T·O ENGINEERS

HEBER VALLEY AIRPORT FLIGHTPATH

5. Facility Requirements

SECTION OVERVIEW

The Facility Requirements chapter identifies airport needs to accommodate the forecasted operations. The FAA's design standards are detailed throughout this chapter relative to the existing and future airport design elements. They are driven by the identified existing and future FAA Airport Reference Code (ARC) C-II designation.

5.1 GENERAL

This chapter compares the ability of the existing conditions at Heber Valley Airport to support the forecast demand. The comparison will identify any forecasted condition which triggers the need for facility additions or improvements, specifically concerning FAA dimensional standards presented in FAA Advisory Circular (AC) 150/5300-13A, Airport Design.

The inventory chapter outlines the existing airport conditions, including buildings, pavements, navigational aids (NAVAIDS), and other infrastructure items. The socioeconomic overview and background chapter describe the economies of Heber City, Wasatch County, and Utah, and the state's goals for airport development. These factors led the Master Plan through the forecast, in which the current and future operations were identified by total, type, and, most importantly, by ARC.

5.2 EMERGING TRENDS

Changes in the aviation industry affect the size, quantity, and types of airport facilities needed to accommodate future demand. The rapid pace of industry change is expected to continue, and airports need to take a proactive approach to support local developmental needs.

On a broad scope, the Next Generation Air Transportation System, or NextGen, is an FAA-led modernization program of the air transportation system. This program is part of the ongoing efforts of the FAA's commitment to ensure that America continues to have the safest, most efficient airspace system possible through modernization. NextGen programs are being implemented across the industry to improve communication, navigation, and surveillance in the National Airspace System (NAS). As programs are planned and implemented, Sponsors must evaluate if programs apply to their airports and consider what actions may be required.

Other enhancements in industry technology include the increasing number of Unmanned Aircraft Systems (UAS) and Urban Air Mobility (UAM) programs. UAS consists of the unmanned aircraft platform and its associated elements, including communication links, sensors, software, and power supply, required for the safe operation in

the NAS. UAM is being developed as a transportation system within urban areas for small package delivery and other UAS services, supported by a mix of onboard/ground-piloted and increasingly autonomous operations.
Finally, sustainability initiatives are pushing for more energy-efficient and environmentally responsible operations through long range airport planning. Sustainable actions reduce environmental impacts, help maintain stable levels of economic growth, and establish organizational goals consistent with the needs and values of the community.

The emerging industry trends revolve around safety using technology to enhance efficiency and sustainability. These influences will continue to drive the infrastructure needs of airports and expand revenue streams beyond the traditional aviation related activities. Therefore, airport sponsors need to continually assess their airport's role and potential with these trends as they become prevalent in their communities.

5.3 FAA CLASSIFICATION SYSTEM

The FAA has an in-depth system of defining requirements for airports based on an aircraft classification system. Understanding the components that comprise the classification system is required to understand the correlation between the classification system and airport design.

AIRPORT REFERENCE CODE (ARC)

The FAA aircraft coding system is comprised of two elements: Aircraft Approach Category (AAC) and Airplane Design Group (ADG). The AAC is designated by a letter (A through E) and ADG by Roman numeral (I through VI).

Each airport has a critical aircraft, typically defined as the most demanding aircraft (or combination of aircraft) that performs at least 500 annual operations. The ARC is derived by combining the critical aircraft's AAC and ADG (for example, A-I or B-II).

Table 5.1 Airport Reference Code (ARC) Aircraft Approach Category

Category	Speed
A	less than 91 knots
B	91 knots or more, less than 121 knots
C	121 knots or more, less than 141 knots
D	141 knots or more, less than 166 knots
E	166 knots or more

Source: FAA AC 150/5300-13A

The FAA recommends a Sponsor start planning for development once operations of a subsequent ARC begin to trend over 350 annual operations.

RUNWAY DESIGN CODE (RDC)

Runways receive a combined AAC and ADG designation for approach and departure operations called the Runway Design Code (RDC). The RDC contains a third component based on a particular runway's instrument approach visibility minimums measured in Runway Visual Range (RVR) (for example, B-II-5,000). These categorizations are applied to individual runways for design criteria, meaning multiple runways at a single airport may have different RDCs. A runway that does

Table 5.2 Airport Reference Code (ARC) Airplane Design Group (ADG)

Group #	Tail Height (Feet)	Wingspan (Feet)
I	<20	<49
II	20 - <30	49 - <79
III	30 - <45	79 - <118
IV	45 - <60	118 - <171
V	60 - <66	171 - <214
VI	66 - <80	214 - <262

Source: FAA AC 150/5300-13A

not have an instrument approach is classified as a visual runway and does not have an associated RVR value.

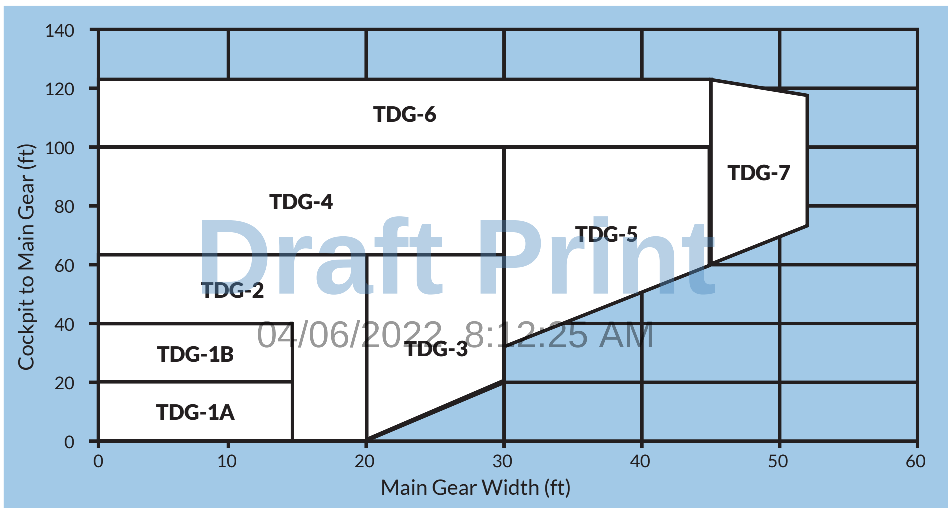
Table 5.3 Runway Visibility Range	
RVR Value (Feet)	**Visibility Minimum**
1,200	<1/4 mile
1,600	1/4 mile - <1/2 mile
2,400	1/2 mile - <3/4 mile
4,000	3/4 mile - <1 mile
5,000	1 mile
VIS	Visual Approach Only

Source: FAA AC 150/5300-13A

TAXIWAY DESIGN GROUP (TDG)

For taxiway design, the FAA utilizes a Taxiway Design Group (TDG), which is a classification for aircraft determined by outer-to-outer Main Gear Width (MGW) and Cockpit to Main Gear (CMG) distance. Taxiways are designed for "cockpit over centerline" taxiing, meaning the pavement is sufficiently wide enough to allow a certain amount of wander. The MGW and CMG represent the critical aircraft's undercarriage dimensions to determine the appropriate standard for taxiway design. The categories range from TDG 1A for the smallest dimensions up to TDG 7.

Figure 5.1 Taxiway Design Group (TDG)



CRITICAL AIRCRAFT SPECIFICATIONS

Chapter 4. Aviation Demand Forecast identified the Bombardier Challenger 350 (CL350) as the critical aircraft at Heber Valley Airport. The CL350 is an ARC C-II, large aircraft with a TDG of 1B. See ***Table 5.4*** for aircraft specifications.

Table 5.4 design Aircraft Specifications	
Bombardier Challenger 350 (CL350)	
Specification	
Wingspan	69 feet
Tail height	20 feet
Approach speed (flaps down)	125 knots
Cockpit to main gear	27.75 feet
Main gear width	12.64 feet
Maximum takeoff weight	40,600 lbs
Applicable FAA Design Standards	
Aircraft Approach Category (AAC)	C
Airplane Design Group (ADG)	II
Taxiway Design Group (TDG)	1B
Weight classification	Small

WEIGHT CLASS

For planning purposes, the FAA uses aircraft weight classes for defining additional design parameters. The weight classifications for aircraft are “small,” with a Maximum Gross Takeoff Weight (MGTOW) of 12,500 pounds or less, “large,” with an MGTOW greater than 12,500 up to and including 300,000 pounds, and “heavy,” for aircraft weighing more than 300,000 pounds. Like the AAC, weight classes receive an alphabetical classification, so it is important to understand the distinction between the two, see ***Table 5.5***.

Table 5.5 Aircraft Weight Classifications

Aircraft Class	Maximum Gross Takeoff Weight	Number of Engines	Wake Turbulence Classification*
A	12,500 lbs. or less	Single	Small
B		Multi	
C	12,500 – 300,000 lbs.	Multi	Large
D	Over 300,000 lbs.	Multi	Heavy

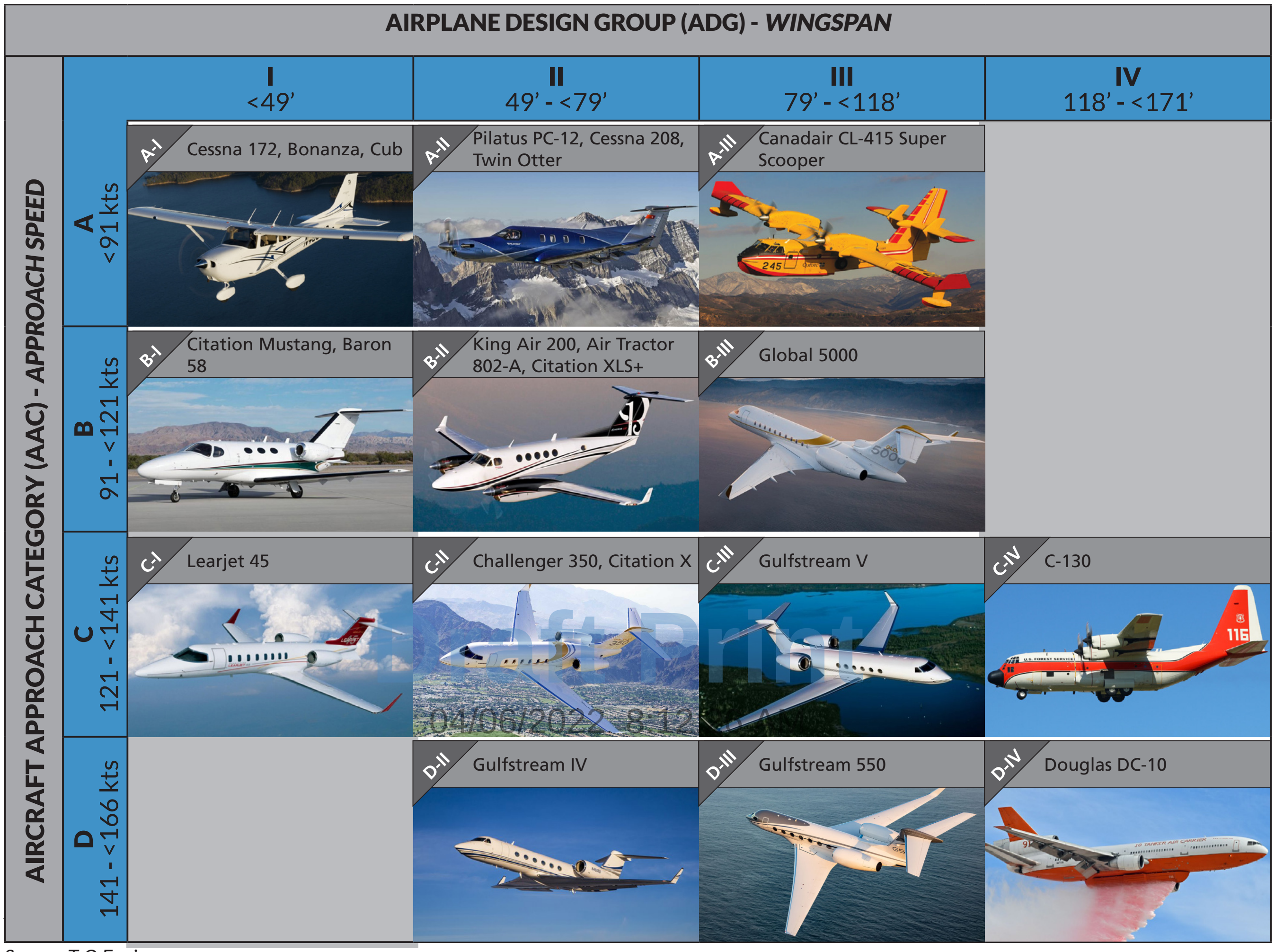
**Wake turbulence is a measure of weight and its capacity to disturb the air.*

Source: FAA AC 150/5060-5 Airport Capacity and Delay, Table 1-1.

EXAMPLE AIRCRAFT

Figure 5.2 shows a small selection of common aircraft and their respective ARC.

Figure 5.2 Representative Aircraft



Source: T-O Engineers

5.4 AIRFIELD CAPACITY

Demand and capacity represent the relationship between an airport's forecast demand and the physical ability to accommodate that demand in accordance with FAA standards. The purpose of a demand and capacity analysis is to assess the airport's ability to efficiently accommodate its day-to-day and long-term demands without undue delays or compromises to safety. The analysis also assists in determining when improvements are needed to meet specific operational demands.

At lower activity airports (less than 100,000 annual operations), airfield capacity often exceeds the anticipated level of demand. FAA AC 150/5060-5, Airport Capacity and Delay, explains how to compute hourly airport capacities and the Annual Service Volume (ASV). The ASV is defined as the reasonable estimate of an airport's annual capacity. It accounts for differences in runway use, aircraft mix, and weather conditions encountered over the year. Airport capacity is calculated based on the number and layout of runways and annual operations by aircraft of certain weight classes.

For calculating capacity, a "mix index" is established. The mix index is a mathematical expression representing the percentage of annual operations by aircraft of the specified weight classifications. Specifically, the mix index is the percent of weight class C aircraft, plus 3 times the percent of weight class D aircraft. Thus, it is written (C+3D)%.

Table 5.6 Runway and Crosswind Runway Use Configuration
Source: FAA AC 150/5060-5, Airport Capacity and Delay, Table 2-1 Configuration No. 1

Mix Index % (C+3D)*	Hourly Capacity Ops/Hr		Annual Service Volume Ops/yr
	VFR	IFR	
0 to 20	98	59	230,000
21 to 50	74	57	195,000
51 to 80	63	56	205,000
81 to 120	55	53	210,000
121 to 180	51	50	240,000

*C= Percent of airplanes over 12,500 pounds but not over 300,000 pounds
*D= Percent of airplanes over 300,000 pounds

For HCR, the following assumptions were made to calculate the mix index:

1. All aircraft with an ARC of B-I and smaller weigh less than 12,500 pounds (weight class A and B);
2. Half of the operations by B-II aircraft and all aircraft of larger ARC weigh greater than 12,500 pounds and less than 300,00 pounds (weight class C);
3. There are no operations by aircraft weighing over 300,000 pounds (weight class D).

When applying the assumptions to the equation, the resultant mix index is 21%. For a mix index of 21%, the AC provides an airfield capacity of 195,000 annual aircraft operations. The existing annual operations were 12,605 in 2021 and are forecasted to reach 16,320 operations in 2041. This equates to 6.5% in 2021, increasing to 8.4% in 2041 of the available capacity being used at HCR.

For planning purposes, 60% of ASV is the threshold for capacity improvements to begin. At 80% of ASV, planning for capacity improvements should be complete, and construction should begin. At 100% of ASV, the airport has reached capacity, and capacity improvement should be made to avoid delays.

Over the 20-year planning horizon, demand at HCR will remain well below 60% of ASV; therefore, capacity improvements are not anticipated over the 20-year planning period.

5.5. RUNWAY REQUIREMENTS

The FAA has established design standards for nearly every aspect of airports, including relevant navigable airspace, airside facilities, and landside facilities. Once the existing and future airport design classifications are determined, the FAA provides the applicable design standards to provide an acceptable level of safety on airports. These standards are outlined in FAA AC 150/5300-13A, and include dimensions for runway width, safety areas, separation distances from fixed or movable objects, and many more facets of the airport layout.

Sponsors receiving federal funds are obligated by federal grant assurances to comply with FAA design standards, and identifying these standards is a core concept for every Airport Master Plan. Applying FAA standards ensures that airport safety and design are congruent with the types of aircraft operations occurring at the airport.

Each design criteria includes associated safety area dimensional standards. Safety areas and object free areas surrounding a runway protect both airport operations and the community. Safety areas limit the accessibility and functionality of the property within the safety areas, establishing a protective buffer around the airport's operating surfaces. The following definitions describe the safety areas associated with a runway and their functionality.

Runway Object Free Area (ROFA): A ROFA is an area on the ground centered about the runway centerline. The ROFA enhances the safety of aircraft operations by requiring the area to be free of objects, except for objects that need to be located in the ROFA for air navigation or aircraft ground maneuvering purposes. Such objects that need to be located in the ROFA must either be less than three inches in height or on a frangible coupling for easy break-away.

Runway Obstacle Free Zone (ROFZ): A ROFZ is a volume of airspace centered above the runway centerline, above the surface whose elevation at any point is the same as the elevation of the nearest point on the runway centerline. The ROFZ must be clear of objects, except frangible visual NAVAIDs that need to be located in the OFZ because of their function.

Runway Protection Zone (RPZ): An RPZ is trapezoidal in shape and centered about the extended runway centerline. The function of an RPZ is to enhance the protection of people and property on the ground by limiting incompatible land use and precluding activities involving congregations of people. Further coordination with the FAA would be required should land use within an RPZ incorporate fuel storage, hazardous materials, wastewater treatment facilities, above-ground utility infrastructure, or other uses.

Runway Safety Area (RSA): An RSA is centered on the runway centerline and is a defined surface surrounding the runway that is prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot/overshoot, approach, or excursion from the runway.

HCR was previously designed as an ARC B-II airport. However, the FAA-approved forecast completed as part of this Airport Master Plan determined the airport is currently an ARC C-II designation and will remain so throughout the 20-year planning period.

Table 5.7 Runway Design Standards

Design Criteria	Existing Runway 4/22 (B-II)	FAA C-II Standards	Standard Met With Existing Condition?
Runway length	6,898 feet	See Section 5.7	
Runway width	75 feet	100 feet	No
Runway Safety Area (RSA) length beyond runway end	300 feet	1,000 feet	No
Runway Safety Area (RSA) width	150 feet	500 feet	No
Runway Object Free Area (ROFA) length beyond runway end	300 feet	1,000 feet	No
Runway Object Free Area (ROFA) width	500 feet	800 feet	No
Runway Obstacle Free Zone (ROFZ) length beyond runway end	200 feet	200 feet	Yes
Runway Obstacle Free Zone (ROFZ) width	400 feet	400 feet	Yes
Runway 4/22 Approach & Departure Runway Protection Zone (RPZ) length	1,000 feet	1,700 feet	No
Runway 4/22 Approach RPZ inner width	500 feet	500 feet	Yes
Runway 4/22 Approach RPZ outer width	700 feet	1,010 feet	No

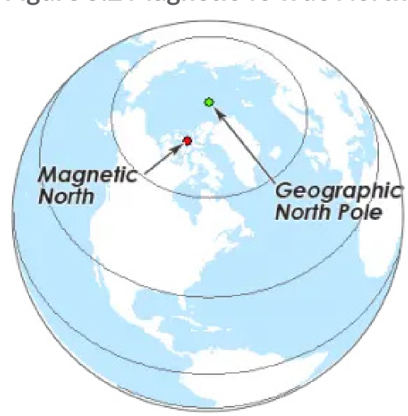
Table 5.7 lists the existing runway conditions at HCR in comparison to ARC C-II FAA design standards. The standards associated with the runway are ARC C-II, visibility not less than 1 mile, or RDC C-II-5,000.

5.6 RUNWAY ORIENTATION AND MARKINGS

Runway orientation is primarily a function of wind coverage. As discussed in the wind analysis in Chapter 3, the runway at HCR provides greater than the FAA minimum coverage of 95% in all-weather scenarios.

Runways are designated based on magnetic azimuth. When considering directions or headings, there are two definitions for what constitutes north. First, magnetic north is the location where the earth's magnetic field leaves the earth. Second, true north is the physical, geographical location of the North Pole. These two poles do not coincide, and the magnetic poles are constantly wandering.

Figure 5.2 Magnetic vs True North



Source: GISGeography.com

The measured difference in angle between the two poles is called magnetic declination or variation, which changes depending on geographical location. It is important to distinguish between the two when talking about runway alignment, as they are designated based on magnetic azimuth.

Because the magnetic pole is constantly changing, it is reassessed every five years to accurately provide declination. At some facilities, shifting in the magnetic pole has resulted in runway renumbering. The FAA advises airports to update their runway designation and markings when the magnetic heading changes by more than 5° from the existing runway marking. A review of the published azimuth compared to magnetic is provided in ***Table 5.8.*** Based on this information, it is not necessary to update the runway designation at HCR.

Table 5.8 Runway 4/22 Orientation

Runway	4	22
Latitude	40°28'32.48"N	40°29'16.49"N
Longitude	111°26'17.76"W	111°25'09.63"
Elevation	5,582.99 feet	5,636.79 feet
Geodetic Heading (true)	049°	229°
Magnetic Heading	039°	219°
Magnetic Declination	10° 54' E Changing 6' (0.11°) west per year	
Updated Runway Designation	Not Applicable	

5.7 RUNWAY LENGTH ANALYSIS

Runway length is an FAA recommendation, not a design standard. It is up to the pilot operating under the unique meteorological conditions and demands of a particular flight to determine the safety of the operation with the available runway length.

Many factors determine the suitability of runway length for airplane operations. These factors include the airport elevation, temperature, wind direction and velocity, airplane operating weight and configurations, runway surface condition (dry or wet), effective runway gradient, presence of obstructions in the vicinity of the airport, and any locally imposed noise abatement restrictions. A given runway length may not be suitable for all aircraft operations.

FAA AC 150/5325-4B, Runway Length Requirements for Airport Design, provides a process for determining the FAA recommended runway lengths for the design of civil airports. According to the AC, the recommended runway length accommodates the airport's ultimate development plan, thus ensuring a runway appropriate for the forecasted critical aircraft. FAA grant assurance obligations do not require an airport sponsor to lengthen a runway, even where a longer runway is recommended to better support the forecast critical aircraft; however, it is important to consider the FAA's recommended runway length in a federally funded master planning effort.

The AC provides progressive steps to determine the FAA recommended runway length, beginning with identifying the critical aircraft, then applying the method summarized in ***Table 5.9***.

Table 5.9 Runway Length Analysis

Airplane Weight Category Maximum Certificated Takeoff Weight (MTOW)			Design Approach	Location of Design Guidelines
12,500 pounds (5,670 kg) or less	Approach Speeds less than 30 knots		Family grouping of small airplanes	Chapter 2; Paragraph 203
	Approach Speeds of at least 30 knots but less than 50 knots		Family grouping of small airplanes	Chapter 2; Paragraph 204
	Approach Speeds of 50 knots or more	with less than 10 Passengers	Family grouping of small airplanes	Chapter 2; Paragraph 205 Figure 2-1
		With 10 or more Passengers	Family grouping of small airplanes	Chapter 2; Paragraph 205 Figure 2-2
Over 12,500 pounds (5,670 kg) but less than 60,000 pounds (27,200 kg)			Family grouping of large airplanes	Chapter 3; Figures 3-1 or 3-2* and Tables 3-1 or 3-2
60,000 pounds (27,200 kg) or more Regional Jets**			Individual large airplane	Chapter 4; Airplane Manufacturer Websites (Appendix 1)

** When the design airplane's APM shows a longer runway than what is shown in figure 3-2, use the airplane manufacturer's APM. However, users of an APM are to adhere to the design guidelines found in Chapter 4.*
*** All regional jets regardless of their MTOW are assigned to the 60,000 pounds (27,200 kg) or more weight category.*

Source: Table 1-1 AC 150/5325-4B

The critical aircraft for HCR, identified in Chapter 4, Aviation Demand Forecast, the CL350, has a maximum takeoff weight of 40,600 pounds. In following the methodology outlined in FAA AC 150/5325-4B for determining the FAA recommended runway length, the design guidelines described in Chapter 3 were applied, which are based on performance curves. ***Table 5.10*** is derived from FAA software, FAA Airport Design, which emulates the tables and graphs in the AC.

Table 5.10 Runway Length Recommendations	
Airport Elevation: 5,634 feet Mean Daily Maximum Temperature of the Hottest Month: 90° F Maximum Difference in Runway Centerline Elevation: 54 feet	
12,500 pounds or less with less than 10 passenger seats	
75% of fleet	4,960 feet
95% fleet	7,030 feet
100% fleet	7,030 feet
12,500 pounds or less with 10 or more passenger seats	7,030 feet
Over 12,500 pounds but less than 60,000 pounds	
75% of fleet at 60% useful load	7,510 feet
75% of fleet at 90% useful load	9,150 feet
100% of fleet at 60% useful load	11,550 feet
100% of fleet at 90% useful load	11,550 feet
More than 60,000 pounds	Approximately 6,990 feet

The percentage of fleet refers to Tables 3-1 and 3-2 within the AC, which list specific aircraft identified for those fleet percentages. The CL350 is in the listing of aircraft that make up 75% of the fleet.

Mathematically, the useful load factor is the difference between the maximum allowable structural gross weight of the aircraft and the operating empty weight. Therefore, the useful load is the aircraft's capacity for fuel, passengers, and cargo (baggage). Thus, the percent useful load is a direct correlated to weight which is the primary consideration for calculating take-off and landing distances for individual aircraft operations.

The AC provides only two load factor curves for calculating runway length, 60%, and 90%. The 60% or 90% application is a condition unique to each airport and depends on the types of operations occurring. The percent useful load is determined by the haul length and service needs of the aircraft, where the haul length relates to fuel loading, and the service needs relate to passengers and baggage.

The FAA Traffic Flow Management System Count (TFMSC) report for HCR shows average arrival and departure seating. For the CL350, the average arrival and departure seats were approximately six in 2019 and 2020, increasing to seven in 2021. The maximum available seating for the CL350, depending on configuration, is 10. There are no statistics to assist in determining cargo loading; therefore, it is assumed there is a direct relation between passengers and baggage. For HCR, it is assumed the useful load for an aircraft operating within the weight range between 12,500 and 60,000 pounds is 60%, meaning the aircraft would not likely be at full capacity for passengers and baggage.

The FAA recommended runway length for large airplanes 60,000 pounds or less, 75% of fleet at 60% useful load is 7,510 feet. The FAA recommended runway length is approximately 612 feet longer than the current runway condition. However, the Sponsor is under no obligation to lengthen the runway to accord with FAA's recommended length.

5.8 PAVEMENT DESIGN STRENGTH

To meet the design life-cycle goals of an airport's infrastructure, airside pavements must be designed to physically withstand the weight of arriving, taxiing, and departing aircraft. The required pavement design strength, or weight-bearing capacity, is an estimate based on average activity levels and is limited in terms of aircraft landing gear type and geometry (i.e., load distribution). The pavement design strength is not the maximum allowable weight; however, operations by aircraft which exceed the weight-bearing capacity should be limited to avoid accelerating pavement deterioration.

Figure 5.3 Single Wheel Gear

Source: Cessna

Figure 5.4 Dual Wheel Gear

Source: Cessna

The runway Pavement Condition Number (PCN) is the way pavement strengths are classified. The PCN for Heber Valley Airport is 32/F/B/X/T. The numerical value, 32, represents the load carrying capacity of a standard single wheel gear (SWG) load at a tire pressure of 181 pounds per square inch (PSI). The "F" classifies the pavement type as flexible, meaning there are layers of pavement through which the impact and load are distributed. The "B" identifies a medium subgrade strength, and "X" represents a high tire pressure, up to 254 PSI. Finally, the "T" means the PCN value was obtained through a technical evaluation. In addition to the PCN, the published weight bearing capacity of the runway is 89,000 pounds for a SWG aircraft and 142,500 for a dual wheel gear (DWG).

The maximum takeoff weight of the CL350 is 40,600 pounds, and it has a DWG. Therefore, the pavement strength of the runway at HCR is sufficient for existing and forecast conditions.

5.9 RUNWAY GRADIENT

The FAA maximum allowable longitudinal runway grade for category C aircraft is 1.5%; however, grades may not exceed plus or minus 0.8% in the first and last quarter, or first and last 2,500 feet (whichever is less) of the runway length. For HCR, this would be the first and last quarter, with a length of approximately 1,724 feet.
The gradient for the first quarter of Runway 4 is approximately 0.89% [(5,598.46-5,582.99)/1,724.5) = .0089].
The gradient for the first quarter of Runway 22 is 0.7 2% [(5,636.79-5,624.25)/1,724.5) = .0072]. The total runway gradient is 0.77% [(5,636.79-5,582.99)/6,898)=.0077]. Therefore, the overall runway gradient is within FAA limits; however, the first quarter of Runway 4 exceeds limits.

5.10 RUNWAY LINE OF SIGHT

The runway line of sight requirements facilitates coordination among aircraft and between aircraft and vehicles operating on active runways. This allows departing and arriving aircraft to verify the location and actions of other aircraft and vehicles on the ground that could create a conflict. Along individual runways with a full parallel taxiway, like HCR, the FAA standard is that any point five feet above the runway centerline must be mutually visible with any other point five feet above the runway centerline that is located at a distance that is less than one half the length of the runway. The runway line of sight at HCR meets this requirement.

5.11 RUNWAY SEPARATION STANDARDS

The FAA specifies separation distances between the runway and other airport facilities, also determined by the design aircraft. ***Table 5.11*** outlines the runway separation standards for a C-II facility, along with the existing conditions at HCR.

Table 5.11 Runway Separation Standards

Design Criteria	Existing Runway 4/22	ARC C-II Standards	Standard Met With Existing Condition?
Runway centerline to parallel taxiway/ taxilane centerline	240 feet	300 feet	No
Runway centerline to aircraft parking area	250 feet	400 feet	No
Runway centerline to holding position	200 feet	250 feet	No

5.12 TAXIWAY REQUIREMENTS

A taxiway is a defined path established for the taxiing of an aircraft from one part of an airport to another. Taxiways at airports provide a designated route for aircraft to use for access to and from the runway. Like the runway, taxiways have designated safety areas and design standards based on the ARC. AC 150/5300-13A provides the standards for taxiway design.

Again, taxiways are designed for "cockpit over centerline" taxiing, which means pavement is sufficiently wide enough to allow a certain amount of wander. The allowance for wander is provided by the Taxiway Edge Safety Margin (TESM), which is measured from the outside of the design landing gear to the edge of the taxiway. Dimensional taxiway design standards are established based on the Taxiway Design Group (TDG).

Like runways, taxiway design includes associated safety and object free areas to provide a safety buffer around movement areas and are determined based on the taxiway's design standard.

Taxilane: A taxiway designed for low speed and precise taxiing. Taxilanes are usually, but not always, located outside the movement area, providing access from taxiways (usually an apron taxiway) to aircraft parking positions and other terminal areas.

Taxiway Safety Area (TSA): The TSA is a defined surface alongside the taxiway prepared or suitable for reducing the risk of damage to an airplane if unintentionally departing the taxiway.

Taxiway/Taxilane Centerline to Fixed or Movable Object Separation: The minimum distance between the centerline of a taxiway or taxilane to a fixed or movable object. Objects that are fixed-by-function, such as Precision Approach Path Indicators (PAPIs), are allowed within this area.

Taxiway/Taxilane Safety Area (TSA): A defined surface alongside the taxiway prepared or suitable for reducing the risk of damage to an aircraft deviating from the taxiway.

Taxiway/Taxilane Object Free Area (OFA): An area on the ground centered on a taxiway/taxilane centerline provided to enhance the safety of aircraft operations by remaining free of objects, except for objects that must be located in the OFA for air navigation or aircraft ground maneuvering purposes.

The TDG associated with the identified critical aircraft at HCR is TDG 1B. The FAA states that different critical aircraft may be identified to define separate elements of airport design. This is common for GA airports which support business jet operations, which typically have a narrow body design. Although this critical aircraft drives the design standards for the runway, there is often a separate aircraft with a more demanding taxiway requirement.

In 2021, the TFMSC reported 849 operations by TDG 2 aircraft, which does not include the roughly 1,600 operations by gliders, which require the wider taxiway for staging and launch operations. Because of the significant operations by aircraft requiring TDG 2 design standards (greater than 500), this becomes the standards for taxiway design at the Airport.

Table 5.12 outlines the existing conditions at HCR compared to the FAA design standards for an ADG-II, TDG 2, taxiway design.

Table 5.12 Taxiway Standards

Taxiway Protection			
Design Criteria	**Existing (ADG II)**	**ADG II Standard**	**Standard Met With Existing Condition?***
Taxiway Safety Area (TSA) Width	79 feet	79 feet	Yes
Taxiway Object Free Area	131 feet	131 feet	Yes
Taxilane Object Free Area	115 feet	115 feet	Yes
Taxiway Centerline to Fixed or Moveable Object	65.5 feet	65.5 feet	Yes
Design Criteria	**Existing (TDG 2)**	**TDG 2 Standard**	**Standard Met With Existing Condition?***
Taxiway Width	35 feet	35 feet	Yes
Taxiway Edge Safety Margin	7.5 feet	7.5 feet	Yes
Taxiway Shoulder Width	15 feet	15 feet	Yes

* While existing conditions satisfy ADG II standards, these standards may not be maintained under the airports current configuration were the runway geometry will need to be modified to meet standards. Runway and taxiway alternatives will be explored in Chapter 6.

5.13 ELECTRONIC, VISUAL, AND SATELLITE AIDS TO NAVIGATION

Navigational aids (NAVAIDS) can be visual or electronic and include Communications, Navigation, Surveillance, and Weather (CNSW) facilities enhancing safety for airport operations. Visual systems can consist of markings or a light source, and electronic NAVAIDS emits a signal either for an aircraft or an Air Traffic Controller (ATC).

NAVAIDS provide pilots with information to assist in locating the airport, update weather conditions, and identify the landing direction. Some NAVAIDS provide horizontal and vertical guidance during landing. Instrument NAVAIDS permit properly equipped aircraft to access the airport during poor weather conditions and include ground-based and satellite systems.

HCR is equipped with a segmented circle and lighted wind cone, runway and taxiway lighting, a 4-light Precision Approach Path Indicator (PAPI) on Runway 22, a beacon, and an Automated Weather Observing System (AWOS) for weather reporting. The AWOS is operational; however, there are some components that are old and in need of replacement and upgrade. The other listed NAVAIDS are in good condition.

There are no ground-based navigational systems at the airport; however, there is one satellite-based instrument approach. The NAVAIDS at HCR are appropriate for existing and future operations at the airport, and there are no improvements being recommended as part of this Airport Master Plan.

5.14 AIRSPACE REQUIREMENTS

Ensuring an airport's operational airspace is planned and protected is necessary for ensuring existing and future safety compliance. This section provides an airspace analysis that includes elements relevant to the FAA AC 150-5300-13A and Title 14 of the Code of Federal Regulations (CFR) Part 77, Objects Affecting Navigable Airspace.

14 CFR PART 77 IMAGINARY SURFACES

CFR Part 77 establishes standards for determining obstructions in navigable airspace. Part 77 describes imaginary surfaces surrounding airports and are specific to individual runways based on runway category and instrument approach.

The most precise existing or proposed instrument approach for the specific runway end determines the slope and dimensions of each approach surface. Any object, natural or man-made, that penetrates these imaginary surfaces is considered to be an obstruction. ***Figure 5.5*** illustrates these surfaces.

Primary Surface: A rectangular area, symmetrically located along the runway centerline, and extends 200 feet beyond each runway threshold. The elevation of the Primary Surface is the same as the corresponding runway elevation. The most demanding existing or planned instrument approach for either runway end determines the Primary Surface width. In all cases, the width equals the inner width of the approach surface.

Horizontal Surface: An oval-shaped, level area situated 150 feet above the airport elevation. The perimeter is established by swinging arcs of specified radii from the center of each end of the Primary Surface of each runway and connecting the adjacent arcs by lines tangent to those arcs. The arcs at either end will have the same value.

Conical Surface: A sloping area whose inner perimeter conforms to the shape of the horizontal surface.

Transitional Surface: An area beginning at the edge of the Primary Surface and slopes at a ratio of 7:1 (horizontal: vertical) until it intersects the Horizontal Surface.

Approach Surface: A surface that begins at the ends of the Primary Surface and slopes upward, and flares outward horizontally at a predetermined ratio. The width and elevation at the inner Approach Surface conform to the Primary Surface. Slope, length, and width of the outer ends are governed by the runway service category, existing or proposed instrument approach procedure, and approach visibility minimums.

Figure 5.5 Part 77 Imaginary Surfaces

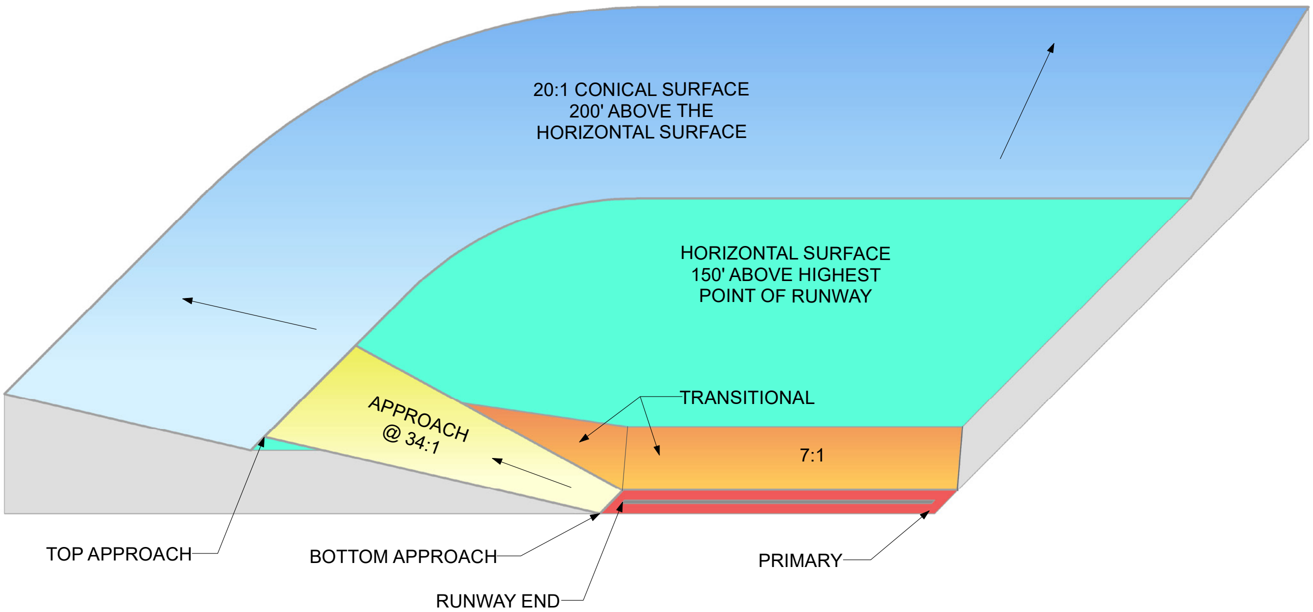


Table 5.13 Part 77 Dimensions	
	HCR
Conical Surface	
Length	4,000’
Slope	20:1
Transitional Surface	
Slope	7:1
	Runway 4/22
Primary Surface	
Width	500’
Length Beyond Runway End	200’
Horizontal Surface	
Height Above Airport Elevation	150’
Radius Arc	10,000’
Approach Surface	
Inner Width	500’
Outer Width	3,500’
Length	10,000’
Slope	34:1

OBSTRUCTION ANALYSIS

The FAA recommends that obstructions penetrating the Part 77 imaginary surfaces be mitigated or removed if possible. The approach zones and RPZs are the busiest areas around an airport and the statistical locations for a higher probability of an aircraft accident. Every effort should be made to minimize obstructions within these areas; however, there are times when this is not possible with existing infrastructure or surrounding terrain.

HCR currently has no obstructions to safety areas or Part 77 surfaces. As discussed in section 5.15, planning coordination should continue between the City and surrounding jurisdictions to ensure appropriate land use and development around the airport.

INSTRUMENT APPROACHES

Heber Valley Airport has a single satellite-based instrument approach procedure, which serves both runway ends by way of a circling approach. The RNAV (GPS) – A approach has a published minimum visibility of 1 1/2 miles with a minimum descent altitude of 8,020 feet. There are no expected changes to the instrument approach procedures; therefore, the airspaces defined in ***Table 5.13*** will remain the same throughout the planning period.

5.15 LAND USE PLANNING

Effective compatible land use planning around airports addresses airspace, safety, and noise considerations. In many instances, the community's willingness to take a proactive approach in establishing land use policies around the airport prevents the need to be reactive and mitigate more severe conflicts in the future. Comprehensive land use compatibility plans consider and incorporate both height restrictions and basic land use restrictions via zoning. Coupled with other proactive measures, such as voluntary noise abatement programs and selective fee simple land acquisition, proactive planning around the airport protects both the airport and the surrounding community.

The Heber City Master Plan, Envision Heber 2050, acknowledges the need for appropriate land use planning to preserve the character and setting of the community. The goal of the City Master Plan is to retain the distinction between communities, enabling Heber residents to embrace the nearby mountains and maintain a more rural sense of community. To achieve this vision, the future land use zoning aims at maintaining the agricultural and rural residential zoning as a buffer around the city. The future land use zoning map protects the airport through appropriate zoning consisting of Airport, surrounded by Agricultural Preservation, and Industrial zoning.

Effective land use planning is also a priority of the County and identified as such in the Wasatch County General Plan. The goal for land use planning around the Heber Valley Airport is that it be compatible with the airport and to implement policies to protect the open space, agricultural, and industrial zones to ensure future land use compatibility.

The 2007 Utah Continuous Airport System Plan, the most current plan available, identified some recommended actions for Heber Valley Airport regarding land use planning. These recommendations include the development and implementation of Part 77 zoning ordinances, implementation of flight path/noise abatement procedures, acquisition of land or easements to protect airport operations, development or adoption of a formal land use compatibility plan, and implementation of overlay zones for flight paths, height, noise, and land use.

The Sponsor should take a proactive approach with land use planning around the airport to ensure zoning, ordinances, and policy continues to align with the compatibility of existing and future operations. Such actions will reduce conflicts that could potentially constrain the airport or lead to safety hazards.

5.16 GENERAL AVIATION REQUIREMENTS

General Aviation (GA) encompasses a wide range of activities, such as recreational, business, commuter, flight training, agriculture applications, emergency medical services, and more. GA aircraft fleet mix includes a number of different aircraft types, including jets and propeller driven aircraft, as well as helicopters, gliders, and balloons. GA needs include aircraft storage facilities, transient parking aprons, terminal facilities, automobile parking areas, and vehicle access. As such, a general aviation airport should accommodate the types of GA operations occurring at the airport.

HANGARS/AIRCRAFT STORAGE

There is an assortment of hangar types and sizes at the airport, all of which are occupied. As of March 2021, there were approximately 250 people on the waiting list to either build or lease hangar space at the airport. Hangar size needs range from small 40 by 40-foot hangars for single engine piston aircraft to large 100 by 100 -foot hangars to support larger business jets.

According to Utah's 2020 Aviation Development Strategy, it is recommended that airports plan for sufficient hangars to accommodate 70% of the based aircraft fleet. In 2021, there were 84 based aircraft at HCR. This number is forecasted to increase to 109 by 2041. At the present time, Heber Valley Airport should have enough hangars/aircraft storage to accommodate approximately 59 aircraft, with this number increasing to approximately 77 aircraft by the year 2041.

As noted in ***Chapter 3***, there were 71 hangars at the airport in 2020. If 25% of the people on the waiting list follow through on their requests for hangars, an additional 63 hangars would be needed, for a total of 134 (71 + 63). By applying the guidelines outlined in the 2020 Aviation Development Strategy and the need to accommodate 25% of the people on the waiting list, the airport would need a minimum of 51 additional hangars [(59 + 63) – 71] in 2021 and 69 additional hangars [(77 + 63) – 71] by 2041.

TRANSIENT AIRCRAFT PARKING

According to the 2020 Utah Aviation Development Strategy, the airport should be able to accommodate 75% of the daily transient aircraft with transient aircraft parking positions. Based on this information, Heber Valley Airport should have 17 transient aircraft parking positions (8,193 transient operations / 365 days = 22 transient operations per day x 75%) available in 2021 and 22 aircraft parking positions (10,608 transient operations / 365 days = 29 transient operations per day x 75%) available in 2041.

The existing transient aircraft parking spaces, which vary in size, total 48 and are located on the FBO apron. While this number of transient aircraft parking spaces is adequate under the formula suggested by the 2020 Aviation Development Strategy, it is notable that the airport experiences several peak periods (e.g., the annual Sundance Film Festival) throughout the year where transient aircraft parking is at capacity. Accordingly, it is recommended that additional transient aircraft parking space be developed at the airport to accommodate peak demand.

BASED AIRCRAFT PARKING

The 2020 Aviation Development Strategy recommends that the airport have sufficient based aircraft parking spaces to accommodate 25% of the facility's based aircraft. In 2021, there were 84 based aircraft at HCR, which is forecasted to increase to 109 by 2041. As of 2021, there is a need for 21 based aircraft parking spaces, growing to 27 by 2041.

Currently, there are no aircraft parking spaces at Heber Valley Airport specifically designated for based aircraft. The FBO offers short and long term leasing of aircraft parking positions; however, lease of these parking positions to based aircraft reduce the parking available for transient parking. It is recommended that apron space be developed to specifically accommodate based aircraft parking. Development of recommendations and alternatives will be explored in ***Chapter 6***.

GENERAL AVIATION FACILITIES

The airport maintains a GA pilot lounge, in addition to the pilot lounge available through the FBO. These facilities include a waiting area, restrooms, vending, and planning areas. This facility is considered sufficient, and no other GA amenities are being recommended.

5.11 SUPPORT FACILITIES

DEICING

The FBO, OK3 Air, provides aircraft deicing. Services include deicing and anti-icing capabilities with type I and type IV fluids. The need for additional facilities or services is not apparent; therefore, no further deicing services are being recommended at this time.

FUEL AND GROUND SERVICES

Fuel services and accessibility at an airport are essential for attracting and maintaining based aircraft and itinerant aircraft to an airport. Fuel service is typically provided by an FBO; however, some airports maintain their own fuel facilities provided by the sponsor. Both 100 low lead (LL), or aviation gasoline (avgas), and Jet A fuel are available at HCR through the FBO. The FBO also maintains a self-service fuel facility available to airport users. Additional ground services are also available through the FBO, such as a Ground Power Unit (GPU), battery cart, and oxygen.

The fuel farm maintain by the FBO is presently located toward the center of the FBO-leased apron, which location is not ideal for the safety and efficient of airport operations. In addition, the FBO has indicated to the sponsor that the fuel farm facilities are nearing the end of their useful life. It is recommended that the fuel farm be reconstructed at more suitable location on the Airport. Additionally, it is recommended that suitable facilities be developed for the storage of mobile refueling equipment and other GSE during winter conditions.

Several airport users have indicated a desire for additional FBO services which cater to light general aviation aircraft, provide competitive self-service fueling facilities, and/or other competitive services. It is recommended that space be identified and/or developed at the Airport for the provision of these additional aeronautical services.

Similarly, some airport users have expressed a desire to conduct self-fueling. The airport's minimum standards currently require that fuel associated with self-fueling activities be stored with the FBO or in a self-service storage facility constructed in a centrally located fuel storage area. The airport does not currently have a designated centrally located fuel storage area for these purposes.

Provisions for these facilities will be explored further in the alternatives analysis.

MAINTENANCE

The FBO provides maintenance and repair services, including structural, avionics systems, and aircraft engines. The need for additional facilities or services is not apparent; therefore, no further services are being recommended at this time.

SNOW REMOVAL EQUIPMENT (SRE) AND STORAGE

FAA AC 150/5220-20A, Airport Snow and Ice Control Equipment, provides guidance on selection and procurement for various SRE. The equipment selection process is based on snow removal clearance times and the square footage and priority of pavement to be cleared. For a general aviation airport with greater than 10,000 operations but less than 40,000, such as HCR, the recommended clearance time for priority 1 areas is three hours.

For HCR, the priority 1 areas are defined in the Snow and Ice Control Plan and include Runway 4/22, Taxiway A, and the fuel and service areas. Priority 2 areas include Taxiway A-3 connector followed by the other connectors and taxilanes. Priority 3 areas are the parking lots, secondary entrances gates, and all other hard surface areas in and around the airport.

The AC recommends that an airport be able to clear the defined priority 1 areas of 1 inch of snow within the recommended time. Based on this criteria, HCR, which receives an average of approximately 74 inches of snow a year, is recommended to have a minimum of one high-speed rotary snow plow, supported by two snow plows of equal snow removal capacity.

The existing fleet of SRE consists of a dump truck with plow, a loader with plow/box pusher attachment, and a snowblower. This equipment is in poor condition. Therefore, in following the AC guidance, it is recommended that the airport procure a class 1 rotary plow and replace the existing fleet to maintain the airport during winter conditions.

The airport's Snow and Ice Control Plan dictates that all SRE will be stored and maintained in the heated SRE building. Should the SRE fleet expand, it would be necessary to ensure that the equipment has appropriate storage space within the facility and expanded SRE storage may be necessary.

VEHICLE PARKING

According to the 2020 Aviation Development Strategy, there should be one vehicle parking space for each based aircraft plus an additional 50% for employees/visitors. As previously noted, there are 84 based aircraft at HCR in 2021. Based on information contained in the 2020 Utah Statewide Airport Economic Impact Study Technical Report, total employment for Heber Valley Airport was 170; therefore, HCR should have a total of 169 vehicle parking spaces [(170 x 50%0 + 84].

The existing vehicle parking lot for general aviation users currently has 21 marked spots and is often at capacity. It is recommended that additional automobile parking spaces be constructed to accommodate hangar complexes and airport areas removed from the FBO and main entrance.

5.12 FACILITY REQUIREMENTS SUMMARY

Increased utilization of the airport by C-II aircraft requires the Sponsor, consistent with the federal grant assurance obligations, to enhance the safety of such operations by meeting FAA design standards for C-II aircraft. These design standards exist to ensure uniform safety and facility development across the Nation's network of airports. For HCR, the enhanced standards primarily relate to the runway and runway protection areas. The existing condition is compared to the C-II FAA design standards in ***Table 5.14***, where the FAA standards must be met.

Table 5.14 Summary of Required Modifications to Satisfy FAA Design Standards

Design Criteria	Existing	C-II Standard
Longitudinal Runway Gradient	Full runway gradient = 0.77% First quarter RWY 4 = 0.89% First quarter RWY 22 = 0.72%	Full Runway Gradient = 1.5% max First Quarter RWY 4 = 0.8% max First Quarter RWY 22 = 0.8% max
Runway width	75 feet	100 feet
Runway Safety Area (RSA) length beyond runway end	300 feet	1,000 feet
Runway Safety Area (RSA) width	150 feet	500 feet
Runway Object Free Area (ROFA) length beyond runway end	300 feet	1,000 feet
Runway Object Free Area (ROFA) width	500 feet	800 feet
Runway 4/22 Approach & Departure Runway Protection Zone (RPZ) length	1,000 feet	1,700 feet
Runway 4/22 Approach RPZ Outer width	700 feet	1,010 feet
Runway centerline to parallel taxiway/ taxilane centerline	240 feet	300 feet
Runway centerline to general aviation aircraft parking area	250 feet	400 feet
Runway centerline to holding position markings (all)	200 feet	250 feet

In addition to the FAA design standards, ***Table 5.15*** summarizes recommendations determined as part of this planning study. Recommendations are not regulatory; however, they present development that should be considered to accommodate the needs of the users and facility upkeep.

Table 5.15 General Aviation, Terminal Area, and Facility Recommendations

Facility	Existing	Recommendation
Fuel Facility	FBO provides fuel services, including avgas and jet A	Relocate and modernize fuel farm; identify areas for additional services.
Hangars/Aircraft Storage	71 hangars of various sizes, including the museum and two leased by the FBO	Construct an additional 51 hangars minimum
Tiedown Space	Transient: 48 spaces of various sizes available on FBO apron. Based: No designated spaces.	Transient: Additional parking spaces. Based: Designated based aircraft apron.
SRE Equipment	Dump truck with plow, loader with plow/box attachment, snow blower.	Procure a Class 1 high-speed rotary plow, and replace the existing fleet with two snow plows of equal snow removal capacity
SRE Facility	Three-bay facility	Expand the SRE facility to accommodate the upgraded fleet
Automobile Parking	Single paved lot with 21 designated spaces.	Provide additional automobile parking spaces

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