4.0 FACILITY REQUIREMENTS AND DEMAND/CAPACITY ANALYSIS

This chapter documents the facilities needed to meet the demand requirements as described in **Chapter 3, Aviation Activity Forecasts**. Current facilities were examined to determine if they meet existing demands of the Airport as well as future needs. Certain items identified in this chapter may have multiple solutions which will be examined to determine the preferred alternatives. These items will be explored in **Chapter 5, Alternatives Analysis**.

4.1 Regional Airport System Role

In 2011 the Colorado Department of Transportation (CDOT) Division of Aeronautics published the Colorado Aviation System Plan (Plan). The Plan evaluated and measured the performance of the Colorado system of publicly-owned airports and assigned each Colorado airport to one of three functional categories: Major, Intermediate, or Minor. The State classifies AEJ as an Intermediate General Aviation (GA) airport in the Plan. CDOT evaluated airports' current facilities against the Plan's objectives and identified facilities and services that need improvements. These objectives included:

- Primary runway length, width, and strength
- Taxiway system objectives for primary runway
- Runway approach
- Visual landing aids
- Runway lighting
- Weather reporting systems
- Telephone service and restroom access
- Fixed base operator services
- Aircraft maintenance services
- Airports with aircraft fuel
- Ground transportation services
- Terminal buildings
- Aircraft parking aprons and aircraft hangars
- Auto parking
- Snow removal and de-icing capabilities
- Fencing
- Additional needs (air traffic control tower, ground communications outlet, electrical vault, Aircraft Rescue and Fire Fighting (ARFF) equipment/building, tractors, mowers, maintenance vehicle, paint machine, crack fill machine)

AEJ meets all but one of the airport-specific objectives identified in the 2011 System Plan. The plan recommends runway end identifier lights (REILs). This recommendation is considered in **Section 4.3.3**.

4.2 FAA Design Standards

Table 4-1 summarizes FAA design standards from FAA AC 150/5300-13A, *Airport Design,* along with the current conditions on existing Runway 15/33. As described in **Chapter 2**, the Runway Design Code (RDC) is a classification given to aircraft based on the maximum approach speed and wingspan of the aircraft and approach visibility minimums. This classification applies design criteria appropriate to operational and physical characteristics of the aircraft types operating at an airport. As described in **Section 2.2**, AEJ meets B-II design standards, as required by FAA AC 150/5300-13A[1]. Runway and taxiway dimensional standards must meet or exceed the specified widths and clearances specific to the critical aircraft to ensure safe operation for landing, take-off, and taxi. The critical aircraft for AEJ is a Cessna Citation II, as discussed in **Section 3.6.6**. **Table 4-1** lists the RDC B-II design standards in comparison to the existing Runway 15/33.

The airfield currently meets B-II design standards.

TABLE 4-1 – FAA DESIGN STANDARDS

Standard	Current Conditions	B-II Design Standards
Runway Width	75'	75'
Runway Shoulder Width	10'	10'
Runway Safety Area (RSA) Width	150'	150'
RSA Beyond Runway End	300'	300'
Runway Object Free Area (ROFA) Width	500'	500'
ROFA Beyond Runway End	300'	300'
Runway Protection Zone (RPZ) Length	1,000'	1,000'
Runway Centerline to Parallel Taxiway Centerline	300'	240'
Runway Centerline to Aircraft Parking	550'	250'
Runway Holding Position Markings	200'	200'

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

Runway Safety Area

The runway safety area (RSA) is a defined surface surrounding the runway that is specifically prepared and suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the paved surface. The standard RSA for a B-II airport is 150 feet wide and extends 300 feet beyond the end of the runway. The existing RSA for Runway 15/33 at AEJ is 150 feet in width and extends 300 feet beyond each end of the runway.

AEJ meets RSA requirements for RDC B-II.

Runway Object Free Area

An object free area (OFA) is an area on the ground that is centered on a runway, taxiway, or taxilane centerline, and is provided to enhance the safety of aircraft operations by clearing the area of above-ground objects. Acceptable objects in the runway object free area (ROFA) are objects that need to be located in that area for air navigation or aircraft ground maneuvering purposes, or are less than three inches tall. As shown previously in **Table 4-1**, AEJ meets both existing and future ROFA requirements.

AEJ meets ROFA requirements for RDC B-II.

[1] Federal Aviation Administration Advisory Circular 150/5300-13A, *Airport Design*

Obstacle Free Zone

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. The OFZ is 400 feet wide and extends 200 feet beyond the end of the runway.

AEJ meets OFZ requirements for RDC B-II.

Runway Hold Position Markings

According to AC 150-5300-13A, holdlines at airports without control towers, such as AEJ, identify the location where a pilot should ensure there is adequate separation from other aircraft before proceeding onto the runway. These locations are chosen to ensure that aircraft are clear of the RSA and OFZ during operations. Based upon AEJ's RDC of B-II the holding position should be 200-feet from runway centerline.

AEJ meets runway hold position marking requirements for RDC B-II.

Building Restriction Lines

Building restriction lines (BRLs) run parallel to the runway and are offset at a distance that ensures that new construction remains outside of Terminal Instrument Procedures (TERPS) surfaces and other protected surfaces as required by 14 CFR Part 77, *Safe, Efficient Use, and Preservation of the Navigable Airspace*. The BRLs at AEJ are calculated based on a 35-foot-tall structure. Structures taller than 35 feet require additional analysis to ensure compliance with the 14 CFR Part 77 surfaces.

AEJ meets the BRL requirements; existing buildings are outside of the BRL.

4.3 Airside Requirements

The airside components evaluated include the runway, taxiways, FAA safety standards, navigational and landing aids, airspace requirements, and obstructions.

4.3.1 Runway

Runway Orientation

The ability of the runway to meet the requirements of airport users is one of the most critical components to the success of an airport. The runway must have the capacity, length, strength, and proper orientation to the wind to meet the demands of its users. This section examines several key factors used in the determination of the adequacy of the runway system.

Runway orientation is the alignment of the runway in relation to magnetic north, and is primarily influenced by wind direction. Runways are aligned so the prevailing wind creates the least amount of crosswind operations. Recognizing that there are variable weather conditions, aircraft are designed to land with an acceptable degree of crosswind, referred to as the crosswind component. When conditions are above the maximum allowable crosswind component for a particular type of aircraft, said aircraft must use another runway or divert to another airport. Since AEJ has just one runway, the only option is to divert to another airport. To reduce the amount of diversions due to wind, the most ideal runway layout results in an allowable crosswind component for the design aircraft 95 percent of the time.

Provided the current runway configuration and the historic combined wind coverage for AEJ, as discussed in **Section 2.9.1**, the runway falls under the 95 percent FAA recommended crosswind coverage for all weather conditions for 10.5 and 13 knots. A crosswind runway could be recommended within the planning period; however, the FAA may not support one due to higher funding priorities within the national system and limited funding for crosswind runways. Consequently, should the community desire a crosswind runway, funding outside of federal support would likely be necessary.

Discussions with local pilots at the public open house held on March 9, 2015 and at their monthly meeting on May 16, 2015 revealed their concern about the strong crosswinds they consistently experience landing on Runway 15/33. They feel that improving the safety of the landing environment for those operating small aircraft should be AEJ's priority.

The pilots also noted that the undulating terrain east of Runway 33 magnifies the intensity of the crosswinds as they disrupt the airflow and suggested grading the terrain to improve conditions. The varied terrain, however, serves as drainage channels and a portion is not located within AEJ boundaries. **Figure 4-1** depicts the terrain.

FIGURE 4-1 – TERRAIN EAST OF RUNWAY 33

Note: Not to scale
Source: Google Earth, 2015

AEJ's current runway orientation does not provide adequate wind coverage per FAA guidance. A crosswind runway may be considered but would be outside of FAA funding. Chapter 5, Alternatives Analysis, will review the possibility of grading the area east of Runway 33 to minimize crosswind effects as well as the orientation of a crosswind.

Runway Magnetic Bearing

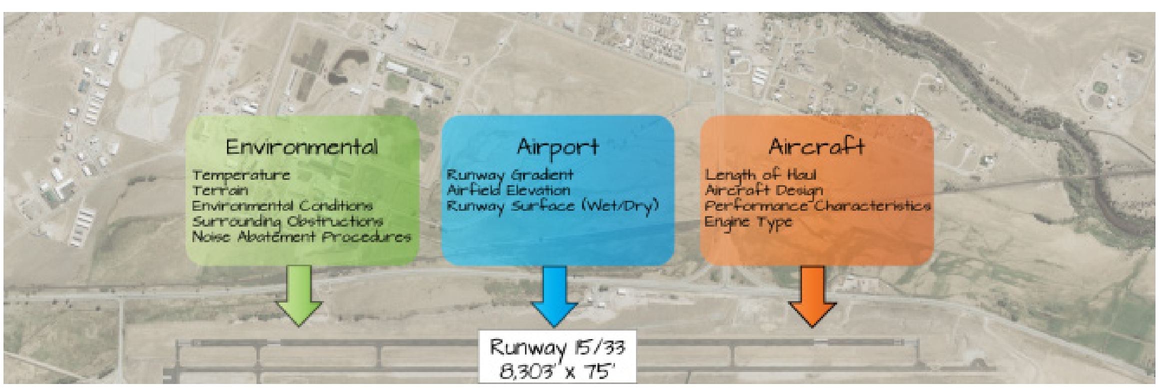
FAA evaluates the numbering for each runway end (known as the runway designation) against magnetic bearing every five years. Magnetic bearings change periodically due to changes in the earth's magnetic field (i.e. the earth's magnetic north is constantly moving at approx. 0^0 6' W per year). As a result, over time, the runway magnetic bearings change as well. AEJ's runway designation is 15/33, which is short hand for 150 degrees and 330 degrees magnetic. The runway true bearing is 340^0-160^0, and the magnetic declination is 8^0 48' E (source: NOAA magnetic field calculator). FAA identifies which airports have runway bearings that require a re-designation due to the shift in magnetic north. Written notice from the FAA Air Traffic Organization (ATO) is issued to airports with runway designations that are due to be changed, and every effort is made to facilitate the change as part of an upcoming runway maintenance or construction project, such as a pavement maintenance project., .

Based on the runways' current true bearing, the rate of magnetic north shift, and the magnetic declination, it does not appear that Runway 15-33 needs to be re-designated within the next five to ten years.

Runway Length

The purpose of the runway length analysis is to determine if the length of the existing runway is adequate for the current and projected aircraft fleet operating at AEJ. The current length of Runway 15/33 is 8,303 feet. Runway length is dependent on numerous factors, including: airport elevation, temperature, wind velocity and direction, ambient air temperature, aircraft design, length of haul, runway surface (wet or dry), runway gradient, presence of obstructions, and any imposed noise abatement procedures or other prohibitions. The required runway length at AEJ is particularly impacted by the airfield elevation, surrounding obstructions, and runway gradient. The terrain surrounding the Airport also impacts runway length as it limits the amount of space available for runway construction. **Figure 4-2** displays factors that impact runway length.

FIGURE 4-2 – IMPACTS TO RUNWAY LENGTH



Note: Not to scale
Source: Jviation

For design purposes, runway length recommendations at GA airports are generally based upon a combination of the most demanding aircraft or family grouping of aircraft within the GA fleet that are operating, or anticipated to operate at the airport in the future. The portion of the GA fleet normally operating at AEJ is dominated by small aircraft weighing up to 12,500 pounds.

While the FAA does not provide standards for runway length, FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design*, provides guidance to assist in determining the recommended runway length for an airport based on the previously noted factors. The process for determining runway length begins with analyzing the operating weight for critical aircraft that are anticipated to account for at least 500 annual operations within the planning period.

Based on their weight, aircraft are placed in three categories: aircraft that weigh less than or equal to 12,500 pounds, aircraft weighing between 12,500 pounds and 60,000 pounds, and aircraft weighing 60,000 pounds or greater. Methodology for determining runway length is dependent on the category to which the critical aircraft belongs. **Table 4-2** shows the recommended runway lengths for small and large airplanes less than or equal to 60,000 pounds.

TABLE 4-2 – RECOMMENDED RUNWAY LENGTHS FOR AEJ

Runway Lengths Recommended for Airport Design	
Small airplanes with approach speeds of < 30 knots	538.5 feet
Small airplanes with approach speeds of < 50 knots	1,436 feet
Small airplanes with < 10 passenger seats – 95% of these small airplanes – 100% of these small airplanes	 10,000 feet 10,000/a/ feet
Large airplanes weighing ≤ 60,000 pounds – 75% of these large airplanes at 60% useful load – 75% of these large airplanes at 90% useful load – 100% of these large airplanes at 60% useful load – 100% of these large airplanes at 90% useful load	 7,700/b/ feet 8,600/b/ feet 11,000/b/ feet 11,000/b/ feet

Notes: /a/Airport elevation exceeds curve parameters at mean daily maximum temperature of the hottest month of year.
/b/Maximum Runway Length (feet) permissible rate of climb according to performance capability as contained in the FAA- approved airplane manuals under an assumed loading condition.
Source: FAA AC 150/5325-4B, Runway Length Requirements for Airport Design

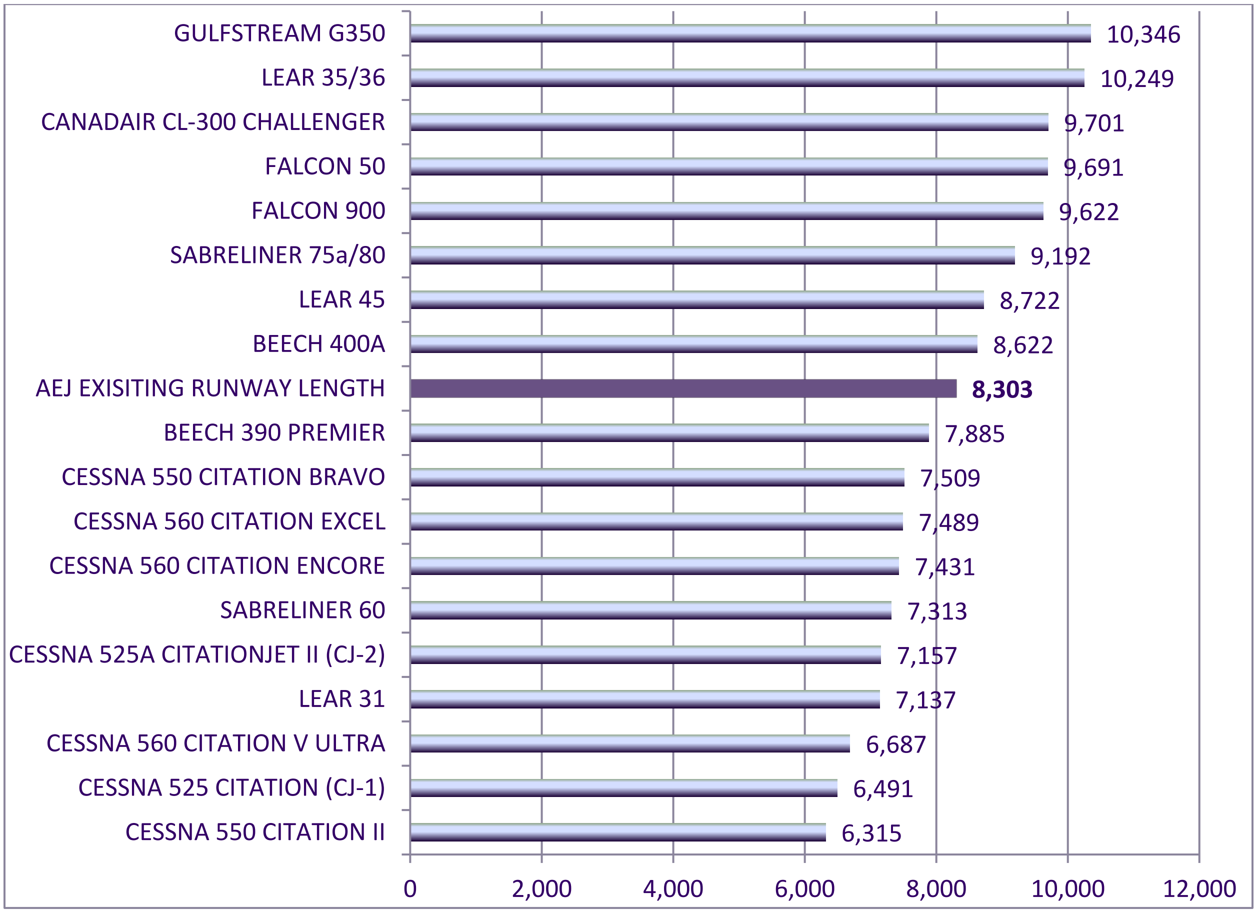
As **Table 4-2** shows, AEJ currently accommodates 100 percent of the small airplane fleet with approach speeds less than 50 knots; however, for aircraft weighing up to 60,000 pounds, there is insufficient runway length to accommodate the large jet aircraft fleet at 90 percent useful load. For larger business jet aircraft, the existing runway length is less than the requirement for maximum takeoff weight.

However, the analysis indicates that at 8,303 feet, Runway 15/33 currently accommodates 75 percent of large airplanes weighing less than or equal to 60,000 pounds at 60 percent useful load. Reduction of useful load by the commercial and business jet fleet is typical for accommodating existing runway lengths at high altitude airports. **Figure 4-3** illustrates that many jets, including AEJ's critical aircraft (Cessna Citation II), are accommodated without operational penalties. Those jets shown that require more runway length than AEJ's existing runway length do have to make operational adjustments.

Documentation from users demonstrating the need for a longer runway length would be necessary in order to justify a runway extension. Currently, such demand for a runway extension is not warranted.

Runway length is adequate for existing and future demand based upon AEJ's critical aircraft.

FIGURE 4-3 – LARGE AIRCRAFT FLEET RUNWAY LENGTH REQUIREMENTS



Note: Runway requirements are approximate only from manufacturer Balanced Field Length or Takeoff Field Length adjusted for a mean max temp (82.1 degrees Fahrenheit) and field elevation (7,950 feet) with a 46.4 foot maximum difference in runway centerline elevation. These lengths are not a substitute for calculations required by individual aircraft operators; however, these calculations provide an estimate of runway length needed for these aircraft types to operate at AEJ at 100% useful load.
Sources: Aviation Research Group, Inc.; aircraft manufacturer data; Jviation

Runway Width

AEJ's current and future RDC of B-II requires a minimum runway width of 75 feet. Additionally, 10-foot-wide runway shoulders and 95-foot-wide runway blast pads are recommended (source: FAA AC 150/5300-13A, Appendix 7, Runway Design Standards Matrix, B-II). AEJ's existing runway width is 75 feet, and AEJ's runway shoulders (unpaved) are 10 feet wide. **Table 4-3** below shows the RDC design standards comparison with the existing Runway 15/33.

Blast pads are recommended for each Runway end (15 & 33), 95' wide x 150' long, if there are erosion conditions off the end of the runways. Given the soil type and lack of vegetation off each runway end, erosion from jet blast appears to be possible.

TABLE 4-3 – RUNWAY DESIGN STANDARDS

	ARC B-II > 1-Mile Visibility Minimums/a/	ARC B-II > ¾-Mile Visibility Minimums/a/	Existing Runway 15/33/a/
Runway Width	75	75	75
Runway Shoulder Width	10	10	10
Blast Pad Width	95	95	None
Blast Pad Length	150	150	None
Runway CL to Parallel TW CL	240	240	300
Runway CL to Aircraft Parking	250	250	550
Runway Hold Line	200	200	200

Note: /a/dimensions are in feet
Source: FAA AC 150/53-00-13A, *Airport Design*

Runway Line of Sight

The runway line of sight standard requires that two points, five feet above the runway centerline be mutually visible for the entire length of the runway. If there is a parallel taxiway, the two five-foot points must be visible for one-half of the runway length. The existing full length parallel taxiway (Taxiway A) and taxiway grades allow for mutual visibility of two five-foot points for at least half of the runway length.

Runway line of sight requirements on Runway 15/33 are met.

Runway 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. Runway 15/33 has a weight-bearing capacity designed to accommodate 30,000 pounds for Single Wheel Gear (SWG) equipped aircraft and 30,000 pounds for Dual Wheel Gear (DWG) equipped aircraft. **Table 4-4** shows runway weight bearing capacity for AEJ.

TABLE 4-4 – RUNWAY WEIGHT CAPACITY

Gear Configuration	Weight (pounds)	Aircraft Classification
Single Wheel Gear (SWG)	30,000	Most GA Aircraft including small and mid-sized business jets.
Dual Wheel Gear (DWG)	30,000	Narrow body aircraft such as Boeing 737 and Airbus A320 aircraft.

Source: Airnav.com

Runway 15/33's pavement strength is adequate for existing and future operational needs. No additional strengthening is recommended.

Runway Surface and Markings

Runway 15/33 is constructed of asphalt. The 2012 CDOT Division of Aeronautics Pavement Condition Index (PCI) study identified that the runway is of acceptable condition. Existing runway markings are in very poor condition.

Runway 15/33 is scheduled to be fog sealed and re-marked in summer 2015. Continued routine maintenance, such as crack and joint sealing, should be performed on a scheduled basis to extend the pavement life of the runway.

Runway Capacity

This section addresses the evaluation method used to determine the capability of the airside facilities to accommodate aircraft operational demand. This evaluation is expressed in terms of potential excesses and deficiencies in capacity. The measurement of airfield capacity is based upon the methodology in FAA Advisory Circular (AC) 150/5060-5, *Airport Capacity and Delay*.

Runway Capacity is defined by the FAA as, "a measure of the maximum number of aircraft operations that can be accommodated on the Airport or airport component in an hour."[1] Capacity is further divided into two categories: Visual Flight Rules (VFR) and Instrument Flight Rules (IFR). Utilizing guidance contained in FAA AC 150/5060-5, *Airport Capacity and Delay,* the runway capacity for AEJ has been calculated to be 74 VFR flights and 57 IFR flights per hour.

Another factor in runway capacity is annual service volume (ASV), which is a reasonable estimate of the Airport's annual capacity. A number of factors that may occur over the period of a year are used to determine ASV. These factors include runway use, aircraft mix, and weather conditions. ASV is calculated using the following criteria:

- ASV = CW x D x H
- CW weighted hourly capacity
  D ratio of annual demand to average daily demand
  H ratio of average daily demand to average peak hour demand

Using this equation, the ASV for AEJ has been calculated to be a maximum of 195,000 annual operations. As noted in **Chapter 3**, **Forecast**, total annual operations in 2015 are anticipated to be 4,392, well below the maximum ASV. FAA planning standards state that when 60 percent of the ASV is reached (117,000 annual operations), the airport should start planning to increase runway capacity, including construction of a new runway or extension of an existing runway. Once 80 percent of ASV is reached (156,000 annual operations), construction should begin in order to increase capacity of the existing facilities.

AEJ's existing facilities are adequate for accommodating future hourly and annual demand.

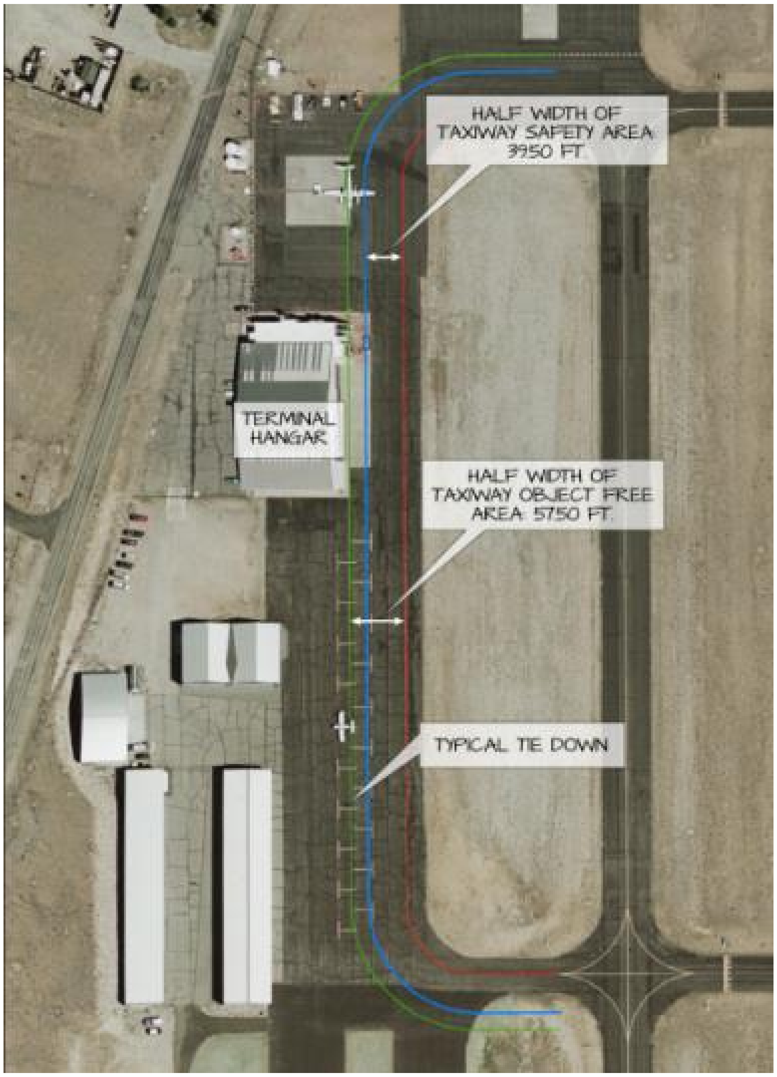
[1] FAA AC 150/5060-5, *Airport Capacity and Delay*

4.3.2 Taxiways and Taxilanes

Taxiways are designed to provide movement from one part of an airport to another. Ideally, the taxiway system should allow an aircraft to taxi to an associated runway in the most direct manner without having to change speed or cross active runways. Taxilanes are designed for lower speed movement and provide access from taxiways to aircraft parking positions and other terminal areas.

The taxiway design standards for width and separation are dictated by Aircraft Design Group (ADG) and Taxiway Design Group (TDG) as described in FAA AC 150/5300-13A, *Airport Design*. The TDG is determined by the main gear width (MGW) and the cockpit to main gear (CMG) of the largest aircraft operating at an airport on a frequent basis (critical aircraft). AEJ's TDG is 2, based upon the critical aircraft Cessna Citation II. All taxiways require a designated width of a Taxiway Safety Area (TSA) and Taxiway Object Free Area (TOFA) centered on the taxiway centerline. These standards allow for the safe movement of aircraft without the threat of striking any objects or other aircraft. AEJ's existing taxilane does not meet several criteria due to the location of the tiedowns, vehicle parking, terminal building, and terminal hangar (Mandes), see **Figure 4-4. Table** 4-5 provides existing taxiway and taxilane conditions and design standards for ADG II/TDG 2.

FIGURE 4-4 – TAXIWAY AND TAXILANE STANDARDS



Note: Not to scale
Source: Jviation

TABLE 4-5 - TAXIWAY DESIGN STANDARDS

Criteria	AEJ Existing Taxiway & Connectors[a]	AEJ Existing Taxilane[a]	ADG II TDG 2 Taxiway[a]	ADG II TDG 2 Taxilane[a]
Width	50 (taxiway) 35 (connector)	35	35	35
Taxiway Safety Area Width	79	Non-standard[b]	79	79
Taxiway Object Free Area Width	131	Non-standard[b][c]	131	115
Taxiway Centerline to – Runway Centerline – Fixed or Moveable Object	 300 65.5	n/a	 300 65.5	n/a
Taxilane Centerline to – Parallel Taxiway	n/a	229	n/a	105

Criteria	AEJ Existing Taxiway & Connectors[a]	AEJ Existing Taxilane[a]	ADG II TDG 2 Taxiway[a]	ADG II TDG 2 Taxilane[a]
– Fixed or Moveable Object		Non-standard[b][c]		57.5
Taxiway/Taxilane Wing Tip Clearance	26	Non-standard[b][c]	26	18
Taxiway Shoulder Width	15	n/a	15	n/a

Notes: [a] dimensions are in feet
[b] tiedowns are located within taxiway safety area and object free area; vehicles parked on east side of terminal encroach safety area.
[c] terminal building and terminal hangar encroach object free area
Sources: FAA AC 150/5300-13A, *Airport Design* and Jviation

Additional recommendations for taxiway system layouts (geometry) were recently included in AC 150/5300-13A[1]. As such, compliance with these recommendations is now mandatory. AEJ's taxiway connectors do not meet current fillet standards. **Figure 4-5** provides an example of one intersection at AEJ with existing geometry and the standard criteria.

Lastly, two connector taxiways (A5 and A6) are not in compliance as these taxiways provide direct access from the apron to the runway. It is recommended that alternatives be evaluated to eliminate direct taxiway access between the apron and Runway 15/33.

FIGURE 4-5 – FAA TAXIWAY DESIGN GROUP 2 FILLET DESIGN REQUIREMENTS

Note: Not to scale
Source: Jviation

It is recommended that tiedowns should be reconfigured to accommodate FAA standard taxilane safety areas and object free areas. This may require additional pavement which should also be considered east of the terminal building and hangar to meet taxilane standards. It is also recommended that direct access to Runway 15/33 from the apron be removed and taxiway/connector fillet standards be met. Options for each of these recommendations will be explored in Chapter 5, Alternatives Analysis. Routine maintenance, such as crack and joint sealing,

[1] FAA AC 150/5300-13A, *Airport Design*, Table 4-5 Standard Intersection Details for TDG 2.

should be performed on a scheduled basis to extend the pavement life of the taxiways. The taxiways are scheduled to be fog sealed in summer 2015.

4.3.3 Airfield Lighting and Signage of Runways and Taxiways

The runway is equipped with a 19-year-old medium intensity runway lighting (MIRL) system which is in fair condition. Lighting systems are eligible for replacement per the FAA's Airport Improvement Program (AIP) Handbook, Order 5100.38D after 15 years. However, systems can last much longer than 15 years and replacement is typically triggered by frequent malfunctioning or replacement of cables, light fixtures, or transformers. It is anticipated that the MIRL system will need replacement during the early to mid-portion of the planning period.

The runway ends do not currently have lights. The 2012 CDOT System Plan recommended that both runway ends be equipped with runway end identifier lights (REILS) in the near-term.

Taxiway A and associated connector taxiways are marked with reflectors. A lighting system should be considered during the planning period.

It is recommended that a medium intensity taxiway lighting (MITL) system be installed on the parallel taxiway and connectors in the first half of the planning period. REILS are also recommended on both runway ends during the earlier portion of the planning period. The MIRL system should be replaced at the end of its useful life (anticipated to be towards the early to middle of planning period).

4.3.4 Navigational Aids & Instrument Approach Procedure Analysis

As discussed in **Chapter 2**, **Inventory**, AEJ has one published non-precision approach procedure. Approach minimums for such procedures are based upon several factors, including aircraft characteristics, obstacles, navigation equipment, approach lighting, and weather reporting equipment. Both ends of Runway 15/33 are equipped with precision approach path indicators (PAPIs), which provide visual decent guidance. The airport also has a rotating beacon to aid pilots in identifying the Airport.

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 NextGen program. NextGen is a complete upgrade of the National Airspace System. A focus of NextGen is the enhancement of pre-departure, departure, climb, en route, and approach phases of a flight. More information on the NextGen program can be obtained from the FAA's website[1].

NextGen and the evolution of Global Positioning System (GPS) have already had profound impacts on instrument approach capabilities at public use airports. Conventional instrument approaches, such as the instrument landing system (ILS), require ground-based facilities on or near an airport for navigation. NextGen and GPS eliminate the need for ground-based facilities and make it possible to develop or improve approaches at airports where it was previously infeasible. The FAA is continuing

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

to expand development and use 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 like accuracy. Due to the advent of this technology an ILS installation at AEJ is highly unlikely.

A discussion with FAA Flight Procedures on March 3, 2015[1] regarding AEJ existing and future approach procedures resulted in the following conclusions:

- Existing terrain to the north prevents publishing an instrument approach to Runway 15.
- An LPV could be considered as an approach to Runway 33; however the climb gradient on the missed approach procedure would need to be at least 973 feet per nautical mile up to 11,200 feet, which is extremely steep. Due to the extreme climb gradient, a waiver would need to be requested and even if approved, most aircraft do not have the performance capability to accomplish the climb gradient.
- Visibility minimums could be reduced by one-half mile on Runway 33's existing procedure by installing a medium intensity approach lighting system with runway alignment indicator lights (MALSR).
- Consideration of a required navigation performance (RNP) to Runway 33 should be given. RNP allows aircraft to fly a specific path between two 3D-defined points in space. RNAV and RNP systems are similar with the key difference between them being the requirement for on-board performance monitoring and alerting for RNP. RNP generally provides lower minimums. AEJ would need to request this approach.

It is recommended that Chaffee County continue to monitor and protect for the future implementation of NextGen. A MALSR is also recommended within the planning period as a mid- to long-term project.

4.3.5 Airspace Requirements

14 CFR Part 77 defines and establishes the standards for determining obstructions that affect airspace in the vicinity of an airport. Prior to any airport development, a 14 CFR Part 77 evaluation must be conducted regardless of the project scale to verify that there will be no hazardous effects to air navigation due to construction. 14 CFR Part 77 defines an airport's imaginary surfaces, which are geometric shapes that are in relation to the airport and each runway. The size and dimensions of these imaginary surfaces are based on the category of each runway for current and future airport operations. The five imaginary surfaces are defined on the following page and depicted in **Figure 4-6**.

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

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[1] Steve Berardo, Jviation spoke with Fred Mitchell, FAA Flight Procedures on March 3, 2015.

Approach Surface – The approach surface is an imaginary obstruction-limiting surface that is longitudinally centered on an extended runway centerline. It extends outward and upward from the primary surface at each end of a runway, at a designated slope and distance, determined 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 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.

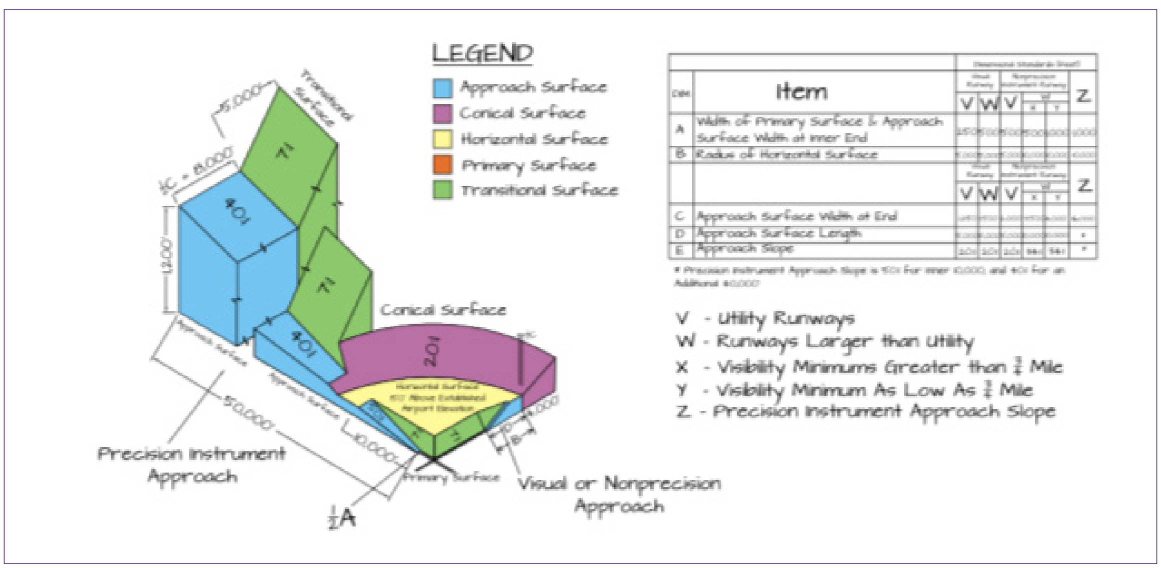
Conical Surface – The conical surface is an imaginary obstruction-limiting surface that extends from the edge of the horizontal surface outward and upward at a slope of 20:1(horizontal:vertical) for a horizontal distance of 4,000 feet.

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 7:1 (horizontal:vertical) from the sides of the primary surface.

Runway 15 is a larger-than-utility runway with a visual approach. Runway 33 is a larger-than-utility runway with a non-precision GPS approach with a visibility minimum of one and one half miles.

With new advances in technology and the potential for more efficient use of existing airspace with future NextGen technology, these limitations may be reduced.

FIGURE 4-6 – PART 77 SURFACES



Source: FAA 14 CFR Part 77, Safe, Efficient Use, and Preservation of the Navigable Airspace

4.3.6 Obstructions

As discussed in **Section 2.3.10** of this document, Woolpert completed mapping of the airport and surrounding area to FAA AGIS standards. The mapping identified penetrations to the imaginary surfaces, which are shown on the airspace drawings within the Airport Layout Plan (ALP) set.

The FAA sponsor grant assurance number 20 states: "It (i.e. the airport sponsor) will take appropriate action to assure that such terminal airspace as is required to protect instrument and visual operations to the airport (including established minimum flight altitudes) will be adequately cleared and protected by removing, lowering, relocating, marking, or lighting or otherwise mitigating existing airport hazards and by preventing the establishment or creation of future airport hazards."

It is recommended that the airport coordinate with FAA to develop an appropriate mitigation plan regarding penetrations to the imaginary surfaces.

4.4 General Aviation

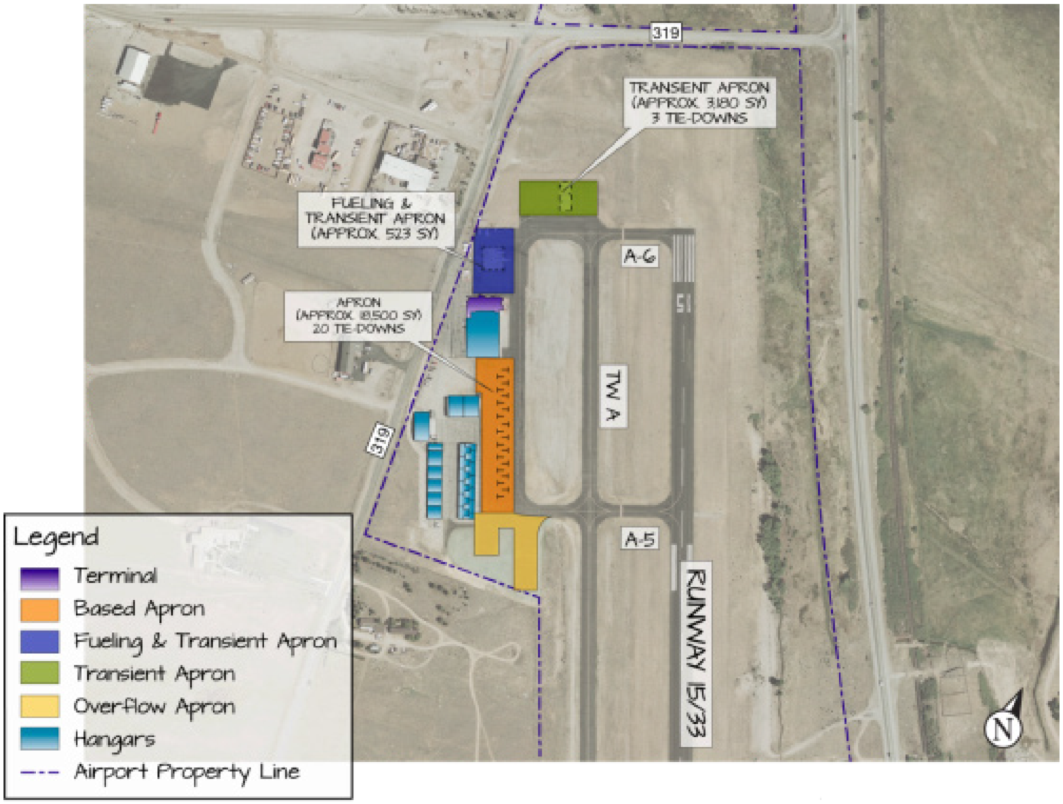
The number and types of projected GA operations and based aircraft can be converted into a generalized projection of GA facility needs. GA facilities include the FBO, hangars, apron, and tiedown space.

A major component of GA facilities is apron space. Apron frontage is considered premium airport space and should be strategically utilized. Apron layout design should take into account the location of airport terminal buildings, FBO facilities, 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. FAA AC 150/5300-13A, *Airport Design,* Appendix 5*,* provides guidelines in assisting with the determination of the layout and design of airplane parking apron(s) and tiedown area(s) for based and transient aircraft.

4.4.1 Aircraft Parking Aprons

The aircraft parking aprons, shown in **Figure 4-7**, provide access to parking, terminal facilities, fueling, and surface transportation for both based and transient aircraft. Specifically, the north apron provides space for transient aircraft only. The fueling and transient apron does have a hardstand to park larger/heavier aircraft; however, the majority of space is taken for fueling and movement of aircraft. Twenty tiedowns exist on the south apron and pads located south of the tiedown area provide additional (overflow) parking for transient aircraft. However, these pavement areas were built to accommodate hangars and should hangars be constructed, the additional parking areas for transient aircraft would be lost.

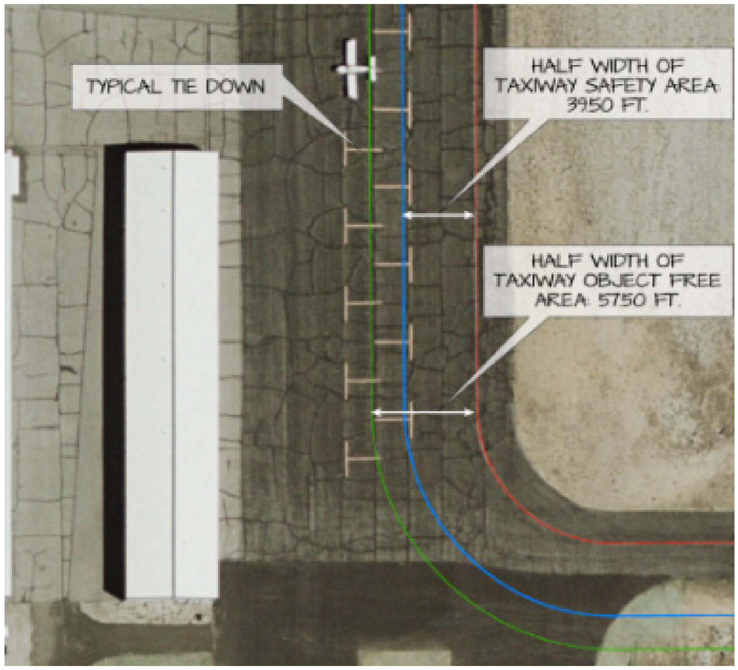
FIGURE 4-7 – AIRCRAFT PARKING APRONS



Note: Not to scale
Source: Jviation

According to airport management, apron space is constrained during the busy summer months when the tiedown area is often full with temporary based aircraft, limiting space for transient aircraft. As noted in **Section 4.3.2**, the tiedowns are within the taxilane safety and object free areas, see **Figure 4-8.** In order to accommodate safety standards, all 20 tiedowns would be lost. Also, when tiedowns are occupied, aircraft cannot taxi past to reach the overflow parking on the pads located south of the apron.

FIGURE 4-8 – TIE-DOWN AND TAXILANE SAFETY STANDARDS



Note: Not to scale
Source: Jviation

It is also important to note that transient aircraft, specifically jet aircraft, prefer power-in/power-out parking which requires significantly more space than nested tiedowns. Allowing an area of 2,000 square yards to accommodate ADG II aircraft would be considered adequate space for each transient aircraft for power-in/power-out parking. The number of aircraft on the ground at any given time is determined by taking 25 percent of peak day transient aircraft.[1] **Table 4-6** summarizes the current space available, along with the minimum apron space required. Hardstands to accommodate several heavier aircraft should be considered as airport management receives requests several times a year by pilots/companies operating aircraft heavier than the current pavement strength of 30,000 pounds.

TABLE 4-6 – TRANSIENT APRON PARKING REQUIREMENTS

	2015	2020	2025	2030	2035
Peak Day Operations	20	23	25	29	32
Required Parking Positions[/a/]	5	6	6	7	8
Space per Position[/b/]	2,000	2,000	2,000	2,000	2,000
Existing Transient Parking Apron Available[/b/]	3,180	3,180	3,180	3,180	3,180
Peak Day Transient Parking Apron Requirement[/b/]	10,000	12,000	12,000	14,000	16,000
Transient Aircraft Parking Apron Requirements Surplus/(Deficit) [/b/]	(6,820)	(8,820)	(8,820)	(10,820)	(12,820)

Notes: [/a/] 25 percent of peak day operations,
[/b/] dimensions are in square yards

[1] Federal Aviation Administration Advisory Circular 150/5300-13A, *Airport Design*

Source: Jviation

It is recommended that additional apron be constructed to accommodate the 20 tiedowns lost due to taxilane safety area and object free area standards. These tiedowns should be configured to meet current FAA standards per FAA AC 150/5300-13A. Additional apron should also be constructed to accommodate transient aircraft parking; hardstands should be considered to accommodate several heavier aircraft. Chapter 5, Alternatives Analysis, will review options to accommodate the additional need.

4.4.2 Apron Pavement

The pavement on the GA tiedown apron is oxidized and exhibits considerable cracking, primarily on the south end. These conditions indicate the pavement and subgrade are in poor condition. No cracking appears on the newer apron areas near the fuel farm. Preventative pavement maintenance is required for all apron areas as well as those that were constructed in 2006 and remain in good condition.

Based upon a preliminary analysis of the apron, it was determined that portions do not meet FAA grade standards per FAA AC 150/5300-13A, Change 1, *Airport Design*.

A fog seal application is scheduled for summer of 2015. GA apron grade correction/rehabilitation is recommended within the planning period prior to year 2020. Preventative pavement maintenance and a pavement maintenance plan are recommended to be continued to ensure pavement life.

4.4.3 Aircraft Storage Requirements

Hangars at AEJ include one 11-unit T-hangar and four box hangar units of different capacities. Two box hangars are located through-the-fence (TTF), and accommodate six aircraft. The Airport has indicated that current hangar space is in demand, specifically to accommodate larger aircraft in box hangars.

One of the on-airport box hangars, the Mandes hangar, is reserved for transient operations (12,700 square feet). The hangar was owned privately until the Town/Airport purchased on April 30, 2015.

In total, AEJ has 43,290 square feet of based and transient hangar space (does not include TTF). Both based and transient space is used in the calculations to account for adequate transient storage as well as to capture "drop and go" passengers during inclement weather conditions from surrounding airports.

Dividing the current 43,290 square feet of existing hangar space by the 2015 quantity of 28 aircraft, results in approximately 1,546 square feet of hangar space for each based aircraft. Specific demand will be based on the actual size of aircraft that ultimately will be based at AEJ and will require new hangar construction; however, for planning purposes it is assumed that the current ratio of 1,546 square feet per aircraft will continue. **Table 4-7** shows AEJ has insufficient aircraft hangar space.

TABLE 4-7 – BASED HANGARED AIRCRAFT REQUIREMENTS

Year	Based GA Aircraft	Based GA Aircraft Using Tie downs	Minimum Hangar Space Required[a]	Current Hangar Space[a]	Surplus or (Shortfall) [a]
2015	28	0	43,290	43,290	0
2020	32	0	49,472	43,290	(6,182)
2025	37	0	57,202	43,290	(13,912)
2030	43	0	66,478	43,290	(23,188)
2035	50	0	77,300	43,290	(34,010)

Note: [a]dimensions in square feet
Source: Jviation

It is recommended that hangars be constructed throughout the planning period as demand warrants. It is also recommended that the Airport purchase the TTF hangar units. Additional hangar development will be investigated in Chapter 5, Alternatives Analysis.

4.5 Landside Access and Parking Requirements

4.5.1 Regional Transportation Network

The roads and highways that provide access to AEJ are adequate to handle both current conditions and the future growth predicted in the approved FAA forecast.

The existing regional access to the Airport from U.S. Routes 285 and 24 are considered adequate for the 20-year planning period.

4.5.2 Access and On-Airport Circulation Roadways

Access to AEJ is from County Road 319, a two-lane road that runs north to south. A large undefined paved area provides direct access from the road to the Airport's main parking area. [Explain safety issue that requires improvement.]

It is recommended that the intersection providing access to the Airport be improved to enhance safety.

4.5.3 Auto Parking

As shown in in **Figure 2-13**, there are two auto parking lots. There is one paved lot west of the terminal facility with 21 public parking spaces, and one secured gravel lot located between the south end of the terminal and hangar facilities with 14 spaces. Auto parking spaces are at capacity. For planning purposes, the existing ratio of one parking space for every 75 itinerant operations was used to determine parking lot demand at AEJ, shown in **Table 4-8**.

TABLE 4-8 – AUTO PARKING DEMAND

	2015	2020	2025	2030	2035
Itinerant GA Operations	2,629	2,963	3,346	3,3784	4,284
Parking Spaces Requirement	35	40	45	50	57

	2015	2020	2025	2030	2035
Parking Spaces Surplus/(Deficit)	0	(4)	(10)	(15)	(22)

Source: Jviation

Construction of an additional 22 parking spaces is recommended by the end of the planning period. Expansion options for auto parking will be evaluated in Chapter 5, Alternatives Analysis.

4.6 Airport Support Equipment and Facilities

4.6.1 Snow Removal Equipment (SRE) and Airport Equipment

AEJ owns two plow trucks, a 1987 Ford L-8000 dump truck 200, and a 2003 International 7400 snow plow, purchased in 2013. The 1987 dump truck and snow plow are in fair condition. The Airport also owns a 1998 Caterpillar IT28B front-end loader. The loader is in fair condition. The Airport is in the process of purchasing a new plow blade to replace the blade on the International 7400. The replacement plow will accommodate the Airport's needs for several years.

Airport management has expressed concern about the amount of foreign object debris (FOD) located on the runway, taxiways, and apron. FOD is a known hazard to aircraft and those operating at an airport. Currently, the only method of removal is manually by the staff. A tow-behind sweeper attachment would aid the Airport in maintaining the pavements free of FOD.

The management also expressed the need for a tractor or mower to maintain the vegetative areas within the property as the current equipment (small tractor and brush hog) is in poor condition.

The replacement of both plow trucks is recommended in the mid- to late planning period in order for AEJ to maintain an operational airport in times of inclement weather. Purchase of a sweeper attachment and a mower are recommended early in the planning period.

4.6.2 Equipment Storage/SRE Building

The majority of equipment is stored outside adjacent to the terminal hanger as a dedicated SRE and equipment building is not available. In order to protect the Airport's investment an SRE and equipment storage building is recommended. The Town has been discussing purchasing the storage building located behind the existing through-the-fence operator for this purpose.

Construction of a new SRE and equipment building or acquisition of the current storage building for use as such is recommended in the short-term planning period. Options will be discussed in Chapter 5, Alternatives Analysis.

4.6.3 Fuel Storage Requirements

AEJ has two 15,000-gallon above-ground storage tanks (AST), for a total capacity of 30,000 gallons of fuel storage. One AST is dedicated to AvGas, and the other is dedicated to Jet-A fuel. These fueling facilities and AEJ's 3,000-gallon Jet-A fuel truck support the based GA aircraft. The fueling infrastructure is owned by the Town of Buena Vista and is located on the north GA apron. National Fire Protection Association NFPA 407: Standard for Aircraft Fuel Servicing, as well as FAA AC

150/5230-4B, Aircraft Fuel Storage, Handling, Training, and Dispensing on Airports, prescribe standards and procedures for installing, maintaining, and operating fuel storage tanks on airports. In addition, local and state building and fire codes also govern fuel tank installation and operation.

The fuel truck is not equipped with a cold weather package, which is critical in Buena Vista's climate. The cold weather package would increase productivity and equipment performance as well as protect against hydraulic pump and hose damage.

Pavement in the fueling area is in good condition and includes a concrete hardstand. Based on fuel data provided by Airport management, an average of 54,830 gallons of fuel was dispensed annually from 2009 through 2013. Measuring fuel flowage against annual operations and comparing to peak month operations from Chapter 3, the existing fuel storage capacity provides approximately 144 days of storage for current operations and 92 days storage in 2035, as shown in **Table 4-9**.

TABLE 4-9 – FUEL STORAGE CAPACITY

	2015	2020	2025	2030	2035
Operations – Average Peak Day	20	23	26	29	32
Fuel (gal) – Average Peak Day	208	232	260	291	326
Existing Fuel Storage	30,000	30,000	30,000	30,000	30,000
Approximate Days of Fuel	144	129	115	103	92

Source: Jviation

It is recommended that AEJ replace both AST's with tanks that are double-walled and meet the standards outlined for the storage and delivery of aviation fuel in an airport environment, in accordance with the National Fire Prevention Association (NFPA)[1]. It is also recommended that the existing fuel truck be equipped with a cold weather package.

4.7 Deicing Facilities

Deicing of aircraft is frequently needed in AEJ's climate due to the propensity of frost, ice, and snow to accumulate on aircraft surfaces. Ice buildup diminishes the aerodynamic qualities of aircraft and can result in loss of lift and stability. Aircraft deicing is not currently offered at AEJ.

It is recommended that AEJ assess the feasibility of providing deicing facilities upon an increase in demand by aircraft operators.

4.8 Utilities

All utility lines serving the Airport are buried underground and provide service to buildings and airfield facilities. Waste water is treated on-site via a new sanitary lift station completed in early 2015. A new water line was also installed to accommodate current and future needs. All existing utilities meet current demand and are anticipated to be sufficient for future demand.

[1] Federal Aviation Administration Advisory Circular 150/5230-4B uses the most recent edition of the National Fire Prevention Association (NFPA) 407, Standard for Aircraft Fuel Servicing. http://www.nfpa.org/aboutthecodes/AboutTheCodes.asp?DocNum=407.

It is recommended that utilities be maintained over the planning period to ensure continued service.

4.9 Emergency Response

Emergency response service is provided to AEJ through a mutual aid agreement with the Town of Buena Vista. As discussed in **Section 2.5.1**, the Airport was a recipient of a 1985 foam truck for ARFF purposes. AEJ no longer utilizes the truck as it has become too costly to maintain. .

It is recommended that the Airport sell the 1985 foam truck and purchase a new ARFF vehicle within the planning period.

4.10 Facility Requirements Summary

A summary of the facility improvements that need to be addressed during the planning period is provided in **Table 4-10**. Certain improvements will be further examined in **Chapter 5**, **Alternatives Analysis** to evaluate options to accommodate the facility requirements.

TABLE 4-10 – FACILITY REQUIREMENTS SUMMARY

Facility	Identified Requirement
Runway Length & Width	Runway length and width are adequate
Runway Strength	Runway strength is adequate
Runway Blast Pads	Add blast pads [really needed?]
Taxiway System	Remove direct access from apron to runway; correct non-standard taxilane safety and object free areas; routine maintenance
Airfield Lighting an Signage	Install MITL system; install REILS on both runway ends; replace/upgrade MIRL system
Navigation Aids/Instrument Approach	MALSR installation on Runway 33
Obstruction Removal	Relocate fence located in departure surface
General Aviation/Transient Apron	Provide additional transient apron space; reconfigure tiedowns (add additional pavement)
Aircraft Hangar Storage	Expand aircraft hangar storage capacity as needed; acquire through-the-fence hangars/property
Landside Requirements	Reconfigure and expand existing parking lot Improve auto entrance/circulation access
Snow Removal Equipment / Airport Equipment	Replacement of plow trucks and dump truck with plow; acquire tractor/mower; acquire sweeper attachment
Snow Removal Equipment Building	Construct or acquire building for dedicated equipment storage
Fuel Storage Requirements	Upgrade existing fuel storage tanks and containment area to comply with NFPA standards and provide more capacity

Notes: MITL – medium intensity taxiway lighting; REILS – runway end identifier lights; MIRL – medium intensity runway lighting; MALSR – medium approach light system with runway alignment indicator lights
Source: Jviation