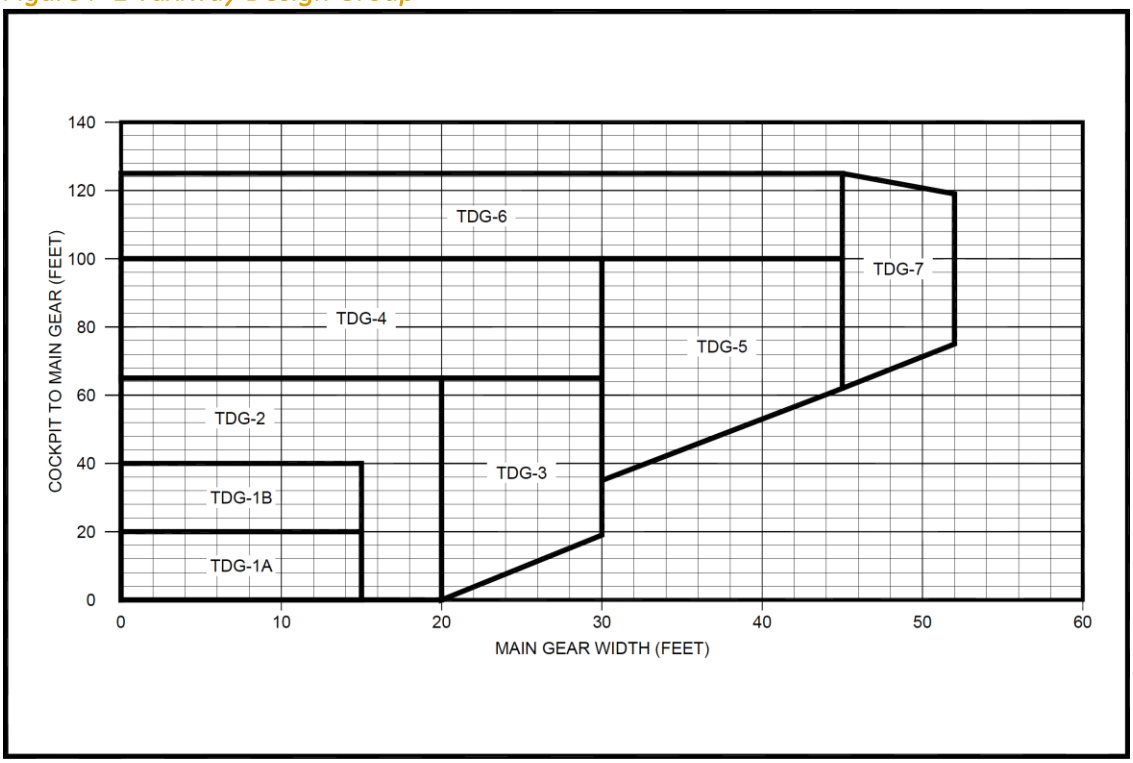
TDG categories range from TDG-1A to TDG-7, with specific standards found in AC 150/5300-13A. Pavement width requirements for taxiing aircraft are based on the TDG. The TDG is also used to determine standards for taxiway safety areas, clearances and the geometry of taxiway intersections. **Table F-2** shows a sample of some basic taxiway dimensions as related to the TDG. However, please see AC 150/5300-13A for complete details.

Table F-2 TDG Groups and Select Design Standards

Taxiway Design Group								
TDG Number	**1A**	**1B**	**2**	**3**	**4**	**5**	**6**	**7**
Taxiway Width	25 ft	25 ft	35 ft	50 ft	50 ft	75 ft	75 ft	82 ft
Taxiway	10 ft	10 ft	15 ft	20 ft	20 ft	30 ft	30 ft	40 ft

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

Figure F-1 Taxiway Design Group



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

Design Codes

Using the codes from **Table F-1**, there are several ways in which the codes are used. This includes codes that recognize existing conditions, codes that identify planned capabilities, codes that are for specific runways and codes for the airport as a whole. In summary, these codes are:

- **Airport Reference Code (ARC)** – an airport designation that signifies the airport's highest Runway Design Code (RDC), minus the third (visibility) component of the RDC.
- **Runway Design Code (RDC)** – a code signifying the design standards to which the runway is to be built.
- **Approach Reference Code (APRC)** – a code signifying the current operational capabilities of a runway and associated parallel taxiway with regard to landing operations.
- **Departure Reference Code (DPRC)** – a code signifying the current operational capabilities of a runway with regard to takeoff operations.

Airport Reference Code (ARC)

The Airport Reference Code (ARC) is an airport designation that represents the AAC and ADG of the aircraft that 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)

Runway designs are based on specific FAA runway design standards. These standards, found in FAA AC 150/5300-13A, provide basic guidelines for a safe and efficient airport system, and are based on the most demanding or "design" aircraft expected to use the runway. Runway lengths are related to the design aircraft but are determined in accordance with procedures detailed in the current version of

FAAAC 150/5325-4. All other critical dimensions related to the design aircraft are found in FAA AC 150/5300-13A, including dimensions for runway widths, safety areas and separations from other infrastructure.

APRC and DPRC (formerly Runway Reference Codes)

The APRC and DPRC were previously known jointly as the Runway Reference Code (RRC) and was defined as **the current operational capabilities of a runway and its associated parallel taxiway**. The RRC described the operational capabilities of the runway where no special procedures are necessary. In an effort to develop a code more indicative of a runway's operational capabilities, Change 1 to FAA AC 150/5300-13A replaced RRC with two new codes: Approach Reference Code (APRC) and Departure Reference Code (DPRC). **Exhibit F-2** and **F-3** summarize the data for APRC and DPRC but refer to FAA AC 150/5300-13A for more specific information on the use of these codes.

Like the RDC, the APRC is composed of three components: the AAC, the ADG, and the visibility minimums. In contrast, the RDC is composed of the same three components, but is based on planned development and has no operational application. APRC signifies the current operational capabilities of a runway and associated parallel taxiway with regard to landing operations. The visibility minimums are linked to critical standards that determine which aircraft can operate on taxiways adjacent to a runway under particular meteorological conditions with no special operational procedures necessary.

DPRC signifies the runway's operational capabilities with regard to takeoff operations. The DPRC code is the similar to the APRC code, but is comprised of two components, AAC and ADG. It represents those aircraft that can takeoff from a runway while any aircraft are present on adjacent taxiways, under particular meteorological condition with no special procedures necessary.

Figure F-2 Approach Reference Code (APRC)

Visibility Minimums	Runway to Taxiway Separation (ft)									
	≥150	≥200	≥225	≥240	≥250	≥300	≥350	≥400	≥500	≥550
Visual	B/I(S)/VIS	B/I(S)/VIS	B/I/VIS	B/II/VIS	B/II/VIS	B/III/VIS D/II/VIS	B/III/VIS	D/IV/VIS D/V/VIS	D/VI/VIS	D/VI/VIS
Not lower than 1 mile	B/I(S)/5000	B/I(S)/5000	B/I/5000	B/II/5000	B/II/5000	B/III/5000 D/II/5000	B/III/5000	D/IV/5000 D/V/5000	D/VI/5000	D/VI/5000
Not lower than 3/4 mile	B/I(S)/4000	B/I(S)/4000	B/I/4000	B/II/4000	B/II/4000	B/III/4000 D/II/4000	B/III/4000	D/IV/4000 D/V/4000	D/VI/4000	D/VI/4000
Lower than 3/4 mile but not lower than 1/2 mile		B/I(S)/2400	B/I/4000 B/I(S)/2400	B/II/4000	B/I/2400	B/III/4000 [1] D/II/4000 B/II/2400	B/III/2400	D/IV/2400 D/V/2400	D/VI/2400	D/VI/2400
Lower than 1/2 mile								D/V/2400 D/IV/1600	D/VI/2400 D/V/1600	D/VI/1600

Notes:
1. (S) denotes small aircraft
2. Entries for Approach Category D also apply to Approach Category E. However, there are no Approach Category E aircraft currently in the civil fleet.
3. For ADG VI aircraft with tail heights of less than 66 feet (20 m), ADG-V separation standards may be used.

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

Figure F-3 Departure Reference Code (DPRC)

Runway to Taxiway Separation (ft)					
≥ 150	≥ 225	≥ 240	≥ 300	≥ 400	≥ 500
B/I(S)	B/I	B/II	B/III D/II	D/IV D/V [1]	D/VI [2]

Note: (S) denotes small aircraft
Entries for Approach Category D also apply to Approach Category E. However, there are no Approach Category E aircraft currently in the civil fleet.

1. Example: With a runway to taxiway separation of 300 feet, the following airplanes may depart:
   - Within Approach Categories A & B, Airplane Design Groups I(S), I, II, & III.
   - Within Approach Categories C & D, Airplane Design Groups I & II.
   - Thus, an airplane of Approach Category C, Airplane Design Group III requires a runway to taxiway separation of 400 feet for departure.
2. For unrestricted operations by ADG-VI airplanes, a runway to taxiway separation of 500 feet is required. However, ADG-VI airplanes may depart with aircraft on the parallel taxiway where the runway to taxiway separation is as little as 400 feet as long as **no ADG-VI aircraft** occupy the parallel taxiway beyond 1500 feet of the point of the start of takeoff roll.
   When there is snow, ice or slush contamination on the runway, ADG-VI airplanes may depart with aircraft on the parallel taxiway where the runway to taxiway separation is as little as 400 feet as long as **no aircraft** occupy the parallel taxiway beyond 1500 feet of the point of the start of takeoff roll.

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

Generally, runway standards are related to aircraft approach speed, aircraft wingspan, and designated or planned approach visibility minimums. Runway to taxiway and taxiway/taxilane to taxiway/taxilane separation standards are related to ADG, TDG, and approach visibility minimums. **Table F-3** summarizes aircraft classifications and their related design components. This information will be covered in greater detail later in this appendix.

Table F-3 Classification & Design Components

Aircraft Classification	Related Design Components
Aircraft Approach Speed (AAC)	Runway Safety Area (RSA), Runway Object Free Area (ROFA), Runway Protection Zone (RPZ), runway width, runway-to- taxiway separation, runway-to-fixed object
Airplane Design Group (ADG)	Taxiway and apron Object Free Areas (OFAs), parking configuration, hangar locations, taxiway-to-taxiway separation, runway-to-taxiway separation
Taxiway Design Group (TDG)	Taxiway width, fillet design, apron area, parking layout

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

Summary

All codes discussed in this section consist of at least two, and sometimes three, characters: a letter, a roman numeral and sometimes a number. As discussed above, the same code can represent planned or actual characteristics of aircraft, runways or airports in a number of different situations. Like many other acronyms, these codes have become a type of "shorthand" in discussions regarding airport design. To avoid confusion, it is important to understand the context in which a code is being used and the specific standards associated with it. This section is a summary of airport design standards found in FAA AC 150/5300-13A and the AC should be referred to for more detailed information.

As an example, a runway designed to accommodate C-II aircraft with minimums lower than ¾ mile but not lower than ½ mile, or CAT-I, would have a RDC code of C-II-2400. For general discussions, an RDC designation, such as C-II, is normally sufficient to identify the critical or design aircraft, as well as the specific standards used as the basis for the runway design.

WALL MUNICIPAL AIRPORT CODES

In accordance with FAA AC 150/5300-13A, the information in **Table F-4** describe the runways and airfield at the Wall Municipal Airport:

Table F-4 Wall Municipal Design Codes

Runway	RDC (Existing)	RDC (Future)	APRC	DPRC	TDG
12	B-II(S)-Vis	B-II-5000	B-II-5000	B-II	1A
30	B-II(S)-Vis	B-II-5000	B-II-5000	B-II	1A
18	A-I(S)-Vis	A-I(S)-Vis	A-I(S)-Vis	B-I(S)	-
36	A-I(S)-Vis	A-I(S)-Vis	A-I(S)-Vis	B-I(S)	-
Airport Reference Code					
Existing	**B-II(S)-Vis**				
Future	**B-II-5000**				

Source: KLJ Analysis

Runway Design Standards

The FAA design and safety standards related to runways are described below.

- **Runway Width** – The physical width of the runway pavement.
- **Runway Safety Area (RSA)** – Graded surface centered on the runway centerline. The RSA shall be free of objects and capable, under dry conditions, of supporting snow removal equipment, aircraft rescue and firefighting equipment, and the occasional passage of aircraft without causing structural damage to the aircraft.
- **Runway Object Free Area (ROFA)** – The ROFA is also centered on the runway centerline and requires the clearing of all above ground objects protruding above the RSA edge elevation (unless objects need to be located in the OFA for air navigation or aircraft ground maneuvering purposes).
- **Runway Object Free Zone (OFZ)** – The OFZ is a defined volume of airspace centered above the runway centerline that extends 200 feet beyond each end of the runway surface that precludes taxiing or parked airplanes and object penetrations, except for frangible visual NAVAIDs that need to be located in the OFZ because of their function.
- **Runway Protection Zone (RPZ)** – The RPZ is a trapezoidal area located 200 feet beyond the runway end and centered on the extended runway centerline. The RPZ is primarily a land use control that is meant to enhance the protection of people and property near the airport through airport control. Such control includes clearing of RPZ areas of incompatible objects and activities. With special application of declared distances, separate approach and departure RPZs are required.
- **Runway Obstacle Free Zone (OFZ)** – The OFZ is a defined volume of airspace centered above the runway centerline that extends 200 feet beyond each end of the runway surface that precludes taxing or parked airplanes and object penetrations, except for frangible visual NAVAIDs that need to be located in the OFZ because of their function.

Runway Protection Zones

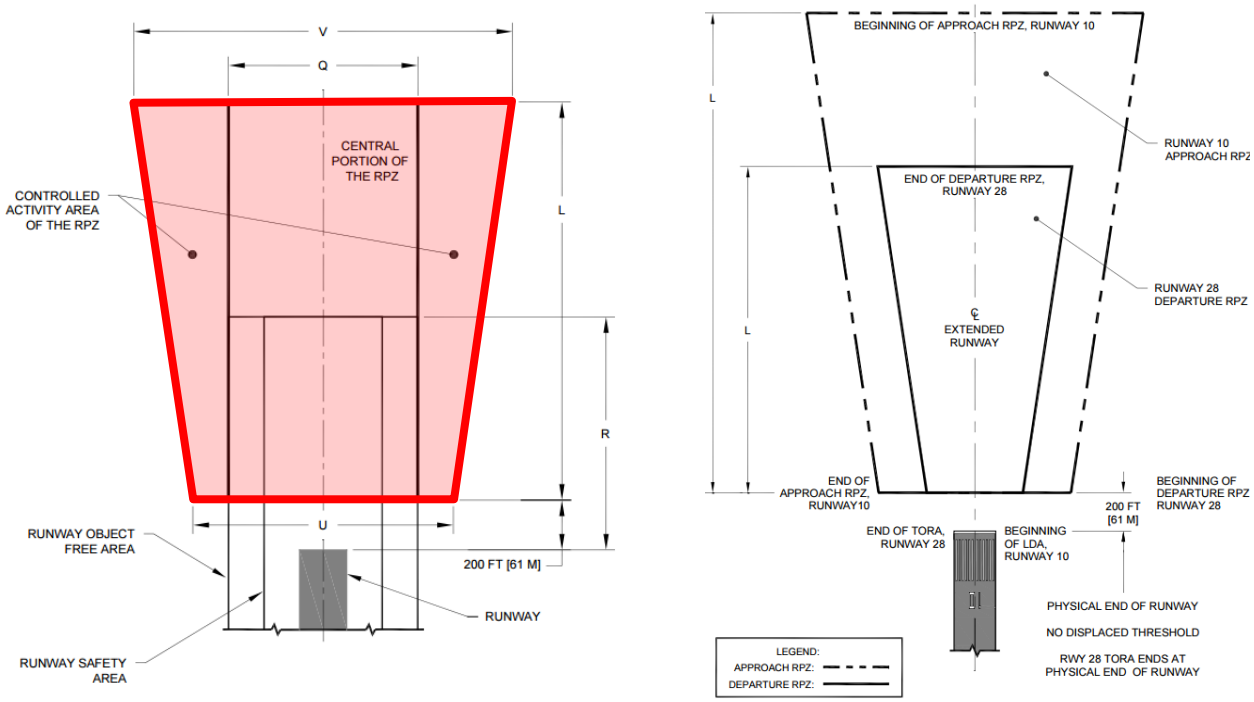
The RPZ's are addressed specifically at this point due to recent changes in how FAA is handling land use in these areas. The RPZ is intended to protect people and property on the ground for approach and departure areas beyond the runway end. It also mitigates the risk of an aircraft collision with an object on the ground. According to FAA, the function of the RPZ is as follows:

> *"The RPZ function is to enhance the protection of people and property on the ground. Where practical, airport owners should own the property under the runway approach and departure areas to at least the limits of the RPZ. It is desirable to clear the entire RPZ of all above-ground objects. Where this is impractical, airport owners, as a minimum, should maintain the RPZ clear of all facilities supporting incompatible activities."*

Formerly known as clear zones, there are two components of RPZs that are evaluated and analyzed in the master planning process. One component is the required dimensions of the RPZ, which are functions of the design aircraft, type of operation and visibility minimums. There are separate approach and departure RPZs however the most stringent RPZ will control which is usually the approach RPZ. The second component is the use of the land within the boundaries of the RPZ, which must meet FAA criteria and regulations, and is commonly discussed as an element of compatible land use. FAA desires a clear RPZ and airport control within its limits.

Figure F-4 identifies the shape of a typical approach and departure RPZ.

Figure F-4 Runway Protection Zone



Source: [FAA AC 150/5300-13A - Change 1, Airport Design]

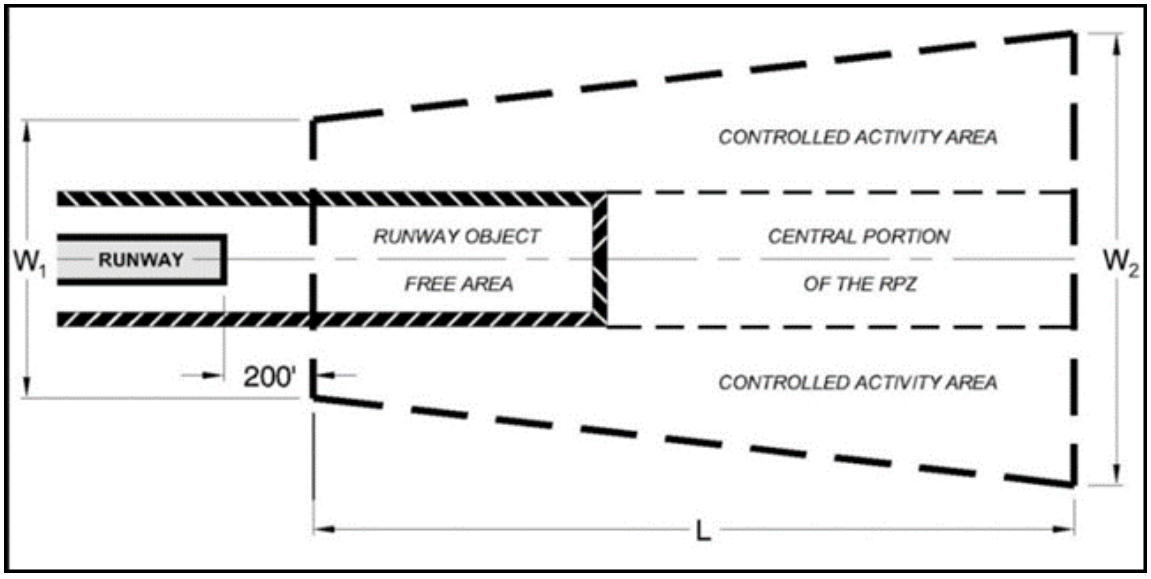
Table F-5 illustrates the RPZ dimensions associated with different runway design standards, as well as the designations of the various areas within the RPZ. After the design aircraft has been determined, in conjunction with the established or planned visibility minimums, the appropriate design standards table in AC 150/5300-13A can be used to determine the specific RPZ dimensions for each runway.

Table F-5 – RPZ Dimensions

Approach Visibility Minimums	Facilities Expected to Serve	Dimensions			
		Length (L)'	Inner Width (W1)'	Outer Width (W2)'	RPZ (Acres)
Visual and Not Lower than 1 Mile	Small Aircraft Exclusively[2]	1,000	250	450	8.04
	Aircraft Approach Categories A & B	1,000	500	700	13.77
	Aircraft Approach Categories C, D & E	1,700	500	1,010	29.47
Not Lower than ¾ Mile	All Aircraft	1,700	1,000	1,510	48.98
Lower than ¾ Mile	All Aircraft	2,500	1,000	1,750	78.91

Source: FAA AC 150-5300-13A, Paragraph 310 and Table 3-5

Figure F-5 – RPZ Areas



[2] Aircraft no more than 12,500 pounds gross landing weight

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 published *Interim Guidance on Land Uses Within a Runway Protection Zone* providing airports with guidance on land use compatibility standards. In some cases, a separate RPZ Alternatives Analysis must be prepared to meet these requirements. 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 as a result of an airfield project, change in RPZ dimensions or local development proposal.
- **Land Uses Requiring FAA Coordination:** Building and structures, residential land uses, transportation facilities (i.e. roads, parking, rail), fuel storage, hazardous material storage, wastewater treatment, above-ground utility infrastructure
- **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.

FAA has acknowledged the ongoing update to the land use compatibility advisory circular where an RPZ land use consideration section will be added. As of the writing of this Master Plan, the document has not yet been released by FAA in draft form.

CONTROL OF RPZS

The FAA strongly recommends that airport sponsors own the complete RPZ area in fee simple title. This enables the sponsor to fully control all development and activity with the RPZ. If this is not practical, the sponsor is expected to control land use and activities in the RPZ through easements, leases, zoning, or restrictive covenants that provide for height restrictions and restrict current and future use of the land surface to preclude incompatible uses. The sponsor is also expected to take all possible measures to remove or mitigate incompatible land uses; this is based on Grant Assurance 21.

ACCEPTABLE OR COMPATIBLE LAND USE IN RPZS

The ultimate goal is to clear the entire RPZ of all above-ground objects. Where this is impractical, airport owners, as a minimum, must clear the RPZ of incompatible objects and activities. Some uses are permitted in the controlled activity areas (CAA), provided they do not attract wildlife, are outside of the central portion of the RPZ, and do not interfere with navigational aids. AC 5300-13A provides for some land uses in the RPZ that are permissible without further evaluation:

- Farming or agricultural activities that meet airport design standards
- Irrigation channels meeting the requirements of AC 150/5200-33 Hazardous Wildlife Attractants On or Near Airports and FAA/USDA manual - Wildlife Hazard Management at Airports
- Airport service roads, if they are not public roads and are directly controlled by the airport operator
- Underground facilities, if they meet other design criteria (i.e. RSA requirements, if applicable)

- Unstaffed NAVAIDs and facilities (e.g. equipment for airport facilities that are considered fixed-by-function in regard to the RPZ)

UNACCEPTABLE OR INCOMPATIBLE LAND USE IN RPZS

The FAA had identified a number of activities that are considered incompatible within the RPZ. Those activities include:

- Fuel handling and storage facilities (except that underground fuel tanks are allowed in the CAA)
- Facilities that generate smoke, dust, or other plumes
- Facilities with misleading lights or that create glare
- Any land use or activity that attracts wildlife
- Residences and places of public assembly (churches, schools, hospitals, office buildings, shopping centers, etc.)

However, on September 27, 2012, the FAA issued interim guidance on land use within an RPZ. The interim guidance clarifies specific land uses that are not permissible inside the RPZ, but the guidance does not apply to existing land uses. The guidance requires coordination with the FAA if certain land uses enter the RPZ as a result of:

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

The following land uses are considered incompatible in the RPZ and must be coordinated with the FAA if any of the above triggering events occur:

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

EXISTING AND FUTURE CONDITIONS

The standards for the existing, future and ultimate runway configurations at the Wall Municipal Airport are identified in **Table F-6**. The size of the approach RPZ will increase for Runway 12 and 30 in the future. When instrument approach capabilities are added for 1-mile visibility minimums, the inner width and outer width increases by 250 feet.

Table F-6 – Wall Current RPZ Dimensions

Runway End	Phase	Design Code	Dimensions			
			Length (L)'	Inner Width (W1)'	Outer Width (W2)'	RPZ (Acres)
12	Existing	B-I(S)-Visual	1,000	250	450	8.04
30	Existing	B-I(S)-Visual	1,000	250	450	8.04
12	Future-Ultimate	B-II-5000	1,000	500	700	13.77
30	Future-Ultimate	B-II-5000	1,000	500	700	13.77
18	Existing-Ultimate	A-I(S)-Visual	1,000	250	450	8.04
36	Existing-Ultimate	A-I(S)-Visual	1,000	250	450	8.04

Source: KLJ Analysis

The existing and future RPZs were evaluated to determine existing land uses and airport control. A graphical illustration of the RPZs is identified in **Exhibit F-1**. As can be seen from the exhibit the Airport owns portions of the land underneath the RPZ. There are incompatible land uses under Runway 30 RPZ (existing and future). An RPZ analysis is being conducted for Runway 30 and will be included as **Appendix H** of this Master Plan.

Wall Runway Design Standards

Including all the elements necessary for the runways at Wall Municipal Airport, the figures on the following pages provide the FAA guidance for what will be required. **Table F-7** provides a summary of existing, proposed, and ultimate design standards for the airport's runways and associated taxiways.

Table F-7 Runway & Associated Taxiway Design Standards

Runway	Existing	Future	Ultimate
Primary Runway (12/30) (13/31 Future/Ultimate)			
Approach Category and Design Group	A-II Small	B-II	B-II
Design Aircraft	Turboprop	Turboprop	Turboprop
Dimensions	3,500' x 60'	4,700' x 75'	4,700' x 75'
Visibility Minimums	Visual	1 mile	1 mile
TDG / Design Aircraft	1-A	1-A	1-A
Primary Taxiway Width	25'	25'	25'
Turf Runway (18/36)			
Approach Category and Design Group	A-I Small	A-I Small	A-I Small
Design Aircraft	Single Piston	Single Piston	Single Piston
Dimensions	2,000' x 100' Turf	2,000' x 100' Turf	2,000' x 100' Turf
Visibility Minimums	Visual	Visual	Visual
TDG / Design Aircraft	1-A	1-A	1-A
Primary Taxiway Width	N/A	N/A	N/A

Source: KLJ Analysis

Primary Runway

The existing RDC for the primary runway (Runway 12-30) is A/B-II(Small), based on the forecast critical design aircraft the future and ultimate RDC for the primary runway is A/B-II. Non-Precision instrument approaches with not less than 1 mile visibility minimums are expected for both the future and ultimate primary runway. The design standards for the primary runway are detailed in **Figure F-6 Runway 12-30 Existing** and **F-7 Runway 13-31 Future/Ultimate.**[3]

Crosswind Runway

The turf crosswind runway (Runway 18-36) is A/B-I(Small) standards. Visual approaches only are planned for the runway ends. The design standards for the runway are shown in **Figure F-8 Runway 18-36 Existing/Future/Ultimate.**[3]

[3] *Figures F-6, F-7, and F-8 are derived from a runway design standards matrix located in Appendix 7 of FAA AC 150/5300-13A. Items in "red" highlight the appropriate design standards. An additional Figure F-9, also from the FAA AC, includes the footnotes referred to on the previous figures.*

Figure F-6 - Runway 12-30 Existing

Table A7-3. Runway design standards matrix, A/B – II Small Aircraft

Aircraft Approach Category (AAC) and Airplane Design Group (ADG):		A/B - II Small Aircraft			
ITEM	**DIM** [1]	VISIBILITY MINIMUMS			
		Visual	Not Lower than 1 mile	Not Lower than 3/4 mile	Lower than 3/4 mile
RUNWAY DESIGN					
Runway Length	A	*Refer to paragraphs 302 and 304*			
Runway Width	B	75 ft	75 ft	75 ft	100 ft
Shoulder Width		10 ft	10 ft	10 ft	10 ft
Blast Pad Width		95 ft	95 ft	95 ft	120 ft
Blast Pad Length		150 ft	150 ft	150 ft	150 ft
Crosswind Component		13 knots	13 knots	13 knots	13 knots
RUNWAY PROTECTION					
Runway Safety Area (RSA)					
Length beyond departure end [9, 10]	R	300 ft	300 ft	300 ft	600 ft
Length prior to threshold	P	300 ft	300 ft	300 ft	600 ft
Width	C	150 ft	150 ft	150 ft	300 ft
Runway Object Free Area (ROFA)					
Length beyond runway end	R	300 ft	300 ft	300 ft	600 ft
Length prior to threshold	P	300 ft	300 ft	300 ft	600 ft
Width	Q	500 ft	500 ft	500 ft	800 ft
Runway Obstacle Free Zone (ROFZ)					
Length		*Refer to paragraph 308*			
Width		*Refer to paragraph 308*			
Precision Obstacle Free Zone (POFZ)					
Length		N/A	N/A	N/A	200 ft
Width		N/A	N/A	N/A	800 ft
Approach Runway Protection Zone (RPZ)					
Length	L	1,000 ft	1,000 ft	1,700 ft	2,500 ft
Inner Width	U	250 ft	250 ft	1,000 ft	1,000 ft
Outer Width	V	450 ft	450 ft	1,510 ft	1,750 ft
Acres		8.035	8.035	48.978	79.000
Departure Runway Protection Zone (RPZ)					
Length	L	1,000 ft	1,000 ft	1,000 ft	1,000 ft
Inner Width	U	250 ft	250 ft	500 ft	500 ft
Outer Width	V	450 ft	450 ft	700 ft	700 ft
Acres		8.035	8.035	13.770	13.770
RUNWAY SEPARATION					
Runway centerline to:					
Parallel runway centerline	H	*Refer to paragraph 316*			
Holding Position		125 ft	125 ft	125 ft	175 ft
Parallel taxiway/taxilane centerline [2, 4]	D	240 ft	240 ft	240 ft	300 ft
Aircraft parking area	G	250 ft	250 ft	250 ft	400 ft
Helicopter touchdown pad		*Refer to AC 150/5390-2*			

Note:

- Values in the table are rounded to the nearest foot. 1 foot = 0.305 meters.

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

Figure F-7 - Runway 13-31 Future & Ultimate

AC 150/5300-13A
Appendix 7

9/28/2012

Table A7-4. Runway design standards matrix, A/B – II

Aircraft Approach Category (AAC) and Airplane Design Group (ADG):		A/B - II			
ITEM	**DIM** [1]	VISIBILITY MINIMUMS			
		Visual	Not Lower than 1 mile	Not Lower than 3/4 mile	Lower than 3/4 mile
RUNWAY DESIGN					
Runway Length	A	*Refer to paragraphs 302 and 304*			
Runway Width	B	75 ft	75 ft	75 ft	100 ft
Shoulder Width		10 ft	10 ft	10 ft	10 ft
Blast Pad Width		95 ft	95 ft	95 ft	120 ft
Blast Pad Length		150 ft	150 ft	150 ft	150 ft
Crosswind Component		13 knots	13 knots	13 knots	13 knots
RUNWAY PROTECTION					
Runway Safety Area (RSA)					
Length beyond departure end [9, 10]	R	300 ft	300 ft	300 ft	600 ft
Length prior to threshold	P	300 ft	300 ft	300 ft	600 ft
Width	C	150 ft	150 ft	150 ft	300 ft
Runway Object Free Area (ROFA)					
Length beyond runway end	R	300 ft	300 ft	300 ft	600 ft
Length prior to threshold	P	300 ft	300 ft	300 ft	600 ft
Width	Q	500 ft	500 ft	500 ft	800 ft
Runway Obstacle Free Zone (ROFZ)					
Length		*Refer to paragraph 308*			
Width		*Refer to paragraph 308*			
Precision Obstacle Free Zone (POFZ)					
Length		N/A	N/A	N/A	200 ft
Width		N/A	N/A	N/A	800 ft
Approach Runway Protection Zone (RPZ)					
Length	L	1,000 ft	1,000 ft	1,700 ft	2,500 ft
Inner Width	U	500 ft	500 ft	1,000 ft	1,000 ft
Outer Width	V	700 ft	700 ft	1,510 ft	1,750 ft
Acres		13.770	13.770	48.978	78.914
Departure Runway Protection Zone (RPZ)					
Length	L	1,000 ft	1,000 ft	1,000 ft	1,000 ft
Inner Width	U	500 ft	500 ft	500 ft	500 ft
Outer Width	V	700 ft	700 ft	700 ft	700 ft
Acres		13.770	13.770	13.770	13.770
RUNWAY SEPARATION					
Runway centerline to:					
Parallel runway centerline	H	*Refer to paragraph 316*			
Holding Position		200 ft	200 ft	200 ft	250 ft
Parallel taxiway/taxilane centerline [2, 4]	D	240 ft	240 ft	240 ft	300 ft
Aircraft parking area	G	250 ft	250 ft	250 ft	400 ft
Helicopter touchdown pad		*Refer to AC 150/5390-2*			

Note:

- Values in the table are rounded to the nearest foot. 1 foot = 0.305 meters.

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

Appendix 7. Runway Design Standards Matrix

Table A7-1. Runway design standards matrix, A/B-I Small Aircraft

Aircraft Approach Category (AAC) and Airplane Design Group (ADG):		A/B - I Small Aircraft			
ITEM	**DIM** [1]	VISIBILITY MINIMUMS			
		Visual	Not Lower than 1 mile	Not Lower than 3/4 mile	Lower than 3/4 mile
RUNWAY DESIGN					
Runway Length	A	*Refer to paragraphs 302 and 304*			
Runway Width	B	60 ft	60 ft	60 ft	75 ft
Shoulder Width		10 ft	10 ft	10 ft	10 ft
Blast Pad Width		80 ft	80 ft	80 ft	95 ft
Blast Pad Length		60 ft	60 ft	60 ft	60 ft
Crosswind Component		10.5 knots	10.5 knots	10.5 knots	10.5 knots
RUNWAY PROTECTION					
Runway Safety Area (RSA)					
Length beyond departure end [9, 10]	R	240 ft	240 ft	240 ft	600 ft
Length prior to threshold	P	240 ft	240 ft	240 ft	600 ft
Width	C	120 ft	120 ft	120 ft	300 ft
Runway Object Free Area (ROFA)					
Length beyond runway end	R	240 ft	240 ft	240 ft	600 ft
Length prior to threshold	P	240 ft	240 ft	240 ft	600 ft
Width	Q	250 ft	250 ft	250 ft	800 ft
Runway Obstacle Free Zone (ROFZ)					
Length		*Refer to paragraph 308*			
Width		*Refer to paragraph 308*			
Precision Obstacle Free Zone (POFZ)					
Length		N/A	N/A	N/A	N/A
Width		N/A	N/A	N/A	N/A
Approach Runway Protection Zone (RPZ)					
Length	L	1,000 ft	1,000 ft	1,700 ft	2,500 ft
Inner Width	U	250 ft	250 ft	1,000 ft	1,000 ft
Outer Width	V	450 ft	450 ft	1,510 ft	1,750 ft
Acres		8.035	8.035	48.978	79.000
Departure Runway Protection Zone (RPZ)					
Length	L	1,000 ft	1,000 ft	1,000 ft	1,000 ft
Inner Width	U	250 ft	250 ft	250 ft	250 ft
Outer Width	V	450 ft	450 ft	450 ft	450 ft
Acres		8.035	8.035	8.035	8.035
RUNWAY SEPARATION					
Runway centerline to:					
Parallel runway centerline	H	*Refer to paragraph 316*			
Holding Position		125 ft	125 ft	125 ft	175 ft
Parallel taxiway/taxilane centerline [2, 4]	D	150 ft	150 ft	150 ft	200 ft
Aircraft parking area	G	125 ft	125 ft	125 ft	400 ft

Note:

- Values in the table are rounded to the nearest foot. 1 foot = 0.305 meters.

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

Figure F-9 Footnotes to Runway Design Standards

Footnotes:

1. Letters correspond to the dimensions in Figure 3-26.
2. The runway to taxiway/taxilane centerline separation standards are for sea level. At higher elevations, an increase to these separation distances may be required to keep taxiing and holding aircraft clear of the inner-transitional OFZ (refer to paragraph 308.c). Using this standard to justify a decrease in runway to taxiway/taxilane separation is not permitted.
3. The standard runway centerline to parallel taxiway centerline separation distance is 400 feet for airports at or below an elevation of 1,345 feet; 450 feet for airports between elevations of 1,345 feet and 6,560 feet; and 500 feet for airports above an elevation of 6,560 feet.
4. For approaches with visibility less than ½-statute mile, runway centerline to taxiway/taxilane centerline separation increases to 400 feet.
5. For approaches with visibility less than ½-statute mile, the separation distance increases to 500 feet.
6. For approaches with visibility less than 3/4 statute mile, the separation distance may increase by an elevation adjustment. For approaches with visibility less than ½-statute mile, the separation distance increases to 550 feet.
7. This distance is increased 1 foot for each 100 feet above 5,100 feet above sea level.
8. This distance is increased 1 foot for each 100 feet above sea level.
9. The RSA length beyond the runway end begins at the runway end when a stopway is not provided. When a stopway is provided, the length begins at the stopway end.
10. The RSA length beyond the runway end may be reduced to that required to install an Engineered Materials Arresting System (EMAS) (the designed set-back of the EMAS included) designed to stop the design aircraft exiting the runway end at 70 knots.
11. This value only applies if that runway end is equipped with electronic or visual vertical guidance. If visual guidance is not provided, use the value for "length beyond departure end."
12. For airplanes with maximum certificated takeoff weight of 150,000 lbs or less, the standard runway width is 100 feet, the shoulder width is 20 feet, and the runway blast pad width is 140 feet.
13. An RSA width of 400 feet is permissible.

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

Taxiway Design Standards

Similar to runways, taxiways are subject to FAA design requirements such as pavement width, edge safety margins, shoulder width, and safety and object free area dimensions. The FAA standards in relation to taxiways (as defined in AC 150/5300-13A *Airport Design*) are described below.

- **Taxiway Width** – The physical width of the taxiway pavement.
- **Taxiway Edge Safety Margin** – The minimum acceptable distance between the outside of the airplane wheels and the pavement edge.
- **Taxiway Shoulder Width** – Taxiway shoulders provide stabilized or paved surfaces to reduce the possibility of blast erosion and engine ingestion problems associated with jet engines which overhang the edge of the taxiway pavement.
- **Taxiway/Taxilane Safety Area (TSA)** – The TSA is located on the taxiway centerline and shall be cleared and graded, properly drained, and capable, under dry conditions, of supporting snow removal equipment, ARFF equipment, and the occasional passage of aircraft without causing structural damage to the aircraft.
- **Taxiway/Taxilane Object Free Area (TOFA)** – The TOFA is centered on the taxiway centerline and prohibits service vehicle roads, parked airplanes, and above ground objects, except for objects that need to be located in the TOFA for air navigation or aircraft ground maneuvering purposes.
- **Taxiway Separation Standards** – Separation standards between the taxiways and other airport facilities are established to ensure operational safety of the airport and are as follows:
    - Taxiway centerline to parallel taxiway/taxilane centerline
    - Taxiway centerline to fixed or moveable object

The dimensions for each of these standards vary according to the group of aircraft the taxiways are intended to accommodate. **Figure F-10** shows AC 150/5300-13A taxiway design standards based on Airplane Design Group (ADG) and Taxiway Design Group (TDG).

Figure F-10 Taxiway Design Standards

Table 4-1. Design standards based on Airplane Design Group (ADG)

ITEM	DIM (See Figure 3-26)	ADG I	ADG II	ADG III	ADG IV	ADG V	ADG VI
TAXIWAY PROTECTION							
TSA	E	49 ft (15 m)	79 ft (24 m)	118 ft (36 m)	171 ft (52 m)	214 ft (65 m)	262 ft (80 m)
Taxiway OFA		89 ft (27 m)	131 ft (40 m)	186 ft (57 m)	259 ft (79 m)	320 ft (98 m)	386 ft (118 m)
Taxilane OFA		79 ft (24 m)	115 ft (35 m)	162 ft (49 m)	225 ft (69 m)	276 ft (84 m)	334 ft (102 m)
TAXIWAY SEPARATION							
Taxiway Centerline to Parallel Taxiway/Taxilane Centerline [1]	J	70 ft (21 m)	105 ft (32 m)	152 ft (46.5 m)	215 ft (65.5 m)	267 ft (81 m)	324 ft (99 m)
Taxiway Centerline to Fixed or Movable Object	K	44.5 ft (13.5 m)	65.5 ft (20 m)	93 ft (28.5 m)	129.5 ft (39.5 m)	160 ft (48.5 m)	193 ft (59 m)
Taxilane Centerline to Parallel Taxilane Centerline [1]		64 ft (19.5 m)	97 ft (29.5 m)	140 ft (42.5 m)	198 ft (60 m)	245 ft (74.5 m)	298 ft (91 m)
Taxilane Centerline to Fixed or Movable Object		39.5 ft (12 m)	57.5 ft (17.5 m)	81 ft (24.5 m)	112.5 ft (34 m)	138 ft (42 m)	167 ft (51 m)
WINGTIP CLEARANCE							
Taxiway Wingtip Clearance		20 ft (6 m)	26 ft (8 m)	34 ft (10.5 m)	44 ft (13.5 m)	53 ft (16 m)	62 ft (19 m)
Taxilane Wingtip Clearance		15 ft (4.5 m)	18 ft (5.5 m)	27 ft (6.5 m)	27 ft (8 m)	31 ft (9.5 m)	36 ft (11 m)

Note: 1. These values are based on wingtip clearances. If direction reversal between parallel taxiways is needed, use this dimension or the dimension specified in Table 4-14 or Table 4-15, whichever is largest.

Table 4-2. Design standards based on Taxiway Design Group (TDG)

ITEM	DIM (See Figure 4-6)	TDG 1A	TDG 1B	TDG 2	TDG 3	TDG 4	TDG 5	TDG 6	TDG 7
Taxiway Width	W	25 ft (7.5 m)	25 ft (7.5 m)	35 ft (10.5 m)	50 ft (15 m)	50 ft (15 m)	75 ft (23 m)	75 ft (23 m)	82 ft (25 m)
Taxiway Edge Safety Margin	TESM	5 ft (1.5 m)	5 ft (1.5 m)	7.5 ft (2 m)	10 ft (3 m)	10 ft (3 m)	15 ft (4.6m)	15 ft (4.6m)	15 ft (4.6m)
Taxiway Shoulder Width		10 ft (3 m)	10 ft (3 m)	15 ft (3 m)	20 ft (6 m)	20 ft (6 m)	30 ft (9 m)	30 ft (9 m)	40 ft (12 m)
Taxiway/Taxilane Centerline to Parallel Taxiway/Taxilane Centerline w/ 180 Degree Turn	J	See Table 4-14							
TAXIWAY FILLET DIMENSIONS		Table 4-3	Table 4-4	Table 4-5	Table 4-6	Table 4-7	Table 4-8	Table 4-9	Table 4-10

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Source: [FAA AC 150/5300-13A – Change 1, Airport Design]

Runway Length

Current Conditions

Runway 12/30 is the primary runway at Wall Municipal Airport. It is 3,500 feet long by 60 feet wide. Runway 18/36 is the turf crosswind runway with 2,000 feet by 100 feet.

Existing FAA Standard

A runway length analysis for other aircraft was performed using the FAA's current methodology found in *FAA AC 150/5325-4B, Runway Length Recommendations for Airport Design*. The design approach identifies a recommended runway length based on a family grouping of design aircraft.

For Wall the current design aircraft includes small general aviation aircraft with approach speeds of 50 knots or greater and maximum certified takeoff weight of 12,500 pounds or less (Air Tractor AT-502B). The future runway length may be driven from a design aircraft greater than 12,500 pounds but less than 60,000 pounds (Air Tractor AT-802A).

SMALL AIRPLANES UP TO 12,500 POUNDS

The FAA design approach identified in Chapter 2 of FAA AC 150/5325-4B for most small aircraft less than 12,500 pounds requires several steps to be performed to determine runway length:

1. **Identify Number of Passenger Seats:** Classify design aircraft as one of two categories; "Less than 10 Passenger Seats" and "10 Passenger Seats or Greater"
2. **Select Percentage of Fleet:** Airplanes classified as "Less than 10 Passenger Seats" are grouped into two percentage categories based on the airport's location and the amount of existing or planned aviation activities. The categories include "95 Percent of Fleet" and "100 Percent of Fleet".
3. **Consider Future Airport Expansion:** Consider runway length requirements during Instrument Meteorological Conditions (IMC) or expansions to accommodate airplanes more than 12,500 pounds.
4. **Determine Airport Data:** Evaluate the airport elevation, mean daily temperature in hottest month and runway condition to make adjustments to runway length.
5. **Calculate Runway Length Based on Curves:** Utilize FAA runway length curves published in AC 150/5325-4B.

LARGE AIRPLANES UP TO 60,000 POUNDS

The FAA design approach identified in Chapter 3 of FAA AC 150/5325-4B for aircraft greater than 12,500 pounds and less than 60,000 pounds requires the following steps to be performed to determine runway length:

1. **Select Percentage of Fleet:** Group the design airplane into one of two percentage categories based on performance. The categories include "75 Percent of Fleet" and "100 Percent of Fleet".
2. **Identify Useful Load Factor:** Determine the useful load factor for the design aircraft based on the difference in maximum gross weight and the basic operating weight. Useful load consists of passengers, cargo and usable fuel. The categories include "60 percent useful load" and "90 percent useful load".
3. **Determine Airport Data:** Evaluate the airport elevation, mean daily temperature in hottest month and runway condition to make adjustments to runway length.

4. **Calculate Runway Length:** Utilize FAA runway length curves published in AC 150/5325-4B.

5. **Apply Adjustments:** The effective runway gradient affects the aircraft's takeoff length. Wet and slippery runways for turbojet airplanes allow for runway length curves to be increased by 15 percent up to 5,500 feet for "60 percent useful load" and 7,000 feet for "90 percent useful load".

The recommended FAA runway length calculations at Wall for aircraft up to 60,000 pounds are summarized in **Table F-8**:

The following pages provide runway length recommendations based on the airport conditions listed below and application of the five steps listed above.

- Mean daily maximum temperature of 89.3°F (31.8°C)
  - Represented by Standard Day Temperature +15°C (30°C) in performance charts
- Elevation of 2,813 feet MSL
- Zero runway gradient (FAA Figures 2-1 and 2-2)
- Increased recommended runway length by 130' for 13' difference in runway centerline elevations from 2,799 feet MSL at Runway 12 threshold to 2,812 feet MSL at Runway 30 threshold (FAA Figures 3-1, 3-2, and Specific Aircraft)

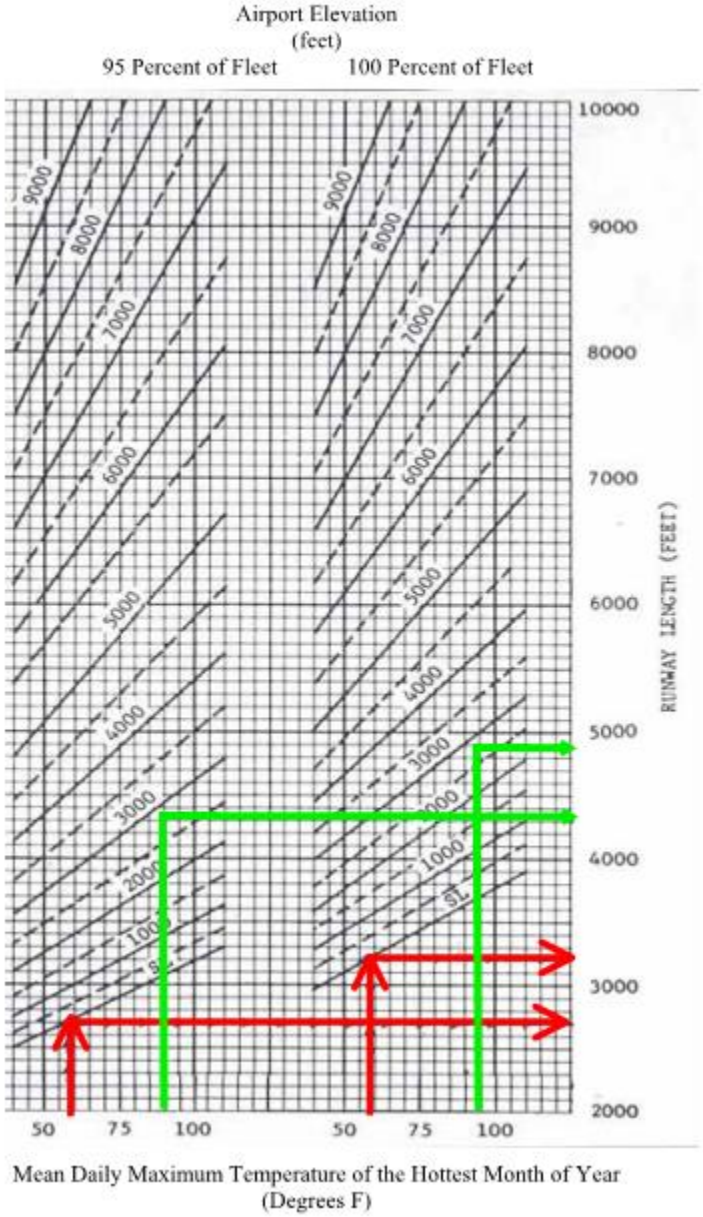
Table F-8 – FAA AC 150/5345-4B Runway Length Requirements (< 60,000 lbs.)

Airport and Runway Data	
Airport Elevation	2,813 feet
Mean Daily Maximum Temperature of Hottest Month	89.3°F
Maximum Difference in Runway Centerline Elevation	13 feet (+130 feet)
Runway Condition	Dry Runways
Aircraft Classification	**Recommended Runway Length**
Small airplanes 12,500 pounds or less	
10 or more passenger seats	4,710 feet
Less than 10 passenger seats at 100 percent of fleet	4,880 feet
Less than 10 passenger seats at 95 percent of fleet	**4,340 feet**
Large airplanes greater than 12,500 lbs. up to 60,000 lbs.	
100 percent of fleet at 90 percent useful load	9,330 feet
100 percent of fleet at 60 percent useful load	6,890 feet
75 percent of fleet at 90 percent useful load	7,940 feet
75 percent of fleet at 60 percent useful load	**5,530 feet**
Specific Aircraft	
Air Tractor AT-502B @ MTOW	**4,180 feet**
Air Tractor AT-802A @ MTOW	**6,230 feet**
Cessna Citation Mustang @ MTOW (Dry)	5,680 feet
Beechcraft Bonanza V35 @ MTOW (Turf)	3,120 feet

Source: FAA AC 150/5325-4B, Runway Length Requirements for Airport Design
Note: Runway length requirements estimated based on charts for airport planning purposes only.
MTOW = Maximum Takeoff Weight

FAA Figure 2-1: Small Airplanes with Fewer than 10 Passenger Seats (Excludes Pilot and Co-pilot)

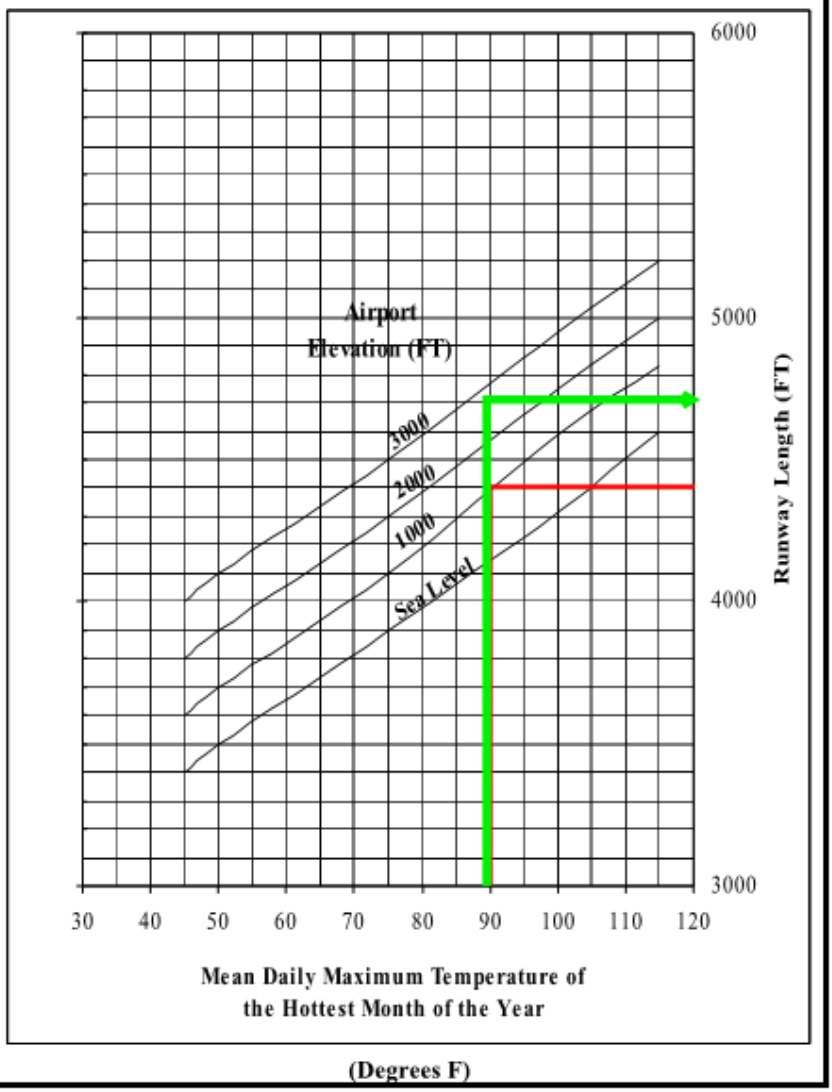
Wall Municipal Airport
Temperature: 89.3˚F / 31.8˚C - Airport Elevation: 2,813' MSL



Runway Length @ 95 Percent of Fleet: **4,340 feet**
Runway Length @ 100 Percent of Fleet: **4,880 feet**

FAA Figure 2-2: Small Airplanes Having 10 or More Passenger Seats (Excludes Pilot and Co-pilot)

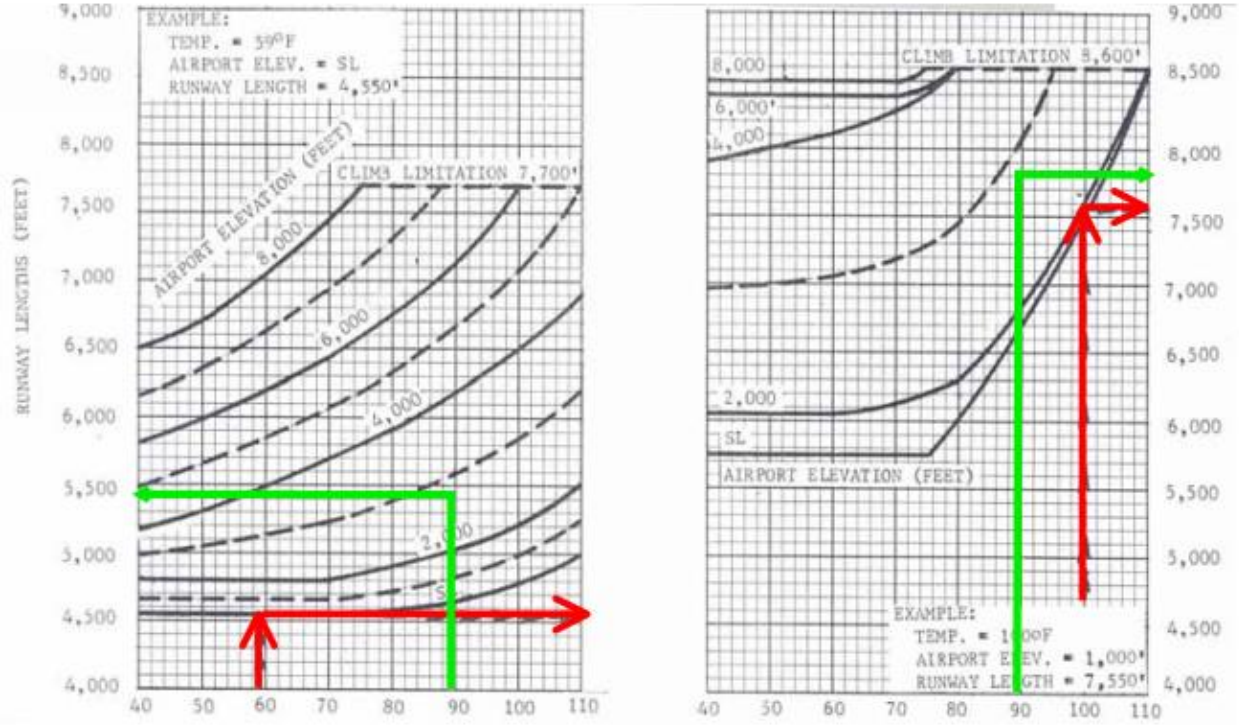
Wall Municipal Airport
Temperature: 89.3° F / 31.8° C - Airport Elevation: 2,813' MSL

Representative Airplanes	Runway Length Curves
Raytheon B80 Queen Air **Raytheon** E90 King Air **Raytheon** B99 Airliner **Raytheon** A100 King Air (Raytheon formerly Beech Aircraft) **Britten-Norman** Mark III-I Trilander **Mitsubishi** MU-2L **Swearigen** Merlin III-A **Swearigen** Merlin IV-A **Swearigen** Metro II	**Example:** Temperature (mean day max hot month) 90° F (32° C) Airport Elevation (msl) 1,000 feet (328 m) Recommended Runway Length 4,400 feet (1,341 m) **Note:** For airport elevations above 3,000 feet (915 m), use the 100 percent of fleet grouping in figure 2-1. 

Recommended Runway Length: **4,710 feet**

FAA Figure 3-1: 75% of Fleet (>12,500 to ≤60,000 lbs.) at 60 or 90 percent Useful Load

Wall Municipal Airport
Temperature: 89.3° F / 31.8° C - Airport Elevation: 2,813' MSL
Maximum Difference in Runway Centerline Elevation: 13 feet = 130 feet in Distance (added)

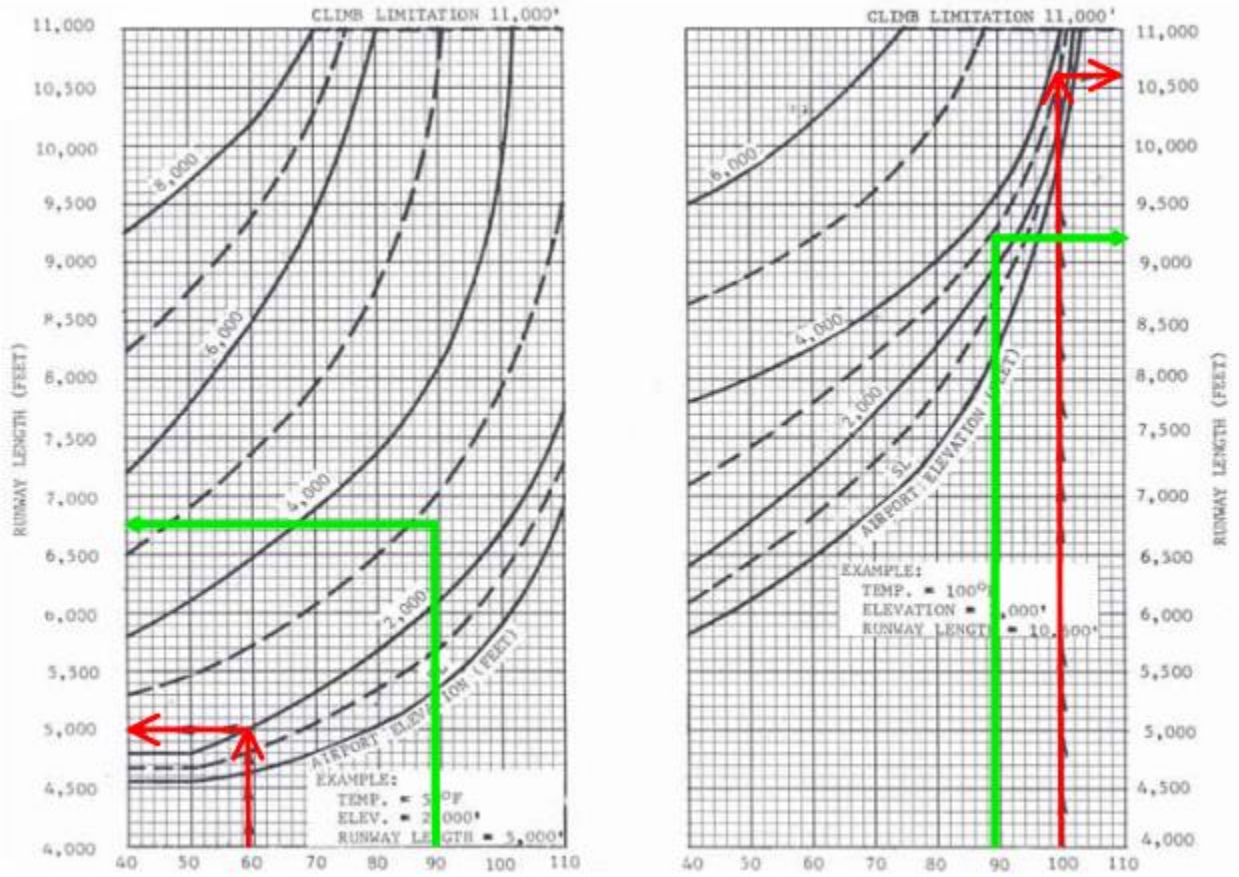


Runway Length @ 60 Percent Useful Load (Dry Runway): 5,400' + 130' = **5,530 feet**
Runway Length @ 60 Percent Useful Load (Wet Runway): **5,530 feet**

Runway Length @ 90 Percent Useful Load (Dry Runway): 7,810' + 130' = **7,940 feet**
Runway Length @ 90 Percent Useful Load (Wet Runway): **7,940 feet**

FAA Figure 3-2: 100% of Fleet (>12,500 to ≤60,000 lbs.) at 60 or 90 percent Useful Load

Wall Municipal Airport
Temperature: 89.3° F / 31.8° C - Airport Elevation: 2,813' MSL
Maximum Difference in Runway Centerline Elevation: 13 feet = 130 feet in Distance (added)

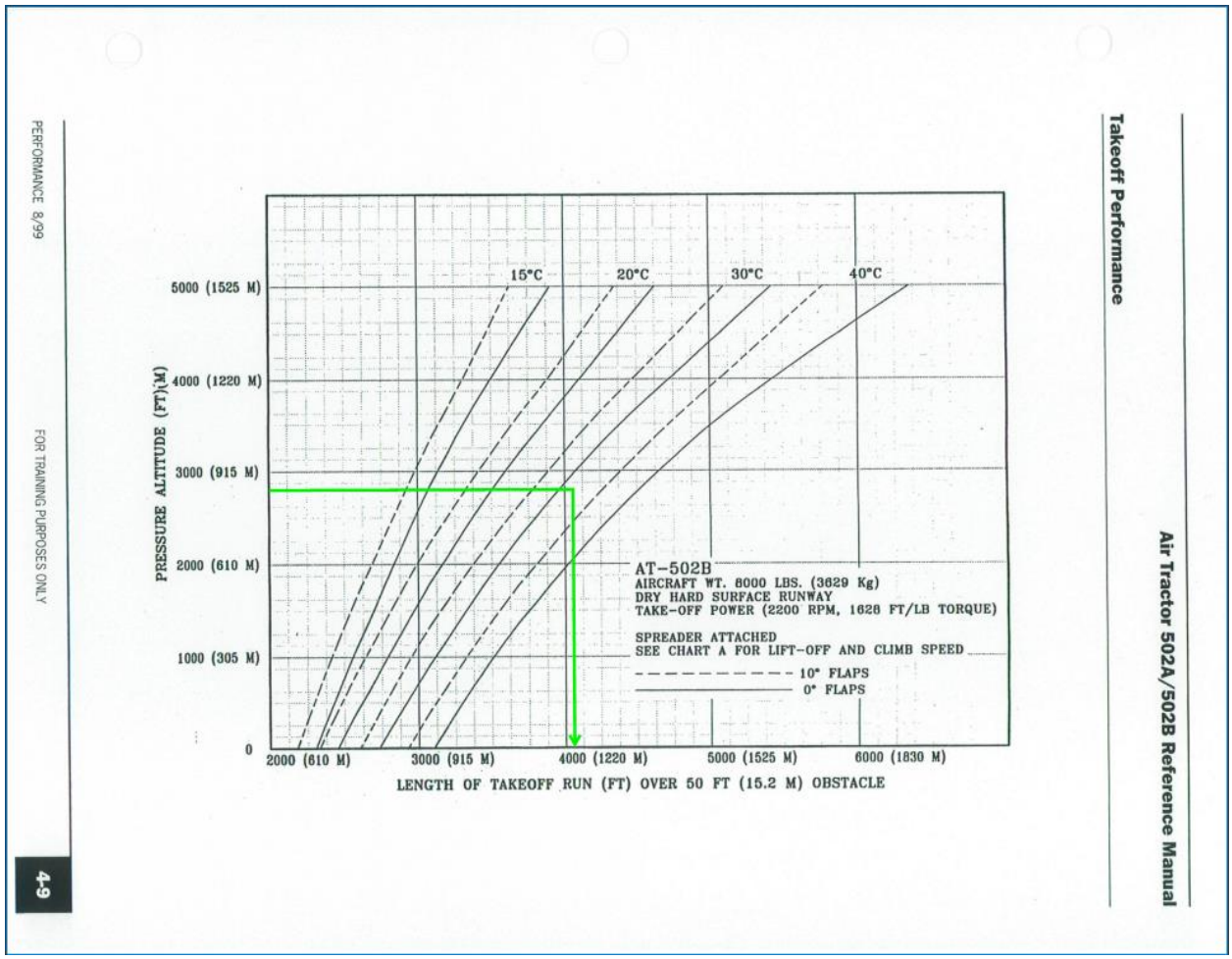


Runway Length @ 60 Percent Useful Load (Dry Runway): 6,760' + 130' = **6,890 feet**
Runway Length @ 60 Percent Useful Load (Wet Runway): **6,890 feet**

Runway Length @ 90 Percent Useful Load (Dry Runway): 9,200' + 130' = **9,330 feet**
Runway Length @ 90 Percent Useful Load (Wet Runway): **9,330 feet**

Air Tractor AT-502B: Takeoff Performance

Wall Municipal Airport
Temperature: 89.3° F / 31.8° C - Airport Elevation: 2,813' MSL
Maximum Difference in Runway Centerline Elevation: 13 feet = 130 feet in Distance (added)



Recommended Runway Length (Dry Runway): 4,050' + 130' = **4,180 feet**

Air Tractor AT-802A: Takeoff Performance

Wall Municipal Airport
Temperature: 89.3° F / 31.8° C - Airport Elevation: 2,813' MSL
Maximum Difference in Runway Centerline Elevation: 13 feet = 130 feet in Distance (added)

A APPROVED
SUED: August 15, 2007

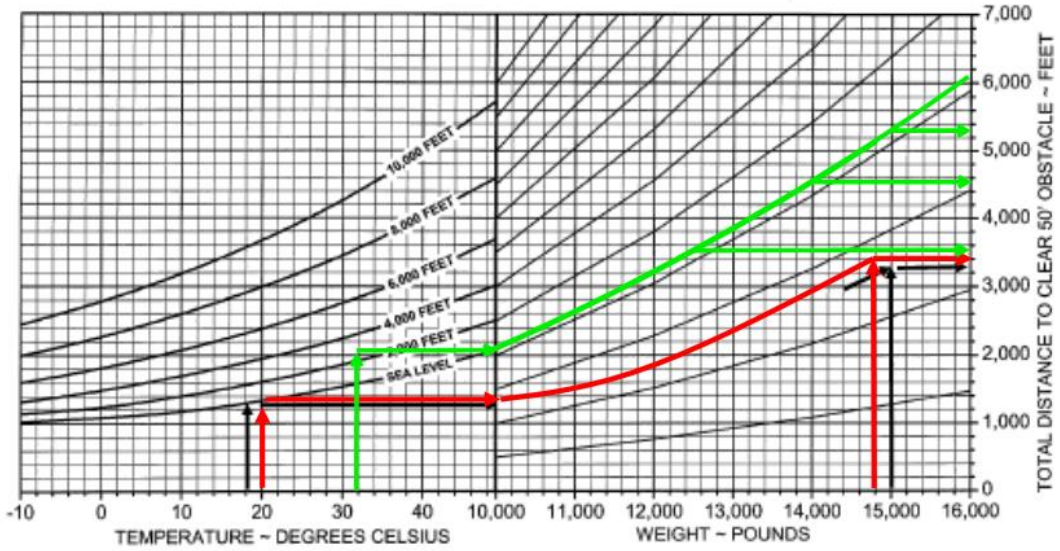
AT-802 AIRPLANE FLIGHT MANUAL

PAGE 32A OF 34

TAKEOFF DISTANCE
AT-802 WITH PT6A-65AG ENGINE

CONDITIONS
- TAKEOFF POWER
- FLAPS UP AT 12,500 POUNDS AND BELOW
- FLAPS 10° ABOVE 12,500 POUNDS
- PAVED RUNWAY, NO WIND
- DISTANCE IS TO 50 FEET ABOVE GROUND LEVEL
- GROUND RUN IS APPROX 75% OF TAKEOFF DISTANCE

	AIRSPEEDS (KIAS)	
WEIGHT (LBS)	TAKEOFF	CLIMBOUT
10,000	78	82
12,000	86	90
14,000	85	96
16,000	91	101



TAKEOFF DISTANCE DATA AT AIRCRAFT GROSS WEIGHT ABOVE 12,500 POUNDS ARE NOT FAA APPROVED
TAKEOFF DISTANCE DATA ABOVE 8,000 FEET MSL ARE NOT FAA APPROVED

Recommended Length @ 16,000 MTOW (Dry Runway): 6,100' + 130' = **6,230 feet**
Recommended Length @ 15,000 MTOW (Dry Runway): 5,320' + 130' = **5,450 feet**
Recommended Length @ 14,000 MTOW (Dry Runway): 4,560' + 130' = **4,690 feet**
Recommended Length @ 12,500 MTOW (Dry Runway): 3,570' + 130' = **3,700 feet**

Cessna Mustang (C510): Takeoff Performance

Wall Municipal Airport
Temperature: 89.3° F / 31.8° C - Airport Elevation: 2,813' MSL
Maximum Difference in Runway Centerline Elevation: 13 feet = 130 feet in Distance (added)

MODEL 510

SECTION IV - PERFORMANCE
TAKEOFF

TAKEOFF FIELD LENGTH - FEET
(OVER 35 FOOT SCREEN HEIGHT)

FLAPS - 15°
3000 FEET

CONDITIONS: DRY RUNWAY
RUNWAY GRADIENT - ZERO
LANDING GEAR - DOWN
SPEEDBRAKES - RETRACT

ANTI-ICE OFF
INOPERATIVE ENGINE - WINDMILLING AFTER V1
OPERATIVE ENGINE - TAKEOFF THRUST

SOME CONDITIONS DO NOT MEET CLIMB REQUIREMENTS. OBTAIN ALLOWABLE WEIGHT FROM MAXIMUM TAKEOFF WEIGHT TABLES.

WEIGHT = 8645 LBS					VENR = 118 KIAS										WEIGHT = 8000 LBS					VENR = 118 KIAS									
TEMP	TAILWIND		ZERO		HEADWINDS										TEMP	TAILWIND		ZERO		HEADWINDS									
DEG	10 KTS		WIND		10 KTS		20 KTS		30 KTS						DEG	10 KTS		WIND		10 KTS		20 KTS		30 KTS					
C	V1 KIAS	DIST FT	V1 KIAS	DIST FT	V1 KIAS	DIST FT	V1 KIAS	DIST FT	V1 KIAS	DIST FT	VR KIAS	V2			C	V1 KIAS	DIST FT	V1 KIAS	DIST FT	V1 KIAS	DIST FT	V1 KIAS	DIST FT	V1 KIAS	DIST FT	VR KIAS	V2		
-45	89	4120	89	2820	89	2630	89	2440	89	2260	89	97			-40	85	3480	85	2400	85	2230	85	2070	85	1910	85	93		
-40	88	4180	89	2870	89	2670	89	2490	89	2300	89	97			-35	85	3520	85	2440	85	2270	85	2110	85	1950	85	93		
-35	88	4230	88	2910	88	2720	89	2530	89	2340	89	97			-30	85	3570	85	2480	85	2310	85	2140	85	1980	85	93		
-30	88	4280	89	2960	89	2780	89	2570	89	2390	89	97			-25	85	3620	85	2520	85	2350	85	2180	85	2010	85	93		
-25	89	4340	89	3010	89	2810	89	2610	89	2420	89	97			-20	85	3690	85	2570	85	2380	85	2210	85	2050	85	93		
-20	89	4400	89	3050	89	2850	89	2650	89	2470	89	97			-15	85	3710	85	2600	85	2420	85	2250	85	2080	85	93		
-15	89	4450	89	3100	89	2890	89	2700	89	2510	89	97			-10	85	3760	85	2650	85	2460	85	2290	85	2120	85	93		
-10	89	4500	89	3140	89	2940	89	2740	89	2550	89	97			-5	85	3800	85	2690	85	2500	85	2320	85	2150	85	93		
-5	89	4560	89	3190	89	2980	89	2790	89	2590	89	97			0	85	3850	85	2740	85	2540	85	2360	85	2190	85	93		
0	89	4620	89	3230	89	3030	89	2830	89	2630	89	97			5	85	3890	84	2780	85	2580	85	2400	85	2220	85	93		
5	89	4670	89	3280	89	3070	89	2870	89	2670	89	97			10	85	3940	84	2830	85	2620	85	2430	85	2260	85	93		
10	89	4730	89	3330	89	3120	89	2910	89	2720	89	97			15	85	4000	84	2880	85	2670	85	2480	85	2300	85	93		
15	89	4800	89	3390	89	3170	89	2970	89	2770	89	97			20	88	4480	86	3140	86	2940	86	2750	86	2560	86	93		
20	90	5460	90	3800	90	3560	90	3340	90	3120	90	97			25	86	5090	86	3530	86	3310	86	3090	86	2880	86	93		
25	90	6380	90	4350	90	4080	90	3830	90	3590	90	97			30	87	5810	87	4030	87	3780	87	3540	87	3300	87	93		
30	91	7700	91	5130	91	4830	91	4540	91	4250	91	97			35	87	7070	87	4720	87	4430	87	4150	87	3880	87	93		
31	91	8060	91	5340	91	5030	91	4720	91	4430	91	97			37	88	7730	88	5100	88	4790	88	4490	88	4200	88	93		
35	91	9980	91	6420	91	6050	91	5700	91	5350	91	97			40	88	9100	88	5870	88	5520	88	5190	88	4860	88	93		
37	92	11540	92	7280	92	6870	92	6479	92	6080	92	97			42	88	10490	88	6640	88	6250	88	5880	88	5520	88	93		

+210' for 1 deg.

Recommended Runway Length (Dry Runway): 5,550' + 130' = **5,680 feet**

Beechcraft Bonanza V35: Takeoff Performance

Wall Municipal Airport
Temperature: 89.3° F / 31.8° C - Airport Elevation: 2,813' MSL

NORMAL TAKE-OFF

ASSOCIATED CONDITIONS:

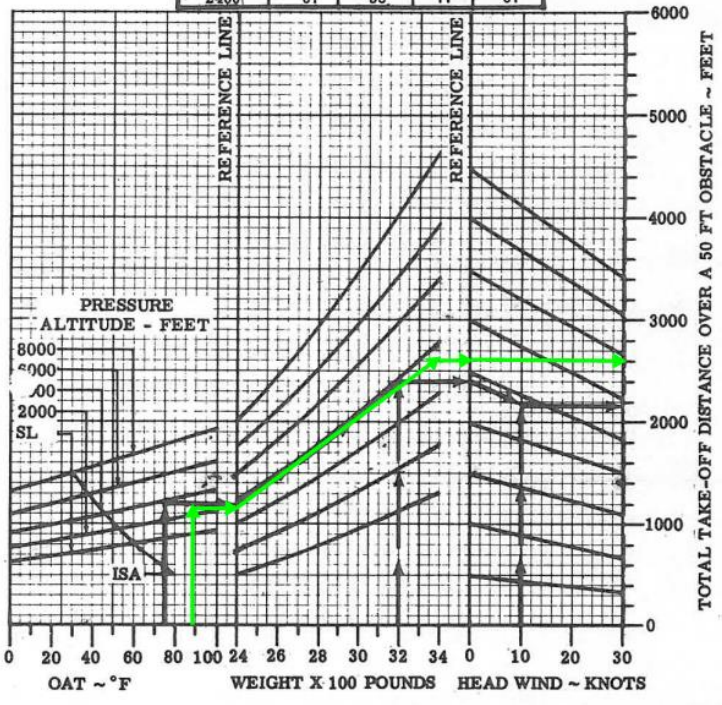
POWER	TAKE-OFF POWER SET BEFORE BRAKE RELEASE
FLAPS	UP
RUNWAY	PAVED, LEVEL, DRY SURFACE
TAKE-OFF SPEED	IAS AS TABULATED

NOTE: GROUND ROLL IS APPROX. 59% OF TOTAL TAKE-OFF DISTANCE OVER A 50 FT OBSTACLE.

EXAMPLE:

OAT	75°F
PRESSURE ALTITUDE	4000 FT
TAKE-OFF WEIGHT	3200 LBS
HEAD WIND	10 KNOTS
TOTAL TAKE-OFF DISTANCE OVER A 50 FT OBSTACLE	2190 FT
GROUND ROLL (59% OF 2190)	1292 FT
IAS TAKE-OFF SPEED LIFT-OFF	79 MPH
IAS TAKE-OFF SPEED AT 50 FT	90 MPH

WEIGHT POUNDS	IAS TAKE-OFF SPEED (ASSUMES ZERO INSTR. ERROR) LIFT-OFF MPH	LIFT-OFF KNOTS	50 FEET MPH	50 FEET KNOTS
3400	81	70	92	80
3200	79	69	90	78
3000	76	66	87	76
2800	73	63	84	73
2600	70	61	80	70
2400	67	58	77	67



Recommended Runway Length (Dry, Paved Runway): **2,600 feet**
Recommended Runway Length (Turf Runway): 2,600 feet x 1.2 = **3,120 feet**

Ground Roll Runway Length (Dry, Paved Runway): 2,600 feet x 0.59 = 1,534 feet
Ground Roll Runway Length (Turf Runway): 3,120 feet x 0.59 = 1,840 feet

Cessna 182: Takeoff Performance

Wall Municipal Airport
Temperature: 89.3° F / 31.8° C - Airport Elevation: 2,813' MSL

TAKEOFF DISTANCE
MAXIMUM WEIGHT 2950 LBS
SHORT FIELD

CONDITIONS:
Flaps 20°
2400 RPM and Full Throttle Prior to Brake Release
Cowl Flaps Open
Paved, Level, Dry Runway
Zero Wind

NOTES:
1. Short field technique as specified in Section 4.
2. Prior to takeoff from fields above 5000 feet elevation, the mixture should be leaned to give maximum power in a full throttle, static runup.
3. Decrease distances 10% for each 9 knots headwind. For operation with tailwinds up to 10 knots, increase distances by 10% for each 2 knots.
4. Where distance value has been deleted, climb performance after lift-off is less than 150 fpm at takeoff speed.
5. For operation on a dry, grass runway, increase distances by 15% of the "ground roll" figure.

+12 Ft +26 Ft

WEIGHT LBS	TAKEOFF SPEED KIAS		PRESS ALT FT	0°C		10°C		20°C		30°C		40°C	
	LIFT OFF	AT 50 FT		GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS	GRND ROLL	TOTAL TO CLEAR 50 FT OBS
2950	49	57	S.L.	635	1220	680	1305	730	1395	780	1490	835	1590
			1000	690	1335	745	1430	795	1530	850	1635	910	1745
-17 Ft			2000	755	1465	810	1565	870	1680	930	1800	995	1925
-35 Ft			3000	825	1605	890	1725	950	1850	1020	1985	1090	2130
			4000	905	1770	970	1905	1045	2050	1120	2205	1195	2370
			5000	995	1965	1065	2115	1145	2280	1230	2460	1315	2655
			6000	1090	2185	1175	2360	1260	2555	1350	2765	1450	3005
			7000	1200	2450	1290	2655	1390	2885	1490	3145	---	---
			8000	1325	2765	1425	3015	1530	3300	---	---	---	---

Figure 5-4. Takeoff Distance (Sheet 1 of 2)

Recommended Runway Length (Dry, Paved Runway): **1,976 feet**
Recommended Runway Length (Turf Runway): 1,976 feet x 1.15 = **2,272 feet**

Ground Roll Runway Length (Dry, Paved Runway): **1,015 feet**
Ground Roll Runway Length (Turf Runway): 1,015 feet x 1.15 = **1,167 feet**

American Champion Citabria: Takeoff Performance

Wall Municipal Airport
Temperature: 89.3° F / 31.8° C - Airport Elevation: 2,813' MSL

TAKEOFF/CLIMB PERFORMANCE

T.O. +31' (Alt) +17' (Temp)

50 Ft +55' (Alt) +20' (Temp)

MODEL		7ECA			7GCBC			7GCAA		
Press Alt Ft.	Temp (°F)	T.O. Dist Ft.	50 Ft. Obst Ft.	R/C	T.O. Dist Ft.	50 Ft. Obst Ft.	R/C	T.O. Dist Ft.	50 Ft. Obst Ft.	R/C
S.L.	0	340	716	800	231	457	1240	289	535	1210
	20	372	768	775	254	491	1210	317	574	1180
	40	415	832	750	279	530	1170	350	618	1150
	60	455	895	725	305	567	1145	382	663	1120
	80	496	961	700	340	616	1110	417	713	1090
	100	544	1034	675	363	649	1090	453	763	1060
2000	0	407	860	685	272	536	1100	343	622	1080
	20	444	929	660	294	573	1070	376	671	1050
	40	492	1004	635	331	629	1030	414	727	1020
	60	543	1086	610	374	684	1010	452	784	990
	80	597	1174	585	397	733	980	497	846	960
	100	655	1269	560	433	777	950	538	904	930
4000	0	482	1043	575	324	635	980	401	738	950
	20	538	1147	545	360	695	930	448	806	920
	40	589	1239	520	393	746	900	479	857	890
	60	640	1329	495	458	834	870	527	925	860
	80	690	1432	470	474	870	840	573	991	830
	100	788	1580	450	522	935	820	643	1086	800
6000	0	576	1301	465	385	763	840	479	886	820
	20	640	1432	435	421	827	800	529	962	790
	40	707	1562	410	474	905	770	582	1040	760
	60	789	1716	385	522	981	740	647	1133	730
	80	858	1858	365	568	1048	720	706	1226	700
	100	968	2058	340	626	1137	690	760	1304	680

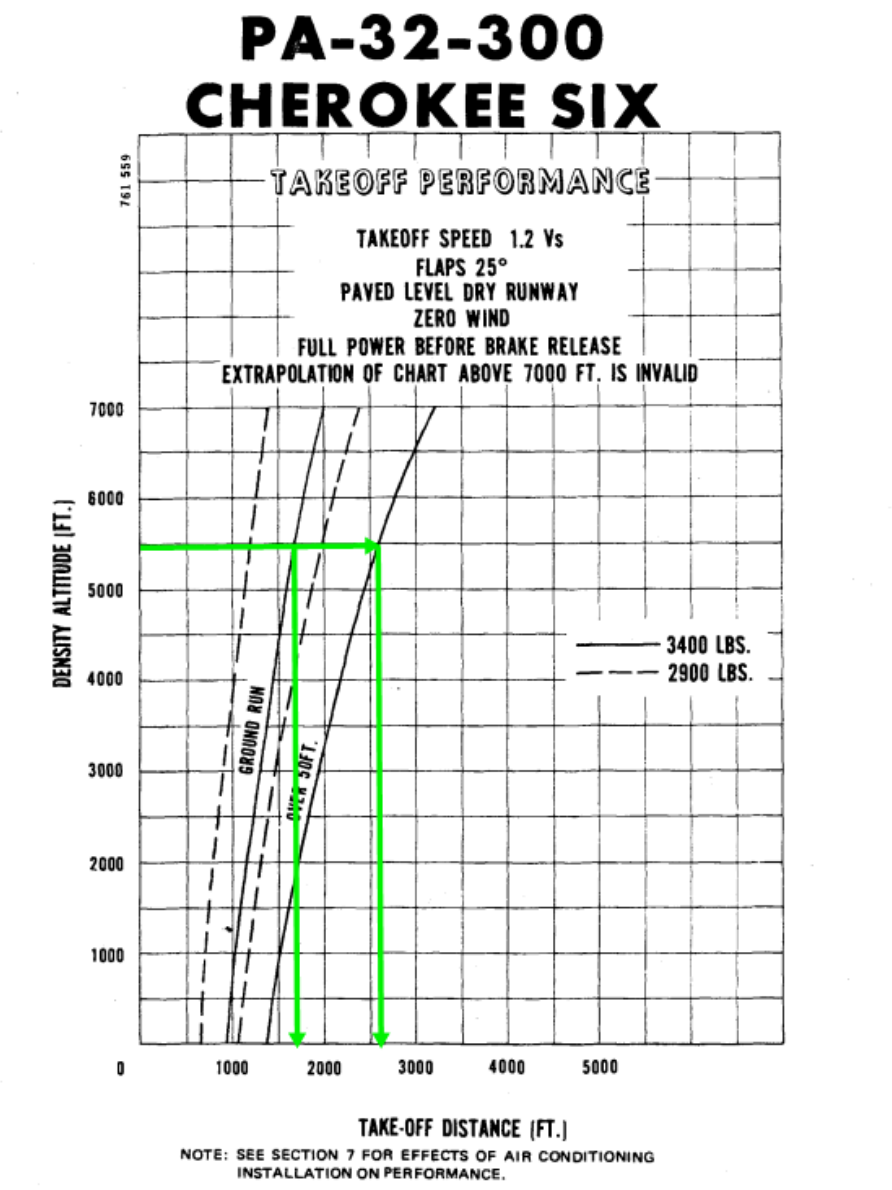
NOTES:
1) All performance at maximum gross weight 1650 lbs.
2) Takeoff performance on dry pavement.
3) 7GCBC with 14° flaps.
4) Climb propeller.
5) Data presented in this table represents maximum airplane capability and requires aircraft in good operating condition and a proficient pilot.

Recommended Runway Length (Dry, Paved Runway): **808 feet**
Recommended Runway Length (Turf Runway): 808 feet x 1.2 = **970 feet**

Ground Roll Runway Length (Dry, Paved Runway): **445 feet**
Ground Roll Runway Length (Turf Runway): 445 feet x 1.2 = **534 feet**

Piper Cherokee Six: Takeoff Performance

Wall Municipal Airport
Temperature: 89.3° F / 31.8° C - Airport Elevation: 2,813' MSL



PERFORMANCE CHARTS
REVISED: JUNE 20, 1974

9-3

Recommended Runway Length (Dry, Paved Runway): **2,610 feet**
Recommended Runway Length (Turf Runway): 2,610 feet x 1.2 = **3,130 feet**

Ground Roll Runway Length (Dry, Paved Runway): = **1,700 feet**
Ground Roll Runway Length (Turf Runway): 1,700 feet x 1.2 = **2,040 feet**

Cessna 172H: Takeoff Performance

Wall Municipal Airport
Temperature: 89.3° F / 31.8° C - Airport Elevation: 2,813' MSL

x 15.72% (Temp)
+27 Ft (Alt) +71 F (Alt)

TAKE-OFF DATA

TAKE-OFF DISTANCE FROM HARD SURFACE RUNWAY, FLAPS UP

GROSS WEIGHT LBS.	IAS AT 50 FT. MPH	HEAD WIND KNOTS	@ S.L. & 59° F		@ 2500 ft. & 50° F		@ 5000 ft. & 41° F		@ 7500 ft. & 32° F	
			GROUND RUN	TOTAL TO CLEAR 50' OBS.	GROUND RUN	TOTAL TO CLEAR 50' OBS.	GROUND RUN	TOTAL TO CLEAR 50' OBS.	GROUND RUN	TOTAL TO CLEAR 50' OBS.
2300	70	0	865	1525	1040	1910	1255	2480	1565	3855
		10	615	1170	750	1485	920	1955	1160	3110
		20	405	850	505	1100	630	1480	810	2425
2000	65	0	630	1095	755	1325	905	1625	1120	2155
		10	435	820	530	1005	645	1250	810	1685
		20	275	580	340	720	425	910	595	1255
1700	60	0	435	780	520	920	625	1095	785	1370
		10	290	570	355	680	430	820	535	1040
		20	175	385	215	470	270	575	345	745

NOTES: 1. Increase distance 10% for each 25°F above standard temperature for particular altitude.
2. For operation on a dry, grass runway, increase distances (both "ground run" and "total to clear 50 ft. obstacle") by 7% of the "total to clear 50 ft. obstacle" figure.

Recommended Runway Length (Dry, Paved Runway): **2,290 feet**
Recommended Runway Length (Turf Runway): 2,290 feet x 1.07 = **2,450 feet**

Ground Roll Runway Length (Dry, Paved Runway): **1,234 feet**
Ground Roll Runway Length (Turf Runway): 1,180 feet x 1.07 = **1,320 feet**

Aviat Husky A-1B: Takeoff Performance

Wall Municipal Airport
Temperature: 89.3°F / 31.8°C - Airport Elevation: 2,813' MSL

Recommended Runway Length (Dry, Paved Runway): **985 feet**

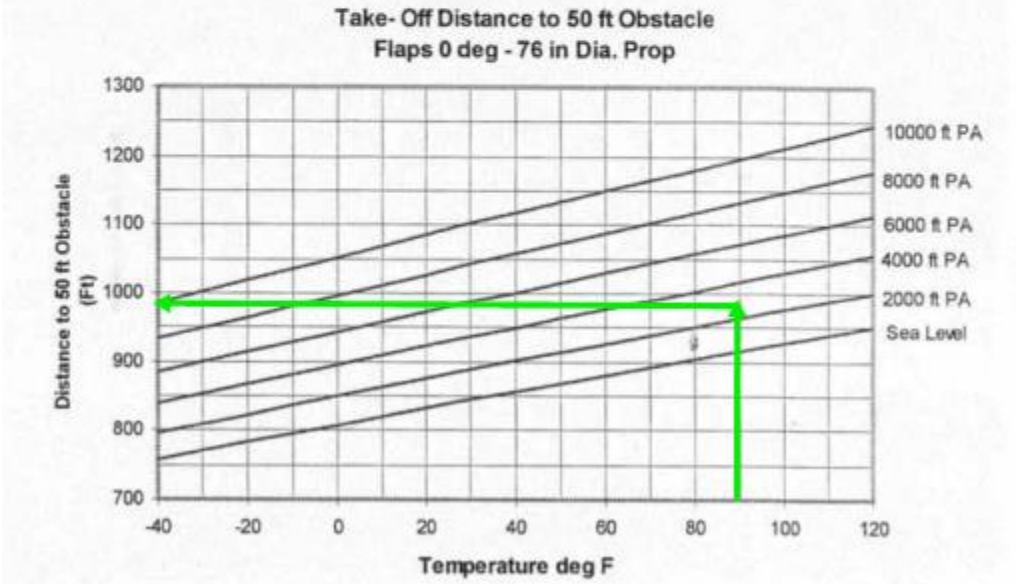
AVIAT AIRCRAFT INC
AIRPLANE FLIGHT MANUAL
MODEL A-1B AIRPLANE

Page 22 of 29

D. TAKE-OFF — 76 Inch Diameter Propeller

1. Take-off Normal — Flaps 0° (Over 50 Ft. Obstacle)
   Maximum weight . . . . . 2000 lbs.

2. Notes:
   1. No wind
   2. Hard surface runway (dry, level)
   3. Lift-off 55 to 60 MPH IAS.
   4. Airspeed at 50 ft. obstacle height 1.3 Vs1 = 75 MPH IAS
   5. Ground roll is approximately 40% of total distance to 50 ft. obstacle height.
   6. Technique as specified in Section II.



Recommended Runway Length (Turf Runway): 985 feet x 1.20 = **1,180 feet**

Ground Roll Runway Length (Dry, Paved Runway): 985 feet x 0.40 = **394 feet**
Ground Roll Runway Length (Turf Runway): 1,180 feet x 0.40 = **472 feet**

APPENDIX G: AIRPORT SOLID WASTE & RECYCLING

Introduction

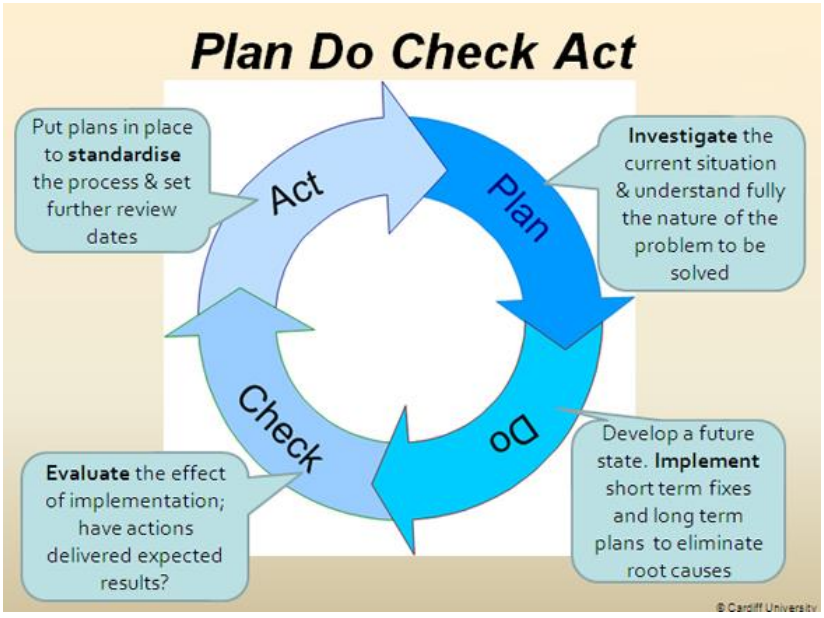
In the FAA Modernization and Reform Act of 2012 (Public Law 112-95), the Airport Improvement Program language was amended (49 USC Section 47106(a)) to include the evaluation of airport solid waste recycling. The change stipulates that the following issues will be addressed:

- Feasibility of Solid Waste Recycling at the Airport,
- Minimizing the Generation of Solid Waste at the Airport,
- Operation and Maintenance Requirements Related to Solid Waste,
- Review of Waste Management Contracts, and
- Potential Cost Savings or Generation of Revenue from Solid Waste Recycling.

To accomplish these objectives this appendix will include:

- Examination of Existing Solid Waste Handling and Recycling
  - Existing Practices including Operations and Maintenance Issues
  - Existing Waste Management Contracts
- Examination of Recycling Opportunities
- Alternatives to Minimize Generation of Solid Waste and
- Cost Savings/Revenue Potential from Recycling.

The FAA released a memorandum on September 30, 2014 titled "Guidance on Airport Recycling, Reuse, and Waste Reduction Plans" that provides technical guidance on preparing airport recycling plans. The FAA also published "Recycling, Reuse and Waste Reduction at Airports – A Synthesis Document" in April 24, 2013. Please note, a Solid Waste Recycling plan is one element of an Environmental Management System (EMS). This appendix will not address all elements of an EMS but information regarding an EMS can be found in FAA AC 150/5050-8 "Environmental Management Systems for Airport Sponsors". The EMS concept follows the "Plan, Do, Check, Act" model which will also be the manner in which the Solid Waste Recycling Plan can be continually evaluated and improved.



The content and scope of a solid waste recycling plan can vary based upon availability of information and the unique environment at every airport. This appendix represents a baseline review of existing

practices and opportunities. A comprehensive analysis of components such as quantity and composition of waste, program performance, and financial analysis would be completed during a waste audit.

Existing Solid Waste Handling and Recycling

There are four types of waste typically generated at an airport. These are: 1) Municipal Solid Waste, 2) Construction/Demolition Waste, 3) Compostable Waste, and 4) Deplaned Waste. These are further described in **Table G-1 Waste Types**.

Table G-1 Waste Types

Waste Type	Description
Municipal Solid (MSW)	Consists of everyday items that are used and discarded. Recyclable MSW at airports includes, but is not limited to, aluminum and steel, glass bottles and containers, plastic bottles and containers, packaging, bags, paper products, and cardboard.
Construction /Demolition (C&D)	Generally categorized as MSW. C&D debris is any non-hazardous solid waste that results from land clearing, excavation, or construction, demolition, renovation, or repair of structures, roads, and utilities. C&D debris includes, but is not limited to, concrete, wood, metals, soil, bricks and masonry material, asphalt, rock, stone, gravel, sand, roofing materials, drywall, carpet, plastic, pipe, rocks, earthwork, land-clearing debris, cardboard, and salvaged building components. In some instances, C&D debris requires special handling and may be subject to special requirements. Examples include tar-impregnated roofing materials and asbestos-containing building materials.
Compostable Waste	Generally categorized as MSW. They are sometimes referred to as green waste and food waste. Green waste consists of tree, shrub, and grass clippings, leaves, weeds, small branches, seeds, pods, and similar debris generated by landscape maintenance activities. Food waste is food that is not consumed, or generated during food preparation activities and discarded.
Deplaned Waste	A type of MSW removed from passenger aircraft. These materials include bottles and cans, newspaper and mixed paper, plastic cups and utensils, food waste, food-soiled paper, magazines, unconsumed or surplus food, and paper towels.

Source: FAA "Recycling, Reuse and Waste Reduction at Airports – A Synthesis Document" April 24, 2013

Existing Practices

Municipal solid waste (MSW) is the primary waste generated by normal airport activity. Waste volume produced is generally low. The airport does not provide containers for MSW and recycling. All airport tenants and users are responsible for hauling and disposal of all wastes. Ascend Ag. Inc. is the only entity on the airport that has a container for MSW and contracted collection service.

The City of Wall maintains a public waste dumping facility and sorted containers for recyclables. Waste oil produced by the airport users are given to local businesses which is used for building heating.

Existing Waste Management Contracts

The disposal of waste is a specialized service not regularly performed by airports. While collection service is not available, users can bring MSW and recyclable materials to the public transfer facility located on the east side of town.

Walker Refuse is contracted by Ascend Ag. Inc. for the collection of MSW. The container is privately owned and is approximately 4 cubic yards. The collection frequency is once per month with a flat rate pickup fee. Waste collected is not weighed so container volume and frequency is the only metric for annual waste generation.

Ascend Ag. Inc. also utilizes the South Dakota Pesticide Container Recycling Collection program for disposing and recycling of used chemical containers. No other contracts for waste service are currently in place.

Airport Instituted Efforts to Minimize the Generation of Solid Waste at the Airport

Efforts have been underway to reduce solid waste at the Wall Municipal Airport. Scrap metal collected by airport tenants is reused for future projects or is brought to a recycling facility for revenue. All grass at the airport is mulched in place, reducing green waste produced. When construction projects occur, any debris that can be reused in the project such as recycled pavement is reused when possible.

In an effort to reduce energy usage the newest hangar constructed utilizes geothermal for facility heating and has installed LED lighting fixtures.

Solid Waste and Recycling Opportunities

Recycling Opportunities

When developing a recycling program it is important to note that all planning for recycling must start with the disposal or the recycling destination in mind. If a destination facility is capable of efficiently sorting the comingled recyclable materials than a single-stream program would be possible. This allows all allowable recyclables to be deposited into a single bin by the depositor. Single stream recycling garners the highest participation rate from the population and has the biggest reduction in products going to the landfill. However, if the destination does not have the means to efficiently sort comingled recyclable materials than a multi-stream recycling program should be planned. This is where the recyclable materials are sorted by the depositor into separate containers and are handled separately throughout the recycling process. The capabilities and requirements of the destination facility should periodically be reassessed to identify any changes and capture new opportunities.

Facilities in Wall do not support the efficient sorting of comingled recyclables. A multi-stream recycling program should be planned where the materials are separated by the depositor. They must be delivered to the collection containers located at the public transfer facility. The recyclable waste currently allowed is listed in **Table G-2 Allowable Recyclable Materials**.

Table G-2 Allowable Recyclable Materials

Type of Waste			
Aluminum cans	Glass bottles	Steel cans	Milk jugs
Aluminum bottles	Glass jars	Aerosol cans	Hairspray cans
Soda/Water bottles	Oil containers	Pesticide containers	Plastic containers

Source: City of Wall Recycling Service

Areas Where Gains Can Be Made at the Airport

It is recommended that the Wall Municipal Airport begin a new collection and sorting program for recyclables and solid waste. The Airport should recognize and establish five 'streams' for waste. The five streams are:

Trash – all trash not otherwise identified as recyclable. Dispose in standard waste containers. Materials can be brought to the city waste facility.

Plastic Containers – A variety of plastic types may be comingled in a single receptacle. Plastic products should be deposited in a separate container with a sealed lid. Materials can be brought to the city collection site where they are processed by a private recycling company.

Glass Containers – Glass bottles and jars may be comingled in a single receptacle. Glass products should be deposited in a separate container with a sealed lid. Materials can be brought to the city collection site where they are processed by a private recycling company.

Steel Containers – Steel containers should be deposited in a separate container with a sealed lid. Materials can be brought to the city collection site where they are processed by a private recycling company.

Aluminum Containers – Aluminum containers should be deposited in a separate container with a sealed lid. Materials can be brought to the city collection site where they are processed by a private recycling company.

It is also recommended that the Airport begin an effort to collect data on how much waste is disposed of monthly as well as how much is recycled. Understanding the measurable amount of waste and recycling produced will help in realizing financial gains and program effectiveness.

Other Methods Which Would Reduce Environmental Impacts of the Airport

1. Complete an energy audit to see where improvements in existing buildings could be made.

2. Installing water dispenser for self-service filling of water bottles in arrival/departure building.

3. Encourage green building policies and practices. Explore the following methods:

    a. White roofs – reduce heat in the summer
    b. Energy efficient lighting (LED)
    c. Solar wall and geothermal heating – reduce cost to heat or cool buildings
    d. Wind and phot-voltaic renewable energy system

Potential Cost Savings

While exact numbers are not known at this time taking solid municipal waste, deplaned waste, food waste and several other wastes out of the waste stream should help reduce the cost for collection services and transportation of waste. It is recommended that the Airport develop a baseline of trash and recyclables collected at the Wall Airport. A quarterly report would show potential areas of improvement and should lead to cost savings in trash collection.

APPENDIX H: RUNWAY PROTECTION ZONE ANALYSIS

Introduction

This appendix is specific to the request made by the FAA regarding the Runway 12 and 30 Runway Protection Zones (RPZ) at Wall Municipal Airport. The appendix follows the same format, page numbering and figures as the Master Plan so the appendix can be incorporated into the final document. The end of this appendix will include the response from the FAA.

RPZ Analysis Report Submitted for FAA Review

Report Date: November 1, 2017

To: Sandy DePottey, Planner, FAA Dakota-Minnesota ADO
From: Kent Penney, Senior Aviation Planner, KLJ
Subject: Runway Protection Zone Analysis for Runway 12-30
Wall Municipal Airport (6V4), Wall, South Dakota

The City of Wall is completing a Master Plan update ("project") and identified early in the project that there were existing incompatible uses within the RPZ of Runway 30 as it existed. The Master Plan has identified that the critical design aircraft and proposed approach capabilities will exacerbate the problems with incompatible uses in the RPZ. Also, with an extension on the Runway 12 end planned in the future, an RPZ issue will be created on that end as well. See **Exhibit H-1 Runway 12-30 RPZ**.

Request

The City requests that the FAA allow the Runway 30 threshold to be displaced 380 feet northwest and allow for a 150' extension to Runway 30 creating a total of 530' displacement for Runway 30. The City further requests that the FAA allow two roadways and a portion of a church parking lot to remain within the RPZ. The 530' total displacement of Runway 30 will remove 3 homes, a church, an office building and 8 above ground fuel tanks from within the RPZ, while allowing the runway to continue to meet existing and future design aircraft needs. For the Runway 12 end, the City requests that an avigation easement be acquired for the agricultural land and rail road property within the RPZ.

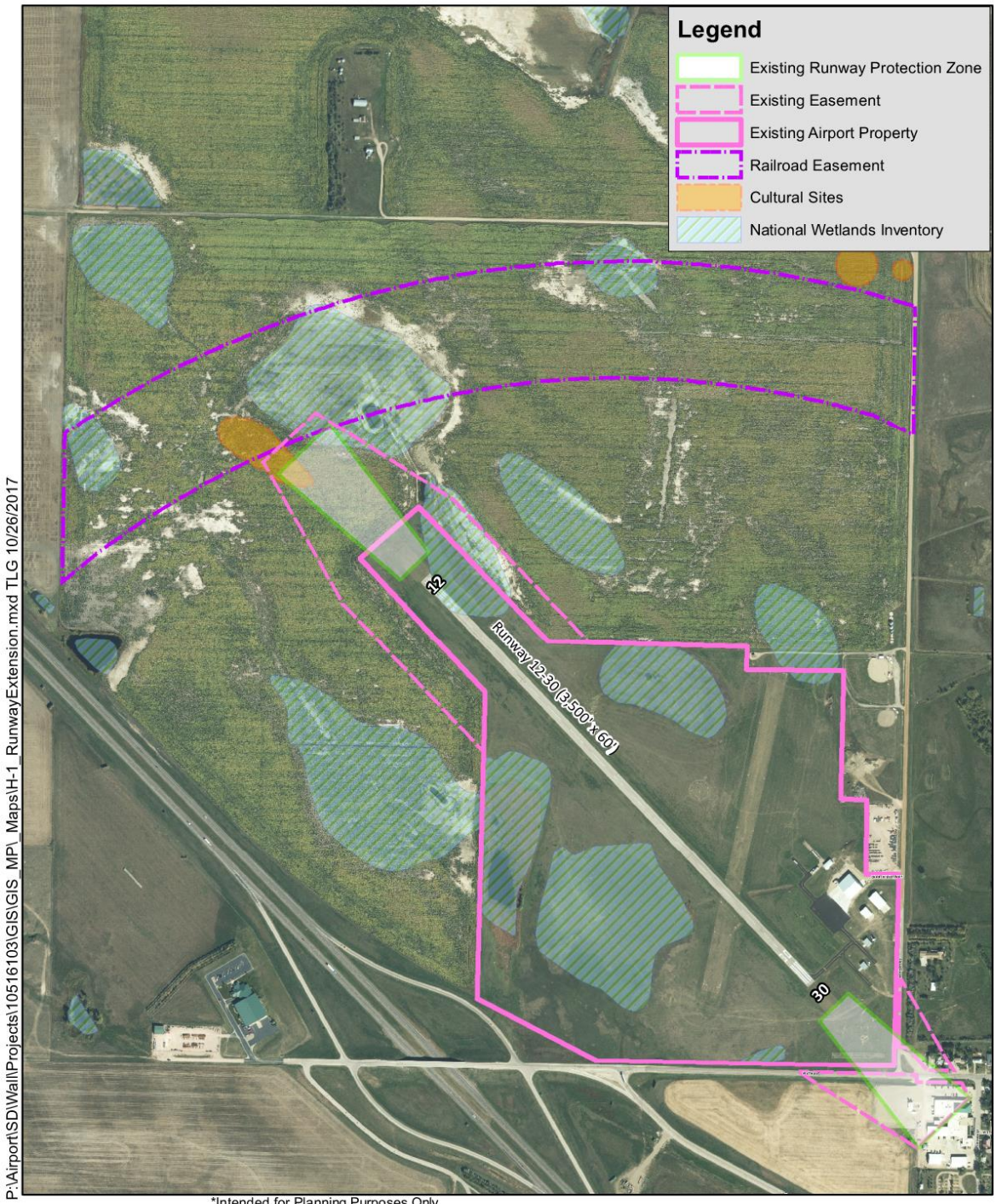
Background

Wall Municipal Airport is a Basic Airport in the FAA's National Plan of Integrated Airport Systems. The current primary runway at Wall is 60' x 3,500' with a Runway Design Code (RDC) A-I(S)-Visual. The scope of the Master Plan was limited to evaluating the runway configuration that could be completed on the existing site, therefore no other sites were considered in the RPZ analysis.

Through the Master Plan it has been determined, and affirmed by FAA in the forecast, that the Future Critical Design Aircraft for Wall is the Air Tractor 802 and the need for the primary runway length is as long as 6,230 feet. The runway length analysis in Chapter 4, identified that the current Critical Design Aircraft, Air Tractor 502B, requires 4,180 feet. Also, using AC 150/5325-4B the charts showed 4,340 feet needed for 95% of the fleet of less than 10 passenger aircraft less than 12,500 lbs.

Because of land constraints to the southeast and northwest, a maximum length of 4,430 feet is achievable; these constraints are shown in Exhibit H-2 and H-3. The length of 4,430 feet is recommended because it allows for the Air Tractor 802 to operate with 75% of useful load and operators on the field have confirmed that this 4,430 foot length will meet needs through the planning period. The future RDC will be B-II-5000. This will require an approach RPZ of 500 feet (inner width) by 700 feet (outer width) by 1,000 feet in length (13.77 acres).

Exhibit H-1 Runway 12-30 RPZs



SOUTHEAST CONSTRAINTS

As depicted in **Exhibit H-2 Runway 30 RPZ**, 4th Avenue, Airport Road, three residences, Evangelical Free Church, Golden West Communications Offices, and eight above ground fuel tanks are all within the RPZ. Also, the airports hangar area is situated north of the Runway 30 threshold. Also provided is **Exhibit H-3 Runway 30 Threshold Penetrations** which shows the current penetrations for Threshold Siting Surfaces (Table 3-2[1] Line 4 Approach (Instrument Approach day/night for ADG A and B aircraft). The airport currently has Threshold Siting Surface, Table 3-2 Line 2 Approach (Visual day/night) which has no penetrations. The Line 4 approach would have eleven penetrations ranging from 1.2 feet to 14.3 feet. Movement of the threshold to the northwest would remove incompatible uses and Type 4 threshold siting surface penetrations, but also moves the future departure surface onto airport property where the existing hangars become encompassed.

NORTHWEST CONSTRAINTS - RAILROAD LAND

The land to the northwest of the airport is owned by Wyoming Dakota Railroad Properties, Inc. with a potential rail line to the north of the airport. See **Exhibit H-4 Runway 12 RPZ and Railroad Property**. The property consists of the quarter sections north and west of airport property and are shown in the figure as SD103-01, SD103-02, SD103-03, SD103-04 and SD103-05. A new rail line in SD103-01 was examined by the railroad for the purpose of moving the rail line outside of town and adding new sidings to accommodate coal traffic from Wyoming. This new rail alignment would also accommodate other long trains; however, based on discussions with Wyoming Dakota Railroad Property, there are no near-term plans to relocate the rail line.

The railroad is now planning to sell the property and retain an easement of the rail corridor SD103-01. The property that will be sold includes parcels SD103-01, SD103-02, SD103-03, SD103-04, and SD103-05. Based on these recent discussions with Wyoming Dakota Railroad Property it was decided during the master planning process to plan the airport improvements with a potential rail line in S103-01.

[1] Table 3-2 is in reference to Table 3-2 Approach/Departure Standards Table in FAA AC 150-5300-13A and is also referred to as Threshold Siting Surface.

Exhibit H-2 Runway 30 RPZ

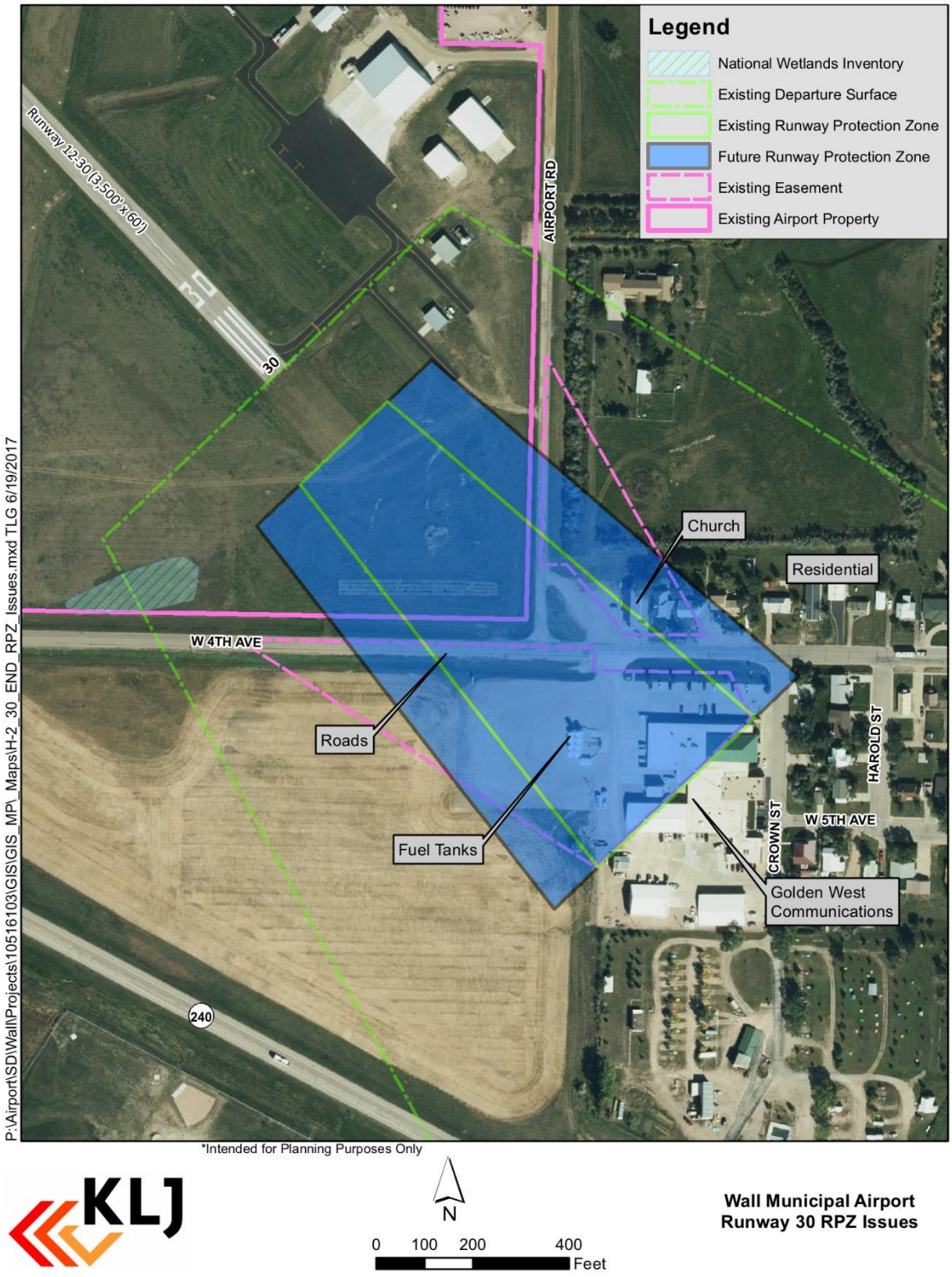


Exhibit H-3 Runway 30 Threshold Penetrations for Table 3-2 Line 4 Approaches

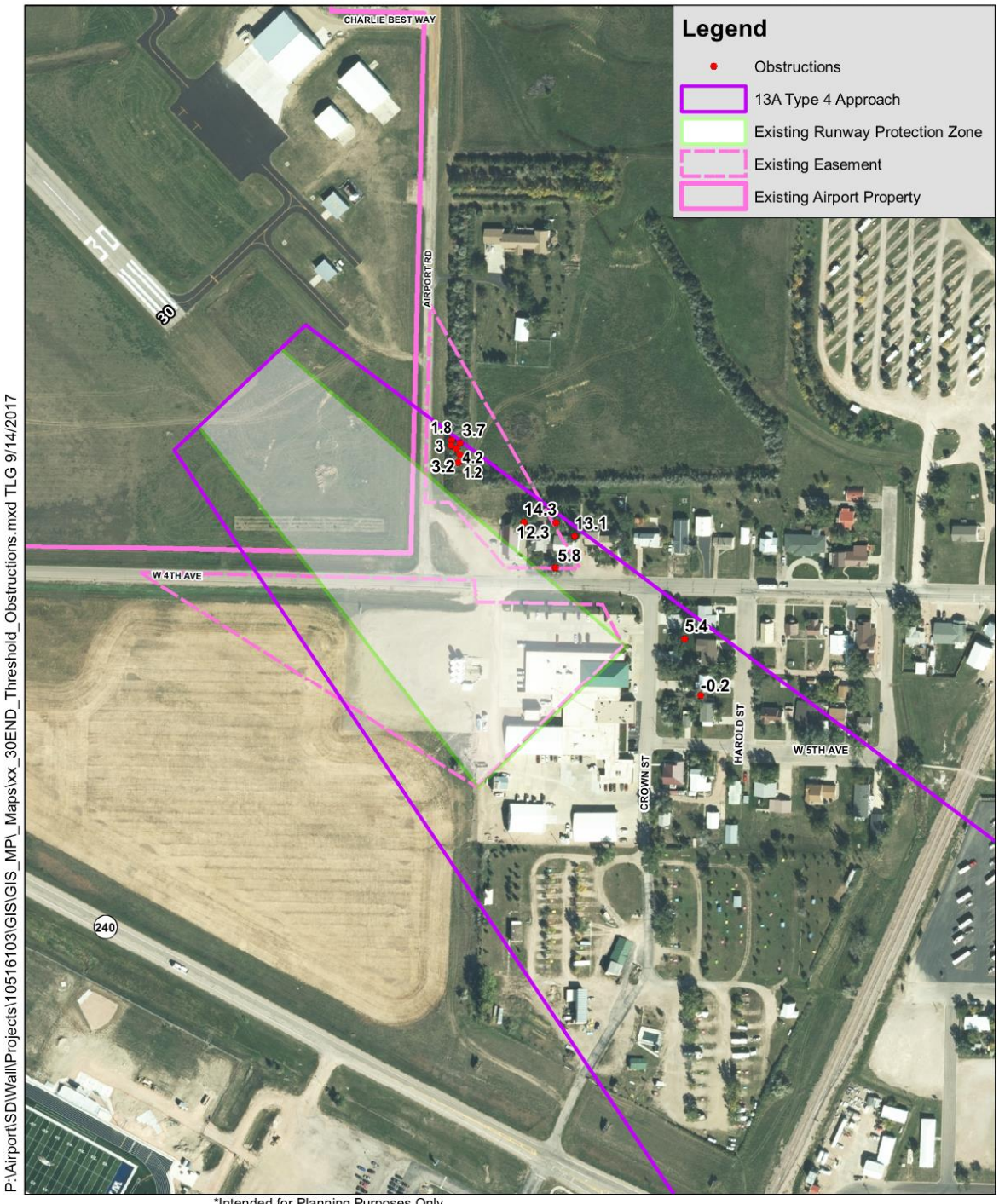
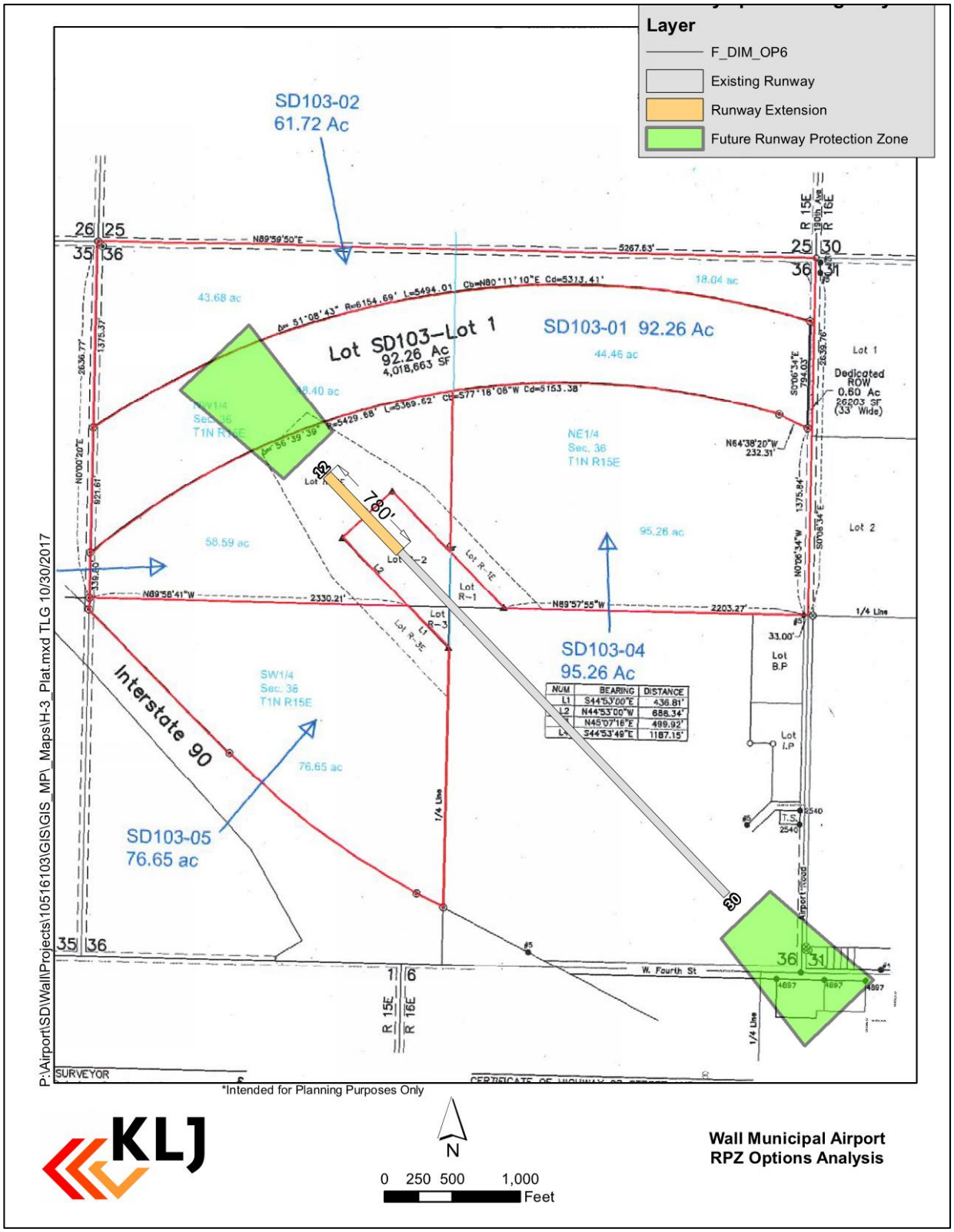


Exhibit H-4 – Runway 12 RPZ and Railroad Property



NUM	BEARING	DISTANCE
L1	S44°53'00"E	436.81'
L2	N44°53'00"W	688.34'
L3	N45°07'16"E	499.92'
L4	S44°53'49"E	1187.15'

Runway 12 RPZ Determination

With an extension of Runway 12 by 780 feet[2], the Runway 12 RPZ will extend over the existing agricultural land and potential rail line. This extension will allow all the infrastructure improvements for the runway to be completed on airport property not affected by the railroad owned corridor. The other safety surfaces around the runway including the Runway Safety Area, Runway Object Free Area, and Runway Object Free Zone would also be on airport property. If the rail line is constructed, there would be enough distance from the Runway 12 threshold to meet the threshold siting surface criteria[3].

Fee acquisition of the full Runway 12 RPZ land for airport purposes is not feasible recognizing the railroad will retain ownership for a potential rail line. A review of use of Eminent Domain against railroads was completed[4]. It is clear that railroads operate with the capabilities of Eminent Domain extended from State's rights of eminent domain because use of property by the railroads is considered fundamentally public.

In the situation for Wall, if the City were to attempt to condemn the Railroad easement for airport purposes, the railroad would assert that this action would interfere with future railroad operations. This is based on the railroads obligations prescribed in 49 U.S.C. § 11101 which states that *"Commitments which deprive a carrier of its ability to respond to reasonable requests for common carrier service are not reasonable."* An eminent domain action for acquisition or easement has been further deemed by case law to violate the 'deprive a carrier' statement of the section.[5] The City can instead complete fee acquisition of the surrounding property and execute a long-term lease for the railroad corridor and secure protection of the RPZ and approaches from incompatible uses. This allows a future rail line to operate without ever impeding the airport.

In the event the railroad does design a rail line to be constructed through the Runway 12 RPZ, it will be important to examine land use and height limitations to maintain the maximum capabilities of the runway. The railroad is subject to strict grade limitations by design and therefore has limited ability to change which is constricted by matching existing rail line to the east then proceeding west under Interstate 90 and descending into the Cheyenne River valley. Based on the final elevation of the rail line, it may be necessary to mitigate the impact on the airport by changing the runway threshold but as noted earlier, the best information available at the time of this Master Plan demonstrates that the threshold can be maintained as proposed with the rail line in place.

[2] Because of the rail line corridor on the northwest end of the runway, a maximum extension of 780 feet is all that is being considered to Runway 12. A 780 foot extension will keep the runway object free area and all improvements on Airport property so it is not affected by a railroad owned corridor.

[3] The location of the potential rail line is based on a rail design included in a 2010 ALP update. Discussions with the railroad found that there were no other designs created or currently available from the railroad.

[4] National Cooperative Rail Research Program Legal Research Digest 2 – Railroad Legal Issues and Resources, September 2015 pp. 68-73.

[5] Title 49 U.S. Code Section 11101 (a)

Alternatives Analysis for Runway 30 RPZ

There were several alternatives examined to contend with the incompatible uses within the Runway 30 RPZ. For all alternatives, non-precision approaches as low as 1-mile visibility are being included for both runway ends. Runway 12-30 will need to be reconstructed and widened from 60 feet to 75 feet in the near term so that cost is being factored into each option. The alternatives in summary are as follows:

- Option 1 – Runway 30 threshold stays as it exists and Runway 12 threshold extended 780'
- Option 2 (Recommended) – Relocate Runway 12-30 300 feet to the southwest and current Runway becomes a parallel taxiway
    - Exhibit H-5 Shows Options 1 and 2
    - Exhibit H-9 provides a detail of the RPZ for Option 2
- Option 3 – Relocate Runway 30 threshold 380' northwest and extend Runway 12 threshold 780'
- Option 4 (Recommended) – Displace Runway 30 landing threshold 380' northwest, extend Runway 30 150' for takeoff threshold, and extend Runway 12 threshold 780'
    - Exhibit H-6 Shows Options 3 and 4
    - Exhibit H-10 provides a detail of the RPZ for Option 4 (and Option 3)
- Option 5 – Relocate Runway 30 threshold 780' northwest and extend Runway 12 threshold 780'
- Option 6 – Displace Runway 30 landing threshold 780' northwest, extend Runway 30 150' for takeoff threshold, and extend Runway 12 threshold 780'
    - Exhibit H-7 Shows Options 5 and 6
    - Exhibit H-11 provides a detail of the RPZ for Option 5 (and Option 6)
- Option 7 – Relocate Runway 30 threshold 150' northwest, extend Runway 12 threshold 780', and relocate Airport Road and 4th Avenue, Church, 3 homes and fuel farm
- Option 8 – Leave Runway 30 threshold, extend Runway 12 threshold 780', and relocate Airport Road and 4th Avenue, Church, 4 homes, fuel farm and Golden West Communications
    - Exhibit H-8 Shows Options 7 and 8

Option 1 - Extend Runway 12 and No Change to Runway 30

Airfield Construction

- Construct 780 foot runway extension northwest of Runway 12 existing threshold
- Runway 75' x 4280'

Uses Inside the Runway 30 RPZ

- 400 feet of Airport Road and 930 feet of 4th Avenue
- Evangelical Free Church (approximately 2,500 square feet) and gravel parking lot
- Two complete single family homes
- 10% of one single family home
- Eight above ground fuel tanks
- 20,000 square feet of Golden West Communications offices and parking

Off Airport Construction

- None

Estimated Cost – Total = $4.25 m

- Reconstruct and Extend Runway 12 (40.7 acres -- 27.5 fee & 13.2 easement)
- Runway 30 (2 acres easement)

Advantages:

- No loss of runway length
- No cost to make changes
- No change in Runway 12 departure surface and therefore no impact to airport hangars

Disadvantages:

- All incompatible uses stay inside the expanded RPZ

Option 2 (Recommended) - Relocate Runway 12-30 300 feet to the southwest (see Exhibit H-9 Detailed RPZ)

Airfield Construction

- Relocate Runway 12-30 300 feet southwest of the existing runway
- Existing Runway 12-30 becomes a 35' full parallel taxiway (ultimate only)
- Runway 75' x 4150'

Uses Inside the Runway 30 RPZ

- 30 feet of Airport Road and 860 feet of 4th Avenue

Off Airport Construction

- None

Estimated Cost – Total = $9.15 m

- New Runway 12-30 (59.2 acres -- 45.7 fee & 13.5 easement)
- Converting old runway into a partial parallel taxiway would be an additional $1.6 m

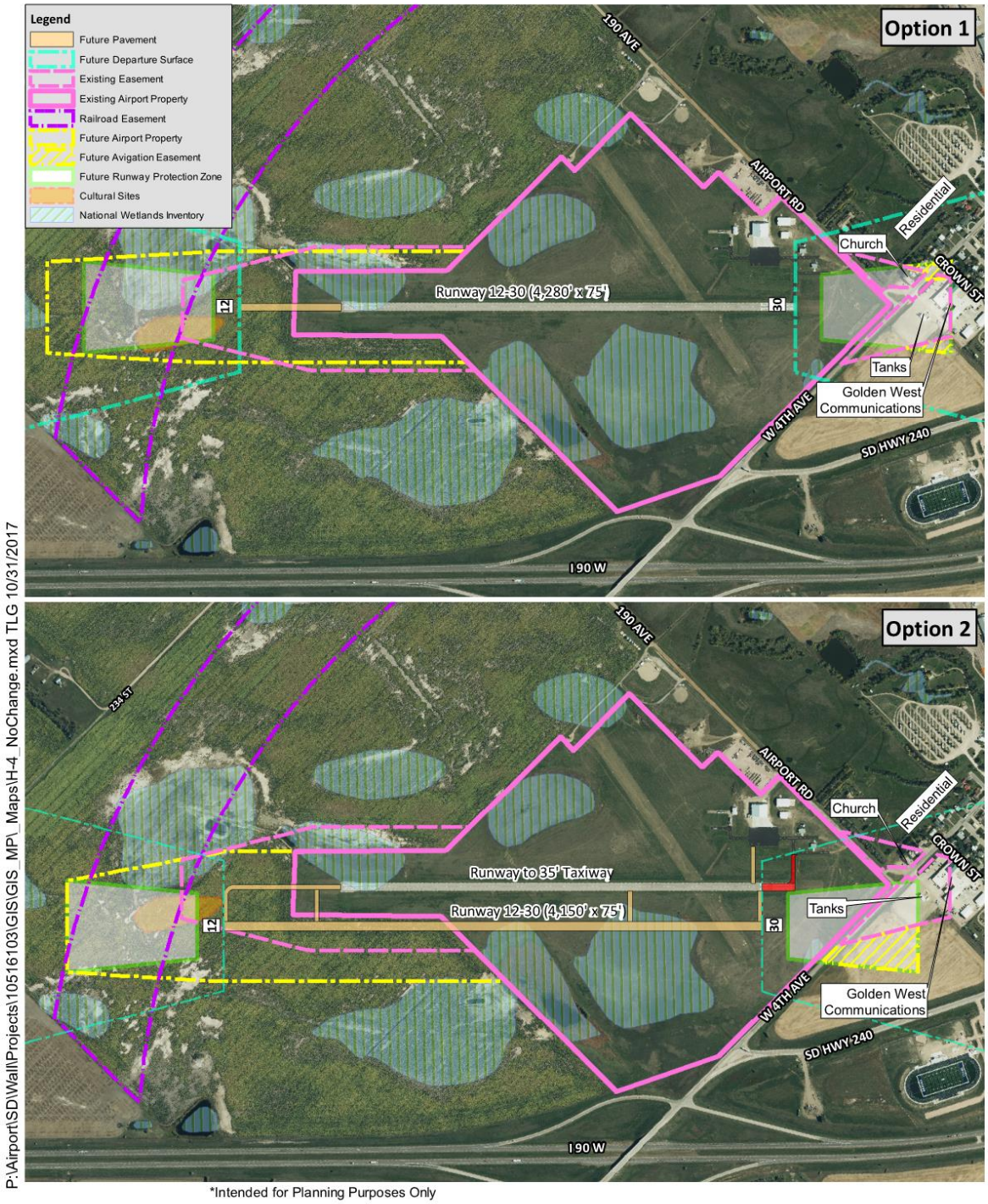
Advantages:

- Current Runway 12-30 becomes a full parallel taxiway
- Runway 12 departure surface moves 300 feet southwest and minimal impact to airport hangars
- Only 4th Avenue remains inside RPZ

Disadvantages:

- Wetlands southwest of current Runway
- Substantial fill work will be needed to bring ground elevation up to current runway and crosswind elevation
- Cultural area impacted on Runway 12 end

Exhibit H-5 – Options 1 and 2



Wall Municipal Airport
RPZ Options Analysis

Option 3 - Relocate Runway 30 Threshold 380' Northwest

Airfield Construction

- Construct 780 foot runway extension northwest of Runway 12 existing threshold
- Relocate Runway 30 threshold 380 feet northwest
- Runway 75' x 3900'

Uses Inside the Runway 30 RPZ

- Incompatible land uses -- 450 feet of Airport Road, 460 feet of 4th Avenue, and 400 sq. yards of gravel Church parking lot

Off Airport Construction

- None

Estimated Cost – Total = $4.09 m

- Reconstruct and Extend Runway 12 (40.7 acres -- 27.5 fee & 13.2 easement)
- Relocate Runway 30

Advantages:

- No buildings inside the RPZ

Disadvantages:

- Change in Runway 12 Departure Surface affects 3 hangars at the airport and development areas to the east
- Two roads and a portion of Church parking lot remains in the RPZ

Option 4 (Recommended) - Displace Runway 30 Landing Threshold 380' Northwest (see Exhibit H-10 Detailed RPZ)

Airfield Construction

- Construct 780 foot runway extension northwest of Runway 12 existing threshold
- Displace Runway 30 landing threshold 380 feet northwest
- Extend Runway 30 threshold 150 feet southeast
- Runway 75' x 4430' with 530' displacement

Uses Inside the Runway 30 RPZ

- No incompatible land uses except for 450 feet of Airport Road, 460 feet of 4th Avenue, and 400 sq. yards of gravel Church parking lot

Off Airport Construction

- None

Estimated Cost – Total = $4.59 m

- Reconstruct and Extend Runway 12 (40.7 acres -- 27.5 fee & 13.2 easement)
- Extend and Displace Runway 30

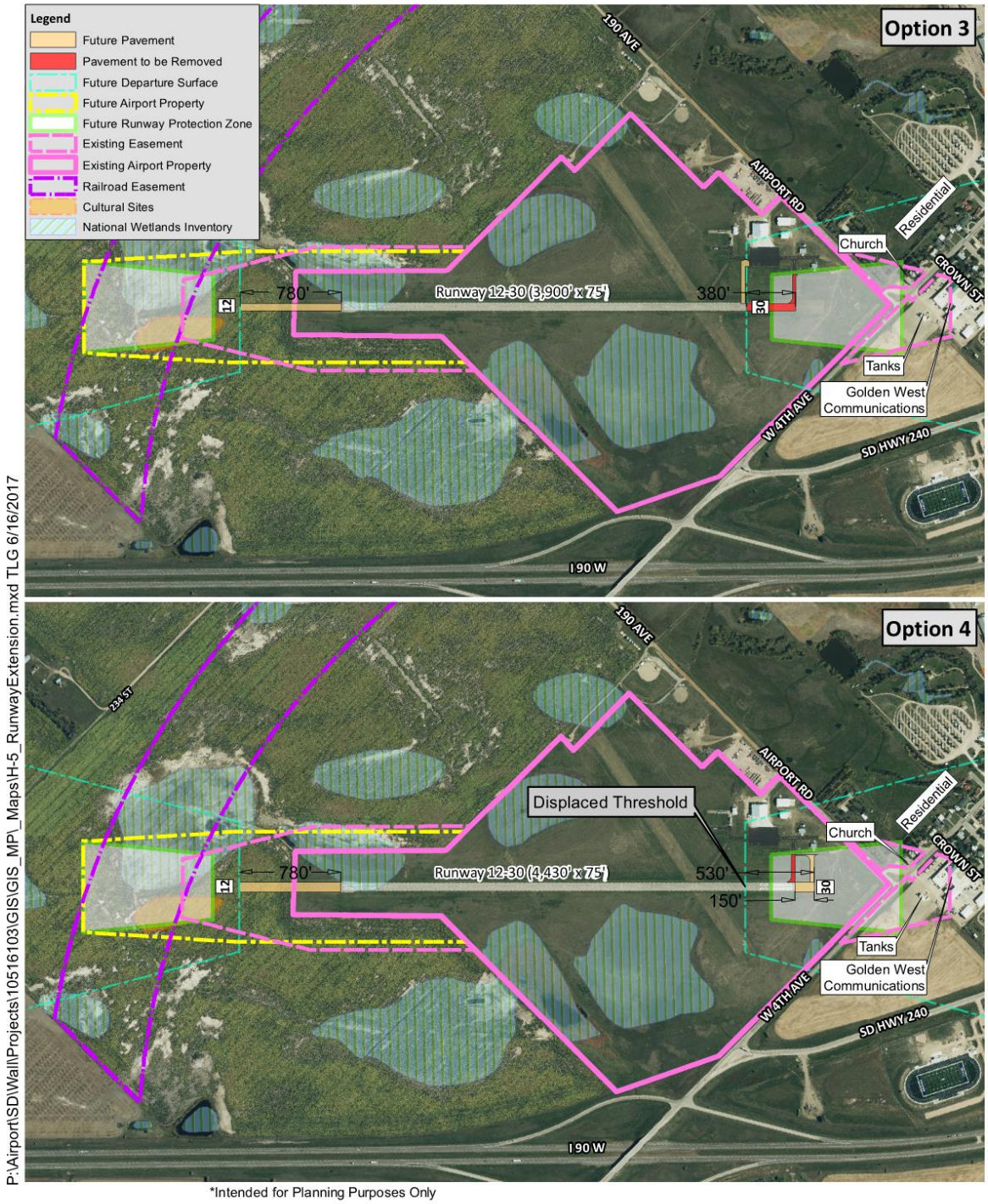
Advantages:

- No buildings inside the RPZ
- Takeoff length of 4430' is available
- Landing length is 3900'

Disadvantages:

- Change in Runway 12 Departure Surface affects 3 hangars at the airport and development areas to the east
- Two roads and a Church parking lot remain in the RPZ

Exhibit H-6 – Options 3 and 4



Option 5 - Relocate Runway 30 Threshold 780' Northwest (see Exhibit H-11 Detailed RPZ)

Airfield Construction

- Construct 780 foot runway extension northwest of Runway 12 existing threshold
- Relocate Runway 30 threshold 780 feet northwest
- Runway 75' x 3500'

Uses Inside the Runway 30 RPZ

- No incompatible land uses

Off Airport Construction

- None

Estimated Cost – Total = $3.90 m

- Reconstruct and Extend Runway 12 (40.7 acres -- 27.5 fee & 13.2 easement)
- Relocate Runway 30

Advantages:

- No incompatible land uses inside RPZ, including roads

Disadvantages:

- Change in Runway 12 Departure Surface affects all 5 hangars at the airport and development areas to the east
- Only 3500' available for takeoff or landing

Option 6 - Displace Runway 30 Threshold 780' Northwest

Airfield Construction

- Construct 780 foot runway extension northwest of Runway 12 existing threshold
- Displace Runway 30 landing threshold 780 feet northwest
- Extend Runway 30 threshold 150 feet southeast
- Runway 75' x 4430' with 930' displacement

Uses Inside the Runway 30 RPZ

- No incompatible land uses

Off Airport Construction

- None

Estimated Cost – Total = $4.44 m

- Reconstruct and Extend Runway 12 (40.7 acres -- 27.5 fee & 13.2 easement)
- Extend and Displace Runway 30

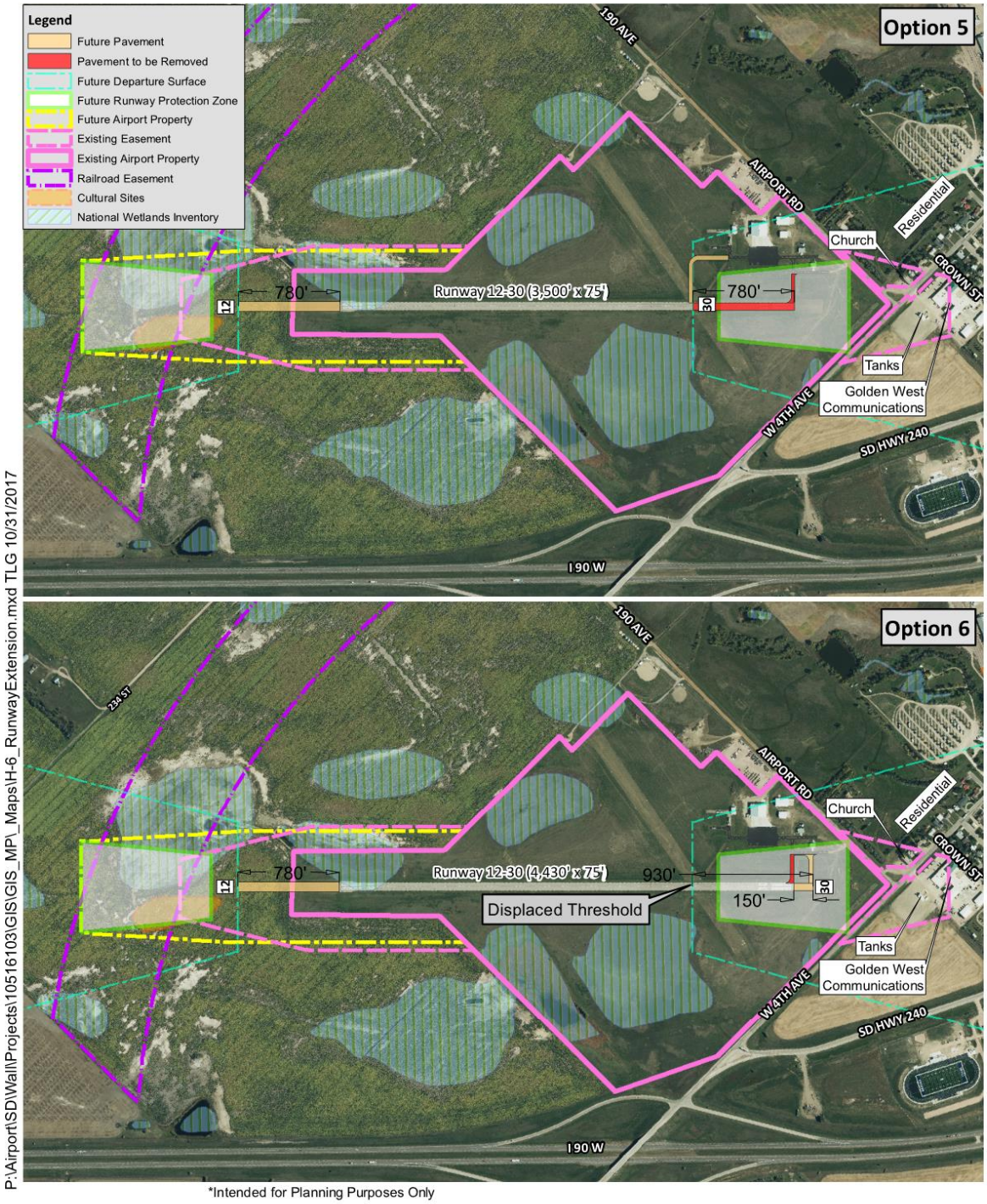
Advantages:

- No incompatible land uses inside RPZ, including roads
- Takeoff length of 4430' available for Runway 30

Disadvantages:

- Change in Runway 12 Departure Surface affects all 5 hangars at the airport and development areas to the east
- Only 3500' available for takeoff on Runway 12
- Only 3500' available for landing on Runway 30

Exhibit H-7 – Options 5 and 6



Option 7 - Relocate Runway 30 Threshold 150' Northwest & Remove Incompatible Uses in RPZ

Airfield Construction

- Construct 780 foot runway extension northwest of Runway 12 existing threshold
- Relocate Runway 30 threshold 150 feet northwest
- Runway 75' x 4130'

Uses Inside the Runway 30 RPZ

- No incompatible land uses

Off Airport Construction

- 820 feet Airport Road realigned to connect to 4th Avenue at Crown Street
- 1400 feet of 4th Avenue realigned to connect to Crown Street, south of 5th Avenue (south of Golden West Communications)
- Relocate 8 above ground fuel tanks
- Relocate church with basement
- Relocate 4 single family residential homes

Estimated Cost – Total = $8.87 m

- Reconstruct and Extend Runway 12 (40.7 acres fee & easement)
- Relocate Runway 30
- Property for Runway 30 RPZ (10.5 acres)
- Relocate Fuel Tanks
- Relocate Church
- Relocate 4 houses
- Realign Airport Road (2 acres)
- Realign 4th Avenue (5.3 acres)

Advantages:

- No incompatible land uses, including roads except for Golden West Communications
- Departure Surface for Runway 12 affects only 2 existing hangars

Disadvantages:

- Area to develop additional general aviation facilities would be confined, and may limit ultimate development of the airport.

Option 8 - Leave Runway 30 Threshold and Remove Incompatible Uses in RPZ

Airfield Construction

- Construct 780 foot runway extension northwest of Runway 12 existing threshold
- Runway 75' x 4280'

Uses Inside the Runway 30 RPZ

- No incompatible land uses including roads except for 80 feet of Crown Street in the outside corner of the RPZ

Off Airport Construction

- 820 feet of Airport Road connecting to 4th Avenue at Crown Street
- 1400 feet of 4th Avenue connecting to Crown Street, south of 5th Avenue (south of Golden West Communications)
- Relocate Golden West Communications
- Relocate church with basement
- Relocate 4 single family residential homes
- Relocate 8 above ground fuel tanks

Estimated Cost – Total = $21.56 m

- Reconstruct and Extend Runway 12 (40.7 acres fee & easement)
- Property for Runway 30 RPZ (13.3 acres)
- Relocate Fuel Tanks
- Relocate Church
- Relocate 4 houses
- Relocate Golden West Communications
- Realign Airport Road (2 acres)
- Realign 4th Avenue (5.3 acres)

Advantages:

- No incompatible land uses inside RPZ including roads
- Takeoff and landing length of 4,280' is available

Disadvantages:

- Most expensive of any option
- Realignment of 4th Avenue will significantly affect the local traffic pattern for the west part of the City

Exhibit H-8 – Options 7 and 8

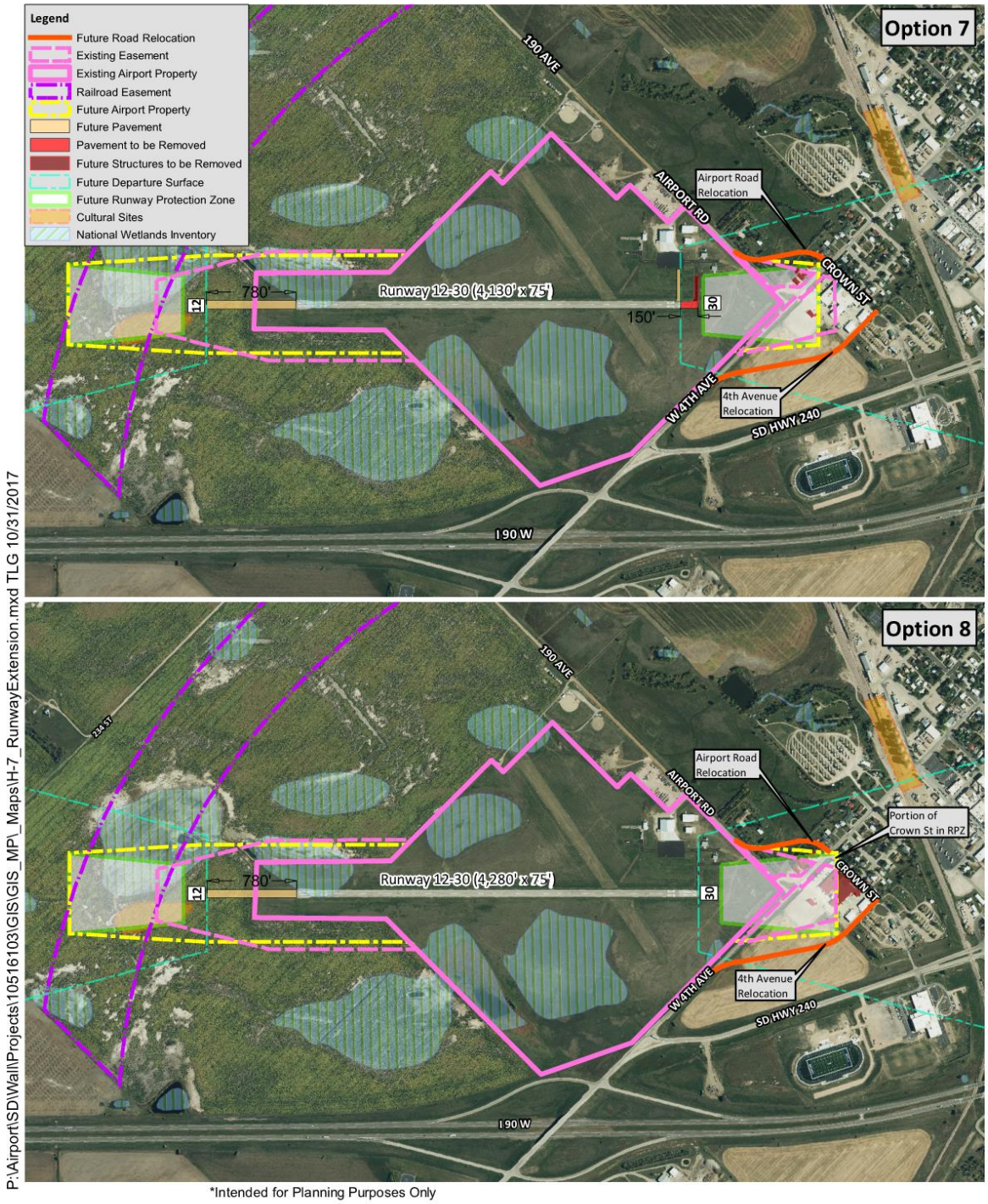


Exhibit H-9 – Detailed RPZ Option 2

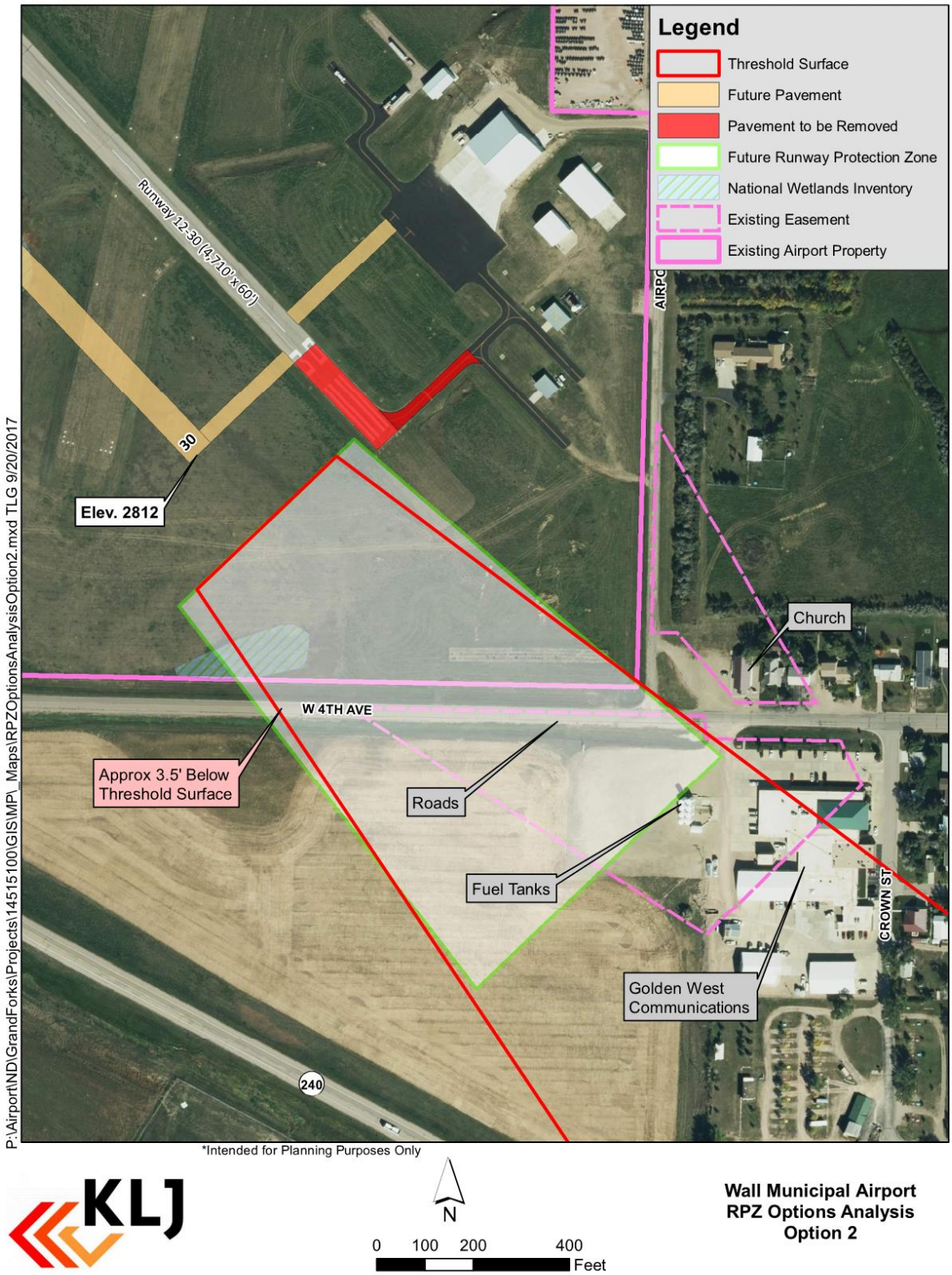


Exhibit H-10 – Detailed RPZ Option 4 (same threshold as Option 3)

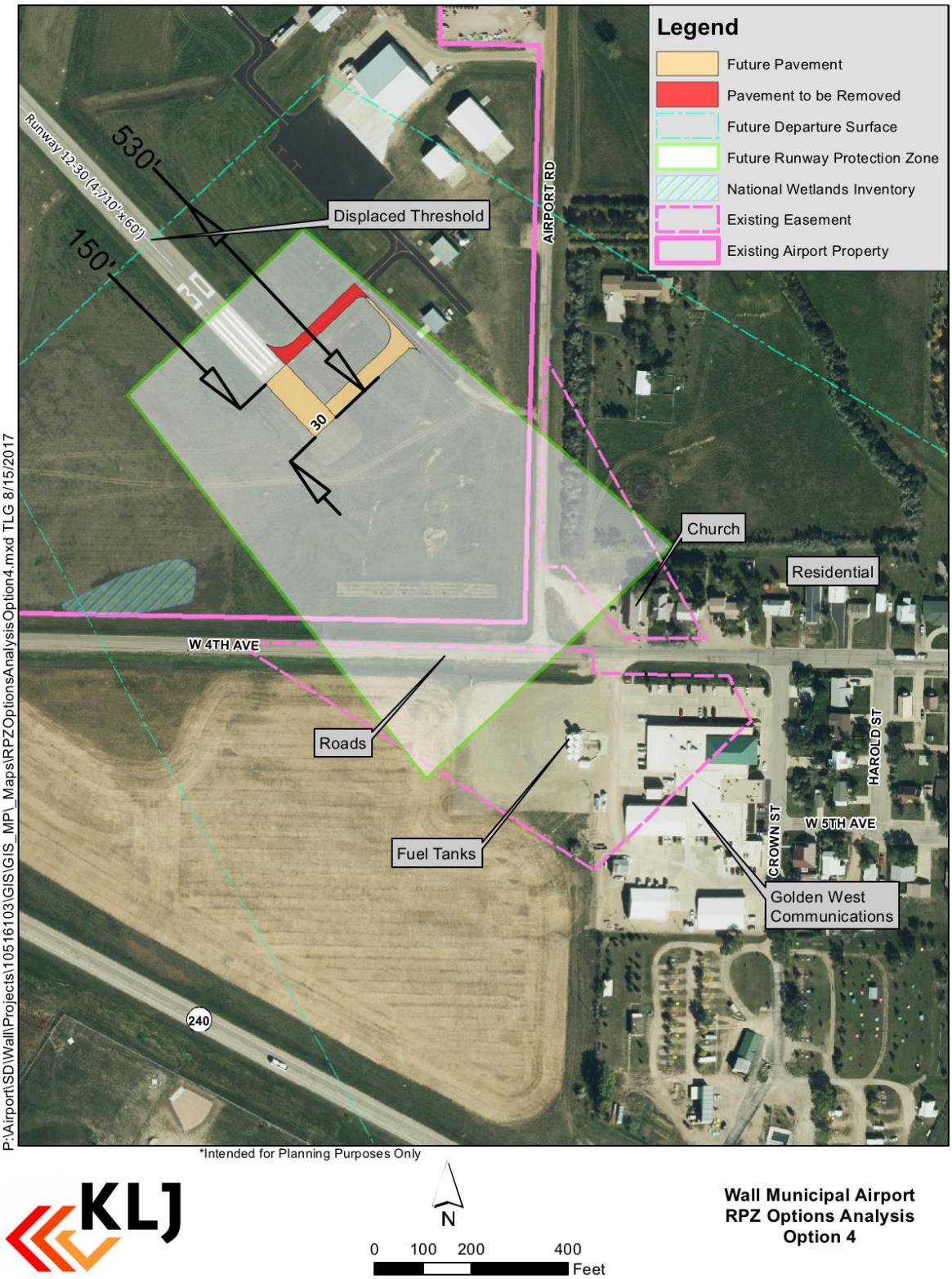
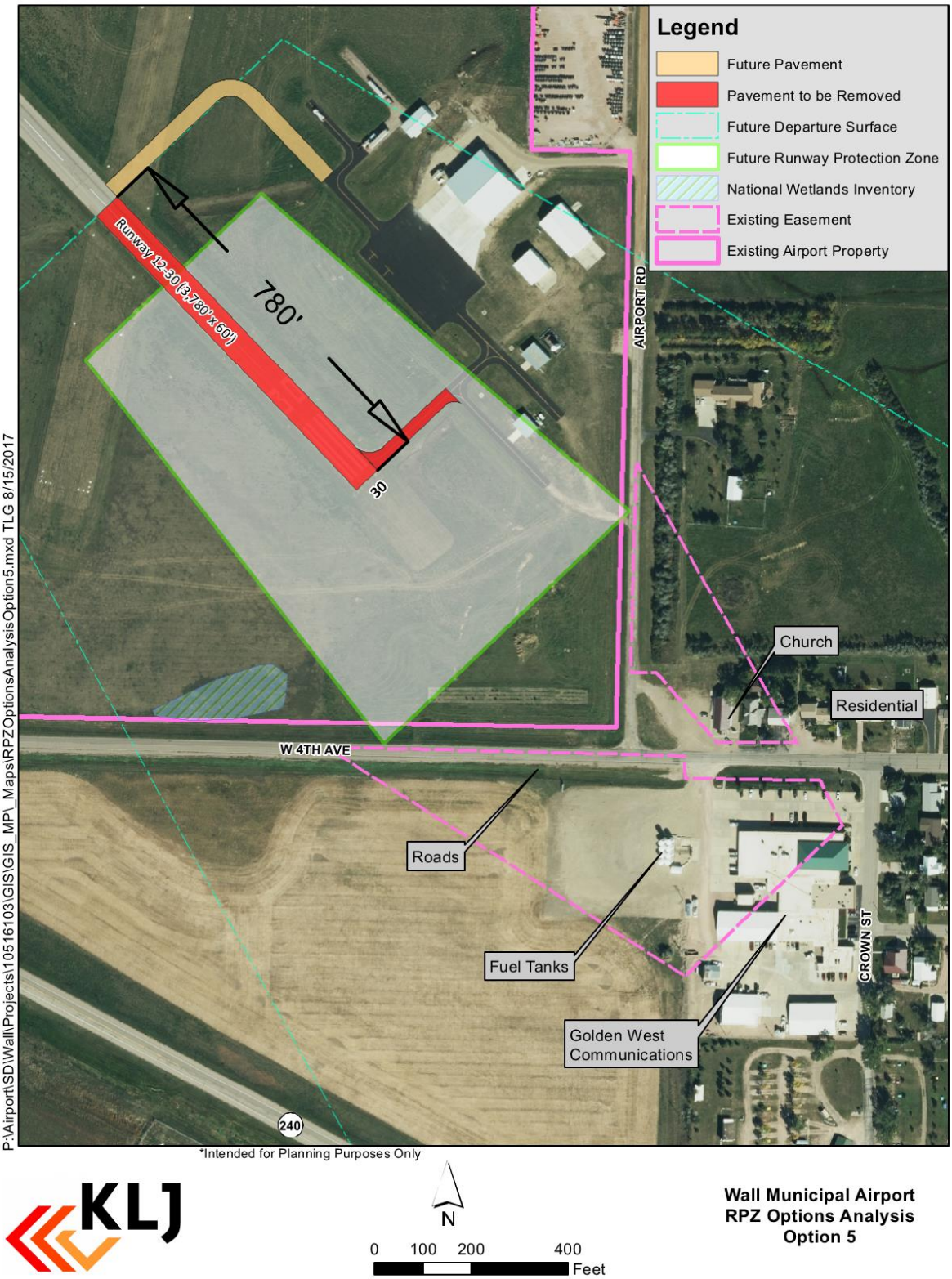


Exhibit H-11 – Detailed RPZ Option 5 (same threshold as Option 6)



Vehicle and Aircraft Operations Information for Options 2, 3, and 4

Options 3 and 4 each include leaving two roads, Airport Road and 4th Avenue, and a portion of the Church parking lot inside the RPZ. Option 2 leaves only a portion of 4th Avenue inside the RPZ. Since these remain, an analysis was completed regarding the probability of an accident based on aircraft operations and vehicle/pedestrian activity.

Aircraft Operations

Yearly operations based on the recently approved forecasts from the Airport Master Plan were used in order to determine Yearly Aircraft Operations and Peak Hour for the Airport. KLJ then determined the percentage of usage for runway end based on the previous 10 year wind data (wind rose data which is shown on the ALP). Runway usage per wind data is shown as follows (totals 100 percent):

Runway 12—48.0%
Runway 18—1.0%
Runway 30—49.0%
Runway 36—2.0%

The Runway usage percentage for Runway 30 was then applied to the Peak Hour Operations in order to determine the number of operations that could be taking place during an hour. Finally, KLJ estimated that it takes a Cessna 182 traveling at 70 knots approximately 0.375 seconds to fly through the road which is in the RPZ. This aircraft was chosen as it represents one of the slower moving aircraft on approach and therefore represents the worst case scenario for aircraft on approach.

Vehicle Traffic

4th Avenue is a paved two lane road oriented east-west. Airport Road is a paved two-lane road oriented north-south and terminating at 4th Avenue. The South Dakota Department of Transportation provides traffic counts for 4th Avenue, but none for Airport Road. The traffic counts from 2012 showed 922 vehicles using this road on an average day. It was assumed that 50 vehicles use Airport Road on an average day based off discussions with airport management. Neither of these roads experience traffic back-ups. There is a stop sign on Airport Road at 4th Avenue but no traffic control devices on 4th Avenue to slow or stop traffic.

Table H-1 Breakout of Aircraft, Vehicle, & Pedestrian Traffic for Runway 30 RPZ identifies the amount of operations and vehicle traffic which could potentially occur in the RPZ off of Runway 30 during an average day.

Table H-1 Breakout of Aircraft, Vehicle, & Pedestrian Traffic for Runway 30 RPZ

	2015	2020	2025	2030	2035
Yearly Aircraft Operations	3,746	3,890	3,988	4,095	4,208
Peak Hour Operations	2.8	2.9	2.9	3.0	3.1
Peak Hour Operations - Runway 30	2.7	2.8	2.8	2.9	3.0
Average Daily Vehicles - 4th Avenue	922	974	1,029	1,087	1,148
Average Hourly Vehicles - 4th Avenue	58	61	64	68	72
Average Daily Vehicles - Airport Road	50	53	56	59	62
Average Hourly Vehicles - Airport Road	3.1	3.3	3.5	3.7	3.9
Persons per hour in Church Parking Lot (Parking lot used 8:30 to 12:00 Sundays with 200 persons in/out for 15 minutes per week)	0.296	0.312	0.376	0.396	0.418
Persons per hour in RPZ (25% of parking lot inside RPZ)	0.074	0.078	0.094	0.098	0.104

Source: SD DOT Traffic Counts of 992 in 2012 at 4th Avenue and Myrtle Street (East of Airport 3 blocks); Hourly Vehicles based on 16 hour day

Table H-2 General Aviation Aircraft Accident Rates for Runway 30 depicts the probability of an aircraft incident occurring based on the conditions shown in **Table H-1**. **Tables H-3 Vehicle Activity for 4th Avenue in the Runway 30 RPZ, H-4 Vehicle Activity for Airport Road in the Runway 30 RPZ,**

and **H-5 Pedestrian Activity for Church Parking Lot in the Runway 30 RPZ** depict the probability of a vehicle or person being within the RPZ on an hourly basis. **Table H-6 Total Accident Potential in the Runway 30 RPZ** summarizes the total accident potential with the data from **Tables H-2, H-3, H-4 and H-5**. In the existing case throughout the planning period the probability of an incident is within the thresholds that the airport considers safe.

Table H-2 General Aviation Aircraft Accident Rates for Runway 30

	2015	2020	2025	2030	2035
Probability of Aircraft Operation over RPZ Object	0.0128%	0.0133%	0.0133%	0.0137%	0.0142%
Probability of an Aircraft Accident per Flight Hour	0.0065%	0.0065%	0.0065%	0.0065%	0.0065%
Probability of an Aircraft Accident over RPZ Object	0.00000083%	0.00000086%	0.00000086%	0.00000089%	0.00000092%
Odds of Incident (:1)	120,307,691	116,010,988	116,010,988	112,010,609	108,276,922

Source: http://www.ntsb.gov/investigations/data/pages/aviation_stats.aspx

Table H-3 Vehicle Activity Rates for 4th Avenue in the Runway 30 RPZ

	2015	2020	2025	2030	2035
Probability of a Car on Road in RPZ	35.4444%	37.2778%	39.1111%	41.5556%	44.0000%
Probability of Aircraft Accident in RPZ when Car in RPZ	0.00000083%	0.00000086%	0.00000086%	0.00000089%	0.00000092%
Odds of Incident (:1)	339,426,090	311,206,825	296,619,005	269,544,248	246,083,915

Source: KLJ Analysis

Table H-4 Vehicle Activity Rates for Airport Road in the Runway 30 RPZ

	2015	2020	2025	2030	2035
Probability of a Car on Road in RPZ	1.8944%	2.0167%	2.1389%	2.2611%	2.3833%
Probability of an Aircraft Accident in RPZ when Car in RPZ	0.000000015%	0.000000017%	0.000000018%	0.000000020%	0.000000022%
Odds of Incident (:1)	6,350,552,672	5,752,611,024	5,423,890,394	4,953,786,194	4,543,087,681

Source: KLJ Analysis

Table H-5 Pedestrian Activity for Church Parking Lot in the Runway 30 RPZ

	2015	2020	2025	2030	2035
Probability of a Persons in the RPZ	5.709E-09%	6.018E-09%	7.253E-09%	7.562E-09%	8.025E-09%
Probability of an Aircraft Accident in RPZ when Person in RPZ	4.746E -17%	5.188E-17%	6.252E-17%	6.751E-17%	7.411E-17%
Odds of Incident (:1)	21,070 Trillion	19,275 Trillion	15,994 Trillion	14,812 Trillion	13,492 Trillion

Source: KLJ Analysis

Table H-6 Total Accident Potential in RPZ

	2015	2020	2025	2030	2035
Probability of Aircraft Accident with Car on 4th Avenue RPZ	0.00000083%	0.00000086%	0.00000086%	0.00000089%	0.00000092%
Probability of Aircraft Accident with Car on Airport Road RPZ	0.000000015%	0.000000017%	0.000000018%	0.000000020%	0.000000022%
Probability of Aircraft Accident with Person in Parking Lot RPZ	4.746E -17%	5.188E-17%	6.252E-17%	6.751E-17%	7.411E-17%
Total Probability of Aircraft Accident in All RPZ Subject Areas	2.240E-09%	2.438E-09%	2.607E-09%	2.821E-09%	3.042E-09%
Odds of Incident (:1)	322,204,794	295,235,086	281,238,755	255,634,708	233,439,283

Source: KLJ Analysis

Use of Declared Distances

Declared distances are the distances the airport owner declares available for use in meeting an airplane's takeoff run (TORA), takeoff distance (TODA), accelerate-stop distance (ASDA), and landing distance (LDA) requirements. For the Wall Municipal Airport, it has been determined it will be necessary to make use of declared distances to achieve the maximum runway length for takeoff. The proposed declared distances for Wall would be applicable for Options 4 and 6. For example the declared distances for Option 4 are show in **Table H-7**.

Table H-7 Declared Distances for Runway 12-30

Declared Distance	Runway 12	Runway 30
TORA	3,900	4,430
TODA	3,900	4,430
ASDA	4,430	4,430
LDA	4,430	3,900

In regards to the use of declared distances, there is an ongoing challenge of making pilots aware that the pavement they see may not necessarily be the pavement available to them at a non-towered airport. Landing distance available is apparent because of displaced threshold markings. Take off distances do not have markings that inform a pilot of a shorter distance available than the departure end of the pavement. The Airport Facility Directory would also have the TORA, TODA, ASDA and LDA for both runway ends.

	Runway 30	Runway 12
TORA	4,430’	3,900’
TODA	4,430’	3,900’
ASDA	4,430’	4,430’
LDA	3,900’	4,430’

Information Sign on Main Apron (SE Side)

Signage will be placed on the main apron showing both Runway 12 and 30 TORA, TODA, ASDA and LDA. The signage examples here are what the signs would look like for Option 4. Frangible signage will also be placed near the hold position marking but outside of the mandatory hold signs which indicated TORA, TODA, ASDA and LDA.

	Runway 12
TORA	3,900’
TODA	3,900’
ASDA	4,430’
LDA	4,430’

Information Sign at Runway 12 Hold Position

Recommendation

After analyzing the options, it is recommended that Options 2 and 4 should be considered as the only viable options.

Option 1 should be dismissed because incompatible uses remain in the Runway 30 RPZ and penetrations would exist for a 1-mile visibility Instrument Approach Procedure for Runway 30.

Option 3 should be dismissed because the runway length would be only 3,900’ and limit the critical design aircraft to 67% of payload.

Option 5 and 6 should be dismissed because all the existing hangars and buildings would be penetrations to the Runway 12 departure surface.

Option 7 and 8 should be dismissed because the cost of relocating the roads and buildings are not necessary in comparison to viable Options 2 or 4.

FAA Determination

On March 9, 2018, the FAA completed their review and provided an email response as follows:

> Thank for you submitting the Runway Protection Zone (RPZ) analysis for Wall Municipal Airport. The FAA has reviewed the documentation and concur that the sponsor completed a sufficient level of analysis in accordance with FAA RPZ Interim Guidance.
>
> The triggering event for this RPZ Alternatives Analysis is the proposed project identified in the ongoing Master Plan Update to extend Runway 12/30 and implement declared distances. The preferred alternative is to displace the Runway 30 landing threshold 380 feet, extend Runway 30 150 feet for takeoff, and extend Runway 12 by780 feet. This would provide sufficient length for the future critical design aircraft - the Air Tractor 802.
>
> Currently, within the Runway 30 RPZ there are two roadways, a church and parking lot, multiple above ground fuel tanks, three residential homes, and an office building and parking lot. Displacing the Runway 30 in the preferred alternative will remove all buildings/structures from the RPZ. Only the two roadways and a portion of the Church parking lot would remain within the proposed RPZ.
>
> The Wyoming Dakota Railroad owns a large amount of the property to the north and west of the airport and intends on building a bypass rail line, but the timeframe is not currently known. The proposed Runway 12 RPZ will extend over the Railroad property and the proposed rail line. The railroad is considering selling the property and retaining an easement on the corridor to be able to build the bypass rail line in the future. The Airport sponsor should work with the railroad to the extent feasible if/when the railroad initiates development of the new line to discuss alternatives and mitigation efforts.
>
> We would recommend that the master plan discussion provide a more robust analysis of the Runway 12 RPZ Determination section on why it's difficult to acquire RR owned property. The current wording leaves it up to the reader to go and find the reference materials that are footnoted without really explaining why they're applicable or what section is applicable. There's also a legal digest #3 on the subject that further expands on this area. The should include more clear wording on how the research has found that it's difficult for local municipalities to use state eminent domain laws against RR properties because the RR's fall under federal law and the Interstate Commerce Commission Termination Act as well as under the supervision of the Surface Transportation Board (STB), and that it's difficult to prove that the eminent domain action would not interfere unreasonably with the RR's operations. The Chicago case should also be explained more as to why future uses by the RR are taken into consideration even if the RR owned land is currently vacant. As the event of the railroad being built is a low risk, but having the research done now and provided in the master plan could provide the sponsor with the information if needed in the future.
>
> Para from the RPZ Analysis on RR land:
>
> > Fee acquisition of the Runway 12 RPZ land for airport purposes is not feasible recognizing the railroad will retain ownership for a potential rail line. A review of use of Eminent Domain against railroads was completed[4]. It is clear that railroads operate with the capabilities of Eminent Domain extended from State's rights of eminent domain because use of property by the railroads is considered fundamentally public.
> >
> > In the situation for Wall, if the City were to condemn the Railroad easement for airport purposes, the railroad could contend that this action would interfere with future railroad operations.[5] The City can instead complete fee acquisition of the surrounding property and execute a long-term lease for the railroad corridor and secure protection of the RPZ and approaches from incompatible uses. This allows a future rail line to operate without ever impeding the airport.
>
> Finally, we want to be very clear that FAA concurrence with the RPZ analysis is concurrence that the Airport Sponsor has reviewed a reasonable number of alternatives, not that the probability calculations of an incident are supported by the FAA.
>
> /s/ Sandy DePottey, FAA Program manager

Per this direction from the FAA, Option 4 from the RPZ Analysis will be pursued and text will be added to the implementation section of this Master Plan document that in the event the railroad does at some point construct a rail line in the Runway 12 RPZ that sufficient precautions are taken to ensure the functionality of the runway and/or adjust the Runway 12 threshold to maintain safe approaches.

Table H-8 Summary of Alternatives

Item	Option 1	Option 2 (Recommended)	Option 3	Option 4 (Recommended)
Description	Extend 12 – Maintain 30 **75' x 4280'**	New Runway 12-30 **75' x 4150'**	Extend 12 – Relocate 30~380' **75' x 3900'**	Extend 12 – Extend 30~150' – Displace 30~530' **75' x 4430'** (530' Displacement)
Airfield Const.	Reconstruct and Widen Runway; Extend Runway 12 780' NW	Construct New Runway 12-30 Modify and Extend Existing Runway 12-30 to Full Parallel Taxiway	Reconstruct and Widen Runway; Extend Runway 12 780' NW Relocate Runway 30 380' NW	Reconstruct and Widen Runway; Extend Runway 12 780' NW Extend Runway 30 150' SE Displace Runway 30 Threshold 530'
Land Acquisition	43 acres fee & easement	59.2 acres fee & easement	40.7 acres fee & easement	40.7 acres fee and easement
Uses in RPZ	400 feet of Airport Road 930 feet of 4th Avenue Evangelical Free Church Two Single Family homes & 10% of One additional home 8 Above Ground Fuel Tanks Golden West Communications Offices	30 feet of Airport Road 860 feet of 4th Avenue	450 feet of Airport Road 460 feet of 4th Avenue 400 square yards of church parking lot	450 feet of Airport Road 460 feet of 4th Avenue 400 square yards of church parking lot
Off-Airport Const.	none	Relocate 8 above ground fuel tanks	none	none
Est. Cost	$4.25 m	$9.15 m	$4.09 m	$4.59 m
Advantages	No loss of runway length No cost to make changes No change in Runway 12 departure surface and therefore no impact to airport hangars	Current Runway 12-30 becomes a full parallel taxiway Runway 12 departure surface moves 300 feet southwest No impact to airport hangars Only 4th Avenue remains in RPZ	No buildings inside the RPZ	No buildings inside the RPZ Takeoff length of 4710' is available Landing length is 4180'
Disadvantages	All incompatible uses stay inside the expanded RPZ	Wetlands SW of current Runway Substantial fill work needed to bring ground elevation up to current runway and crosswind elevation	Change in Runway 12 Departure Surface affects 3 hangars at the airport and development areas to the east Two roads and a portion of Church parking lot remains in the RPZ	Change in Runway 12 Departure Surface affects 3 hangars at the airport and development areas to the east Two roads and a portion of Church parking lot remains in the RPZ
Recommendation	No	Yes – Viable Option	No	Yes – Viable Option

Source: KLJ Analysis

Table H-8 Summary of Alternatives (Cont.)

Item	Option 5	Option 6	Option 7	Option 8
Description	Extend 12 – Relocate 30~780' **75' x 3500'**	Extend 12 – Extend 30~150' – Displace 30~930' **75' x 4430'** (930' Displacement)	Extend 12 – Relocate 30~150' – Clear Incompatible Uses from RPZ **75' x 4130'**	Extend 12 – Clear Incompatible Uses from RPZ **75' x 4280'**
Airfield Const.	Reconstruct and Widen Runway; Extend Runway 12 780' NW Relocate Runway 30 780' NW	Reconstruct and Widen Runway; Extend Runway 12 780' NW Extend Runway 30 150' SE Displace Runway 30 Threshold 990'	Reconstruct and Widen Runway; Extend Runway 12 780' NW Relocate Runway 30 Threshold 150' NW	Reconstruct and Widen Runway; Extend Runway 12 780' NW
Land Acquisition	40.7 acres fee and easement	40.7 acres fee and easement	58.5 acres fee and easement	61.3 acres fee and easement
Uses in RPZ	none	none	none	None except 80 feet of Crown Street in outer corner of RPZ
Off-Airport Const.	none	none	780 feet Airport Road realigned to connect to 4th Avenue just west of the intersection with Crown Street 1400 feet of 4th Avenue realigned to connect to Crown Street, south of 5th Avenue (south of Golden West Communications) Relocate 8 above ground fuel tanks Relocate church with basement Relocate 3 single family residential homes	820 feet of Airport Road connecting to 4th Avenue at Crown Street 1400 feet of 4th Avenue connecting to Crown Street, south of 5th Avenue (south of Golden West Communications) Relocate Golden West Communications Relocate church with basement Relocate 4 single family residential homes Relocate 8 above ground fuel tanks
Est. Cost	$3.90 m	$4.44 m	$8.87 m	$21.56 m
Advantages	No incompatible land uses inside RPZ, including roads	No incompatible land uses inside RPZ, including roads Takeoff length of 4710' available for Runway 30	No incompatible land uses, including roads except for Golden West Communications Departure Surface for Runway 12 affects only 2 existing hangars	No incompatible land uses inside RPZ including roads Takeoff and landing length of 4,560' is available
Disadvantages	Change in Runway 12 Departure Surface affects all 5 hangars at the airport and development areas to the east Only 3500' available for takeoff or landing	Change in Runway 12 Departure Surface affects all 5 hangars at the airport and development areas to the east Only 3500' available for landing on Runway 30 Only 3500' available for takeoff on Runway 12	Very expensive option Area to develop additional general aviation facilities would be confined, and may limit ultimate development of the airport	Most expensive of any option Realignment of 4th Avenue will significantly affect the local traffic pattern for the west part of the City
Recommendation	No	No	No	No

Source: KLJ Analysis