4.0 FACILITY REQUIREMENTS

Chapter 3, *Aviation Activity Forecasts*, projected the type and frequency of aircraft that will utilize Rock Springs-Sweetwater County Airport (RKS) over the next 20 years. The objective of the *Facility Requirements* chapter is to evaluate and quantify the facilities needed to meet the forecasted demand at RKS. Once the facility needs have been quantified, recommended and required improvements will be identified to accommodate the projected demand on airside and landside facilities. These facility needs will examine FAA design criteria; airfield requirements; airfield markings, lighting, and signage; navigational aids; instrument approach procedures; obstructions and airspace requirements; airspace class and air traffic control; terminal requirements; general aviation requirements; landside requirements; airport equipment; fuel storage requirements; deicing facilities; utilities; and, regulatory requirements. In **Chapter 5**, *Alternatives Analysis*, alternatives to key facility requirements will be evaluated to determine the best strategy to meet the needs of airport users and the community.

As identified in **Chapter 2**, *Inventory* and **Chapter 3**, *Aviation Activity Forecasts*, to accommodate the critical aircraft (Gulfstream 550), Runway 9/27 has a Runway Design Code (RDC) of C-III with approach visibility minimums lower than ¾-mile. Additionally, the critical aircraft for Runway 3/21 is the Embraer 120, and the RDC for Runway 3/21 is B-II with visual approaches. The RDC standards for each runway and the forecasted demand discussed in **Chapter 3** will be used throughout this chapter to evaluate the anticipated demand on RKS facilities. A summary of the requirements and recommendations can be found at the end of this chapter.

4.1 FAA SAFETY AND SEPARATION DESIGN CRITERIA

For all airport planning efforts, FAA safety and separation standards are the primary consideration because they define the width and clearance required to meet FAA design criteria for the safe operation for aircraft landings, takeoffs, and taxiing. As discussed in the previous section, Runway 9/27 has an RDC of C-III and Runway 3/21 has an RDC of B-II. The Airplane Design Group (ADG) is the grouping of airplanes based on tail height or wingspan of the critical aircraft. The ADG of the critical aircraft ultimately defines the safety and separation standards for taxiways. As a result, in relation to their corresponding runway, parallel Taxiway A is ADG-III, and parallel Taxiways D and F are ADG-II. Taxiway Design Group standards will be reviewed further in **Section 4.2.8**. **Table 4-1** shows the FAA safety and separation design criteria according to FAA AC 150/5300-13A, *Airport Design*, and will be further discussed in the following sections.

4.1.1 Runway and Taxiway Safety Areas

A safety area is a defined surface surrounding the runway or taxiway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the paved surface.[49] FAA design standards require safety areas be graded and clear of

[49] FAA AC 150/5300-13A, *Airport Design*

depressions, humps, ruts, and other surface variations and drained by grading or storm sewers. Safety areas are also required to be free of non-frangible objects except when fixed by function. As shown in **Table 4-1**. RKS's runway and taxiway safety areas are currently compliant with FAA design standards.

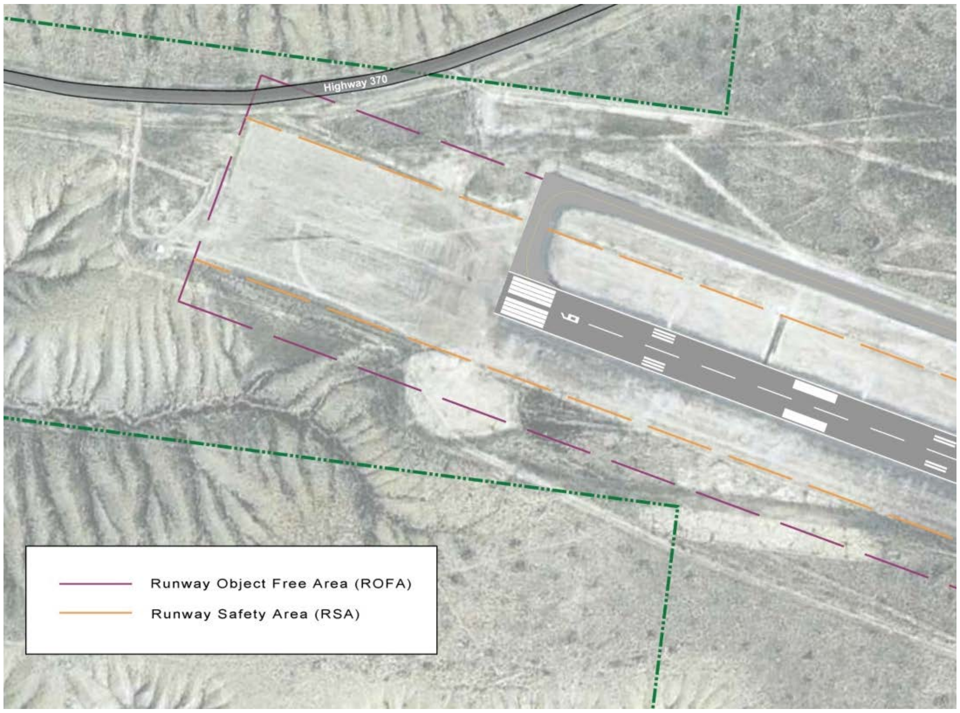
All safety area requirements are met.

4.1.2 Runway and Taxiway Object Free Area (OFA)

An Object Free Area (OFA) is a space on the ground, centered on a runway, taxiway, or taxilane centerline, that enhances the safety for aircraft operations by clearing the area of aboveground objects. Some objects are acceptable in the OFA, including objects that need to be located within the OFA for air navigation or aircraft ground maneuvering purposes. These objects must be frangible or less than three inches tall.[50] As shown in **Table 4-1**, except for Runway 9, the runway system and the taxiway system meet OFA design standards. A road encroaches the Runway 9 OFA on the northwest corner by 200 feet and 150 feet, which is graphically depicted below in **Figure 4-1**. This Modification to Design Standards was approved by the FAA in August 1993 and is currently listed as a non-standard condition on the Airport Layout Plan. **Table 4-3** shows the existing approved Modification to Design Standards for the existing OFAs.

All OFA requirements are met.

FIGURE 4-1 – RUNWAY 9 OFA ENCROACHMENTS



Source: Jviation, Inc.

[50] FAA AC 150/5300-13A, *Airport Design*

4.1.3 Runway Obstacle Free Zone (OFZ)

The Obstacle Free Zone (OFZ) is a volume of airspace intended to protect aircraft in the early and final stages of flight. It must remain clear of object penetrations, except for frangible Navigational Aids (NAVAIDs) located in the OFZ because of their function. For runways serving aircraft with Maximum Takeoff Weight (MTOWs) greater than 12,500 pounds, the OFZ is 400 feet wide and extends 200 feet beyond the end of the runway. Both runways at RKS are designed to accommodate aircraft weighing more than 12,500 pounds.

All OFZ requirements are met.

4.1.4 Runway Protection Zone (RPZ)

The Runway Protection Zone (RPZ) is an area beyond each runway end designed to enhance the protection of people and property on the ground. In order to ensure that the RPZs are kept clear of incompatible uses, the land included in the RPZ should be owned by the Airport or protected via an avigation easement. This gives the airport the right to control the presence and height of objects as well as the use of the land within the RPZ.

All land within the RPZs is controlled through airport ownership and existing avigation easements.

TABLE 4-1 – RDC: RUNWAY DESIGN STANDARDS

Criteria	Existing Runway 9/27	RDC C-III Vis. <3/4 Mile	Existing Runway 3/21	RDC B-II Visual	RDC B-II Vis. ≥ 3/4 Mile
Runway Safety Area Width Length Beyond RW End	500’/500’ 1,000’/1000’	500’ 1,000’	150’/150’ 300’/300’	150’ 300’	150’ 300’
Runway Object Free Area Width Length Beyond RW End	Nonstandard*/800’ Nonstandard*/1,000’	800’ 1,000’	500’ 300’	500’ 300’	500’ 300’
Runway Object Free Zone Width Length Beyond RW End	200’/200’ 200’/200’	200’ 200’	200’/200’ 200’/200’	200’ 200’	200’ 200’
Precision Object Free Zone Width Length	800’/800’ 200’/200’	800’ 200’	N/A	N/A	N/A
Approach RPZ Length Inner Width Outer Width	1,700’/2,500’ 1,000’/1,000’ 1,510’/1,750’	2,500’ 1,000’ 1,750’	1000’/1,000’ 500’/500’ 700’/700’	1,000’ 500’ 700’	1,700’ 1,000’ 1,510’
Departure RPZ Length Inner Width Outer Width	1,700’/1,700’ 500’/500’ 1,010’/1,010’	1,700’ 500’ 1,010’	1,000’/1,000’ 500’/500’ 700’/700’	1,000’ 500’ 700’	1,000’ 500’ 700’
Runway CL to Parallel TW CL Taxiway A Taxiway D & F	400’ -	400’ -	- 400’	- 240’	- 240’
Runway CL to Aircraft Parking	500’	500’	500’	250’	250’

** A road encroaches the Runway 9 OFA on the northwest corner by 200 feet and 150 feet. The Modification to Standards was approved by the FAA in August 1993, and is currently listed as a non-standard condition on the Airport Layout Plan. See also Section 4.1.8 of this study.*

Source: AC 15/5300-13A, Airport Design; Table: Jviation, Inc.

TABLE 4-2 – TAXIWAY DESIGN STANDARDS

Criteria	Taxiway A	ADG III	Taxiway D & F	ADG II
Taxiway Safety Area Width	118'	118'	79'	79'
Taxiway Object Free Area Width	186'	186'	131'	131'
Taxiway Centerline to				
Parallel Taxiway/Taxilane	152'	152'	105'	105'
Fixed or Movable Object	>93'	93'	>65.5'	65.5'
Taxiway Wing Tip Clearance	44'	44'	26'	26'

Source: AC 15/5300-13A, Airport Design; Table: Jviation, Inc.

4.1.5 Building Restriction Lines (BRLs)

The Building Restriction Line (BRL) is a line inside of which airport buildings must not be located, due to proximity to aircraft movement areas.[51] Portions of BRLs run parallel to the runway and are offset at a distance that ensures that new construction is below the protected airspace, per 14 CFR Part 77 imaginary surfaces. The BRL also contains other protected areas such as RPZs and RVZs (see **Sections 4.1.4** and **4.1.7**). The BRL encompasses the RPZs, the OFAs, NAVAID critical areas, and the runway visibility zone. The BRLs at RKS are calculated using a 35-foot tall structure. Structures that are taller than 35 feet will require additional analysis to ensure compliance with Part 77 surfaces.

All buildings are clear of the BRL.

4.1.6 Line-of-Sight

The Line of Sight standard requires that two points five feet above located five feet above the runway centerline must be mutually visible for the entire runway length. However, if there is a parallel taxiway (which is Taxiway A at RKS), the visibility requirement is reduced to one half of the runway length.

All line-of-sight standards are met.

4.1.7 Runway Visibility Zone (RVZ)

The Runway Visibility Zone (RVZ) is an area required to ensure clear visibility for converging aircraft when an airport has intersecting runways. The RVZ is a four-sided polygon that connects at the midpoint of the runway intersection to each of the runway ends. Terrain must be graded and permanent objects must be designed or sited to provide an unobstructed line of sight from any point five feet above one runway centerline to any point within the runway visibility zone.

The Airport must restrict buildings, other structures, and maintain the grassy areas in the RVZ to preserve clear visibility.

[51] FAA AC 150/5300-13A, *Airport Design*

4.1.8 Non-Standard Conditions and Modifications to Standards

Modifications to Standards are any change to FAA design standards (except for RSA dimensional standards), that are an equivalent level of safety and unique local conditions.[52] Once the nonstandard condition is approved as a Modification to Standards, the standard at that location is no longer a nonstandard condition. **Table 4-3** shows the existing Modification to Design Standards (MODs) and their approval date as indicated on the 2003 RKS Airport Layout Plan. The approval of these MODs does not require the condition to be fixed within a specific time limit. Additionally, according to AC 150/5300-13A, *Airport Design*, MODs 2 and 4 are no longer considered non-standard conditions.

TABLE 4-3 – MODIFICATION TO DESIGN STANDARDS

#	RW	Item	Standard	Comments	Approval Date	Airspace Case No.
1	9	Object Free Area (OFA)	Width = 800' Length = 1,000'	Road encroaches Runway 9 OFA on the northwest corner by 200' and 150'.	8/4/1993	93-SNM/D-185-NRA
2	9 & 27	Object Free Area (OFA)	Width = 800' Length = 1,000'	Wildlife fence encroaches the OFA but has a top elevation below the RSA	5/14/1998	98-DEN-037-NRA
3	3 & 21	PAPI	Horizontal plane shall be within ±1' of elevation of the runway centerline at the intercept point of the visual glidepath with the runway	The horizontal plane is located 2' above the elevation of the runway centerline at the intercept point of the visual glidepath with the runway.	8/7/2000	00-DEN-037-NRA
4	21	Object Free Area (OFA)	Width = 500' Length = 300'	Wildlife fence encroaches the OFA but has a top elevation below the RSA	-	-

Source: 2003 RKS Airport Layout Plan

4.2 AIRFIELD REQUIREMENTS

In consideration of the forecasts of future aviation activity, the adequacy of the airfield system must be analyzed from several perspectives. These include airfield capacity and runway orientation, runway length, width, runway shoulders, pavement strength, surface, and taxiways.

Taxiways enable the movement of aircraft between the runway system and the functional areas on the Airport. Some taxiways are necessary to provide safer and more efficient use of the airfield, while other taxiways are necessary simply to provide access between runways and aircraft parking aprons. This section presents the analysis of requirements of the facilities within the runway and taxiway system necessary to meet aviation demand at RKS.

[52] FAA AC 150/5300-13A, *Airport Design*.

4.2.1 Airfield Capacity

FAA AC 150/5060-5, *Airport Capacity and Delay*, provides criteria to determine the capacity of an airport based on the number and configuration of its runways. The intersecting runway configuration at RKS has a theoretical airfield peak hourly capacity of 98 aircraft operations in Visual Flight Rules (VFR) conditions and 59 aircraft operations in Instrument Flight Rules (IFR) conditions, with an Annual Service Volume (ASV) of 230,000 operations per year. The ASV is a reasonable estimate of an airport's annual activity, at which the average delay in the peak hour per operation is four minutes.[53] It accounts for differences in runway use, aircraft mix, weather conditions, etc., that would be encountered over a year's time. FAA planning standards state that when 60% of the ASV is reached (138,000 annual operations at RKS), an airport should start planning to increase runway capacity, which may include the construction of a new runway or the extension of an existing runway. Once 80% of ASV is reached (184,000 annual operations), construction should begin in order to increase capacity of the existing facilities.

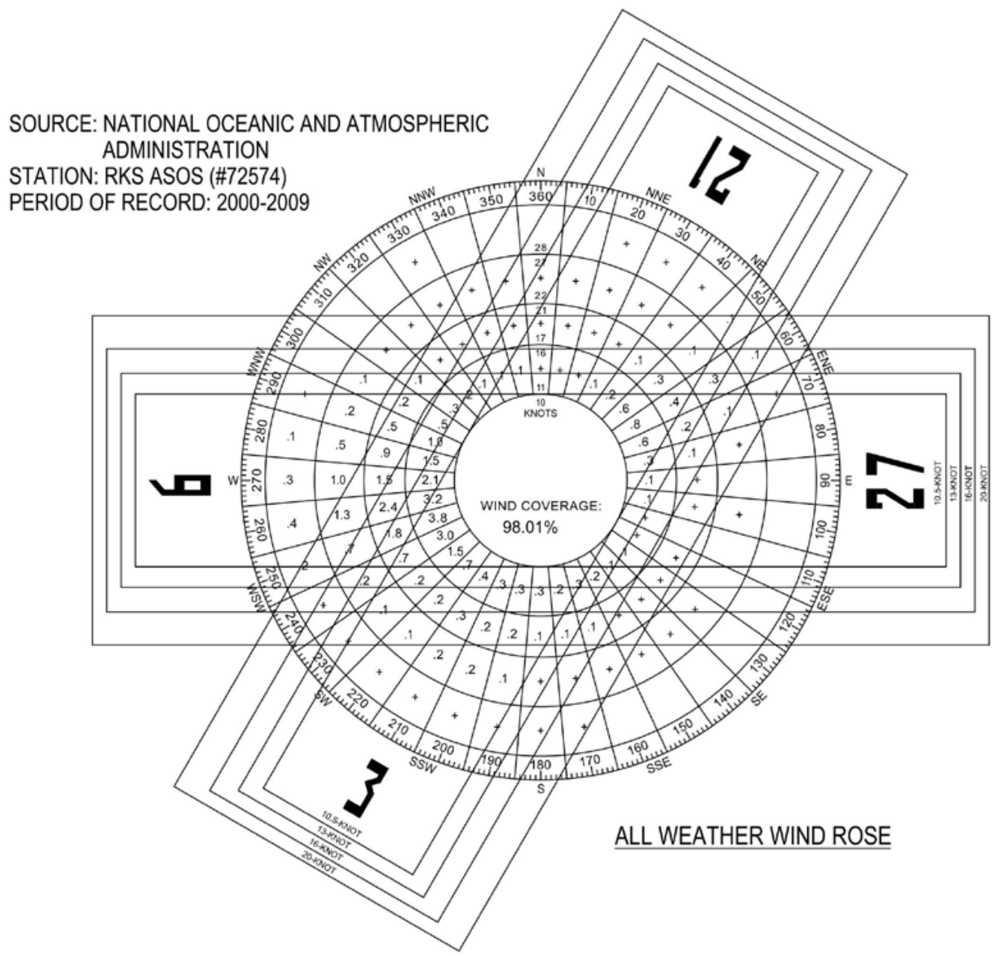
It is anticipated that RKS will not exceed these hourly and annual capacities in any given year during the 20-year planning period. ***Since the operations forecasted in the 20-year planning period will not exceed 60% of the ASV, planning for additional runways will not be required during this planning period on the basis of capacity.***

4.2.2 Runway Orientation

The most important factor that determines a runway's preferred orientation is the wind. The ideal runway orientation would be aligned with the prevailing wind so that crosswind operations are minimized. All aircraft have a limit of crosswinds that can be handled during landing. When crosswinds exceed aircraft design limitations, the aircraft must utilize another runway on the airfield or divert to another airport. Crosswinds affect smaller aircraft more than large aircraft because of their weight. Therefore, for planning purposes, a 10.5-knot crosswind component is used for A-I and B-I aircraft, a 13-knot crosswind component is used for B-II aircraft, and a 16-knot crosswind component is used for C-II aircraft. Per FAA AC 150/5300-13A, *Airport Design*, it is desirable for current runway(s) to provide 95% or greater wind coverage for aircraft operating at RKS on a regular basis. The FAA All Weather Wind Rose for RKS is depicted in **Figure 4-2**.

[53] FAA Order 5090.3C, *Field Formulation of the National Plan of Integrated Airport Systems*

FIGURE 4-2 – ALL WEATHER WIND ROSE



ALL WEATHER WIND ROSE

Runway Designation	20-Knot Crosswind Component	16-Knot Crosswind Component	13-Knot Crosswind Component	10.5-Knot Crosswind Component
RUNWAY 03/21	96.97%	92.35%	85.75%	78.39%
RUNWAY 9/27	99.11%	97.84%	95.79%	92.78%
COMBINED	99.97%	99.84%	99.37%	98.01%

Source: NCDC; Image: Jviation, Inc.

As discussed in **Section 2.11.1**, the runway orientation of Runways 9/27 and 3/21 provide 98.01% coverage in all weather conditions and 96.08% in IFR conditions for a crosswind component of 10.50-knots, which exceeds the 95% wind coverage requirement. Further, since Runway 3/21 has an RDC of B-II, the 13-knot all weather crosswind component for Runway 3/21 is 85.75% and 99.37% for both runways combined. For Runway 9/27 (RDC of C-III), the 16-knot crosswind component is 97.84%, and with both runway combined, the 16-knot crosswind component is

99.84%. ***All aircraft operating at RKS are safely accommodated at least 95% of the time during crosswind conditions.***

4.2.3 Runway Length

At a minimum, runway length should accommodate the critical aircraft or family of aircraft identified for the runway complex. The runway length analysis determines if the existing runway lengths are adequate for the critical aircraft that utilize them. The current length of Runway 9/27 is 10,000 feet and Runway 3/21 is 5,223 feet, as previously discussed in **Section 2.4.1**.

A method for determining runway length is using AC 150/5325-4B, *Runway Length Requirements for Airport Design*. **Table 4-4** shows the FAA recommended runway lengths for RKS based on using information provided in FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design*. The runway lengths are calculated using the airport elevation, average maximum daily temperature of the hottest month with no wind conditions, and the runway gradient.

TABLE 4-4 – FAA RUNWAY LENGTH REQUIREMENTS

Airport and Runway Data	
Airport Elevation	6,760.4'
Mean Daily Maximum Temperature of the Hottest Month	83.8˚F
Maximum Difference in Runway Centerline Elevation	33'
Runway Length Recommended for Airport Design	
Small Airplanes with Approach Speeds of <30 knots	500'
Small Airplanes with Approach Speeds of <50 knots	1,340'
Small Airplanes with < 10 Passenger Seats	
95% of these Small Airplanes	5,720'
100% of these Small Airplanes	8,110'
Small Airplanes with ≥10 Passenger Seats	8,110'
Large Airport of ≤60,000 pounds	
75% of these Large Airplanes at 60% Useful Load	7,670'
75% of these Large Airplanes at 90% Useful Load	8,930'
100% of these Large Airplanes at 60% Useful Load	11,330'
100% of these Large Airplanes at 90% Useful Load	11,330'

Source: Chapter 2 of AC 150/5325-4B, Runway Length Requirement for Airport Design

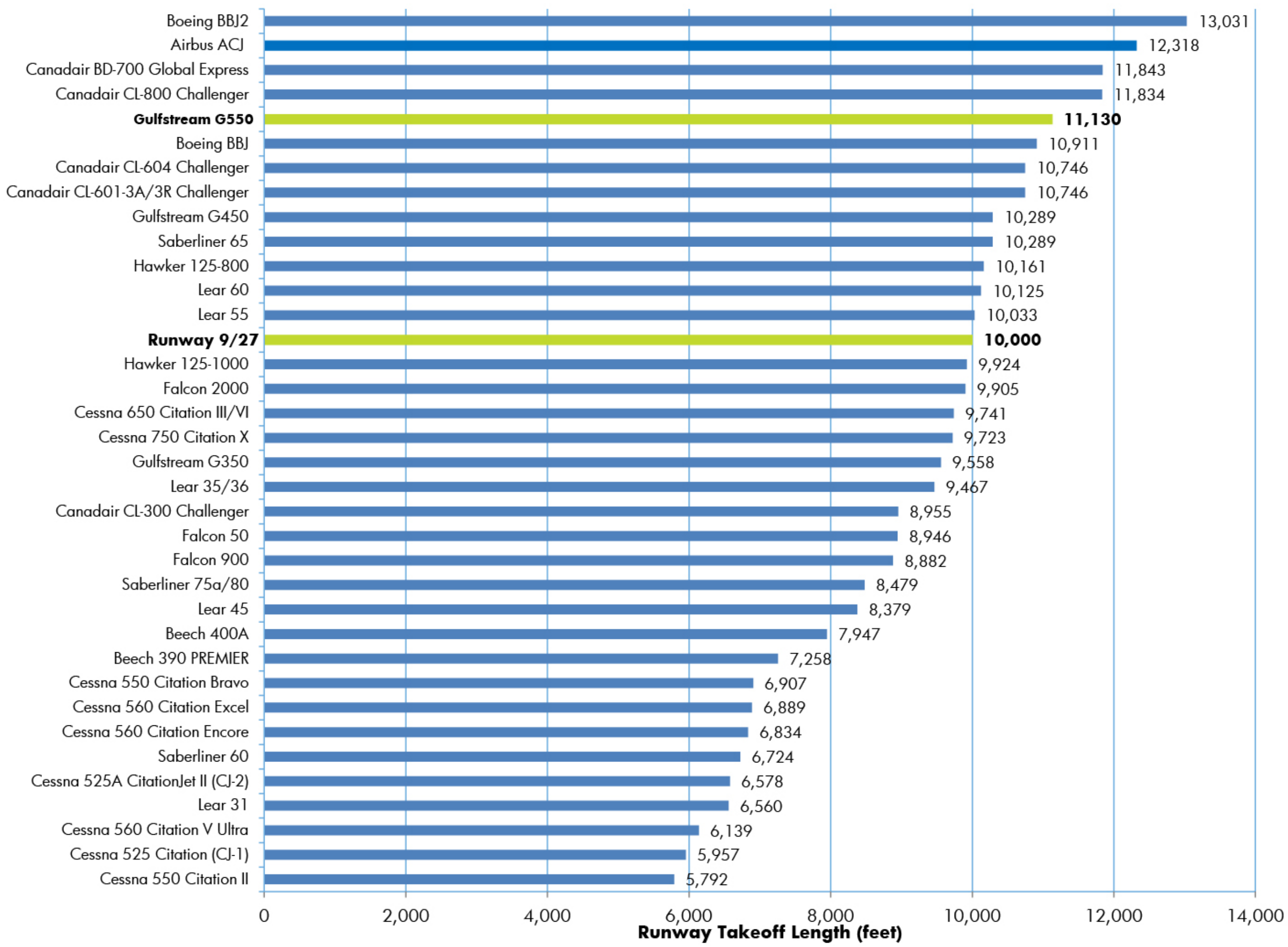
For aircraft weighing more than 60,000 pounds, specific aircraft manufacturer technical data is used to determine runway length requirements with maximum takeoff weight, no wind conditions, adjusted for airport altitude, mean maximum temperature of the hottest month, and effective runway gradient.[54] [55] Depending upon the stage length, aircraft can operate on shorter runways by modifying the aircraft loading (i.e. passengers, fuel, or cargo). **Figure 4-3** shows the runway length requirements for typical business jets that currently operate at RKS for comparison purposes. These lengths are not a substitute for calculations required by airplane operating rules, and does not

[54] Aviation Research Group, Inc. http://compair.aviationresearch.com/index.aspx?action=aircraft_comparison
[55] FAA Central Region, Airport Planning Division, 2005. *Takeoff Runway Length Adjustment Worksheet*

include the specific requirements for runway length applied by individual aircraft operators. However, these calculations provide an estimate of runway length needed for these aircraft types at RKS.

As indicated in **Figure 4-3**, Runway 9/27 currently accommodates approximately 91% of these jets, with only two aircraft types requiring a minimal weight reduction.

FIGURE 4-3 – BUSINESS JET RUNWAY LENGTH REQUIREMENTS



Source: Aviation Research Group, Inc; Aircraft manufacturer data; Jviation, Inc.

4.2.3.1 Runway 9/27 Length Analysis

The FAA Runway Length Analysis indicates that at 10,000 feet, Runway 9/27 currently accommodates 75% of large airplanes weighing less than 60,000 pounds at 90% useful load. The runway length analysis from the aircraft manufacturers' data shows that Runway 9/27 currently accommodates 91% of the business jet fleet that currently use RKS. ***The existing length for***

Runway 9/27 is sufficient to accommodate most large aircraft operating at RKS with minimal weight penalties; therefore, no runway extension is recommended.

4.2.3.2 Runway 3/21 Length Analysis

Runway 3/21 is constructed for small aircraft use during high crosswind conditions. The FAA Runway Length Analysis for Runway 3/21 indicates that the existing 5,223 feet does not accommodate all small airplanes with less than 10 passenger seats, as shown in **Table 4-4**. To accommodate 95% of small airplanes, a total length of 5,720 (497-foot extension) could be justified; however, airport users have not indicated the need for a longer crosswind runway. ***The existing length for Runway 3/21 is adequate for current airport users; therefore, no runway extension is recommended at this time.***

4.2.4 Runway Width

Runway 9/27 is 150 feet wide, which meets ADG III standards (with approach visibility minimums lower than ¾-mile), as shown below in **Table 4-5**. Runway 3/21 is 75 feet wide, which accommodates runway design standards for ADG II (with a visual approach). ***RDC runway width standards for each runway are met; therefore, no widening is required.***

4.2.5 Runway Shoulders

Runway shoulders provide resistance to blast erosion and accommodate the passage of maintenance and emergency equipment. Paved 25-foot shoulders are recommended (though not required) for runways accommodating RDC CIII. For runways accommodating RDC II or smaller, it is recommended that stabilized runway shoulders be constructed of turf, aggregate turf, soil cement, lime, or bituminous materials. ***The existing runway shoulders on Runway 9/27 are recommended to be upgraded to 25 feet.***

TABLE 4-5 – RUNWAY DESIGN STANDARDS

	Runway 9/27	RDC C-III Vis. <3/4 Mile	Runway 3/21	RDC B-II Visual
Runway Width	150’	150’	75’	75’
Runway Shoulder Width	9-11’	25’	Not Provided	20’
Recommended Shoulder Construction	-	Paved	-	Stabilized Surface

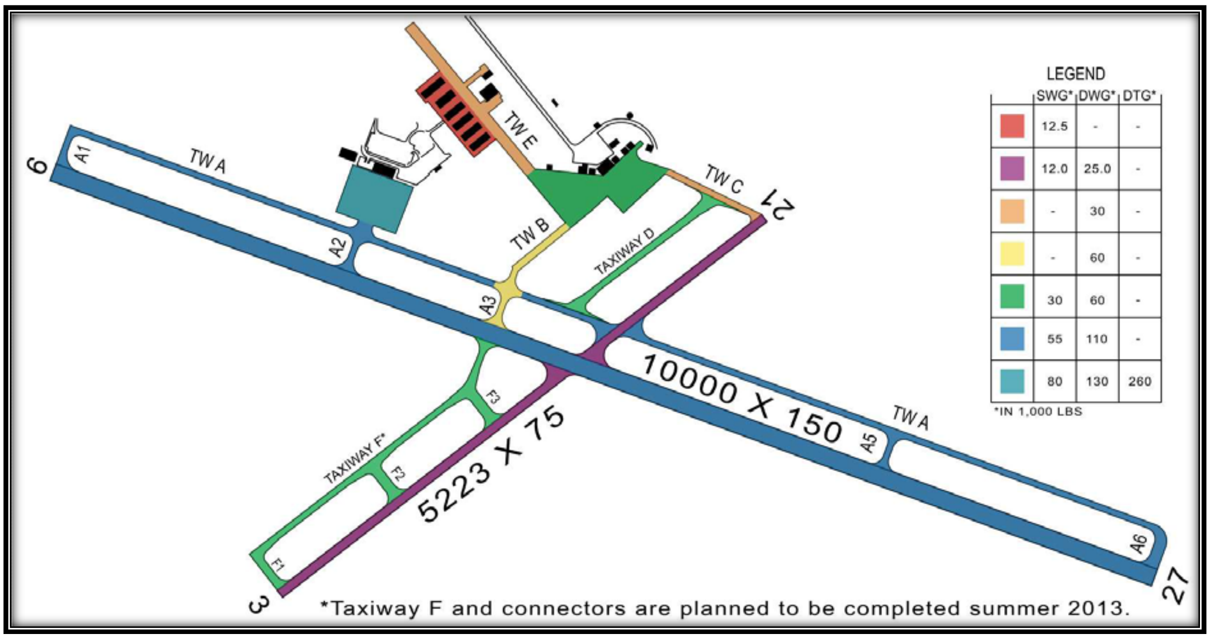
Source: AC 15/5300-13A, Airport Design; Table: Jviation, Inc.

4.2.6 Runway Strength

As shown in **Figure 4-4**, Runway 9/27 has a weight-bearing capacity designed to accommodate 55,000 pounds for Single Wheel Gear (SWG) equipped aircraft and 110,000 pounds for Dual Wheel Gear (DWG) equipped aircraft. Runway 9/27’s critical aircraft is the Gulfstream 550, which has a maximum takeoff weight (MTOW) of 91,000 pounds.[56] ***Runway 9/27's pavement strength accommodates the critical aircraft; therefore, no additional strengthening is recommended.***

Runway 3/21 is constructed for small aircraft use and has a weight-bearing capacity of 12,000 pounds SWG and 25,000 pounds DWG. Runway 3/21's critical aircraft is the Embraer 120, with a MTOW of 26,455 pounds, which exceeds the existing pavement strength. ***The Runway 3/21 pavement strength is recommended to be increased to at least 26,500 pounds DWG during the next scheduled resurfacing to better accommodate the existing/future critical aircraft.***

FIGURE 4-4 – PAVEMENT STRENGTH



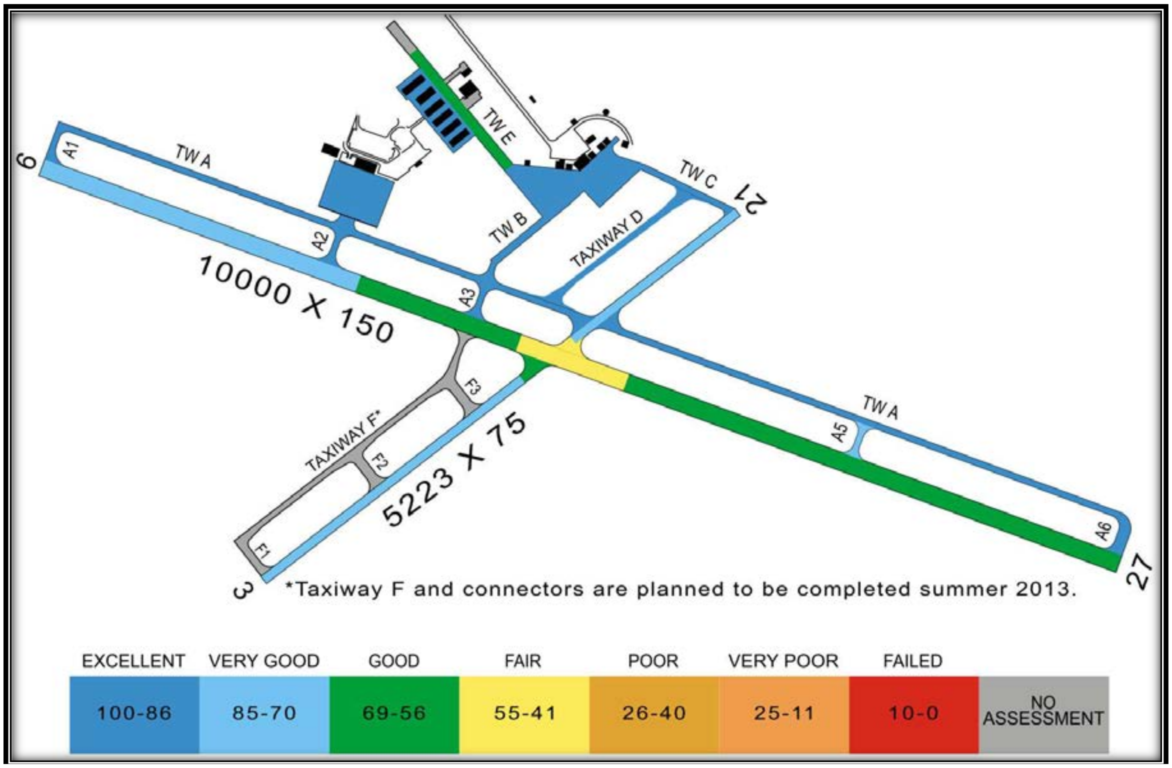
Source: FAA Denver Airports District Office; Form 5010; Image: Jviation, Inc.

4.2.7 Runway Surface

Runway 9/27 is constructed of grooved asphalt and Runway 3/21 is constructed of asphalt with a porous fiction course overlay. The 2012 Pavement Condition Index (PCI) Study performed by WYDOT Aeronautics, shown in **Figure 4-5**, identified sections of pavement in "Fair" and "Good" condition at the runway intersection. RKS recently rehabilitated Runway 3/21 during the writing of this report (summer 2013), and is now considered to be in excellent condition. Runway 9/27 is scheduled to be rehabilitated during the summers of 2016 and 2017.

[56] FAA AC 150/5300-13, *Airport Design*, Change 19; Appendix 1

FIGURE 4-5 – PAVEMENT CONDITION INDEX 2012



Source: 2012 WYDOT Pavement Index Condition Study; Image: Jviation

Routine maintenance, such as joint and crack sealing, should be performed on a scheduled basis to extend the pavement life. In addition to the runway rehabilitation scheduled in 2013, 2016, and 2017, no other surface improvements to Runway 9/27 and Runway 3/21 are recommended.

4.2.8 Taxiways

One of the key updates from the recently revised AC 150/5300-13A, *Airport Design,* is the addition of the Taxiway Design Group (TDG) as the new classifier for designing taxiways.[57] The TDG is determined by the aircraft undercarriage dimensions, overall Main Gear Width (MGW), and the Cockpit to Main Gear (CMG) distance of the most demanding aircraft. The TDG also establishes the taxiway/taxilane width and fillet standards, and in some instances, runway to taxiway and taxiway/taxilane separation requirements. The TDG also improves the design of taxiways fillets and radii, enabling safe and efficient aircraft taxiing while minimizing excess pavement.

Using TDG standards, taxiways are designed for "cockpit over centerline" taxiing, with the pavement wide enough to allow for a certain amount of wander, which is measured from the outside of the landing gear to the pavement edge ("taxiway edge safety margin"). Per AC 150/5300-13A, any taxiways and taxiway fillets designed using "judgmental oversteering" (when the pilot

[57] FAA AC 150/5300-13A, *Airport Design*

must purposely steer the cockpit outside the marked centerline) should be eliminated whenever feasible.

Because of the fact that the design of the taxiway system has an effect on the safety of aircraft movement and possible incursions of taxiing aircraft onto runways, special care goes into the design of taxiways. To that end, new design principles for a system of taxiways are outlined in AC 150/5300-13A, *Airport Design*. **Table 4-6** provides an overview of the key design concepts.

TABLE 4-6 – TAXIWAY DESIGN PRINCIPLES

Design Principle	Summarized Definition
Steering Angle	• Design taxiways such that the nose gear steering angles is ≤ 50 degrees
Intersection Angles	• 90 degree turns • 30, 45, 60, 90, 120, 135, and 150 degree preferred intersection standard angles
Runway Intersections	
Increase Pilot Situational Awareness	• Utilize the "three-node concept" • Pilot should have three or fewer choices at an intersection (left, right, straight ahead)
Avoid Wide Expanses of Pavement	• Wide pavement requires placing signs far from a pilot's eye
Limit Runway Crossings	• Reduces the opportunity for human error
• Avoid "High Energy" Intersections	• Located in the middle third of the runways • Limit the runway crossings to the outer thirds of the runway
Increase Visibility	• Provide right angle intersections for best pilot visibility • Acute angle runway exits should not be used as a runway entrance or runway crossing
Avoid "Dual Purpose" Pavements	• Runways used as taxiways and taxiways used as runways can lead to confusion
Indirect Access	• Eliminate taxiways leading directly from an apron to a runway
Hot Spots	• Limit the number of taxiways intersecting in one spot

Source: AC 15/5300-13A, Airport Design; Table: Jviation, Inc.

The existing paved taxiway system at RKS consists of Taxiway A (full-length parallel taxiway for Runway 9/27), Taxiways D and F (full-length parallel taxiways for Runway 3/21), Taxiway B, Taxiway C, and Taxiway E. All taxiways are 50 feet wide, and are designed to the previous version of the *Airport Design* AC (150/5300-13), as shown in **Table 4-7**.

TABLE 4-7 – FAA TDG DESIGN STANDARDS

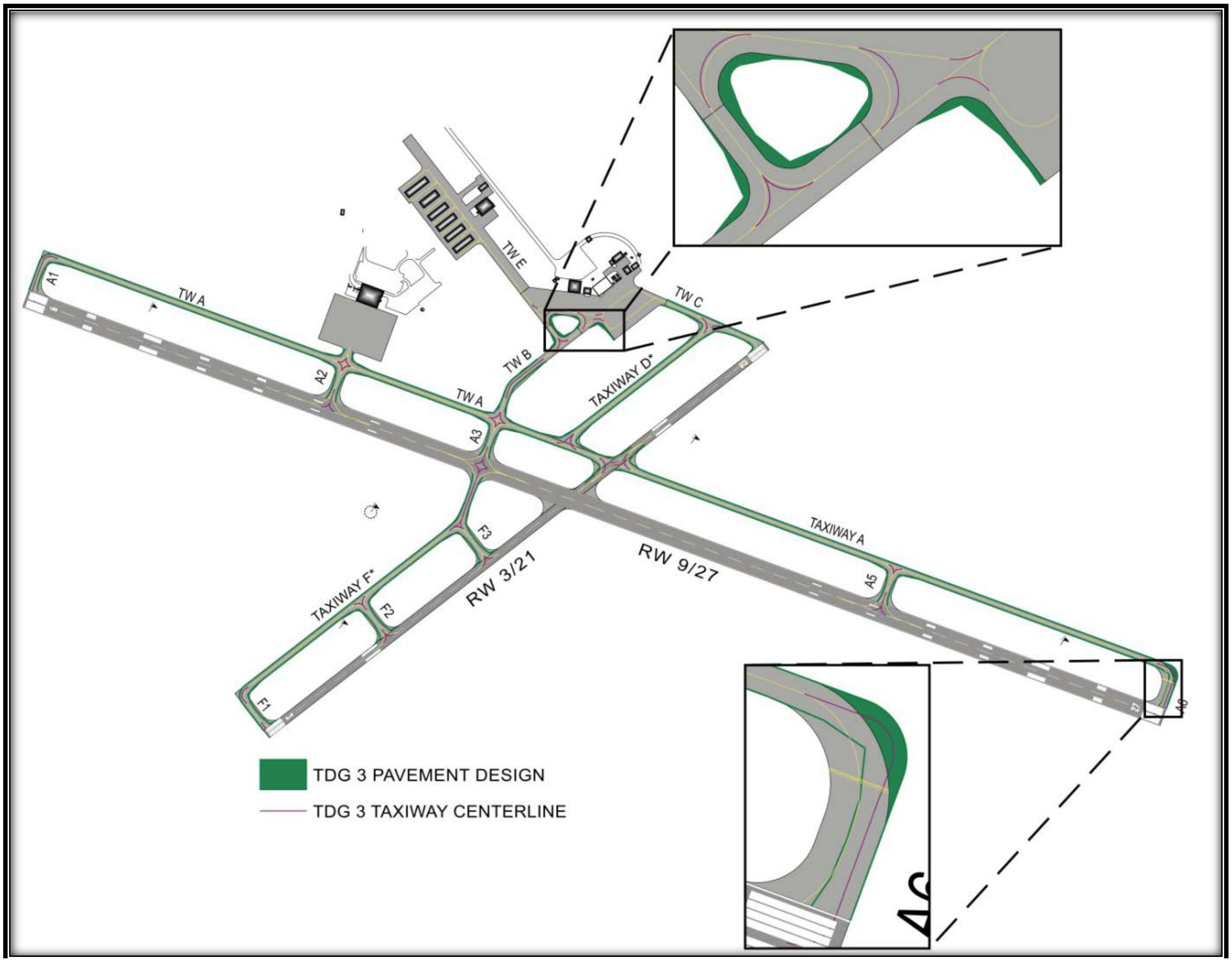
	Existing Taxiways	TDG 3
Taxiway Width	50'	50'
Taxiway Edge Safety Margin	Not Provided	10'
Taxiway Shoulder Width	Not Provided	20'

Source: AC 15/5300-13A, Airport Design; Table: Jviation, Inc.

The majority of larger aircraft that frequently operate at RKS [including the Gulfstream 450, Gulfstream 550, Embraer 120, and the forecasted Canadair Regional Jet (CRJ) 200] are all within TDG 3. **Figure 4-6** below identifies where the existing taxiway dimensions in relation to these new standards for TDG 3. The new TDG 3 standards facilitate safe and efficient taxiing while *minimizing* surplus pavement, as such, the majority of existing taxiway fillets at RKS were overbuilt. To meet TDG 3 standards, additional pavement is needed where Taxiway B connects to the GA Apron and the fillet from Taxiway A to Taxiway A6, as shown in **Figure 4-6**. AC 150/5300-13A recommends that existing taxiway geometry be improved to meet the new TDG standards whenever feasible.[58] ***It is recommended that existing taxiways at RKS be updated to meet TDG 3 design standards, including taxiway shoulders. However, it is more critical that runway shoulders meet RDC standards prior to taxiway shoulders.***

[58] FAA AC 150/5300-13A, *Airport Design*

FIGURE 4-6 – RKS TAXIWAY SYSTEM USING TDG 3



Source: Jviation

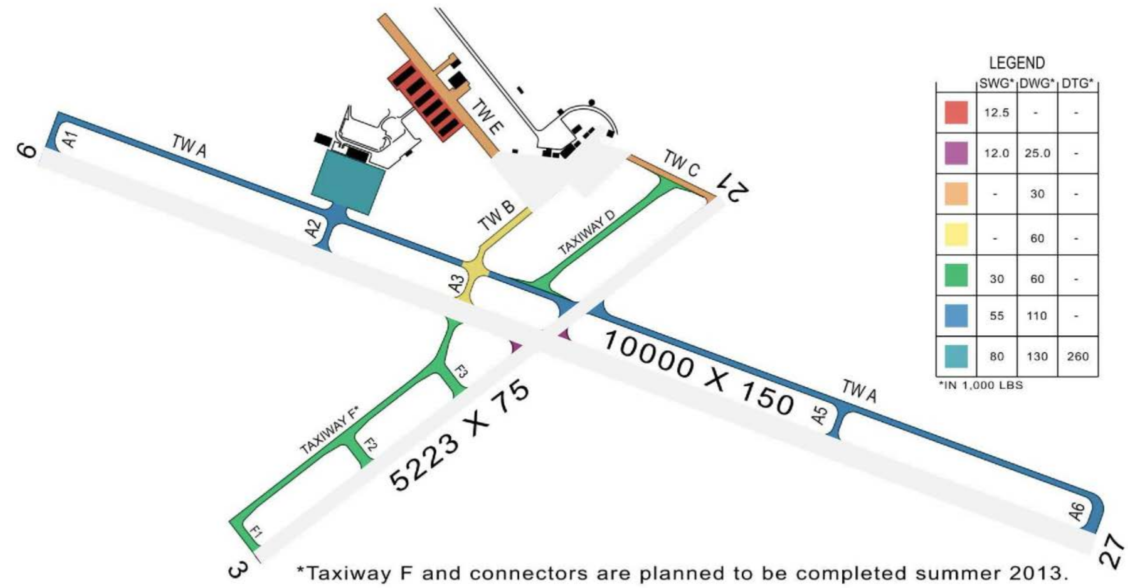
The portion of Taxiway C between Taxiway D and the Runway 21 threshold currently does not meet this recommendation. To increase visibility, basic taxiway design principles outlined in Chapter 4 of AC 150/5300-13, *Airport Design*, suggest taxiways have 90-degree intersection angles wherever possible. A safety enhancement at RKS would be to increase the acute angle of the Taxiway C to 90 degrees, improving visibility.

It is recommended that alternatives be examined to enhance the safety and visibility on Taxiway C.

4.2.9 Taxiway Pavement Strength

Airfields are constructed to provide adequate pavement strength for aircraft loads, as well as resisting the abrasive action of traffic and deterioration from adverse weather conditions and other influences. The taxiway pavement strengths for RKS are shown below in **Figure 4-7**. Taxiway A and its connectors have the necessary pavement strength required to accommodate the Gulfstream 550, the design aircraft for Runway 9/27. Additionally, Taxiway D and F pavement is strong enough to accommodate Runway 3/21's design aircraft, the Embraer 120. ***All taxiway pavement strengths accommodate the critical aircraft; therefore, no increase in taxiway pavement strength is required.***

FIGURE 4-7 – TAXIWAY PAVEMENT STRENGTH



Source: FAA Denver ADO; Form 5010; Image: Jviation, Inc.

4.3 AIRFIELD MARKINGS, LIGHTING, AND SIGNAGE

4.3.1 Airfield Markings

According to Ac 150/5340-1K, *Standards for Airport Markings*, precision markings are required for runways with precision instrument approaches with vertical guidance lower than ¾ mile visibility minimums. Since Runway 27 has a ½-mile precision Instrument Landing System (ILS), Runway 9/27 has precision runway markings. Further, 14 CFR Part 139 requires marking systems for air carrier operations, which include takeoff and landing minimum specifications for each runway, hold position markings, ILS critical area markings, centerlines, edge markings, aiming points, threshold, and touchdown zone markings. Runway 3/21 has non-precision markings, which include centerline, threshold, and aiming point markings. All taxiways are marked with yellow centerline striping, and runway intersections are marked with an enhanced yellow centerline and runway hold bars to meet the new Airport Marking Standards as required in AC 150/5340-1J, *Standards for Airport Markings*. However, the new TDG taxiway pavement design standards in AC 15/5300-13A, *Airport Design*[59], decrease the taxiway centerline radius from 75 feet to 60 feet at 90-degree taxiway intersections. Existing taxiway intersections currently have angles other than 90 degrees, yet still have a 75-foot taxiway centerline radius. ***It is recommended that taxiway pavement markings be updated during the next scheduled taxiway striping to reflect the new taxiway centerline radius standards for TDG 3.***

4.3.2 Airfield Lighting

AC 150/5300-13A, *Airport Design*, requires precision instrument runways with less than ¾-visibility minimums (Runway 9/27) to have either High Intensity Runway Lighting (HIRL) or Medium Intensity Runway Lighting (MIRL). Further, 14 CFR Part 139 requires Part 139 airports provide and maintain airfield lighting systems for air carrier operations at night or during conditions that are below visual flight rules (VFR). Runways with only visual approaches do not require runway lighting. However, these runways are required to have MIRL or Low Intensity Runway Lighting (LIRL) if the runway is used for nighttime operations. Runway 9/27 currently has HIRL and Runway 3/21 has MIRL. All existing taxiways are equipped with Medium Intensity Taxiway Lighting (MITL) and are currently in good condition. ***Airfield lighting at RKS currently meets FAA design standards; no improvements are recommended.***

4.3.3 Airfield Signage

Per 14 CFR Part 139, the airport is required to have signs for air carrier operations, which include hold position signs, ILS critical area signs, and signs that identify taxi routes on the movement area. Airfield signage provides essential guidance information that is used to identify items and locations on an airport. RKS is currently equipped with standard FAA required signage including instruction, location, direction, destination, and information signs, and meet the standards given in AC 150/5340-1J, *Standards for Airport Sign Systems*. ***Existing airfield signage meets FAA standards and is in excellent condition; no improvements are recommended.***

4.4 NAVIGATIONAL AIDS (NAVAIDS)

Navigational aids (NAVAIDs) consist of equipment to aid pilots in locating the Airport (particularly for those airports without Air Traffic Control assistance during approach), provide horizontal guidance information for a non-precision approach, and provide horizontal and vertical guidance information for a precision instrument approach. The existing NAVAIDs for RKS provide one precision instrument approach to Runway 27, and four non-precision approaches to both Runways 9 and 27. As discussed in **Section 2.4.7**, due to the steep terrain, Runway 27 has a unique glideslope antenna array called the Endfire Glideslope (EFGS) at the approach end of Runway 27. A summary of the existing visual and navigational aids are shown in **Table 4-8**. ***No NAVAID improvements are recommended.***

[59] FAA AC 150/5300-13A, *Airport Design*

TABLE 4-8 – NAVAID SUMMARY TABLE

RKS Visual and Navigational Aids (NAVAIDS)	Condition
General	
UNICOM – 122.8	Good
Rotating Beacon	Good
Lighted Wind Cones and Segmented Circle	Good
ASOS	Good
VOR/DME	Good
Runway 9/27	
LOC/GS	Fair
High Intensity Runway Lighting (HIRL)	Good
Supplemental Wind Cone – Runway 27	Good
PAPI (4-Box) – Both ends	Good
ODALS – Runway 9	Good
MALSR – Runway 27	Good
Runway 3/21	
Medium Intensity Runway Lighting (MIRL)	Good
Supplemental Wind Cone – Runway 21	Good
PAPI (2-Box) – Both ends	Good
REIL – Both ends	Good

Source: Jviation, Inc.

4.5 Instrument Approach Procedures

RKS currently has five instrument approaches, two for Runway 9 and three for Runway 27, as shown in **Table 4-9**. Approach minima for the procedures are based upon several factors, including obstacles, navigation equipment, approach lighting, and weather reporting equipment.

TABLE 4-9 – RKS INSTRUMENT APPROACHES AND MINIMUMS

Runway 9 - Approach	Lowest Minimums	Decision Height (feet-AGL)
RNAV (GPS)	6,941' – ¾ mile	200'
VOR (DME)	7,020' – ¾ mile	279'
Runway 27 - Approach	**Lowest Minimums**	**Decision Height (feet-AGL)**
RNAV (GPS)	6,964' - ½ mile	200'
VOR (DME)	7,040' - ½ mile	280'
ILS or LOC	6,964' - ½ mile	200'

Source: FAA Instrument Approach Charts

Recent technological advancements have made possible the use of satellite-based navigation systems that rival conventional ground-based predecessors in accuracy and dependability. These capabilities are expected to further improve with the continued implementation of the FAA's Next Generation Air Transportation System (NextGen) program. A focus of NextGen is the enhancement of pre-departure, departure, climb, en-route, and approach phases of a flight.[60]

[60] http://www.faa.gov/nextgen/

NextGen and the evolution of GPS have already had significant impacts on instrument approach capabilities at public use airports. Conventional instrument approaches, such as the ILS, require ground-based facilities on or near an airport for navigation. With NextGen and GPS, this is no longer the case; NextGen and GPS develop or improve approaches at airports, where in the past it was not feasible. The FAA is continuing to expand development of GPS for use in aircraft navigation and instrument approach procedures via Area Navigation (RNAV) and the Wide Area Augmentation System (WAAS). WAAS utilizes a network of ground-based antennas to send correcting signals to the GPS satellite constellation, allowing for ILS accuracy.

4.5.1 Instrument Approach Improvements at RKS

A review of the meteorological data from the National Climatic Data Center shows that total Instrument Meteorological Conditions (IMC) occur approximately 2.51% of the time, resulting in 413 IFR operations in 2012. Most of these conditions are due to low clouds. WYDOT's 2010 Instrument Approach Study recommends an LNAV approach for Runways 3 and 21 to establish an instrument approach with visibility minimums of one statute mile. Currently, Runway 3/21 has no instrument approach procedures; however, ***a GPS approach is recommended for Runway 3 and Runway 21***.

To request a GPS approach procedure for a runway, an airport must have a recent obstruction survey which meets the latest FAA standards. As part of this Master Plan project, an obstruction survey is currently being completed. A GPS approach can be requested by the Airport by submitting an Instrument Flight Procedures (IFP) Request Form. FAA will then prioritize the request against other instrument approach requests in the region. More information, including the requirements for an approach, and an online request form can be found through the website below:

http://www.faa.gov/air_traffic/flight_info/aeronav/ifpinitiation/

It is recommended that RKS continue to monitor the implementation of NextGen. Continued coordination with the FAA is also recommended to ensure RKS is considered for any and all emerging technologies that may improve instrument approach capabilities.

Due to the steep terrain at the approach end of Runway 27, RKS has a unique glideslope antenna array called the Endfire Glideslope Antenna (EFGS). The EFGS is only installed in limited applications at airports that cannot accommodate a standard glideslope antenna. Although the antenna can be simpler to install in these circumstances, long-term maintenance can become problematic since it is not a standard piece of equipment. **Chapter 5**, *Alternatives Analysis,* will evaluate other current technologies and options to replace the EFGS with a standard glideslope in order to improve reliability.

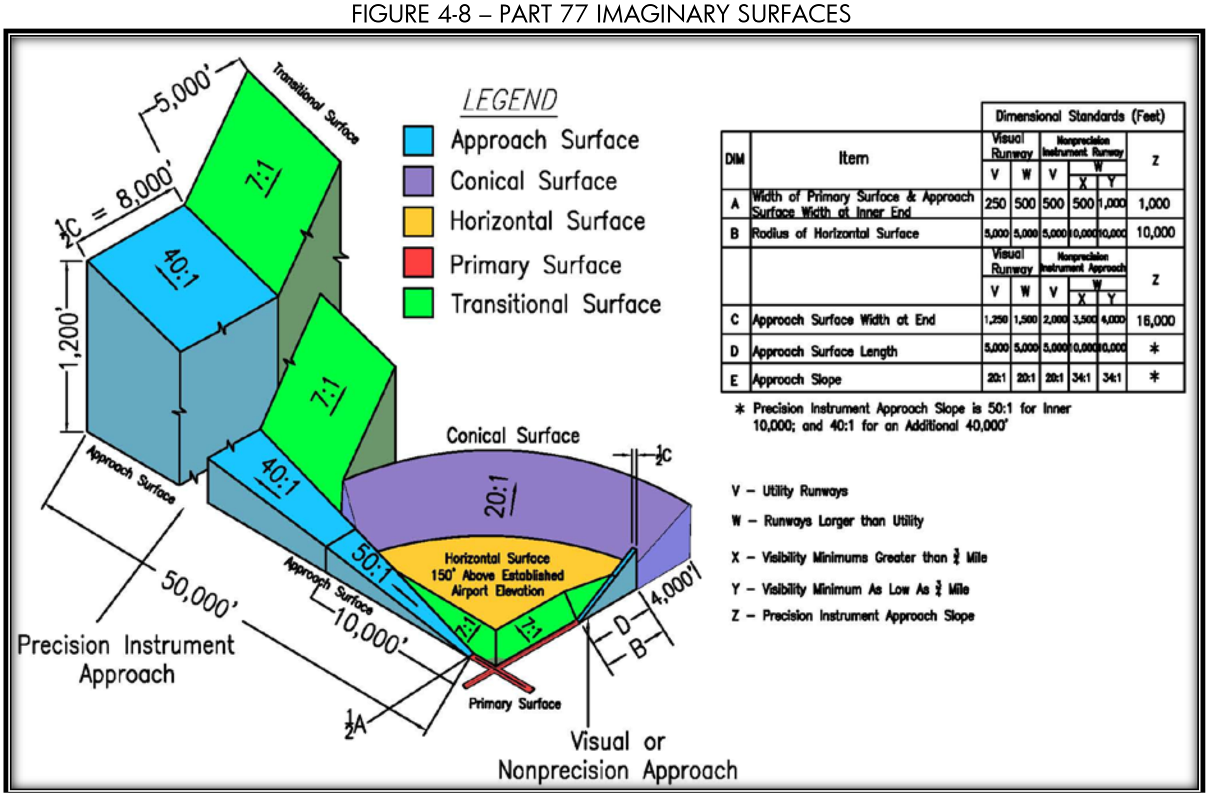
It is recommended to examine alternatives to replace the Endfire Glideslope with a standard glideslope.

4.6 OBSTRUCTIONS AND AIRSPACE REQUIREMENTS

FAR Part 77 defines and establishes the standards for determining obstructions that affect airspace in the vicinity of an airport. Prior to any airport development, RKS must request the FAA to conduct an airspace evaluation to determine the impact to the National Airspace System (NAS) and air safety, regardless of project scale. Part of the airspace evaluation involves the determination of the impact of proposed development on the Airport's imaginary surfaces. Imaginary surfaces are geometric shapes that are in relation to the Airport and each runway, as defined in FAR Part 77. The size and dimensions of these imaginary surfaces are based on the category of each runway for existing and planned airport operations. The five imaginary surfaces are the Primary, Approach, Horizontal, Conical, and Transitional, as shown in **Figure 4-8**, and are defined below. Any object which penetrates these surfaces is considered an obstruction and may affect navigable airspace.

With respect to FAR Part 77, Runway 27 is a larger than utility runway with a precision instrument approach and ½-mile visibility minimums. Runway 9 is a larger than utility runway with a precision instrument approach and visibility minimums as low as ¾-mile. Runways 3 and 21 are utility runways with visual approaches only. However, as discussed in **Section 4.5.1,** Runways 3 and 21 should be planned as non-precision runways in the future.

FIGURE 4-8 – PART 77 IMAGINARY SURFACES



DIM	Item	Dimensional Standards (Feet): Visual Runway V	Visual Runway W	Nonprecision Instrument Runway V	Nonprecision Instrument Runway W X	Nonprecision Instrument Runway W Y	Z
A	Width of Primary Surface & Approach Surface Width at Inner End	250	500	500	500	1,000	1,000
B	Radius of Horizontal Surface	5,000	5,000	5,000	10,000	10,000	10,000
		Visual Runway V	Visual Runway W	Nonprecision Instrument Approach V	Nonprecision Instrument Approach W X	Nonprecision Instrument Approach W Y	Z
C	Approach Surface Width at End	1,250	1,500	2,000	3,500	4,000	16,000
D	Approach Surface Length	5,000	5,000	5,000	10,000	10,000	*
E	Approach Slope	20:1	20:1	20:1	34:1	34:1	*

Source: Jviation, Inc.

Primary Surface - The Primary Surface is an imaginary obstruction-limiting surface that is specified as a rectangular surface longitudinally centered about a runway. The specific dimensions of this surface are functions of the types of approaches existing or planned for the runway.

Approach Surface - The Approach Surface is an imaginary obstruction-limiting surface that is longitudinally centered on an extended runway centerline and extends outward and upward from the primary surface at each end of a runway at a designated slope and distance upon the type of available or planned approach by aircraft to a runway.

Horizontal Surface - The Horizontal Surface is an imaginary obstruction-limiting surface that is specified as a portion of a horizontal plane surrounding a runway and is located 150 feet above the established airport elevation. The specific horizontal dimension of this surface is a function of the types of approaches existing or planned for the runway.

Conical Surface - The Conical Surface is an imaginary obstruction-limiting surface that extends from the edge of the horizontal surface outward and upward at a slope of 20 to 1 for a horizontal distance of 4,000 feet.

Transitional Surface - The Transitional Surface is an imaginary obstruction-limiting surface that extends outward and upward at right angles to the runway centerline and the runway centerline extended at a slope of 7 to 1 from the sides of the primary surface.

4.6.1 Obstructions

Obstructions are defined as any object of natural growth, terrain, permanent or temporary construction equipment, or permanent or temporary manmade structures that penetrate an FAR Part 77 imaginary surface.

An obstruction survey has been completed and is pending National Geodetic Survey (NGS) review.

4.7 AIRSPACE CLASS AND AIR TRAFFIC CONTROL

The airspace that surrounds an airport is classified according to the activity level of the facility and the presence of an air traffic control tower. RKS is currently in Class E airspace, which is airspace that surrounds an airport without an operating airport traffic control tower. The next highest level of airspace is Class D, which involves an operating control tower. Airport traffic control towers typically several million to construct and operate, and must be justified in a cost-benefit analysis. Given the current budget realities of the Air Traffic Control industry, the construction and operation of new control towers are being funded. ***The activity levels that are forecasted for RKS do not justify the construction and staffing of a control tower; therefore, the airspace should remain Class E.***

All aircraft that are on an instrument approach require contact with an air traffic facility. The aircraft on approach to RKS must remain in contact with the controller at the Denver Terminal Radar Approach

Control Facility (Denver TRACON), until pilots have visual contact with the Airport and then cancel their instrument flight plan. The communications link with Denver Center fulfills the current and future air traffic control needs at RKS. ***It is not anticipated that airport traffic control requirements will change during the 20-year planning period. No improvements are recommended.***

4.8 TERMINAL REQUIREMENTS

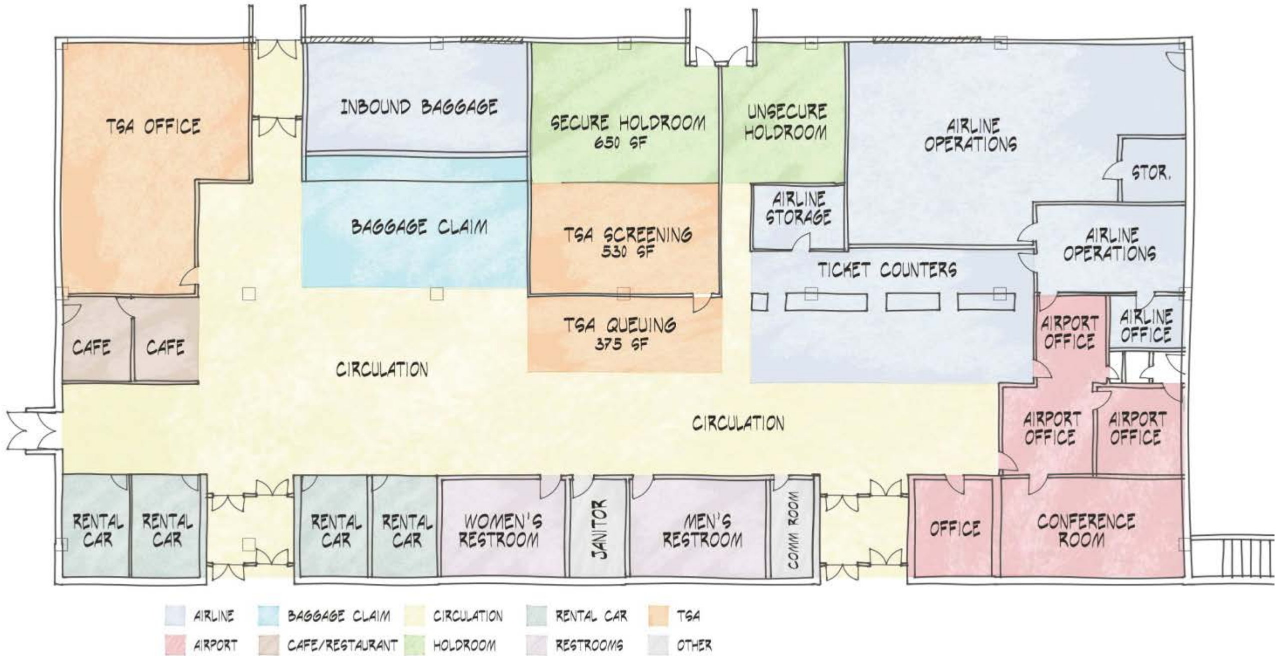
The existing terminal building is in good condition and includes approximately 15,925 square feet of functional space. The approximate square footage of each existing functional area is shown in **Table 4-10** and **Figure 4-9**.

TABLE 4-10 – TERMINAL FUNCTIONAL AREAS

Functional Area	Square Feet
Circulation	4,870
Airport Offices	1,350
Secure Holdroom	650
Unsecure Holdroom	450
Aviator Café	325
Rental Car	750
Restrooms	700
Airline	
Offices/Operations	3,000
Ticket Counter	1,000
Baggage Claim	800
TSA	
Screening	530
Offices	1,100
Utility/Storage	300
Misc	100
Total	**15,925**

Source: HTB, Inc: RKS Terminal Building Drawings

FIGURE 4-9 – RKS TERMINAL



Source: HTB, Inc: RKS Terminal Building Drawings; Image: Jviation, Inc.

The FAA's Airport Cooperative Research Program's (ACRP) A*irport Passenger Terminal Planning and Design* models were used to determine the adequacy of RKS's terminal for the existing and forecasted demand. As discussed in **Chapter 3**, *Aviation Activity Forecasts*, RKS's airline service is anticipated to transition from the 30-seat Embraer 120 to the 50-seat CRJ-200 during the planning period. The peak period for the terminal is 100 enplanements in 2017, which is based on two CRJ-200s departing within 30 minutes of each other. **Table 4-11** shows the terminal requirements, using ACRP's *Airport Passenger Terminal Planning and Design* models based on forecasted demand for the 20-year planning period. Passenger comfort is measured by Level of Service (LOS) and is evaluated on a scale from A to F, with A providing the best passenger experience and F providing the worst. If a functional area is evaluated to be at a LOS of C it is considered adequate. As LOS begins to drop to D and F levels, it is recommended that improvements be made. As shown in **Table 4-11**, the RKS terminal currently has a LOS A.

TABLE 4-11 – TERMINAL AREA NEEDS

	Existing	2012	2017	2022	2032
Aircraft at Peak Hour	2 Emb 120	2 Emb 120	2 CRJ-200	2 CRJ-200	2 CRJ-200
Load Factor	90%	100%	75%	80%	95%
Peak Hour Enplanements	54	60	75	80	95
Gate(s)	1	1	1	1	1
Ticketing					
Counter Positions	7	4	5	5	6
Kiosk Positions	4	2	2	2	3
Curbfront Length*	190	LOS A	LOS A	LOS A	LOS A
Baggage Make Up (SF)	700	600	600	600	600
Baggage Claim Frontage (LF)	36	17	22	23	27
Security					
# of Screening Lanes	1	1	2	2	2
Queue Area (SF)	300	250	500	500	500
Total Screening Area (SF)	600	875	1,750	1,750	1,750
Holdroom	650	1,300	1,600	1,700	2,000
Circulation	4,800	2,000	2,000	2,000	2,000

** Level of Service (LOS)*
Source: ACRP Terminal Planning Spreadsheet Model; Jviation, Inc.

The terminal was built almost 30 years ago and was not initially designed for TSA facilities. As a result, the existing secure holdroom and TSA screening area is tightly configured, and is already at full capacity during peak periods, as shown in **Table 4-11**. Additionally, there are no public restrooms within the secure holdroom. ***It is recommended that the terminal be reconfigured or expanded to better accommodate the existing and future demand for the secure holdroom.*** **Chapter 5**, *Alternatives Analysis,* will examine possibilities to reconfigure or expand the terminal to better accommodate existing and future passenger demand.

4.8.1 Gates and Apron Frontage

As shown in **Table 4-11**, ACRP's *Airport Passenger Terminal Planning and Design* models indicate that one gate is adequate for the 20-year forecast of 40,975 departing passengers in 2032, with six average daily departures. ***Although no additional gates are needed, it is recommended to reserve additional gate space for future activity.***

The commercial apron is made up of roughly 7,200 square yards of concrete and was designed to accommodate at least two parking spaces for aircraft such as the Boeing 737. Although the commercial apron has two designated parking positions designed for the Embraer 120, large charter, or other similar sized aircraft, it can accommodate up to four of these aircraft when necessary. Additionally, the commercial apron has a pavement strength of 80,000 pounds SWG aircraft, 130,000 pounds DWG aircraft, 260,000 pounds Dual Tandem Gear (DTG) aircraft. The commercial apron also is rated in "Excellent" condition according to the 2012 WYDOT Pavement Index Condition Report. The commercial apron's size, pavement strength, and condition are adequate to accommodate existing and future aircraft. ***The commercial apron is adequate for the current and forecasted demand at RKS; no modifications are recommended. If hold room expansion occurs on a portion of the existing apron, alternatives will need to be evaluated for potential apron expansion.***

4.9 General Aviation Requirements

The number and types of projected GA operations and based aircraft can be converted into a generalized projection of GA facility needs. GA facilities include the Fixed Base Operator (FBO), hangars, and apron/tiedown space.

4.9.1 Aircraft Storage Facility Requirements

Hangar requirements are a function of the number of existing and forecasted based aircraft. RKS currently has approximately 95,000 square feet of conventional hangar and T-hangar space to accommodate based aircraft, including six T-hangar units, four box hangars, and one FBO hangar. This equates to approximately 1,827 square feet of hangar space for each existing based aircraft. However, because there are no vacant hangars and many airport users have indicated the need for additional hangar space, a planning ratio of 2,000 square feet will be used for future based aircraft storage requirements, as shown in **Table 4-12**. Specific demand will be based on the actual size of aircraft that ultimately base at RKS.

Additionally, the condition of the facilities range from new (good) to poor. Some hangars are already beyond their useful life and will require replacement. ***Aircraft hangar storage is currently at capacity; additional hangar development is recommended***. Alternative hangar development options will be investigated in **Chapter 5**.

TABLE 4-12 – HANGAR REQUIREMENTS

Year	Based General Aviation Aircraft	Based Aircraft Using Tiedowns	Minimum Hangar Space Required (square feet)	Current Hangar Space (square feet)	Hangar Surplus or Shortfall (square feet)
2017	50	2	104,000	95,000	-9,000
2022	52	2	108,000	95,000	-13,000
2027	53	2	110,000	95,000	-15,000
2032	55	2	114,000	95,000	-19,000

Source: Jviation, Inc.

4.9.2 Aircraft Parking Aprons

Apron frontage is premium airport space and should be strategically utilized with the highest and best use. The planning and design of aprons take into account the location of airport terminal buildings, FBO buildings, and other aviation related access facilities at an airport. Aprons provide parking for based and transient airplanes, access to the terminal facilities, fueling, and surface transportation. Currently, the GA apron at RKS has 44 aircraft tiedown positions; two are used for based aircraft and the remaining 42 acre reserved for transient aircraft. The apron consists of approximately 17,370 square yards of concrete with pavement strengths of 30,000 pounds SWG and 60,000 pounds for DWG.

4.9.2.1 Aircraft Parking Apron

As a general guideline, an area of 1,100 square yards is needed for each transient aircraft parked on the apron. This space takes into account the taxilane OFA width and other necessary space for fueling, parking and other airplane related activity. Transient airplane activity is estimated to determine the area of apron needed for existing and future demand. As indicated in **Table 3-14,** there will be approximately 18,887 operations at RKS in 2032. Additionally, **Table 3-15** shows that in 2032, peak day activity is estimated to be approximately 69 operations. Due to the type of users that operate at RKS, it is reasonable to assume that 14 transient aircraft will be using the GA apron simultaneously on a peak day in 2032.

Additionally, apron space utilized for based aircraft is separate from that of transient aircraft. Currently, two based aircraft are stored on tiedowns along Taxiway E, and do not use the GA apron. ***It is anticipated that additional based aircraft will be stored in hangars; therefore, no additional apron space is required for based aircraft.***

Table 4-13 summarizes current apron space available and the minimum apron space required, for years 2017, 2022, 2027, and 2032. The minimum apron space required meets the current space available, although it is nearing capacity. ***No additional apron space is needed; however, it is recommended to reserve an area for future apron expansion as the existing apron is nearing capacity.*** **Chapter 5**, *Alternative Analysis*, will evaluate future apron expansion alternatives.

TABLE 4-13 – APRON REQUIREMENTS

Year	Peak Day Operations	Minimum Apron Required	Current Apron Space	Apron Surplus or Shortfall
2017	12 Transient	13,093 SY	17,370 SY	4,277 SY
2022	12 Transient	13,086 SY	17,370 SY	4,284 SY
2027	14 Transient	15,149 SY	17,370 SY	2,221 SY
2032	14 Transient	15,796 SY	17,370 SY	1,574 SY

Source: Jviation, Inc.

4.9.3 FBO Facility Needs

RKS has one full-service FBO, located northeast of the terminal building. As discussed in **Section 2.7.1**, the FBO facility is currently owned and operated by RKS, and caters to GA traffic with fuel sales, tiedowns, and other amenities. In addition, the facility provides space for other basic functions such as a pilot lounge, flight planning, and restrooms. The FBO facilities and hangar are outdated, and the Airport has received feedback from users requesting FBO facility improvements.

Improvement to the FBO facilities and hangar are recommended. Improvement options will be discussed in detail in **Chapter 5**, *Alternatives Analysis*.

Additionally, as part of this Master Planning effort, an FBO Management Structure Analysis will be conducted to identify and assess different potential FBO privatization options that would create the greatest return while minimizing risk. This study will be discussed later in **Chapter 7**, C*apital Improvement and Financial Implementation Plan* and in Appendix E.

4.10 LANDSIDE REQUIREMENTS

Landside facilities support airside operations, such as the facilities necessary for handling aircraft and passengers while on the ground. The landside facilities consist of FBO buildings, access roads, hangars, and other support facilities. The capabilities and capacities of various landside components are examined in relation to the projected demand to help identify future landside facility needs.

4.10.1 Regional Transportation Network

The Interstate 80 connection to Wyoming Highway 370 provides direct access to RKS. ***The access roads leading to RKS are sufficient to accommodate daily traffic, even during peak periods.***

4.10.2 On-Airport Circulation Roadways

Ground access to the passenger terminal building is provided by a loop road circling the parking areas, and provides curb front access and general circulation. ***The on-airport circulation roads and curb front are adequate for current and projected demand at RKS.***

4.10.3 Terminal Auto Parking

Parking space requirements for the terminal parking lot are a function of forecasted enplanements. RKS currently has 374 free long-term and short-term paved parking spaces for commercial passengers, located north of the terminal building. Due to the long-term parking characteristics of the passengers that use RKS, there is a high ratio of parking spaces to enplanements. For planning purposes, the existing ratio of one parking space for every 70 enplanements was used to determine parking lot demand at RKS, as shown in **Table 4-14**.

TABLE 4-14 – TERMINAL PARKING DEMAND

	Existing	2012	2017	2022	2032
Parking Spaces	374	355	417	493	687

Source: Jviation, Inc.

It is recommended that by 2032, 313 parking spaces be added to the terminal parking lot to accommodate projected demand at RKS. **Chapter 5**, *Alternative Analysis,* will evaluate future parking lot expansion options.

4.10.4 General Aviation Auto Parking

For GA parking, there are 76 paved public parking spaces located in front (west) of the FBO hangar. The GA parking lot is heavily used and is currently over capacity, which is due to frequent charter activity for Halliburton. Halliburton frequently transports oil field workers to North Dakota, which places a heavy demand on the existing GA parking lot. An unpaved overflow lot, which accommodates approximately 50 parking spaces, was recently constructed on the west side of the existing parking lot to help accommodate demand. Parking space requirements for GA users are a function of the number of parking space and itinerant operations. Due to the long-term parking characteristics of GA users, there is a high ratio of parking spaces to itinerant operations. For planning purposes, the existing ratio of one parking space for every 90 itinerant operations was used to determine parking lot demand at RKS, as shown in **Table 4-15**.

TABLE 4-15 – GA USER PARKING DEMAND

	Existing	2012	2017	2022	2032
Parking Spaces	76	110	116	122	134

Source: Jviation, Inc.

The construction of an additional 58 parking spaces to the GA parking lot is recommended to accommodate future demand at RKS. Alternatives for the GA parking lot will be investigated in **Chapter 5**.

4.11 AIRPORT EQUIPMENT

4.11.1 ARFF Equipment

RKS's Oshkosh ARFF vehicle has a capacity of 1,500 gallons of water, 210 gallons of Aqueous Film Forming Foam (AFFF), and 450 pounds of dry chemical, which meets ARFF Index B requirements. According to the 2012 Wyoming Airports Capital Improvement Plan (WACIP), RKS will be purchasing an additional ARFF vehicle in 2014. ***No additional or replacement ARFF equipment is recommended for this planning period.***

4.11.2 Snow Removal Equipment (SRE)

RKS's snow removal equipment (SRE) includes a 2006 Unimog snow plow with 14-foot blade attachment, a 1989 Oshkosh snow plow with a 22-foot blade attachment, a John Deere tractor with front-end bucket and 12-foot blade attachments, and a Western Star snow plow with 20-foot blade and 20-foot Sweepster broom attachments. The John Deere tractor is also used for mowing operations. The Airport's snow removal and maintenance equipment adequately meets the requirements of AC 150/5200-30C, *Airport Winter Safety and Operations*, which requires enough equipment to clear one inch of falling snow per hour from the primary runway, taxiway(s), and commercial service apron. ***The replacement of the 1989 Oshkosh snowplow is recommended within the 20-year planning period.***

4.12 SUPPORT FACILITIES

4.12.1 Aircraft Rescue and Firefighting (ARFF) Station

The ARFF Station was constructed in 2009 and is located adjacent to the FBO hangar on the GA apron. It is a 50-foot by 50-foot building with two bays, one of which holds the current Oshkosh ARFF vehicle. The bays' door openings are 14 feet tall and 14 feet wide. The ARFF station is currently in excellent condition and is adequate to accommodate the existing ARFF vehicle, as well as the additional ARFF vehicle scheduled to be purchased in 2014. ***No modifications to the ARFF station are recommended.***

4.12.2 Airport Maintenance Facilities

The airport maintenance building was also constructed in 2009, and it is located directly southeast of the ARFF station. It is a 100-foot by 100-foot building with six parking bays, which house all snow removal and maintenance equipment. The building also has several offices, restrooms, and a kitchen for airport staff to use during snow removal operations, and is also in excellent condition. ***The SRE/Maintenance Building is sufficient to house the existing snow removal and maintenance equipment, and has room for additional vehicles. No modifications are recommended.***

4.13 FUEL STORAGE REQUIREMENTS

RKS has four underground storage tanks (USTs) located in the FBO service area. The USTs include two 12,500-gallon Jet A tanks and two 12,500 gallon AvGas tanks. The Airport also owns two fuel trucks for dispensing aviation fuel: one AvGas truck with a capacity of 750 gallons and one Jet A truck with a capacity of 2,200 gallons.

Based on fuel data provided by RKS, an average of 378,760 gallons of fuel was dispensed annually between 2009 and 2010. The average annual operations for the same time period were approximately 14,075 operations.[61] Measuring fuel flowage against annual operations equates to approximately 27 gallons of fuel per operation. Comparing the average 27 gallons per operation against the Airport's existing fuel storage capacity, approximately 27 days of fuel storage can be accommodated in 2032, as detailed in **Table 4-16**.

TABLE 4-16 – FUEL STORAGE CAPACITY

	2012	2017	2022	2032
Operations - Average Peak Day	60	61	63	69
Fuel (gal) – Average Peak Day	1,620	1,647	1,701	1,863
Existing Fuel Storage	50,000	50,000	50,000	50,000
Approximate Days of Fuel	31	30	29	27

Source: Jviation

[61] FAA TAF 2012

The existing fuel storage provides an adequate level of service for existing and future operations for the 20-year planning period. Existing storage capacity also provides for possible delays which could occur in fuel delivery, given the location of the Airport. ***Existing and future fuel storage capacity requirements are met; no modifications are recommended.***

4.14 DEICING FACILITIES

Deicing is the removal of frost, ice, slush, or snow through the application of heated water and propylene or ethylene glycol to ensure safe aircraft operations. Deicing operations use large amounts of chemicals, which drain off airport facilities into nearby rivers, lakes, and streams. This can significantly impact water quality, including reductions in dissolved oxygen, reduced organism abundance and species diversity, and drinking water contamination.

On August 28, 2009, the EPA issued their proposed rule 40 CFR 449, entitled *Effluent Limitation Guidelines and New Source Performance Standards for the Airport Deicing Category*, in the Federal Register.

As originally proposed, the rule would require that airports over a certain size, as determined by the number of operations, collect either 20% or 60% of Aircraft Deicing Fluid (ADF), depending on the total amount of gallons dispensed per year. However, after undergoing an extended comment period, the final published rule removed many of these collection requirements. As currently published, existing airports with 1,000 or more annual jet departures that generate wastewater associated with airfield pavement deicing are to use non-urea-containing deicers, or alternatively, meet a numeric effluent limitation for ammonia[62]. ***The current collection system meets the 20% requirements; therefore, RKS will not be required to collect deicing fluid. RKS should continue to monitor ADF collection activities and compliance with EPA standards.***

4.15 UTILITIES

Utilities at the Airport include potable water, sanitary sewer, fiber optics and phone, electric, storm water, and natural gas. Currently, all existing utilities, except water, are adequate to meet the existing demand. Currently, there is no water service that connects RKS to the City of Rock Springs municipal water system. Potable water is delivered by truck to RKS and stored in a 74,000-gallon on-site water tank, located west of the SRE/Maintenance Building. The existing amount of available water to RKS has limited hangar expansion. In 2012, RKS was awarded a Wyoming Business Council grant to construct a new 300,000-gallon water tank to store untreated water for fire protection activities. The tank will be constructed in 2013 and will only meet the existing needs of RKS. For there to be **any future building development**, including hangars and terminal expansion, a larger water tank and ultimately a water line from the City to the Airport will need to be installed.

The City of Rock Springs and Sweetwater County have discussed a possible extension of the City's water supply to RKS. Although the complexity and cost to extend the water line approximately seven miles has

[62] United States Environmental Protection Agency, Fact Sheet: *Effluent Guidelines for Airport Deicing Discharges*, April 2012

delayed the project, the City and County have indicated that extending the water service to RKS is still a priority once funding becomes available.[63]

Any future building development will require improvements to the existing water storage capacity (such as a larger water tank) and water line access, which will be examined in Chapter 5.

4.16 REGULATORY REQUIREMENTS

4.16.1 Airports Geographic Information Systems (AGIS)

In order to better support FAA NextGen, GIS standards have been introduced and are gradually being phased in over time. The goal with NextGen is to create a system-wide standard for collection and input of aviation data. The FAA introduced three new advisory circulars to provide guidance for these new standards, which became mandatory for all federally obligated airports on September 2009. AC 150/5300-16A, AC 150/5300-17C, and AC 150/5300-18B, which describe how the data is collected and processed, replaced the now obsolete FAA Survey Standard No. 405.

As part of the Master Plan Update, GIS data was collected, which meets the requirements of AC 150/5300-16A, *General Guidance and Specifications for Aeronautical Surveys*, AC 150/5300-17C, *General Guidance and Specifications for Aeronautical Surveys: Airport Imagery Acquisition and Submission to the appropriate government agencies*, and AC 150/5300-18B, *General Guidance and Specification for Aeronautical Surveys: Airport Survey Data Collection and Geographic Information System Standards*.

In addition to following these guidelines, the FAA plans to further standardize the data collection process so future Airport Layout Plans (ALPs) are uniform and easily obtained through an online depository. As these methods and technologies are created, they will be rolled out to the system in a phased approach.

RKS will be compliant with the AGIS requirement at the completion of this Master Plan.

4.16.2 Airport Emergency Plan

After the events of 9/11, the FAA released a revision to AC 150/5200-31C, *Airport Emergency Plan* (AEP). The change provided guidance for airports to develop and implement the now mandated FAA-approved emergency plan outlined in Title 14 Code of Federal Regulations (CFR) 139.325.

Significant changes were included in the revised AC to allow airports to better respond to emergencies. In particular, the National Incident Management System (NIMS) and the Incident Command System (ICS) have now been incorporated. This inclusion required changes to organizational structure and response methodology. These changes would require additional training and resources for airports.

[63] Rock Springs Master Plan 2012, Chapter 7: Transportation – Roadways, Public Transit, Air Service

In order to remain in compliance with RKS submitted an updated AEP in September 2012 for FAA's review and approval.

4.17 SUMMARY

A summary of the recommended improvements is provided in **Table 4-17**. Detailed discussions of ten recommended enhancements or modifications were explained throughout the chapter.

TABLE 4-17 – RKS FACILITY REQUIREMENTS SUMMARY

Section	Facility	Enhancements Recommended
4.2.4	Runway Width	*Widen Runway 9/27 shoulders to 25 feet*
4.2.6	Runway Strength	*Increase Runway 3/21 pavement strength to 26,500 pounds DWG during the next scheduled resurfacing project*
4.2.8	Taxiways	*Update taxiways to meet TDG 3 design standards* *The angle of Taxiway C at Runway 3/21 should be increased to 90° to enhance safety* *Add paved taxiway shoulders to taxiways serving ADG-III aircraft*
4.3	Airfield Markings, Lighting, Signage	*Update taxiway centerline marking to meet TDG 3 design standards*
0	Instrument Approaches	*Continue to monitor the implementation of NextGen*
4.6	Obstructions	*To be completed pending obstruction survey*
4.8	Terminal Requirements	*Reconfigure or expand terminal to accommodate a 2,000 SF holdroom and 1,750 SF for TSA screening demands*
4.9.1	GA Hangar Facilities	*An additional 19,000 SF of hangar development is recommended by 2032*
4.9.3	FBO Facility	*Improvements to the FBO facilities and hangar are recommended*
4.10	Landside Requirements	*Add 313 parking spaces to the Terminal Parking lot and add 58 parking spaces to the GA Parking lot by 2032*
4.15	Utilities	*Add water capacity improvement to facilitate development*

Source: Jviation, Inc

5.0 ALTERNATIVE ANALYSIS

There are several key areas at Rock Springs-Sweetwater County Airport (RKS) which need to be developed to accommodate existing and/or future aviation demand. The purpose of this chapter is to describe and evaluate several development alternatives, and to select a preferred development plan that will accommodate future demand, and meet identified facility needs outlined in **Chapter 4**, *Facility Requirements*. The preferred alternatives will serve as the basis for the Airport Layout Plan (ALP) drawing set. These alternatives are not only a refinement of the identified facility requirements, but are designed development objectives:

- Comply with FAA design standards and guidelines given in AC 150/5300-13A, *Airport Design*
- Be compatible with other existing and proposed uses on and off the Airport
- Minimize negative environmental impacts
- Provide the technical basis necessary to determine the preferred course of action
- Be cost effective

As previously discussed in **Chapter 4**, identified facility needs require further analysis to determine the optimum layout and potential of the facilities. The result of this analysis will be a cohesive plan for airport development that functionally combines recommended improvements. The key development areas for improvement that will be evaluated include:

- Realignment of Taxiway C
- Evaluation of the Endfire Glideslope
- Reconfiguration or expansion of the terminal building
- Remodel or construct a new FBO facility
- Development of GA hangars
- Expansion of the terminal auto parking lot
- Expansion of the GA auto parking lot

Inclusion of the identified projects on the ALP does not indicate a commitment on the part of the FAA and State of Wyoming to provide funding for any or all projects.

5.1 Evaluation Criteria

To assist in evaluating the following alternatives, several criteria were used. Where applicable, the alternatives will be evaluated based on these broad categories:

- Operational Criteria will evaluate the ability of the alternative to accommodate the existing and/or projected demand of aircraft, passengers, and/or vehicles.
- Environmental Criteria will be evaluated to determine if the proposed development provides for minimal environmental disruption.
- Compatibility Criteria will determine if the development is compatible with future, short and long-term needs of the Airport.
- Feasibility Criteria will evaluate the tangible and intangible factors that affect an airport's ability to implement certain development projects.
- Economic Criteria will evaluate an estimate of costs to provide a basis for comparison of each alternative.

5.2 Taxiway C

As discussed in **Section 4.2.8**, Taxiway C, between Taxiway D and the threshold of Runway 21, does not meet the 90 degree taxiway to runway intersection design principle as outlined in Chapter 4 of AC 150/5300-13A, *Airport Design*. This design principle increases visibility for the pilot, which will enhance safety at this location. There is only on alternative that exists to meet this standard. It is being presented her to offer discussion on whether it is feasible to implement their recommendation. The second alternative would be to keep the current taxiway geometry.

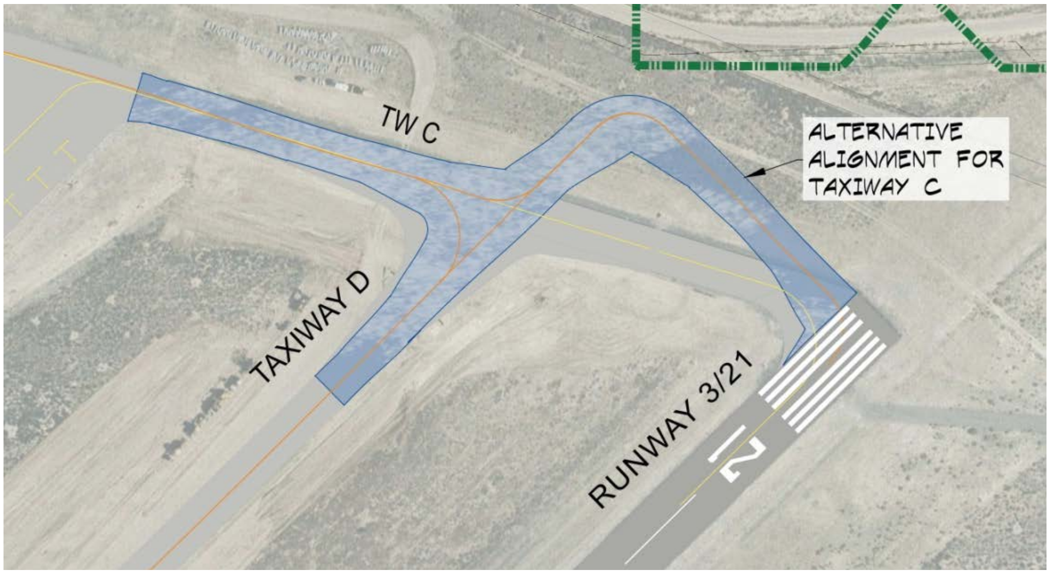
5.2.1 Alternative 1 – Taxiway C Realignment

As shown below in **Figure 5-1**, Alternative 1 realigns Taxiway C using the new TDG 3 design standards in AC 150/5300-13A, *Airport Design*. The Taxiway C realignment provides a 90-degree intersection at Runway 3/21, which enhances visibility for the pilot, thus increasing the safety of aircraft operations. This taxiway realignment will cost approximately $1.4 million.

Evaluation Criteria:

- Operational Criteria: Alternative 1 will accommodate existing and projected aircraft demand.
- Environmental Criteria: No significant environmental impacts anticipated. The appropriate level of environmental review is required prior to construction.
- Compatibility Criteria: Taxiway C realignment is compatible with the short and long-term needs of the Airport.
- Feasibility Criteria: The Taxiway C realignment will require FAA approval for funding.
- Economic Criteria: The estimated cost to realign Taxiway C is approximately $1.4 million.

FIGURE 5-1 – TAXIWAY C REALIGNMENT ALTERNATIVE



Source: Jviation, Inc.

5.2.2 Alternative 2 – Keep Existing Geometry

Alternative 2 maintains the existing taxiway geometry, with Taxiway C not meeting the design standard of a 90 degree taxiway to runway intersection at the Runway 21 threshold. This would become a "nonstandard" condition, and would be submitted to the FAA for Modifications to Standards during the Airport Layout Plan approval process.

Evaluation Criteria:

- Operational Criteria: Alternative 2 will accommodate existing and projected aircraft demand.
- Environmental Criteria: No significant environmental impacts anticipated.
- Compatibility Criteria: Maintaining the existing taxiway geometry is compatible with the short and long-term needs of the Airport.
- Feasibility Criteria: Maintaining the existing taxiway geometry will create a nonstandard condition. FAA approval will be required when submitting a Modification to Standards.
- Economic Criteria: There is no anticipated cost by maintaining the existing taxiway geometry, other than scheduled pavement maintenance.

5.2.3 Alternative Summary (Recommendation)

Although a lower priority than the scheduled airfield pavement rehabilitation, the Taxiway C realignment is recommended when funding is available.

This section will be updated following direction from Airport Management and the Airport Board for the Taxiway C realignment.

5.3 ENDFIRE GLIDESLOPE

As discussed in **Section 2.4.7**, due to the steep terrain, Runway 27 has a unique glideslope antenna array called the Endfire Glideslope (EFGS) at the approach end of Runway 27. Although this antenna can be simpler to install in these conditions, this nonstandard piece of equipment has become problematic for long-term maintenance. However, replacement of this particular glideslope with a standard glideslope, or with other current technologies, is not practical at this time. For RKS to replace the EFGS with a standard glideslope, it requires a level area in front of the glideslope, 2,050 feet by 400 feet, which would require a deep fill that would be extremely costly. However, recent technological advancements have made possible the use of satellite-based navigation systems that rival conventional ground-based (e.g. glideslope) equipment in accuracy and dependability. As GPS technology advances, RKS eventually may be able to have a precision GPS approach to all the runway ends. GPS satellite based instrument approaches follow the same basic guidelines as ground based systems. The lowest possible minimums for approaches with horizontal-only guidance are 300 feet above ground with one mile visibility. With the addition of vertical guidance through Wide Area Augmentation System (WAAS) or Ground Base Augmentation System (GBAS), the minimums can be reduced to 200 feet above ground and ½-mile visibility.

5.3.1 Alternative 1 – Replace Endfire, Invest in Terrestrial/Standard Glideslope

Alternative 1 includes the replacement of the existing Endfire Glideslope with a terrestrial-based/standard glideslope. This would require a deep fill to level of 2,050 feet by 400 feet. The estimated cost for replacing the EFGS with a terrestrial-based/standard glideslope is estimated in excess of $5 million.

- Operational Criteria: Alternative 1 will support existing and projected aircraft demand.
- Environmental Criteria: The appropriate level of environmental review is required prior to construction.
- Compatibility Criteria: The replacement of the Endfire Glideslope with a terrestrial-based/standard glideslope is compatible with the short and long-term needs of the Airport.
- Feasibility Criteria: The replacement of the Endfire Glideslope will require FAA approval for funding.
- Economic Criteria: The estimated cost to replace the Endfire Glideslope will be in excess of $5 million. The majority of this cost is for the earthwork necessary to provide the required graded area for a traditional glideslop antenna.

5.3.2 Alternative 2 – Monitor NextGen for Space/Satellite Solutions

Alternative 2 involves maintaining the existing Endfire Glideslope while monitoring for space/satellite-based navigation systems, such as NextGen and GPS technology for future approaches. This would require the routine maintenance costs for the existing EFGS; however, should a satellite-based navigation system eventually replace the EFGS, the maintenance costs for a satellite-based system would be less over the long-term.

- Operational Criteria: Alternative 2 will support existing and projected aircraft demand.
- Environmental Criteria: No significant environmental impacts anticipated. Appropriate level of environmental review is required.
- Compatibility Criteria: Maintaining the existing Endfire Glideslope while monitoring for NextGen and GPS technology solutions are compatible with the short and long-term needs of the Airport.
- Feasibility Criteria: the ultimate implementation of a satellite-based navigation system would require FAA approval for funding.
- Economic Criteria: Only routine maintenance costs for maintaining the existing Endfire Glideslope are required.

5.3.3 Endfire Glideslope Recommendation

The implementations of NextGen and GPS technology have already had profound impacts on instrument approach capabilities at public use airports. It is recommended that the Airport monitor NextGen and the evolution of GPS technology for future approaches.

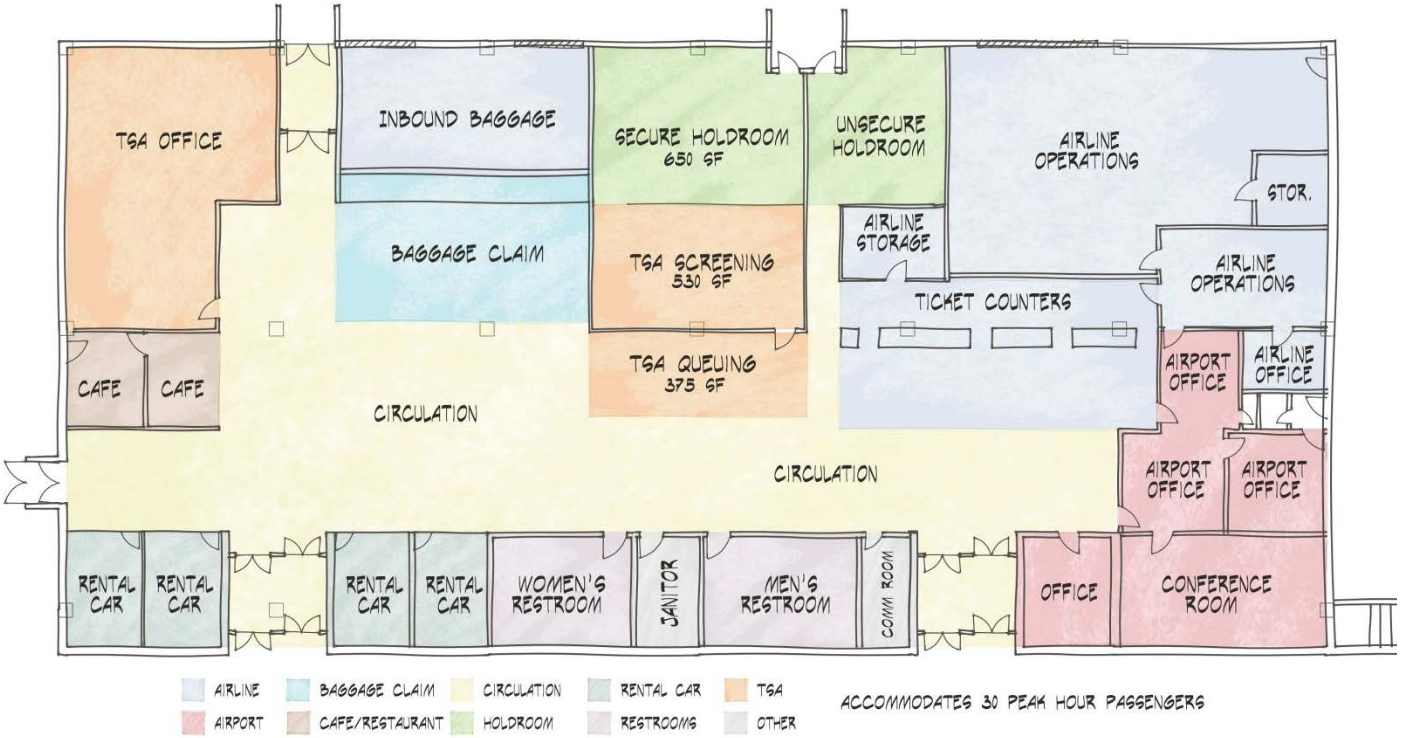
5.4 Terminal Building

The terminal building was constructed almost 30 years ago and was not initially designed for TSA facilities. As a result, the existing secure holdroom and TSA screening area are tightly configured, and already at full capacity during peak periods. Further, there are no public restrooms within the secure holdroom.

In **Section 4.8**, this study evaluated the adequacy of RKS's terminal against the existing and forecasted demand using the FAA's Airport Cooperative Research Program's (ACRP) A*irport Passenger Terminal Planning and Design* models. Additionally, the airlines are projected to transition from the 30-seat Embraer 120 to the 50-seat CRJ-200 during the 20-year planning period. As a result, peak hour enplanements are anticipated to increase from 35 in 2011 to 75 beginning in 2017 (see **Section 3.2.1.1**). This calculation is based on two CRJ-200 regional jets departing within 30 minutes of each other to hit the morning banks at DIA and SLC. Consequently, the existing secure holdroom and TSA screening and queuing areas are too small to accommodate existing and future demand.

It was previously recommended in **Chapter 4** that the terminal be reconfigured or expanded to meet existing and future demand requirements. **Figure 5-2** shows the existing terminal building layout, and **Table 5-1** shows terminal space requirements.

FIGURE 5-2 – RKS TERMINAL



Source: HTB, Inc: RKS Terminal Building Drawings; Image: Jviation, Inc.

TABLE 5-1 – TERMINAL AREA NEEDS

	Existing	2012	2017	2022	2032
Aircraft at Peak Hour	2 Emb 120	2 Emb 120	2 CRJ-200	2 CRJ-200	2 CRJ-200
Load Factor	90%	100%	75%	80%	95%
Peak Hour Enplanements	54	60	75	80	95
Gate(s)	1	1	1	1	1
Ticketing					
Counter Positions	7	4	5	5	6
Kiosk Positions	4	2	2	2	3
Curbfront Length	190	LOS A	LOS A	LOS A	LOS A
Baggage Make Up (SF)	700	600	600	600	600
Baggage Claim Frontage (LF)	36	17	22	23	27
Security					
# of Screening Lanes	1	1	2	2	2
Queue Area (SF)	300	250	500	500	500
Total Screening Area (SF)	600	875	1,750	1,750	1,750
Holdroom	650	1,300	1,600	1,700	2,000
Circulation	4,800	2,000	2,000	2,000	2,000

Source: ACRP Terminal Planning Spreadsheet Model; Jviation, Inc.

As can be seen in Table 5-1, some balancing of the existing terminal space is necessary, but some additional space may be required or desirable. The following alternatives examine possible reconfigurations and expansions of the terminal building to better accommodate existing and future passenger demand. The design of any reconfiguration and/or expansion to the terminal building will require further analysis of:

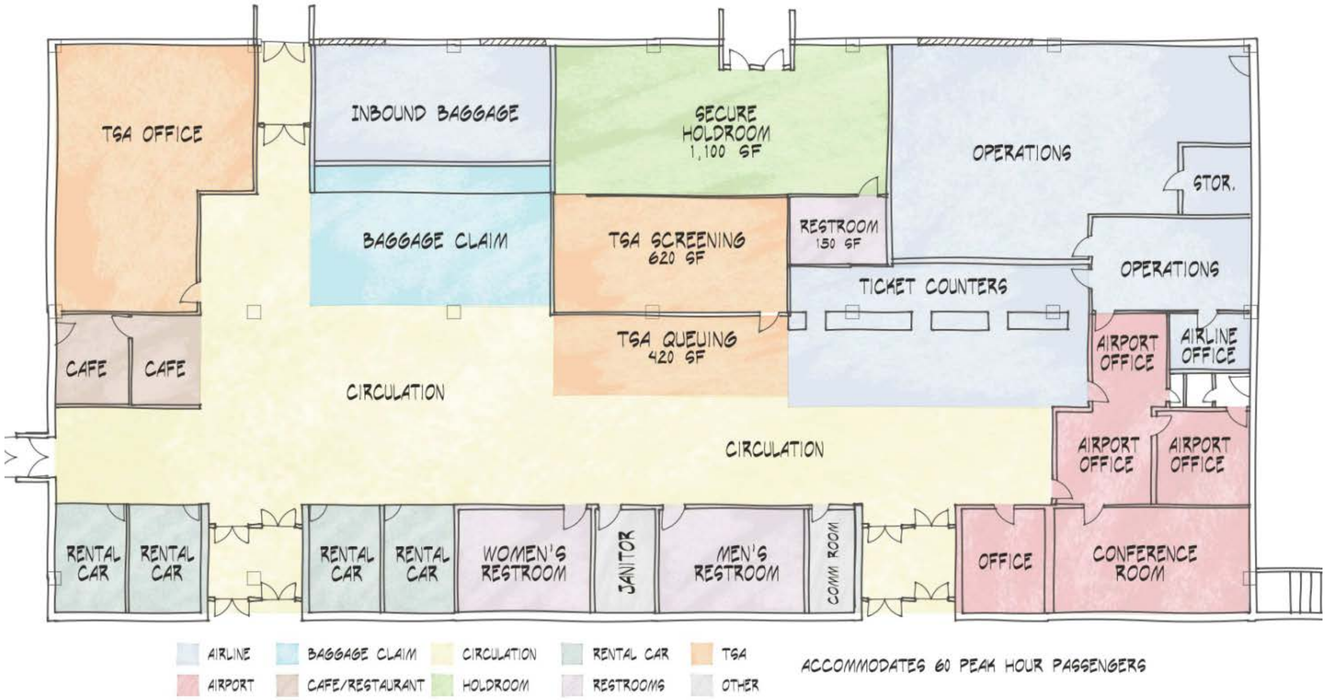
- Mechanical / HVAC system
- Electrical service
- Impact on domestic water and sanitary sewer services
- Architectural styling and detailing to integrate the expansion with the existing terminal
- The architectural program should be studied to determine the required space needs, space types, adjacencies, and additional square footage necessary for the reconfiguration
- Circulation/access will need to be analyzed to determine the locations of access points
- If the reconfiguration and/or expansion are large enough, (either by cost or square footage, depending on the local building department) a re-evaluation of the entire terminal building may be required to ensure compliance with current building codes. This would generally have an impact to life safety elements of the building and compliance with the Americans with Disabilities Act (ADA).

5.4.1 Alternative 1 – Minimum Expansion

Alternative 1 provides a modest reconfiguration of the existing terminal building to meet short-term demand, accommodating approximately 60 peak hour passengers. This alternative expands the existing secure holdroom into the adjacent unsecure holdroom, increasing the size of the secure holdroom from approximately 650 to 1,100 square feet. Also, the existing TSA screening and queuing is expanded into the adjacent hallway, increasing the size of the TSA screening room from 530 to 620 square feet, and increasing the TSA queuing area from 375 to 420 square feet. Further, the existing airline storage area is converted into a restroom to provide bathroom facilities within the secure area.

This reconfiguration does not increase water usage demand enough to necessitate a larger water tank, nor the addition of any new water lines. The cost of this alternative will depend upon the degree of aesthetics and amenities; however, the reconfiguration and renovation of the 2,290 square feet will cost approximately $100,000. Alternative 1 for the terminal building is shown in **Figure 5-3**.

FIGURE 5-3 – TERMINAL ALTERNATIVE 1 – SHORT TERM RECONFIGURATION

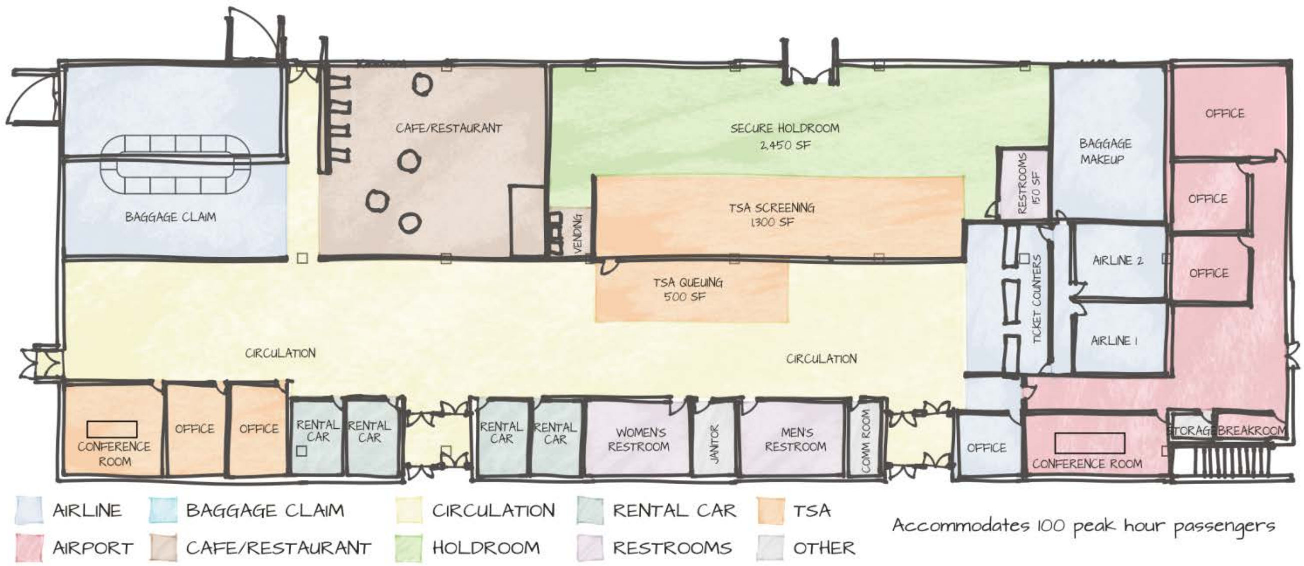


Source: Jviation, Inc.

5.4.2 Alternative 2 – Expand Each End Out

Alternative 2 reconfigures and expands the existing terminal building laterally, meeting the projected demand (nearly 100 peak hour passengers) within the 20-year planning period. This alternative encompasses the reconfiguration elements of Alternative 1 and also expands the terminal to the west and east by an additional 3,850 square feet. This expansion increases the size of the secure holdroom from 650 to 2,450 square feet, the TSA screening area increases to 1,330 square feet, and the TSA queuing area increases to 500 square feet. Bathroom facilities are also added within the secure holdroom. This expansion and reconfiguration moves the airport administration offices to the west side of the airport and TSA offices to the northeast side of the terminal building, while expanding the café to accommodate a potential restaurant adjacent to the baggage claim. Since this alternative increases the overall size of the terminal building, a water line or a larger water tank would be required before any expansion would be possible. The cost of this expansion will depend on the degree of aesthetics and amenities, but the reconfiguration and expansion to 3,850 square feet will cost approximately $2.5 million. Alternative 2 for the terminal is shown in **Figure 5-4**.

FIGURE 5-4 – TERMINAL ALTERNATIVE 2 – LARGE RECONFIGURATION & LATERAL EXPANSION



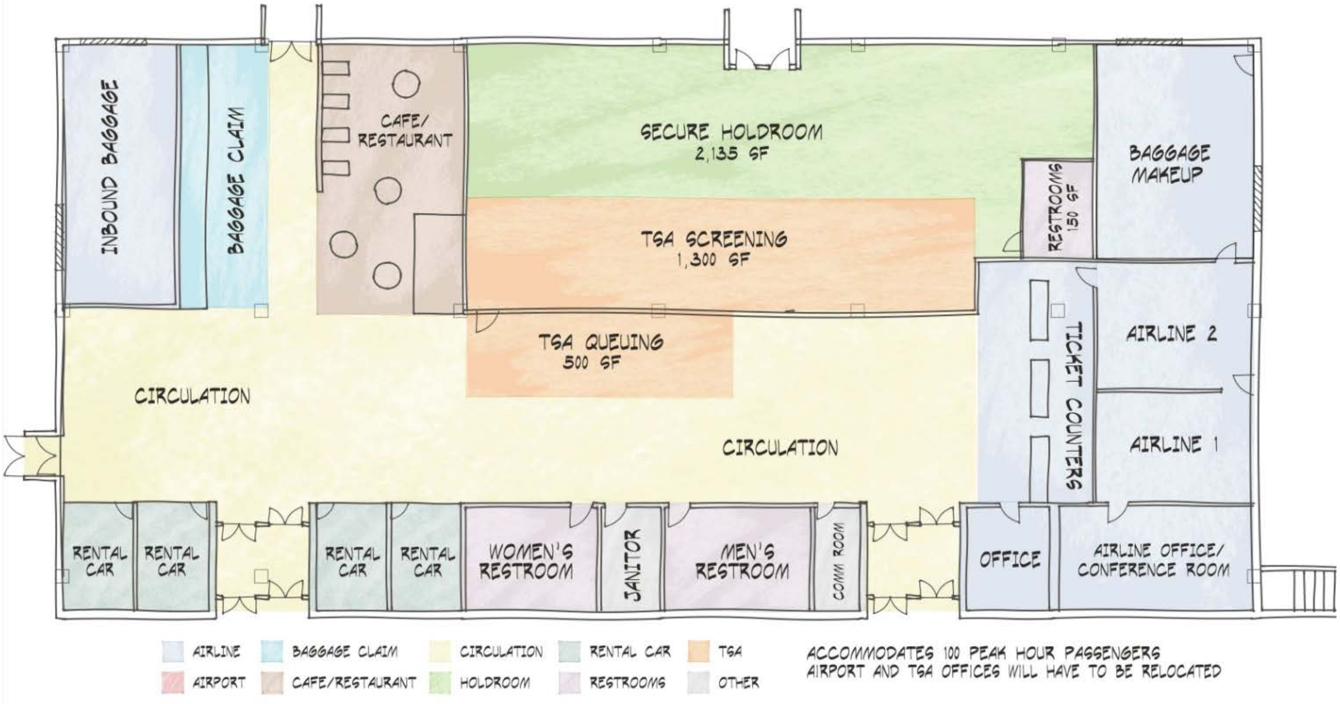
Source: Jviation, Inc.

5.4.3 Alternative 3 – Large Reconfiguration

Alternative 3 reconfigures the majority of the existing terminal building without an expansion, and can accommodate 100 peak hour passengers. Airline functions, such as baggage makeup, ticket counters, and offices are relocated to the west side of the terminal. Inbound baggage and baggage claim are moved to the east side of the terminal. The secure holdroom and TSA screening are expanded into the existing airline operations and ticketing areas. Furthermore, the Airport Café/Restaurant is relocated to the existing inbound baggage location. This alternative increases the size of the secure holdroom from approximately 650 to 2,135 square feet, the TSA screening from 530 to 1,300 square feet, and the TSA queuing area from 375 to 500 square feet.

Similar to the other alternatives, a restroom is provided within the secure area. This reconfiguration requires a separate facility to house airport administration and TSA offices. Since this alternative does not increase the size of the terminal building, there is no requirement to change the size of the existing water tank or install an additional water line. The cost of this alternative will depend on the degree of aesthetics and level amenities, but the reconfiguration and renovation of approximately 10,000 square feet will cost about $1 million. Alternative 3 is shown in **Figure 5-5**.

FIGURE 5-5 – TERMINAL ALTERNATIVE 3 – LARGE RECONFIGURATION



Source: Jviation, Inc.

5.4.4 Alternative 4 – Large Reconfiguration & 2nd Level

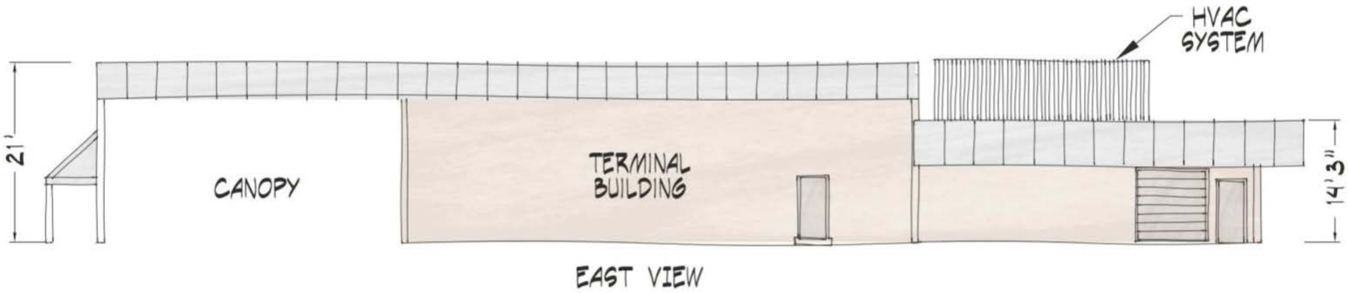
Alternative 4 examines the possibility of a second level expansion, which is shown in **Figure 5-6**. This alternative is similar to Alternative 3, but the Airport Café/Restaurant, and the airport administration and TSA offices are relocated to the second level. This alternative increases the size of the secure holdroom from approximately 650 to 2,135 square feet, the size of the TSA screening area increases to 1,300 square feet, and the TSA queuing area increases to 500 square feet.

FIGURE 5-6 – TERMINAL ALTERNATIVE 4 – LARGE RECONFIGURATION & 2ND LEVEL

Source: Jviation, Inc.

For this alternative, the second level has been placed on the south side of the terminal to provide a view of the airfield, although a second level could be placed on the north side with a view of the parking lot and hangars if preferred. If a second level alternative is chosen, it is important to note that the north half of the existing terminal building is approximately 21 feet tall, and the southern half of the building is approximately 14 feet tall, as shown in **Figure 5-7**. A second story on the south side would require relocating the HVAC system and solar panels that are currently located on the south side of the roof.

FIGURE 5-7 – EXISTING TERMINAL ELEVATIONS



Source: Jviation, Inc.

Since this alternative increases the size of the terminal building, an additional water line or larger water tank would be required before any expansion occurs. Additionally, a structural analysis of the existing building will be required to determine if the existing load bearing members can support the addition of a second level or if structural retrofitting/reinforcing will be required. Although the cost of this alternative will depend on the degree of aesthetics and amenities, the reconfiguration and renovation of approximately 10,000 square feet and the addition of a second level will cost about $3.8 million. **Table 5-2** summarizes the alternatives for the terminal expansion.

TABLE 5-2 – TERMINAL ALTERANTIVES COMPARISON MATRIX

	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Operational Criteria	**Advantages:** Meets up to 60 PHP* **Disadvantages:** Additional future expansion required to meet the 100 PHP demand	**Advantages:** Meets the long-term 100 PHP demand **Disadvantages:** Increased costs to operate ahead of need for 100 PHP capacity	**Advantages:** Meets the long-term 100 PHP demand; allocations of airline lease space reconfigured to meet actual need **Disadvantages:** Increased costs to operate ahead of need for 100 PHP capacity	**Advantages:** Meets the long-term 100 PHP demand; Allocations of airline lease space reconfigured to meet actual need; expandable **Disadvantages:** Increased costs to operate ahead of need for 100 PHP capacity
Environmental Criteria	**Advantages:** No building expansion beyond current footprint **Disadvantages:** None	**Advantages:** None **Disadvantages:** Small increase to the footprint	**Advantages:** No building expansion beyond current footprint **Disadvantages:** None	**Advantages:** No building expansion beyond current footprint **Disadvantages:** None
Feasibility Criteria: ***Additional Infrastructure Requirement***	**Advantages:** No water service increase required **Disadvantages:** None	**Advantages:** None **Disadvantages:** Requires increase in water service requirements	**Advantages:** No water service increase required **Disadvantages:** Potential projects to relocate of airport administration and TSA offices	**Advantages:** All terminal uses are accommodated within the building **Disadvantages:** Requires increase in water service requirements
Feasibility Criteria: ***Impacts to Tenants & Passengers***	**Advantages:** Minimal impacts to Tenants and Passengers **Disadvantages:** None	**Advantages:** Minimal impacts to Tenants and Passengers **Disadvantages:** None	**Advantages:** None **Disadvantages:** Relocation of airport administration and TSA offices; Impacts to airline tenants and restaurant during construction	**Advantages:** Expandable for tenants and spaces **Disadvantages:** Temporary construction and phasing impacts, resulting in user and tenant inconvenience
Economic Criteria	**Advantages:** Lowest cost; no water service increase required **Disadvantages:** None	**Advantages:** Meets the long-term need in one phase; can be completed in phases. **Disadvantages:** Requires expansion of the building envelope; cost of additional water service requirements	**Advantages:** Lowest cost of the three expansion alternatives: No water service increase required **Disadvantages:** Requires relocation of airport administration and TSA office.	**Advantages:** Meets the long-term need in one phase **Disadvantages:** Highest cost; cost of additional water service requirements; cost of reconfiguration and second level

**Peak Hour Passengers (PHP)*
Source: Jviation, Inc.

5.4.5 Preferred Alternative

The preferred alternative for the terminal expansion is Alternative 2 – Expand Each End Out. This alternative could be phased out over the 20-year planning period, and allows for expansion to a 2nd level if demand dictates beyond the planning period.

5.5 FBO Facilities

RKS has one full-service FBO and provides various services for transient and based aircraft at RKS. The existing FBO facility and hangar are outdated, and the Airport frequently receives feedback from airport users requesting facility improvements. Airport Management indicates that the existing FBO location is the most ideal location. As such, all alternatives presented below keep the FBO in its current location. Further, an FBO Management Structure Analysis will be conducted as part of this Airport Master Plan to identify and assess various FBO privatization options that would create the greatest return while minimizing risk. This study will be discussed in **Chapter 7**, *Capital Improvement Plan and Financial Implementation*

5.5.1 Alternative 1 – Remodel & Renovate FBO Facilities

The first alternative consists of remodeling and renovating the existing FBO pilot lounge and hangar. The cost of this alternative depends on the degree of aesthetics and amenities; however, the renovation of 3,000 square feet of the pilot lounge and office areas, as well as an 8,000-square foot hangar will cost about $825,000.

5.5.2 Alternative 2 – Construct New FBO Facilities

Alternative 2 includes the construction of a new FBO facility, pilot lounge, and hangar, and demolishes the existing FBO facility. Similar to Alternative 1, the cost of this alternative depends on the degree of aesthetics and amenities. The construction of a new a facility of approximately equal size as the existing facility will cost roughly $1.6 million.

5.5.3 Alternatives Recommendation

The recommended FBO facilities alternative will be selected following the Advisory Committee meeting scheduled on May 16, 2013. **Table 5-3** summarizes the two alternatives for FBO facility development.

TABLE 5-3 – FBO FACILITIES ALTERNATIVES COMPARISON MATRIX

	Alternative 1	Alternative 2
Operational Criteria	**Renovation:** 3,000 SF pilot lounge & office area 8,000 SF hangar	**Construction:** New FBO facility, pilot lounge, and hangar **Demolition:** Existing FBO facility
Environmental Criteria	No significant environmental impacts anticipated. Appropriate level of environmental review is required prior to construction.	
Feasibility Criteria	FBO development is dependent upon 3rd party developer funding.	
Economical Criteria	**Facility Cost**: $825,000	**Pavement Cost**: $1.6 Million

Source: Jviation, Inc.

5.5.4 Preferred Alternative

The preferred FBO Facilities Alternative is Alternative 2, Construct New FBO Facilities. This alternative will cost approximately $1.6 million.

5.6 GA Development (Hangars and Apron)

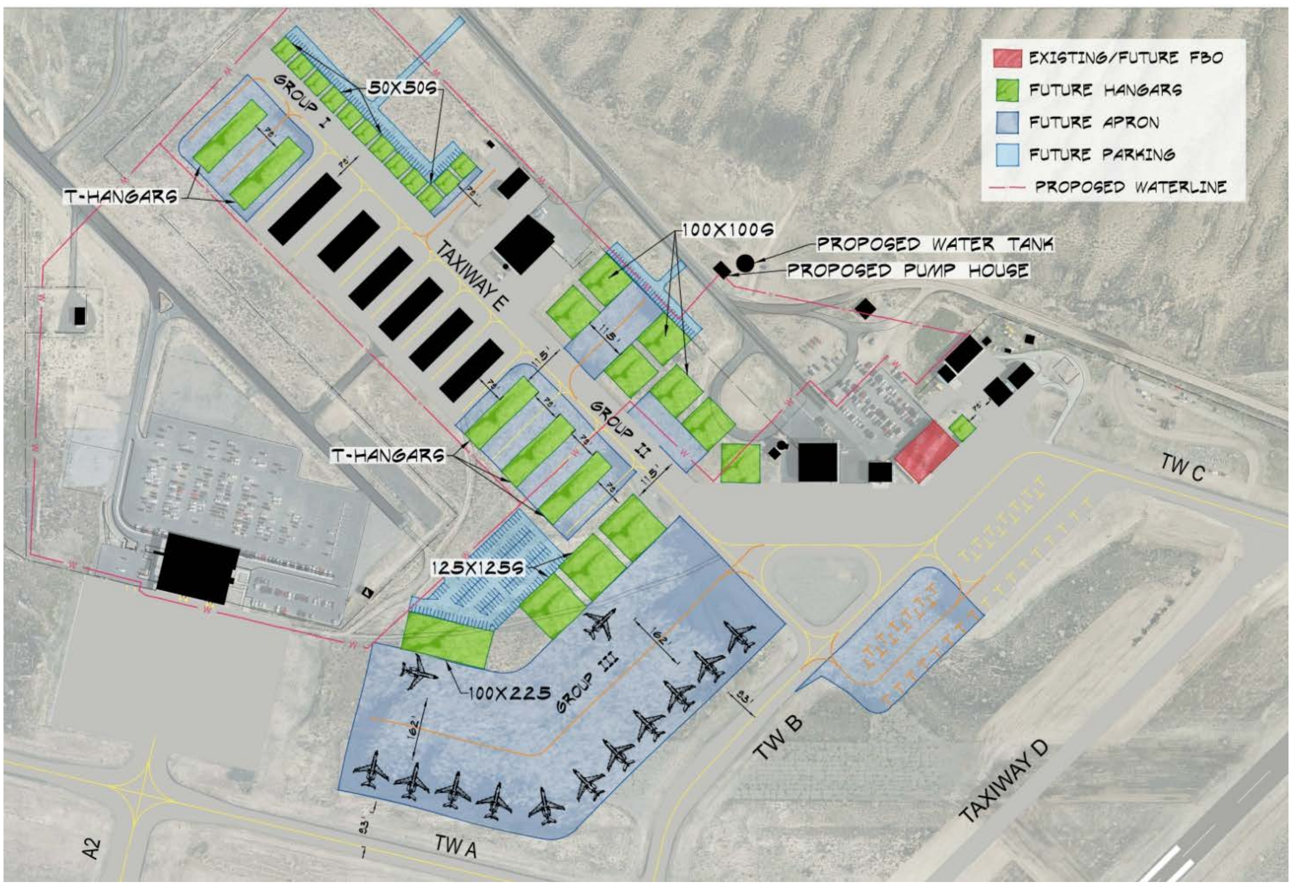
GA aircraft hangar storage is currently at full capacity; therefore, additional hangar development is recommended during the 20-year planning period. As discussed in **Section 4.9**, RKS has approximately 95,000 square feet of conventional and T-hangar space, and will need an additional 19,000 square feet of hangar space. In addition, the Airport currently has approximately 17,370 square yards of apron for GA use (including 44 tiedowns), and although no additional apron space is needed, the apron will be nearing capacity by 2032. The alternatives below examine possible GA development options to meet the projected demand within and beyond the planning period. All alternatives presented include the FBO facility, which will either be renovated or a new facility will be constructed in the same location. Cost estimates for all of the GA development alternatives assume that hangar construction costs will be absorbed by private/third party developers, while a large portion of needed airside taxilane and apron pavement will be funded by the Airport.

As part of this Master Planning effort, a GA development plan will be prepared based on the preferred GA development alternative chosen. This plan will be roughly a 30% design effort, phased in order to meet short-, medium-, and long-term demand, which will reflect the overall potential for the site at full build-out. This plan will also be incorporated in the Airport Layout Plan Update.

5.6.1 GA Development Alternative 1

GA Development Alternative 1 includes five T-hangars along the western side of Taxiway E, twelve 50-foot by 50-foot and seven 100-foot by 100-foot box hangars along the eastern edge, as shown in **Figure 5-8**. Also included in this alternative is an extension of the GA apron in between the existing GA apron and the terminal apron. This apron can accommodate approximately eleven parking positions for Airplane Design Group (ADG) III size aircraft, and has one 100-foot by 225-foot and three 125-foot by 125-foot corporate hangars on the northwestern edge. Additionally, the GA apron is expanded on the southeastern side, adjacent to Taxiway B, to accommodate aircraft tiedown positions that will have to be removed from Taxiway E in order to construct the box hangars. This alternative provides an additional 233,180 square feet of conventional and T-hangar space. Approximately 86,500 square yards of asphalt pavement is required for Alternative 1, at a total estimated cost of $10.6 million.

FIGURE 5-8 – GA DEVELOPMENT ALTERNATIVE 1

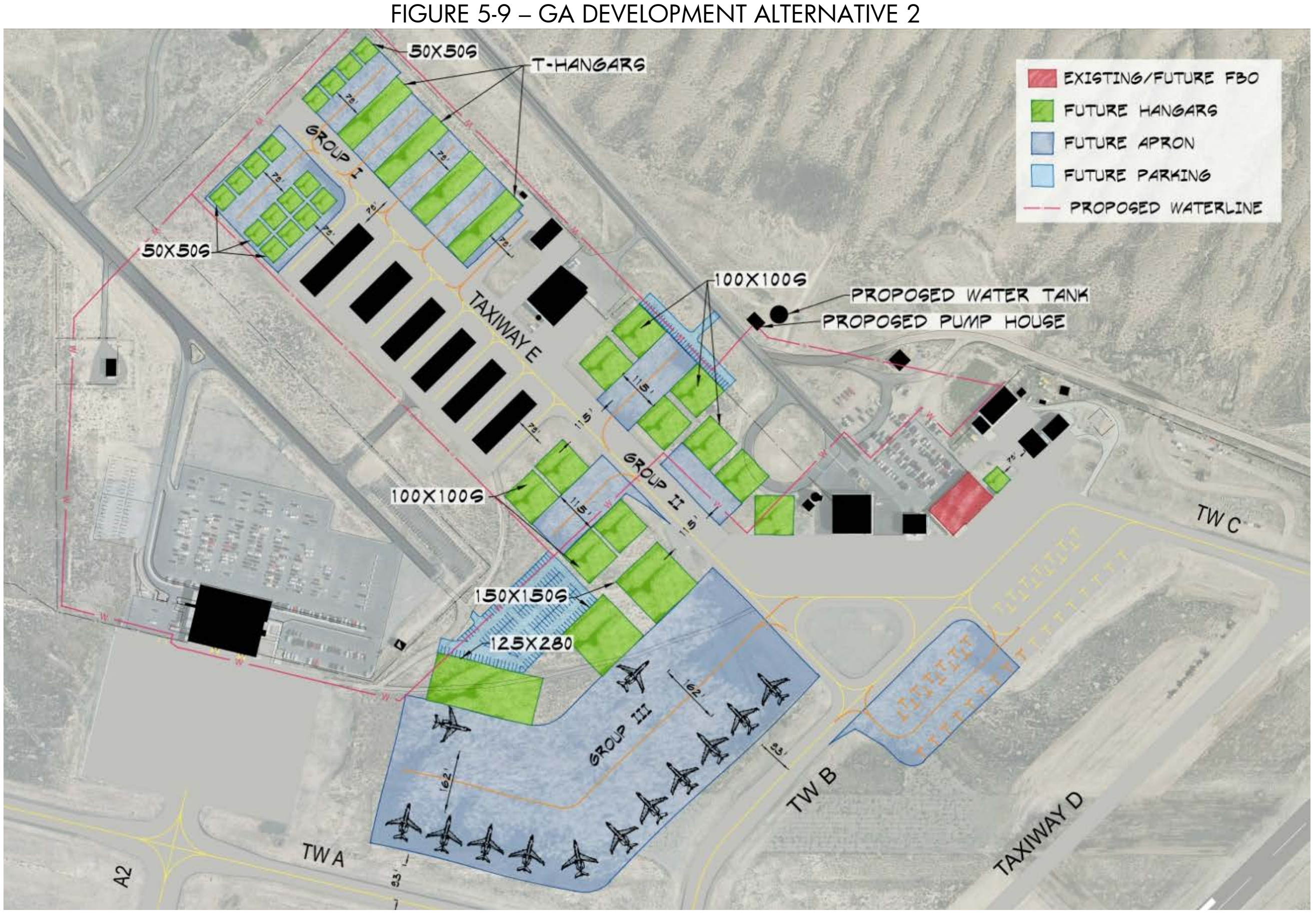


Source: Jviation, Inc.

5.6.2 GA Development Alternative 2

This alternative places twelve 50-foot by 50-foot box hangars on the northwestern edge, four 50-feet by 50-foot box hangars and four T-hangar units on the northeastern edge, and eleven 100-foot by 100-foot hangars on the southern edge of Taxiway E, as shown in **Figure 5-9**. Similar to Alternative 1, Alternative 2 extends the GA apron in between the existing GA apron and the terminal apron, accommodating approximately eleven parking positions for ADG III size aircraft. This alternative includes one 125-foot by 280-foot and two 150-by 150-foot corporate hangars on the northwestern edge of the apron. Similarly, the GA apron is expanded on the southeastern side, adjacent to Taxiway B, to accommodate aircraft tiedown positions that will be removed in order to construct the box hangars along Taxiway E. This alternative provides 291,700 square feet of additional conventional and T-hangar space. Approximately 93,000 square yards of asphalt pavement is required for Alternative 2, for a total estimated cost of $12.9 million.

FIGURE 5-9 – GA DEVELOPMENT ALTERNATIVE 2

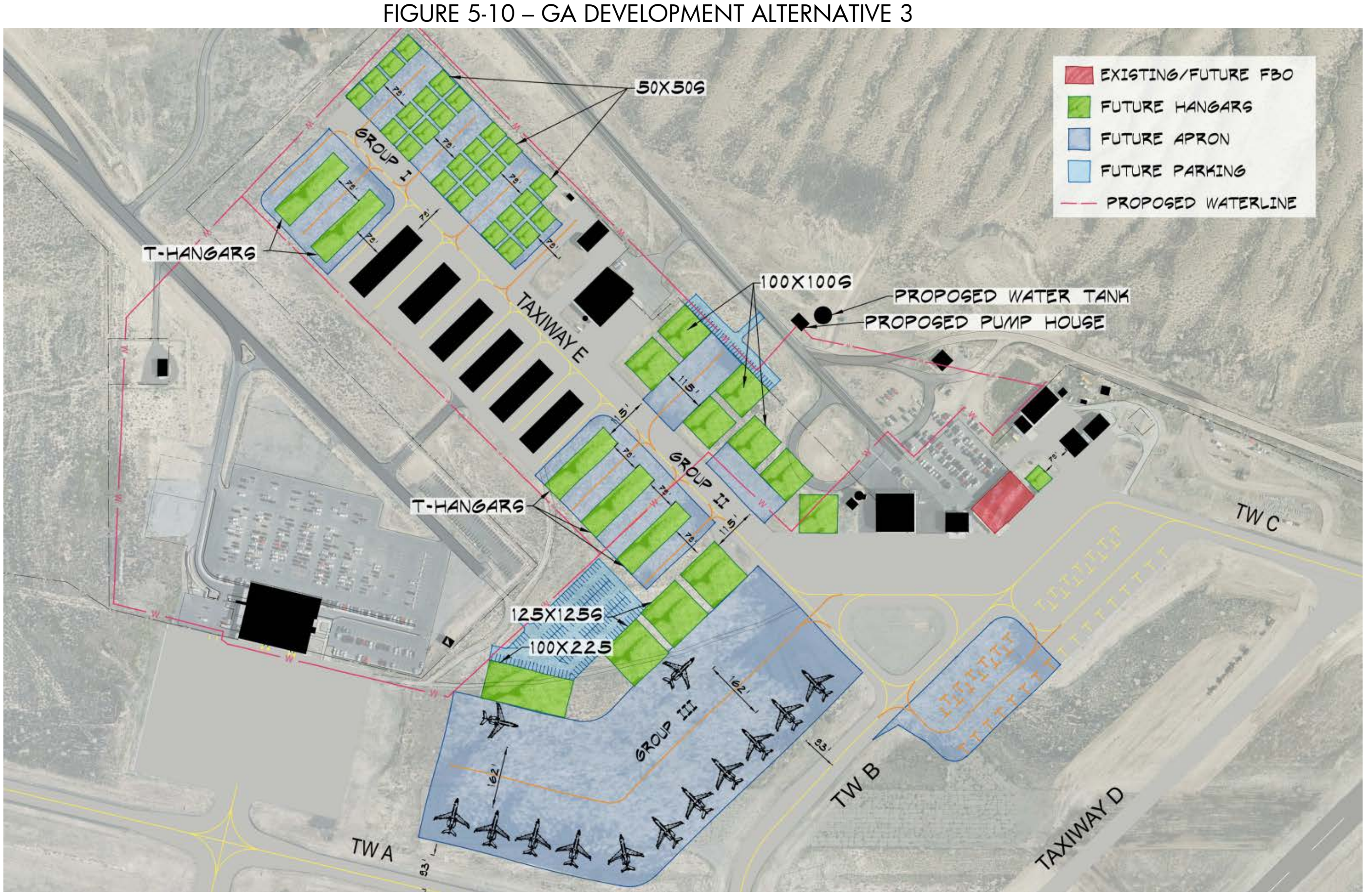


Source: Jviation, Inc.

5.6.3 GA Development Alternative 3

Similar to Alternative 1, Alternative 3 includes two T-hangars along the western side of Taxiway E, as well as the seven 100-foot by 100-foot box hangars along the southeastern edge, as shown in **Figure 5-10**. However, Alternative 3 has 27 50-foot by 50-foot box hangars on the northeastern edge of Taxiway E. This alternative is similar to Alternative 1, by extending the GA apron to accommodate approximately 11 parking positions for ADG III size aircraft, and has one 100-foot by 225-foot and three 125-foot by 125-foot corporate hangars on the northwestern edge of the extended GA apron. Additionally, the GA apron is also expanded on the southeastern side to replace aircraft tiedown positions that will have to be removed. Alternative 3 provides 280,700 square feet of additional conventional and T-hangar space. For this alternative, approximately 101,900 square yards of asphalt pavement is required, for a total estimated cost of $13.8 million.

FIGURE 5-10 – GA DEVELOPMENT ALTERNATIVE 3



Source: Jviation, Inc.

5.6.4 Alternatives Summary (Recommendation)

Table 5-4 summarizes the three alternatives for GA development. All alternatives exceed the requirements for hangar and apron space demand as discussed in **Chapter 4**, and each alternative includes hangar storage and apron parking for ADG I, II, and III sized aircraft. Additionally, each alternative has the ability to be expanded, modified, and built as demand dictates. It is recommended that the City of Rock Springs and Sweetwater County include in the Master Plan the hangar design concepts for private hangars with specific design to be determined at the time of development. The actual need will be determined when a development proposal is submitted to the City and the County.

TABLE 5-4 – GA DEVELOPMENT ALTERNATIVES COMPARISON MATRIX

	Alternative 1	Alternative 2	Alternative 3
Operational Criteria	**Hangars:** 5 – T-hangar units 12 – 50'x50' 7 – 100'x100' 1 – 100'x225' 3 – 125'x125' =Total of 233,180 SF of hangar space **Apron:** 86,500 SY	**Hangars:** 4 – T-hangar units 11 – 50'x50' 7 – 100'x100' 1 – 125'x280' 2 – 150'x150' =Total of 291,700 SF of hangar space **Apron:** 93,000 SY	**Hangars:** 5 – T-hangar units 27 – 50'x50' 7 – 100'x100' 1 – 100'x225' 3 – 125'x125' =Total of 280,700 SF of hangar space **Apron:** 102,000 SY
Environmental Criteria	No significant environmental impacts anticipated. Appropriate level of environmental review is required prior to construction.		
Feasibility Criteria	Apron development will require FAA approval for funding. Hangar development is demand-driven by 3rd party developers.		
Economical Criteria	**Pavement Cost**: $10.6 Million	**Pavement Cost**: $12.9 Million	**Pavement Cost**: $13.8 Million

Source: Jviation, Inc.

5.6.5 Preferred Alternative

The Preferred Alternative for GA Development is Alternative 1.

5.7 AUTO PARKING – TERMINAL

The current Terminal parking lot provides 374 free long-term and short-term paved parking spaces for commercial passengers. As a result of the long-term parking characteristics of passengers, the parking lot is approximately 90% full during peak travels months. **Table 5-5** shows the parking demand for the 20-year planning period, as previously discussed in **Section 4.10.3**. An additional 313 parking spots are recommended by 2032. The following alternative examines a possible parking lot expansion alternative to meet the projected demand.

TABLE 5-5 – TERMINAL PARKING DEMAND

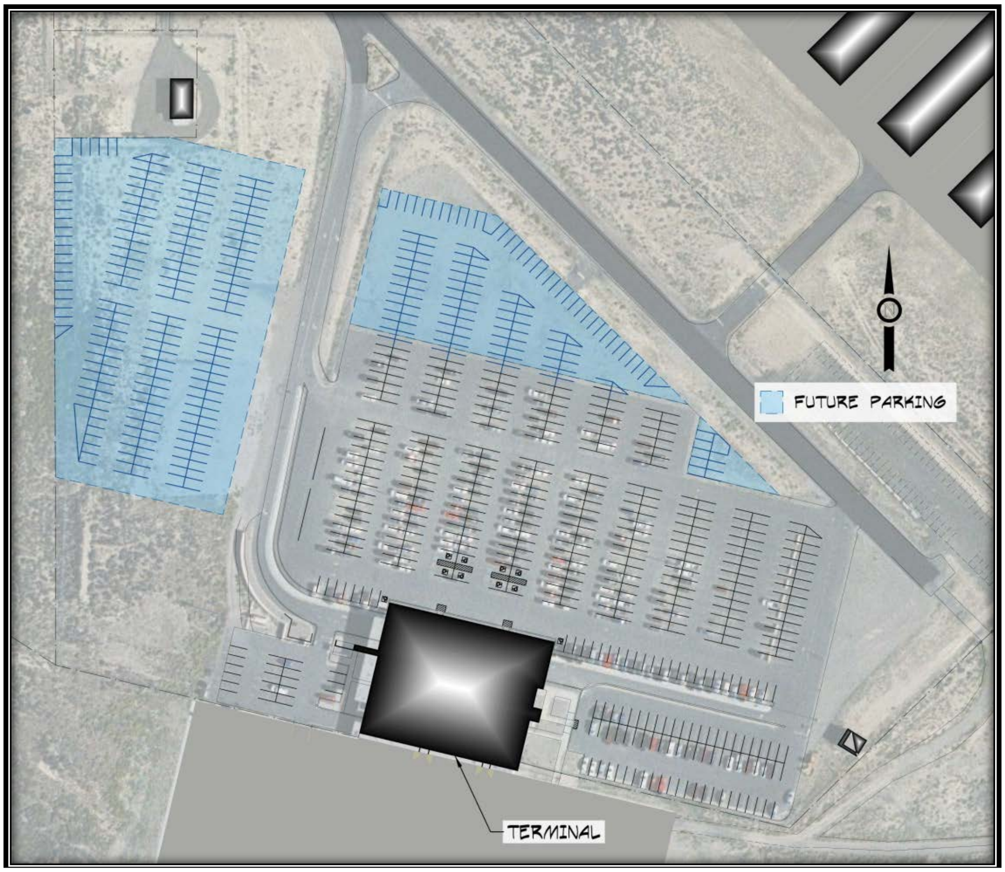
	Existing	2012	2017	2022	2032
Parking Spaces	374	355	417	493	687

Source: Jviation, Inc.

5.7.1 Alternative 1

The most logical areas to expand the existing terminal parking lot are to the north and the west. **Figure 5-11** shows an example of a possible parking lot expansion alternative. The parking lot expansion is located on airport property, which will not alter on or off-airport land use. No significant environmental impacts are anticipated, although an appropriate level of environmental review will be required prior to construction. This parking lot expansion provides an additional 353 parking spaces and will cost approximately $1.3 million.

FIGURE 5-11 – TERMINAL AUTO PARKING ALTERNATIVE 1



Source: Jviation, Inc.

5.7.2 Alternatives Recommendation

It is recommended that the Airport initially expand the terminal parking lot to the north to meet the short-term parking demand. Once demand dictates, an additional parking lot should be added to the west of the existing terminal parking lot.

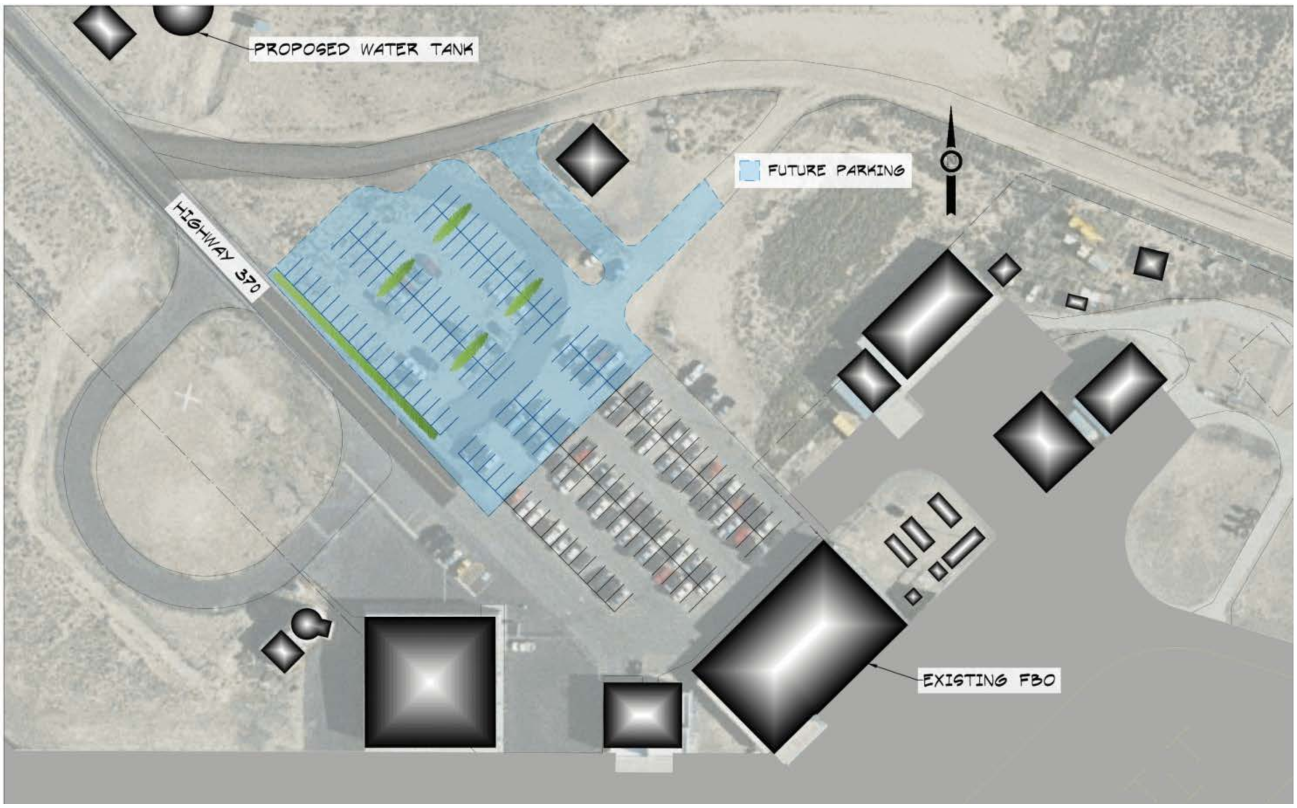
5.8 AUTO PARKING – GENERAL AVIATION AREA

RKS currently has 76 paved public parking spaces for GA users located in front (west) of the FBO hangar. The GA parking lot is heavily used and is currently over capacity. An unpaved overflow lot has been recently constructed on the west side of the existing lot to help meet existing demand. As discussed in **Section 4.10.4**, the construction of an additional 58 parking spaces is recommended to accommodate existing and future demand at RKS.

5.8.1 GA Auto Parking Alternative 1

As shown below in **Figure 5-12**, this alternative provides an additional 85 parking spaces to the northwest of the existing GA auto parking, and continues the existing northeast /southwest orientation. This alternative is comprised of 4,055 square yards of asphalt, and will cost approximately $350,000.

FIGURE 5-12 – GA AUTO PARKING ALTERNATIVE 2



Source: Jviation, Inc.

5.8.2 Alternative Recommendation

This alternative expands the existing GA parking lot to the northwest, and maintains the current parking space configuration. Currently, Highway 370's ownership is being transferred from WYDOT to Sweetwater County. Once the ownership transfer is complete, the Airport will need to coordinate with Sweetwater County to purchase a portion of the highway in order to expand the GA parking lot into the highway's right-of-way. The advantages of investing in GA parking expansion at RKS would not only enhance the Airport's attractiveness for aviation and non-aviation businesses, but would also provide an improved level of service for the existing

Halliburton charter operations. The GA auto parking expansion alternatives are summarized below in **Table 5-6**.

TABLE 5-6 – GA PARKING LOT ALTERNATIVES COMPARISON MATRIX

	Alternative 1
Operational Criteria	**Parking Spaces:** 85 **Paved Asphalt:** 4,055 SY
Environmental Criteria	No significant environmental impacts anticipated. Appropriate level of environmental review is required.
Feasibility Criteria	Parking lot development depends upon the ownership transfer of Highway 370 to Sweetwater County, and approval and funding availability by the City of Rock Springs and Sweetwater County.
Compatible Land Use	Will not alter on or off-airport land use
Economical Criteria	**Pavement Cost**: $350,000