ENGINEERING, REIMAGINED

AIRPORT MASTER PLAN
NARRATIVE REPORT

Rapid City Regional Airport (RAP)

Rapid City, South Dakota

2022

This project was funded by the City of Rapid City and South Dakota DOT Office of Air, Rail and Transit.

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CHAPTER 1: INTRODUCTION

Purpose and Scope

The information presented in this report represents the findings for the 2020 Rapid City Regional Targeted Airport Master Plan Update study prepared for the City of Rapid City, the airport owner/sponsor. 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 South Dakota Department of Transportation Office of Aeronautics.

This targeted Master Plan update for the Rapid City Regional Airport will identify development needs to accommodate existing and future aviation demands given the substantial growth in activity and operations since completion of the 2014 Master Plan. 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 surfaced since the last Master Plan study was initiated in 2014. *Specifically, annual enplanements for 2019 exceeded the forecasted 2033 enplanements from the 2014 Master Plan.*

The airport sponsor and KLJ developed the scope for the project in cooperation with FAA Airports District Office and South Dakota officials to identify the specific needs and objectives of the airport. 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 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 November 2019 from the airport sponsor. The baseline project data is from inventory efforts completed in 2020 along with a baseline of existing airport information.

Background

Rapid City Regional Airport sits on 1,720 acres of land nine miles east of the Rapid City Central business district. The airport used to be collocated at the Rapid City Army Air Base that is now known as Ellsworth Air Force Base. Since 1950 the airport has been owned and operated by the City of Rapid City and has expanded to accommodate the aviation needs of the community and Black Hills region including a terminal building in 1989 with an expansion and renovation in 2013. The airport is the second largest in the state of South Dakota with 303,471 revenue passenger enplanements in calendar year 2018. As of November 2019, there were four domestic airlines flying to six non-stop destinations year-round and six additional non-stop seasonal destinations, but commercial air service continues to expand for the airport.

The community of Rapid City serves as a regional commercial and business hub for tourism hot spots and surrounding agricultural uses. Significant contributors to increases in airport use and passenger enplanements include thriving health care, finance and agriculture industries, along with travel related to Ellsworth AFB, and growth in tourism.

Planning Considerations & Objectives

Planning considerations for an airport master plan are elements that should be evaluated because they have the potential to affect airport facilities over the planning period. Some key considerations and objectives are listed below and referenced on **Figure 1-1**.

Runway Needs & Sustainable Airport Operations

The study will determine runway length and pavement strength requirements. The study will also evaluate alternatives to avoid or minimize closure of the primary runway when the existing runway requires reconstruction, including alternatives of relocating the runway.

General Aviation

General Aviation (GA) elements include facilities that serve aeronautical needs beyond needs for commercial airlines. This covers the movement of aircraft as well as parking, service, and storage of aircraft. The airfield is located atop of a low plateau, limiting areas where cost-effective development can occur. Maximizing available space in GA areas is an important element of this study.

Passenger Terminal Area

The terminal building was remodeled in 2013 with significant improvements for passenger screening, rental car and baggage claim areas. Even after the remodel there are several areas that need to be updated to meet current demands. The terminal building currently exceeds capacity thresholds at times for individual flights. This study will look at expansion options for the passenger concourse, baggage handling facilities, and aircraft parking aprons.

Rental Car Areas

Expansion options, including parking garage structures will be analyzed.

Air Cargo Space

Short and long-term options for cargo facilities will be analyzed as part of this study.

Landside Facilities

The study will analyze development areas for support facilities (e.g. snow removal equipment buildings) along with general locations for non-traditional revenue producing facilities (e.g. hotels) that are compatible with airport operations.

Figure 1-1 – Planning Considerations Map

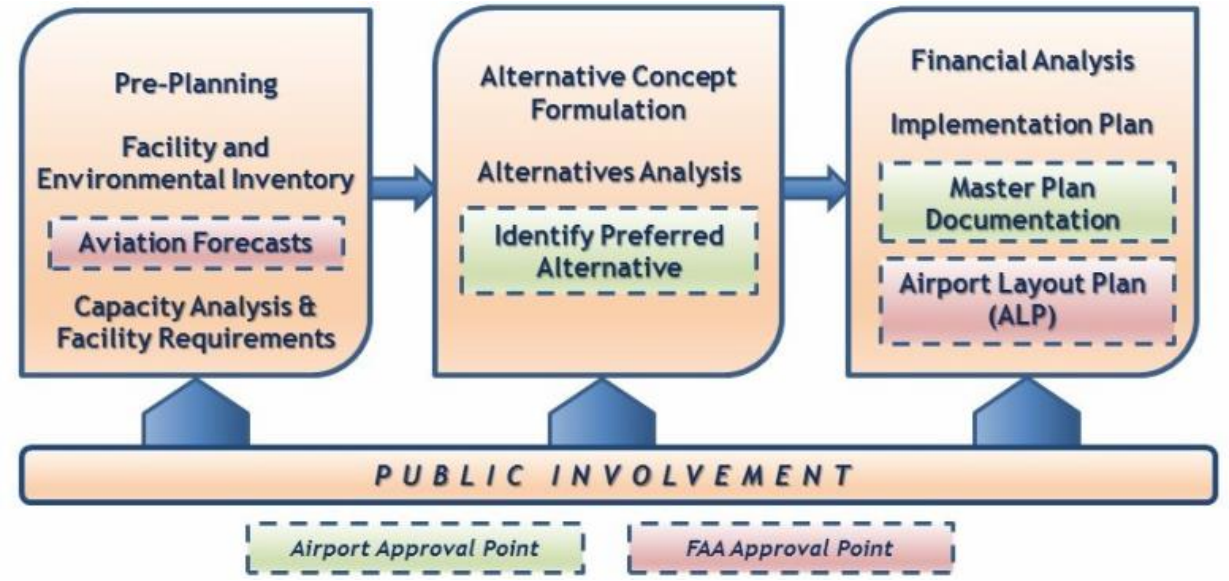
Master Plan Process

Guidelines for completing a Master Plan are set forth in FAA AC 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 RAP 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 utilizing data from an FAA Aeronautical Survey.
- **Environmental Inventory/Overview** – Identify environmental constraints and planning considerations that may affect airport development.
- **Forecast of Aviation Demand** – Using established forecasting methods, estimate current and project future airport activity for general aviation, air cargo, and passenger enplanements.
- **Demand 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.
- **Implementation Plan** – Provide a comprehensive plan for implementation of the preferred alternative including project triggers, sequencing, and cost estimates.
- **Airport Layout Plan (ALP)** – 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 1-2 – Airport Master Planning Process



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 following sections included in the narrative report:

- Chapter 1 – Introduction
- Chapter 2 – Facility & Environmental Inventory
- Chapter 3 – Aviation Activity Forecasts
- Chapter 4 – Facility Requirements
- Chapter 5 – Alternatives Analysis
- Chapter 6 – Implementation Plan
- Chapter 7 – Airport Layout Plan

In addition to the chapters, four appendices are anticipated for the Master Plan:

- Appendix A – Glossary of Terms
- Appendix B – Commercial Airports 101
- Appendix C – Meetings & Public Involvement
- Appendix D – Runway Length

Each chapter was prepared separately and distributed to the airport owner for review and comment. 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. Each approved final draft chapter was then published on the airport's website for public viewing.

The Master Plan Update was approved by the Rapid City Airport Board in June 2021. The ALP was submitted to the State and FAA for review and approval in January 2022.

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 study presents data in a sequential manner following the typical FAA planning process. Appendices are included to provide more detailed information on a subject. In addition, internet hyperlinks are included when appropriate 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 public. Stakeholders were broken into an advisory committee, a strategic partner committee and several focus groups. Public involvement provides valuable input to assist the airport owner in decision making and develop consensus on study conclusions.

See **Appendix C – Meetings & Public Involvement** for other information including copies of public involvement meeting agendas, attendees, presentations, and summaries.

COVID-19

In the midst of project planning, a pandemic swiftly spread throughout the world and prompted travel bans and restricted gatherings of large groups. These responses had a profound impact on the Rapid City Regional Airport and the surrounding community. The novel (new) coronavirus, identified as COVID-19, was first discovered in China and quickly spread beyond the region reaching the stage of a global pandemic within a few months. It is a respiratory virus that can be spread through droplets generated when an infected person comes in contact with another person. The virus can lead to severe medical complications such as pneumonia in both lungs, several organ complications and even death.

The initial reports of the virus started as a cluster of pneumonia cases in China in December 2019. By mid-January 2020, China reported its first death linked to the new virus and a few weeks later the first cases were reported outside of China in Thailand, Japan, South Korea and the United States. By the end of January, the World Health Organization (WHO) declared the outbreak a global public health emergency with more than 9,000 cases in 18 different countries. Early February the WHO announced the disease caused by the new coronavirus will be known by the official name of COVID-19.

As the infection spread to new territories, governments responded with travel bans, stay-at-home orders, and in some cases mandatory lockdowns. The sudden amount of cases stressed many medical systems with a shortage of supplies, increase of patients in hospitals and an exhaustion of medical workers. Many events, schools, public transportation, business, and major industries were forced to cancel or close, taking a toll on the economies and individual incomes. The travel restrictions along with

public fear of getting the virus, forced airlines to drastically cut the number of flights, resulting in significant profit loss. COVID-19 also spread to air traffic controllers which caused the shutdown of various towers and Air Route Traffic Control Centers (ARTCC). Many aircraft needed to be re-routed and flights were cancelled to avoid the closed airspace.

In response to the economic impact of a global pandemic, the federal government passed several pieces of legislation to provide economic relief for suffering industries, small business and individual Americans, and support the medical efforts to contain the spread. The aviation industry was included in the act that offered relief for losses related to the direct impact of COVID-19. These legislative actions were: 1) the Coronavirus Aid, Relief, and Economic Security Act (CARES Act) on March 27, 2020 with $10 billion in airport funding, 2) the Coronavirus Response and Relief Supplemental Appropriation Act (CRRSAA) on December 27, 2020 with $2 billion in airport funding, and 3) the American Rescue Plan Act of 2021 on March 11, 2021 with $8 billion in airport funding. The industry is responsible for more than 750,000 jobs directly and supports more than 10 million jobs indirectly.

COVID-19 has changed how and when project meetings are conducted. These aspects will be taken into consideration moving forward trying to construct reasonable results. More details about the unique impacts of COVID-19 will be discussed in Chapter 3.

Conclusion

This Airport Master Plan Update study for the Rapid City Regional Airport provides a guidance document to assist with capital improvement decision making to meet aviation demands over the 20-year planning period. 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 airport needs.

CHAPTER 2: FACILITY & ENVIRONMENTAL INVENTORY

Introduction

The Inventory chapter represents a summation of the existing Rapid City Regional Airport (RAP) facilities and environmental conditions. An on-site assessment was conducted in the spring of 2020 and supplemented with a comprehensive data collection effort that included feedback from a variety of stakeholders through on-site and remote meetings.

The information compiled during the inventory effort will be used to assess the existing facilities ability to meet the projected airport needs identified in subsequent sections of the Master Plan. This chapter includes the following elements:

Background

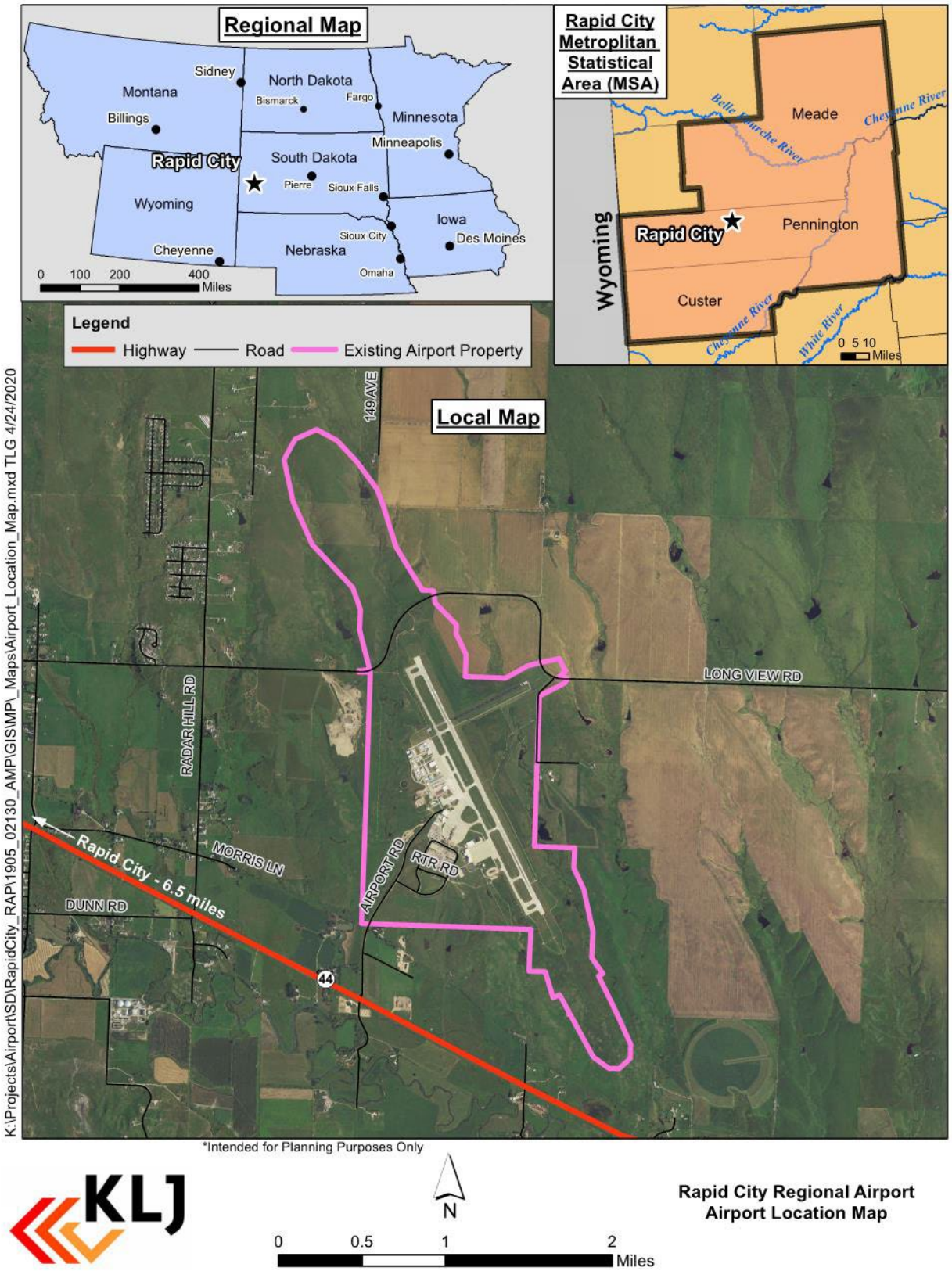
General

The Rapid City Regional Airport (FAA ID: RAP) is a commercial service airport located near the City of Rapid City in Pennington County on the western side of South Dakota. Since 1950, Rapid City Regional Airport has expanded to accommodate the aviation needs of western South Dakota and has helped support the social and economic vitality of the City of Rapid City and the Black Hills region. It is the second busiest airport in the state with 303,471 enplanements in 2018 and 342,794 enplanements in 2019.

Area Setting

The Rapid City Regional Airport sits on a plateau 3,203 feet above mean sea level (MSL). The airport is in an agricultural area just east of residential developments. The surrounding terrain is generally grassland with ravines, valleys, low plateaus and a ridge line to the north of the Airport. **Figure 2-1 – Airport Location Map** provides an overview of the Airport's location on local and regional levels.

Figure 2-1 – Airport Location Map



RAP is located nine miles east of Rapid City's central business district. The best direct access to and from the airport from downtown Rapid City is South Dakota Highway 44. Currently there is no direct access to the airport from Interstate I-90, so the best route from the interstate to RAP is through Box Elder, South Dakota. Box Elder is four miles north of the airport, ten miles by the local roads to I-90. Rapid City is the second largest municipality in South Dakota after Sioux Falls, South Dakota which is approximately 320 miles east.

Climate

Rapid City has a steppe climate. It experiences periods of arid weather in the summer, short springs and autumns, then cold and dry winters. In the winter, the warmest part of the state is the Black Hills area because of the warm "Chinook" winds and frequent sunny days. In the summer, the area has cooler temperatures than the rest of the state. Prevailing winds are northwest, averaging 11.2 miles per hour. The highest average temperature of the hottest month is recorded in July at 87.0 degrees Fahrenheit. The daily average temperature for July is 72.6 degrees Fahrenheit.

Airport Ownership & Management

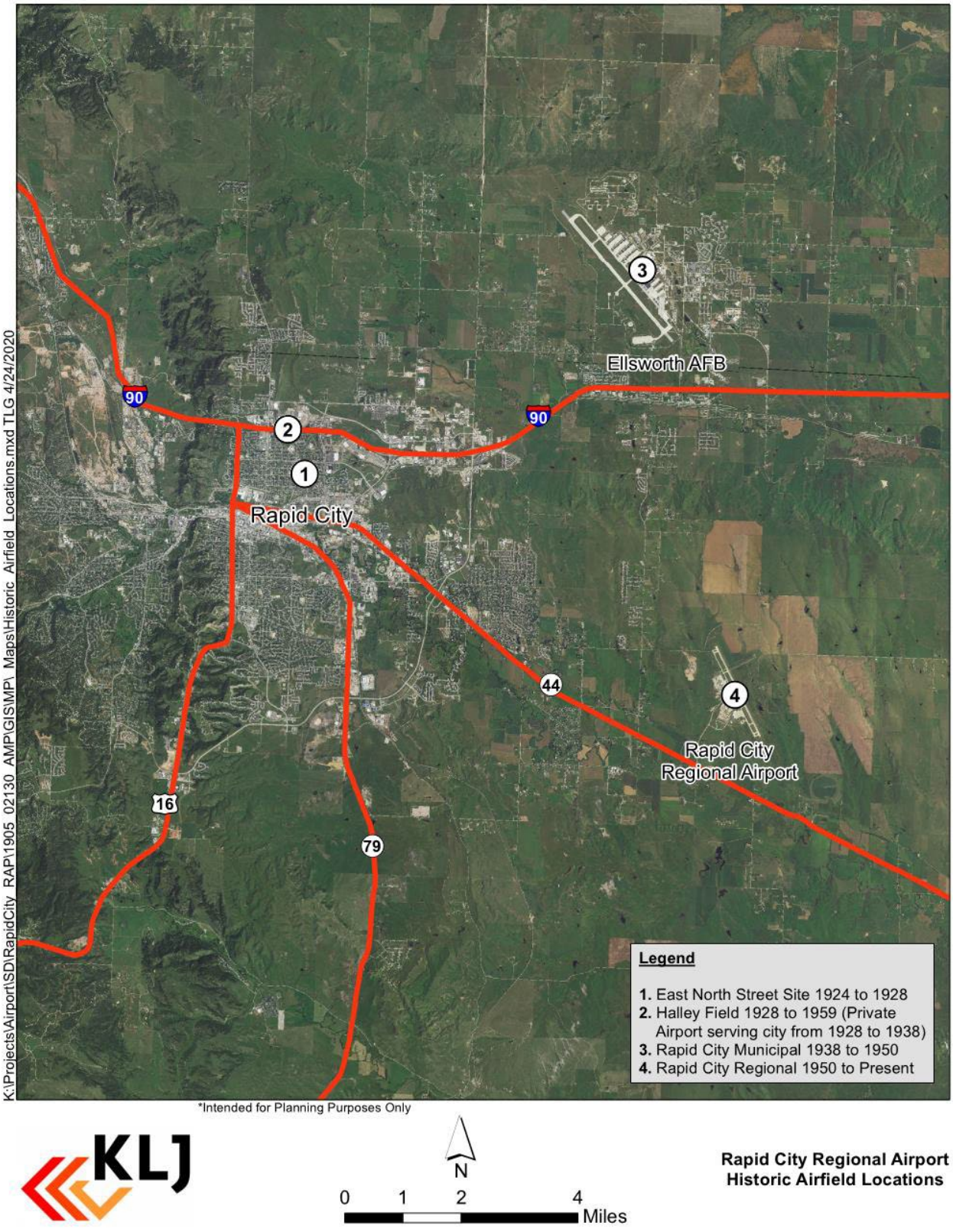
The City of Rapid City owns and operates the Rapid City Regional Airport. Policies for the airport are established by a five-member board of directors and carried out by the airport's executive team. The board is a semi-autonomous board which operates the airport on behalf of the City of Rapid City. These board members are responsible for the general oversight of the airport, can sign contracts on behalf of Rapid City and authorize the expenditure of funds needed to operate the airport. The board relies on staff members which include the Executive Director and two Deputy Directors who oversee Operations, Security, Maintenance and Facilities, and Finance and Administration. The executive team and staff are responsible for all aspects of maintenance, operations and administrative matters for daily operation of the airport.

Airport History

The municipal airport has been moved to four different locations since 1924. The first site was in operation until 1928, the second until 1938. In 1938, the U.S. Mail Service refused to use a privately-owned airport, so a new municipal airport was constructed at the current location of Ellsworth Air Force Base. The City of Rapid City offered this location to the Army Air Corp during World War II and the Rapid City Army Air Base was constructed there in 1942. Since there was significant use of the airfield by the Air Force, the city moved the municipal airport to the current location of Rapid City Regional Airport in 1950.

Figure 2-2 – Historic Airfield Locations shows the general location of each of Rapid City's four airport sites.

Figure 2-2 – Historic Airfield Locations



Airport Role & Design

RAP accommodates scheduled airline passenger service, air cargo, military operations and a wide array of general aviation activity. The airport is a part of the National Plan of Integrated Airport Systems (NPIAS) as classified by the Federal Aviation Administration (FAA) and is vital to the national air transportation system. According to FAA classification, the airport is classified as a non-hub primary commercial airport since it has more than 10,000 annual enplanements but less than 0.05 percent of the national total enplanements (approximately 450,000 in 2018). RAP is certificated under Federal Aviation Regulation (FAR) Part 139 guidelines as a Class I airport, to serve scheduled operations of large air carrier aircraft.

Airports are designed to accommodate aircraft up to a certain wingspan, tail height, and approach speed parameters. The prior (2014) Airport Master Plan determined that RAP had an FAA Airport Reference Code (ARC) of C-III using the Airbus A320. The Airbus A320 requires a Taxiway Design Group (TDG) of TDG-3. Critical design aircraft will be analyzed in greater detail in Chapter 3 and 4 of this Master Plan.

RAP is a part of the South Dakota State Aviation System Plan (SASP). The plan identifies the system's capability to meet current and future demand along with the conditions and needs of the 56 public-use airports in the state. The SASP provides in-depth data of airport facilities, planning documents, land use, airport services and activities, along with support roles.

Table 2-1 – Surrounding Airports provides a list of surrounding airports and **Table 2-2 – Airport Role & Design** summarizes airport role and design. See **Appendix B – Commercial Airports 101** for more details on FAA design classifications. More information on the design aircraft can be found in **Chapter 3: Aviation Activity Forecasts**.

Table 2-1 – Surrounding Airports

Airport Name	City	FAA ID	Location from Airport	Primary Runway	Based Aircraft	Approach Procedure
Rapid City Airport	Rapid City	RAP	--	8,701' x 150'	125	PI 200' ½ m
Ellsworth AFB	Box Elder	RCA	7 m N	13,497 x 300'	N/A	PI 200' ½ m
Sturgis Municipal	Sturgis	49B	40 m NE	5,100' x 75'	42	Visual
Custer County	Custer	CUT	50 m SE	5,489' x 60'	13	Visual
Custer State Park	Fairburn	3V0	45 m SE	4,000' x 50'	0	Visual
Black Hills Airport	Spearfish	SPF	57 m NE	6,401' x 75'	72	NPI 300' 1 m
Wall Municipal	Wall	6V4	55 m E	3,500' x 60'	14	Visual
Dan's Airport	Rapid City	4SD4	0.5 NW	2,400' x 100'	6	Visual

Table 2-2 – Airport Role & Design

Airport ID	State Classification	FAA Classification	ARC	TDG
RAP	Commercial	Primary	C-III	4
RCA	-	Military		
49B	Medium	Non-Primary	B-I	2
CUT	Medium	Non-Primary	A-I (s)	1B
3V0	Basic	-		
SPF	Large	Non-Primary	B-II (s)	2
6V4	Small	Non-Primary	B-I (s)	1A
4SD4	-	-	-	-

Airport Service Area

RAP serves the commercial air service needs of western South Dakota, southeastern Montana and northeastern Wyoming. The nearest commercial airports are Gillette-Campbell County Airport in Wyoming (a 2-hour drive west) with one airline and 21,136 enplanements in 2018 and Pierre Regional Airport in central South Dakota (a 2 ½ hour drive east) with one airline and 30,124 enplanements in 2018. RAP has year-round flights to major airport hubs that can connect people to domestic and international flights and is especially critical for the surrounding communities during the summer months (tourist season).

Airport Activity

Passenger Airlines

The airport has four commercial air carriers (or their regional subsidiaries) that include Allegiant, American, Delta, and United. There are six cities that one can fly direct to year-round, and six other destinations that are seasonal during the summer months when tourism is at its peak. For the latest full year of FAA records in 2018 the airport enplaned 303,471 passengers with 3,579 airline flights operated. In 2019, enplanements were 342,794, an increase more than ten percent from 2018. See **Chapter 3: Aviation Activity Forecasts** for more detailed information on existing and projected scheduled air service activity.

Air Cargo

Three cargo carriers operate out of RAP: Empire Airways (FedEx); Alpine Air (UPS & USPS); and Encore Air (occasional UPS). Empire Air operates the ATR-42 and Alpine Air operates Beech 1900's. In 2019 the airport handled over 3,677,311 pounds of cargo.

General Aviation

The Airport is home to one Fixed-Base Operator (FBO) WestJet Air Center, and seven Specialized Aviation Service Operators (SASO); Rapid Fuel, Advanced AeroTechnologies, Dale Aviation, Air Methods, Black Hills Life Flight, Rapid Avionics, Medical Air Rescue Company, and Plane Training.

Based Aircraft

From the 2019 South Dakota State Aviation System Plan (SDSASP), there are 125 based aircraft at RAP. This includes 94 single engine aircraft, 21 multi engine, along with four jets and five helicopters. The SDSASP also states that Rapid City Regional Airport reported the largest number of based aircraft of the commercial service airports.

Army National Guard

The South Dakota Army National Guard (SDARNG) is located southeast of the terminal (approximately 31 acres on a long-term lease). Their mission at the airport is medical transport and air cargo transport with Blackhawk and Lakota helicopters based at RAP. The SDARNG currently has a fuel farm and three buildings. A readiness center will be completed in spring of 2021 directly south of the current buildings.

The United States Forest Service Air Tanker Base

Directly southeast of the SDARNG is the United States Forest Service (USFS) facility which supports aerial firefighting operations. Currently, a loop taxilane is in place which can only load one aircraft at a time with fuel and fire retardant. The Rapid City Base can accommodate aircraft up to approximately 120-foot wingspan. The base can handle most aircraft used as Airtankers except for the Boeing 747 and McDonnel Douglas DC10.

Facility Inventory

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

Land

The Rapid City Regional Airport property currently encompasses 1,720 acres of land in fee; the original airport property consisted of approximately 1,104 acres in 1948. Additional acreage was purchased by the City of Rapid City for airport expansion and runway protection.

Airside 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 **Figure 2-3 – Airside Facilities**. Information on design codes is contained in **Appendix B: Commercial Airports 101**.

RUNWAY 14-32

The primary runway at RAP is 8,701 feet long and 150 feet wide. This runway is currently designed to accommodate the lowest precision instrument approach minimums on the airfield (½ mile visibility approach to the Runway 32 end) and a non-precision approach on the Runway 14 end with 1-mile visibility minimums. The Approach Reference Code (APRC) and Departure Reference Code (DPRC) for the runway is D-IV-2400 and D-V-2400 respectively.

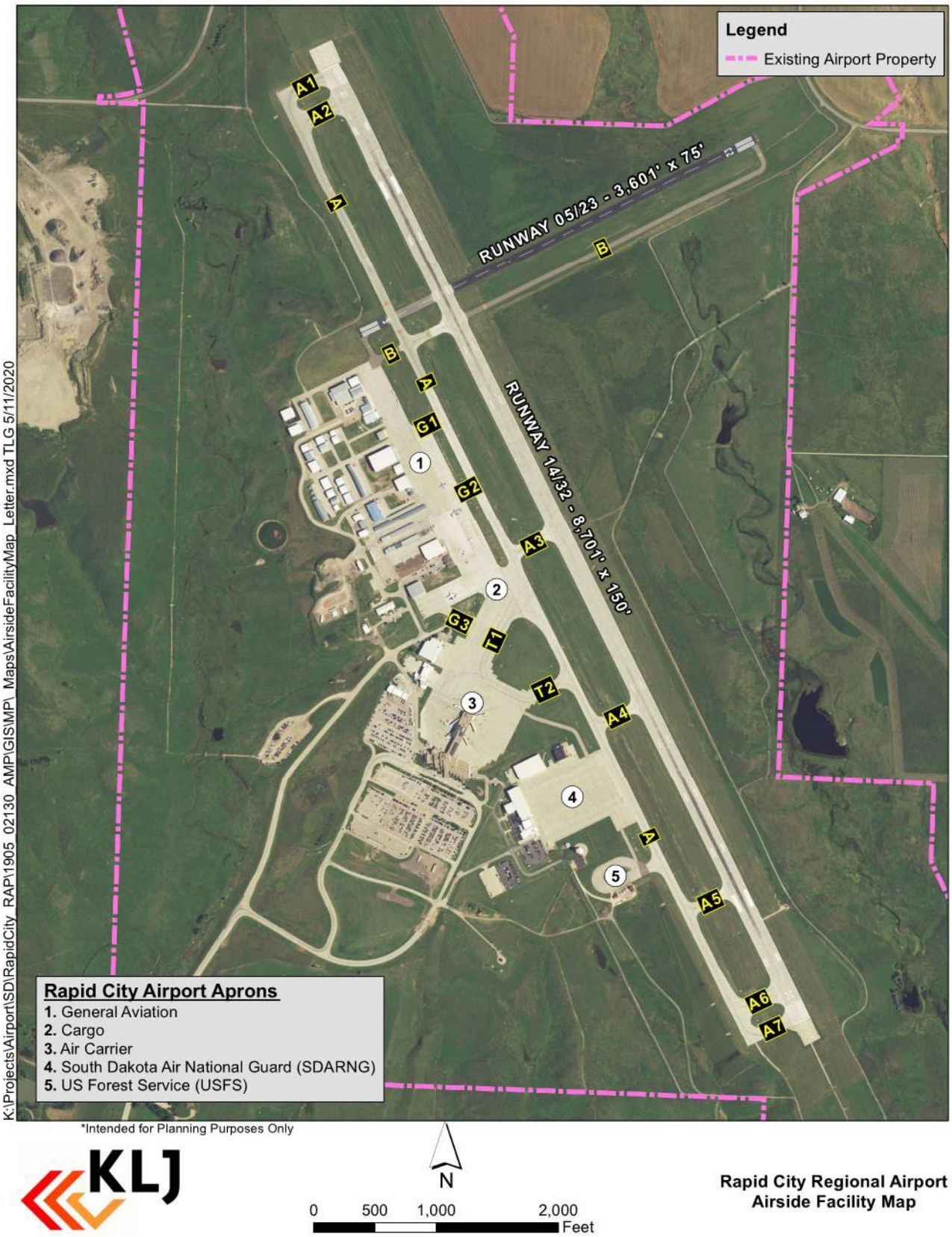
RUNWAY 5-23

Runway 5-23 is a 3,601-foot long by 75-foot wide secondary runway. Runway 5-23 has non-precision instrument approaches with 1-mile visibility minimums and was designed for use by aircraft which weigh 12,500 pounds or less. The APRC and DPRC are B-II-5000. Runway facilities are summarized in **Table 2-3 – Runway Facility Summary**.

Table 2-3 – Runway Facility Summary

Component	Runway 14/32	Runway 5/23
Runway Length (feet)	8,701	3,601
Runway Width (feet)	150	75
Runway Surface Material	Concrete	Asphalt
Runway Surface Treatment	Grooved	
Single Wheel Pavement Strength	140,000	12,500
Double Wheel Pavement Strength	190,000	-
Dual Tandem Pavement Strength	300,000	-
Pavement Classification Number	65 /R/C/W/T	15 /F/C/X/T
Runway Design Code	C - III-2400	B-I-5000 (small)

Figure 2-3 – Airside Facilities



HELIPADS

The South Dakota Army National Guard operates UH-60 Blackhawks and UH-72 Lakota's on their designated ramp. Other military rotorcraft are parked on the FBO ramp. Medical helicopters land on the far north side of the GA apron in front of the medical hangars. There are no designated helipads at RAP.

TAXIWAYS

A system of taxiways facilitates the movement of aircraft from the runway to other airport facilities including hangars and parking aprons. Locations and identifiers are depicted above in **Figure 2-3 – Airside Facilities**.

- **Taxiway A – Parallel for Runway 14/32.** This taxiway is west of the main runway that is 75' wide and 8,701' long of concrete, placing the Taxiway Design Group (TDG) at 5.
- **Taxiway A Connectors.** There are seven connecting taxiways of concrete that lead to the runway and the apron areas. There are two entrance taxiways, Taxiway A1 on the 14 end and Taxiway A7 on the 32 end that are 100' wide and there are also two bypass taxiways at each end, Taxiway A2 and Taxiway A6 are 125' wide.
- **Taxiway B – Parallel for Runway 5/23.** This asphalt taxiway is 40' wide and south of the crosswind runway with two connector taxiways marked B1 and B2, one at each end of the runway.
- **General Aviation Taxiways.** There are two concrete taxiways connecting from Taxiway A to the GA apron areas, Taxiway G1 and G2 which are both 75' wide.
- **Terminal Apron Taxiways.** There are two 75' wide concrete taxiways that connect from the air carrier apron to Taxiway A (Taxiway T1 and T2).

TAXILANES

The airport is served by various taxilanes that provide access from the aprons to hangars and terminal areas. The taxilanes that make up the general aviation area mainly run east/west and go from the north apron to various SASOs, private hangars and the FBO hangars.

APRONS

Apron areas serve the loading, unloading, parking and maneuvering needs for commercial airlines, air cargo, and general aviation operations. Locations are identified in **Figure 2-3 – Airside Facilities**. **Table 2-4 – Apron Area Summary** provides a summary of the apron areas.

- **Terminal Apron** is a parking area for commercial passenger aircraft. Part of the apron near Gate 2 and 4 is the narrowest position at 210' and 250' along with accommodating parking for deicing trucks for the airplanes. The rest of the gates range from 300' to 350' in apron depth.
- **Deicing Apron** is used to apply deicing treatment during cold weather conditions prior to aircraft departure. The apron is located along Taxiway T1 and can only accommodate one aircraft at a time and is approximately 200 feet wide.
- **Air Cargo (non-dedicated)** does not have a designated apron area serving FedEx, USPS or UPS. FedEx currently uses an area south of the FBO and UPS and USPS use an area toward the north end of the GA apron.

- **General Aviation Apron** serves all civil aviation activities except commercial service carriers. This activity includes corporate travel, medical transport, flight training, personal and business flights as well as recreational flying.
- **South Dakota Army National Guard Apron** serves various military aircraft on 39,000 square yards of concrete apron.

Table 2-4 – Apron Area Summary

Identifier	Primary Purpose	Area (Square Yards)
Terminal Apron	Commercial Airlines	49,000
Deicing Apron	Applying Deicing Treatment to aircraft	8,000
Air Cargo	Loading/unloading of cargo	Portions of GA Apron
General Aviation	Medical transport, flight training, personal & business flights & recreational flying.	70,000
SDARNG	Military operations	39,000
	TOTAL	166,000

Source: KLJ Analysis

PAVEMENT CONDITION

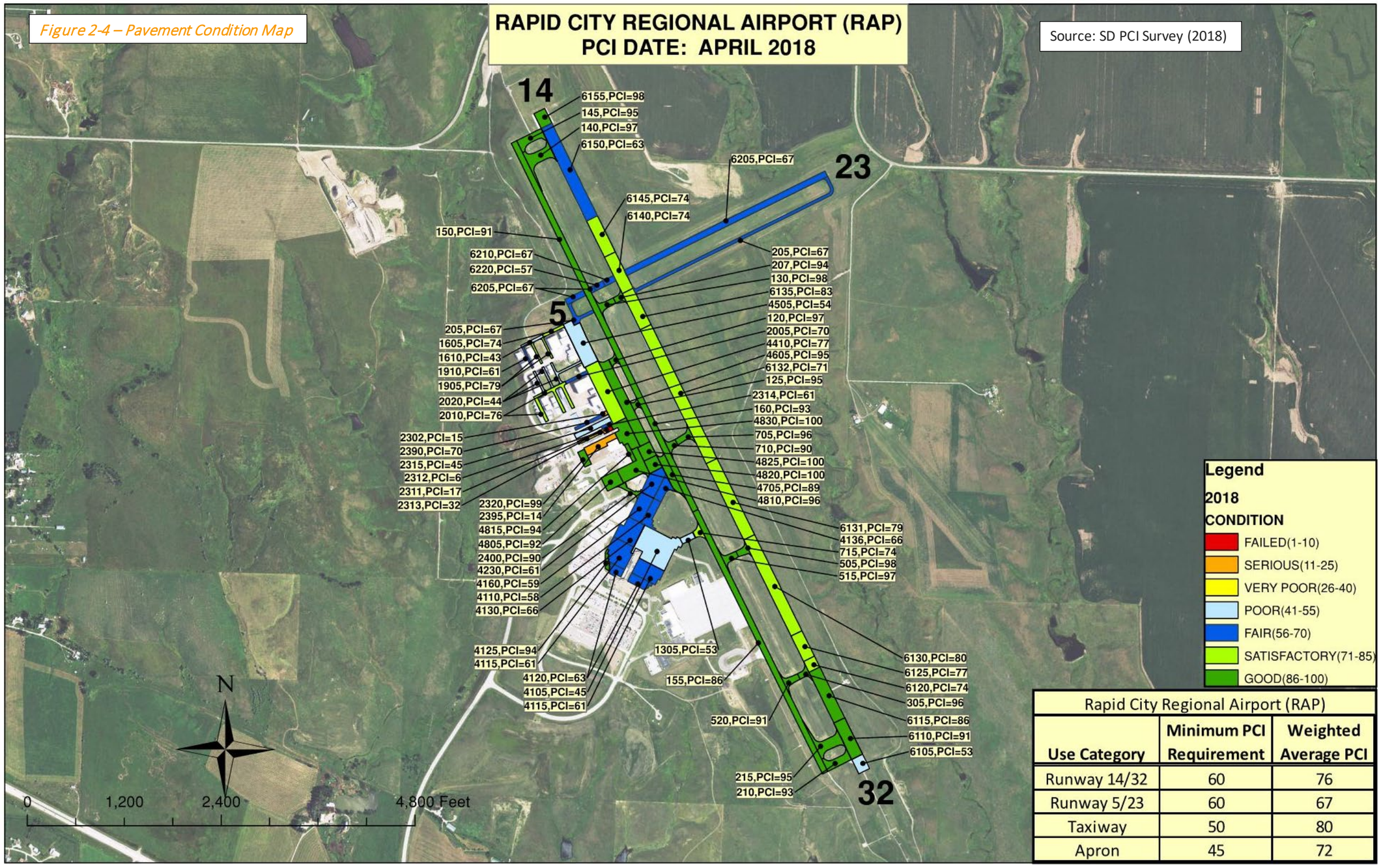
Airport pavements are basic infrastructure components at airports. Airfield pavements need to be maintained in a safe and operable condition for aircraft operations. Pavement condition is comprehensively evaluated by the State every three years and measured on a 0 to 100 scale known as the Pavement Condition Index rating. Pavement evaluation includes runway, taxiway, and apron pavements. A summary of the latest PCI rating for the runway and selected other airfield pavements is tabulated in **Table 2-5 – Pavement Condition Summary (2018)** and depicted on **Figure 2-4 – Pavement Condition Map**.

Table 2-5 – Pavement Condition Summary (2018)

Component	Surface Type(s)	Weighted Average	Range
Runway 14-32	PCC	76	53-98
Runway 5-23	AC/PCC	67	57-767
Taxiway A, A1-A7	PCC	91	86-98
Taxiway B	AC/PCC	73	67-98
Taxiways T1, T2	PCC	64	53-74
Terminal Apron	PCC	56	45-94
North GA Apron	APC	54	54
Main GA Apron	PCC	91	77 to 100
South GA/Large Hangar Apron	PCC	94	90-96
Deicing Apron by T1	PCC	60	59-61
Taxilanes	AC	53	6-99
SDARNG	PCC	N/A	No Ratings
USFS	AC/APC	N/A	No Ratings

Source: SD PCI Survey (2018)
PCI = Pavement Condition Index rating (0-100), LCD = Last Major Construction Date, AC = Asphalt Concrete, APC = Asphalt Overlay over PCC, PCC = Portland Cement Concrete

Figure 2-4 – Pavement Condition Map



Rapid City Regional Airport (RAP)		
Use Category	**Minimum PCI Requirement**	**Weighted Average PCI**
Runway 14/32	60	76
Runway 5/23	60	67
Taxiway	50	80
Apron	45	72

Navigational Aids & Airspace

Navigational aids (NAVAIDs) provide visual and electronic guidance to pilots enabling the airport to accommodate safely, efficiently, and effectively arriving and departing flights. **Figure 2-5 – NAVAID Facilities** identifies navigational aids and weather facilities.

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 the airport are summarized in the following sections.

Identification Lighting

The airport beacon serves as the airport identification light so approaching pilots can identify the airport location during night and instrument flight rule conditions. The beacon can be visible from 40 miles away at night. The brightness or intensity of beacons can vary by airport. A clear (white) and green beacon indicates a lighted land airport. The rotating beacon for Rapid City Regional Airport is a white/green beacon located on the west side of the general aviation hangar area, south of Runway 5-23. It operates sunset to sunrise.

Runway Lighting

Runway edge lights are placed off the edge of the landing surface of a runway. The lights help pilots define the edges and end of the runway to facilitate safe operations during night and low visibility conditions. These lights are spaced at equal distances along a runway, and perpendicular from side to side of a runway. These lights are generally white in color (bi-directional). The runway threshold lights appear red to a pilot approaching the end of the runway, and green as aircraft approach the runway from the air. Instrument runways have a row of eight lights at the end of a runway while visual runways have four. For medium and high intensity systems, the last 2,000 feet of each runway with instrument approaches have amber lights to caution pilots that the end of the runway is approaching. The light intensity can be adjusted by use of a radio-controlled switch (pilot-controlled lighting) on an airport frequency or manually by airport attendants and/or air traffic controllers. Runway lights are classified according to the intensity of light they produce:

- High Intensity Runway Lights (HIRL) are generally installed on precision instrument runways
- Medium Intensity Runway Lights (MIRL) are typically installed on visual or non-precision instrument runways
- Low Intensity Runway Lights (LIRL) installed on visual runways at small airports

Runway 14-32 has high intensity runway lights (HIRL) and Runway 5-23 has medium intensity runway lights (MIRL). The FAA standards require the lighting to be spaced no more than 200 feet apart. There are four locations at Rapid City where the lighting for Runway 14-32 is greater than 200 feet apart. These are at the Runway 14-32 intersection with taxiways A3, A4, A5 and B. This modification to standards is approved by the FAA and recorded in the Airport Certification Manual.

Figure 2-5 – NAVAID Facilities

Taxiway Lighting

Taxiway edge lighting delineates the taxiway and apron edges. Taxiway lights are blue in color and spaced according to FAA standards. Taxiway lights are, by design, of lower intensity than runway lights. The FAA standard taxiway edge lighting system is Medium Intensity Taxiway Lights (MITL). The taxiway lights at Rapid City Regional Airport are all MITL.

Other taxiway lights are installed at airports to promote safe operations. For Rapid City Regional Airport these include Runway Guard Lights installed on all Taxiways connecting to Runway 14-32 and Taxiway A at Runway 5-23. Runway Guard Lights are elevated and/or in-pavement unidirectional yellow lights installed along the taxiway indicating the runway holding position. The lights alternately illuminate to provide a visual indication of a nearby active runway.

In-Pavement Lighting

Rapid City Regional Airport currently has two in-pavement lights; they are located on Runway 14-32 at Taxiway Connectors A2 and A6. Two in-pavement lights were placed at A2 and A6 since those connector taxiways are wider than the other connectors to and from the runway.

Visual Approach Lighting

Visual approach lighting (or visual approach aids) provide vertical descent guidance to pilots for a specific runway end. These approach aids enable the pilot to acquire and maintain the correct glide path for landing. Precision Approach Path Indicator Lights (PAPI) are the current FAA standard equipment installed for this purpose. The PAPI has red and white lights that are used by the pilot to indicate whether they are too high, too low, or on the appropriate glidepath. Currently, the airport has a PAPI system for all four runways. A four box PAPI for Runway 14 and 32 to the left of the runway and two light PAPI systems on Runway 5 and 23 to the left of the runway.

Approach Lighting System (ALS)

An ALS extends the runway centerline beyond the threshold to provide a visual cue for pilots landing in instrument conditions. There are various configurations, lighting types and complexities to these systems dependent on the type of precision approach and visibility minimums for the approach. RAP has a Medium-intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR) for Runway 32 that is maintained by the FAA. This system consists of a green threshold bar of lights followed by several rows of lights and sequenced flashing lights. The system is 2,400 feet in total length.

Runway End Identification Lighting (REIL)

The Airport has REILs on Runway 14. REILs consist of high intensity flashing white strobe lights located on the approach ends of runways to assist the pilot in early identification of the runway threshold. These lights are aimed directionally into the approach zone of aircraft to assist the pilot in early identification of the runway threshold at night or in poor visibility conditions. The system can be unidirectional for the designated runway approach or omnidirectional to provide good circling guidance.

Pilot-Controlled Lighting

The pilot-controlled lighting systems allow for pilots to control the operation and intensity of lights. This system is available when the air traffic control tower (ACTC) at the airport is closed. All airfield lighting

for runways and taxiways can be illuminated using the CTAF frequency after 10:00 p.m. MT and before 6:00 a.m. MT at the airport.

PAVEMENT MARKINGS

Pavement markings provide visual guidance to aircraft to critical areas on the runway and taxiway surface. Through FAA AC 150/5340-1, Standards for Airport Markings, the FAA has defined numerous pavement markings to promote safety and situational awareness.

Runway

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)

Additional runway markings for a displaced threshold, blast pad, stopway or shoulders may also be required for an airport. Cone markers may be used to identify the edges and ends of turf runways.

Runway 14/32 has precision runway markings identifying the runway designation, threshold, centerline, side stripes, aiming point and touchdown zone. Runway 5/23 has non-precision runway markings identifying the runway designation, threshold, centerline and aiming point. Please note, since Runway 5/23 is less than 4,200' in length, an aiming point marking is not required.

Taxiway/Taxilane

Taxiway and taxilane markings are important for directional guidance for taxiing aircraft and ground vehicles. Common taxiway and apron markings include:

- Holding Position Markings - yellow bars and dashes on a black background.
- Taxiway/Taxilane Centerline - solid yellow stripe along the designated centerline.
- Taxiway/Taxilane Edge markings - solid or dashed yellow stripes delineate edge of usable taxiway.
- Non-Movement Area markings - delineate the edge of the area controlled by local air traffic control or available for parked aircraft or objects.

Enhanced taxiway markings are required to further provide additional visual cues to an aircraft or vehicles approaching a runway holding position. Other markings include surface painted signs, geographic position markings and vehicle roadways. On light colored pavements, the markings should have black borders to help delineate their existence on airport pavements. Some markings require glass beads for enhanced reflectivity.

Airfield Guidance Signs

Airfield signage provide location, direction and guidance information that is essential for the safe and efficient operation of aircraft and ground vehicles on the airport movement area. Signs are located adjacent to the edge of runways, taxiway and aprons. There are several types of signs that each serve a unique purpose. Mandatory signs are red and identify an intersection with a runway or critical safety zone. Since RAP is certificated under 14 CFR Part 139, the airport has a sign plan developed and implemented to identify taxi routes and holding positions. This plan is consistent with FAA AC 150/5340-

18F and is maintained to meet current standards and operating procedures. All airfield signs at Rapid City Regional Airport currently meet the requirements of the FAA.

ELECTRONIC NAVIGATION AIDS

Electronic navigational aids are installed to provide critical guidance information when operating in the airport environment. These navigational aids provide horizontal and/or vertical guidance in conjunction with published navigation procedures. Electronic navigation aids at the airport are summarized below:

Radar

An Airport Surveillance Radar (ASR) facility provides primary and secondary surveillance radar to air traffic controllers to detect the position of aircraft within the surrounding terminal airspace, generally within 60 miles. The Dakota Air Traffic Control Facility, located at Ellsworth AFB, has a Digital Airport Surveillance Radar (DASR) which is situated to provide coverage for both Ellsworth AFB and Rapid City Regional Airport. The DASR is located along Radar Hill Road, northwest of Rapid City Regional Airport and is maintained by the U.S. Air Force.

Very High Frequency Omni-Directional Range (VOR)

A VOR is a ground based NAVAID used for enroute and approach course navigation. The radio beacon has the longest range of ground based NAVAIDs. Aircraft can navigate to and from this beacon using compatible airborne receivers to receive the radio signals. It gives pilots a direct indication of bearing relative to the facility. With VORs that are collocated with distance measuring equipment (DME), certain aircraft navigation radios can triangulate the signal between several different VOR/DME stations to choose a direct course of flight on a desired heading. For VORs collocated with a tactical air navigation system (TACAN) beacon, these facilities are referred to as a VORTAC. The TACAN is the system typically used by the military and the majority of VORs include a TACAN. The TACAN provides the same distance information as the DME and is available for both military and civil use. The widespread use of satellite-based GPS technology has caused FAA to review decommissioning a large portion of existing VORs.

Rapid City Regional Airport has one VORTAC located 4.5 miles southeast of the airport. The VORTAC is identified as 'Rapid City'. The VORTAC is the instrument used for the Runway 14 and Runway 32 VOR or TACAN approaches

Precision Approach Categories

There are three categories of precision instrument approaches. Each category is capable of supporting approaches in equipped aircraft with lower weather minimums, however each category also requires an increasing complexity of airport equipment as well as aircraft and flight crew certifications. Rapid City Regional Airport has a Category I instrument approach for Runway 32.

Table 2-6 – Precision Approach Categories

Approach Category	Decision Height (ft.)	Runway Visual Range (ft.)	Equivalent Visibility
Category I	200	2,400 or 1,800	½ mile or 3/8 mile
Category II	100	1,200	¼ mile
Category III	100 -> 0	700 -> 0	¼ mile -> 0
The Decision Height (DH) or Decision Altitude (DA) is a specified altitude or height in the Precision Approach or approach with vertical guidance at which a missed approach must be initiated if the required visual reference to continue the approach has not been established. Runway visual range (RVR) is a measurement of actual visibility down the runway in terms of feet vs. statute miles.			

Instrument Landing System (ILS)

An Instrument Landing System is installed for a runway end to allow pilots to capture a horizontal and vertical radio beam to the runway threshold to assist in landing. Components of an ILS include the glideslope antenna, localizer antenna, approach lighting system and marker beacons. The glideslope antenna is located alongside the runway providing vertical guidance, the localizer antenna is installed beyond the opposite runway end providing horizontal guidance, the approach lighting system provides visual guidance to the runway end, and the marker beacons provide aural cues for pilots flying the approach. Runway 32 at RAP has an ILS approach.

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.

As a part of the FAA's NextGen program, an ADS-B Transmitter-Receiver was placed at the Rapid City Regional Airport in 2013 near the airport electrical vault.

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(s)

Wind direction indicators visually indicate the current wind direction and velocity on an airfield. A primary wind cone is located in a central visible location on the airport and is lighted for night operations. A segmented circle is installed around the wind cone to aid pilots in its identification from the air. Supplemental wind cones are installed around the airfield to provide surface wind direction information to pilots where the primary wind cone is not visible. Wind cones must be lit for night air carrier operations. Rapid City Regional Airport's primary wind cone and segmented circle is located east of Runway 14-32 and south of Runway 5-23. There are supplemental wind cones near the Runway 14, 32 and 23 ends.

Weather Reporting

There are various types of surface weather observation stations. An Automated Surface Observation System (ASOS) is a Federal weather reporting station at airports. It provides continuous 24-hour observations and reporting for the FAA, National Weather Service (NWS) and Department of Defense (DoD). The suite of sensors provide temperature, dew point, wind speed and direction, visibility, cloud ceiling and precipitation information. Some stations have optional freezing rain and thunderstorm sensors. RAP has an ASOS located on the airport east of Runway 14-32 and south of Runway 5-23. The ASOS is maintained by the NWS and broadcasts continuously at 118.525 MHz.

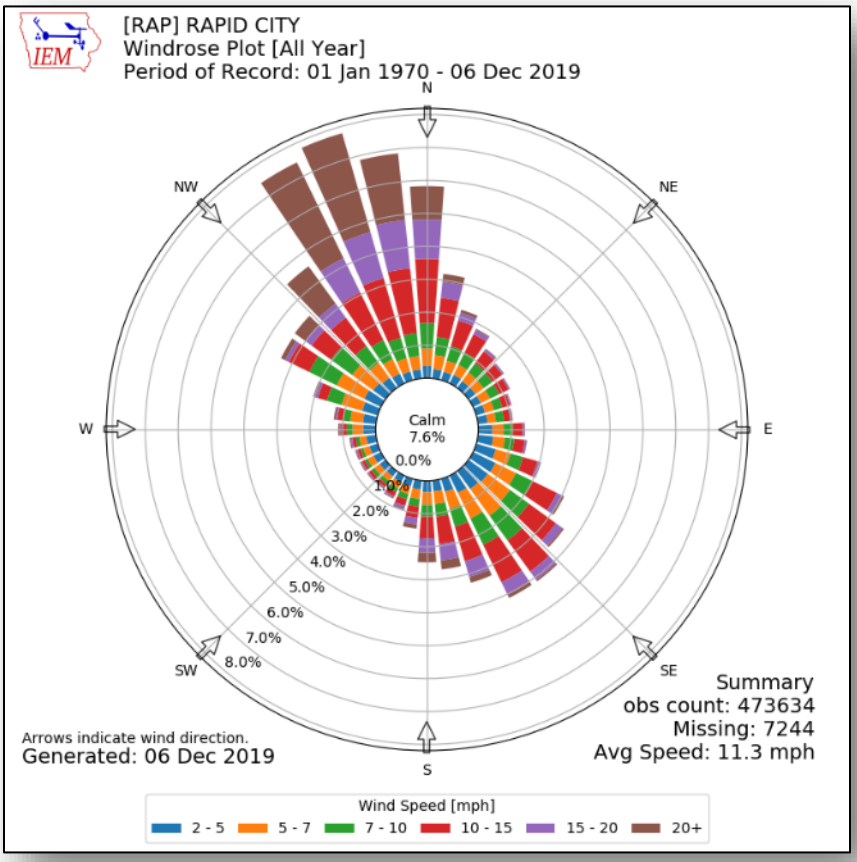
Other

Rapid City Regional Airport is equipped with Runway Visual Range (RVR) visibility sensor systems. The RVR provides instant reporting of the visibility at targeted locations on the airfield. These systems must be located at the touchdown zone, mid-point (if required for runway length) and rollout points to allow for Category II or lower operations.

METEOROLOGICAL DATA

Local weather conditions are a significant factor in the design and development of airport facilities since they affect aircraft performance. Temperature affects runway length, wind direction and speed affects runway orientation, and visibility and cloud ceiling conditions determine the need for runway navigational aids and lighting. Over the last 30 years (1989-2019) the average maximum temperature at RAP during the hottest month has been 87.0 degrees Fahrenheit (July).

Prevailing winds are from the northwest and southeast and are generally aligned 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 smallest aircraft are typically the most affected operationally by crosswinds.



A runway's wind coverage is determined by an aircraft's ability to operate with a "direct" crosswind, which is defined as 90 degrees to the direction of travel. For planning purposes, FAA has defined the maximum direct crosswind for small aircraft as 10.5 knots. For increasingly larger aircraft, a 13-knot direct crosswind is used up through 20 knots for the largest aircraft. Aircraft can operate safely in progressively higher wind speeds as the crosswind angle decreases and the wind direction aligns more closely with the opposing direction of flight. In addition, some aircraft are designed to safely operate with higher crosswind components. Ideally, an aircraft will take off and land directly into the wind or with a light crosswind. The FAA recommends that primary runways accommodate at least 95 percent of local wind conditions; when this level of coverage is not provided, the FAA recommends development of a secondary (crosswind) runway.

The Airport's primary runway, Runway 14-32, meets the 95% FAA criteria for all aircraft sizes during "all-weather" conditions. **Table 2-7 – All-Weather Wind Coverage** provides the calculated all-weather wind coverage for the airport.

Table 2-7 – All-Weather Wind Coverage

Runway	Crosswind Component (Wind Speed)			
	10.5 knots	13.0 knots	16.0 knots	20.0 knots
Runway 14-32	97.25%	98.92%	99.60%	99.90%
Runway 5-23	72.66%	81.51%	--	--
Combined*	**98.91%**	**99.73%**	**99.60%**	**99.90%**

Source: KRAP ASOS (2010-2019, HOURLY) FROM NATIONAL CLIMATIC DATA CENTER 87,079TOTAL OBSERVATIONS
**Combined assumes up to maximum design aircraft crosswind component for each runway*

Pilots can fly with visual reference to the ground and other aircraft during most weather conditions. This is known as Visual Meteorological Conditions (VMC). Pilots are required to reference flight instruments and be on 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 VMC is evaluated to determine the ideal alignment for runways used during visual operations, such as VFR flight training. As shown in **Table 2-8 – VMC Wind Coverage**, the 95% FAA criteria is met for VMC conditions with only Runway 14-32.

Table 2-8 – VMC Wind Coverage

Runway	Crosswind Component (Wind Speed)			
	10.5 knots	13.0 knots	16.0 knots	20.0 knots
Runway 14-32	97.43%	98.95%	99.60%	99.90%
Runway 5-23	73.20%	81.89%	--	--
Combined*	**98.99%**	**99.75%**	**99.60%**	**99.90%**

Source: SOURCE: KRAP ASOS (2010-2019, HOURLY) FROM NATIONAL CLIMATIC DATA CENTER 80,825 TOTAL OBSERVATIONS
**Combined assumes up to maximum design aircraft crosswind component for each runway*

Wind coverage during IMC is evaluated to determine the ideal alignment for instrument approach to an airport's runway. As shown in **Table 2-9 – IMC Wind Coverage**, Runway 14-32 by itself does not meet the 95% FAA criteria wind coverage during IMC. When combined with Runway 5-23, the wind coverage standard is met.

Table 2-9 – IMC Wind Coverage

Runway	Crosswind Component (Wind Speed)			
	10.5 knots	13.0 knots	16.0 knots	20.0 knots
Runway 14-32	94.84%	98.53%	99.58%	99.95%
Runway 5-23	65.73%	76.59%	--	--
Combined*	**97.89%**	**99.50%**	**99.58%**	**99.95%**
Runway 14 Only	**40.79%**	**47.97%**	**48.21%**	**48.33%**
Runway 32 Only	**61.08%**	**65.55%**	**65.95%**	**66.13%**

Source: KRAP ASOS (2010-2019, HOURLY) from NCDC 6,254 total observations
**Combined assumes up to maximum design aircraft crosswind component for each runway*

COMMUNICATION FACILITIES

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

The Rapid City Regional Airport has an airport traffic control tower (ATCT) which operates daily from 6:00 a.m. to 10:00 p.m. This tower is in the FAA's contract tower program and is operated by Midwest Air Traffic Control using tower frequency 125.85 MHz and ground control 121.90 MHz. The airport does not have an Automatic Terminal Information Service (ATIS) broadcast. The ATCT facility is located immediately south of the SDARNG facilities. ATCT provides clearances, radar advisories and safety alerts to Instrument Flight Rules (IFR) and Visual Flight Rules (VFR) flights within the controlled Class D airspace. Class D airspace controlled by the ATCT typically extends out five miles from the airport and up to an altitude of 2,500 feet Mean Sea Level (MSL). Beyond the immediate local airport environment, air traffic control radar services in the local area are provided by Ellsworth AFB, identified as 'Ellsworth Approach'. When Ellsworth Approach is closed, aircraft contact Denver ARTCC. The nearest Remote Communication Air/Ground (RCAG) transmitter for ARTCC communications is located on the airport. Pilots communicate with Ellsworth Approach to obtain traffic advisories and flight clearances. Both Ellsworth Approach and Denver ARTCC can be reached on the ground at the airport.

When the ATCT is closed, pilots "see-and-avoid" other aircraft in the local area aided by the use of a series of position reports using the Common Traffic Advisory Frequency (CTAF). This frequency also can be used to select the intensity of the runway and approach lighting using the pilot-controlled lighting system. The CTAF frequency for Rapid City is 125.85.

When the ATCT is closed, pilots open and close FAA flight plans on the ground through phone or internet, or through Ellsworth Approach, Denver ARTCC or Flight Service Station (FSS) in the air. FSS provides various services including flight plan opening/cancelling, timely en-route weather information, Notices to Airmen (NOTAM), and Air Traffic Control advisories. A Remote Communications Outlet (RCO) provides a reliable link allowing aircraft to directly contact the FSS.

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. All procedures are conducted at the direction of the local ATCT.

Instrument Approach Procedures

Pilots operating under IFR intending to land at an airport must navigate aircraft on published Instrument Approach Procedures (IAP). Seven IAPs (see **Table 2-10 – Instrument Approach Procedures**) are available for Runways 14-32 and 05-23 with either ground-based or satellite-based NAVAIDS. Instrument approach weather minimums are a result of the approach type, airport infrastructure, and any prevailing airspace obstructions.

Table 2-10 – Instrument Approach Procedures

Approach Procedure	Approach Type	Lowest Cloud Ceiling Minimum (HAT)	Lowest Visibility Minimum (n.m.)
ILS or LOC RWY 32	Precision Approach (Category I ILS)	ILS: 200 feet LOC: 460 feet	ILS: ½ mile LOC: A & B Aircraft – ½ mile C & D Aircraft – 7/8 mile
RNAV (GPS) RWY 05	Non-Precision Approach with Vertical Guidance	LPV: 250 feet LNAV/VNAV: 250 feet LNAV MDA: 301 feet	A & B Aircraft: 1 mile C & D Aircraft: N/A
RNAV (GPS) RWY 14	Non-Precision Approach with Vertical Guidance	LPV: 259 feet LNAV/VNAV: 680 feet LNAV MDA: 589 feet	1 mile
RNAV (GPS) RWY 23	Non-Precision Approach with Vertical Guidance	LPV: 250 feet LNAV/VNAV: 250 feet LNAV MDA: 356 feet	A & B Aircraft: 1 mile C & D Aircraft: N/A
RNAV (GPS) RWY 32	Non-Precision Approach with Vertical Guidance	LPV: 200 feet LNAV/VNAV: 250 feet LNAV MDA: 460 feet	½ mile
VOR or TACAN RWY 14	VOR with VORTAC	S-14: 609 feet	A & B Aircraft: 1 mile C & D Aircraft: 1 ¾ mile E Aircraft: 2 miles
VOR or TACAN RWY 32	VOR with VORTAC	S-32: 280 feet	¾ mile

Source: SkyVector.com, RAP Instrument Approach Procedure (IAP) Charts
Note: HAT = Height Above Touchdown, n.m. = nautical miles (reported), VG = Vertical Guidance, NVG = Non-Vertical Guidance, ILS = Instrument Landing System, LPV = Localizer Performance with Vertical Guidance, LNAV = Lateral Navigation, VNAV = Vertical Navigation, VOR = Very High Frequency Omni-Directional Range, DME = Distance Measuring Equipment

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 special departure procedures for all runways at RAP.

AIRSPACE & SURVEILLANCE

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.

Airspace Classification

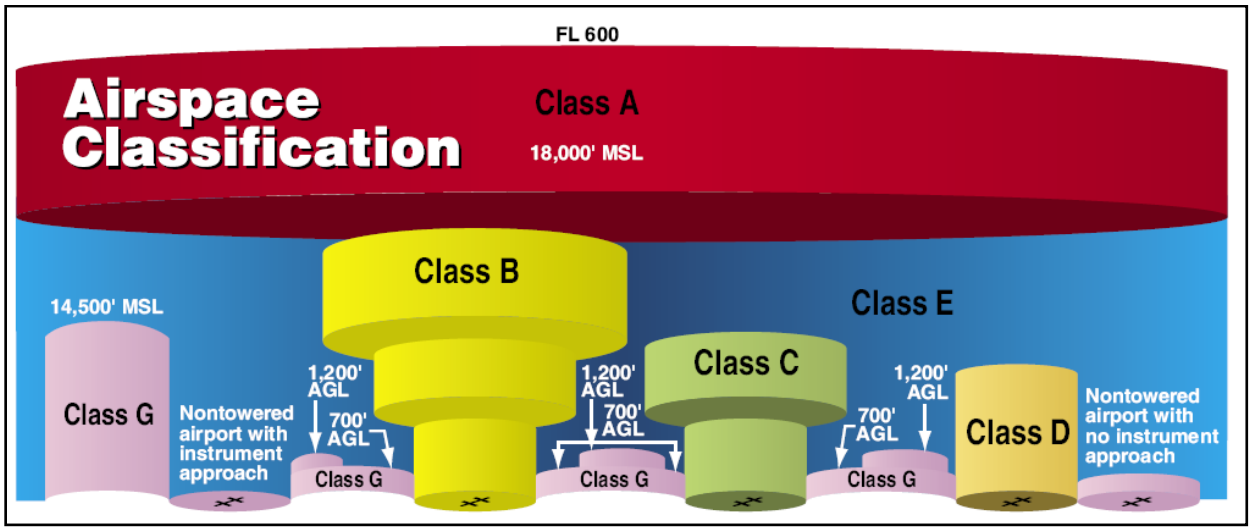
Airspace is segregated into controlled, uncontrolled, special use or other airspace. Each airspace class has different operating rules. Including and within five nautical miles of Rapid City, the airspace

classification is Class D controlled airspace. Ellsworth Air Force Base provides approach/departure control because the base is a terminal radar approach control facility (TRACON) known in the U.S. Air Force as radar approach control (RAPCON). Traffic is controlled within approximately a 40 nautical-mile radius of RAP and up to an elevation of 18,000 feet.

Ground Radar

Radar relies on direct line-of-sight, therefore the further the target is away from a radar site the higher altitude is required. The Dakota Air Traffic Control Facility, located at Ellsworth AFB, has a Digital Airport Surveillance Radar (DASR) which is situated to provide coverage for both Ellsworth AFB and Rapid City Regional Airport. The DASR is located along Radar Hill Road, northwest of Rapid City Regional Airport and is maintained by the U.S. Air Force.

Figure 2-6 – FAA Airspace Classifications



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.

Table 2-11 – Navigational Aid Summary provides a summary of aids available at the airport.

Table 2-11 – Navigational Aid Summary

Component	Runway 14-32	Runway 5-23
Pavement Markings	Precision	Non-Precision
Runway Lighting	HIRL	MIRL
Taxiway Lighting	MITL	MITL
Approach Aids	ILS, DME, MALSR, PAPI	PAPI
Airport Navigational Aids & Meteorological Facilities	ASOS, Rotating Beacon, VORTAC	

Commercial Passenger Terminal

TERMINAL BUILDING

The passenger terminal area is located on the west side of the airport along the southern portion of the airport's primary runway, Runway 14-32. The terminal area consists of the passenger terminal building, terminal curb front, commercial aircraft parking apron, the road network, public parking areas, car rental parking and servicing areas, and the airport administrative offices.

The Rapid City Regional Airport Terminal is two levels with one concourse totaling approximately 120,000 square feet. The terminal was constructed in 1989 and was designed to reflect the natural beauty of the surrounding area. A terminal renovation was completed in 2013 and included three new boarding bridges with corresponding passenger seating areas, new TSA operations offices and expanded two lane security check point area (with the possibility for a third), all new ADA restrooms, a cafe, and a new gift shop. Renovation was done to existing offices, the six ticketing areas, a new kitchen and restaurant area, a fully remodeled baggage claim area, and a 3,000 square foot addition which includes a new rental car wing and upper level outdoor patio. Mechanical, electrical, IT and security components were also upgraded throughout the entire terminal. In 2020 the airport completed a vertical circulation project reconfiguring and replaced the elevator and two escalators to improve circulation and intuitive wayfinding.

AIRLINES

The Airport is currently served by Allegiant, American, Delta and United which offer twelve to twenty-one commercial flights per day with the higher number of flights occurring in the summer tourism season.

Each airline has a limited amount of baggage make-up space for outbound luggage which includes the area needed to move the bags from the counters to the area where they are loaded onto carts to transport to the aircraft. There are also portions of the ticket counter area that are used for checked baggage screening which is conducted by TSA staff. Explosive Detection Systems and Explosive Trace Detectors are located behind three ticket counters (1, 2 & 4) while TSA staff must reposition from one ticket counter to another.

PASSENGER SCREENING CHECKPOINT FACILITIES

Once passengers are ticketed, they proceed to the passenger-screening checkpoint. The 2013 remodel included expansion of the screening checkpoint. There are currently two processing lanes at the Airport with a theoretical capacity of accommodating up to 200 passengers per hour per lane. Sterile areas for passengers that require security clearance is about 24,100 square feet including the checkpoint. One lane has recently been dedicated to TSA Pre-Check. The screening checkpoint also includes an observation area for supervisory staff and a separate room for private screening.

CONCESSIONS & GATE AREA

Prior to security screening there is a full-service restaurant on the second level. This area is often used as meeters/greeters wait for their friends/family to arrive. It is also used by employees at the airport. Once ticketed and through security, passengers proceed to the hold room/gate area to await aircraft boarding. This area is approximately 240 feet long with a total area of 20,000 square feet including a gift shop, a café style restaurant and restrooms.

BAGGAGE CLAIM

The baggage claim area for the Rapid City Regional Airport is on the lower level and is accessible to deplaning passengers by stairs, elevator or escalator. The area has two baggage conveyors but typically only one is used. There is also a doorway between the two baggage conveyors for large luggage items. Since it is between the two conveyors there is not a large amount of space for oversize luggage items.

RENTAL CAR

The rental car area was expanded in 2013. There are four counter areas with queuing space for passengers waiting in line for rental car services. The rental car area is adjacent to baggage claim with a doorway directly to the ready/return lot.

APRON & GATES

The primary purpose of the terminal apron is to provide parking for commercial passenger aircraft at the terminal gate and provide circulation space for aircraft and airline support functions. There are seven passenger boarding bridges with nine independent parking positions around the terminal gate. The passenger boarding bridges provide shelter from outside weather and are suitable for the turboprops, regional jets and narrow body jets which serve the airport. The boarding bridges are basic and are not equipped with HVAC for the corridor leaving the temperature roughly equal to the outside temperature in either summer or winter.

The primary driver for the size of a terminal apron is the terminal building. The terminal apron size and configuration is a function of the total number of gates, building configuration, aircraft type, airfield configuration, aircraft maneuvering and FAA design standards including wingtip clearances. As the terminal building concepts are developed, gate configurations will be modeled to help identify the required terminal apron size.

Known existing considerations to the terminal apron size include deicing operations along Taxiway T-1, narrowed apron depth for Gates 1 and 2, deicing truck parking near Gate 2 and airline ground support equipment (GSE) under the terminal bridge. Gate 2 is also bounded on the landside by a road and parking for rental cars. Currently, aircraft parked at Gate 2 are pushed back to behind Gate 7 before being released to taxi. Gates 5 and 6 each have two parking positions noted as 5A, 5B, 6A and 6B. Aircraft can park independently at each of these positions. For example, the earliest departure in the morning will leave from 5A and then a later departure can leave from 5B using the same boarding bridge without needing to reposition the aircraft. A special arrangement is made at Gate 5 with a position 5X. This is for an ADG-IV aircraft such as the B757. When an aircraft is parked at 5X, neither 5A nor 5B can be used. **Table 2-12 – Terminal Gates** provides a detailed list of the gates and the aircraft they typically accommodate.

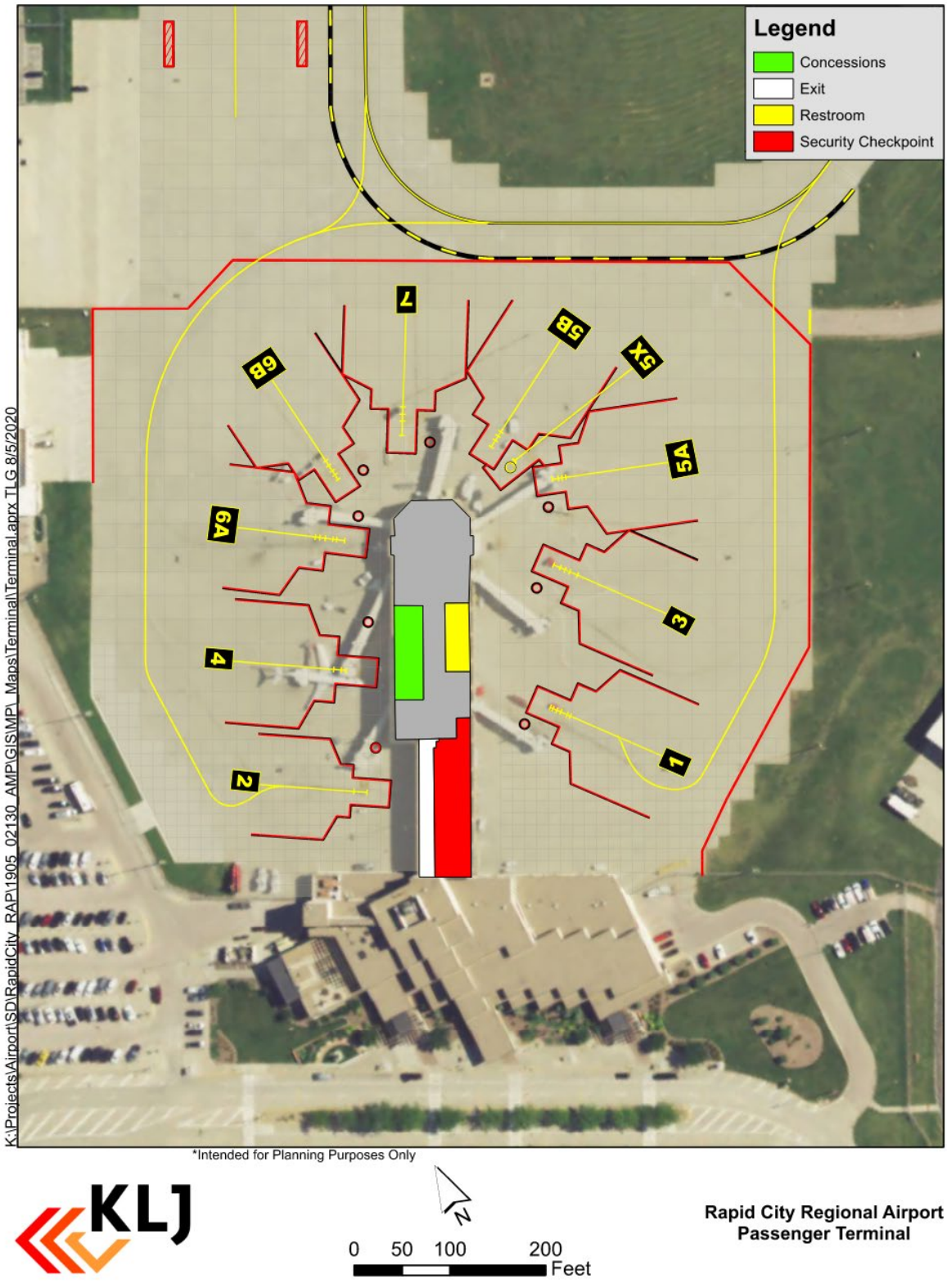
Table 2-12 - Terminal Gates

Gate Position	Typical Airline	Gate Markings			Hold Rooms	
		ADG II	ADG III	ADG IV	Seats	Notes
1	American	Y	Y	-	54	Seating constricted by Permanent Walls
2	United	Y	Y	-	60	
3	Delta	Y	Y	-	51	Open space for seating between gates 3, 4, 5, 6 and 7
4	United	Y	Y	-	49	
5A	Various	Y	Y	-	86	
5B	Various	Y	Y	-		
5X	Various	-	-	Y		
6A	Delta	Y	Y	-	82	
6B	Delta	Y	Y	-		
7	Various	Y	Y	-	58	

Source: KLJ Analysis

Note: ADG II includes Bombardier CRJ200 & CRJ700, and Embraer E135 & E145; ADG III includes Airbus A220, A319 & A320, Boeing B717, B737 & MD88, Bombardier CRJ900 and Embraer E170, E175 E190 & E195; ADG IV includes Boeing B757: Use of Gate 5X precludes the use of Gates 5A and 5B.

Figure 2-7 - Terminal Gates



GROUND ACCESS & CIRCULATION

The Rapid City Regional Airport is connected to Rapid City by State Highway 44. Interstate 90 is approximately 10 miles to the north by local roads. See **Figure 2-8 – Area Roads**.

Access to the passenger terminal complex is provided by Airport Road and Terminal Road from State Highway 44. There is one entrance and exit to the terminal area complex via Terminal Road. See **Figure 2-9 – Terminal Access and Parking.** The terminal building is served by one curbside area adjacent to the arrival and departure areas. There are a total of five lanes, two parking and three driving, providing access to the terminal area to pick-up and drop-off passengers.

General aviation users and people conducting business at the airport need an efficient route to travel by vehicle without entering or crossing the airfield. This need is met currently for vehicles to travel around the landside of the airport by using Airport Road, Terminal Road, Westjet Drive, and LaCroix Court.

Inside of the airfield, there is a need for vehicles to move around without impeding aircraft movements. This includes ARFF, FAA NAVAID maintenance, airport maintenance, airport operations and others. RAP has a perimeter road along the interior of the perimeter fence that only airport personnel may access.

AUTOMOBILE PARKING

Terminal Parking

Public parking is provided in the lot on the southwest side of the passenger terminal; 17 parking spaces are handicapped accessible. To the northwest of the terminal is a parking lot for rental cars. See **Figure 2-9 – Terminal Access and Parking** and **Table 2-13 – Terminal Parking Facilities** for more details.

Figure 2-8 – Area Roads Map

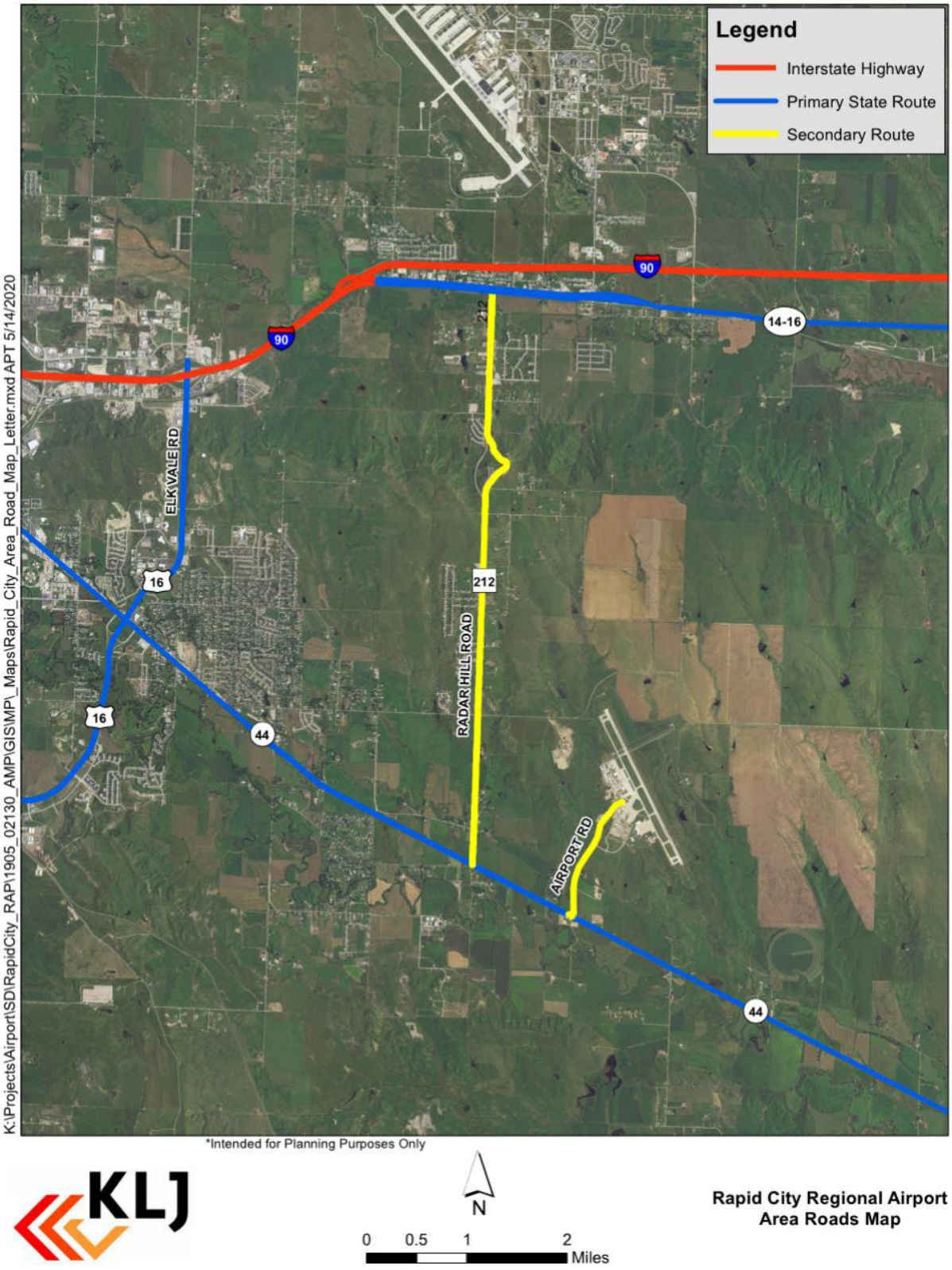


Figure 2-9 – Terminal Access and Parking

Table 2-13 – Terminal Parking Facilities

Group	Parking Lot Use/Name	Spaces
Public*	P1	344
Public*	P2	709
	Total Public	**1,069**
Employee	Employee Parking	27
	Total Employee	**27**
Rental Car	Ready/Return	340
Rental Car	Storage	83
	Total Rental Car	**171**
	Grand Total	**1,267**
*Most employees in the terminal park in the short term and long-term lots and not in the smaller employee lot.		

Source: KLJ Analysis

There are many other parking lots for the GA facilities and government facilities on the west side of the airport. Please see **Table 2-14 – Other Airport Parking Facilities** for a description of these lots.

Table 2-14 – Other Airport Parking Facilities

Tenant	Parking Lot Use/Name	Spaces
USFS*	USFS	9
ATCT*	Air Traffic Controllers	19
ARNG*	National Guard	111
RCRA*	Airport Terminal Employees	28
RCRA	ARFF Employees & Airport Operations	26
Fugro	Survey Company	15
FBO Lot	WestJet & Cargo	54
RCRA*	Airport Maintenance	15
SASO Lot	Rapid Fuel, MARC	30
	TOTAL	**307**
* Parking lots not accessible by public roads or for public parking.		

PUBLIC TRANSPORTATION

There is no public transportation service to RAP. Airport Express Shuttle provides on demand ground transportation to/from the airport and covers western South Dakota and eastern Wyoming. Most of the local hotels including The Hotel Alex Johnson and The Rushmore Hotel will pick up and drop off at the airport. Lyft is available through the Lyft app. Rapid Taxi Inc. and City Cab provide taxi services.

Air Cargo

FedEx shipments are conducted by Empire Airlines. Empire Airlines utilizes ATR 42 aircraft and the apron south of WestJet for their operations. UPS shipments are conducted by Alpine Air and occasionally Encore Air Cargo. USPS shipments are conducted by Alpine Air. Alpine Air utilizes Beechcraft 1900 aircraft and the apron north of WestJet for their operations.

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/Executive terminal, and commercial aviation operators. Please see **Figure 2-10 – Landside Facilities** for a map of landside facilities.

AIRCRAFT PARKING APRON

The general aviation aprons are west of Taxiway A and north of the Terminal area. It is approximately 70,000 square yards in size primarily consisting of a concrete surface and a pavement strength the same as the runways. The FBO, self-serve fuel and most of the SASOs are located along the GA apron.

BUSINESS 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.

Westjet Air Center is the only full service FBO at RAP and is located on the GA Apron near Taxiway A3. They offer Jet A and 100 LL fuel along with pilot amenities, hangars and concierge service.

There are many SASOs at the airport which are listed as follows with the type of service they provide. Rapid Fuel provides self-serve fuel tanks located between Taxilane G1 and Taxiway B and has a building on the GA apron across from the tanks. Advanced AeroTechnologies Group LLC sells avionics and pilot supplies. Dale Aviation provides aircraft maintenance, air ambulance (through MARC), pilot services and aircraft management. Dale Aviation also provides avionics installations and repairs through Rapid Avionics. Air Methods-Black Hills Life Flight and Medical Air Rescue Company (MARC) are medical air transportation companies. Their fleets consist of rotor wing and fixed wing aircraft such as King Air C90A's and Bell 407's. Fugro has been flying mapping missions out of RAP since 1968 and base numerous aircraft in its facility north of the ARFF station. Finally, Plane Training, LLC is a flight school which provides training and aircraft rentals in five different types of aircraft including a Cessna 182, Cessna 310, Piper 28 and Bellanca Decathlon.

AIRCRAFT STORAGE HANGARS

Aircraft storage facilities are listed in **Table 2-15** shown on **Figure 2-10**.

Table 2-15 – Aircraft Storage Facilities

Facility Number	Operator/Owner	Description (if not Hangar Storage)	Use	Hangar Area (SF)
2	Private			4,200
3	Medical Air Rescue	Operations	SASO	8,275
4	Rapid Fuel	Office	SASO	-
5	Medical Air Rescue	Operations	SASO	5,100
6	Dale Aviation	Maintenance	SASO	6,000
7	Private			3,600
8	WestJet		FBO	28,000
9	WestJet	Maintenance	FBO	4,800
10	WestJet		FBO	10,000
11	Air Methods - Black Hills Life Flight	Office	SASO	-
12	Dale Aviation	Maintenance	SASO	18,000
15	Private			1,600
16	Private			2,700
18	RC Airport	8 Unit T-Hangar		10,000
20	Private	8 Unit T-Hangar		12,100
21	Rapid Avionics	Avionics Shop	SASO	3,600
22	Private			3,600
25	Private			3,000
26	Private			3,000
27	Private			4,400
31	Private			6,400
32	Private			5,525
33	Private			2,900
34	Private			3,500
35	Fugro	Aerial Photography	SASO	5,900
36	Private			5,400
37	Private			3,600
38	Private			3,000
39	Private			1700
40	Private	1 Unit T-Hangar		1,000
41	Private	1 Unit T-Hangar		1,100
42	Private	1 Unit T-Hangar		1,400
43	Private	4 Unit Hangar		9,100
47	WestJet		FBO	15,000
48	WestJet	Terminal	FBO	-
50	Plane Training		SASO	11,500
61	Fugro	Aerial Photography	SASO	15,600
TOTAL	***FBO Hangars (1 Operator)***			*57,800*
	SASO Hangars (7 Operators)			*73,975*
	Private Single Hangars			*58,125*
	T-Hangars (23 units)			*34,700*
	Grand Total			**224,600**

Figure 2-10 – Landside Facilities

Support Facilities

Support facilities are necessary to facilitate the day-to-day maintenance and operation of the airport.

AIRPORT ADMINISTRATION

Airport administration is located in the main terminal building on the second floor before security. The area is approximately 2,400 square feet and includes offices for administrative staff, restrooms, the airport board room and a kitchenette.

AIRCRAFT RESCUE AND FIRE FIGHTING (ARFF)

The FAR Part 139 index for an airport is calculated based on the largest air carrier aircraft in passenger service that conducts an average of five or more daily operations. The ARFF facility is also required to maintain vehicles, chemicals, and response items in accordance with FAR Part 139 Index B.

The ARFF facility is on the terminal apron directly north of the passenger terminal building. The facility itself is 14,000 square feet and houses a 2000 Oshkosh T3000 (fair condition) and a 2011 Rosenbauer Panther (good condition). Combined, these trucks provide the airport with ARFF equipment sufficient for FAR Part 139 Index C. There are six primary staff members and nine relief staff. Two personnel are on duty 24 hours per day.

AIRPORT OPERATIONS & MAINTENANCE FACILITIES

Airport operations staff (six full-time employees) are based out of the ARFF station.

There is a total of 22,400 square feet of space made up of four buildings for airport maintenance. Of this space, 12,800 square feet is for equipment storage and maintenance, two equipment storage buildings of 4,200 square feet and 3,000 square feet, then a 2,400 square foot material storage building. Airport staff conducts all maintenance at RAP including airfield, buildings and snow and ice control. Rapid City Regional Airport owns and operates all the maintenance equipment including the snow removal equipment (SRE). The SRE fleet is made up of three runway/taxiway plows, two snow haulers with 8-foot plows attached, three brooms, a liquid deicer and a snow blaster, and two loaders. A multi-function power broom is expected in January 2021, reducing the number of brooms needed to two.

The airport's electrical vault is located south of the maintenance area and just north of the ARFF station. The building receives power from commercial providers and distributes that power through regulators, controls and wiring to light the airfield. Other buildings at the airport are not powered through the electrical vault. The building also houses the emergency generator for lighting the airfield in the event of a power failure. The electrical vault was constructed in 2008.

Maintenance staff includes thirteen full-time employees operating twenty-four hours a day with at least one person on duty at any time.

FUELING FACILITIES

Existing fuel tanks are located above ground in a fuel farm area west of Airport Road in the general aviation area. The tanks are double walled, providing self-contained spill prevention. The tanks include 100 low lead (100LL) and Jet A fuel owned by the FBO, WestJet. Automobile fuel includes unleaded and diesel fuel tanks owned by the airport.

WestJet has five fuel trucks, three for Jet A and two for 100LL that dispense fuel where aircraft are parked. There is also a self-fueling facility at the airport where pilots can choose to fuel their own aircraft. Fuel storage facilities are listed in **Table 2-16 – Aircraft Fueling Facilities**.

Table 2-16 – Aircraft Fueling Facilities

Location	Fuel Type	Capacity (gallons)	Above /Under Ground	Use / Condition	Owner	Year
Fuel Farm	Jet A	20,000	Above	FBO	WestJet	1998
Fuel Farm	Jet A	20,000	Above	FBO	WestJet	1996
Fuel Farm	100LL	15,000	Above	FBO	WestJet	1996
North GA Apron	100LL	10,000	Above	Self-Fuel	Rapid Fuel	1989
North GA Apron	Jet A	10,000	Above	Self-Fuel	Rapid Fuel	1986
SD ARNG	JP-8	12,500	Above	ARNG	ARNG	2000
SD ARNG	JP-8	12,500	Above	ARNG	ARNG	2000

Source: (SD Department of Environment and Natural Resources) January 2014

GROUND VEHICLE/OTHER FUELING

The Rapid City Regional Airport has three tanks with a total capacity of 30,000 gallons of diesel, 42,000 gallons of unleaded for use at the airport, and five other tanks of diesel dedicated to emergency generators. **Table 2-17 – Ground Vehicle/Other Fueling Facilities** provides a detailed listing of fueling storage at the airport. This fuel is used to support airport operations, rental cars, and others.

Table 2-17 – Ground Vehicle/Other Fueling Facilities

Location	Fuel Type	Capacity (gallons)	Above /Under Ground	Use / Condition	Owner	Year
Fuel Farm	Unl	30,000	Above	Airport	Airport	1986
Fuel Farm	Diesel	30,000	Above	Airport	Airport	1986
Rental Car Service	Unl	12,000	Under	Rental Cars	Airport	2014
Electrical Vault	NatGas			Generator	Airport	
Terminal	Diesel	2,000	Under	Generator	Airport	1988
ARFF	Diesel	2,000	Under	Generator	Airport	2010
ATCT	Diesel		Above	Generator	FAA	
SD ARNG	Diesel	250	Above	Generator	SD ARNG	1996
SD ARNG	Diesel	250	Above	Generator	SD ARNG	2001

Source: (SD Department of Environment and Natural Resources) January 2014

FENCING & SECURITY

The Rapid City Regional Airport has a perimeter fence that provides both wildlife control and a security perimeter to keep the airfield safe and limit access to only those who have need or permission to use the airfield. The fencing and gate access is maintained and operated by the airport staff in accordance with Transportation Security Administration and FAA requirements. The air operations area at RAP has a security fence to prevent unauthorized access to the active airport environment. The fence is a six-foot high chain link with a barbed wire top in the terminal area. The remainder of the airfield has a ten-foot high chain link with barbed wire top.

CUSTOMS & IMMIGRATION

The Rapid City Regional Airport does not have a customs and immigration facility. The nearest port of entry in South Dakota is at the Sioux Falls Regional Airport.

DEICING FACILITIES

Deicing for airlines at the Rapid City Regional Airport is conducted on a portion of apron immediately north of the terminal apron and north of Taxiway T1. The deicing is conducted by each individual airline with their own dedicated equipment. When the equipment is not in use or when it is warming up for use it is parked on the terminal apron at the north end of the terminal building adjacent to the baggage claim and car rental area. Airlines primarily store deicing fluid in individual totes with a typically capacity of 200 gallons.

Aircraft deice over a closed inlet and any excess fluid is then vacuumed with a glycol recovery vehicle. The airport regularly monitors discharges from the storm sewer system in compliance with the Storm Water Discharge permit from the South Dakota Department of Environment and Natural Resources.

Utilities

The following utility infrastructure is available at the airport:

- **Sanitary Sewer:** Currently the airport has a lagoon system for treatment. A sanitary sewer connection to the City of Rapid City's system is being planned at this time.
- **Landside Power:** Electricity is provided by West River Electric with service connection points on the west side of the airport.
- **Airfield Power:** An electric vault distributes power from commercial providers through regulators, controls and wiring to airfield lighting and houses emergency generators.
- **Water:** Provided by the City of Rapid City with connection points on the south and west area of the airport.
- **Storm Sewer:** The storm sewer for the airport is maintained by the airport and generally remains on the airport.
- **Telecommunications:** Midcontinent Communications runs along Airport Road and provides communications along with internet.
- **Natural Gas:** MDU is the provider for natural gas on the airport and is on the north end of Airport Road.

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 **Figure 2-11 – Land Use Map.**

Existing Land Uses

The Rapid City Regional Airport is situated in an agricultural area with residential developments in various locations to the west of the airport. Terrain is generally grasslands with low plateaus, ravines and broad valleys.

The airport is part of Rapid City but is surrounded by unincorporated portions of Pennington County. The Box Elder city limits lie less than a mile north of the airport property line and Meade County is located approximately 5 miles north of the airport property line.

Land Use Compatibility & Zoning

CITY OF RAPID CITY

The City of Rapid City added Chapter 17.58 - Airport Zoning District to the Rapid City Municipal Code (RCMC) in 2005. The Chapter establishes zoning authority over the Airport Zoning District, which encompasses the airport property.

PENNINGTON COUNTY

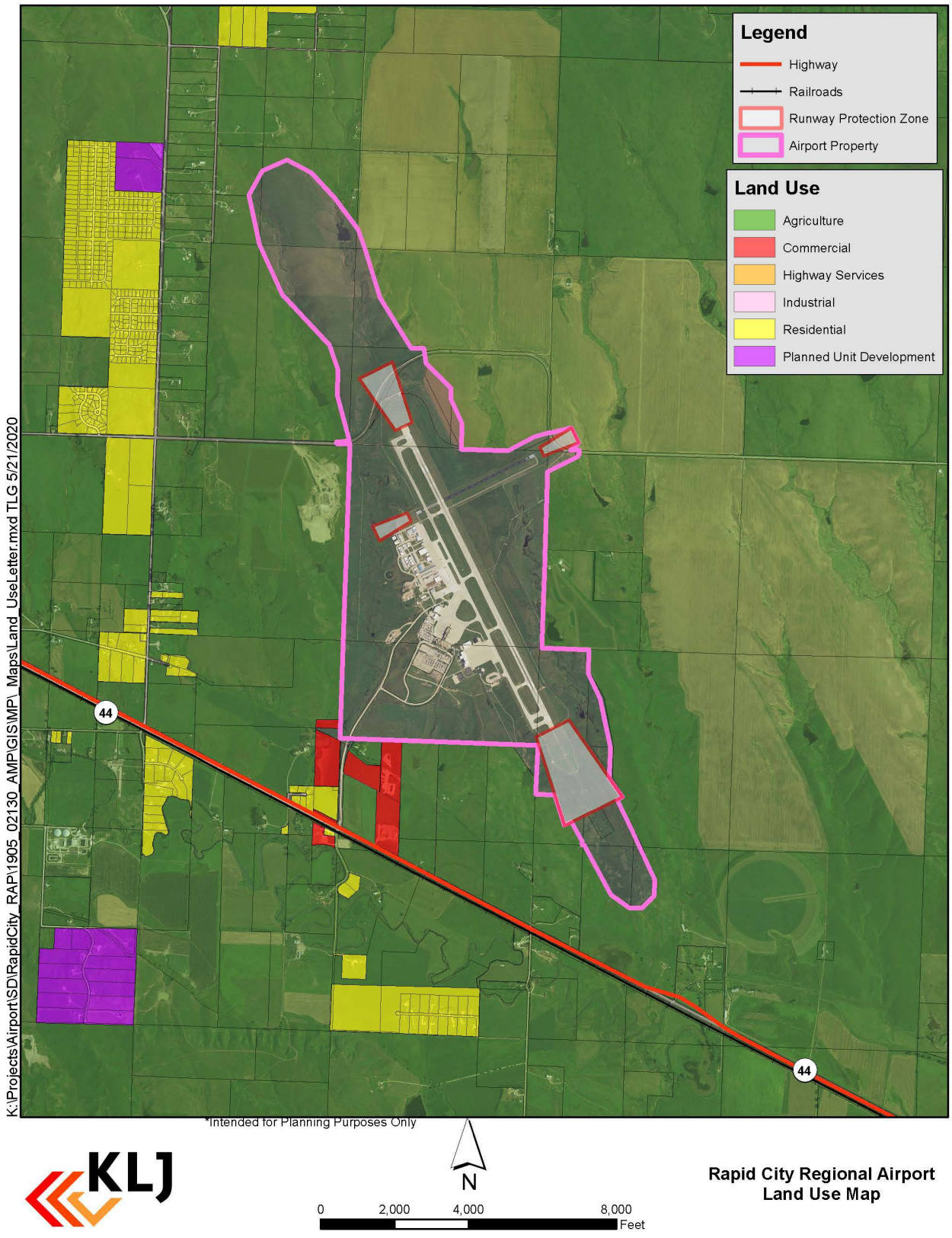
Pennington County has zoning authority over the area surrounding and abutting airport property. Section 301 of the Pennington County Zoning Ordinance regulates and restricts the height of structures and use of property in the vicinity of the Rapid City Regional Airport. Section 301 establishes zones and height limitations consistent with FAR Part 77, exempts existing non-conforming uses, establishes a variance approval process, and allows appeals to the Board of Adjustment, followed by judicial review.

CITY OF BOX ELDER

The City of Box Elder has zoning specific to Ellsworth Air Force Base along with a general Aviation Hazards Zone (AHZ) to protect RAP and Ellsworth from hazardous wildlife attractants and tall structures.

Non-Aeronautical Land Uses

Airport property is to be used for aeronautical purposes. In order for an airport to develop land for non-aeronautical use, the FAA must first approve of the change in use from aeronautical to non-aeronautical. All airport property is identified in the Exhibit "A"/Airport Property Map.


Legend
Highway
Railroads
Runway Protection Zone
Airport Property
Land Use
Agriculture
Commercial
Highway Services
Industrial
Residential
Planned Unit Development
44
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Rapid City Regional Airport
Land Use Map

Environmental Inventory

Introduction

This section provides an overview of environmental conditions and issues at the 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 to airport improvement areas 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 any airport projects.

Figure 2-12 – Environmental Overview Map (North) and **Figure 2-13 – Environmental Overview Map (South)** depict existing environmental conditions in the vicinity of RAP.

The following sections lists Environmental Impact Categories to be analyzed when determining the types of impacts a proposed action/project may have.

Environmental Impact Categories

BIOLOGICAL RESOURCES

Biological resources include flora and fauna that are present in an area. 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. Bison historically roamed through the area. Wildlife species likely to be encountered in the area surrounding the airport include mule and white-tail deer, antelope, jackrabbit, cottontail-rabbit, coyote, badgers, raccoons, skunks, prairie dogs, turkey, pheasant, and grouse.

According to the U.S. Fish and Wildlife Services website, federally listed endangered, threatened, proposed or candidate species in Pennington County include the Whooping crane, Northern long-eared bat, and Red Knot Rufa. 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 any proposed projects.

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

Section 4(f) is applicable to projects which require the use of publicly-owned land from a public park, recreation area, or wildlife and waterfowl refuge of national, state, or local significance, or land of an historic site of national, state, or local significance. There are blocks of land owned by the City of Rapid City to the west of RAP and Cultural Resource Inventories on and near RAP have identified areas of historic significance. Figure 2-10: Environmental Overview Topo Map Inventory provides a graphical depiction of the areas surrounding the Airport property.

There are no known publicly owned lands from parks, recreation areas, or refuge areas within the immediate vicinity of the Airport. Further review of the potential to impact Section 4(f) resources specifically regarding potential cultural sites or historic properties would be required at the environmental documentation phase of any projects that would require ground disturbance.

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. A review of Land Water Conservation Fund grants for Pennington County indicates that 57 grants have been issues for properties within the county. These properties are not located near the Airport. Proposed improvements are not anticipated to impact existing Section 6(f) properties; therefore, no further analysis is required.

Figure 2-12 - Environmental Overview Map (North)

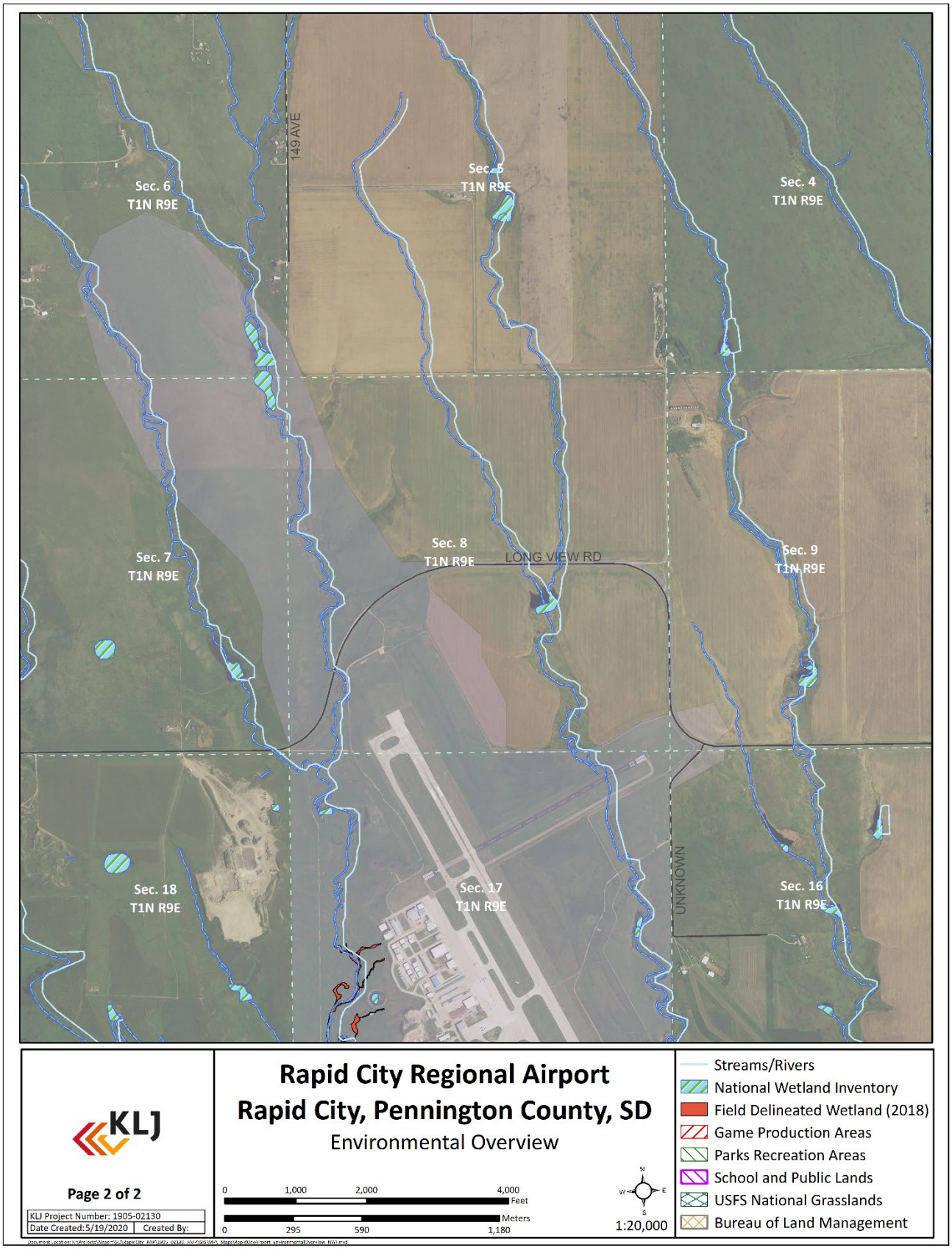
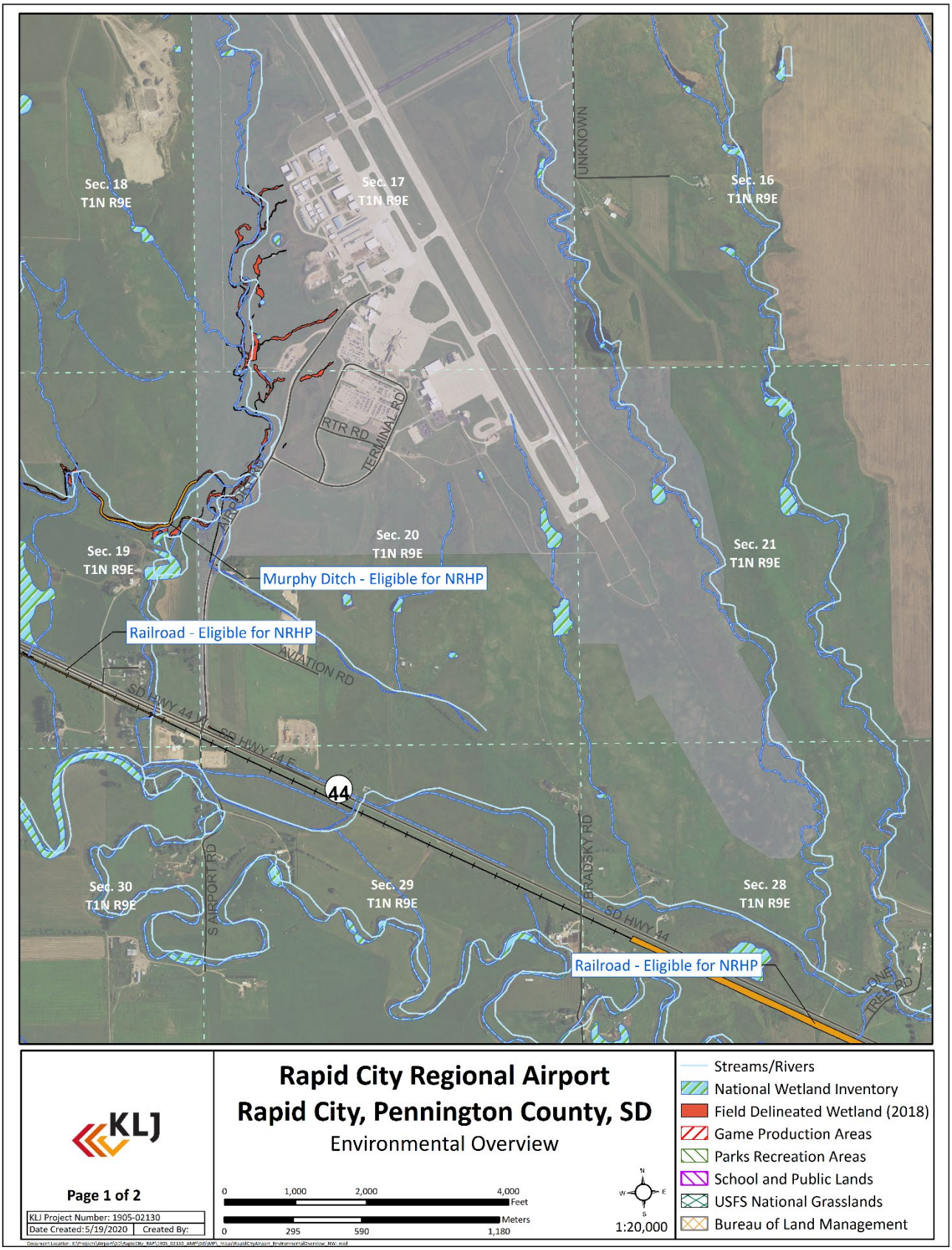


Figure 2-13 - Environmental Overview Map (South)



HAZARDOUS MATERIALS

Based on a review of the SD Department Agricultural and Natural Resources and Environmental Protection Agency databases regarding underground storage tanks, listings for superfund sites, and sites covered under the Resource Conservation and Recovery Act there are leaking tanks in or around RAP. There was a discharge of firefighting foam, Aqueous Film Forming Foam (AFFF) during a drill in May 2017. AFFF is not hazardous to humans but has a high biochemical oxygen demand (BOD) and can adversely affect bacterial in stream and river environments. The site of the spill has been monitored and measures have been put into place to prevent a similar discharge in the future. 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.

HISTORICAL, ARCHITECTURAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

Section 106 of the National Historic Preservation Act of 1966, as amended, requires that federally funded projects be evaluated for the effects on historic and cultural properties included in, or eligible for listing in, the National Register of Historic Places. The Archaeological and Historic Preservation Act of 1974 provides for the survey, recovery, and preservation of significant scientific, prehistoric, archaeological, or paleontological data when such data may be destroyed or irreparably lost due to a federal, federally licensed, or federally funded project.

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 State Historic Preservation Office (SHPO) is necessary for projects involving land disturbance. Additionally, any project affecting buildings that have the potential to be listed in the National Register of Historic places would require coordination with SHPO.

A Level III Cultural Resource Survey and a traditional cultural properties survey was conducted as part of this Master Plan Update. Traditional cultural properties were identified on Airport property and the SD SHPO accepted the findings for the survey report in February 2022, further coordination will be necessary to determine if development projects have the potential to impact these properties and to evaluate avoidance options if deemed necessary.

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, RAP is surrounded by pastureland and open spaces. There is homes located approximately 1,800 feet to the east of Runway

14-32. Other land use considerations including surrounding physical land uses, airport zoning regulations and FAA airport design land use compatibility standards have been previously identified in this Chapter.

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.

Property surrounding RAP is pastureland. The city of Rapid City wastewater treatment facility is located 2.5 miles to the southeast of the airfield and should be monitored to ensure wildlife attracted to it are not a danger to aircraft using RAP. Additionally, Rapid City is located approximately two miles south of the Airport and should be monitored as well.

RAP is surrounded by a 10-foot-high perimeter fence that has shown to provide adequate protection from large mammals such as deer, antelope and coyotes from crossing over the Airport property including operations areas such as the runway. The Airport should monitor wildlife concerns and if an issue is identified a site visit from a qualified wildlife biologist could help to provide recommendations to reduce wildlife concerns at the airport.

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.

WATER RESOURCES

Wetlands

Analysis of the National Wetlands Inventory data indicates the presence of wetlands within the study area. Wetlands in the area would serve a variety of functions, including groundwater recharge, flood control, sediment removal, and nutrient cycling. A wetland delineation cover a portion of the west side of the Airport was completed concurrent to this Master Planning study, the delineated wetlands from that delineation are shown on **Figure 2-12 & 2-13 – Environmental Overview Map.** A larger wetland delineation and coordination with applicable resource agencies may be necessary prior to project implementation to further analyze the impacts proposed improvements would have on wetlands.

Surface and Ground Waters

Airport activities can impact water quality, mainly due to stormwater runoff from paved areas. Typical pollutants found in airport runoff include spilled oil and fuel, loose debris, rubber tire deposits, and accidentally discharged chemicals. Water pollution problems can be intensified during winter if deicers are used to clear taxiways, runways, and apron areas. Additionally, washing and deicing agents used on aircraft can pollute stormwater runoff.

AIR QUALITY CLASSIFICATION

Rapid City Regional 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 predict pollutant discharges high enough to cause degradation to the existing air quality. Temporary increases due to construction will be mitigated through the use of Best Management Practices (BMPs).

COASTAL RESOURCES

The project area is not located in a coastal zone as defined in the Coastal Zone Management Act of 1972.

FARMLAND

The Farmland Protection Policy Act 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.

Information from the Natural Resources Conservation Service (NRCS) Web Soil Survey for Pennington County, SD indicates the land on and adjacent to the airport property contains some areas classified as prime farmland if drained. NRCS Form AD-1006, Farmland Conversion Impact Rating, would need to be completed for any land being purchased to determine the level of impacts to farmland. Section 658.4(c)(3) of the Farmland Protection Policy Act (FPPA) states that sites receiving a score totaling 160 or more be given increasingly higher levels of consideration for protection. The form is not required by projects that occur on airport property or within city limits.

NATURAL RESOURCES AND ENERGY

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. Any proposed improvements at Rapid City Regional Airport would require additional energy but are not anticipated to cause impacts to energy supplies or natural resources.

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.

VISUAL IMPACTS

Light emissions from the various types of lighting installed on an airport can be a potential annoyance for people living or working in the vicinity of the installation. Simple shielding, changing a beam angle, or considering the location of lighting systems can avoid such an annoyance. These lights are not anticipated to significantly increase light emissions or cause visual impacts to the area. 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.

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. The Airport is located in an area that has a 0.2% annual chance of flood as well as areas that have a 1% chance of annual flood.

Figure 2-14 – Floodplain Map

Source: FEMA.gov

WILD AND SCENIC RIVERS

The Wild and Scenic Rivers Act of 1968, as amended, identified rivers within the United States that are eligible to be included in a system afforded protection, which are free flowing and possessing outstandingly remarkable scenic recreational, geologic, fish and wildlife, historic, cultural or other similar values. Rapid City Regional Airport is not located near a wild or scenic river.

Conclusion

The information collected and documented in this Inventory chapter provides a baseline foundation to update the Rapid City Regional Airport Master 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

Federal Aviation Administration COVID-19 Disclaimer

This forecast was prepared in 2020 at the same time as the evolving impacts of the COVID-19 public health emergency. Forecast approval is based on the methodology, data, and conclusions at the time the document was prepared. However, consideration of the impacts of the COVID-19 public health emergency on aviation activity is warranted to acknowledge the reduced confidence in growth projections using currently-available data.

Accordingly, FAA approval of this forecast does not constitute justification for future projects. Justification for future projects will be made based on activity levels at the time the project is requested for development. Documentation of actual activity levels meeting planning activity levels will be necessary to justify AIP funding for eligible projects.

Introduction

The Aviation Activity Forecasts chapter of the Airport Master Plan analyzes current and future airport activity at the Rapid City Regional Airport (RAP). Forecasting provides an airport with a general idea of the magnitude of growth, as well as fluctuations in activity anticipated over the forecast period. They assist the Airport 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.

An update of the master plan was needed because by 2019, RAP had already surpassed year 2033 forecasts from the 2014 Airport Master Plan. This chapter includes aviation activity forecasts for the following primary elements:

- Passenger Enplanements
- Based Aircraft
- Airport Operations
- Critical Design Aircraft
- 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 Federal Aviation Administration (FAA). It is the FAA's policy (ref. 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:

- Forecasts differ by less than 10 percent in the five-year forecast and 15 percent in the 10-year period, or
- Forecasts do not affect the timing or scale of an airport project, or
- Forecasts do not affect the role of the airport as defined in the current version of FAA Order 5090.5, *Formulation of the NPIAS and AICP*.

Forecasts that are inconsistent with the TAF require additional FAA review to confirm the planning assumptions and appropriate methodologies are used. The TAF model used for this report is from the 2019 FAA TAF published in January 2020. This is latest data available when the forecasting effort began for this study.

Factors Affecting Forecasts

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

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

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

- Based on availability of data when the project began (January 2020), Federal fiscal year 2018 (October 1, 2017 through September 30, 2018) has been used as the baseline year.
- FAA data from 2019 (where available) has been used to validate forecast assumptions and update the forecast baseline.
- The forecast period is 20 years encompassing years 2020 through 2039.
- The core airport service area is considered the Rapid City, SD Metropolitan Statistical Area (MSA) for this forecasting effort. The MSA includes Pennington, Meade, Lawrence and Custer counties.

COVID-19 has significantly impacted the aviation industry, including reduced operations and enplanements. The aviation industry experienced a major loss of revenue, resulting in airlines and general aviation companies laying off employees, canceling flights or even shutting down. It's difficult to predict how coronavirus will alter travel patterns in the short and long-term.

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 2024, 2029, 2034, and 2039. Forecasts may be developed using a composite of methodologies over the planning period.

Socioeconomic Data

Socioeconomic information within the airport service area can provide insight into factors that affect aviation activity at an airport. Commonly evaluated metrics include population, income, and gross regional product. Historic trends, current data and forecast estimates are evaluated in this section to identify socioeconomic trends that may affect aviation activity forecasts at RAP. Growth rates are used as a method to compare the airport service area to other regional, statewide, and national trends.

For purposes of this study analysis, the Rapid City area has been determined to represent the core local airport service area, while the MSA includes the Rapid City area along with the City of Spearfish area.

Population

Population is a basic indicator of the number of people who may utilize the airport. A comparison of population data for the county, the MSA, the state, and the US is shown in **Table 3-1 Population/Demographic Summary** with the Historic and Forecast Annual Growth Rate (AGR).

Table 3-1 – Population

Year	Pennington County, SD[1]	MSA	South Dakota	United States
1990	103,659	127,507	697,101	249,622,802
2000	113,124	136,062	755,844	282,162,374
2010	126,728	152,211	816,227	309,338,364
2019 (est.)	140,391	167,409	880,887	330,393,265
Historic AGR	*1.06%*	*0.95%*	*0.82%*	*0.98%*
2024	*145,830*	*173,618*	*908,413*	*341,996,829*
2029	*151,049*	*179,488*	*935,122*	*353,468,845*
2034	*155,846*	*184,824*	*959,999*	*364,431,014*
2039	*160,122*	*189,535*	*982,529*	*374,692,158*
Forecast AGR	*0.66%*	*0.62%*	*0.55%*	*0.63%*

Source: Woods & Poole Economics

Income

Per Capita Personal Income (PCPI) was also considered as a factor affecting aviation activity. Those who have more disposable income may have a higher propensity to utilize the time savings of aviation, or simply more disposable income for leisure.

[1] Pennington County is the smallest jurisdiction reported, inclusive of Rapid City, from the Woods & Poole data.

Table 3-2 – Per Capita Personal Income (current dollars)

Year	Pennington County, SD	MSA	South Dakota	United States
1990	17,035	16,869	16,475	19,621
2000	26,710	26,195	26,890	30,657
2010	39,833	39,436	41,058	40,545
2019 (est.)	50,886	50,761	52,722	55,672
Historic AGR	*3.84%*	*3.87%*	*4.10%*	*3.65%*
2024	*62,671*	*62,452*	*65,330*	*68,922*
2029	*79,430*	*79,060*	*83,287*	*87,836*
2034	*100,794*	*100,213*	*106,461*	*112,185*
2039	*127,450*	*126,582*	*135,657*	*142,891*
Forecast AGR	*4.70%*	*4.67%*	*4.84%*	*4.83%*

Source: Woods & Poole Economics, U.S. Census Bureau

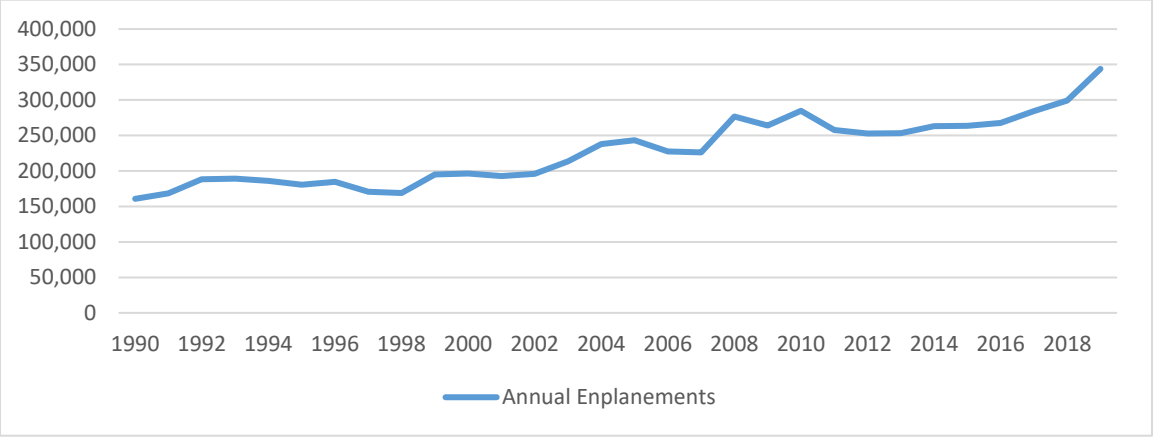
Passenger Enplanements

Passenger airline enplanements represent the number of revenue passengers boarding commercial service aircraft that depart an airport. Enplanement figures are vital for project planning at commercial service airports because the numbers help determine size and space requirements for the terminal building, as well as validate the airport's FAA classification and funding.

Passenger Demand

On average since 1990, passenger enplanements at Rapid City have been increasing, but there have been fluctuations which are likely attributed to economic conditions such as the recession of 2009. Population and income since 2000 has increased at a steady rate. Rapid City's location has allowed it to typically capture most of the travel within its catchment area with some leakage to Denver and Sioux Falls which are both approximately six hours away. As mentioned above, the fluctuation in enplanements is primarily from changes in the national economy which impacts the tourism element. While tourism will remain a major part of the Rapid City's economy, the area is diversifying, which will help if another national economic downturn occurs.

Figure 3-1 – RAP Historic Enplanements



Source: FAA Annual Enplanements

Table 3-3 – RAP Historic Passenger Data

Year	Enplanements	Load Factor
2015	266,979	79.79%
2016	276,684	82.31%
2017	288,384	77.33%
2018	306,419	83.29%
2019	345,155	81.98%
CAGR	*5.27%*	

Source: U.S. DOT T-100 Summary Report (January 2015-December 2019)

Forecasts

A forecast of enplaned passengers has been prepared using existing data and the best available information regarding airline industry trends to serve the Rapid City market for both tourism and local demand. The market has seen annualized growth of 2.24% over the past 20 years, but has seen annualized growth of 6.87% over the past four years, rising to 343,926 enplaned passengers in 2019. There were a number of items considered in generating this Master Plan forecast which include:

- The local Rapid City economy will remain strong and resilient. Population, and income growth will generally follow projections.
- Rapid City Regional Airport will continue air service development efforts.
- Airline consolidations were completed in 2010 for Delta (merging with Northwest), in 2012 for United (merging with Continental) and in 2015 for American (merging with US Airways). The networks established by these carriers are beginning to incorporate the Rapid City market to multiple destinations. This expansion to other destinations will continue.
- Enplanement demand will be met by the airlines through adding flight frequency, aircraft capacity and airline destinations to meet the need at existing hub airports.
- 'Niche' airlines are expected to begin serving Rapid City during the planning period which will add capacity and destinations.
- The impact of COVID-19, starting in the spring of 2020, was considered by lowering enplanements through 2022, before returning to existing levels by 2023.

The airport's airline passenger service consultant, Mead & Hunt, provided projections at a Normal and High forecast level through 2029. This information is provided in **Tables 3-4** and **3-5**.

For the preferred forecast, the Mead & Hunt Normal forecast was used for the first 10 years (through 2029) at 4.11% CAGR. For the remaining portion of the 20-year period, a lower growth rate was used, resulting in a 2.98% CAGR over the full 20-year period. The preferred forecast is listed in **Table 3-6 RAP Long Range Passenger Enplanement Forecast** as the Normal/Level forecast.

Table 3-4 – RAP Passenger Enplanement (Normal Forecast)

Month	2019	2021	2023	2025	2027	2029	CAGR
January	19,142	11,318	14,189	17,036	17,036	20,501	*0.69%*
February	17,594	12,124	14,521	17,363	17,923	23,322	*2.92%*
March	19,956	16,911	20,566	22,523	24,022	26,387	*2.83%*
April	20,778	18,470	22,077	24,063	24,980	30,188	*3.81%*
May	27,778	20,224	25,353	32,921	33,422	42,055	*4.20%*
June	37,764	33,168	49,848	56,956	63,154	73,156	*6.84%*
July	43,259	39,845	58,214	65,398	73,195	79,248	*6.24%*
August	41,062	38,118	56,185	63,369	70,315	76,944	*6.48%*
September	37,732	28,494	38,805	46,641	48,072	56,655	*4.15%*
October	30,379	23,785	30,025	32,114	35,186	36,265	*1.79%*
November	21,515	16,007	22,448	22,448	22,448	23,494	*0.88%*
December	26,964	19,184	23,675	24,439	25,203	26,282	*-0.26%*
Total	343,926	277,647	375,906	425,272	454,956	514,497	*4.11%*
Load Factor	81.69%	74.23%	81.39%	82.52%	82.87%	82.81%	

Source: Mead & Hunt

Table 3-5 – RAP Passenger Enplanement (High Forecast)

Month	2019	2021	2023	2025	2027	2029	CAGR
January	19,142	11,318	14,189	17,036	18,791	20,501	*0.69%*
February	17,594	12,124	14,521	17,363	19,795	23,322	*2.92%*
March	19,956	16,911	20,566	23,645	26,387	27,534	*3.27%*
April	20,778	18,470	22,077	25,191	27,385	31,335	*4.19%*
May	27,778	20,224	26,486	36,420	38,793	46,728	*5.30%*
June	37,764	33,168	52,477	62,213	71,606	82,356	*8.11%*
July	43,259	39,845	60,911	70,814	82,072	88,838	*7.46%*
August	41,062	38,118	58,893	68,785	79,088	86,422	*7.73%*
September	37,732	28,494	39,973	49,048	54,991	61,412	*4.99%*
October	30,379	23,785	30,025	32,114	36,516	37,434	*2.11%*
November	21,515	16,007	22,448	22,448	23,738	23,494	*0.88%*
December	26,964	19,184	23,674	24,439	26,533	26,282	*-0.26%*
Total	343,926	277,647	386,251	449,518	505,695	555,657	*4.91%*
Load Factor	81.69%	74.23%	81.44%	82.59%	82.90%	82.90%	

Source: Mead & Hunt

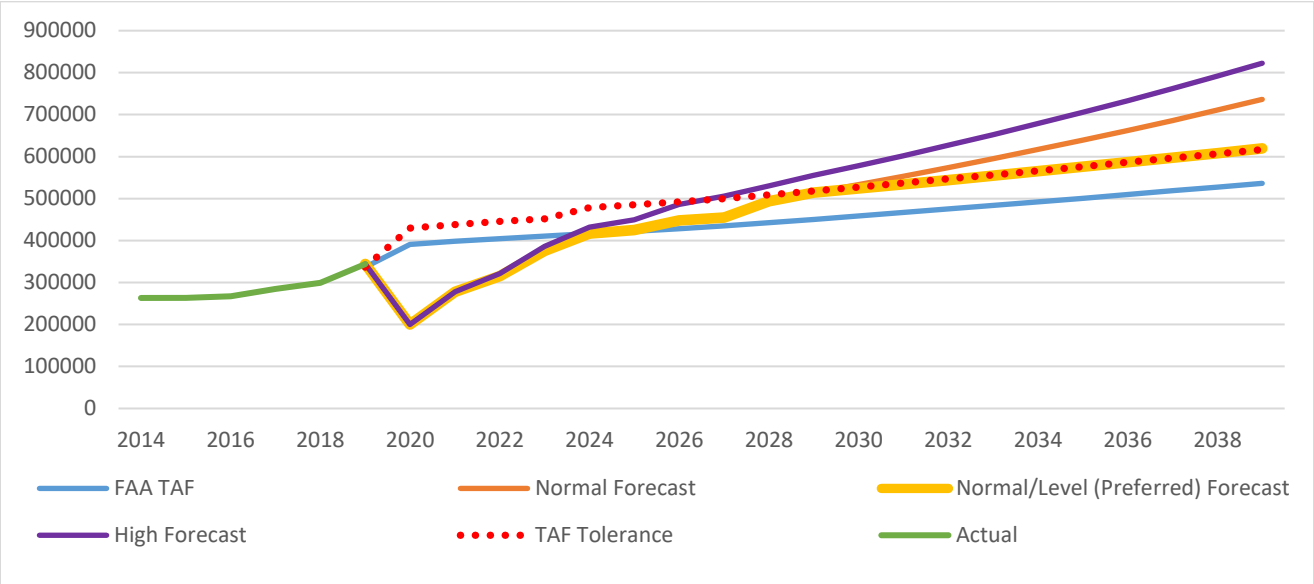
Table 3-6 – RAP Long Range Passenger Enplanement Forecast

Forecast	2019	2024	2029	2034	2039	2019 to 2029 CAGR	2019 to 2039 CAGR
Normal	343,926	416,470	514,497	616,987	736,334	*4.11%*	*3.88%*
Normal/Level	343,926	416,470	514,497	565,267	619,525	*4.11%*	*2.98%*
High	343,926	432,095	555,657	679,299	822,505	*4.91%*	*4.46%*
Preferred Normal/Level	343,926	416,470	514,497	565,267	619,525	*4.11%*	*2.98%*
FAA TAF	336,697	416,334	450,458	492,201	536,341	*2.95%*	*2.36%*

Source: KLJ Analysis and Projection of Mead & Hunt data

The FAA Terminal Area Forecast (TAF) projects 536,341 enplanements by 2039 which is based on an annual growth rate of 2.36%. In **Figure 3-2 RAP Enplanement Forecast**, the TAF is provided in comparison to the normal and high forecast.

Figure 3-2 – RAP Passenger Enplanement Forecasts



Source: FAA Terminal Area Forecast (January 2020), Mead & Hunt Projections, KLJ Analysis

Enplanement Recovery

As of August 2020, the enplanement activity has been rebounding. See **Table 3-7 Rapid City Enplanements through Pandemic** to see the actual activity in comparison to the 2021 forecast.

Table 3-7 – RAP Enplanements through Pandemic

Month	2019 Actual	2020 Actual	2021 Actual	2021 Forecast
January	19,142	21,045	11,820	11,318
February	17,594	20,270	12,106	12,124
March	19,956	11,641	17,308	16,911
April	20,778	1,486	17,524	18,470
May	27,778	5,807	28,756	20,224
June	37,764	11,119	42,466	33,168
July	43,259	19,922	50,805	39,845
August	41,062	24,692	48,195	38,118
September	37,732	20,628	39,501	28,494
October	30,379	20,732	31,526	23,785
November	21,515	14,555	24,121	16,007
December	26,964	13,695	24,225	19,184
Total	343,926	185,592	348,269	277,647

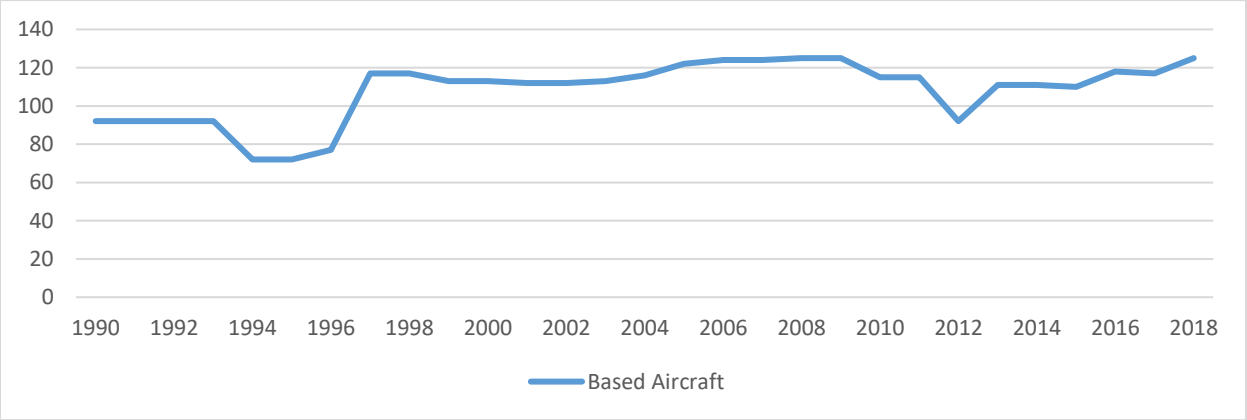
Source: Rapid City Regional Airport, Mead & Hunt; Note: 2019 is only Revenue Enplanements as counted by FAA

Based Aircraft

A based aircraft is an operational and airworthy aircraft claiming an airport as its home for most of the year. Civil (non-military) based aircraft at Rapid City are used for general aviation (GA) and some Air Taxi (AT) operations. National forecasts show a modest growth rate of 0.80 percent annually over the next 20 years. Based aircraft had been increasing steadily with decreased growth during economic downturns. Events affecting the number of aircraft include increased security regulations since 9/11, increased cost of aircraft ownership and economic conditions. Aircraft types are evolving to include more turboprop and turbojet aircraft and fewer multi-engine piston aircraft.

The historic TAF for Rapid City showed a downturn of based aircraft in 2011 to 2012 from 115 down to 92 aircraft. In discussions with Rapid City airport staff it was learned that the based aircraft information for 2012 was gathered by sending mailings to all aircraft known to be based at the airport. The 2012 based aircraft numbers were recorded as a result of those aircraft owners' responding. If an aircraft owner did not respond or was otherwise not known to airport, it was not recorded as a based aircraft in 2012. As a result, the 2012 based aircraft number of 92 aircraft appears to be an error in data collection and not a correct representation of the aircraft at the airport in that year. Rapid City reported 125 based aircraft in 2020 which are detailed by aircraft type in **Table 3-8**.

Figure 3-3 – Historic FAA Recorded Based Aircraft



Source: FAA Terminal Area Forecast (January 2020)

Table 3-8 – Based Aircraft Fleet Mix

Aircraft Type	Based Aircraft	Percent of Total
Single-Engine	94	75.2%
Multi-Engine	21	16.8%
Jet	4	3.2%
Helicopter	5	4.0%
Ultralight/Other	1	0.8%
Total Based Aircraft	125	**100.0%**

Source: FAA 5010 Rapid City Regional Airport 2020

Forecast

An important local and regional consideration is the stagnant level of based aircraft at Rapid City in comparison to the multi-county area. Increases occurred in the region in 1998, 2001 and 2007 but did

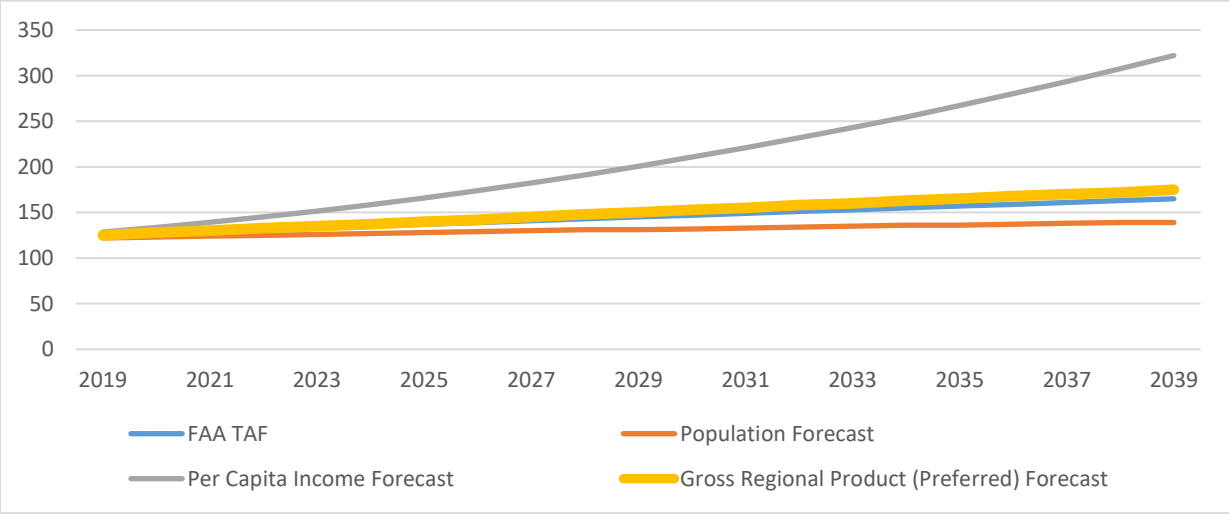
not occur at Rapid City. This has resulted in based aircraft locating at surrounding airports other than Rapid City. This will have an effect on the forecast of based aircraft at Rapid City. There were three airports mentioned most in discussions about where pilots are basing their aircraft.

- Black Hills Airport (SPF): SPF is in Spearfish, SD [41 nautical miles northwest of RAP]. This facility has a 6,401-foot runway with two non-precision GPS approaches. According to the FAA TAF, based aircraft at SPF have increased rapidly from 43 to 73 over the past 20 years for an average growth rate of 2.7 percent annually. From Rapid City it is a 45-mile (47 minute) drive.
- Sturgis Municipal Airport (49B): 49B is in Sturgis, SD [26 nautical miles northwest of RAP]. This facility has a 5,100-foot runway and 42 based aircraft with two non-precision GPS approaches. According to the FAA TAF, based aircraft at 49B have increased from 30 to 42 over the past 20 years for an average growth rate of 1.7 percent. From Rapid City it is a 35-mile (38 minute) drive.
- Hot Springs Airport (HSR): HSR is in Hot Springs, SD [42 nautical miles south of RAP]. This facility has a 4,506-foot runway and 30 based aircraft with two non-precision GPS approaches. According to the FAA TAF, based aircraft at HSR have increased rapidly from 10 to 30 over the past 20 years for an average annual growth rate of 4.3 percent. From Rapid City it is a 54-mile (54 minute) drive.
- In comparison, Rapid City Regional Airport is east of the city. It is a 10-mile (15 minute) drive to Rapid City Regional Airport from the central business area. The airport has grown from 113 to 125 aircraft in the same time period for a 0.5 percent annual growth.

There are two factors which are believed to have limited based aircraft growth at Rapid City. These are first the lack of space to develop, since the airport is on a low plateau with additional cost to fill and level land for hangar development. Second is the airport is now within City of Rapid City limits and as of 2005, was required to abide by City building codes. If these factors are addressed, it is believed that additional based aircraft will be added.

It is estimated Rapid City based aircraft will grow at a marginal growth rate for the short-term following historical trends. New based aircraft will include a variety of aircraft types. Rapid City based aircraft is forecast to grow from 125 currently to 175 at the end of the forecast period for an average annual growth rate of 1.78 percent.

Figure 3-4 – Based Aircraft Forecasting Methods



Source: FAA TAF issued January 2020, Woods & Poole, KLJ Analysis

The preferred based aircraft forecast, which was based on the Gross Regional Product, was expanded to distribute across different aircraft types. **Table 3-9 – Based Aircraft Forecast** shows the total based aircraft forecast and the distribution by aircraft type. Turboprop, Jet aircraft and Helicopters are expected to see higher growth than Piston aircraft. Piston aircraft make up the majority of the RAP Single-Engine aircraft and a few of the Multi-Engine aircraft.

Table 3-9 – Based Aircraft Forecast

Metric	2019	2024	2029	2034	2039	*CAGR*
Single-Engine*	94	99	104	108	112	*0.93%*
Multi-Engine*	21	25	30	35	41	*3.58%*
Jet	4	5	7	9	12	*5.95%*
Helicopter	5	6	7	8	9	*3.14%*
Ultralight/Other	1	1	1	1	1	
Total Based Aircraft	**125**	**136**	**149**	**161**	**175**	***1.79%***

Source: KLJ Analysis. CAGR = Compounded Annual Growth Rate
** Single and Multi Engine aircraft include both piston and turboprop aircraft.*

Aircraft Operations

Commercial

Commercial aviation consists of civil aviation that involves operating an aircraft for hire to transport passengers or cargo. These operations are scheduled or unscheduled. The commercial operations forecasts for RAP listed in **Table 3-10** and **Table 3-11** consider both new airline service anticipated as well as changes in the industry aircraft fleet mix.

Table 3-10 – RAP Passenger Aircraft Operations (Normal Forecast)

Month	2019	2021	2023	2025	2027	2029	CAGR
January	670	520	528	608	608	668	*-0.03%*
February	586	514	522	598	598	714	*2.00%*
March	694	664	726	744	806	798	*1.41%*
April	756	738	798	816	836	880	*1.53%*
May	976	770	874	1,046	1,062	1,292	*2.84%*
June	1,406	1,120	1,450	1,610	1,694	1,814	*2.58%*
July	1,568	1,294	1,612	1,776	1,860	1,960	*2.26%*
August	1,478	1,260	1,572	1,736	1,820	1,940	*2.76%*
September	1,274	1,002	1,200	1,360	1,422	1,602	*2.32%*
October	1,136	842	946	988	1,086	1,086	*-0.45%*
November	810	588	726	726	726	726	*-1.09%*
December	936	672	752	752	752	752	*-2.17%*
Total	12,290	9,984	11,706	12,760	13,270	14,232	*1.48%*

Source: Mead & Hunt

Table 3-11 – RAP Passenger Aircraft Operations (High Forecast)

Month	2019	2021	2023	2025	2027	2029	CAGR
January	670	520	528	608	608	668	*-0.03%*
February	586	514	522	598	598	714	*2.00%*
March	694	664	726	736	798	814	*1.61%*
April	756	738	798	810	830	896	*1.71%*
May	976	770	890	1,072	1,096	1,356	*3.34%*
June	1,406	1,120	1,486	1,682	1,844	1,940	*3.27%*
July	1,568	1,294	1,648	1,848	2,010	2,086	*2.90%*
August	1,478	1,260	1,608	1,808	1,970	2,066	*3.41%*
September	1,274	1,002	1,216	1,392	1,522	1,666	*2.72%*
October	1,136	842	946	988	1,086	1,102	*-0.30%*
November	810	588	726	726	726	726	*-1.09%*
December	936	672	752	752	752	752	*-2.17%*
Total	12,290	9,984	11,846	13,020	13,840	14,786	*1.87%*

Source: Mead & Hunt

As with the enplanement forecast, the preferred operations forecast also used the Mead & Hunt Normal forecast for the first 10 years through 2029 at 1.48% CAGR. For the remaining portion of the 20-year period a lower growth rate was used resulting in a 1.49% CAGR over the full 20-year period. The preferred forecast is listed in **Table 3-12**.

Table 3-12 – RAP Long Range Passenger Aircraft Operations Forecast

Forecast	2019	2024	2029	2034	2039	2019 to 2029 CAGR	2019 to 2039 CAGR
Normal[1]	11,290	11,387	13,074	14,435	15,550	*1.48%*	*1.61%*
Normal/Level[1]	11,290	11,387	13,074	14,224	15,173	*1.48%*	*1.49%*
High[1]	11,290	11,580	13,583	14,997	16,156	*1.87%*	*1.81%*
Cargo	2,200	2,200	2,300	2,400	2,500	*0.80%*	*0.64%*
Preferred (Normal/Level +Cargo)	13,490	13,587	15,374	16,624	17,673	*1.31%*	*1.36%*
FAA TAF[2]	15,587	14,432	15,476	16,697	17,989	*-0.07%*	*0.72%*

Source: KLJ Analysis and Projection of Mead & Hunt data

General Aviation

General Aviation (GA) is non-commercial aviation activity not classified in another category. At airports with a local Air Traffic Control Tower (ATCT) like RAP, takeoffs and landings (operations) are counted and classified as civil local or itinerant. Local operations are performed by aircraft that remain in the local traffic pattern and stay within a 20–mile radius. These operations typically include practice landings, touch-and-go operations, practice approaches and maneuvering within the local area in non-military aircraft. Local operations are usually performed by recreational and flight training aircraft. Itinerant

[1] All airline passenger aircraft operations including those classified as Air Carrier and Air Taxi/Commuter.
[2] Air Carrier and Air Taxi/Commuter Operations which includes cargo and also some unscheduled operations.

operations are performed by a landing aircraft arriving from outside the airport area (20 miles) or a departing aircraft that leaves the airport area. Itinerant operations are conducted in all types of aircraft including airlines, general aviation and military.

From a national perspective, the trend of strong growth in corporate aircraft and steady or decreased use of piston aircraft is expected to continue over the planning period. This national forecast may fluctuate with new unleaded fuel engines potentially reducing the cost of flying. The number of fixed wing turbojet aircraft is expected to increase 1.84 percent annually with hours flown increasing at a 2.39 percent rate. Fixed wing piston aircraft are expected to decrease at a rate of 0.96 percent annually with activity decreasing at a 1.08 percent annual rate. Overall GA operations at RAP are expected to increase at a consistent rate through 2039.

Military Operations

Military missions are difficult to predict but the local SDANG base is expected to remain at RAP for the foreseeable future. Total, local and itinerant military operations were forecast to remain steady and follow average figures from the last 10 years assuming the same type of mission will occur at RAP. Total operations are forecast to remain at 3,178 for the planning period. Itinerant operations make up about 69 percent of the total with local operations at 31 percent based on historical trends.

The preferred forecast for military operations is consistent with the 2019 FAA TAF.

Operations Summary

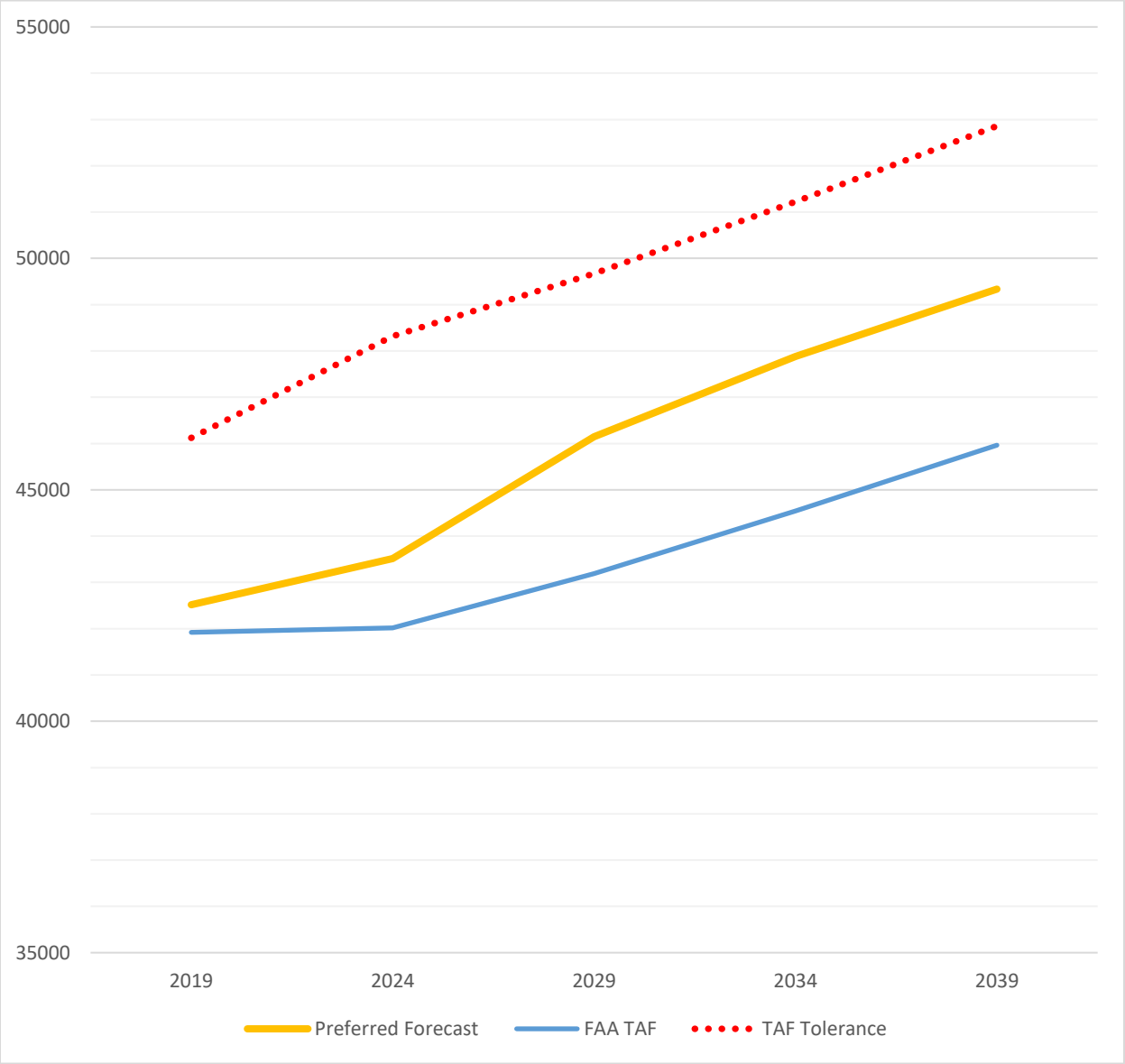
The total annual operations forecast for RAP is summarized in the following table, including a breakdown between operations types.

Table 3-13 – Total Operations Forecast Summary

Metric	2019	2024	2029	2034	2039	CAGR
Commercial	13,490	13,587	15,374	16,624	17,673	*1.36%*
GA Itinerant	17,083	17,571	17,912	18,026	18,180	*0.31%*
GA Local	8,767	9,171	9,528	9,797	9,961	*0.64%*
Military	3,178	3,178	3,178	3,178	3,178	*0.00%*
Total Forecast Operations	**42,517**	**43,508**	**45,992**	**47,625**	**48,992**	***0.71%***
FAA TAF Operations						
Air Carrier	5,174	8,706	9,413	10,277	11,189	*3.93%*
Air Taxi/Commuter	10,413	5,726	6,063	6,420	6,800	*-2.11%*
GA Itinerant	14,706	14,865	14,870	14,875	14,880	*0.05%*
GA Local	9,411	10,504	9,667	9,792	9,917	*0.26%*
Military	3,178	3,178	3,178	3,178	3,178	*0.00%*
Total TAF Operations	**41,920**	**42,017**	**43,191**	**44,542**	**45,964**	***0.46%***

Source: KLJ Analysis, CAGR = Compounded Annual Growth Rate
Note: Some numbers may not add up due to rounding

Figure 3-5 – Total Operations Forecast



Fleet Mix

The fleet mix for passenger airline and cargo airline operations are turbojet and turboprop respectively. Average annual passenger airline operations were 9,490 from 2014 through the 3rd quarter of 2019 and average annual cargo airline operations were 1,980 for this same period. This type of fleet mix is expected to continue through the planning period.

For Rapid City, the largest variety of aircraft come from general aviation operations. TFMS data was gathered from years 2014 through the 3rd Quarter of 2019. The fleet mix of aircraft identified in the following table is used for itinerant flights conducted under IFR. An aggregate of 2014-2019 aircraft types were ranked and the top 20 moved forward to help establish an overall IFR fleet mix. It is estimated about 35 percent of all general aviation operations at RAP are recorded in the TFMS.

Table 3-14 – TFMS Data Fleet Mix (2014 to 3rd Quarter 2019)

Aircraft ID	Make/Model	Type	Total Period Operations	Annual Baseline GA Operations
BE9L	Beechcraft King Air C-90	Turboprop	12,788	Historic Annual General Aviation Operations with IFR (11,930) and VFR (16,370)
PC12	Pilatus PC-12	Turboprop (Single)	10,320	
BE20	Beechcraft King Air 200	Turboprop	3,916	
LJ45	Learjet 45	Turbojet	1,189	
C525	Cessna Citation CJ1	Turbojet	1,588	
C310	Cessna 310	Multi-Engine Piston	1,522	
EA50	Eclipse 500	Turbojet	1,771	
C441	Cessna Conquest	Turboprop	827	
C56X	Cessna Excel	Turbojet	1,187	
SR22	Cirrus SR-22	Singe Engine Piston	1,414	
P46T	Piper Meridian	Turboprop (Single)	709	
E55P	Embraer Phenom 300	Turbojet	532	
C560	Cessna Citation Ultra	Turbojet	1,436	
C25A	Cessna Citation CJ2	Turbojet	925	
C550	Cessna Citation II	Turbojet	944	
C172	Cessna 172 Skyhawk	Singe Engine Piston	817	
TBM8	Socata TBM-850	Turboprop (Single)	395	
BE40	Beechcraft Beechjet 400	Turbojet	1,130	
C750	Cessna Citation 10	Turbojet	759	
BE36	Beechcraft Bonanza 36	Singe Engine Piston	485	
		Total Top 20 Sample (80.2%)	51,435	
		Total TFMS Recorded Operations	68,603	
		Turboprop (52.3%)	35,882	7,890
		Turbojet (27.3%)	18,700	3,300
		Piston (19.8%)	13,623	17,110
		Total Baseline Annual General Aviation Operations		28,300

Source: FAA Traffic Flow Management System (TFMS), KLJ Analysis

The data table above is a sample of IFR operations and the remaining 65 percent is with VFR operations which are primarily single-engine piston aircraft. Estimated fleet mix percentages are then identified for general aviation operations conducted under IFR and VFR. Of the 16,370 VFR operations, 90% were

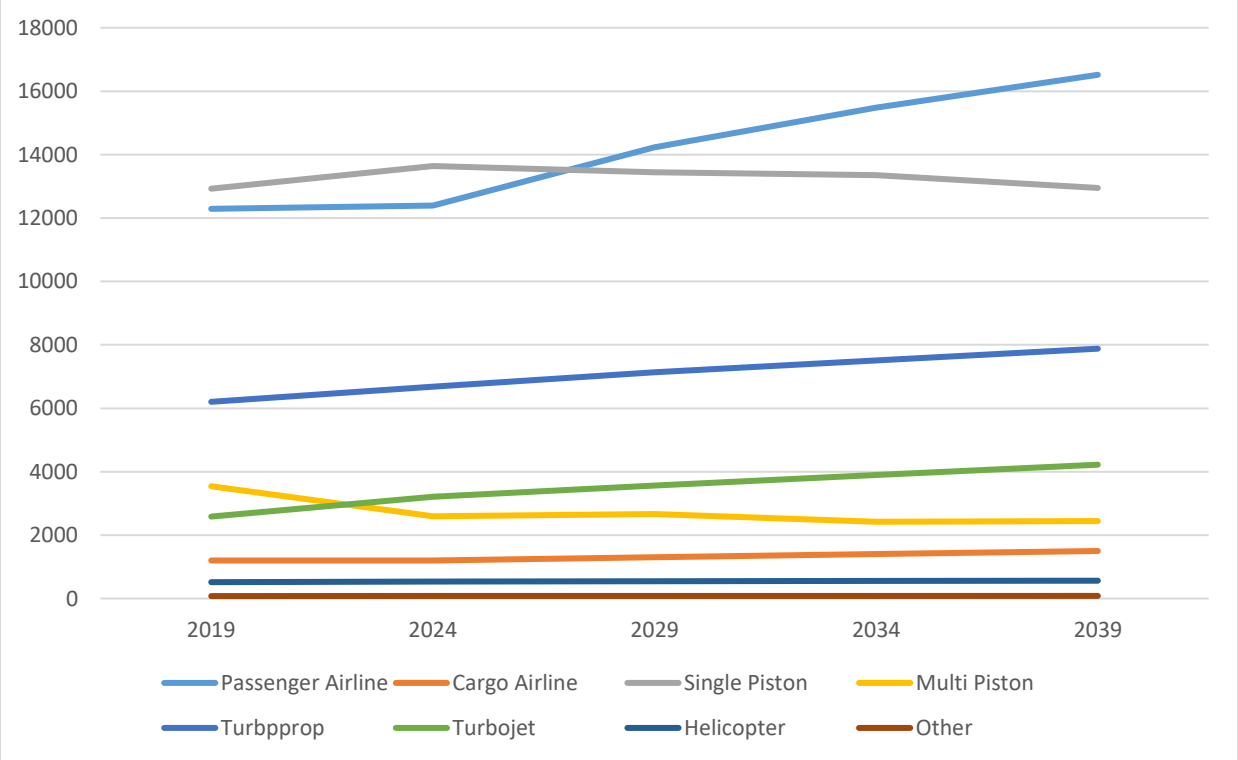
allocated to piston aircraft and 10% were allocated to turboprop aircraft. The overall estimated fleet mix share breakdown is identified in **Table 3-14**. The total annual operations are prorated by the estimated fleet mix share percentage to yield a fleet mix operational forecast in **Table 3-15**.

Table 3-15 – Commercial & GA Operations Fleet Mix Forecast

Metric	2019	2024	2029	2034	2039	CAGR
Passenger/Cargo Airlines						
Passenger Airline (Turbofan)	11,290	11,387	13,074	14,224	15,173	*1.49%*
Cargo Airline (Turboprop)	2,200	2,200	2,300	2,400	2,500	*0.64%*
Total Airline Operations	**13,490**	**13,587**	**15,374**	**16,624**	**17,673**	***1.36%***
General Aviation						
Single-Engine Piston	12,925	13,639	13,446	13,355	12,945	*0.01%*
Multi-Engine Piston	3,541	2,594	2,662	2,421	2,448	*-1.83%*
Turboprop	6,204	6,686	7,134	7,512	7,880	*1.20%*
Turbojet	2,585	3,209	3,567	3,895	4,221	*2.48%*
Helicopter	517	535	549	556	563	*0.43%*
Ultralight/Other	78	80	82	83	84	*0.43%*
Total GA Operations	**25,849**	**26,742**	**27,440**	**27,823**	**28,141**	***0.43%***

Source: KLJ Analysis

Figure 3-6 – Commercial & GA Operations Fleet Mix Forecast



Critical Design Aircraft (Airlines)

The critical design aircraft is defined as the most demanding aircraft or family of aircraft to regularly use the airport. A critical design aircraft type or family must operate at least 500 annual operations at the airport to be considered "regular" use by FAA for improvements to be justified for FAA funding. The methodology identified in FAA AC 150/5000-17, Critical Aircraft and Regular Use Determination was used for this analysis. For Rapid City, the analysis of critical aircraft only focused on the airline activity since these aircraft have the highest design standards.

Existing

Table 3-16 – Existing Critical Design Aircraft

Aircraft Type (Operator)	2018 Operations	AAC	ADG	TDG
Airbus A319 (Allegiant)	295	C	III	3
Airbus A320 (Allegiant)	320	C	III	3
Boeing 737-800, 900 (United, Charters)	94	D	III	3
Boeing 737-400, 700 (Charters)	26	C	III	3
CRJ-200 (Delta, United)	5,071	C	II	1-B
CRJ-700 (Delta, United)	1,040	C	III	2
CRJ-900 (American, Delta)	1,739	C	III	2
Embraer 135/145 (United, Charters)	2,386	C	II	2
Embraer 170/175 (United)	170	C	III	3
Total AAC-C	**11,141**			
Total ADG-III	**3,684**			
Total TDG-3	**879**			

Source: KLJ Analysis, FAA Traffic Flow Management System Counts (TFMSC) Data at RAP (2018). AAC = Aircraft Approach Category, ADG = Airplane Design Group, TDG = Taxiway Design Group, MTOW = Maximum Takeoff Weight (pounds); Total Critical Aircraft operations exceeding the FAA regular use threshold are shown in Green

Figure 3-7 – Existing Critical Design Aircraft Family

Airbus A320 (ARC C-III)

CRJ-900 (ARC C-III)

Photography Source: Airlinesfleet.com

Future

Table 3-17 – Future Critical Aircraft Operations Breakdown

Representative Aircraft	AAC-ADG	2019	2024	2029	2034	2039
Airbus A220 (Delta, Jet Blue)	C-III	-	171	353	427	455
Airbus A319 (Allegiant, DL, UA)	C-III	406	1,765	3,726	4,054	4,324
Airbus A320 (Allegiant)	C-III	395	285	183	213	228
Boeing 737-400, 700, 800 & 900 (UA)	C/D-III	248	57	65	71	76
CRJ-200 (Delta)	C-II	4,516	1,879	327	284	303
CRJ-700 (Delta)	C-III	1,806	854	-	-	-
CRJ-900 (Delta)	C-III	2,043	1,651	1,673	1,849	1,927
Embraer 135/145 (UA)	C-II	1,660	1,196	-	-	-
Embraer 170/175 (Alaska, AA, DL, UA)	C-III	215	3,530	6,746	7,325	7,814
	Total	11,290	11,387	13,074	14,224	15,173
	Total C-III	5,114	8,370	12,812	14,010	14,945

Source: KLJ Analysis and Projection of Mead & Hunt data. AAC = Aircraft Approach Category; ADG=Airplane Design Group

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. **The critical design aircraft will remain the C-III design group.**

Figure 3-8 – Future Critical Design Aircraft Family

Airbus A319 (ARC C-III)

Embraer-175 (ARC C-III)

Boeing 737 (ARC C/D-III)

Airbus A220 (ARC C-III)

Photography Source: Airlinesfleet.com

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 periods evaluated include the peak month, busy day and design hour characteristics for passenger enplanements and airport operations. The results of the peak activity forecasts will be used to determine the airport facility requirements.

Passenger Airline Activity

This analysis provides an estimate of peak passenger activity for planning purposes. Actual airline flight scheduling is based on passenger demand and individual airline requirements. A detailed projection of airline activity was used to identify the busy day and peak hour activity. Per **Figure 3-9**, the busy day for RAP is on Saturdays in July with peak hour periods in the late morning and early afternoon. The peak time projected for 2029 results in 1,320 total passengers in a one-hour time period spread across 16 aircraft operations (9 departures).

Table 3-18 – Peak Month, Design Day Passenger Airline Activity Forecast

Metric	2019	2024	2029	2034	2039
Passenger Airline Enplanements					
Annual	343,926	416,470	514,497	565,267	619,525
Peak Month (15.98%)	54,959	66,552	82,217	90,330	99,000
Busy Day (3.85%)	2,116	2,562	3,165	3,478	3,812
Passenger Airline Operations					
Annual	11,290	11,387	13,074	14,224	15,173
Peak Month (14.10%)	1,592	1,606	1,843	2,006	2,139
Busy Day (3.90%)	62	63	72	78	83

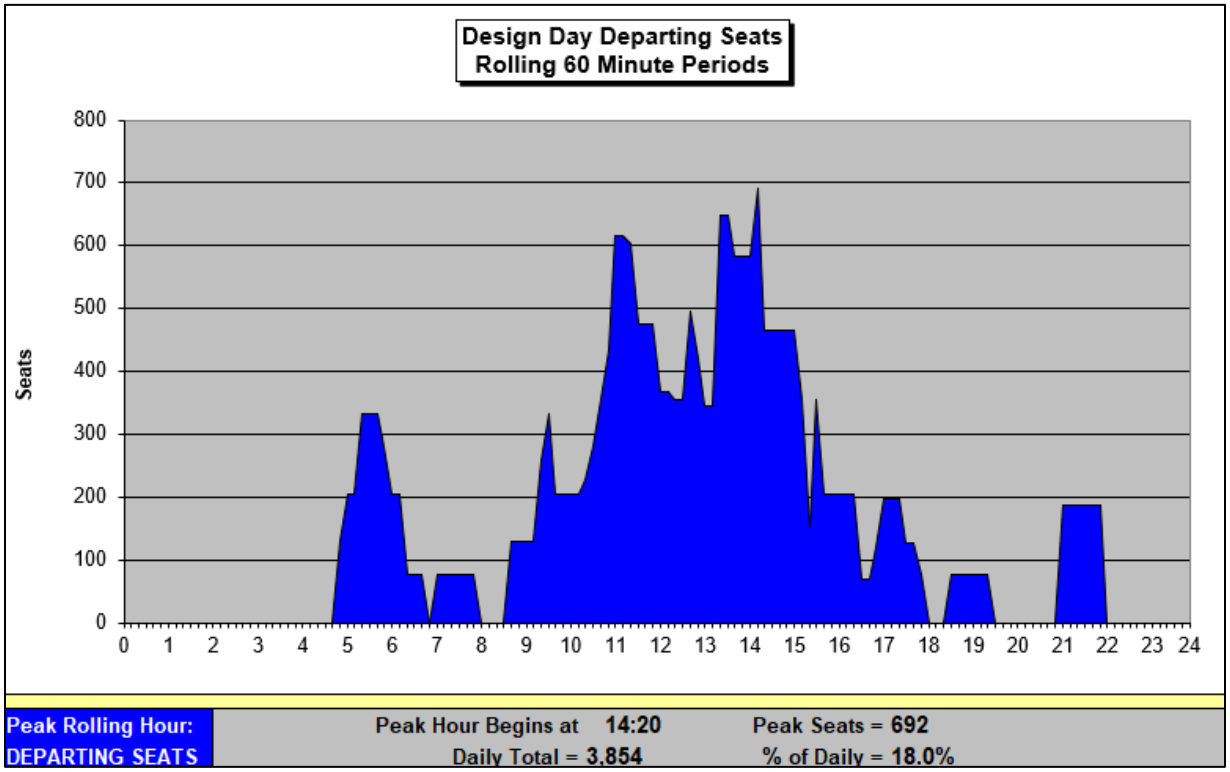
Source: KLJ Analysis

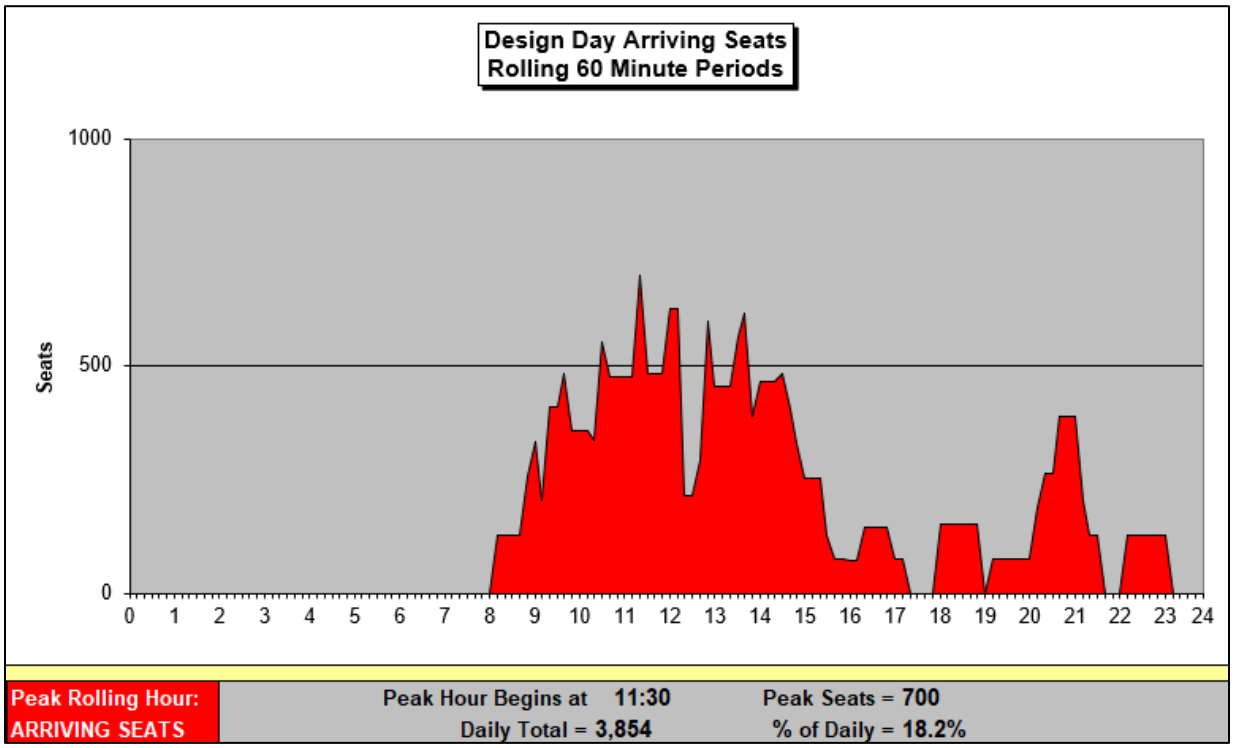
Table 3-19 – Design Day Passenger Airline Activity Forecast

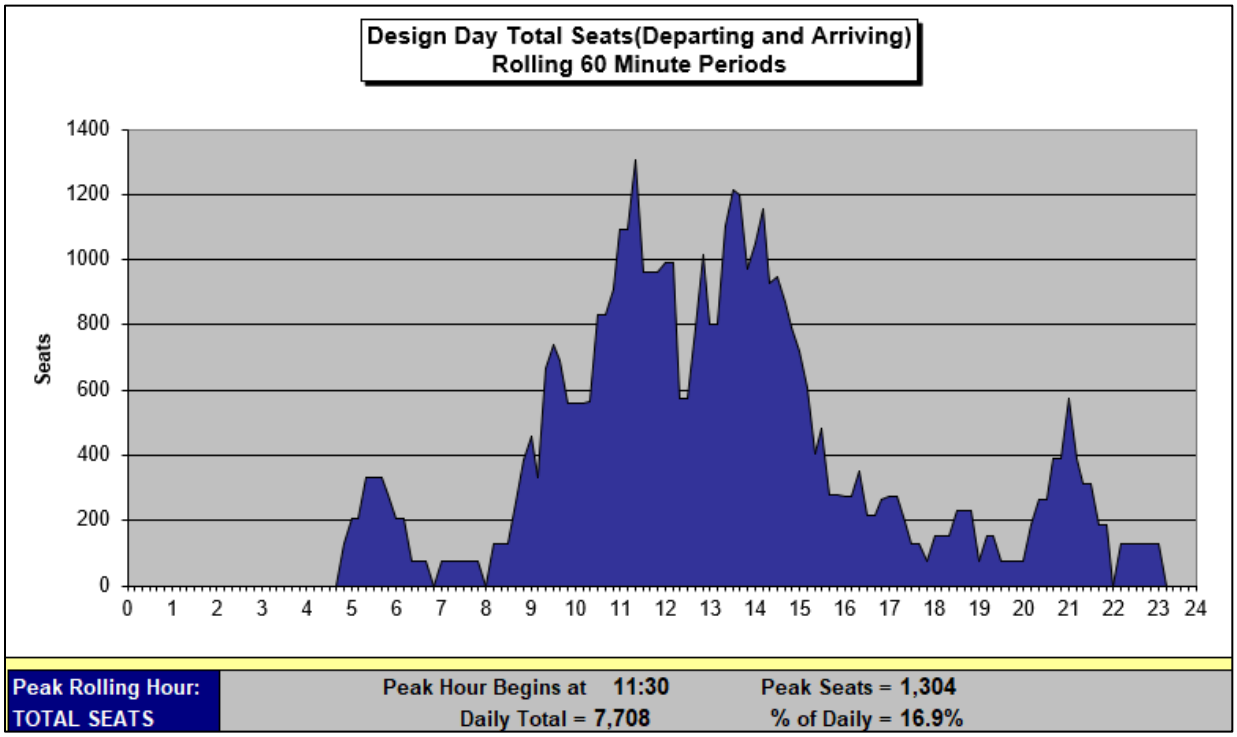
Metric	2019	2024	2029	2034	2039
Passenger Airline Passengers					
Busy Day Enplanements	2,116	2,562	3,165	3,478	3,812
Design Hour Enplanements (21.0%)	444	538	665	730	800
Design Hour Deplanements (21.0%)	444	538	665	730	800
Design Hour Passengers (21.0%)	888	1,076	1,320	1,460	1,600
Passenger Airline Operations					
Busy Day	62	63	72	78	83
Design Hour (21.0%)	13	13	15	16	18

Source: KLJ Analysis

Figure 3-9 – Busy Day Activity







Airport Operations

Using TFMS and Air Traffic Control Tower data, 1) peak month of July, 2) busy weekend day, and 3) design hour were examined. The busy day is considered to be 3.80% of the peak month and the design hour is considered to be 15% of the busy day.

Table 3-20 – Airport Operations Peak Forecast

Metric	2019	2024	2029	2034	2039	CAGR
Annual Operations	42,517	43,508	45,992	47,625	48,992	0.71%
Peak Month (13.00%)	5,527	5,656	5,979	6,191	6,369	*0.71%*
Busy Day (3.80%)	210	215	227	235	242	*0.71%*
Design Hour (15.0%)	32	32	34	35	36	*0.71%*

Source: FAA Operations Network (OPSNET), KLJ Analysis, CAGR = Compounded Annual Growth Rate

Forecast Summary

A summary of the forecast is provided below in **Figure 3-21**.

Figure 3-21 – Aviation Activity Forecast Summary

	Activity Levels					Average Annual Compound Growth Rates			
Forecast Levels	2019	2024	2029	2034	2039	0-5 Years	0-10 Years	0-15 Years	0-20 Years
Passenger Enplanements									
Air Carrier & Commuter	343,926	416,470	514,497	565,267	619,525	-	-	-	-
TOTAL ENPLANEMENTS	343,926	416,470	514,497	565,267	619,525	3.90%	4.11%	3.37%	2.99%
Operations									
Itinerant									
Air Carrier & Commuter	13,490	13,587	15,374	16,624	17,673	-	-	-	-
Total Commercial	13,490	13,587	15,374	16,624	17,673	0.14%	1.32%	1.40%	1.36%
General Aviation	17,083	17,571	17,912	18,026	18,180	0.57%	0.47%	0.36%	0.31%
Military	2,216	2,216	2,216	2,216	2,216	-	-	-	-
Total Itinerant	32,789	33,374	35,502	36,865	38,069	0.35%	0.80%	0.78%	0.75%
Local									
Civil	8,767	9,171	9,528	9,797	9,961	0.91%	0.84%	0.74%	0.64%
Military	962	962	962	962	962	-	-	-	-
Total Local Operations	9,729	10,133	10,490	10,759	10,923	0.82%	0.76%	0.67%	0.58%
TOTAL OPERATIONS	42,517	43,508	45,992	47,625	48,992	0.46%	0.79%	0.76%	0.71%
Annual Instrument Approaches	752	766	843	897	943	0.36%	1.15%	1.18%	1.14%
Peak Hour Operations	31.5	32.2	34.1	35.3	36.3	0.46%	0.79%	0.76%	0.71%
Based Aircraft									
Single Engine	94	99	104	108	112	1.04%	1.02%	0.93%	0.88%
Multi Engine	21	25	30	35	41	3.55%	3.63%	3.46%	3.40%
Turbojet	4	5	7	9	12	4.56%	5.76%	5.56%	5.65%
Helicopter	5	6	7	8	9	-	-	-	-
Other	1	1	1	1	1	-	-	-	-
TOTAL BASED AIRCRAFT	125	136	149	161	175	1.70%	1.77%	1.70%	1.70%
Operational Factors	2019	2024	2029	2034	2039				
GA Operations per Based Aircraft	208	198	185	174	162	-1.02%	-1.17%	-1.20%	-1.26%

Source: KLJ Analysis. Note: Some figures are rounded

Forecast Comparison with FAA TAF

Proposed aviation activity forecasts must be reviewed and approved by the 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 passenger enplanements, based aircraft and total operations. The 2019 FAA TAF issued January 2020 is used for comparison.

PASSENGER ENPLANEMENTS

The airport's proposed forecast of enplanements is **consistent** with the FAA TAF for the 10-year forecast horizon.

Table 3-22 – Passenger Enplanements vs. FAA TAF

Metric	2019	2024	2029	2034	2039	CAGR
RAP Enplanement Forecast	343,926	416,470	514,497	565,267	619,525	*2.99%*
2019 FAA TAF	336,697	416,334	450,458	492,201	536,341	*2.36%*
Difference	2.15%	0.03%	14.22%	14.84%	15.51%	-
Allowable Difference	-	10.0%	15.0%	-	-	-
Consistent with FAA TAF?	-	**YES**	**YES**	-	-	-

Source: KLJ Analysis, FAA Terminal Area Forecast (January 2016), CAGR = Compounded Annual Growth Rate

BASED AIRCRAFT

The airport's proposed forecast of constrained based aircraft is **consistent** with the FAA TAF for the 10-year forecast horizon. The unconstrained forecast for facility planning purposes yields 187 based aircraft, 4.4 percent greater than the FAA TAF at the end of the planning period.

Table 3-23 – Based Aircraft vs. FAA TAF

Metric	2019	2024	2029	2034	2039	CAGR
RAP Based Aircraft Forecast	125	136	149	161	175	*1.71%*
2019 FAA TAF	127	135	145	155	165	-
Difference	-2.36%	0.0%	2.07%	3.23%	5.45%	-
Allowable Difference	-	10.0%	15.0%	-	-	-
Consistent with FAA TAF?	-	**YES**	**YES**	-	-	-

Source: KLJ Analysis, FAA Terminal Area Forecast (January 2020), CAGR = Compounded Annual Growth Rate

TOTAL OPERATIONS

The airport's proposed forecast of constrained total operations is **consistent** with the FAA TAF for the 10-year forecast horizon. The unconstrained forecast for facility planning purposes yields 383,120 operations, 4.8 percent greater than the FAA TAF at the end of the planning period.

Table 3-24 – Total Operations vs. FAA TAF

Metric	2019	2024	2029	2034	2039	CAGR
RAP Operations Forecast	42,517	43,508	45,992	47,625	48,992	*0.71%*
2019 FAA TAF	41,920	42,017	43,191	44,542	45,964	*0.46%*
Difference	1.43%	3.55%	6.48%	6.92%	6.59%	-
Allowable Difference	-	10.0%	15.0%	-	-	-
Consistent with FAA TAF?	-	**YES**	**YES**	-	-	-

Source: KLJ Analysis, FAA Terminal Area Forecast (January 2020), CAGR = Compounded Annual Growth Rate

CHAPTER 4: FACILITY REQUIREMENTS

Introduction

This chapter of the Airport Master Plan analyzes the existing and anticipated future facility needs at the Rapid City Regional Airport (RAP). The report is divided into sections that assess the needs of primary airport elements including airside facilities, commercial passenger terminal, general aviation, air cargo, 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
- Passenger Terminal
- Air Cargo
- General Aviation
- Support Facilities

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

Planning Activity Levels (PALs)

There are various airport activity measures used to determine airport facility requirements including passenger enplanements, peak hour activity, annual operations, and based aircraft. Airport activity can be sensitive to industry changes, national and local economic conditions. This results in difficulty identifying a specific calendar year for associated demand-driven improvements. Further, limited developable space at RAP tends to put less emphasis on PALs and more emphasis on utilizing space for its highest and best use

For this study, PALs are used when appropriate 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 an anticipated planning level calendar year to each PAL (2024, 2029, 2034, 2039) from the preferred aviation forecasts as shown on **Table 4-1**.

Table 4-1 – Planning Activity Levels (PALs)

Key Activity Metrics	Base	PAL 1	PAL 2	PAL 3	PAL 4
Forecast Year	**2019**	**2024**	**2029**	**2034**	**2039**
Annual Enplanements	343,926	416,470	514,497	565,267	619,525
Airline Operations	13,490	13,596	15,532	16,884	18,016
Total Operations	42,517	43,516	46,150	47,884	49,336
Based Aircraft	125	136	149	161	175

Source: KLJ Analysis

Airside Facilities

Airfield Design Standards

Airport design standards provide basic guidelines for a safe, efficient, and economic airport system. FAA guidance is found in FAA AC 150/5300-13A, *Airport Design (Change 1)*. 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. Information on airport design can be found in **Appendix B: Commercial Airports 101** – Airport Design.

Critical Aircraft

The critical aircraft types for RAP were outlined in Chapter 3: Aviation Activity Forecasts. Per FAA policy, the critical aircraft is the most demanding aircraft type, or grouping of aircraft with similar characteristics, that make regular use of the airport. Regular use is 500 annual operations, including both itinerant and local operations but excluding touch-and-go operations. An operation is either a takeoff or landing.

For RAP, the critical aircraft is a grouping of ARC C-III, TDG-3 aircraft based on the most demanding group of passenger airline aircraft forecast to regularly use RAP through the planning period. **Table 4-2** provides a summary of the aircraft serving passengers and cargo. Critical aircraft include the Airbus A320 operated by Allegiant Airlines, the CRJ-900 operated by American and Delta and the Embraer 175 operated by United. Aircraft in Approach Category D or greater, Design Group IV or greater, and TDG-4 or greater operate out of RAP; the operations are simply not expected to exceed 500 per year.

Table 4-2 – Design Aircraft Operations Breakdown

Design Standards	Representative Aircraft	Base	PAL 1	PAL 2	PAL 3	PAL 4
Passenger Airlines						
C-II	CRJ-200, E145	6,176	3,075	327	284	303
C-III	A320, A319, E175	5,114	8,370	12,812	14,010	14,945
Cargo Airlines						
B-I and II	B1900, Metroliner	1,680	1,680	1,750	1,800	1,850
B-III	ATR 42	520	520	550	600	650
Aircraft Approach Category	**AAC-C**	**11,290**	**11,445**	**13,139**	**14,294**	**15,248**
Airplane Design Group	**ADG-III**	**5,634**	**8,890**	**13,362**	**14,610**	**15,595**

Source: KLJ Analysis, Aircraft design aircraft operations exceeding FAA regular use threshold are shown in Green

Meteorological Considerations

Meteorological conditions were examined in Chapter 2: Facility & Environmental Inventory. There are no facility deficiencies related to wind coverage. Wind coverage is the percent of time crosswind components are below an acceptable velocity. The desirable wind coverage for an airport is 95 percent, which RAP meets.

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 planning-level analysis was completed using the methods outlined in Airport Cooperative Research Program (ACRP) Report 79: *Evaluating Airport Capacity*. Airfield capacity as defined in the ACRP report is the Maximum Sustainable Throughput which answers the question, "How many aircraft can an airfield reasonably accommodate in a given period of time when there is a continuous demand for service during that period?"

From ACRP Report 79, the Level 1 analysis was used considering the airfield configuration at RAP and the mix of activity. While using the single runway table from the report, there are a range of five fleet mix options and the middle option was chosen as the one that most closely met activity at RAP through the planning period. In following, the fleet mix information and resulting annual service volume (ASV) is presented for RAP through the planning period.

Aircraft Fleet Mix

Aircraft operating on an airport impact capacity in different degrees. In addition to required arrival and departure flow separation requirements between similar aircraft types, aircraft with different speeds require additional spacing to maintain minimum separation. The airport's fleet mix index is established using guidelines established in ACRP Report 79.

Table 4-3 – Aircraft Fleet Mix Classifications

Aircraft Classification	Characteristics
Small - S	Less than 12,500 lbs. (Single Engine)
Small - T	Less than 12,500 lbs. (Twin Engine)
Small +	Aircraft between 12,500 lbs. and 41,000 lbs.
Large - TP	Turboprop between 12,500 lbs. and 255,000 lbs.
Large - Jet	Jet between 41,000 lbs. and 300,000 lbs.
Large -757	Boeing 757 series
Heavy	More than 300,000 lbs.

In analyzing flight activity through the planning period, up to 33.6 percent of the total operations are estimated to be conducted in Large Jet aircraft.

Table 4-4 – Aircraft Fleet Mix Assumptions

Aircraft Classification	Base	PAL 1	PAL 2	PAL 3	PAL 4	Single Runway Table
Small - S	38.2%	39.4%	36.9%	35.6%	33.9%	5%
Small - T	21.3%	19.5%	19.2%	18.5%	18.5%	20%
Small +	11.4%	12.5%	12.8%	13.4%	14.0%	20%
Large - TP	-	-	-	-	-	25%
Large – Jet	29.1%	28.7%	31.0%	32.5%	33.6%	25%
Large –757	-	-	-	-	-	5%
Heavy	-	-	-	-	-	0%
Annual Service Volume (ASV) from ACRP Report 79						206,000

Source: ACRP Report 79, KLJ Analysis

Hourly Capacity

Hourly capacity was calculated allocating the ASV to the Busy Day period and comparing it with the activity from the forecast through the planning period. There is no indicator that the operations at RAP will be near the ASV through the planning period.

Table 4-5 – Hourly Capacity

Factors	Base	PAL 1	PAL 2	PAL 3	PAL 4
Forecast Operations					
Annual Operations	42,517	43,508	45,992	47,625	48,992
Busy Day (3.8% of Peak Month)	210	215	227	235	242
Design Hour (15.0% of Busy Day)	32	32	34	35	36
VFR Percentage of ASV Capacity	50%	50%	54%	55%	57%
IFR Percentage of ASV Capacity	57%	57%	60%	62%	64%
ASV					
Annual Operations	206,000				
VFR Hourly Capacity	63				
IFR Hourly Capacity	56				

Source: KLJ Analysis, ACRP Report 79

Runways

Rapid City has two runways, one air carrier runway and one general aviation runway. Runway 14-32 is the longest runway at 8,701 feet long and 150 feet wide. This runway is currently designed to accommodate precision approaches with lowest precision instrument approach minimums on the airfield of ½ mile (2400 RVR). Runway 5-23 is a secondary runway used by general aviation aircraft which are 12,500 pounds and under. This runway is 3,601 feet long by 75 feet wide with non-precision instrument approaches with visibility minimums as low as 1 mile.

Runway 14-32 runs northwest southeast while Runway 5-23 is aligned northeast southwest. They intersect 2,000 feet from the Runway 14 end 675 feet from the Runway 5 end. A clear line of sight is required for intersecting runway with the Runway Visibility Zone to allow pilots to maintain visual contact with other objects and/or aircraft that may pose a hazard.

The existing design aircraft identifies the RDC for Runway 14-32 as C-III-2400. The RDC for Runway 5-23 is B-I (small)-5000 accommodating small aircraft exclusively. These are expected to remain through the future as C-III-2400 and B-I (small)-5000 respectively.

Runway Design Standards

A major purpose of master plans is reviewing compliance with all FAA safety and design standards and working toward fully meeting 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.

The existing, future and ultimate design standards for Runway 14-32 and Runway 5-23 are provided in **Table 4-6** and **4-7** respectively.

Deficiencies To Design Standards

For RAP, the most significant deficiency to existing runway design standards is the Runway 14-32 gradient. In order to meet standards for runways serving “C” category or greater aircraft, no grade changes are allowed in the first or last quarter of Runway 14-32. There are grade changes within the last 25% of both Runway 14 and Runway 32 ends. Additionally, longitudinal grades may not exceed ±0.80 percent in the first and last quarter of the runway and this standard is exceeded for the Runway 32 end. **The width for the Runway 32 blast pad is currently 150 feet; it should be widened to 200 feet**. Deficiencies to airport design standards will be noted in the ALP and the Alternatives Chapter will evaluate options to resolve those deficiencies.

Table 4-6 – Runway 14-32 FAA Design Standard Matrix

Design Standard	Actual	Runway Design Code (RDC)	
		C-III-2400 (Future)	C-III-2400 (Ultimate)
Approach Reference Code	C-III-2400	C-III-2400	C-III-2400
Departure Reference Code	C-III	C-III	C-III
Runway Width	150 feet	150 feet	150 feet
Shoulder Width	0 feet*	0 feet*	0 feet*
Blast Pad Width	200' – RW 14 150' – RW 32	200 feet	200 feet
Blast Pad Length	200 feet	200 feet	200 feet
Line of Sight Requirements	No Objects	No Objects	No Objects
RSA Width	500 feet	500 feet	500 feet
RSA Length Past Departure End	1,000 feet	1,000 feet	1,000 feet
RSA Length Prior to Threshold	600 feet	600 feet	600 feet
ROFA Width	800 feet	800 feet	800 feet
ROFA Length Past Departure End	1,000 feet	1,000 feet	1,000 feet
ROFA Length Prior to Threshold	600 feet	600 feet	600 feet
ROFZ Length Past Runway	200 feet	200 feet	200 feet
ROFZ Width	400 feet	400 feet	400 feet
Inner Approach OFZ	N/A	50:1 Slope	50:1 Slope
Inner Transitional OFZ	N/A	Varies	Varies
Precision ROFZ Length	200' RW 32	200 feet	200 feet
Precision ROFZ Width	800' RW 32	800 feet	800 feet
Approach RPZ Start from Runway	200 feet	200 feet	200 feet
Approach RPZ Length	1,700' RW 14 2,500' RW 32	2,500 feet	2,500 feet
Approach RPZ Inner Width	500' RW 14 1,000' RW 32	1,000 feet	1,000 feet
Approach RPZ Outer Width	1,010' RW 14 1,750' RW 32	1,750 feet	1,750 feet
Departure RPZ Start from Runway	200 feet	200 feet	200 feet
Departure RPZ Length	1,700 feet	1,700 feet	1,700 feet
Departure RPZ Inner Width	500 feet	500 feet	500 feet
Departure RPZ Outer Width	1,010 feet	1,010 feet	1,010 feet
Runway Centerline to Parallel Taxiway Centerline	450 feet	400 feet	400 feet
Runway Centerline to Edge of Aircraft Parking	570 feet	500 feet	500 feet
Runway Centerline to Hold Line	282 feet	282 feet	282 feet

*Source: FAA AC 150/5300-13A Airport Design, KLJ Analysis; RED indicates a deficiency to existing design standards. *Not required for aircraft operations type and RDC*

Table 4-7 – Runway 5-23 FAA Design Standard Matrix

Design Standard	Actual	Runway Design Code (RDC) B/I/5000 – Small Aircraft (Existing & Future)
Approach Reference Code	B-I Small	B-I Small
Departure Reference Code	B-I	B-I
Runway Width	75 feet	60 feet
Shoulder Width	0 feet*	0 feet*
Blast Pad Width	0 feet*	0 feet*
Blast Pad Length	0 feet*	0 feet*
Line of Sight Requirements	No Objects	No Objects
RSA Width	150 feet	120 feet
RSA Length Past Departure End	300 feet	240 feet
RSA Length Prior to Threshold	300 feet	240 feet
ROFA Width	500 feet	250 feet
ROFA Length Past Departure End	300 feet	240 feet
ROFA Length Prior to Threshold	300 feet	240 feet
ROFZ Length Past Runway	200 feet	200 feet
ROFZ Width	250 feet	250 feet
Approach RPZ Start from Runway	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	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 Centerline to Parallel Taxiway Centerline	250 feet	150 feet
Runway Centerline to Edge of Aircraft Parking	300 feet	125 feet
Runway Centerline to Hold Line	125 feet	125 feet

*Source: FAA AC 150/5300-13A Airport Design, KLJ Analysis; RED indicates a deficiency to existing design standards; *Not required for aircraft operations type and RDC*

Runway Length

The recommended runway length for an airport facility varies widely based on runway usage (number of operations per year), specific aircraft operational demands (aircraft type, weight/load) and local meteorological conditions (elevation, temperatures). Runway length should be suitable for the forecasted critical design aircraft. Restrictions on runway length may lead to reduced weight on a flight, which then translates into reduced fuel, passenger and/or cargo loads. The design approach identified in FAA Advisory Circular AC 150/5325-4B, Runway Length Requirements for Airport Design was used to determine runway length calculations for Rapid City.

A runway length analysis was performed using aircraft manufacturer's planning manuals and other available performance data. The following sections describe recommended length for different aircraft categories operating out of RAP.

Small Airplanes Up to 12,500 Pounds

The FAA design approach to determine recommended runway length in small aircraft is identified in Chapter 2 of FAA AC 150/5325-4B. The method requires several steps to be performed including identifying percentage of fleet and using airport data to calculate runway length based on curves. Calculations for RAP are identified in **Table 4-8**.

Table 4-8 – FAA AC 150/5345-4B Runway Length Requirements (≤ 12,500 lbs.)

Airport and Runway Data	
Airport Elevation	3203.5 feet
Mean Daily Maximum Temperature of Hottest Month	87.1°F
Aircraft Classification	**Recommended Runway Length**
Small Airplanes 12,500 Pounds or less	
10 or more passenger seats	5,000 feet
Less than 10 passenger seats at 100 percent of fleet	5,000 feet
Less than 10 passenger seats at 95 percent of fleet	4,600 feet

Source: FAA AC 150/5325-4B, KLJ Analysis
Note: Runway length requirements estimated based on charts for airport planning purposes only.

Large Airplanes Up to 60,000 Pounds

The FAA design approach to determine recommended runway length in large aircraft greater than 12,500 pounds up to 60,000 pounds is identified in Chapter 3 of FAA AC 150/5325-4B. The method requires several steps to be performed including identifying percentage of fleet, useful load factor and using airport data to calculate runway length based on curves.

The recommended runway length calculations at RAP for large aircraft up to 60,000 pounds are summarized in **Table 4-9**.

The existing length of 8,701 feet is sufficient for Runway 14-32 to handle the majority of departures for large airplanes up to 60,000 pounds with the exception of the "100 percent of fleet at 90 percent useful load" category.

Table 4-9 – FAA AC 150/5345-4B Runway Length Requirements (>12,500 but ≤ 60,000 lbs.)

Airport and Runway Data	
Airport Elevation	3203.5 feet
Mean Daily Maximum Temperature of Hottest Month	87.1°F
Maximum Difference in Runway Centerline Elevation	49 feet
Runway Condition	Wet and Slippery Runways
Aircraft Classification	**Recommended Runway Length**
Large Airplanes more than 12,500 Pounds but less than 60,000 Pounds	
100 percent of fleet at 90 percent useful load	9,700 feet
100 percent of fleet at 60 percent useful load	7,600 feet
75 percent of fleet at 90 percent useful load	8,600 feet
75 percent of fleet at 60 percent useful load	5,700 feet

Source: KLJ Analysis, FAA AC 150/5325-4B; Runway length requirements estimated based on charts for airport planning purposes only.

The FAA's runway length AC defines useful load factor of an airplane as *"the difference between the maximum allowable structural gross weight and the operating empty weight. A typical operating empty weight includes the airplane's empty weight, crew, baggage, other crew supplies, removable passenger*

service equipment, removable emergency equipment, engine oil, and unusable fuel. In other words, the useful load then consists of passengers, cargo, and usable fuel. It is noted that although operating empty weight varies considerably with individual airplanes, the curves used in the figures were based on the average operating empty weights of numerous business jets."

It can be challenging to determine when business jet operations should fall under the 60 or 90 percent useful load category. For purposes of this study, a flight of 800 nautical miles was considered a reasonable break point to divide business jet operations into the two categories. **Figure 4-1** illustrates an 800 nautical mile radius from Rapid City Regional Airport.

Figure 4-1 – 800 Nautical Mile Radius from RAP

Source: Google Earth

Utilizing aircraft operational data from Traffic Flow Management System Counts (TFMSC), an estimated number of operations by *Large Airplanes more than 12,500 Pounds but less than 60,000 Pounds* was sorted according to the two "percent of fleet" and two "useful load" categories. Please see **Table 4-10** for details.

Table 4-10 – Business Aircraft Runway Length by Destination Range

Aircraft Type	Destinations	Runway Length Requirement	Annual Operations
100% of Business Jet Fleet at 90% Load	> 800 NM	9,700 feet	142
75% of Business Jet Fleet at 90% Load	> 800 NM	8,600 feet	279
100% of Business Jet Fleet at 60% Load	<800 NM	7,600 feet	654
75% of Business Jet Fleet at 60% Load	<800 NM	5,700 feet	3,678

Aircraft Greater than 60,000 pounds

The FAA design approach identified in Chapter 4 of FAA AC 150/5325-4B for aircraft greater than 60,000 pounds requires reviewing the individual aircraft performance based on how the aircraft actually operates at the airport.

The MD-83 aircraft that previously drove runway length needs at RAP now only has limited use in aerial firefighting out of the airport. Along with significant increases in enplanements since the prior study, there are new destinations served by airlines operating out of RAP. Flights to the east coast (CLT, EWR, LGA) and Florida indicate a runway length of 8,700' is sufficient, but necessary. Reduction in runway length could impact operations. **Table 4-11** identifies aircraft over 60,000 pounds and destinations requiring over 7,000' of runway length. The 49' difference in runway elevation is factored into the calculations. Aircraft performance charts and additional information on runway length analysis can be found in **Appendix D**.

Table 4-11 – Airline Runway Length Requirements by Destination

Aircraft Type	Destinations	Runway Length	Annual Operations
Bombardier CRJ-900	CLT	8,680 feet	283
Embraer ERJ-175	EWR/LGA	8,590 feet	68
Airbus A319	PGD	8,500 feet	44
Bombardier CRJ-900	DFW	7,940 feet	1,616
Bombardier CRJ-200	ORD	7,890 feet	300
Embraer ERJ-175	ORD	7,870 feet	170
Embraer ERJ-145	ORD	7,830 feet	242
Bombardier CRJ-700	ORD	7,640 feet	633
Airbus A320	PGD	7,250 feet	44
Airbus A319	IWA	7,050 feet	374

The future design aircraft is expected to evolve over the planning period, but a length of 8,700' is expected to be sufficient for future needs. An extension may be shown on the ALP in order to protect airspace should additional runway length becomes necessary.

Crosswind Runway

FAA recommends secondary "crosswind" runways have a length capable of accommodating the lower crosswind capable aircraft expected to use this runway. The recommended length and width of the crosswind is dependent on the aircraft requiring the crosswind. According to **Table 4-8** the minimum recommended runway length for small aircraft is 4,500 feet, approximately 1,000 feet longer than the current Runway 5-23. However, the runway is not recommended to be lengthened due to Runway 14-32 providing 95% wind coverage and high construction costs and impacts associated with a 1,000-foot extension of Runway 5-23 (extending 5-23 requires the relocation of Long View Road).

Pavement Strength

Airfield pavements should be adequately maintained, rehabilitated and reconstructed to meet the operational needs of the airport. 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.

The FAA standard for measuring the reporting pavement strength on runways with pavement strengths greater than 12,500 pounds is defined in FAA AC 150/5335-5C, *Standard Method of Reporting Airport Pavement Strength*. The Aircraft Classification Number – Pavement Classification Number (ACN-PCN) method is defined within this guidance. The PCN value measures the cumulative damage resulting from an aircraft fleet mix. In general, the PCN value should equal or exceed the ACN value assigned for the design aircraft. Larger aircraft could occasionally exceed the pavement strength but not on a regular basis. Existing runway pavement strength is summarized in **Table 4-12**.

Table 4-12 – Pavement Strength

Runway	Existing	
	Capacity	PCN
Runway 14-32	140,000 (SW)	65/R/C/W/T
	190,000 (DW)	
	300,000 (DTW)	
Runway 5-23	12,500 (SW)	na

Source: RAP Airport Master Record (FAA Form 5010-1), KLJ Analysis
SW = Single Wheel, DW = Dual Wheel, DT = Dual Tandem landing gear configuration

The pavement strength for Runway 14-32 is sufficient to accommodate regular use by the design aircraft. The design aircraft for pavement strength calculations is the A320 with an ACN of 51. The calculated Pavement Classification Number (PCN) of the runway is 65. RAP should monitor the type of aircraft arriving to ensure airfield pavements can accommodate those aircraft. Operations by aircraft exceeding the PCN can shorten pavement life even if the number of operations are far below the 500 annual operation threshold for "regular use".

Runway 5-23 should be maintained to accommodate small aircraft of 12,500 pounds or less maximum takeoff weight.

Pavement Surface

Runway 14-32 pavement is concrete with a grooved surface. Runway grooving improves aircraft stopping performance when runway contaminants are present (water, ice, snow, slush, etc.). Runway

grooving or friction treatment is recommended by the FAA for primary and secondary runways at commercial service airports. Runway 5-23 has bituminous asphalt with no grooving. No changes in surface type are anticipated over the planning period.

Instrument Procedures

Instrument approach procedures to a runway end are used by landing aircraft to navigate to the airport during instrument conditions when the cloud ceiling is less than 1,000 feet and/or visibility is less than 3 miles. Establishing approaches with the lowest possible weather minimums allow the airport to maximize its operational utility. Each approach type requires differing infrastructure and navigational aids. Types of approach procedures include non-precision approach (NPA), approach with vertical guidance (APV) and precision approach (PA).

RAP has a Category I Instrument Landing System (ILS) established for Runway 32 with a 200-foot cloud ceiling minimum. The runways 14, 5 and 23 have non-precision RNAV (GPS) approach with the lowest design visibility minimums of 1 mile.

The existing approach procedures are considered adequate for the current facility. The goal for an airport is to enhance its approach procedures to increase its operational capability. At RAP, the objective would be both ends of the primary runway accommodating precision instrument approach procedures with visibility minimums lower than ¾-mile. This would require upgrading the Runway 14 end approach and meeting associated design standards and support facility requirements (lighting systems, etc.).

Land Use Compatibility & Airspace

Through Airport Sponsor Assurances 20 and 21, the FAA expects airport sponsors to: 1) restrict the use of land adjacent to or in the immediate vicinity of the airport to activities compatible purposes compatible with normal airport operations; and 2) take appropriate action to assure that such terminal airspace as is required to protect instrument and visual operations to the airport 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. This is often accomplished through land acquisition and/or zoning.

LAND USE CONTROL

Land Acquisition

Land acquisition allows the airport to protect airspace and land use areas from possible intrusions. Land that may be required for future development will be identified in **Chapter 5: Alternatives Analysis**. FAA encourages the airport sponsor to own the following land for existing and planned airport facility:

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

Runway Protection Zones

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 an Approach RPZ and Departure RPZ.

The FAA expects airport sponsors take appropriate measures to protect against, remove, or mitigate land uses that introduce incompatible development within RPZs. Airports should, at a minimum, maintain the RPZ clear of all facilities supporting incompatible activities, such as residential structures. Control over the RPZ is typically achieved through fee title ownership, easements or zoning.

There is a public road, Long View Road, within the Runway 14 RPZ and the Runway 23 RPZ. New development discouraged within the RPZ includes new roads, structures and places of public assembly.

AIRSPACE

Airspace is an important resource around airports that is essential for safe flight operations. There are established standards to identify airspace obstructions around airports. As mentioned previously, FAA grant assurances require the airport sponsors take appropriate action to assure 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 of future airport hazards.

Rapid City Regional Airport currently has airspace zoning in place covering FAR Part 77 imaginary surfaces to help prevent airspace incompatibilities. Any existing, future, or ultimate Part 77 obstructions located around RAP will be identified on the ALP for further review/action.

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 according to an airport's location, activity and usage type. For more details about each NAVAID please refer to **Chapter 2: Facility & Environmental Inventory.**

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. ATCT requires clear line of sight to the airfield. Currently, the tower has limited visibility to Taxiway T2 and the terminal apron due to SDARNG buildings. In addition to the building visibility shadows, the ATCT staff advised that aircraft on Taxiway B, when they are near the approach end of Runway 23, are not visible due to terrain.

The tower is over 50 years old and within the planning period the structure may need to be replaced on the current site or at another location. There may be

opportunities for either remote tower facilities or remote cameras at airports like RAP during the planning period. Recent supplemental federal funding is being targeted at FAA contract tower facilities. FAA Order 6480.4B, Airport Traffic Control Tower Siting Process identifies the criteria used for considering a new tower location:

1. Visual performance
2. TERPS airspace surfaces
3. FAR Part 77 airspace
4. Sunlight/daylight
5. Airport/background lighting
6. Atmospheric Conditions
7. Industrial Municipal Discharge
8. Site Access
9. Interior Physical Barriers
10. Security

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.

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. **Table 4-13** and **Table 4-14** describe the specific FAA taxiway design standards for various ADG and TDG design aircraft, respectively.

Table 4-13 – FAA Taxiway Design Standards Matrix (ADG)

Design Standard	Airplane Design Group (ADG)		
	ADG I	ADG II	ADG III
Aircraft Wingspan	<49’	49’ - <79’	79’ - <118’
Taxiway Safety Area	79 feet	79 feet	118 feet
Taxiway Object Free Area	131 feet	131 feet	186 feet
Taxilane Object Free Area	115 feet	115 feet	162 feet
Taxiway Centerline to Parallel Taxiway/Taxilane Centerline	105 feet	105 feet	152 feet
Taxiway Centerline to Fixed or Movable Object	65.5 feet	65.5 feet	93 feet
Taxilane Centerline to Parallel Taxiway/Taxilane Centerline	97 feet	97 feet	140 feet
Taxilane Centerline to Fixed or Movable Object	57.5 feet	57.5 feet	81 feet
Taxiway Wingtip Clearance	26 feet	26 feet	34 feet
Taxilane Wingtip Clearance	18 feet	18 feet	27 feet

Source: FAA AC 150/5300-13A, Change 1, KLJ Analysis

** ADG II applies to general aviation, ADG III applies to some general aviation and existing and future commercial service aircraft.*

Table 4-14 – FAA Taxiway Design Standards Matrix (TDG)

Design Standard	Taxiway Design Group (TDG)			
	TDG 1	TDG 2	TDG 3/4	TDG 5
Taxiway Width	25 feet	35 feet	50 feet	75 feet
Taxiway Edge Safety Margin	5 feet	7.5 feet	10 feet	15 feet
Taxiway Shoulder Width	10 feet	10 feet	20 feet	25 feet
Taxiway Fillet Dimensions	See specific guidance in FAA AC 150/5300-13A			

Source: KLJ Analysis, FAA AC 150/5300-13A, Change 1:

The existing airfield system serving Runway 14-32 has taxiways that are at least 75 feet in width. **Figure 4-2** depicts major taxiways. Taxiway A (including A1, A2, A6 and A7) and terminal taxiways T1 and T2 are designed to TDG 5 standards. Taxiway connector A1 and A7 are 100 feet wide, A2 and A6 are 125 feet wide. Taxiways A3, A4, A5 and Taxiway B (between A and Runway 14-32) are designed to TDG 4 standards for the fillets. Taxiway B east of Runway 14-32 is 40 feet wide and designed to TDG 2 standards.

The existing taxiway system is sufficient to accommodate the anticipated aircraft fleet through the planning period.

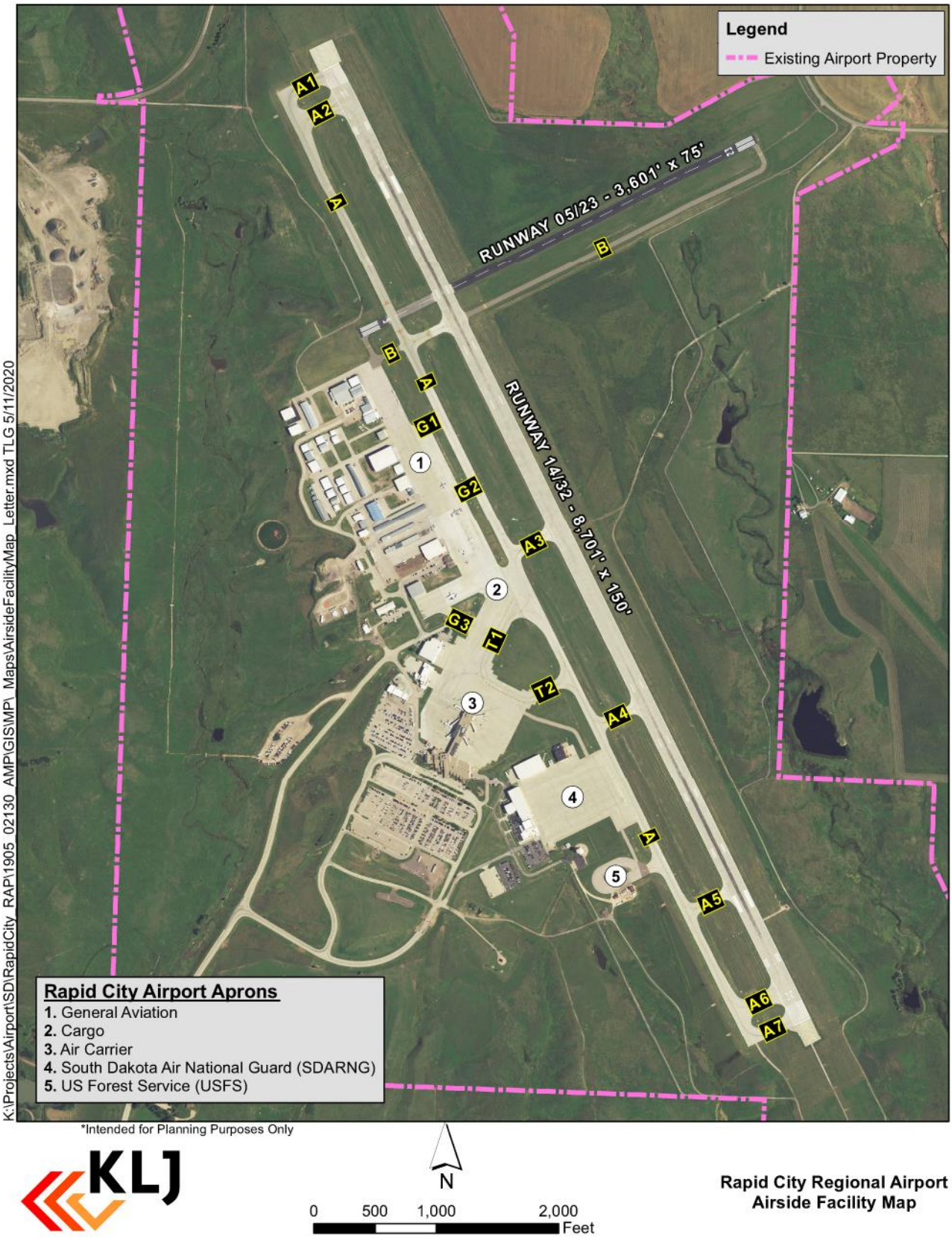
Bypass Taxiways & Holding Bays

Runway departure delays can be caused by aircraft awaiting departure clearance or completing pre-flight checks. Bypass taxiways and holding bays provide the flexibility to allow runway use when an aircraft is not ready for takeoff and would otherwise block the taxiway. Bypass taxiways provide a secondary access to runways, whereas holding bays a provide space for aircraft away from the taxiway environment. Both bypass taxiways and holding bays improve capacity and overall flow.

Rapid City has Taxiways A5 and A6 that can be used as a bypass taxiway within 1,200 feet of Runway 32. There is also Taxiway A2 that can be used as a bypass taxiway within 250 feet of Runway 14. See **Figure 4-2 Airside Facility Map**. These bypass taxiways should be sufficient to meet the needs at Rapid City through the planning period.

Rapid City does not have holding bays for any of the four runways and it is not anticipated to need hold bays through the planning period.

Figure 4-1 – Airside Facilities Map



Passenger Terminal

Background

The requirements identified for the passenger terminal are identified to accommodate the travelling public with a sufficient level of service based on existing and projected growth. The analysis for this section was led by Alliiance Architects as a subconsultant to KLJ. The section will identify key issues with the existing passenger terminal building and provide planning-level space requirements.

Terminal Design

Overall Considerations

Terminals are designed to handle passenger volume and functions to interface between aircraft and ground transportation. Terminals must accommodate changes in the airline industry and passenger preferences. Factors that influence terminal design include:

- **Total Passenger Volume**: The annual number of passenger enplanements affects the total size and recommended configuration of a terminal building.
- **Passenger Peaking Characteristics:** Arriving or departing flights concentrated into a small timeframe require adequate space and throughput for surges in passenger ticketing, security, gates, baggage claim and concessions.
- **Passenger Preferences:** Business travelers typically are more experienced with airports, demand shorter wait times and efficiency. Leisure passengers require more time, attract meters/greeters and typically have more baggage to process. Airline fees also drive passenger preferences to check or carry-on baggage.
- **Aircraft Mix**: The size and frequency of the aircraft affects the number and size of the gates, passenger waiting holdroom and the terminal apron configuration.
- **Industry Trends**: Industry changes are affecting terminal design. Examples include reduced airline flight frequency, higher load factors, evolving aircraft types, use of check-in kiosks, TSA pre-check program and airline baggage fees.

Passenger Activity Levels

Planning activity levels (PAL) numbers in **Table 4-15** are used for terminal building space planning. These figures provide an estimate of the number of passengers to arrive, depart and generally flow through the terminal building. The figures are based on a percentage of total enplaned passengers the existing airline schedule. No surge factor is provided for irregular operations.

Table 4-15 – Passenger Terminal Activity Levels

Metric	Base	PAL 1	PAL 2	PAL 3	PAL 4
Terminal Passengers					
Annual Enplanements	343,926	416,470	514,497	616,087	619,525
Design Hour Departing	444	538	665	730	800
Design Hour Arriving	444	538	665	730	800
Design Hour Total	888	1,076	1,320	1,460	1,600

Source: KLJ Analysis

Space Requirements By Area

At RAP, peak utilization occurs in the late morning and early afternoon. **Table 4-16** summarizes space needs according to 2019 (base year) and 2029 (PAL 2) projections.

Table 4-16 –Passenger Terminal Space Requirements

Functional Area	*Existing Facilities*	2019 (base)	2029
General			
Annual Enplanements		343,926	514,497
Aircraft Gates/PBB	7	8	10
Aircraft Positions	9	8	10+2
Public Space (square feet)			
Circulation	26,090	36,200	47,800
Ticket Lobby	2,735	3,400	4,500
Passenger Security Screening & TSA Offices	7,843	6,400	8,800
Passenger Holdrooms	8,843	13,300	21,800
Baggage Claim (equipment/meter & greeter)	5,359	8,100	8,400
Restrooms	3,229	5,100	6,800
Other	656	700	700
Airline Space (square feet)			
Ticketing (Counter, ATO)	4,735	4,600	6,200
Baggage Screening & Makeup	5,212	25,000	30,300
Airside Ops/Storage	744	800	1,000
Inbound Bag Claim (Laydown)	3,395	3,900	3,900
Inbound/Outbound Bag Circulation	3,325	1,600	2,400
Baggage Service Offices	0	400	400
Concessions (square feet)			
Landside including Rental Cars (with Storage)	5,639	4,200	5,400
Airside (with Storage)	1,882	3,400	4,900
Non-Public Space (square feet)			
Airport Administration	2,474	4,100	4,100
Restrooms/Circulation	1,423	2,600	3,000
Airport Operations (maint/custodial, storage)	6,703	2,500	3,200
Building Systems	14,676	19,800	25,600
Total Gross (square feet)	104,963	146,100	189,200

Source: Alliiance Architects

Aircraft Apron

Terminal Apron

The primary purpose of the terminal apron is to provide parking for commercial passenger aircraft at the terminal gate and provide circulation space for aircraft and airline support functions.

There are 7 passenger boarding bridges and 9 parking positions around the terminal gate at RAP. The primary driver for the size of a terminal apron is the terminal building. Future building layouts and configurations will primarily drive size and space needs for the apron.

Other considerations for the terminal apron include deicing operations along Taxiway T-1 and deicing truck parking. Also, gates 1 and 2, which are closest to the terminal, may be impeded in the future because of needs to expand the terminal to accommodate baggage makeup and baggage screening.

Deicing Apron

Aircraft deicing is necessary prior to departure in cold weather conditions. Deicing facilities need to have space for aircraft and wingtip clearance, as well as space for mobile equipment maneuvering, a bypass taxiway, appropriate runoff mitigation to meet environmental requirements, lighting and support facilities. Aircraft deicing pads should be located in reasonable proximity to the departure runway.

Deicing operations are currently accomplished north of the concourse on the apron along taxilane T-1. This area can only accommodate one aircraft at a time. Since there is just one position this creates delay as aircraft gate pushback and deicing operations can last approximately 15 minutes.

Options to expand or relocate deicing operations will be analyzed in the following chapter.

Remain Overnight Parking (RON)

There is not a designated RON parking apron at Rapid City. Commercial aircraft typically park overnight at the terminal gates. Currently, there are 9 aircraft parking stands surrounding the terminal building accommodating aircraft ranging from a CRJ-200 to a Boeing 757. All 9 aircraft can connect to a passenger boarding bridge depending on aircraft size. Options for remain overnight parking will be analyzed in the following chapter.

Ground Equipment Storage

Airlines operate their own ground service equipment (GSE), including a variety of aircraft tugs, pushbacks, service vehicles, deicers, ground power units (GPUs), baggage belt-loaders, and other support vehicles. GSE is currently stored outdoors clear of critical areas, under the concourse in open and garaged space and inside the baggage make-up corridor behind the airline offices. Additional GSE storage space for the airlines should be considered.

Air Cargo

Rapid City is a destination airport for air cargo flights, mostly from Sioux Falls, SD. FedEx, UPS and USPS serve the airport through feeder airlines and cargo is processed in various non-designated apron areas. The air cargo operations at Rapid City occur in the morning and early evening for FedEx and UPS and occur in the late evening only for USPS to meet delivery schedules.

Currently, FedEx, UPS and USPS do not have processing facilities located on the airport, nor enough storage space for GSE. Empire, operating FedEx aircraft, uses the old rental car wash bay located on Airport Road for parts and tools storage.

Future options for cargo apron and associated buildings will be analyzed in the following chapter.

General Aviation

Background

General Aviation includes all civil aviation activities except for commercial service. GA activities found at Rapid City include corporate travel, medical transport, flight training, personal and business flights as well as recreational flying. These types of aeronautical activities serve the public in a way that is less noticeable to the average citizen. Providing facilities and access for GA users at Rapid City will continue to be vital for the community and region.

Rapid City Regional Airport continues to serve as the primary GA facility for the community handling corporate business traffic. There are 125 based aircraft and over 25,000 annual flight operations classified as GA. Based aircraft is projected to grow to 175 aircraft with operations growing to 28,000 annually by the end of the planning period. GA facilities are necessary to support these operations on the airfield. On-airport businesses providing aeronautical services known as Fixed-Base Operators (FBOs) and Specialized Aviation Service Operators (SASOs) provide aircraft maintenance, fueling and other pilot and passenger services.

Table 4-17 - General Aviation Planning Activity Levels (PALs)

Metric	Base	PAL 1	PAL 2	PAL 3	PAL 4
Based Aircraft					
Single Engine	94	99	104	108	112
Multi-Engine	21	25	30	35	41
Jet	4	5	7	9	12
Helicopter	5	6	7	8	9
Other	1	1	1	1	1
Total Based Aircraft	125	136	149	161	175
General Aviation Operations					
Local Operations	8,767	9,171	9,528	9,797	9,961
Itinerant Operations	17,083	17,571	17,912	18,026	18,180
Total Operations	25,849	26,742	27,440	27,823	28,141

Source: KLJ Analysis

Aircraft Storage

Aircraft storage requirements are driven by the aircraft size, local climate and owner preferences. Aircraft are becoming more complex and expensive and covered parking decreased the risk of damage. This is important with harsh winters in the upper Great Plains that drives owners to seek aircraft storage facilities rather than outdoor parking on an aircraft parking apron. Covered parking also offers security and the option to add other aeronautical facilities including an office or maintenance/storage areas. Nearly all the based aircraft at Rapid City are stored in covered storage facilities.

Actual space needs and requirements for hangar space will be demand driven. To the extent practical, space should preserved to accommodate a variety of hangar development needs, including: FBO/SASO hangars, t-hangars, small conventional hangars, and corporate/large conventional hangars. Given limited developable areas, the used of space for hangars will need to be balanced with other facility needs (e.g. cargo operations and SRE facilities).

Aircraft Parking Apron

The GA apron space analysis was completed using aviation activity demand forecasts. General aviation aircraft parking is used by both itinerant and based aircraft and driven by the number and size of aircraft. At Rapid City Regional Airport nearly all based aircraft are stored in hangars and most of the aircraft parking area is for itinerant aircraft for shorter periods of time ranging from a few minutes to a few days. The design day aircraft operations that use GA facilities were evaluated to determine the total apron size requirements at RAP during the peak month. Assumptions to determine apron requirements include:

- Transient operations are 70 percent of itinerant operations, conducted by non-local users.
- Peak month (10.28 percent of annual operations) and design day (4.41 percent of monthly operations) are based on the aviation forecasts.
- An operation is an arrival or a departure.
- Apron space will be needed by 80 percent of arriving transient aircraft, with the remaining 20 percent requiring hangars.

Table 4-18 - Transient Apron Aircraft Requirements

Category	Base	PAL 1	PAL 2	PAL 3	PAL 4
Operations					
GA Itinerant	17,083	17,571	17,912	18,026	18,180
Apron Aircraft					
Transient Operations	11,958	12,300	12,538	12,618	12,726
Peak Month Ops.	1,229	1,264	1,289	1,297	1,308
Design Day Ops.	54	56	57	57	58
Design Day Arrivals	27	28	28	28	29
Apron Aircraft	***22***	***22***	***23***	***23***	***23***

Source: KLJ Analysis

Itinerant airport operations included 27 percent single/multi-engine piston and helicopters, 53 percent turboprop and 20 percent business jet. From the determined number of operations it is necessary to figure out the fleet mix using the aviation forecasts. Aircraft types were then split by Airplane Design Group (ADG) classification to determine the necessary parking area with required FAA setbacks. Size requirements were calculated for each design aircraft:

- Single/Multi-Engine Piston (ADG-I) – 800 square yards per aircraft
- Turboprop (ADG-II) – 2,000 square yards per aircraft
- Business Jet (ADG-II) – 2,000 square yards per aircraft (98% of business jet operations)
- Business Jet (ADG-III) – 4,100 square yards per aircraft (2% of business jet operations)

Table 4-19 -Transient Apron Space

Category	*Existing*	Base	PAL 1	PAL 2	PAL 3	PAL 4
Apron Aircraft						
Single/Multi Engine Piston	*27%*	6	6	6	6	6
Turboprop	*53%*	12	12	12	12	12
Turbojet	*20%*	4	4	5	5	5
Total	*100%*	22	22	23	23	23
Apron Space (SY)						
Single/Multi Engine Piston	-	4,800	4,800	4,800	4,800	4,800
Turboprop	-	24,000	24,000	24,000	24,000	24,000
Turbojet	-	8,000	8,000	10,000	10,000	10,000
Approximate Apron Space	*60,000*	36,800	36,800	38,800	38,800	38,800
Capacity/(Deficiency)	-	*23,200*	*23,200*	*21,200*	*21,200*	*21,200*

Source: KLJ Analysis; RED indicates a deficiency to existing facilities

The majority of tie-downs on the apron are configured for ADG-I aircraft (wingspan not greater than 49') but there are four positions configured for larger aircraft. Larger aircraft can also park across multiple small tie-downs positions if necessary. There are a total of 26 tie-downs on the main apron (adjacent to Taxiway A). Additional parking/tiedown spots are available on the "cargo apron", and Westjet has aircraft parking spots to the west of their hangar and FBO terminal.

RAP's GA aprons meet current needs and should be sufficient to meet projected needs through the planning period. The alternative analysis in the following chapter will look at expansion potential and options to reconfigure some tiedowns 90 degrees to be aligned NW-SE.

GA Terminal Building

In most cases the terminal building is located within or near the Fixed Base Operator (FBO) providing aeronautical services. Westjet Air Center constructed a new general aviation terminal in 2015. The alternatives chapter will analyze options for additional FBO and SASO space.

Landside Facilities

Terminal Curbside

The terminal building at Rapid City is served by one curbside area adjacent to the arrival and departure areas. There are a total of five lanes, two parking and three driving, providing access to the terminal area to pick-up and drop-off passengers:

Inner Curbside (Personal Vehicles)

- Lane 1 – Direct curbside access next to the terminal building providing 425 linear feet of capacity for personal vehicles.
- Lane 2 – Lane used for vehicle circulation. In some airports the second lane is used for double-parking but at RAP with only 3 lanes for the inside curb, it leads to too much congestion.
- Lane 3 – Dedicated vehicle through lane for those entering and exiting the inner curbside area. (marked No Parking)

Outer Curbside (Ground Transportation)

- Lane 4 – Outer curbside access for other vehicles such as taxis, shuttles, TNC and busses. This portion has 320 linear feet of capacity for vehicles.
- Lane 5 - Dedicated vehicle through lane for the outer curbside area vehicles. (marked No Parking)

Terminal curbside needs are evaluated using industry planning criteria to determine linear frontage for the curb to meet level-of-service (LOS) standards. A dwell time of 4 minutes was used for personal vehicles at Rapid City assuming unloading, loading or waiting times. Industry standard vehicle lengths were used to determine curbside length requirements based on demand. The individual peak 15-minute period represents 30 percent of the design hour vehicles which is a conservative estimate.

A summary of the design-hour (peak 15 minute) vehicle traffic for both personal vehicle and commercial/public transportation space is noted in **Table 4-20**.

Table 4-20 – Curbside Requirements (peak 15 minutes)

Category	*Exist.*	Base	PAL 1	PAL 2	PAL 3	PAL 4
Inner Curbside (Personal Vehicles)						
Personal Occupancy Vehicles		32	38	48	53	58
Curbside Length (Feet)	*425*	187	225	282	310	338
Level of Service		A	B	D	D	D
Outer Curbside (Ground Transportation)						
Taxis/TNCs		16	18	22	26	28
Shuttles		1	1	1	2	2
Busses		1	1	1	1	1
Curbside Length (Feet)	*320*	114	133	166	183	194
Level of Service		A	A	B	C	C
Totals for All Curbside Lanes						
Total Curbside Length Used (Feet)	*745*	301	358	448	493	532
Level of Service (Total)		B	C	C	D	D
Curbside Required for LOS C (Feet)		462	552	689	759	818

Source: KLJ Analysis; TNC – Transportation Network Companies such as Lyft and Uber

As enplanements increase at the airport, so will the number of vehicles occupying the terminal curbside. The curbside length at Rapid City is projected to be adequate for LOS "C" standards with lanes approaching capacity through the mid-point of the planning period. It will be important to actively manage the parking curbs through the planning period and direct lingering vehicles to the Cell lot or Paid lots. Toward the middle of the planning period, it may be necessary to consider an additional inner curb lane to allow for double-parking since lengthening the curb will not be workable with such a narrow terminal frontage.

Automobile Parking

The automobile parking needs at a commercial service airport directly relates to the number of annual enplaned passengers. Automobile parking types include public, employee and rental car parking. The number of effective parking spaces was determined. This figure assumes 95 percent of the actual supply of spaces is available. The effective space count will be used for planning purposes. Existing baseline automobile parking supply is summarized in the **Table 4-21**.

Table 4-21 – Automobile Parking Supply

Parking Category	Actual Spaces	Effective Spaces (95%)
Public Parking		
Gravel Cell Phone Lot	16	15
P1 Lot	344	327
P2 Lot	709	674
Total Public Parking	1,069	1,016
Employee Parking		
East Employee Lot	27	26
Total Employee Parking	27	26
Rental Car Parking		
Ready-Return Lot	340	323
Remote Gravel Storage Lot	140	133
Total Rental Car Parking	480	456
Total Parking Spaces	1,576	1,498

Source: KLJ Analysis

TERMINAL PUBLIC PARKING

Public parking includes cell phone, P1 and P2 parking lots at Rapid City. This analysis combines all public parking needs into a cumulative review. The need for public parking spaces is driven by passenger enplanements in the peak day of the peak month.

Public parking demand is projected using a ratio of 2.0 spaces per 1,000 annual enplanements. The forecasted demand is larger than the available capacity through the planning period with 378 additional spaces needed by PAL 4. Estimated parking projections are depicted in **Table 4-22**. Additional public parking needs are anticipated through the planning period and parking expansion options will analyzed in the next chapter.

Table 4-22 – Public Parking Requirements

Category	Base	PAL 1	PAL 2	PAL 3	PAL 4
Enplanements	343,926	416,470	514,497	565,267	619,525
Public Parking Demand (with 10% daytime accumulation)	756	916	1,131	1,243	1,362
Effective Public Parking Supply	1,016	1,016	1,016	1,016	1,016
Capacity/(Deficiency)	260	100	-115	-227	-346

Source: KLJ Analysis; RED indicates a deficiency to existing facilities

Employee Parking

The majority of employee parking is comingled with the P1 and P2 public parking. There is also a 27-stall east lot used by some airline and airport personnel. Additional parking will likely be necessary over the planning period.

Rental Car Parking & Facilities

Rental car parking needs include ready/return lots for customers near the terminal, and long-term storage lots where the rental car fleet can be stored. Facilities with the parking areas include a quick-turn facility for rental car companies to clean and maintain vehicles. Each of the four car rental concessionaires at Rapid City will have different facility needs but car rental facility requirements are evaluated cumulatively.

Ready/Return Parking

Ready/return parking needs correlates with the peak number of customer transactions rather than the total number of customers. Increased demand requires rental car staff to transport cars to/from the storage lot more frequently placing additional costs and demands on their operation. Demand is based on one space per 1,200 arriving passengers.

Rental Car Storage

The size of the rental car storage lot is directly tied to the total rental car fleet. Total fleet is directly attributed to the total number of arriving passengers requiring rental cars. Storage is typically at its highest to "ramp up" to serve peak demand periods. There is insufficient space for the ready return and storage areas to handle the ramp-up periods during summer months and late October through late November. Rental car companies have indicated a need for 300 storage spaces and have also noted vehicle hail damage has been a significant issue. The alternatives chapter will explore options for additional parking, including covered parking options. A summary of existing ready/return and storage space available, and recommended space relative to planning activity levels are noted in **Table 4-23**.

Table 4-23 – Rental Car Parking Requirements

Category	Existing	Base	PAL 1	PAL 2	PAL 3	PAL 4
Ready/Return						
Peak Hour Transactions/Demand*	323	286	347	428	471	516
Capacity/(Deficiency)		**37**	**(24)**	**(105)**	**(148)**	**(193)**
Storage						
Rental Car Storage Demand	**133**	300+				
Capacity/(Deficiency)		**(167+)**				

*Source: KLJ Analysis; *Estimated*

Quick Turn Around (QTA) Facility

A facility to accommodate rental car operations is a maintenance or "quick-turn around" facility. These facilities are located within the vicinity of rental car operations and parking. A typical rental car QTA consists of a car wash, maintenance bays, storage and fueling area. The existing rental car QTA facility was completed in 2014 and is located within the rental car parking area. Total space is approximately 9,800 square feet of total space two car washes, five maintenance bays and a fueling area with underground storage tanks.

Ground Access & Circulation

Airport Access Road

Access to the passenger terminal is provided by Airport Road and Terminal Road from State Highway 44. There is one entrance and exit. All vehicle traffic for the terminal complex is guided to the terminal via Terminal Road. This includes passenger vehicles, busses, taxis, shuttles and rental cars. The rental car area is accessible from general aviation road immediately north of the terminal complex.

As passenger volumes increase so will the traffic count and flow through the terminal complex. The existing ground access and circulation infrastructure is adequate through the planning period.

Roadway System Considerations

The only access road to Rapid City Regional Airport is State Highway 44. This roadway provides direct connection to the Rapid City central business district which is 11 miles from the airport terminal building. Airport property is within 4 miles of Interstate 90, 10 miles by road.

When exiting the airport and heading south on Airport Road, the Highway 44 intersection should be evaluated. Drivers do not have a clear view of the intersection as a turn occurs at the gore of the island and accidents have happened resulting in reoccurring damage to the light pole on the slip ramp island. Airport Road has a 50 mile-per-hour speed limit and driver expectations are violated as they approach the intersection with what appears to be a shallow radius turn which unexpectedly is a sharp radius through a right turn ramp. There is no approach to the turn ramp resulting in combined driver actions at the island to move

into a new lane and turn through the right turn ramp. Calculations indicate that a 200 foot approach ramp with 500 foot taper should be added to the intersection.

Public Transportation

There is no public transportation access to Rapid City to serve passengers or airport employees. State Highway 44 is not served by fixed route service on the Rapid Transit System, Rapid City's public transportation system. The closest bus stop is at the corner of State Highway 44 (Omaha Street) and Centre Street adjacent to Western Dakota Technical Institute approximately 8 miles from the airport terminal. Taxi companies and Transportation Network Companies (TNCs) like Uber and Lyft are options for passengers.

Support Facilities

Support facilities are necessary to support a safe and efficiently run airport supporting airport operations and the travelling public.

Fueling Facilities

The airport has one Fixed Base Operator and a Specialized Aviation Service Operator that sells fuel. Each operator has their own dedicated fuel facilities with Jet-A and 100 low lead (LL) aviation fuel types.

The fuel tanks for the airport equipment and FBO are located in a fuel farm west of the general aviation area and outside of the airfield fenced area. Airport equipment and refuelers must exit the airfield through gates and transit the unpaved fuel farm area in all weather conditions to have access to fuel. Expansion capability and alternative locations for the fuel farm will be considered in the following chapter.

The SDARNG also maintains JP-8 fuel tanks within the National Guard leasehold.

Aircraft Rescue and Fire Fighting (ARFF)

As a certificated FAR Part 139 facility, Rapid City Regional Airport must comply with ARFF equipment, staffing, training and operational requirements. The airport owns and operates the ARFF facility with the City of Rapid City Fire Department staff on the north side of the terminal building. This facility, Station 8, was completed in 2011 and meets FAA operational requirements.

ARFF requirements are driven by the length of the largest air carrier aircraft that serves the airport with an average of five or more daily departures (see **Table 4-24**). Rapid City is currently classified as an ARFF Index B facility but maintains equipment sufficient to meet Index D requirements. The ARFF index is not anticipated to change into the future.

Table 4-24 – ARFF Index Requirements

ARFF Index	Aircraft Length	Representative Aircraft
A	< 90 feet	Beech 1900D
B	90 feet - < 126 feet	CRJ-900, A-320, ERJ-145

C	126 feet - < 159 feet	B-737-800, B-757
D	159 feet - < 200 feet	B-767, A-300
E	> 200 feet	B-747

Source: Title 14 CFR Part 139

The ARFF station must be located so that at least one firefighting vehicle can reach the midpoint of the farthest runway serving air carrier aircraft within three minutes and the remaining firefighting vehicles reaching this same midpoint within four minutes. The current ARFF site meets this requirement and is expected to adequately meet future needs.

Airport Maintenance & Snow Removal Equipment

Total facilities at RAP consist of 22,400 square feet of offices, maintenance, storage and shop space in four different buildings. The newest (Building 14) was constructed in 1998, the original shop was built in 1970 (Building 24), an old hangar (Building 25) is pre 1970, and the other storage (Building 26) was built in the 1990's. See **Figure 4-3** Existing SRE Buildings. The following chapter will look at expansion and relocation options for SRE and maintenance facilities.

Figure 4-3 - Existing SRE Buildings

*Intended for Planning Purposes Only

Security, Access & Wildlife

SECURITY & FENCING

Security is an important consideration when operating a safe airport. Transportation Security Administration (TSA) publishes recommended airport design guidelines. The first line of security protection infrastructure is a perimeter fence. Its installation will help prevent unauthorized persons from entering the airfield and help control wildlife. The fencing is currently 6-feet high but is

recommended to be 10-feet high with barbed wire top to provide optimum security for people and to control wildlife. All access points are controlled.

The TSA currently uses offices in a building located near the general aviation area. Through the planning period, it is recommended that space for TSA should be considered in any terminal building expansion in the event that the area of the current office building is converted to an aeronautical use.

Internal Airfield Circulation

FAA generally recommends airports have a full internal access road system that allows authorized vehicles to access various portions of the airfield, minimizing the need to navigate on taxiways, cross runways or leave the boundaries of airport property. A typical perimeter road is 20 to 24 feet wide and located outside of the airfield safety areas. Rapid City uses aprons and taxilanes for traversing the east side of the airport. This is the most heavily traveled area of the airport and keeps vehicle activity off of runways, taxiways and most aircraft movement areas.

An unpaved perimeter road exists around all of the airport. This road is used to access navigational aids and the perimeter fence. As opportunity arises, the unpaved portions of the perimeter road should be paved beginning with those roads nearest to aircraft movement areas and those used to access navigational aids.

Wildlife Control & Mitigation

The Rapid City Regional Airport has a perimeter fence sufficient to meet the needs of the airport. This fence provides both wildlife control and a security perimeter to keep the airfield safe and limit access to only those who have need or permission to use the airfield. The fencing and gate access is maintained and operated by the airport staff in accordance with Transportation Security Administration and FAA requirements. The air operations area at the Rapid City Airport is encompassed by a security fence to prevent unauthorized access to the active airport environment. The fence is a six-foot-high chain link with barbed wire security top in the terminal area with the remainder of the airfield protected with a ten-foot-high chain link with barbed wire top. Fencing and security needs will be included in the airports Capital Improvement Plan included in this Master Plan.

Airport Utilities

On-airport utilities including water, sanitary sewer, storm sewer, gas, power and communications are discussed in this section. Future facility development may require the relocation, replacement and/or upgrading of portions of the airport utility infrastructure. A brief discussion of special considerations is below.

Water

Water service to the airport is provided by the City of Rapid City. The service is a 12” water main connecting to the airport at Airport Road and RTR road which includes a looped water main along Taxiway A. There is also a new water main connection from the north which provides additional capacity to meet fire suppression requirements up to 4,000 gallons per minute of fire flow near the terminal.

Sanitary Sewer

The airport uses a lagoon system for wastewater treatment. The lagoon is located on the west side of the airport and is estimated to be inadequate for the airport within the planning period. A sanitary sewer connection to the City of Rapid City's system is being evaluated. The current City treatment facility is 2 miles directly southwest of the airport on the south side of State Highway 44. The connection will require a lift station and that lift station will either be directly south of the airport or further east of the airport along State Highway 44.

Storm Sewer

The airport maintains its own storm sewer system. Modifications during the planning period will likely be necessary as infrastructure improvements are made.

Gas, Power & Communications

The utility services for electrical power, communications and natural gas are provided by a variety of companies and organizations. There is an ongoing effort within the United States to encourage the use of electric vehicles which for the airport includes ground support equipment as well as personal vehicles. The current electrical infrastructure at the airport needs to be evaluated to assure it can meet this increase in demand in the future. As facility improvements and expansion occurs, additional utility infrastructure will be necessary.

Other

Military Facilities

The military facilities at RAP support the South Dakota Army National Guard (SDARNG). SDARNG leases approximately 30 acres of land from the Airport for both aeronautical and non-aeronautical facilities. The scope of this Master Plan related to the military is limited to planning the appropriate location on the Airport for military area requirements, as determined by the military.

Recommended development of SDARNG facilities are driven by their own facility master plan studies. These facilities have a lease with the airport through at least 2056; beyond the planning period for this study.

USFS Facilities

The United States Forest Service (USFS) maintains an air tanker base at the airport. Adequate space should be reserved for USFS to make improvements deemed necessary. The current facility can accommodate C-130 aircraft, but these aircraft can only enter one at a time because the loop taxilane is not separated from the perimeter fence and other taxilane enough for two aircraft to be in the loop at

one time. The USFS uses aircraft as large as the MD-87 and DC-10 which could potentially operate out of RAP if adequate facilities were available.

Since the SDARNG and USFS facilities are funded by the state and federal government, improvements are generally not eligible for funding from the FAA through the Airport Improvement Program. Funding for these improvements to the SDARNG must come from other state or federal funding sources or may come from the airport through long term leases and thus annual payments for the improvements.

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.

Airport property should primarily be reserved for existing and planned aeronautical uses, however, non-aeronautical uses can enhance airport user experience and provide additional revenue-generation opportunities to the airport. If airport-owned land does not have any aeronautical need for the safety, capacity or other airport development needs then it can be considered for a non-aeronautical use.

Examples of non-aeronautical land uses at RAP include certain SDARNG facilities and agricultural production. Other examples of non-aeronautical land uses include hotels, retail, manufacturing/storage facilities, mineral extraction and even cell phone towers (if compatible with airspace). Non-aeronautical development can be financially lucrative for the airport but may require FAA approval.

Options for a hotel will be considered in the alternatives chapter. The airport should continue to explore development opportunities in areas not needed for aeronautical use.

Summary

This chapter identifies safety, capacity and development needs for the Rapid City Regional Airport. These recommendations provide the basis for formulating development alternatives in **Chapter 5: Alternatives Analysis** to adequately address recommended improvements. The following list summarizes the facility recommendations.

Airside Facilities

- Resolve Runway 14-32 gradient issues during the next major reconstruction, or through the construction of a new runway.
- Maintain a length of 8,700’ with flexibility to extend the runway beyond its current length.
- Establish precision instrument approach procedures (less than ¾-mile visibility) to both ends of the primary runway (existing/future Runway 14-32). Precision approach procedures to Runway 32 are currently in place.

Passenger Terminal Facilities

- Develop expansion plans to 10 gates in the future and 12 gates in the ultimate timeline.
- Expand and improve baggage screening systems to increase throughput.
- Expand baggage claim and car rental counter space
- Provide options for ticketing area expansion
- Provide an area for storage of GSE
- Provide sufficient electrical power for electric GSE
- Other needs per the Terminal Study located in **Appendix E**

Air Cargo Facilities

- Provide expansion areas for air cargo with airside/landside access and sufficient space for space for hangars and storage buildings.

General Aviation Facilities

- Identify development areas for a variety of hangar sizes. T-hangars and large conventional hangars are those that are expected to be in in the greatest demand.
- Reconfiguration of Airport Road opens significant opportunity for aeronautical development. Put available space to its highest and best use.

Landside Facilities

- Connect the airport to the City of Rapid City's sanitary sewer system (in process).
- Parking expansion options
- Provide Electrical charging capabilities for personal vehicles
- Hotel location options

Support & Other Facilities

- Identify long-term expansion areas for SRE/Operations/Maintenance buildings.
- Identify potential ATCT replacement locations in order to update the facility and improve visibility of the movement areas from the tower.
- Identify expansion area options for the USFS.
- Identity options for deicing operations.
- Continue to coordinate with the SDARNG regarding facility needs.

CHAPTER 5: ALTERNATIVES ANALYSIS

Introduction

This chapter of the Airport Master Plan discusses airport development alternatives considered in the planning process for the Rapid City Regional Airport (RAP). 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 airport.

Alternatives evaluated for this study are based on comparing existing conditions with facility requirements reviewed in the previous chapters. Potential impacts of each alternative considered are discussed and used to help the airport select a preferred alternative(s) to be shown on the Airport Layout Plan. As mentioned in the prior chapter, limited developable space at RAP tends to put less emphasis on Planning Activity Levels and more emphasis on utilizing space for its highest and best use. Alternatives outlined are split into the following functional facility areas:

- Airfield
- Terminal Area/Landside
- General Aviation Areas
- Support & Non-Aeronautical Facilities

A Preferred Development Strategy based on the selected alternative(s) is summarized after the analysis. The recommended plan to implement the proposed development is outlined in **Chapter 6: Implementation**.

Evaluation Process

Steps

A wide range of alternatives are evaluated to determine the best solution for the airport to meet facility needs. In many cases the process is iterative to react to new information and input. FAA Advisory Circular (AC) 150/5070-6B, *Airport Master Plans* identifies an alternatives analysis process to progressively screen alternatives to 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. 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. Criteria used to evaluate alternatives include operational performance, best planning tenets, environmental and fiscal factors. No weighting factors were used through the evaluation process because weighting factors by their nature create a bias and impedes the ability to truly consider the complexities of planning decisions.

3. **Select** preferred alternative(s) that best meet the needs of the airport based on the benefits and impacts. Preferred alternatives are combined into a single recommended alternative with refinements made as needed.

Evaluation Criteria

Evaluation criteria is developed to determine the relative strength and weaknesses of the alternatives. FAA AC 150/5070-6B identifies criteria to be examined during alternatives evaluation. Using this guidance and local considerations, airport-specific criteria has been formulated. The alternative evaluation criteria referenced 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 tenets 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.
Fiscal Factors

Fiscal analysis is necessary to determine if the alternative fits within the financial resources of the airport, as well as potential federal and state funding partners. Preparing 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.

Airfield Development Alternatives

Primary Runway

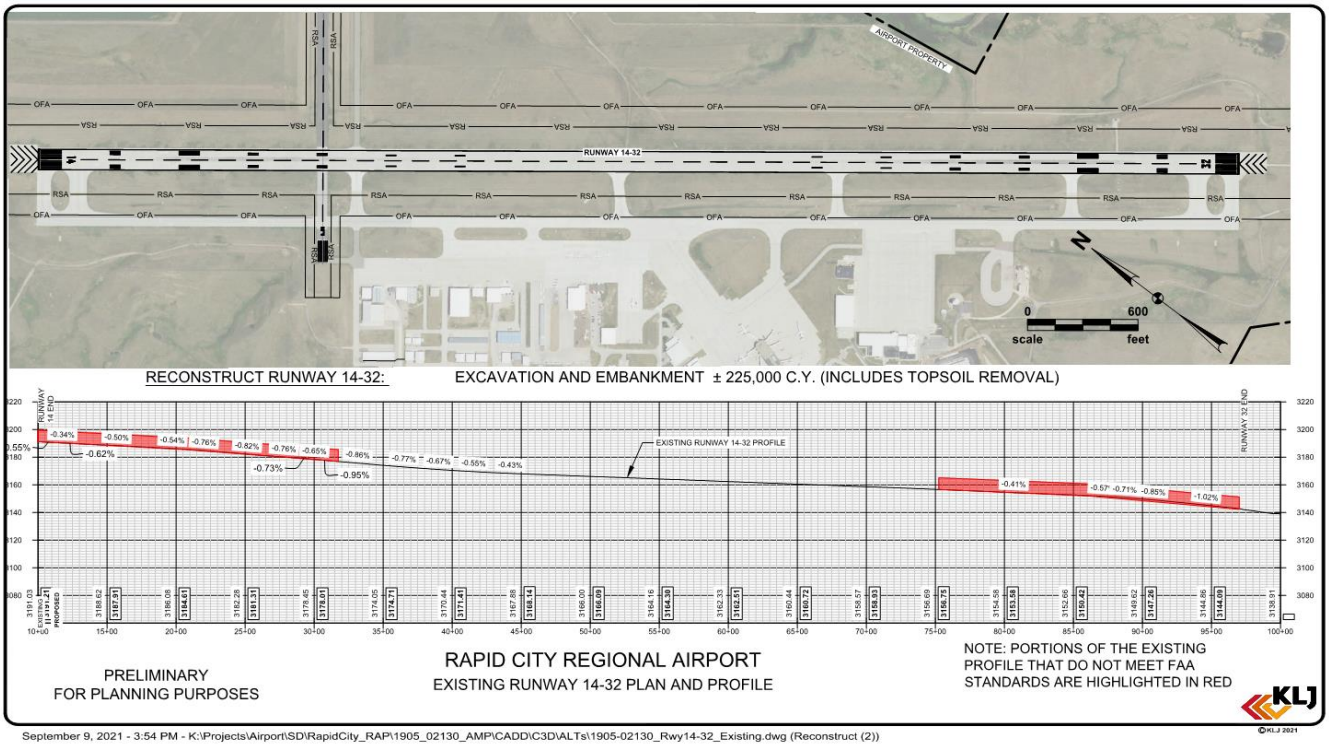
As identified in **Chapter 4: Facility Requirements**, there is a need to maintain a primary runway with C-III-2400 capabilities at the existing 8,700-foot length. Rapid City Regional Airport's Runway 14-32 will be nearing the

end of its useful life within the next 10 years. Maintaining continuity of services is critical; closure of the primary runway would significantly impact airport users and the Black Hills region. When the last full reconstruction of Runway 14-32 occurred in 1996, Ellsworth Air Force Base served as an alternate airport. After September 11, 2001, and new security requirements that followed, Ellsworth Air Force Base is no longer an option. This study looked at options to reconstruct Runway 14-32 in its existing location as well as alternatives to construct a new primary runway.

RECONSTRUCTION

Reconstruction of the existing Runway 14-32 is complicated by runway gradient requirements. As mentioned in the previous chapter, runways serving "C" category or greater aircraft cannot have grade changes in the first or last quarter of the runway. There are currently grade changes within both end quarters of Runway 14-32. Additionally, longitudinal grades at the Runway 32 End exceed the ±0.80 percent allowed for the first and last quarters of runways serving Category C aircraft. These deficiencies would need to be resolved as part of the reconstruction option. **Figure 5-1** shows gradient deficiencies highlighted in red.

Figure 5-1 - Deficiencies in Runway 14-32 Gradient for Category C Aircraft



Source: KLJ

Sections of Runway 14-32 would need to be raised or lowered in order to meet gradient requirements. Since existing Runway 14-32 cannot simply be reconstructed as-is, there are challenges with project phasing. Stopping points where the existing 14-32 runway grade matches the reconstructed grade occur over 2,000' from each runway end. In order to provide necessary gradient transitions the smallest phase of construction achievable would be approximately 2,500'. After including a 1,100' buffer beyond the construction area to meet runway safety area (RSA) and approach surface clearance requirements, approximately 5,100' of runway would be available at best. This length is insufficient to accommodate scheduled airline service and larger

business jets. Also, operational capabilities would be diminished while construction occurs (reduced instrument approach capabilities, closure of the crosswind for the northern phase of construction).

Project duration for the reconstruction of Runway 14-32 would be dependent on the phasing option selected and available funding. It's likely reconstruction would take place over two to three construction seasons. The planning level estimate of cost for the reconstruction is $55 million.

"NEW" RUNWAY ALTERNATIVES

Three "new" runway alternatives were evaluated, with the third option having three variations. These alternatives are briefly described below and shown on **Figure 5-2**. More detailed analysis and exhibits are provided later in this report.

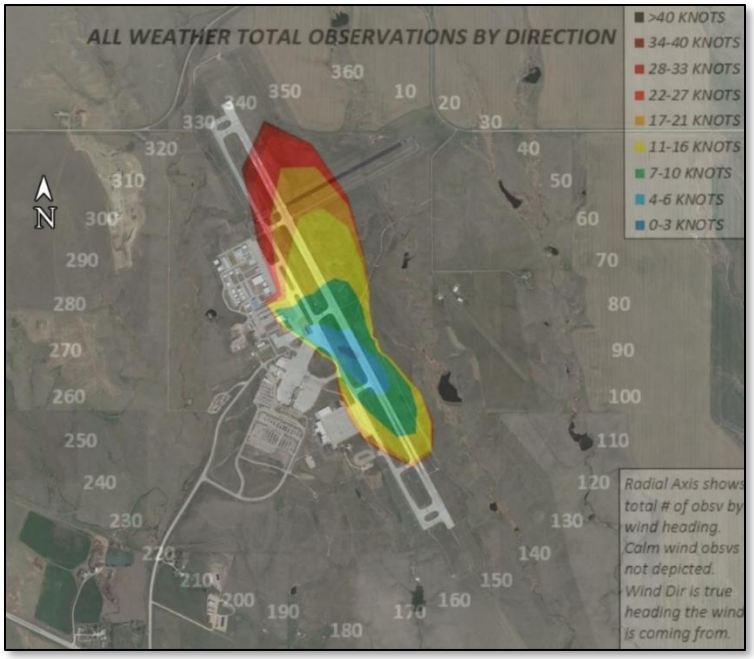
1. Extend/expand the crosswind runway.
2. Extend Runway 14-32 to provide additional construction phasing options.
3. Construct a New Runway 14-32 offset 550' to the east of existing Runway 14-32.
    a. No shift - Longview Road remains in the Runway 14 runway protection zone (RPZ).
    b. Shift 1,500' to the southeast to provide a clear "lower than ¾-mile" Approach RPZ.
    c. Shift 600' to the southeast to provide a clear "not lower than ¾-mile" Approach RPZ.

The first two alternatives were discarded for reasons detailed below. Alternative 3 options were carried forward for further evaluation.

Alternatives Considered & Discarded

Alternative 1 – Expand Crosswind Runway

Expanding and extending crosswind Runway 5-23 would be extended from 3,600' to 8,700' and include instrument approach capabilities to ¾ mile visibility and:

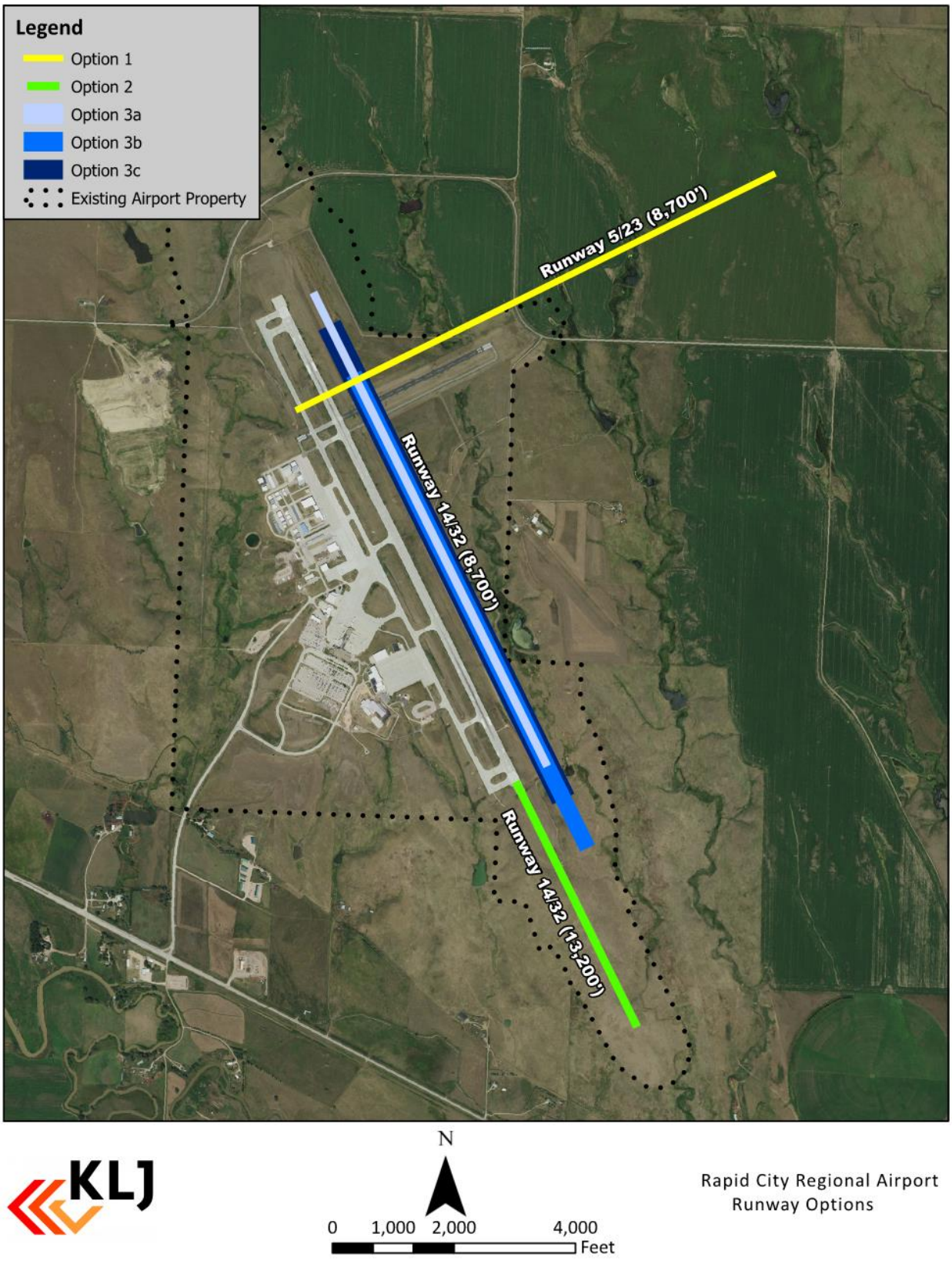


1) Requires the relocation of Long View Road
2) Requires significant land acquisition
3) Provides poor wind coverage (72.66%) and not be able to meet primary runway needs
4) Require maintaining Runway 14-32 as the primary runway which has 97.25% wind coverage

Predominant winds at RAP strongly favor a NNW/SSE alignment as depicted on all weather wind observations. Other crosswind alignments were considered but weren't feasible/practical for reasons similar to the 5-23 alignment.

Source: KRAP ASOS (2010-2019, hourly) From National Climatic Data Center 87,079 Total Observations

Figure 5-2 - Runway Alternative Options



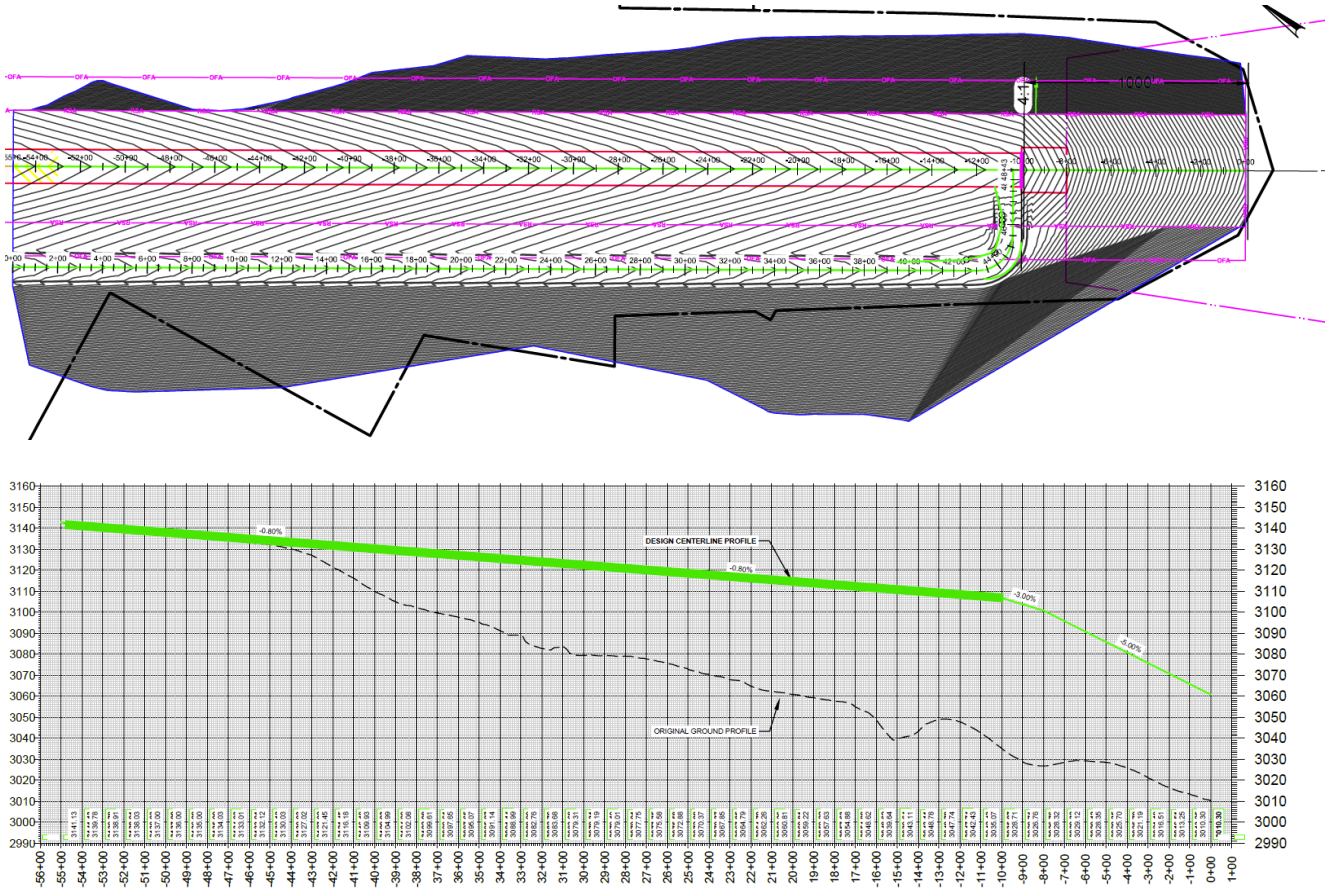
Alternative 2 – Extend Runway 14-32

Alternative 2 would involve the southeast extension of Runway 14-32 and its parallel taxiway to a length of 13,200' with the objective of minimizing operational impacts when reconstruction occurs. The extension of Runway 14-32 stops at a point prior to roads and residences in the 32 Precision Approach RPZ. Extensions to the north were not evaluated since that would likely require closure or relocation of Long View Road.

While the additional 4,500' of runway length gained from the extension would lessen time Runway 14-32 would be closed during reconstruction, the substantial earthwork costs make this option impractical. The terrain drop from north to south exceeding the allowable drop for an extension of Runway 14-32 (maximum 0.8% downward slope for the last ¼ of the runway). Toward the shifted Runway 32 End there would be approximately 70' of difference between the likely runway elevation and existing ground. See **Figure 5-3** for more details. While earthwork analysis was somewhat limited by available terrain data, at least 8 million cubic yards (C.Y.) of fill would be needed according to available high-quality data. Final estimates would likely be closer to 10 million C.Y. if better data became available.

The amount of fill needed greatly exceeds the amount of "cut" available on-site. Since "balancing" dirt on-site isn't an option, fill would have to be brought in from off-site. This was likely to increase cost estimates from $4/C.Y. to $10-$20/C.Y. For planning purposes, a price of $15/C.Y. was utilized, resulting in earthwork costs nearing $150 million for Alternative 2. Total estimated costs for this alternative would exceed $200 million.

Figure 5-3 - Extend Runway 14-32 Cut & Fill Analysis



Source: KLJ

Alternatives Considered & Analyzed Further

Alternative 3 variants were developed including constructing a new runway in a 14-32 alignment, offset 550' to the east of existing Runway 14-32. Current Runway 14-32 would then serve as the parallel taxiway to the new offset runway. These options would minimize operational impacts during construction and increase developable space.

The 550' offset allows for 50' of buffer space between the RSAs of the existing Runway 14-32 and new 14-32 depicted in the following alternative variants

- Alternative 3a – New Runway 14-32 offset 550' with No Shift
- Alternative 3b – New Runway 14-32 Offset 550' with 1,500' Shift southeast
- Alternative 3c – New Runway 14-32 Offset 550' with 600' Shift southeast and ¾-mile IAP (14 End)

An overview of Alternative 3 variants is provided below and depicted in **Figures 5-5**, **5-6** and **5-7**

The primary differences between the three variants are the amount of shift and corresponding ability to accommodate instrument approach procedures and provide RPZs clear of uses typically considered incompatible. The further the runway is shifted to the southeast, the higher associated earthwork, land acquisition, and paving costs become. Environmental impacts associated with the three variants are similar.

Alternative 3 variants would allow for additional expansion on the west side of the runway. **Figure 5-4** depicts potential development areas shown in yellow. The future runway visibility zone for Alternative 3a are shown in red. Development would not occur within the 250' offset in order to preserve RSA space needed for temporary reversions back to the existing runway configuration when closures of the new offset runway become necessary. Air Traffic Control line-of-sight requirements would also need to be met for development.

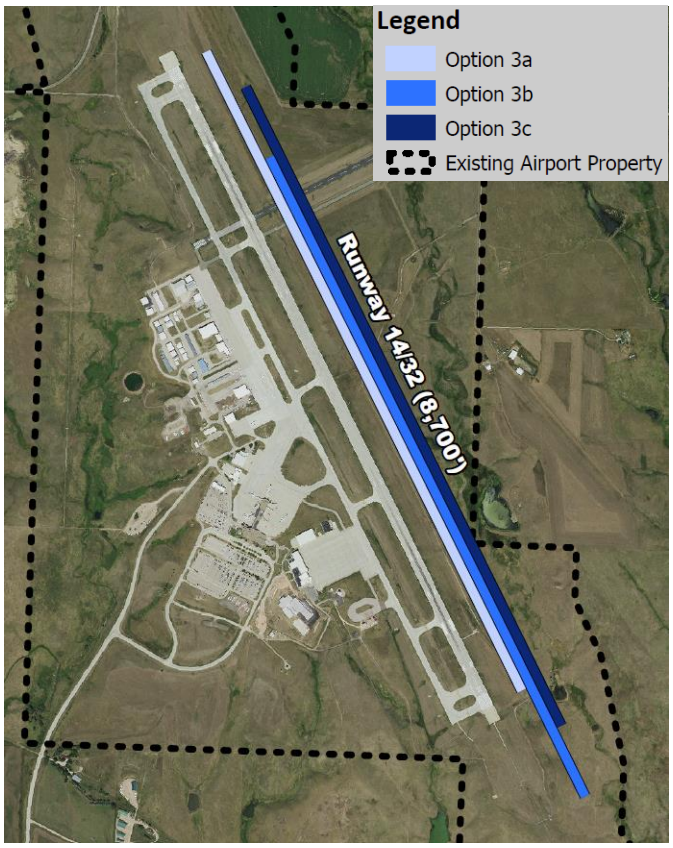
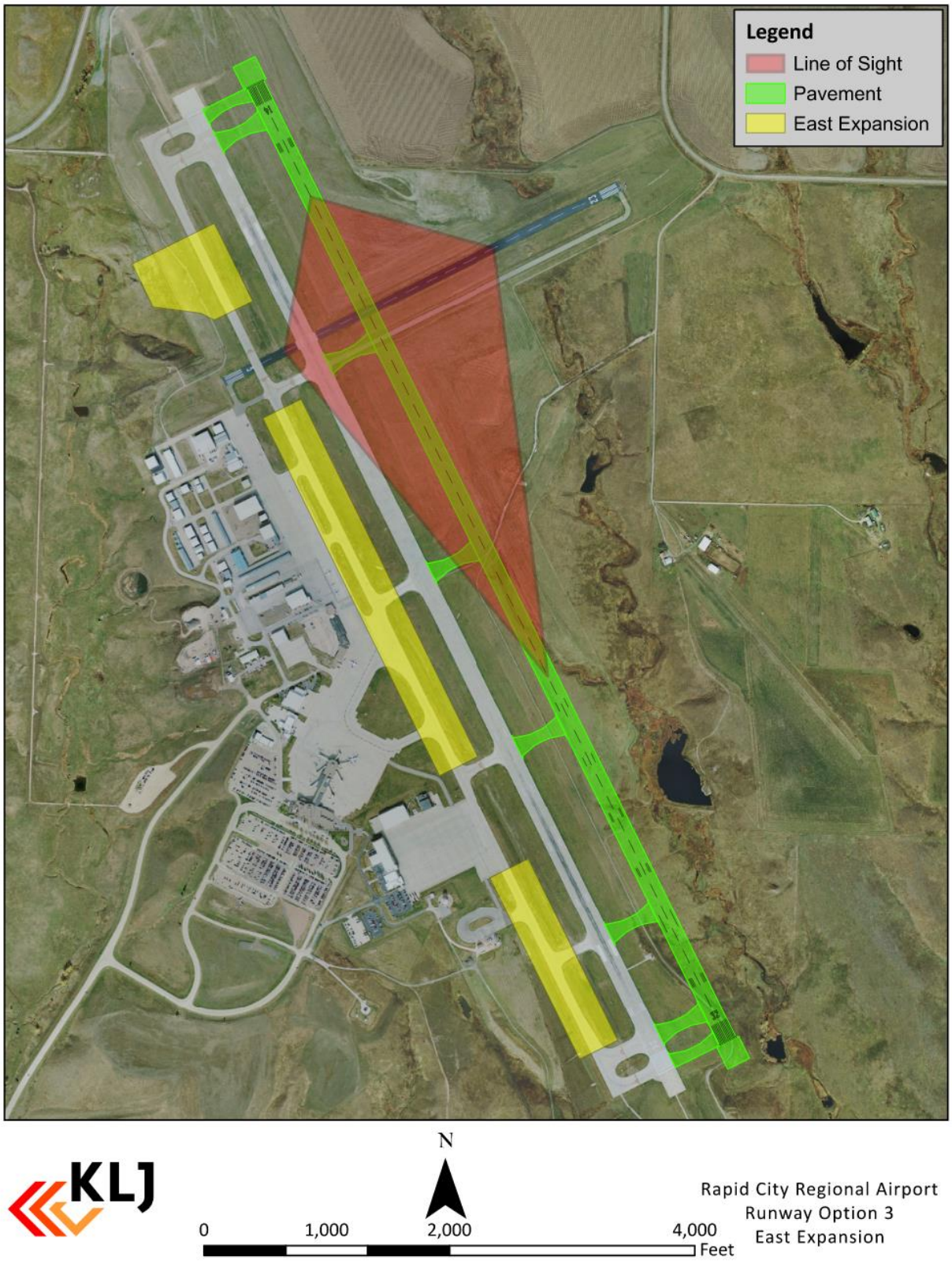


Figure 5-4 - East Expansion with New Runway



Alternative 3a – New Runway 14-32 with 550' Offset and No Shift

Alternative 3a includes a 550' offset, but no southeasterly shift. This option minimizes land acquisition and earthwork costs, with a total estimated project cost of $70 million. Precision instrument approach procedures are planned for both ends and the corresponding RPZ footprint is depicted above on **Figure 5-5**. Long View Road runs through the proposed 14 End RPZ, but due to the 550' offset, the extent of the road is located within the 14 RPZ is actually lessened compared to the existing Runway 14 end. This is due to the curvature of the road in the vicinity of the 14 End. While the RPZ associated with a 1-mile instrument approach is far smaller than an RPZ for a precision approach (less than ¾-mile), an "apples to apples" comparison for different RPZ sizes results in an overall reduction of public road footprint within Runway 14 RPZs. Road relocation outside the RPZ was not considered practical due to the high costs and unnecessary impact to surrounding pasture. An RPZ analysis is recommended as a preliminary design step if alternative 3a is selected.

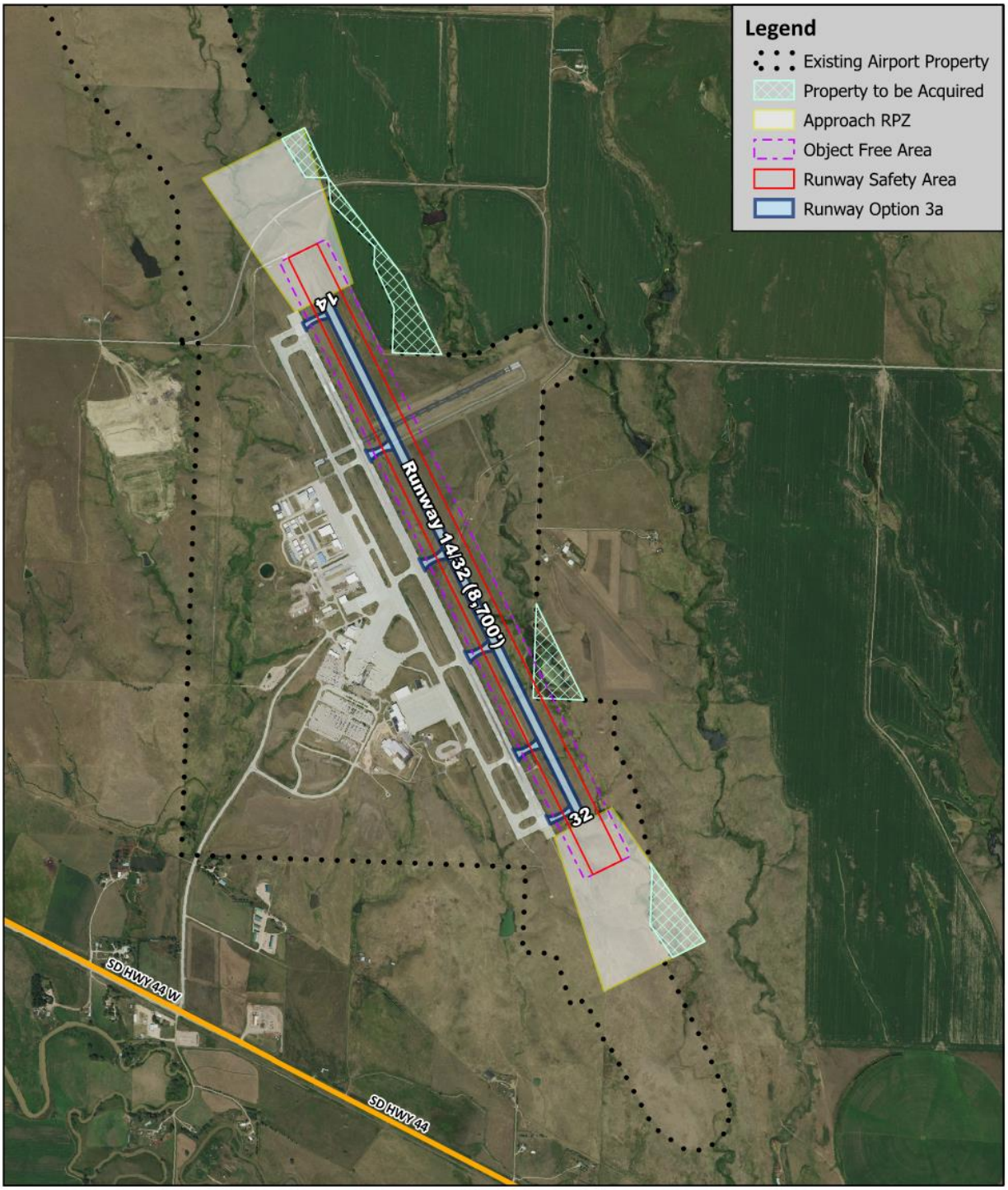
If a precision approach to Runway 14 is pursued, 190'of Longview Road would penetrate the FAA AC 150/5300-13a Table 3-2 34:1 threshold siting surface, requiring the road to be lowered.

Table 5-1 – Alternative 3a

Alternative Element	3a Features
Offset from Existing Runway 14-32	550'
Runway 14 Approach	½ Mile
Runway 32 Approach	½ Mile
Runway Length	8,700'
Impact on Long View Road	Road must be lowered on East end
Land Acquisition	55 acres
Earthwork Quantities (Cut/Fill in Cubic Yards)	3.7 million
Planning Level Cost Estimate	$70 million

Source: KLJ Analysis

Figure 5-5 - Runway Option 3a



Alternative 3b –New Runway 14-32 Offset 550' and Shifted 1,500' South

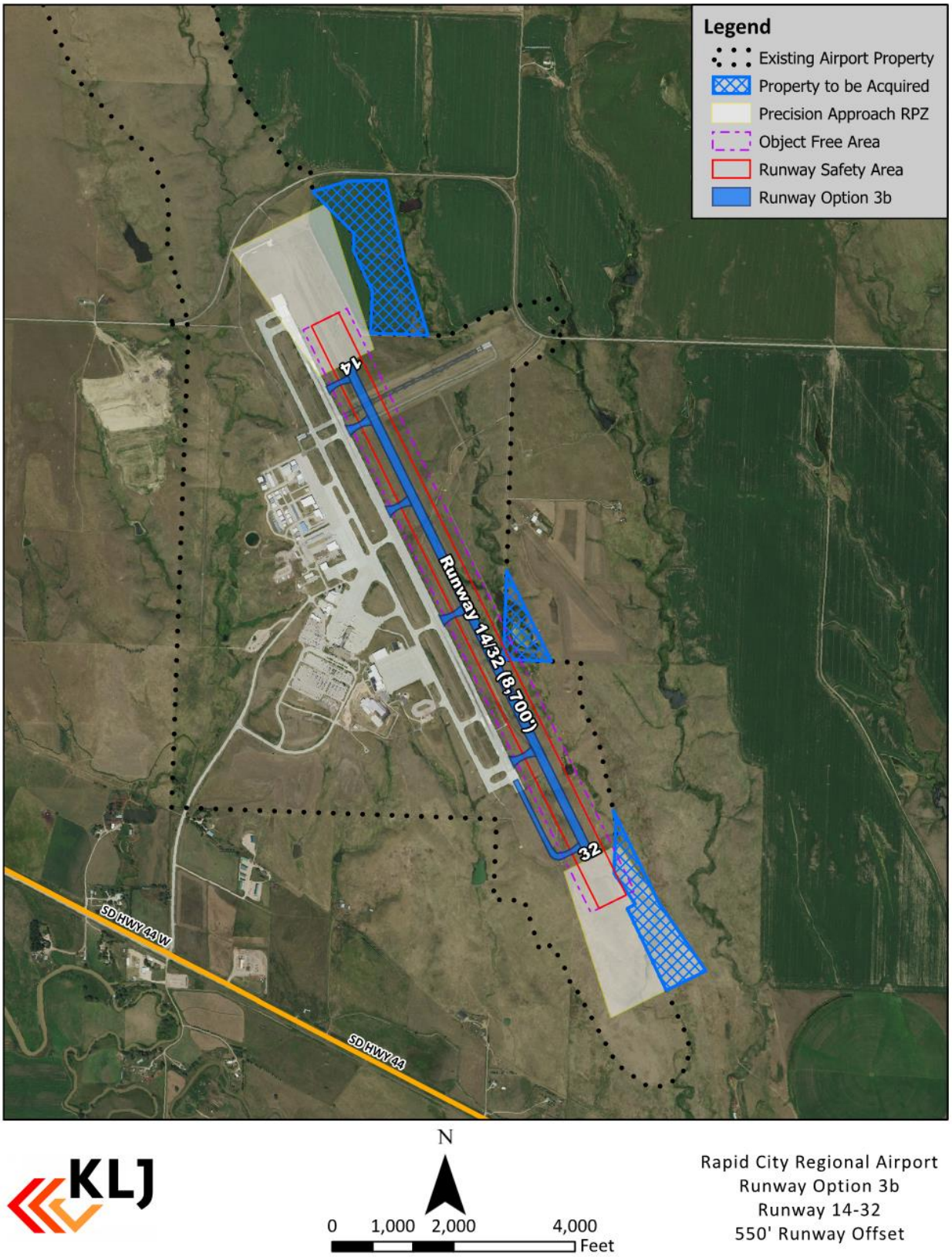
Alternative 3b would allow for precision approach procedures (down to ½ mile visibility) on both runway ends while avoiding uses typically considered incompatible within RPZs. However, the 1,500' shift required to clear roads from the RPZs results in more land acquisition and earthwork costs, with a total estimated project cost of $85 million, approximately $15 million more than Alternative 3a. Environmental impacts would be similar for all variants of Alternative 3.

Table 5-2 – Alternative 3b

Alternative Element	3a Features
Offset from Existing Runway 14-32	550'
Runway 14 Approach	½ Mile
Runway 32 Approach	½ Mile
Runway Length	8,700'
Impact on Long View Road	No Impact
Land Acquisition	100 acres
Earthwork Quantities (Cut/Fill in Cubic Yards)	6.4 million
Planning Level Cost Estimate	$85 million

Source: KLJ Analysis

Figure 5-6 - Runway Option 3b



Alternative 3c– New Runway 14-32 Offset 550' and Shifted 600' South

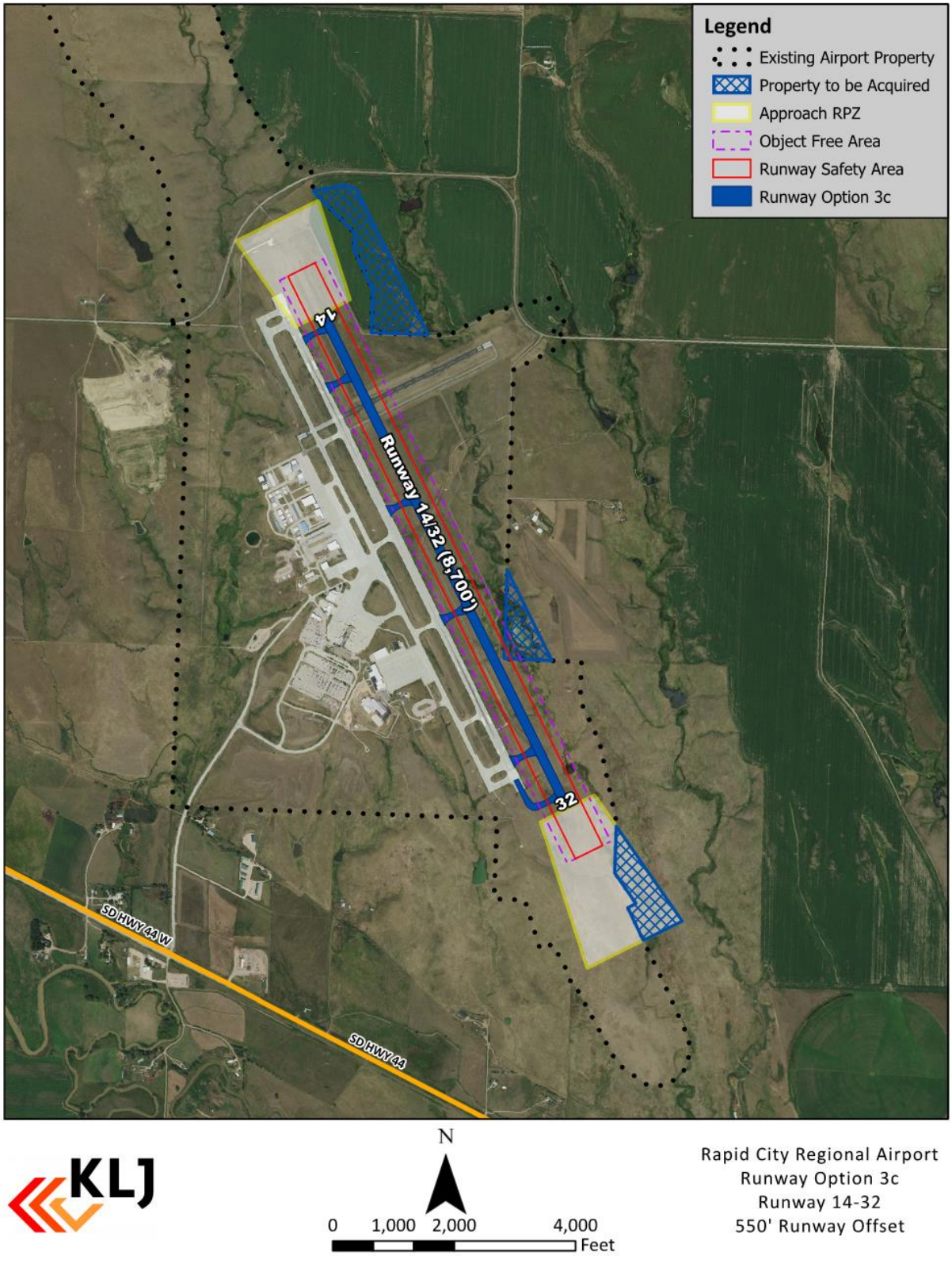
Alternative 3c includes constructing a new Runway 14-32 east of the current runway and shifting 600' to the south to clear Long View Road from the RPZ for ¾-mile instrument approach procedures to Runway 14. With the ¾ approach, a smaller RPZ is used which is only 1,700' long as compared to 2,500' feet long for the ½ mile visibility approach. Precision instrument approach procedures would be planned for the Runway 32 end. Alternative 3c involves more earthwork and land acquisition than 3a, but less than 3b. The total estimated project cost for Alternative 3c is $75 million.

Table 5-3 – Alternative 3c

Alternative Element	3a Features
Offset from Existing Runway 14-32	550'
Runway 14 Approach	¾ Mile
Runway 32 Approach	½ Mile
Runway Length	8,700'
Impact on Long View Road	No Impact
Land Acquisition	70 acres
Earthwork Quantities (Cut/Fill in Cubic Yards)	4.6 million
Planning Level Cost Estimate	$75 million

Source: KLJ Analysis

Figure 5-7 - Runway Option 3c



PRIMARY RUNWAY ALTERNATIVE SUMMARY

A summary of the reconstruction alternative and Alternative 3 variants are provided in **Table 5-4**.

Table 5-4 Runway 14-32 Option Summary

Category	Reconstruct	Option 3a	Option 3b	Option 3c
Operational Performance				
Alignment	14-32	14-32	14-32	14-32
Runway Length	8,700’	8,700’	8,700’	8,700’
Best Planning Tenets and Other Factors				
Impact to RAP Operations	Requires Significant Partial and Full Runway Closures	No Runway Closure Required Requires Displaced Threshold When Constructing Runway End Connector Taxiways		
Timeframe Estimates	2-3 Construction Seasons	3 Construction Seasons		
RPZ North (14 end) South (32 end)	(14) Road in RPZ (32) Clear	(14) Road in RPZ (32) Clear	(14) Clear (32) Clear	(14) Clear for ¾-Mile Approach (32) Clear
Adds Developable Space	No	Yes	Yes	Yes
Environmental				
Wetland Impacts	No	3a, 3b and 3c are similar		
Env. Sensitive Area Impacts	None	3a, 3b and 3c are similar		
Estimated Land Acquisition	None	55 Acres	100 Acres	70 Acres
Fiscal Factors				
Planning Level Estimate	**$55 Million**	**$70 Million**	**$85 Million**	**$75 Million**

Source: KLJ

PREFERRED PRIMARY RUNWAY ALTERNATIVE

After review of positives and negatives associated with the various alternatives, the airport has chosen a hybrid of Alternative 3a and 3c for its preferred alternative. The preferred option would depict Alternative 3a with precision instrument approach procedures on both ends and include a potential extension/shift 600' to the southeast to the location of the Alternative 3c Runway 32 end. The hybrid alternative provides flexibility to plan and protect for both Alternative 3a and 3c. As noted, all alternative 3's secondary benefit is the increase to developable space from the proposed runway shift. See **Figure 5-8 - Preferred Runway Alternative**.

While reconstructing Runway 14-32 has the lowest associated cost and environmental impacts, closure of the airport for two to three construction seasons for the reconstruction would have substantial impacts to airport users and the Black Hills region. Gillette, Wyoming (approx. 2 hr. drive) and Pierre, South Dakota (approx. 2 ½ hr. drive) are the nearest commercial service airports; however, these airports have a fraction of the airline service in comparison to RAP.

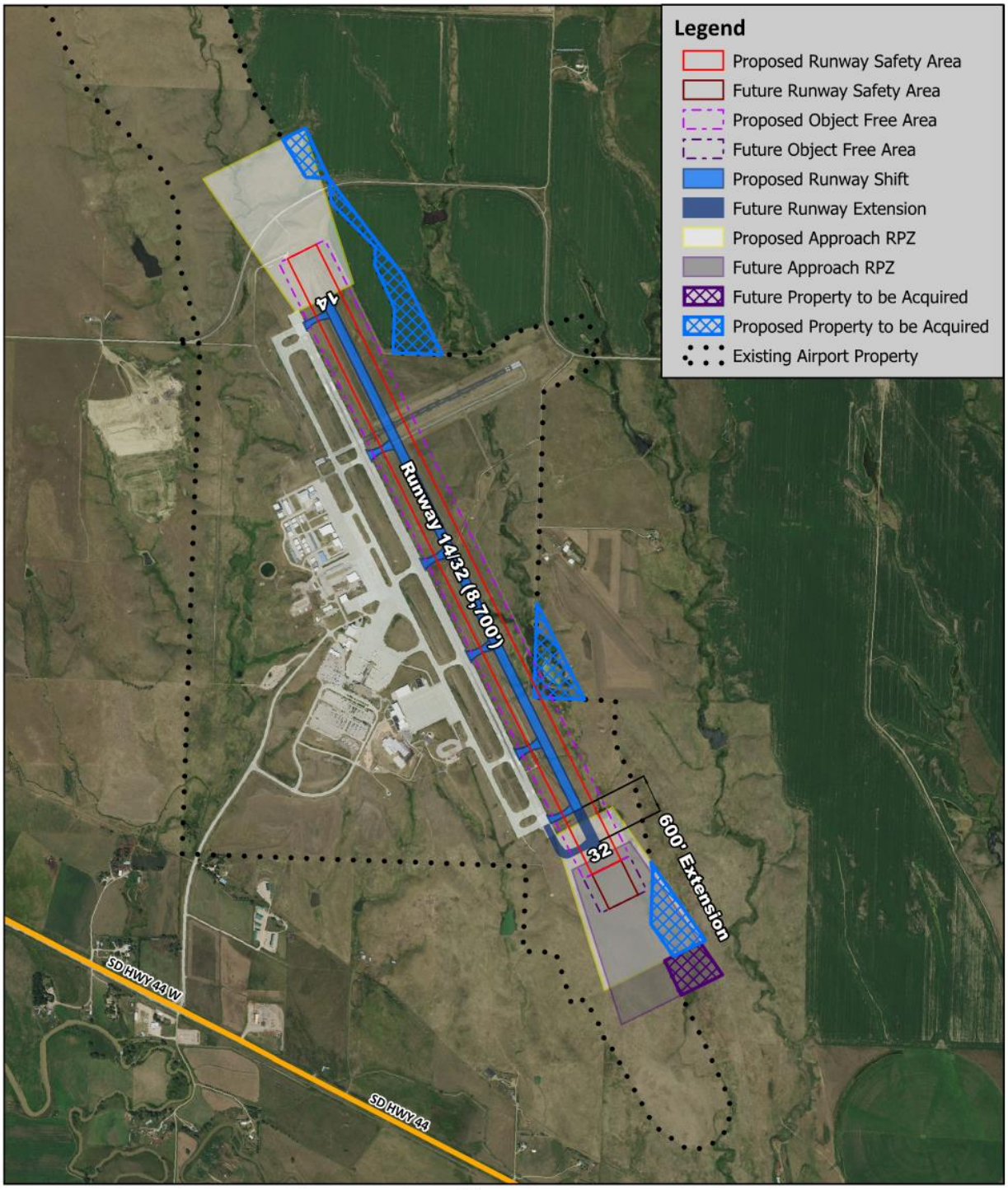
Preferred Runway Profile & Earthwork

A hybrid alternative was developed of option 3a and 3c. This would still shift the new runway 550' east of the current runway and mirror its length of 8,700'. This option would then offer a potential extension/shift of 600' to the southeast. Precision instrument approach procedures would be offered on both runway ends. Additional developable space will be offered for various aspects of the airport. This option will turn the current primary runway into a parallel taxiway.

Crosswind Runway 5-23

Crosswind Runway 5-23 is planned to remain a 3,600' x 75' runway at its current location. Construction of a "new" Runway 14-32 as detailed previously would require reconstruction of the portion of Runway 5-23 east of existing Runway 14-32.

Fiaure 5-8 - Preferred Runwav Alternative



Terminal Area Alternatives/Landside Alternatives

PASSENGER TERMINAL

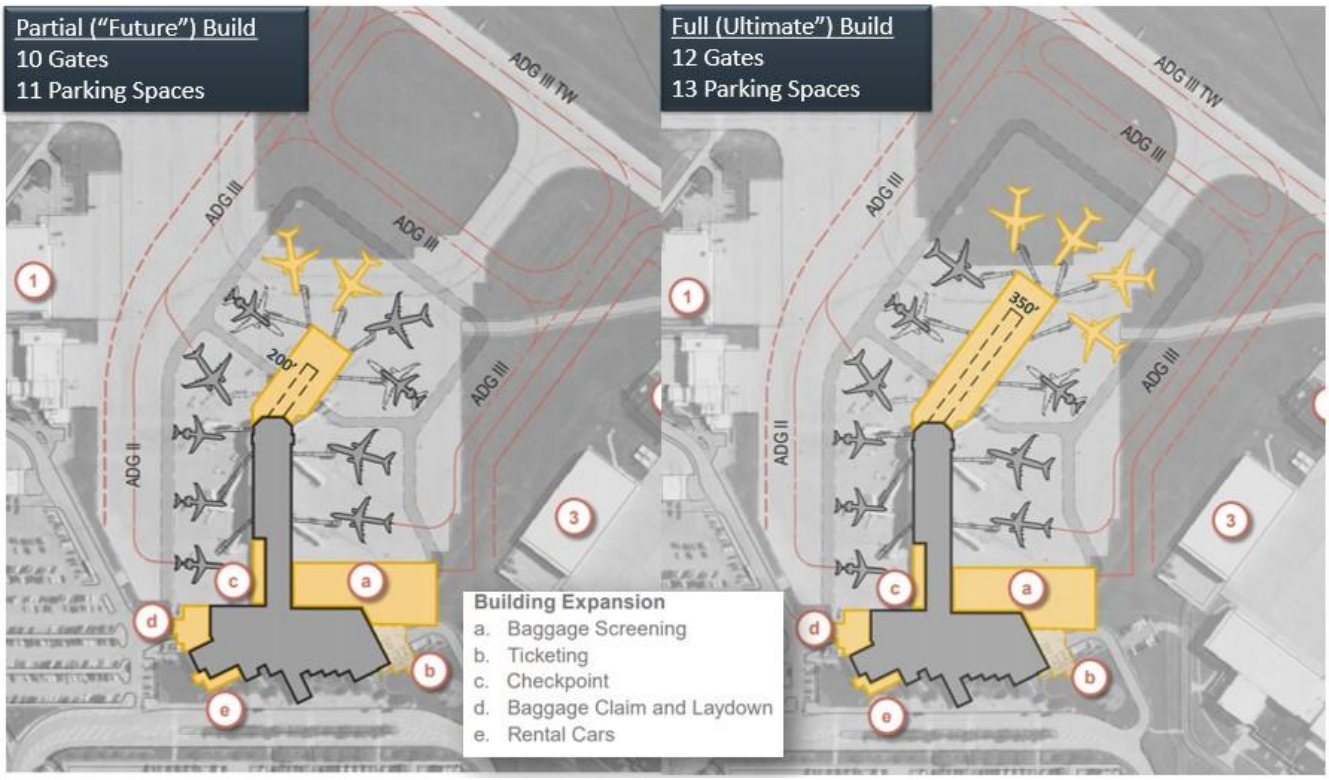
The growth projected in enplaned passengers will drive the need for terminal expansion during the planning period. Expansion will be pursued as demand is manifested. Alliiance Architects evaluated two options for terminal alternatives. The first is a partial build used for future planning, and the second being a full build used for the ultimate layout for the master planning.

The partial build would consist of ten gates with six bridged regional gates and four bridged narrowbody aircraft gates. It would also include a remain overnight (RON) parking position for narrowbody aircraft that would share a passenger boarding bridge (PBB) with the adjacent gate at the end of the concourse. The terminal would be extended to the northeast by 200'.

The ultimate build will provide a total of twelve bridged gates plus an additional RON which would share a PBB with the adjacent gate. This would increase the existing parking capacity by four positions and PBB gates by five. The new gates consist of six large regional (CR7/9, E75) and seven narrowbody (737, A320) type aircraft bringing the total expansion to 350' which is 150' more than the partial build mentioned previously.

For both the partial and full build of the terminal, Taxiway T1 and T2 will offer Aircraft Design Group (ADG) III access along all sides of the concourse narrowing down to an ADG II for current gates 2, 4, and 6 for the partial and full build of the terminal which are constrained to regional aircraft. **Figure 5-9** shows both the partial and full build of the terminal along with a description of the expanded areas.

Figure 5-9 - Terminal Expansion



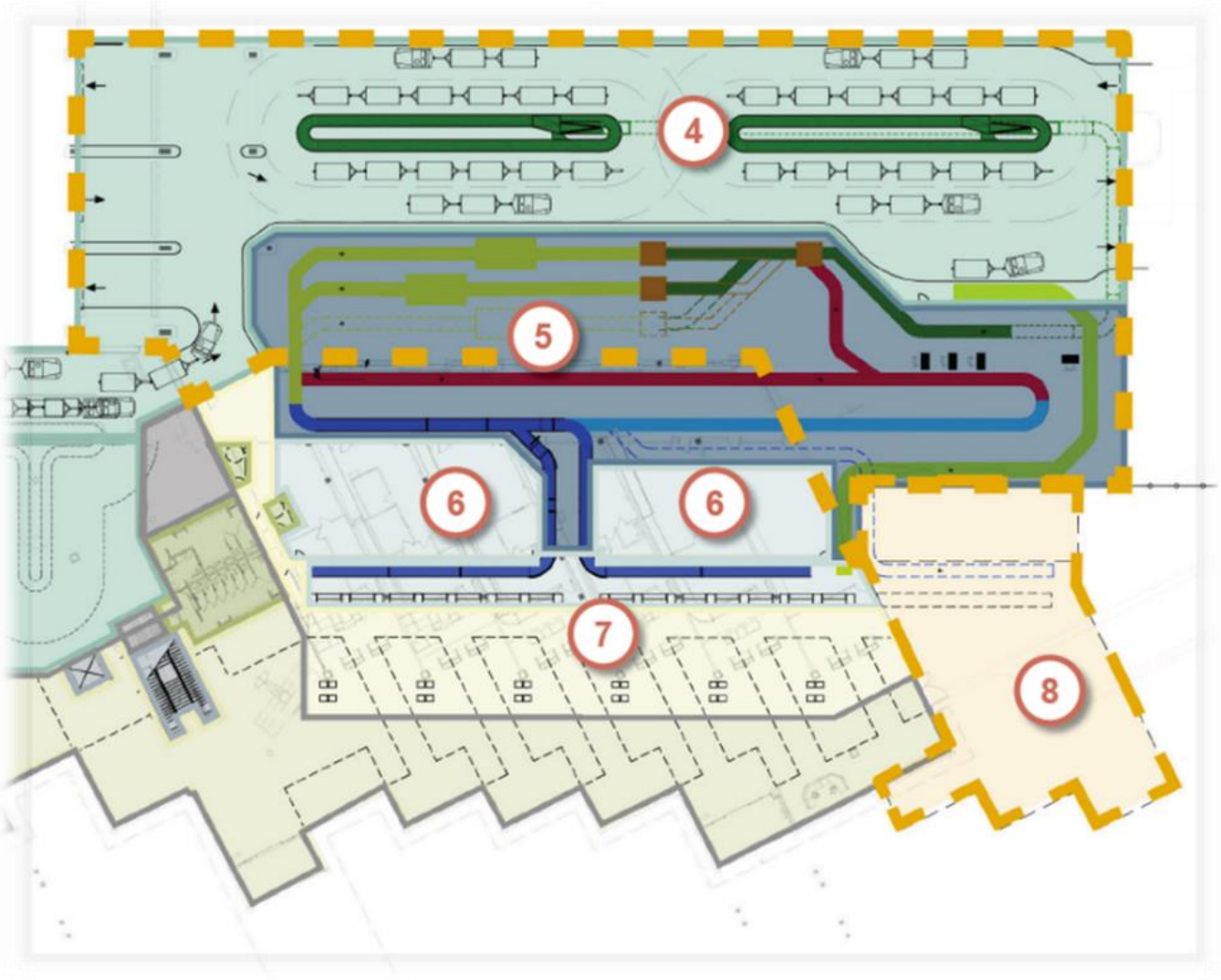
Source: Alliiance Architects

Terminal – Ticketing/Departure Area

With the terminal expansion, there were several areas noted as Sections a. through e. which are described as follows. As shown on **Figure 5-10**, sections a. and b were broken down into 5 areas. The east (section a.) offers expansion of new consolidated explosive detection system (EDS) for baggage screening. The southeast expansion (section b.) will allow a two-bay ticketing expansion to meet the 10-year demand requirements.

4. Baggage Makeup Addition (20,000 sf)
   - Two 160 LF Baggage Makeup carousels
   - 24-cart capacity
5. Baggage Screening area (15,000 sf)
6. Airport Ticket Offices (ATOs)
7. New Ticket Counters & Scales: 28 positions
8. Future Ticketing Hall expansion (6,000 sf)

Figure 5-10 Terminal – Ticketing/Departures Area

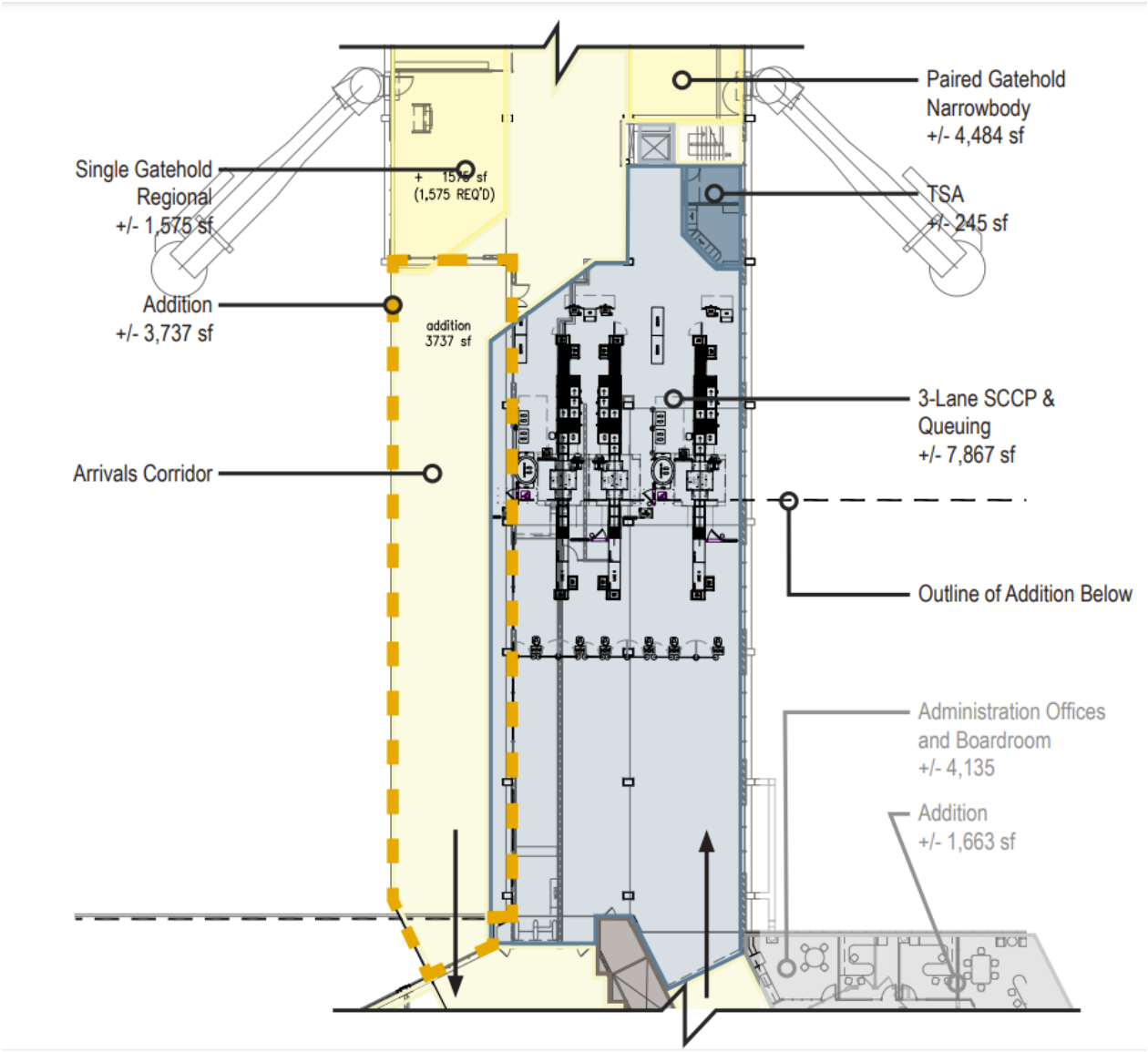


Source: Alliiance Architects

Terminal – Security Checkpoint/Arrivals Corridor

Section c. shown in **Figure 5-11** allows more room for security screening with a center expansion of the terminal that builds a new arrivals corridor. With the new arrivals corridor, the security checkpoint can then be widened to encompass the previous arrivals corridor, which adds about 25% in new checkpoint capacity.

Figure 5-11 Terminal – Security Checkpoint/Arrivals Corridor



Source: Alliiance Architects

Terminal – Baggage Claim/Arrivals Area

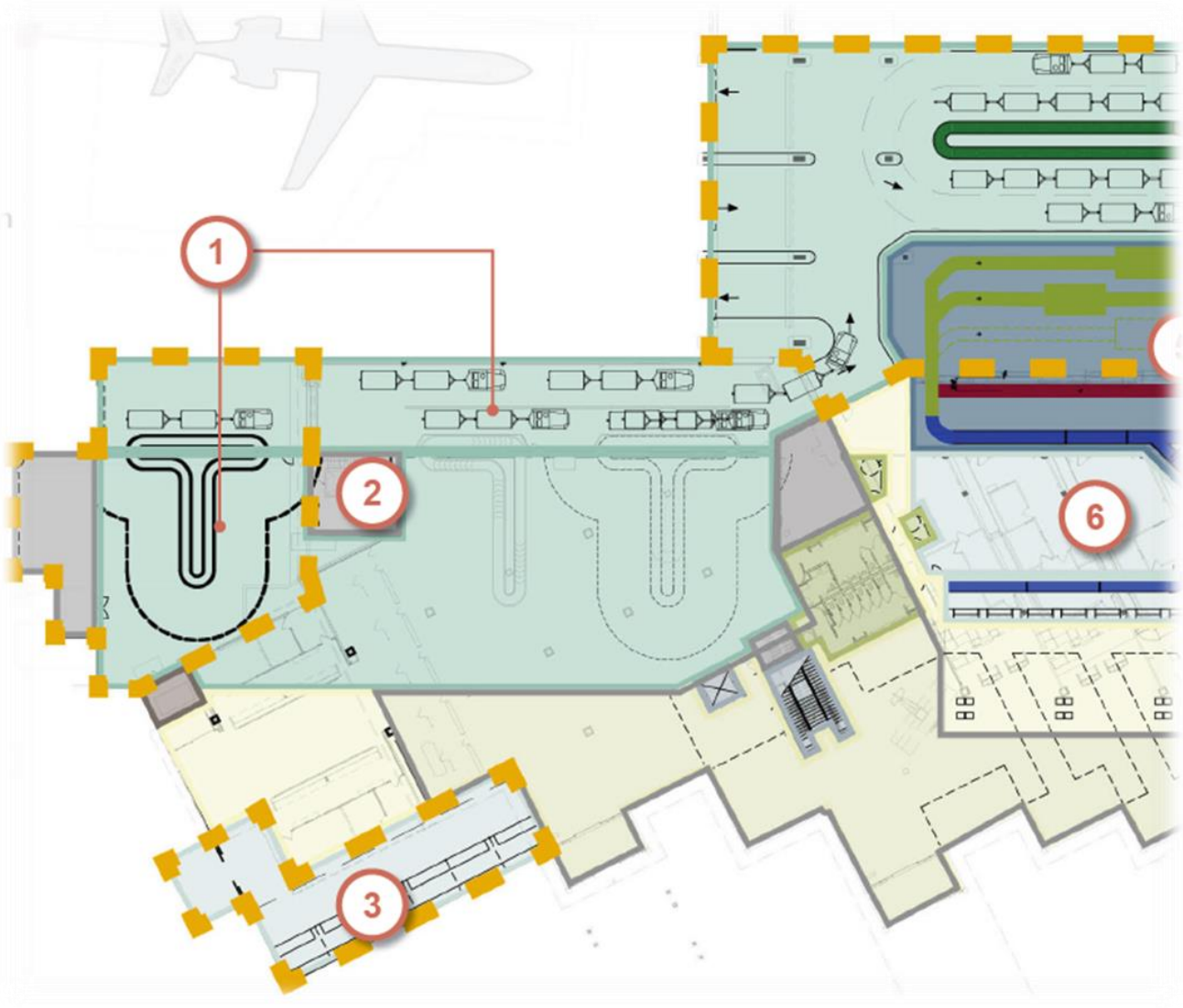
The terminal area improvements noted as d. and e. will improve the baggage claim and rental car areas. In detail these improvements provide the following (see **Figure 5-12**):

Expansion to the northwest adds space additional for a flat plate "T" baggage claim device as well as increased baggage laydown and circulation.

The west expansion will be for rental car counters and offices relocation to a curbside building opening space for additional baggage claim retrieval and circulation.

1. New Baggage Claim Device / Loading Dock expansion (+/- 6,000 sf)
2. New enclosure at existing vertical circulation
3. New addition for Car Rental (+/- 2,800 sf)

Figure 5-12 Terminal – Baggage Claim/Arrivals Area



Source: Alliance Architects

HOTEL

A few locations (see **Figure 5-13**) were evaluated that could be suitable for a small hotel (similar to the AeroStay Hotel located at Sioux Falls Airport (FSD)). However, the preferred location became an area that was not originally identified. RAP was contacted by a development group looking to site a hotel on the airport and specifically asked about the location in red. This site was suitable for development and the view of the Black Hills was preserved so the site was selected as the preferred alternative.

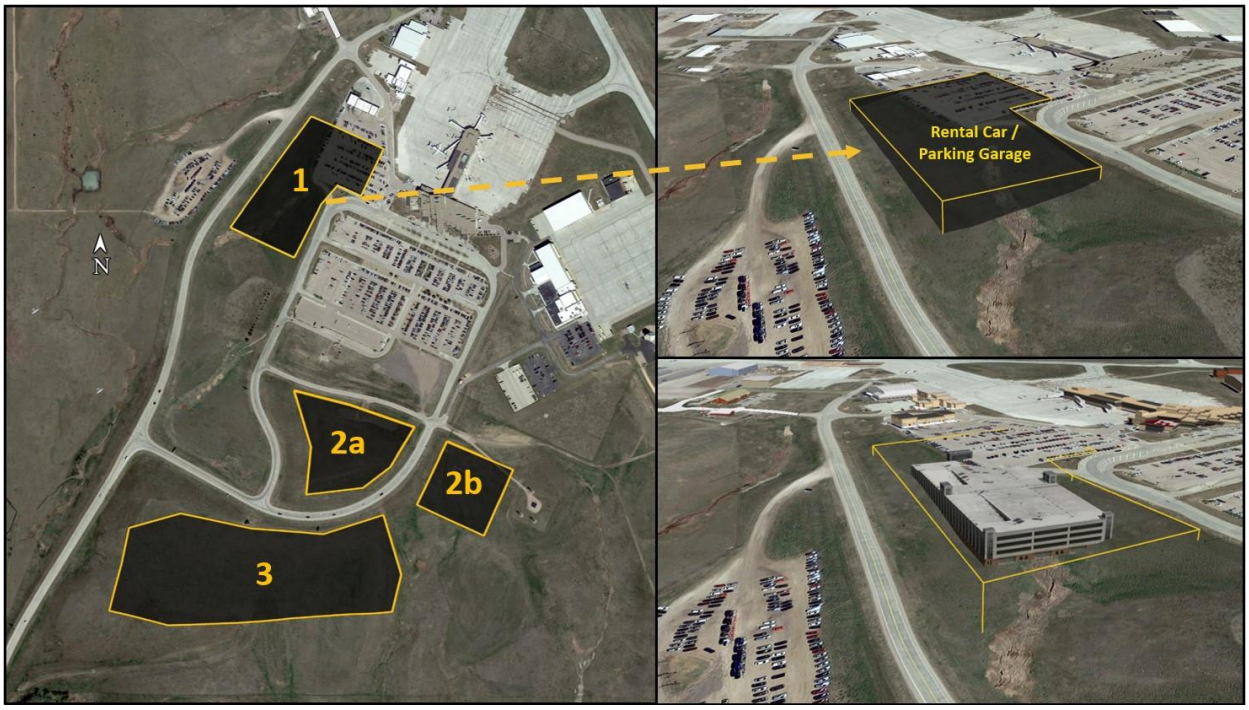
Figure 5-13 Hotel Location Options (preferred in Red)

RENTAL CARS

Currently the rental car operations are made up of four components: the rental car counters in the terminal, the ready/return lot, the storage/overflow lot, and the quick turnaround (QTA) facility for cleaning/fueling of the vehicles. See **Figure 5-14** for the current layout of the rental car areas. Three different areas were evaluated for rental car parking expansion including covered parking options (see **Figure 5-15**).

Figure 5-14 Current Rental Car Facilities

Figure 5-15 - All Rental Car Alternatives



Source: KLJ

RAP and the rental car companies were excited about the possibility for a parking garage structure in area 1. Hail damage has been a significant problem in the area and covered parking would help minimize that issue. It is important to point out that many car dealerships in Rapid City in 2021 began installing covered parking for their lots to protect from hail damage.

Area 1 would convert an otherwise undevelopable area by building the parking garage into the hillside. Another side benefit was keeping the garage at a lower profile to preserve views of the Black Hills in the distance. When terminal facilities were discussed in the Alliiance Architects report it was determined the rental car counter portion could continue to be accommodated in the terminal. The QTA facility is satisfactory at this time but could be relocated to the parking garage structure if constructed. However, it's possible an ultimate parking garage location could be closer to the terminal if it will also be utilized for premium/general parking. A drawback of the garage close to the terminal would be substantial disruption to existing rental car parking if the garage is being built in that area.

Areas 2a, 2b and 3 could be preserved for future rental car parking facilities depending on funding and needs.

PARKING

With forecasted numbers determined in Chapter 4, an additional 378 spaces are needed through the planning period. Some areas are the same as the rental car parking options. The ideal areas for expansion would be areas 2a and 2b for public parking in the future. Other areas should be preserved for airport parking expansion if needed later. There is currently a lack of parking for employees, it was identified by airport staff that Area 1 would be the ideal location for future employee parking.

General Aviation Alternatives

GENERAL AVIATION APRON/HANGARS

Rapid City is forecast to see growth in general aviation (GA) operations and based aircraft. The airport is the only public use facility serving Rapid City and is sufficient to meet the general aviation needs of the area as well as the commercial needs already identified. General Aviation has seen growth in the Rapid City area but development of facilities has been only on an incremental basis.

GA development concepts were focused on the west side of the airfield generally in the current area. There are two primary groups of general aviation aircraft that the hangar development is intended to address. These are Group I Aircraft (<49' wingspan, with a 79' Taxilane Object Free Area (TOFA)) and Group II Aircraft (≥49' but <79' wingspan, with a 115' TOFA).

DEVELOPMENT AREAS & CONCEPTS

As mentioned in the **Facility Requirements Chapter**, a heavier focus was put on "highest and best use" for different development areas on the airfield given terrain and other constraints limiting developable space. The alternatives analysis in some ways was more of a "what's the best/most flexible option for a certain area" approach as compared to designating the preferred area for each use. Also, as mentioned in the **Facility Requirements Chapter 4**, there is less reliance on planning activity levels (PALs) dictating a certain amount of square footage for specific hangar space, etc.

At the beginning of the alternative analysis, as shown in **Figure 5-16**, many of the areas could be used for multiple purposes. The matrix of what was considered developable areas were evaluated to determine the most suited use.

The airport road reconfiguration underway and the preferred runway alternative to construct a new runway offset 550' to the east opened up areas for development. The areas with a "U" designation relate to the future runway alternative that will offer more developable space. To simplify how the alternatives are examined the general aviation area is divided into three areas:

North Hangar Area - all hangars north of La Croix Court including north of Runway 5-23.

Middle Hangar Area – all hangars and buildings south of La Croix Court but north of the terminal area. This includes support facilities such as RAP operations and maintenance, cargo, FBO space and tiedown areas.

South Area – all areas south of the terminal area.

Figure 5-16 - Developmental Area

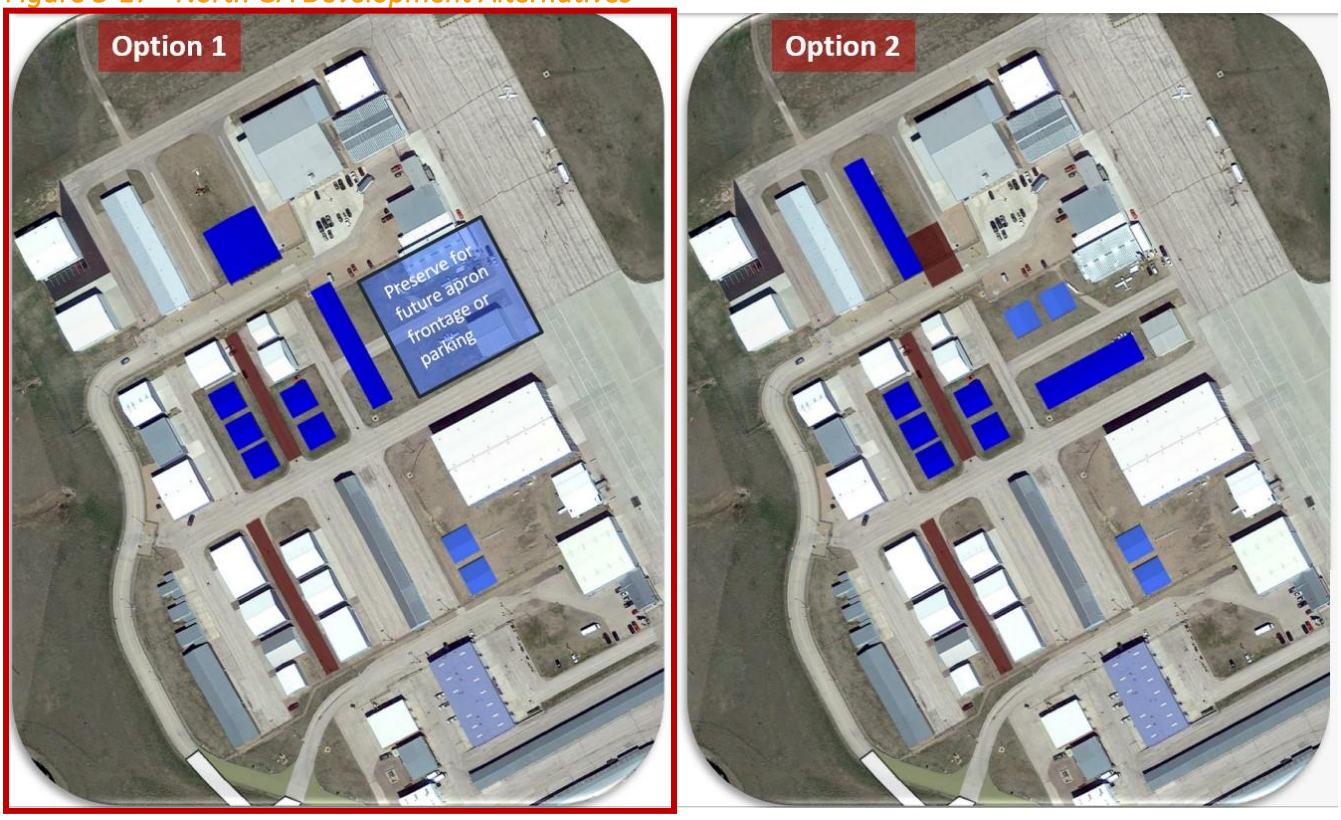
Use	Area																					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	R1	U1	U2	U3	U4
SRE/Ops/Maint																						
FBO/FBO Hangars																						
SASO																						
Lg./Corp. Hangars																						
GA Hangars																						
Cargo																						
USFS																						
Parking																						
Fuel Farm																						
Rental Car																						
Hotel																						
Misc./Nonaero																						

Source: KLJ

NORTH GA DEVELOPMENT AREA

North General Aviation development includes finding the preferred "infill" uses for the area north of Lacroix Court as depicted in yellow. Two general concepts were developed (see **Figure 5-17**) with Option 1 more or less mirroring what was portrayed in the prior Master Plan (MP). Option 2 looked at some additional T-hangar infill, but at the expense of future development along the GA apron. RAP staff chose to continue with development in a similar manner to the prior MP (Option 1). This option offers additional box hangars surrounding current hangars with a larger 100' x 100' hangar that could be used as a Specialized Aviation Service Operation (SASO) with an apron to the west. The option includes future apron frontage/parking connecting to the current apron and a four unit T-hangar.

Figure 5-17 - North GA Development Alternatives



Source: KLJ

ULTIMATE NORTH GA DEVELOPMENT

With the new runway shift, other ultimate north GA concepts were evaluated. The idea was to expand towards the new runway while allowing roadside access. The area would not be developed until the new Runway 14-32 is constructed and earthwork is completed west of the current runway. If the current Runway 14-32 were to be the primary runway at any point in the future, then aircraft would likely have to back-taxi on the runway to access the most northern part of this area and might require closure of Crosswind Runway 5-23 due to the Air Traffic Control Tower (ATCT) line-of-sight (LOS) requirements. Three options were drafted to show how the hangar areas and access road would layout, see **Figure 5-18**. Option 1 was chosen because it offered the best access. For the airport layout plan, only the road access and apron layout was prepared. No building development was detailed but **Figure 5-19** shows an example of how the space could be laid out.

Figure 5-18 - Ultimate North GA Development

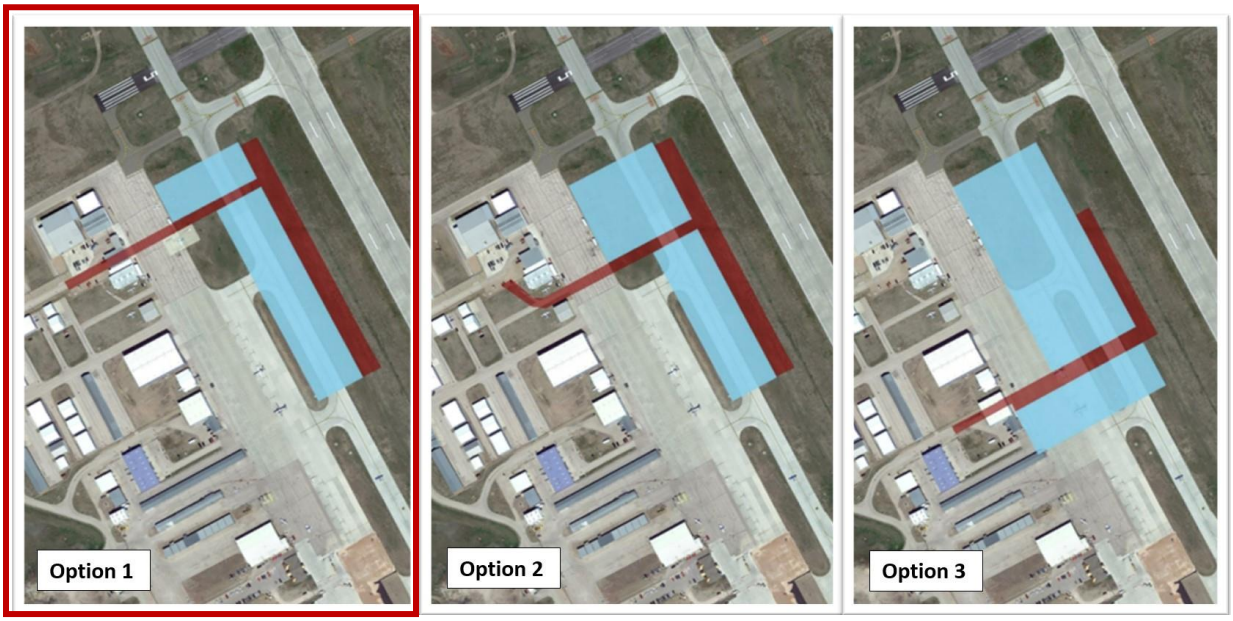
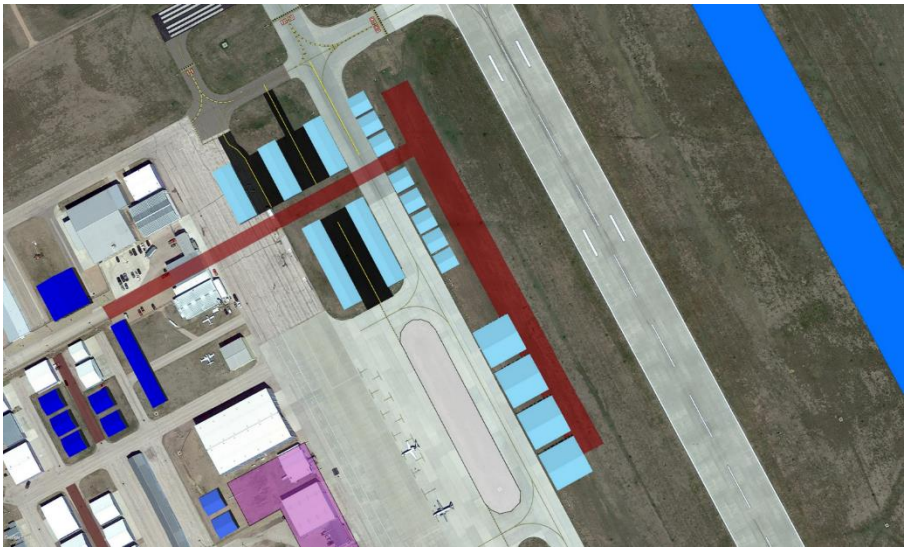


Figure 5-19 - Example of Ultimate North GA Development



ULTIMATE NW CARGO OPTION

With the new Primary Runway 14-32 there will be developable space available north of crosswind runway 5-23. The only options feasible for this area are large corporate hangars or a cargo area. With the earthwork and the infrastructure, an additional cargo area was the reasonable option.

Additional cargo options are presented later in this chapter in the middle GA area and USFS area. Both of those options are more practical from the previous meetings held. This northwest option will still be included for ultimate development if a need were to arise.

SRE/OPERATIONS/MAINTENANCE FACILITIES

Currently airport operations is based out of the Fire Station directly west of the terminal area. It was decided airport operations would best be served if relocated with the maintenance facilities. That being determined, four general areas for snow removal equipment (SRE) storage, airport operations and maintenance facilities were discussed. The front runners were areas 1 and 3. Area 3 was initially chosen as the preferred development area, but after further discussion, it was decided the best use of area 3 would be to keep it flexible for GA expansion if the TSA building was removed in the future. Area 1 was then chosen and subsequently expanded because the intersection of Airport Road and Lacroix Court is being reconfigured to a 90 degree intersection. Of the remaining areas, area 4 was considered best for car rental for the foreseeable future while area 2 could be used for general expansion area. **Figure 5-21** in the Middle GA Development Area section shows the final layout of Area 1.

Approximate Footprint

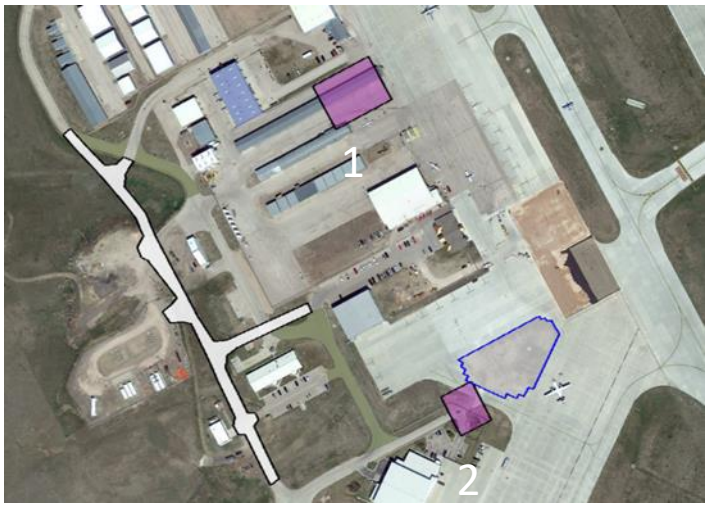
Area 1 – 80,000 sf

Area 2 – 80,000 sf

Area 3 – 65,000 sf

Area 4 – 80,000 sf

FIXED BASED OPERATOR (FBO) OPTIONS



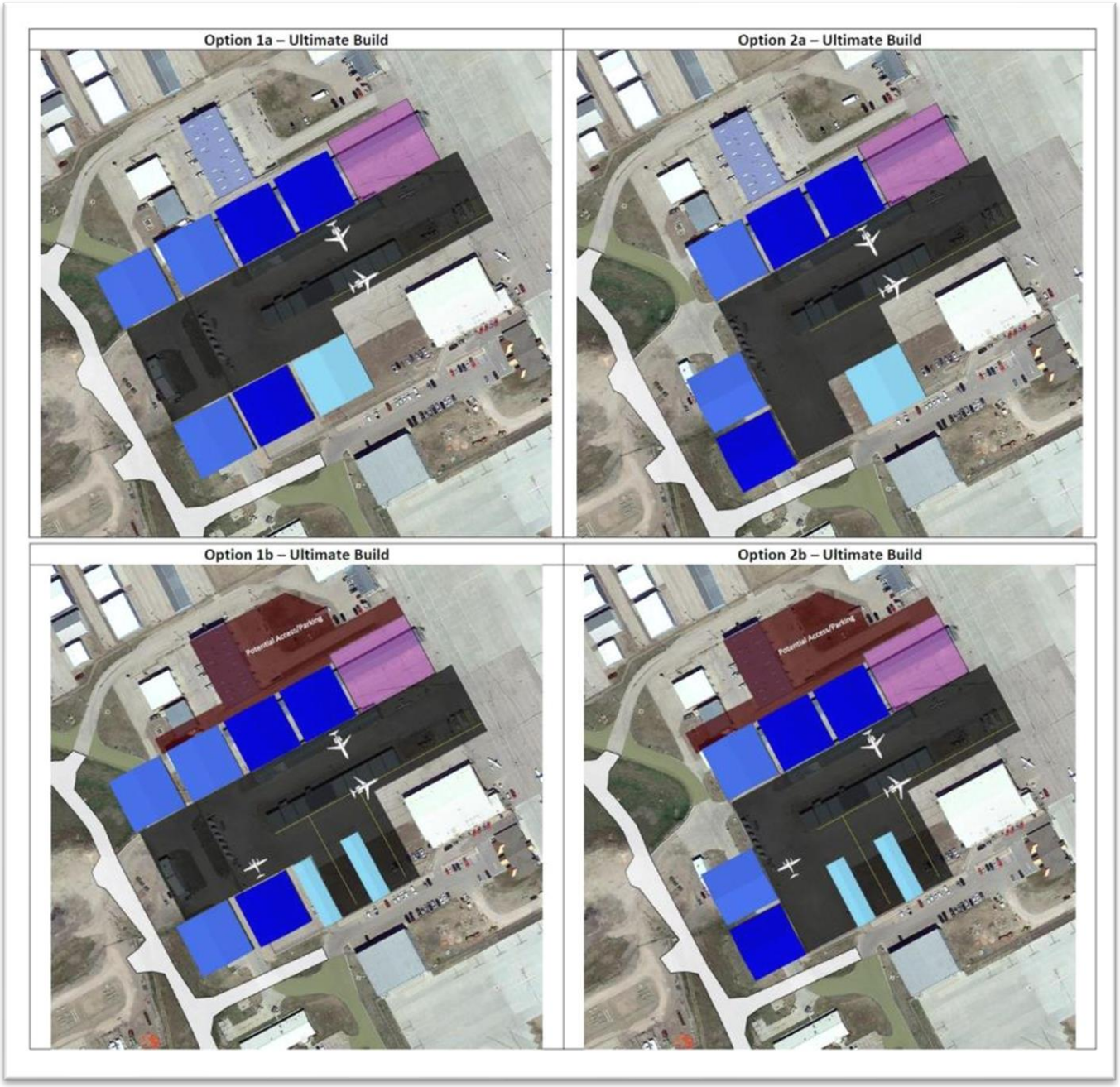
In the planning process it is very important to take into consideration any viable development effort that might reasonably occur at an airport. One of these is in FBO facilities. Considering the number of based aircraft, it is conceivable that a second FBO could choose to locate at RAP. There were two general areas considered for a second FBO facility should the demand warrant a second FBO. The south option, option 2 near the terminal wasn't considered practical given space limitations and lack of access and parking. The north area, Option 1 would eventually be expanded north and adjusted as the "redevelopment" of the GA tiedown area morphed and changed. This area would offer the best place to expand if needed and offered access to the apron area that could be easily identified by transient aircraft. The access and parking for the additional FBO area are already factored into alternatives for the middle GA development area identified in the next section. A phased approach to redevelopment of the area will have to be done to make it work into the future. **Figure 5-21** shows the final layout of this middle GA development area.

MIDDLE GA DEVELOPMENT AREA

This area is between Lacroix Court and Westjet Drive south of the North GA development area and currently has airport maintenance facilities, SRE storage, and one SASO, Black Hills Life Flight. With the three T-hangars between the airport maintenance facility and the Westjet Hangar being removed, and the Airport Road relocation, there is developable space for alternative options. The priority for this area was to look at options for large/corporate hangar development and the associated hangar frontage needs. One of the early decisions was to try and have a "backbone" taxilane that would serve the area with enough apron space in front of hangars to allow business jets to maneuver without encroaching on the Group II taxilane object free area (OFA).

Initially there were four main concepts; Option 1a and 1b had hangars along the north and south side only whereas Option 2a and 2b had hangars located on the west end of the apron as well. See **Figure 5-20** for the original layout options. Option 1a became the preferred of these four options for a cleaner and more efficient layout and further variations were developed and refined. Eventually the northwestern most hangar on Option 1a was replaced with SRE expansion while the southern hangar was shifted north to allow for access road/parking expansion. Considerations for phasing included existing leaseholds and initial access/parking.

Figure – 5-20 - Middle GA Options



Reevaluation of Option 1a allows space for the maintenance facility and SRE storage which will also incorporate the airport operations office with the maintenance facility. Tiedown space and business jet maneuvering was also reevaluated for the final alternative along with reserved space for future FBO options. Westjet lease agreement with the airport and their need for more customer parking was also factored into the new option 1a. Please remember that hangars, SASO and FBO building construction is demand driven. **Figure 5-21** is a layout of the final preferred alternative.

Figure 5-21 - Middle GA Preferred Alternative

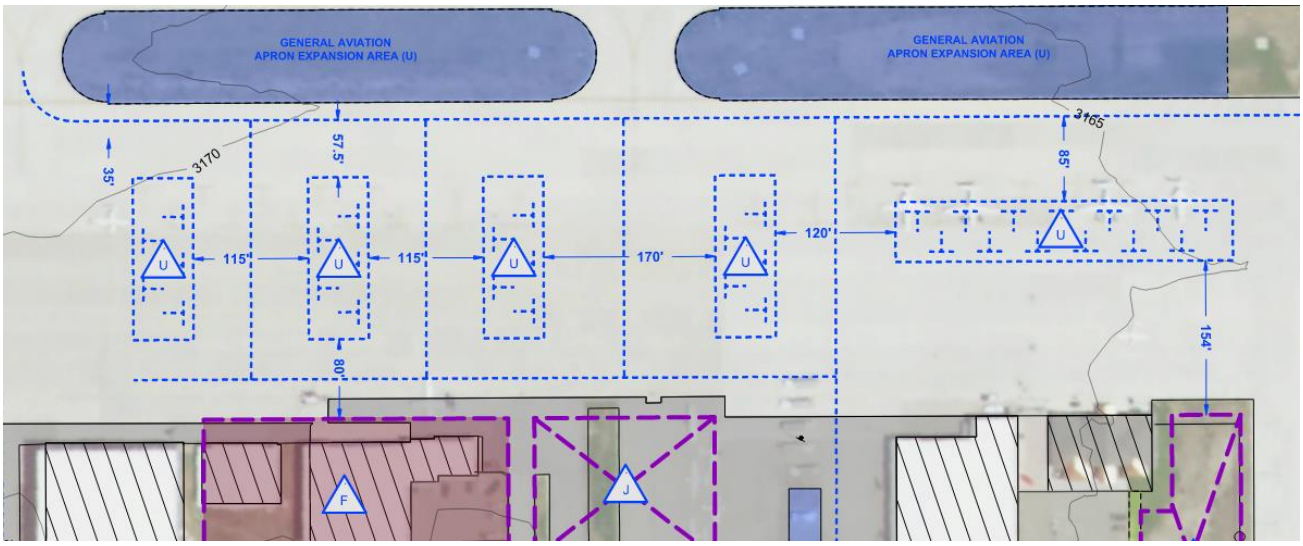
CARGO FACILITIES

Three cargo development area options were identified in the middle GA area to be used for air cargo operations.

Pavement infill would be a component of all three options. Option 3 was considered the preferred near-term option with Option 2 as a place holder for larger cargo expansion or for general aeronautical development so RAP has flexibility to respond if a need should arise. Option 1 was eliminated due to the lack of future expansion. Potential for a larger cargo facility area near future USFS expansion may be another possibility depending on what type of USFS facility expansion is planned.

GA Apron Tiedown Reconfiguration

One of the items considered was reorienting the GA apron tiedowns. It was discovered that the current alignment can lead to less-than-optimal tiedown situations because of predominant winds. Realignment was evaluated to see if additional parking positions could become available or if a more efficient layout would be presented. The preferred reorientation tried to minimize impacts to existing tenants while offering easy maneuvering area for aircraft. The new configuration will leave access for ADG II-III aircraft to a large hangar with apron frontage. Shift of tiedowns east of Westjet was done to provide better apron taxilane clearance for full ADG Group II taxing to the new middle GA development area.



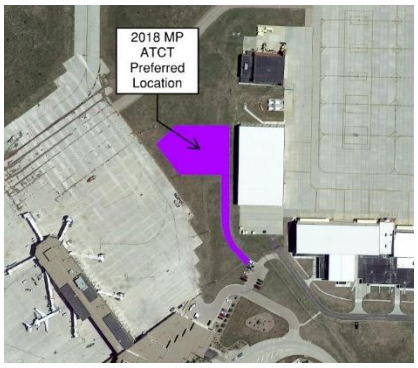
In conclusion for the majority of the General Aviation needs, **Figure 5-22** portrays the preferred alternative for the north and middle GA development areas.

Figure 5-22 - Preferred North/Middle GA Development

South Development Concepts

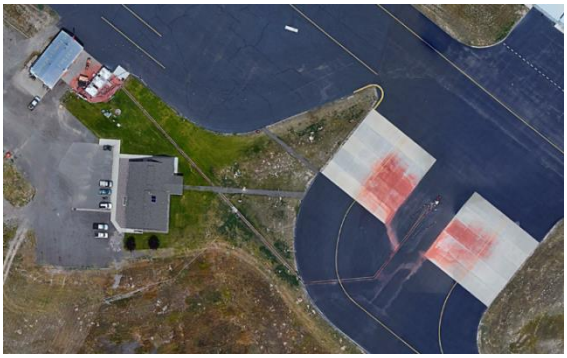
"Southern" more or less implies everything south of the terminal area. This includes, South Dakota Army National Guard, USFS, the air traffic control tower and other space that may be suited to cargo operations.

AIR TRAFFIC CONTROL TOWER (ATCT)



Minimal effort was spent discussing potential tower locations. The initial thought was technology such as remote towers or cameras will help improve some shortcomings of the existing tower regarding the line-of-sight issue (LOS) and the age of the tower. The preferred future tower from the prior MP was placed between the current terminal apron and South Dakota Air National Guard apron. This is no longer possible due to the proposed terminal and terminal apron expansion. The preferred area for a future tower would be located to the east when the new runway is constructed which should allow for better viewing angles. The current space the ATCT sits will be preserved for expansion or redevelopment. The next MP may take a harder look at options on the other side of the primary runway, but without infrastructure it is not feasible/practical at the moment. See **Figure 5-23** for possible ATCT expansion area.

UNITED STATES FOREST SERVICE (USFS)



Missoula International Airport (MSO)

The USFS Tanker Base could expand as they see fit and their lease footprint would increase correspondingly. The State of South Dakota is interested in funding USFS expansion. It is currently unknown how much funding could be available for expansion and/or improvements of the current Tanker facility. Ideally, a concept was developed that portrayed the minimum apron footprint for a RAP USFS Tanker Based to be able to handle most of the larger tankers including the DC-10 which Missoula International Airport (MSO) Tanker Base was used to layout the alternative for the apron at RAP. **Figure 5-23** shows the new layout and how it would phase out the existing USFS loop while maintaining the current Tank facility and allow multiple tankers to use the space at once. This option would also add a new access road, additional parking and space that could be reserved for future aeronautical use. An additional apron was added to the west to show how the larger apron could allow for air cargo in the same area if demand warrants. This will be discussed in the following section. I

SOUTH CARGO

As briefly mentioned in the USFS section, cargo facilities could also make use of the infrastructure development in the USFS area. The cargo apron expansion was developed to support ATRs and Beechcraft 1900s and possibly larger aircraft depending on apron availability. Because of terrain constraints a cargo apron would not be possible further south or west of the proposed option. The expansion of cargo on the south side of the airport also offers space for storage hangars or buildings stretching across the west side of the potential cargo apron. See **Figure 5-23** for more details.

Figure 5-23 - Preferred South Development Area

Support Facility & Non-Aeronautical Alternatives

DEICING APRON

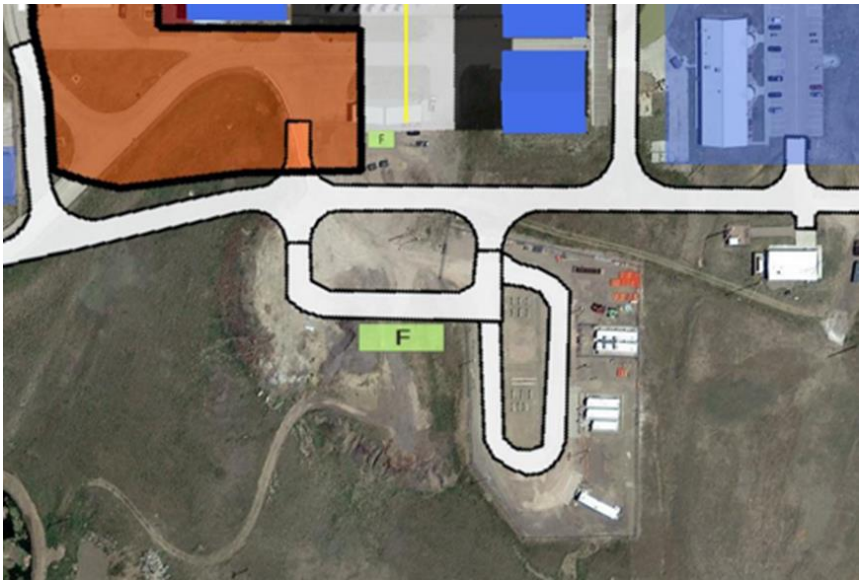
After the future concourse configuration was determined, deicing operations were evaluated with potential RON parking, if necessary. The area shown offers two aircraft deicing positions bordered by red areas for deicing vehicle staging. This also offers enough room for aircraft to taxi by while other aircraft are being deiced.

There is also potential to shift the Deicing apron further south since it has been indicated apron infill near Fugro could occur and the Fugro lease may move west by the orange line.

GROUND SERVICE EQUIPMENT (GSE) STORAGE

With the expansion of the concourse, more open and garaged areas under the concourse will be available for GSE storage. In addition, there will be areas created with the departure area expansion. Taller equipment, like deicing trucks can be staged near the terminal or near the airport's SRE area when not in use during the off season.

FUELING



General guidance was provided on what type of fuel farm reconfiguration makes sense for RAP and a concept was developed. The concept includes a new loop that would take equipment to fuel dispensers. This also includes a dispenser on the east side of the road that could be fed by a fuel line from the fuel farm. The new fueling position, east of the road, will allow operations and maintenance staff to fuel equipment without having to leave the airside.

Internal Perimeter Road

An internal perimeter road provides secure airside access for authorized vehicles and minimize the need to cross active runways and taxiways. The current perimeter road is paved for a small portion around the Rapid City airport. The remaining portions are a mixture of all weather and trail. It is recommended that the airport continue to add material to create all weather roads around the perimeter and have the roads paved when they are within 400 feet of connecting with any airfield pavement. The plan is also to minimize the number of connections from the perimeter road to aircraft movement areas in order to dissuade the use of aircraft movement areas to get to and from perimeter roads.

Airport Utilities

The location and type of airport utilities for facility development will be considered at the time of facility development. Development must consider the location and capacity of water main lines to assure sufficient fire protection is in place. The existing water system and city building codes will have an effect on the types of construction for buildings at the airport.

The sanitary sewer facility for the airport currently is a lagoon system. Connection to the City of Rapid City's water reclamation facility should be included in the airport's long-term plans and coordinated with the City.

Summary

The recommended development identified in this chapter includes the following (see **Figure 5-24**):

Airfield

- Construct 8,700' x 150' Runway 14-32 550' east of current Runway 14-32 (9,300' is preserved depending on the threshold placement of the Runway 14 end) Implement a ½ mile approach for both runway ends

Terminal

- Extend terminal gates to the northeast by 200' adding hold room/concessions space and three boarding gates. Total gates will be 10 with 11 parking positions.
- Continue terminal extension an additional 150' adding hold room/concessions space and two boarding gates. Total gates will be 12 with 13 parking positions.
- Add a new arrivals corridor to allow space for a third security screening lane.
- Add third security screening lane to meet current and future passenger volume.
- Update the pre-security concessions to offer table, bar, and grab-and-go options.
- New arrivals corridor impacts security and allows administration offices to expand space to six offices, expanded kitchen area, conference and support spaces and a large board room.
- Implement a consolidated in-line baggage screening area incorporating required TSA screening equipment and space for a third screening device and oversized baggage screening.
- Add new ticket counters and scales and preserve space for future ticket expansion.
- Relocate rental car desks in a linear alignment across from baggage claim.
- Add a T-shape baggage claim device to have a total of 3 baggage belts.

Landside Facilities

- Preserve space for a small hotel.
- Develop parking garage into the hillside to provide covered parking and additional space for rental cars.
- Evaluate the need for an additional Inner Curbside lane midway through the planning period to allow for double-parking lanes at the curb.
- Develop area directly southeast of the terminal for employee parking and preserving space southwest of current parking lot for additional public parking.

North GA Development

- Preserve space for new box hangars around current hangars.
- Once new runway is constructed preserve apron space to the east for additional apron space, aircraft storage and roadside access.
- Once new runway is constructed preserve area north of Runway 5-23 for aeronautical development such as cargo operations with roadside access from Long View Road.

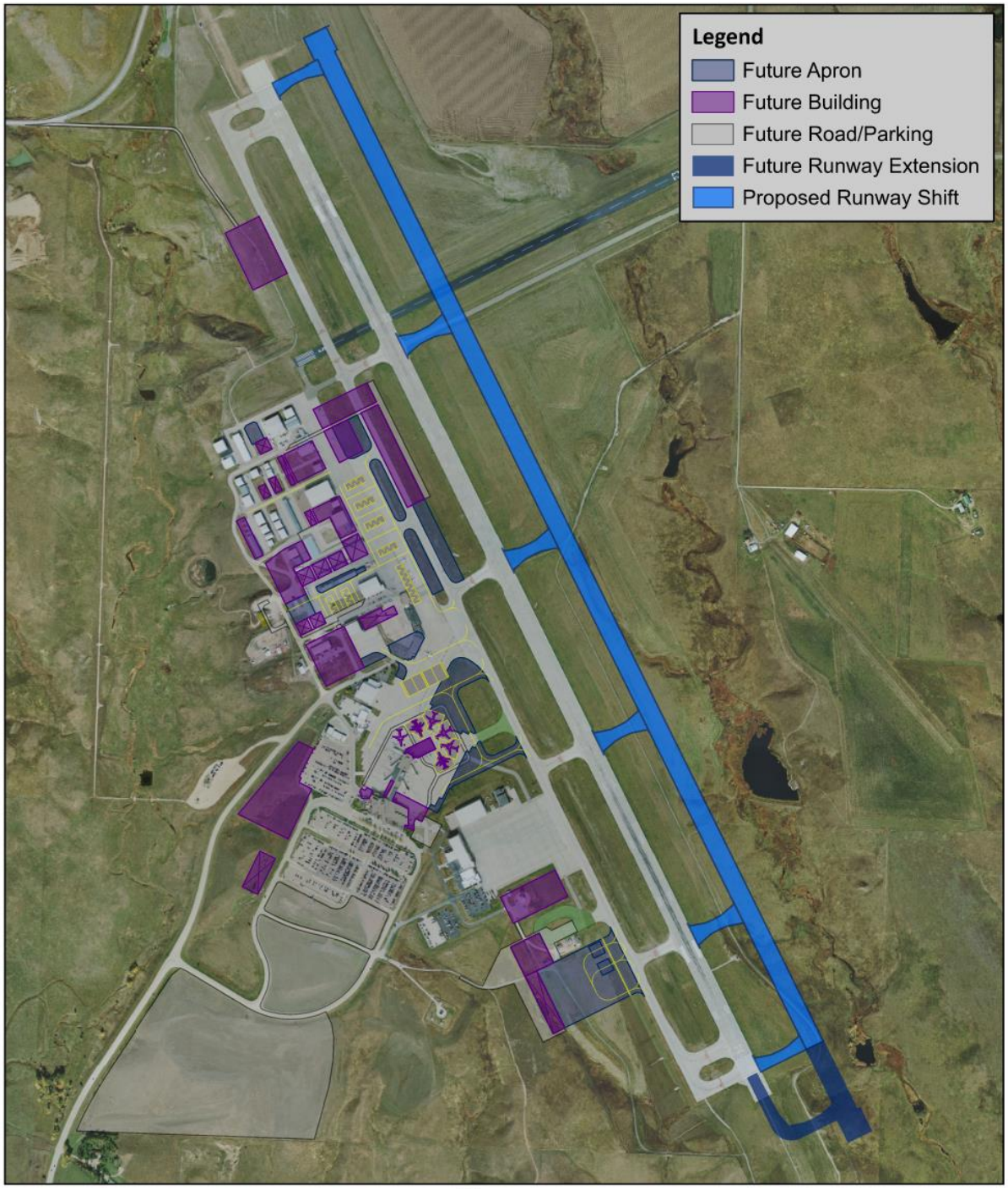
Middle GA Development

- Replace existing Airport Maintenance facilities with Airport Operations/Maintenance/SRE facility in the existing area.
- Preserve space on the main apron accessible by Lacroix Ct. for future aeronautical development.
- Between Lacroix Ct. and Westjet Drive. Preserve space for large hangars with access to the apron from a Group II taxilane.
- Add apron space west of Plane Training for tiedown spots.
- Build additional parking and roadside access from Lacroix Ct. for the future maintenance/operations building and aeronautical development.
- Expand FBO parking lot to add more parking spaces.
- Provide space for cargo hangars and storage on current cargo ramp.
- Reconfigure tiedown areas to align into the wind and accommodate ADG I and II aircraft.

South Development

- Preserve space around current ATCT for future ATCT expansion/development.
- Provide space for new USFS apron to handle multiple larger air tankers using the current USFS loading facility.
- Preserve space for a potential cargo apron with hangars/storage.
- Reconfigure access road for the area.

Figure 5-24 – Preferred Development



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 Rapid City Regional Airport (RAP) over the planning period can be formulated. This chapter includes the following sections:

- Project Sequence
- Financial
- Environmental Review
- Compatibility

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.

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 facility implementation and financial feasibility plan is identified for the near-term (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 2021 dollars. Final project costs are subject to change based on actual construction and project formulation needs.

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

Projects

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

Table 6-1 - Major Projects

Project	Scope	Estimated Cost (millions)
Terminal – Ticketing/Baggage Screening	Reconfigure and expand ticketing and baggage screening areas to allow the relocation of baggage screening to a new 'in-line' system.	$25.0
Terminal - Concourse	Addition of four gates to the concourse. The addition will include associated hold room areas, concessions and support areas.	$31.0
Terminal – Arrival Corridor	Addition to the concourse to create a new arrival corridor. The work will allow the expansion of the security checkpoint into the existing arrivals corridor.	$10.0
Terminal Apron	Expand and rehabilitate the terminal apron to accommodate additional gates, two deicing stands and overnight parking positions.	$42.0
Runway 14-32	Replace existing Runway 14-32 with a new 8,700' x 150' runway east of the existing runway. Existing Runway 14-32 will later be rebuilt as a 'super-taxiway' that can be used as a runway when the primary runway needs major repair.	$75.0

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 discussed in more detail for realistic project sequencing based on identified needs, airport priorities and available funding. Financial feasibility is a major consideration in developing the implementation plan and Capital Improvement Plan (CIP).

Airport 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 B – Commercial Airports 101 (Airport Funding)**. A realistic project implementation plan must consider financial resources. The financing strategy for the Rapid City Regional Airport provides sufficient federal, state, and local funding for future airport improvements. Projected funding sources are based on existing legislation.

Federal Funding

Federal Airport Improvement Program (AIP) funding provides financing for most of the improvements proposed at the Rapid City Regional Airport. While maximizing the projected entitlement funding available to Rapid City ($2,200,000/year), these entitlements will only finance a portion of the proposed improvements through the 20-year period. Entitlements will be used to fund AIP-eligible projects, particularly critical maintenance, safety, and capacity enhancements. Discretionary funding is anticipated to fund a large portion of the cost of airport improvement projects through the planning period.

COVID-19 Funding for Airports

During the Coronavirus Disease Pandemic (COVID-19), the United States enacted three pieces of economic assistance to U.S. airports through 2020 and 2021. These funds were to be used to prevent, prepare for, and respond to COVID-19.

The first, the Coronavirus Aid, Relief, and Economic Security (CARES) Act was signed on March 27, 2020, for $2.3 trillion dedicated towards combatting the effects of COVID-19. Of this, $10 billion were to keep airports in operation to serve the industry, traveling public and to support the economy, along with keeping airports credited ratings stable, and to keep airport and aviation workers employed. These funds could be used for any purpose for which airport revenues may be lawfully used.

On December 27, 2020, the Coronavirus Response and Relief Supplemental Appropriation Act (CRRSAA) was the second law signed including $900 billion in supplemental appropriation for COVID-19 relief. The FAA established the Airport Coronavirus Response Grant Program (ACRGP) which was $2 billion of the act.

Then, the American Rescue Plan Act of 2021 was signed into law on March 11, 2021, which included $1.9 trillion to address the ongoing health crisis and spur a strong economic recovery. The FAA established Airport Rescue Grants which is $8 billion of those funds.

The Rapid City Regional Airport was granted $9,282,023 under the CARES Act as a non-hub primary airport. $2,752,399 was granted from the ACRGP also as a non-hub primary, $74,886 of that was for concession and airport administration relief. Then, a total of $4,545,716 was granted from the Airport Rescue Grants as a non-hub primary. Of the Rescue Grant, $234,936 was for small business concession relief and $58,734 for large business concession relief.

In addition to the AIP funding, on November 6, 2021, the Bipartisan Infrastructure Law (BIL) was passed for a five year infrastructure improvement effort. This included $ 1 trillion for improvements to highways, bridges, roads, passenger and freight rail, airports, water and wastewater treatment, internet access and modernizing the electric grid. The FAA awarded the $25 billion received from the law to 3,075 airports and divided it into three grant groups and to be allocated over five years:

1. $5 billion for airport terminals to replace aging terminals, increase energy efficiency and accessibility.
2. $5 billion for air traffic facilities to update and upgrade equipment to improve safety, security and environmental standards and replace necessary facilities.
3. $15 billion for airport infrastructure for projects as defined under the existing Airport Improvement Grant and Passenger Facility Charge criteria including runways, taxiways, safety and sustainability projects, terminal, airport-transit, and roadway.

Rapid City has been allocated $2,784,809 from BIL for the airport for 2022 and is expected to have a similar allocation each year over the five-year term of BIL. In addition, Rapid City will be eligible to receive additional funds from BIL using the different grant categories.

State Funding

State funding will primarily be used to provide a match for Federal AIP funding. This is expected to be based on a 3.5% match from the State. Rapid City 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 Rapid City Regional Airport.

Local Funding

A local match will be needed for the AIP funded projects. This requirement will be at least 6.5% of the project cost but could vary depending on project eligibility and the structure of the State and Federal funding programs. The Rapid City Regional Airport has a slate of projects planned and should consider a few options to increase the local funding for annual operations as well as project funding.

Passenger Facility Charge

The Aviation Safety and Capacity Expansion Act of 1990 authorized the Secretary of Transportation to grant public agencies the authority to impose a Passenger Facility Charge (PFC) to fund eligible airport projects. The current cap on PFC is $4.50 per revenue passenger. Rapid City imposes at $4.50 PFC on passengers and the revenue is currently dedicated to the payment of debt for various airport projects through 2035.

Customer Facility Charge

A customer facility charge (CFC) is in place at Rapid City for on-airport rental car agencies. The funds are collected by the rental car agency from their customers and then paid to the airport. The majority of these funds were recently used to pay the debt service on the Quick Turn Car Rental Facility completed in 2014. The funds can be used for any other capital project related to the Rental Car facilities such as parking or building improvements.

Leases for Aeronautical Uses

One primary means that an airport has to produce income to cover annual expenses and project matches is through property leases. Airports have found that a review of current leasing practices can assure the maximum income is derived considering the market conditions of a specific airport.

Leasing for Non-Aeronautical Uses

The only other significant asset that the airport has is land that is needed to protect the airport but may not be necessarily suitable for aeronautical uses. Airports allow various agricultural activity through leases and can also look at retail and commercial leasing if the market conditions exist.

Environmental Review

Introduction

FAA AC 150/5070-6B, *Airport Master Plans* identifies a planning-level environmental review as one of the elements of effective planning. The purpose behind this element of the airport master planning process is to help the airport sponsor thoroughly evaluate environmental impacts of airport development alternatives, and to provide information for subsequent environmental processing. Key environmental considerations for future development at RAP 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 environmental review is to provide community, airport sponsor, and regulatory awareness of the importance of minimizing the environmental impacts to this airport improvement area and to provide a general indication of the likely need for further investigation. Appropriate environmental documentation in accordance with FAA Order 5050.4B, *NEPA Instructions for Airport Actions* and FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures* is required to be completed prior to commencing with project actions.

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.

Environmental Categories

Descriptions of potential impacts associated with the proposed Master Plan improvements are discussed by the impact categories identified in FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*. Additional consultation regarding the improvement area would be warranted in the future during the environmental review phase of the project action.

Impact categories that will remain potentially unaffected by the proposed airport improvements identified in this study include:

- **Air Quality** – The improvements identified are not anticipated to effect air quality.
- **Climate** - The improvements identified are not anticipated to affect the climate.
- **Coastal Resources –** The airport is not located in a coastal environment.
- **Natural Resources and Energy Supply** – The proposed airport improvements would not affect any natural resources and energy supply.
- **Visual Impacts** – Visual impacts to adjacent properties from proposed airport activities are not expected.
- **Wild and Scenic Rivers** – There are no wild and scenic river designations near the Airport.

The categories identified below have the potential to be affected by the airport improvements identified in this study.

BIOTIC RESOURCES

As identified in **Chapter 2: Facility & Environmental Inventory**, three threatened or endangered species and no critical habitat have been identified for Rapid City Regional Airport. Due to the potential for some of these threatened or endangered species to be located on or near the Airport, biological resources will be reviewed for each proposed activity. An example of an activity that could affect biological resources is tree removal, a common construction practice on many projects. However, based on aerial imagery no trees appear to be located on the Airport. It's anticipated that impacts to biological resources will not be significant.

FARMLANDS

The Farmland Protection Policy Ace (FPPA) defines prime farmland as land that has the best combination of physical and chemical characteristic 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. NRCS Form AD-1006, Farmland Conversion Impact Rating, would need to be completed for any land being purchased. A search of the USDA Natural Resources Conservation Service (NRCS) web soil survey shows that land surrounding the airport property contains some areas classified as prime farmland if drained. Therefore, further review is required for projects involving land acquisition.

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. The proposed developments at Rapid City Regional Airport are not located within a 100-year floodplain; therefore, no further analysis is required.

HAZARDOUS MATERIALS, SOLID WASTE, AND POLLUTION PREVENTION

There are no proposed activities that would require hazardous materials, solid waste, and pollution prevention to be addressed, provided that all construction activities would meet stormwater pollution prevention plan and MPCA requirements. 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.

HISTORIC AND CULTURAL FEATURES

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 State Historical Preservation Offices (SHPO) and tribal members is necessary for projects involving land disturbance. A Level III Cultural Resources Inventory with Tribal Review was performed Fall 2019 and traditional cultural properties were identified within the study area and coordination with the tribes is ongoing.

Any buildings affected that have potential to be listed in the National Register of Historic Places (NRHP) would require coordination with SHPO. Projects involving ground surface disturbance would require a determination of affect to historic property to be obtained from the SHPO. Structures more than 50 years old are eligible for inclusion on the NRHP and further review is required to determine if these structures have significant historical, cultural, or architectural characteristics.

LAND USE

Rapid City Regional Airport is surrounded by evergreen forest and low-density rural development. Compatible land use is typically 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. See **Chapter 2: Facility & Environmental Inventory** on wildlife hazards.

NOISE

Effects from noise during construction and use of the airport is another resource that may need to be addressed as needed depending on the proposed action. FAA does not require a noise analysis at airports whose forecasted operations do not exceed 90,000 annual propeller operations or 700 annual jet operations. These operations normally result in a cumulative noise exposure to be less than a 65 decibel Day-Night Level (DNL) identified as a critical threshold by FAA to take actions to mitigate sound exposure. Current airport operations at RAP are above this threshold, therefore projects will need to be

reviewed to determine if they have the potential to increase operational numbers or change flight patterns around the Airport. Further review is required.

DEPARTMENT OF TRANSPORTATION-SECTION 4(F) & SECTION 6(F) PROPERTIES

Section 4(f) applies only to those portions of a multiple-use public property that is designated by statute or identified in an official management plan as being primarily for public park, recreation, or wildlife and waterfowl refuge purposes and are determined to be significant for such use. As noted earlier, further coordination is needed to determine if Historic properties will be impacted.

No grants have been used to fund projects near Rapid City Regional Airport; therefore, no further analysis of Section 6(f) is required. See **Chapter 2: Facility & Environmental Inventory** for more details.

SOCIOECONOMIC IMPACTS, ENVIRONMENTAL JUSTICE & CHILDREN' S ENVIRONMENTAL HEALTH & 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 effect 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 including acquisition of land use and airspace avigation easements and potential future obstruction mitigation. Further analysis is required.

WATER RESOURCES – SURFACE AND GROUND WATERS

Airport activities can affect water quality mainly due to stormwater runoff from paved areas. Providing treatment for stormwater runoff from runway, taxiway and apron areas using best management practices and grassed swale areas would minimize potential impacts to water quality. Drainage at the Airport generally flows into ditches that flow south towards Rapid Creek after leaving the airport.

A General Permit for Storm Water Discharges Associated with Construction Activities may be required from the SD Department of Agriculture and Natural Resources (DANR) 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 DANR is needed for airport development projects.

WATER RESOURCES - WETLANDS

There are wetlands in the National Wetland Inventory (NWI) located near the Airport property and wetlands were delineated on the west side of the airport as part of a project that occurred concurrent with this Master Plan. In addition to maintaining water quality in rivers and recharging groundwater among other positive benefits, wetlands have the potential to attract wildlife that can be hazardous to aircraft using the Airport.

All wetlands would require delineation to clearly identify their boundaries. Projects with wetland impacts greater than one half acre of wetlands requires a U.S. Army Corps of Engineers (USACE) general

permit. A wetland delineation and coordination with applicable resource agencies would 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.

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 potential 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
Terminal – Ticketing/Baggage Screening	CATEX
Terminal – Concourse	CATEX
Terminal – Arrival Corridor	CATEX
Terminal Apron	CATEX
Runway 14-32	Environmental Assessment*

*Source: KLJ Analysis; * Aquatic Resource Delineation will be included*

Environmental Impact Summary

The Environmental Review Summary identified in **Table 6-9** 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 6-9 – 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	No
Hazardous Materials, Pollution Prevention, and Solid Waste	Yes
Historical and Cultural Resources	Yes
Land Use	Yes
Natural Resources and Energy Supply	No
Noise	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

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 for 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 not place undue restrictions 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 Federally (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 Rapid City Regional 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 Airport, City of Rapid City, City of Box Elder, and Pennington County.

Roles and Responsibilities

AIRPORT SPONSOR

As the airport sponsor, the City of Rapid City, applies and receives federal grants. These federal grants require the city to develop and maintain the airport so it is 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. FAA has published Order 5190.6B *Airport Compliance Manual* to assist FAA personnel and airport sponsors to maintain compliance with grant and land obligations. 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 Rapid City Regional Airport is the responsibility of the airport sponsor.

FEDERAL AVIATION ADMINISTRATION

The FAA can provide guidance and funding to promote compatible land development around airports; however, it has no regulatory authority for controlling land uses. State and local governments are responsible for land use planning, zoning, and regulations. The FAA develops grant assurances to protect federal investments in airports but are the responsibility of the airport sponsor to maintain.

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 Rapid City Regional Airport, surrounding jurisdictions affected by the airport includes the City of Rapid City, City of Box Elder, and Pennington County.

Land Use Compatibility Elements

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

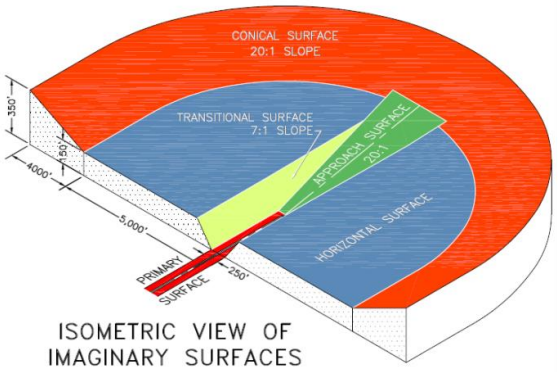
- Airspace
- Safety
- Noise
- Compliance

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. South Dakota state law requiring airport zoning and other regulations be consistent with the Airport Layout Plan.

Recommendations

Recommendations to maintain airspace compatibility at RAP include:

- Consider provisions in building codes to require FAA Form 7460-1 *Notice of Proposed Construction or Alterations* 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 the 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 safety element primarily associated with compatible land use is focused on minimizing risks to persons and property on the ground.

FAA Runway Protection Zones

To reduce the public safety risk associated with aircraft operations, communities typically use FAA airport design standards and safety compatibility guidelines developed by state aeronautical agencies to formulate safety policies. The safety element primarily associated with compatible land use is focused on minimizing risks to the flying public, as well as persons and property on the ground. FAA has defined minimum land use standards in the form of a Runway Protection Zone (RPZ) in FAA AC 150/5300-13A *Airport Design*. See **Chapter 4: Facility Requirements** for definitions. Existing RPZs are either owned in fee or by avigation easement. There are no incompatible land uses inside the existing RPZs at Rapid City. For future RPZs it is recommended that the City acquire necessary property interest to insure no incompatible land uses.

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. The airport has an existing deer-proof perimeter fence and it is recommended to maintain that fence and extend it to encompass any new airfield improvements.

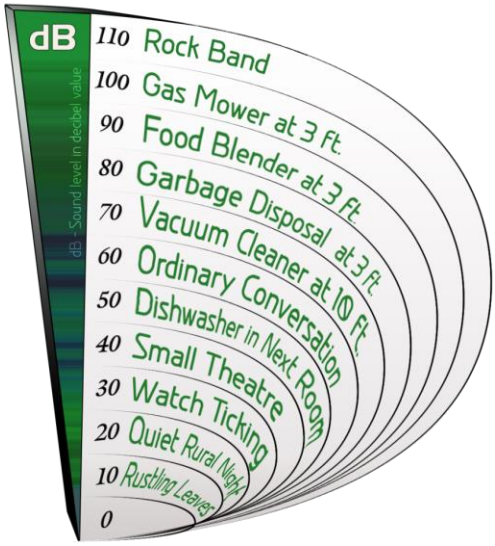
Recommendations

It is recommended that RAP maintain the existing wildlife fence.

NOISE

The noise element is focused on minimizing the number of people exposed to high frequency and event levels of aircraft noise. Noise emitted from aircraft can affect the well-being of persons living or working near an airport. While there are several effects of aircraft noise upon people, the most common is annoyance. Annoyance can be defined as the overall adverse reaction of people to noise. Other effects of aircraft noise include sleep disturbance and speech interference. Noise affects everyone differently.

Noise analysis for airports is conducted using FAA's Aviation Environmental Design Tool (AEDT). FAA has determined that a cumulative noise exposure of individuals to noise resulting from aviation activities must be established in terms of Yearly Day Night Average Sound Level (DNL).



COMMON SOUNDS AND THEIR ASSOCIATED DECIBEL LEVELS

No noise analysis is needed for Airplane Design Group I or II airplanes if operations do not exceed 90,000 annual propeller-driven or 700 annual jet aircraft. The FAA has established significant noise impact thresholds for DNL 60 or 65 dB over a noise sensitive area (e.g. residences, schools, hospitals, parks, recreation areas) for airport projects.

The proposed annual jet aircraft operations exceed 700 operations annually in Design Group II aircraft, therefore noise impacts should be evaluated in future environmental review documents for project that have the potential to increase operations or change flight patterns at RAP.

COMPLIANCE

As noted before, 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.

Land Releases

When requested, the FAA will consider a release, modification, reform, or amendment of any airport agreement to the extent that such action has the potential to protect, advance, or benefit the public interest in civil aviation. Such action may involve only relief from specific limitations or covenants of an agreement, or it may involve a complete and total release that authorizes subsequent disposal of federally obligated airport property. Common types of release requests include concurrent use, request for change in use or the sale/disposal of airport property. No land has been released from federal obligations or sold at RAP.

Through-the-fence Operations

Agreements that permit access to the airfield by aircraft based on land adjacent to, but not a part of, the airport property are commonly referred to as a “through-the-fence'' operation (even though a perimeter fence may not be visible). “Through-the-fence” arrangements can encumber the airport property and reduce an airport’s ability to meet its federal obligations. There are no documented through-the-fence operations at RAP.

Action Plan & Recommendations

Recommendations to address airport compliance at RAP include:

- Identify encumbrances and non-aeronautical land uses in the Airport Layout Plan and Exhibit “A”/Airport Property Map to ensure sufficient control by the airport.
- Continue to control development that occurs on airport and consult with FAA as needed to verify compliance with FAA rules and regulations.

CHAPTER 7: AIRPORT LAYOUT PLAN

Background and Purpose

This Chapter presents the Airport Layout Plan (ALP) and associated drawings for the Rapid City Regional Airport (RAP). 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)

These drawings will be submitted to the FAA and SDDOT Office of Aeronautics Services 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 airports 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 RAP ALP (2018). RAP ALP drawings in this planning study include:

- Sheet A-1: Title Sheet
- Sheet A-2: Airport Data Sheet
- Sheet A-3: Airport Layout Plan (Existing)

- Sheet A-4: Airport Layout Plan (Ultimate)
- Sheet A-5: North General Aviation Area (Existing)
- Sheet A-6: North General Aviation Area (Ultimate)
- Sheet A-7: Terminal Area (Existing)
- Sheet A-8: Terminal Area (Ultimate)
- Sheet A-9: South Aviation Area (Existing & Ultimate)
- Sheet A-10: Inner Approach Surface – Runway 14 End (Existing)
- Sheet A-11: Inner Approach Surface – Runway 14-32 Northwest (Existing)
- Sheet A-12: Inner Approach Surface – Runway 14-32 Southeast (Existing)
- Sheet A-13: Inner Approach Surface – Runway 32 End (Existing)
- Sheet A-14: Inner Approach Surface – Runway 14 End (Ultimate)
- Sheet A-15: Inner Approach Surface – Runway 14-32 Northwest (Ultimate)
- Sheet A-16: Inner Approach Surface – Runway 14-32 Southeast (Ultimate)
- Sheet A-17: Inner Approach Surface – Runway 32 End (Ultimate)
- Sheet A-18: Inner Approach Surface – Runway 5 End (Existing & Ultimate)
- Sheet A-19: Inner Approach Surface – Runway 23 End (Existing & Ultimate)
- Sheet A-20: Part 77 Airspace (Existing)
- Sheet A-21: Extended Part 77 Airspace – 14 End (Existing)
- Sheet A-22: Part 77 Airspace (Ultimate)
- Sheet A-23: Extended Part 77 Airspace – 14 End (Ultimate)
- Sheet A-24: Extended Part 77 Airspace – 32 End (Ultimate)
- Sheet A-25: Departure Surface (Existing & Ultimate)
- Sheet A-26: Land Use Plan
- Sheet A-27: Airport Property Map

Sheet A-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. The title sheet also includes the airport wind coverage tables and wind roses for space purposes. The title sheet is similar to the 2018 RAP ALP.

Sheet A-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 several development phases. These include existing (E), future (F), and ultimate (U). These have been identified to better match with the development sequence identified in the Master Plan. A description of the features is included in the Airport Layout Drawing discussion. There are not FAA Modifications to Airport Design Standards for RAP.

Sheets A-3 & A-4: Airport Layout Drawings

The Airport Layout Drawing is a graphical depiction of the airport facilities and design standards. Existing conditions and future development phases are distinguished. RAP development will be completed with

incremental steps as identified through Chapter 6: Implementation & Compatibility, but the airfield is shown as if all development is completed in the Ultimate sheet.

The ALP sheet depicts the existing Runway 14-32 and the ultimate Runway 14-32 to be positioned 550 feet parallel to the east of the existing.

Sheets A-5 through A-8: Terminal Area Plans

The Terminal Area Plan sheets provide a large-scale view of areas with significant terminal facility development in the north, passenger terminal and south areas, so that features such as aprons, buildings, hangars, and parking lots are easily discernable. Dimensions are included to clearly depict clearance from objects.

Sheets A-9, A-10 & A-11: Airport Airspace Drawings

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 primary surface for Runway 14-32 will remain at 1,00 feet wide for a precision approach runway. The width of the Runway 5-23 primary surface remains at 500 feet for a non-precision approach 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 ultimately planned approach surfaces at the Airport reflect a non-precision instrument approach (3/4 mile) for Runway 14, and a precision instrument approach (1/2 mile) to Runway 32. The approach surface to Runway 14 has an inner width of 1,000 feet, extends outward 10,000 feet to an outer width of 4,000 feet, and rises at a slope of 34:1. The precision approach surface to Runway 32 has an inner width of 1,000 feet, extends outward 50,000 feet to an outer width of 16,000 feet, and rises at a slope of 50:1 (40:1 beyond 10,000 feet).

The approach surface to Runway 5-23 will remain non-precision utility, with an inner approach surface width of 500 feet, extending outward 5,000 feet to an outer width of 2,000 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 an elevation 150 feet above the established airport elevation (3,203.5' MSL). 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 3,553.5' MSL.

The obstacle data is based on an aeronautical survey performed in 2014 and 2015 as part of the 2018 ALP. Airspace surface obstructions with actions recommended are listed on the applicable sheet.

The Runway 14-32 Part 77 airspace surfaces now recognize the ultimate Runway 14-32 position and the Runway 5-23 Part 77 surfaces have not changed from the 2018 RAP ALP.

Sheet A-12: Runway Departure Surface Drawing

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 all existing, future, and ultimate runway end locations for Runway 14-32 and Runway 5-23.

In general, no new vertical development penetrating the FAA departure surface is allowed. Departure Surface obstructions are noted with actions recommended on the applicable sheet.

Sheets A3 through A-21: 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.

The obstacle data is based on an aeronautical survey performed in 2014 and 2015 as part of the 2018 ALP. This ALP includes the new Runway 14-32 so the ultimate sheets for Runway 14-32 are shown separately from the existing sheets.

Any obstructions found in safety surfaces are noted in the applicable sheet including penetration, future disposition and triggering event.

Sheet A-22: 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

The City of Rapid City and Pennington County control the land uses around the Airport. An airport safety ordinance was adopted in 2014 to help control surrounding land use and airspace. Airport land use compatibility is a significant consideration in the airport development plan. Significant land use considerations within the airport environs include a mobile home park, natural gas pipeline, snowmobile trail and surrounding roadways. The FAA land use sheet depicts the on- and off-airport land uses as well as the existing, future, and ultimate FAA Runway Protection Zones.

Sheets A-23: Airport Property Map

This sheet serves as an Airport Property Map and does not meet the requirements of Exhibit 'A' as defined by FAA SOP 3.0 Exhibit A Property Map. The Property Map is a snapshot of the inventory of parcels that make up dedicated airport property. The map provides boundary information and detailed information is provided on airport property interests, released, or sold property. All land shown on the map constitutes the airport property federally obligated for compliance. The airport property map also depicts property to be acquired to support the future and ultimate development of the airport.

The existing Airport encompasses 1,720 acres owned in fee and 5 acres of property controlled through clear zone easements. It is currently proposed that an additional xx acres are needed to accommodate the ultimate build-out of the Airport. Future and ultimate property acquisition is shown to cover aeronautical expansion, FAA Runway Protection Zone, Building Restriction Line, and navigational aid protection areas.