The preparation of this document may have been supported, in part, through federally obligated funds as provided under Title 49 U.S.C., Section 47104. The contents of this report reflect the views of the Casper/Natrona County International Airport and the consultants, Reynolds, Smith and Hills, Inc., do not necessarily reflect the views of the policy of the FAA and the Wyoming Department of Aeronautics. Acceptance of this report by the FAA and the Wyoming Department of Aeronautics does not in any way constitute commitment on the part of the United States to participate in any development depicted herein nor does it indicate that the proposed development is environmentally acceptable or would have justification in accordance with applicable public laws.
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CHAPTER 1

INVENTORY OF EXISTING CONDITIONS
The Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5070-6B, *Airport Master Plans*, outlines the necessary steps in the development of an Airport Master Plan. The initial step in documenting the master planning process is the identification of an airport’s existing conditions. This involves the collection of planning data pertinent to an airport and the area it serves. The objective of the existing conditions task for the Casper/Natrona County International Airport (Airport) is to provide background information for subsequent phases of analysis.

The existing conditions information for the Airport has been obtained through:

» On-site investigations of the Airport.
» Interviews with Airport management, Airport users/stakeholders, Air Traffic Control Tower staff, and other tenants or interested parties.
» The collection and analysis of previous reports and studies, as well as guidelines for airport development.

This chapter is organized into the following sections:

» **Background**: describes the history, location, and weather conditions of the Airport site. Additional information is provided regarding other studies and regulations that influence Airport development.

» **Airfield Facilities**: describes existing runways, taxiways, aircraft parking areas and navigational aids (NAVAIDs).

» **Landside Facilities**: describes landside access, roadway, and facility data including routes to and from collector and arterial roadways, on-airport roadways, parking facilities, vehicle staging and storage areas.

» **Passenger Terminal Building**: describes space allocations by major passenger terminal functions including their size, condition, use, configuration, and the adequacy of these facilities under current operating conditions.

» **Support Facilities**: describes other facilities important to the overall operation of the Airport. It inventories aircraft hangars, air cargo facilities, the Air Traffic Control Tower (ATCT), Aircraft Rescue and Fire Fighting (ARFF) facilities, the Fixed Base Operator (FBO), Maintenance, and general aviation facilities.

» **Airport Environ**: describes land use planning; existing off-airport land uses and future trends; zoning regulations; and socioeconomic/demographic data in the immediate vicinity of the Airport.

» **Environmental Data**: describes existing recycling and environmental management plans, noise-sensitive areas, solid waste disposal, drainage, hazardous waste, wetland areas, and endangered flora and fauna. It also describes any constraints that could affect the future development alternatives at the Airport.
1.1 BACKGROUND

The Airport is located approximately seven miles northwest of downtown Casper, which is the county seat of Natrona County (see Figure 1-1). The Airport was constructed as an U.S. Army Air Base in 1942 and converted into a public airport, Natrona County Airport, in 1949. The Airport was renamed the Natrona County International Airport, to recognize the addition of Customs and Border Protection, and in 2007, the Airport was renamed again to better reflect its location to Casper/Natrona County International Airport (C/NCIA). The Airport is owned by Natrona County. Natrona County Commissioners appoint a five member Airport Board of Trustees which oversees the management of the Airport. The Airport Manager and Airport staff are responsible for the day to day operation of the Airport.

The Airport property encompasses 5,131 acres including: two active runways - Runway 03/21 and Runway 08/26, two decommissioned runways - Runway 12/30 and Runway 17/35, a flight line with 75 T-hangars and 13 corporate hangars (14 corporate units), the C/NCIA Business Park which includes a Foreign Trade Zone, the Airport’s historic district, and leased buildings, ground, and pasture land. The Airport leases land or buildings to more than 300 tenants.

The Airport is designated as a Non-hub Primary Commercial Service Airport. Scheduled airline services by Delta Connection to Salt Lake City, United Express to Denver, and Allegiant Airlines to Las Vegas operates using Canadair Regional Jets (CRJ) 200s and McDonnell Douglas (MD) 80 aircraft. The Airport has 123 based aircraft.

The climate of Casper can be characterized as semi-arid. Winters are dry, cold and windy, with the greatest snowfall in April (average of 11.5 inches). Summers are dry and hot with cool evenings. The mean annual temperature at the Airport is 45.9 degrees Fahrenheit, with an average annual precipitation of 12.5 inches. The average annual high temperature is 59.7 degrees, and the hottest month, July, has an average high temperature of 88.5 degrees. The average annual low temperature is 32.1 degrees, and the coldest month, December, has an average low temperature of 14.2 degrees.
FIGURE 1-1
AIRPORT VICINITY MAP

1.2 AIRFIELD FACILITIES

The airfield was originally constructed in 1942 with four runways, varying in length from 8,679 feet to 8,900 feet, to support bomber training, for the U.S. Army. In 1974, Runway 03/21 was extended to its present day length of 10,165 feet. In 2011, two of the original runways, Runway 12/30 and Runway 17/35, were decommissioned. Runway 03/21 and Runway 08/26 remain and are described below in Table 1-1.

The primary runway, Runway 03/21, is oriented northeast-southwest. Runway 03/21 is 10,165 feet in length, 150 feet in width and classified as a Design Group III runway. Runway 03/21 has a grooved asphalt surface and a gross bearing weight capacity of 130,000 pounds single-wheel, 170,000 pounds dual-wheel, and 270,000 pounds dual tandem-wheel main landing gear configuration. Runway 03/21 has High Intensity Runway Lights (HIRL) and 4-light Visual Approach Slope Indicators (VASI) located at both runway ends. Runway End Identifier Lights (REIL) serve Runway 21, and a Medium Approach Lighting System with Runway Alignment Indicator Lights (MALSR) as well as a glide slope and localizer serve Runway 03. Additionally, both runways offer precision approach runway markings and lighted distance remaining signs.

The crosswind runway is oriented east-west. Runway 08/26 is 8,679 feet in length and 150 feet in width and is a Design Group III runway. Runway 08/26 is constructed of grooved asphalt with a gross bearing weight capacity of 85,000 pounds single-wheel, 140,000 pounds dual-wheel, and 260,000 pounds dual tandem-wheel main landing gear configuration. Runway 08/26 has HIRL and 4-light VASI located at both runway ends. REILs serve Runway 26, and a MALSR with glide slope and localizer serve Runway 08. Additionally, both runways offer precision approach runway markings and lighted distance remaining signs.

### Table 1-1

<table>
<thead>
<tr>
<th>Runway</th>
<th>03/21</th>
<th>08/26</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orientation</td>
<td>NE-SW</td>
<td>E-W</td>
</tr>
<tr>
<td>Length (feet)</td>
<td>10,165</td>
<td>8,679</td>
</tr>
<tr>
<td>Width (feet)</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>Design Group</td>
<td>III</td>
<td>III</td>
</tr>
<tr>
<td>Surface Type</td>
<td>Grooved Asphalt</td>
<td>Grooved Asphalt</td>
</tr>
<tr>
<td>Weight Capacity</td>
<td>Single - 130,000</td>
<td>Single - 85,000</td>
</tr>
<tr>
<td></td>
<td>Dual - 170,000</td>
<td>Dual - 140,000</td>
</tr>
<tr>
<td></td>
<td>Dual-tandem - 270,000</td>
<td>Dual-tandem - 260,000</td>
</tr>
<tr>
<td>Lighting</td>
<td>HIRL</td>
<td>HIRL</td>
</tr>
<tr>
<td>Markings</td>
<td>Precision</td>
<td>Precision</td>
</tr>
<tr>
<td>Distance Remaining Signs</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Source: FAA 5010 Master Record, 2012

The Airport has three main taxiways, each with connectors, as shown in Figure 1-2. Taxiway A is a full parallel taxiway with seven connector taxiways to Runway 03/21. It connects to the Terminal Apron and provides...
access to Runway 03/21. Taxiway B has one connector taxiway and connects the Terminal Apron to the threshold of Runway 26. Taxiway C connects Taxiway A5 and Runway 03/21 to the mid-section and west end of Runway 08/26.

**FIGURE 1-2 AIRPORT LAYOUT**

![Airport Layout](image)

Source: RS&H Team, 2013

The primary aircraft parking area is located southeast of Runway 03/21 and Taxiway A, and includes the Terminal Apron and the General Aviation Apron. The Terminal Apron, on the southwest section, provides approximately 9,600 square yards of aircraft parking and movement space for air carriers. The General Aviation Apron, located on the northern section, provides approximately 144,100 square yards of parking for cargo and general aviation. Both the Terminal Apron and the General Aviation Apron are constructed of a combination of Portland cement concrete and asphalt overlay over asphalt concrete.

A Pavement Condition Index (PCI) survey was completed in 2013 (see **Figure 1-3**). The condition of all airport pavements that were evaluated in the 2013 PCI ranged from Good to Excellent, with both runways being primarily in very good condition. The Terminal Apron is in very good to excellent condition and the General Aviation Apron is in good or excellent condition. **Figure 1-3** graphically depicts the PCI survey results from 2013.
There are currently eight published approaches at the Airport. Runway 03 and Runway 08 have Instrument Landing System (ILS) approaches with ½ mile visibility minimums. All four runways have Area Navigation (RNAV) approaches. Additionally, Runway 03 and Runway 21 have very high frequency omni-directional range distance measuring equipment (VORDME) approaches.

**FIGURE 1-3**

_PCI MAP 2013_

Source: 2013 C/NCIA PCI Report
1.3 LANDSIDE FACILITIES

The landside facilities section describes the Airport’s landside access, roadways, rail access, public, employee and rental car parking, the C/NCIA Business Park, and the Foreign Trade Zone (FTZ). Figure 1-4 illustrates the location of roadways, railways, parking, the C/NCIA Business Park, and the FTZ.

1.3.1 Roadways

The Airport is accessed on the south by U.S. Highway 20-26 using two entry points - Commerce Drive accesses the C/NCIA Business Park and the east and northeast portions of the Airport property and Airport Parkway accesses the passenger terminal area and flight line buildings. Over 20 other paved Airport roadways provide access throughout the C/NCIA Business Park and to the flight line.

1.3.2 Rail

The BNSF Railway Class I rail line is located north of Airport property. The Casper Logistics Hub (CLH) owns 700 acres located between the BNSF rail line and Airport property. CLH provides transloading, trucking, erecting, storage, warehouse and switching. The transload facility is managed by CTRAN (Casper Transloading) and is operated by Bighorn Divide & Wyoming Railroad Inc.

1.3.3 Parking

Automobile parking southeast of the terminal building includes public, rental car, and employee parking. The public parking lot provided 504 parking spaces for public parking. Short term parking (0-3 hours), which is free of charge. The daily rate is $5 per day for the first 10 days, $4 per day from 11 to 20 days, and $3 per day from day 21 on. In 2012, the parking lot was expanded to the southeast to include an additional 87 parking spaces. The original parking lot pavement is in poor condition and received a PCI of 17 in 2013. Per Wyoming Statue 315-5-501(d), the Airport is required to provide 20% of its public parking spaces free of charge. These spaces are located along Coffman Drive and a designated area off of Commerce Drive. Thirty-two employee and 97 rental car ready spaces are located northeast of the public parking lot. Fifteen minute parking for loading/unloading passengers, designated hotel shuttle spaces, and taxicab spaces are available adjacent to the terminal building on both sides of Airport Parkway totaling approximately 40 spaces.

1.3.4 C/NCIA Business Park

The C/NCIA Business Park is located east and northeast of the terminal building and lies within Airport property. The C/NCIA Business Park consists of almost 200 acres of land with typical business park and industrial facilities. Two hundred additional acres are adjacent to the C/NCIA Business Park for future development. Figure 1-4 shows the location of the C/NCIA Business Park within Airport property. FTZ 157 is also located within the C/NCIA Business Park (see Section 1.3.5). The C/NCIA Business Park contains 38 businesses (listed in Table 1-2) and 136 buildings. The businesses represent sectors as diverse as manufacturing, retail, and aviation. The Airport’s Historic District is part of the C/NCIA Business Park (see Section 1.7.3 for more details). The C/NCIA Business Park provides vital income to financially sustain the Airport. A majority of the businesses within the park are non-aeronautical.
FIGURE 1-4
LANDSIDE LAYOUT

Source: RS&H Team, 2013
### TABLE 1-2
C/NCIA BUSINESS PARK TENANTS

<table>
<thead>
<tr>
<th>Apogee Aircraft 3745-B Studer</th>
<th>FAA Control Tower 7710 Fuller Street</th>
<th>Intermountain Records 3765 Airport Parkway</th>
<th>World War II Museum 3740 Jourgensen Avenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avis/Budget Car Rental 3823 Schulte Avenue</td>
<td>FAA Field Sector Office 8411 Fuller Street</td>
<td>Intermountain Threading 3741 Bell Avenue</td>
<td>World War II Museum 3739 Schulte Avenue</td>
</tr>
<tr>
<td>BME Fabrication 3746 Esmay Avenue</td>
<td>FAA Storage Building 8033 Fuller Street</td>
<td>Superior Plus Construction 3465 Bell Avenue</td>
<td>Sport Truck USA 7607 Fuller Street</td>
</tr>
<tr>
<td>Chucks Auto Repair 3811 Dame</td>
<td>Forward Bit Pipe &amp; Tool 3700-E Allen</td>
<td>Mosquito Abatement 3874 Dame Avenue</td>
<td>Wyoming Precast Products 7600-B Allen Avenue</td>
</tr>
<tr>
<td>Community Corrections Airport Property</td>
<td>Fowles Custom Cabinetry 3770 Allen Avenue</td>
<td>Nalco Fab-Tech, LLC 3777 Airport Parkway</td>
<td>Full Contact Cement 3817 Esmay Avenue</td>
</tr>
<tr>
<td>Con-way Freight 8315 Werner Street</td>
<td>Hertz Car Rental 3812 Jourgensen Avenue</td>
<td>Process Fabrication 3600 Schulte Avenue</td>
<td>Sage Technical Service Parade Ground</td>
</tr>
<tr>
<td>Cowboy Transportation 3395 Allen Avenue</td>
<td>High Adventure Race Fabrication 7450 Werner Street</td>
<td>Trout Transport 3823-A Studer</td>
<td>Wyoming Wood ‘n Works 3812 Dame</td>
</tr>
<tr>
<td>C-Tran Airport Property</td>
<td>Evershine Trucking Allen and Commerce Drive</td>
<td>Silver Tip Services 3882 Jourgensen Avenue</td>
<td></td>
</tr>
<tr>
<td>Enviro Engineering 7600- A Werner Street</td>
<td>Reach for A Star 4250 Six Mile Road</td>
<td>Totally Benign Enterprise 3745-A Studer Avenue</td>
<td></td>
</tr>
</tbody>
</table>

Source: www.iflycasper.com, 2013

### 1.3.5 Foreign Trade Zone

Foreign Trade Zone (FTZ) 157 was established on January 29, 1989 within the C/NCIA Business Park and expanded north to include a portion of the Casper Logistics Hub facility. The zone currently encompasses 1,476 acres and is shown in Figure 1-4. A FTZ is a specific area where any form of imported merchandise may be stored, packaged, assembled, manufactured, cleaned, sorted, and graded without the expense of Customs duties or taxes. While the Airport’s FTZ has not yet been used, there has been interest by neighboring developers in activating and using the FTZ.
1.4 PASSENGER TERMINAL BUILDING

The passenger terminal building is located at 8500 Airport Parkway, on the south end of Airport property, south of Runway 03/21. Constructed in 1952/1953 the brick, two story building encompasses approximately 70,000 square feet. The terminal building was expanded in 1982/83 and remodeled in 2004. As shown in Figure 1-5, the building provides space for the following: airline ticketing counters, offices, and bag makeup areas; baggage claim and handling areas; passenger waiting areas; passenger screening; rental car counters; Airport, airline, and Transportation Security Administration (TSA) administrative offices; room rental; advertising; a restaurant, gift shop, and lounge; and offices for U.S. Customs and Border Protection (CBP).

Airline ticketing counters are located on the southern side of the first floor of the terminal building. There are four airline ticketing counter positions. Currently three ticket counters are leased. Airline Ticketing Offices (ATOs) are located directly behind the ticket counters and have direct access to baggage makeup areas and the Secured Identification Display Area (SIDA) on the ramp. SkyWest Airlines ground handles both United Express and Delta Connection flights. SkyWest leases 480 square feet of counter space, 684 square feet of bag make-up, 735 square feet of office space, and 1,056 square feet of cargo space. Allegiant Airlines leases office space and uses ticket counter and bag makeup areas on a per use basis.

The baggage claim is served by one baggage belt on the northeast end of the terminal building on the first floor. The airlines lease 3,200 square feet of common use baggage claim space (public and non-public).

Three rental car counters serve passengers near the baggage claim on the first floor. Offices for rental car staff are located behind the counters. The Airport is served by Avis, Budget and Hertz in the terminal building. Enterprise serves the Airport from an offsite location. Hertz has a rental carwash/service facility in the C/NCIA Business Park at 3812 Jourgensen Avenue, and Avis/Budget has a carwash/service facility in the C/NCIA Business Park at 3823 Schulte Avenue.

Concessionaires at the Airport include the Airport Gift Shop (Wyoming Trading Company) and Sky Terrace Lounge. Wyoming Trading Company leases 704 square feet in the southeast portion of the first floor of the terminal building and offers gifts, snacks, and coffee. Sky Terrace Lounge leases 1,589 square feet in the southwest portion of the first floor of the terminal building and offers food, alcohol, and games. An unleased deli and kitchen space of 1,924 square feet is located adjacent to Sky Terrace Lounge. Additionally, vending machines and an ATM are also located in the passenger lobby.

The Airport lobby, located on the first floor of the terminal building, provides approximately 112 seats for passengers waiting to go through security or for people awaiting the arrival of passengers. Public restrooms are located in the southwest side of the lobby adjacent to Wyoming Trading Company and behind Sky Terrace Lounge.

TSA currently leases 5,680 square feet of space from the Airport. TSA’s screener staff offices are located on the south end of the first floor of the Terminal building and TSA Wyoming administration offices are located on the northern half of the second floor. TSA has expanded their lease space numerous times over the past five years. The Security Screening Check Point (SSCP) is located on the first floor. The Airport is currently served by two screening lanes at the SSCP. The SSCP is equipped with two x-ray machines, an AT2 and a
RapiScan, one Ceia walk through metal detector, two explosive trace detectors, and 2 DESKO boarding pass readers. The SSCP area is staffed with Airport Public Safety Officers during flight times.

The gate hold room is 5,400 square feet post security and provides 169 seats for passengers waiting to board a flight. Passengers enplane and deplane via one jet bridge at Gate 2 or air stairs onto the apron from Gates 1 and 3. Restrooms and vending machines are available in the gate hold room. The exit lane from the gate hold room into the passenger lobby was reduced in size in December 2013 to 916 square feet.

In 2012, the observation deck on the second floor was reconfigured to be accessible via the gate holding room for additional space for passengers waiting for flights. The observation deck can become secured when needed from the gate hold room. When not secure, the observation deck is open to the general public and offers 5,000 square feet of rental space for events or to view airport operations.

The Airport Administration Office is located on the second floor of the terminal building. The Airport Board Room is also located on the second floor directly across from the Airport Administration Office. The Airport management utilizes approximately 4,000 square feet of the terminal building.

Space for CBP offices is allocated within the terminal building; see Section 1.5.2 for more detailed information. The building also has a basement, accessed from the south end of the terminal, which is used mostly for storage and provides a shelter during inclement weather.
PAGE LEFT BLANK INTENTIONALLY
Existing Terminal Building

Approximate Total Building Area: 70,000 sf *

*Excludes Basement Area

Program Areas:

- Airline Space: 18,000 sf
- Airport Management Space: 4,000 sf
- Concession Space: 11,000 sf
- Customs and Border Protection: 200 sf
- Public Space: 25,000 sf
- Utilities: 3,800 sf
- TSA Space: 8,000 sf

Source: RS&H Team, 2013
1.5 SUPPORT FACILITIES

The support facilities section describes the location and condition of the various facilities important to the overall operation of the Airport. These facilities include the Air Traffic Control Tower, Customs and Border Protection, Aircraft Rescue and Firefighting facilities, Airport maintenance facilities, fuel facilities, utilities, fixed based operator facilities, aircraft hangars, and air cargo facilities. Figure 1-6 shows the locations of these support facilities.

**FIGURE 1-6**
SUPPORT FACILITIES LAYOUT

1.5.1 Air Traffic Control Tower

The Airport’s ATCT is located at 7710 Fuller Street and was constructed in 1954. The tower building is owned and maintained by the Airport. The Base Building, constructed in 1992, is owned and maintained by the FAA and land is leased from the Airport. In 2006, a prefabricated building which houses a backup generator was installed to the west of the Base Building. According to the December 2012 Condition Assessment and 6480.17 Facility Evaluation Report, the ATCT and Base Building facility are in fair condition. As part of this master plan study, the facility’s condition, location, and functional and useful life will be evaluated. If deemed necessary, an alternate tower site may be evaluated.
Tower operations have fluctuated over the past 10 years, ranging from a high of 48,301 in 2003 to a low of 35,505 in 2010. The ATCT/Terminal Radar Approach Control (TRACON) is open seven days a week between the hours of 5:00am and 9:00pm. Controllers are responsible for Casper Class D airspace, which is defined as the airspace extending upward from the surface up to and including 7,800 mean sea level (MSL) within a five nautical mile (NM) radius of the defined coordinates of the Airport. Additionally, these controllers are responsible for directing ground movement of all aircraft and vehicles on the runway and taxiway system. Figure 1-7 depicts the airspace surrounding the Airport.

![Airspace Diagram](source: www.vfrmap.com, 2013)

**FIGURE 1-7**
AIRSPACE DIAGRAM

1.5.2 Customs and Border Protection

The Airport is served by the only Customs and Border Protection Port of Entry in the State of Wyoming, by one part time agent. The Customs and Border Protection (CBP) operation at the Airport has been in existence since 1970. The hours of operation are based on operational requirements and all aircraft operators must call two hours prior to intended arrival time to arrange service. The Casper CBP agent clears more than 500 aircraft a year.

The CBP office is located within the terminal building on the second floor. CBP currently leases 215 square feet. Due to space constraints and lack of airfield access in the current location, a new CBP office is being
designed and will be located on the south side of the first floor behind the Sky Terrace Lounge. The new space will have direct access to the apron south of the terminal building.

1.5.3 Aircraft Rescue Firefighting
The Airport offers ARFF Index B services based on the length of the air carrier aircraft (greater than 90 feet and less than 126 feet) and the average daily departures of air carrier aircraft. Determination of the ARFF Index is described within Title 14 CFR, Part 139.315, Aircraft rescue and firefighting: Index determination. The Public Safety Building, constructed in 1974 to the northeast of the terminal building, houses police/ARFF staff and equipment. The Public Safety Building is 8,029 square feet and has three airside bays for ARFF and three landside bays for police, operations, and structural fire equipment. A control tower on the west corner provides incident command a view of most of the airfield. Additionally two offices provide space for the Chief and Assistance Chief. A bunkroom with six beds and living quarters are also located in the Public Safety Building. The Airport owns a 1995 E-One Titan with a 1,500 gallon water tank, a 2009 Rosenbauer Panther with a 1,500 gallon water tank, and a Becker Fastak 500 gallon premixed water/foam quick response vehicle. The Public Safety Building is in fair condition; however, it does not provide adequate space for security functions now required as a result of the attacks on September 11th 2001.

Additionally, the Airport maintains and operates the Wyoming ARFF Training Facility. The Training Facility, constructed in 1994, is located on Commerce Drive in the northeast part of the C/NCIA Business Park. The diesel fueled facility offers training to ARFF departments from Wyoming and out-of-state. The facility is subsidized by a grant from the Wyoming Aeronautics Division to offer Wyoming firefighters discounted training. The facility is staffed by Airport Public Safety Officers. The facility has now exceeded its life expectancy and is currently being reviewed by the Airport for potential replacement, upgrade, or closure.

1.5.4 Airport Maintenance Facility
The Airport maintenance facility is 17,928 square feet and is located along Commerce Drive in the northeast part of the C/NCIA Business Park. The shop is supplemented by four nearby equipment storage buildings. The Airport owns and operates a variety of maintenance equipment that is needed for ground maintenance, pavement and facilities maintenance, general repairs, and snow removal. The Airport maintenance facility houses equipment and maintenance work shops, including an electrical shop, plumbing shop, carpentry shop, vehicle maintenance area, and administration offices. These facilities were originally constructed and used by the Casper Army Air Base. The maintenance facilities are in poor condition and are well beyond their expected life. The Snow Removal Equipment Facility Concept and Budget Report was completed in December 2013 to evaluate a replacement facility.

1.5.5 Fuel Facilities
The Airport owns and operates a fuel farm located at 7785 Fuller Street near the ATCT. The fuel farm was constructed in 2009 and contains 120,000 gallons of Jet A, 24,000 gallons of Avgas, 12,000 gallons of unleaded fuel, and 10,000 gallons of on-road diesel. The Jet A tanks are single wall and the Avgas, unleaded, and diesel tanks are doublewalled tanks with secondary containment basins provided by a concrete dike. Additionally 5,000 gallons of off-road diesel fuel is located near the Airport maintenance facility for vehicle fueling and 5,000 gallons of off-road diesel is located at the ARFF Training Facility for live fire training. A

CAPSER/NATRONA COUNTY INTERNATIONAL AIRPORT MASTER PLAN I-16
few tenants within the C/NCIA Business Park also have above ground fuel tanks on their leased premises for their private use.

Fuel is sold to various businesses and individuals including Atlantic Aviation, the rental car companies, FedEx, Sage Truck Driving School, the Airlines, and Airport staff. The fuel farm is in excellent condition and is regulated by the Wyoming State Fire Marshall and the Wyoming Department of Environmental Quality (WDEQ). Atlantic Aviation also has a self-fueling Avgas tank with 10,000 gallons of fuel on the General Aviation apron.

1.5.6 Utilities
Electricity is provided to all buildings at the Airport by Rocky Mountain Power. The Casper/Natrona County International Airport water system is a consecutive distribution system from the City/Regional Systems. The water distribution system was replaced in 1979 and is nearing the end of its useful life for the underground metal components. Water pressure and quality has frequently been an issue; therefore, the Central Wyoming Regional Water System Joint Powers Board is planning for the construction of a new water tank in the footprint of the existing tank in 2014. The Airport maintains a sanitary sewer system serving all Airport buildings. The sanitary sewer infrastructure was constructed in the 1940’s. Natural Gas is available throughout the C/NCIA Business Park and to the terminal building.

1.5.7 Fixed Based Operators
The Airport’s full service FBO, Atlantic Aviation, is located in the middle of the flight line on Fuller Street. Atlantic Aviation leases four multi-storage hangars from the Airport in addition to ramp space, ground rent, and fuel farm use. Atlantic Aviation provides aircraft parking, heated hangar space and hangar rentals, cargo and ground handling services, Type I and IV deicing, Jet A, Avgas, self-serve Avgas, and aircraft maintenance services. Atlantic Aviation leases 64 T-hangars from the Airport and then subleases the hangars to their customers. The FBO remodeled their office and pilot lounge facility in 2013, which is in excellent condition. Other FBO facilities are in fair to poor condition.

Other FBOs providing limited aeronautical services at the Airport include Crosswind Aviation, Natrona Avionics, M&N Aviation, and Imperial Aeronautical Services. Crosswind Aviation offers flight instruction with four Cessna 172s, a helicopter, and a Piper Arrow. The company also provides aircraft rental, ground handling services for Allegiant Air, and aerial photography. Crosswind Aviation also partners with Casper College to provide courses and flight instruction for the college’s Associate’s Degree in Aviation. Natrona Avionics offers avionics installation and repair, M&N provides Part 135 charter services, and Imperial Aeronautical Services offers aircraft maintenance services.

1.5.8 Aircraft Hangars
As noted in the previous section, the Airport leases 64 T-hangars to Atlantic Aviation. Another 10 T-hangars, located northeast of the Public Safety Building, and two T-hangars located on the north end of the airfield are owned by the Airport and leased directly to tenants. Currently a 26-person waiting list exists for these
T-hangars. Additionally, the Airport owns and leases 11 corporate hangars or land for three privately developed hangars along Fuller Street to tenants such as Atlantic Aviation and FedEx.

1.5.9 Air Cargo

Two air cargo operations are located on the Airport: FedEx and UPS. FedEx’s 13,427 square foot sorting center, leased from the Airport, is adjacent to Atlantic Aviation at 8094 Fuller Street. Daily flights from Memphis, served by a Boeing 757-200 or Airbus A300/310 aircraft, provide packages to the facility where they are then sorted and sent via Cessna Caravans to other airports across the State of Wyoming, Colorado, Nebraska, or locally by truck. UPS packages are brought by truck to the Airport for loading onto aircraft. Key Lime Air is contracted by UPS to fly their packages from Casper to Denver and Steamboat Springs, Colorado. The FedEx cargo facilities are in fair to poor condition.
1.6 AIRPORT ENVIRONS
This section describes the 2013 Airport Land Use Review, Airport relative zoning regulations which include an Airport Overlay District, and socioeconomic and demographic data of Casper and Natrona County.

1.6.1 Land Use/Zoning
The Airport currently encompasses 5,131 acres. The Airport Land Use Review was completed in 2013 and identified that out of the 5,131 acres, 845 acres contained the runway and taxiway system, 1,025 acres contained approach areas, 291 acres contained other types of developed property, and 2,086 acres contained property that has not been developed or is minimally developed. As illustrated in Figure 1-8, the study suggested that current aeronautical use encompasses approximately 125 acres (Area 1), some of which is minimally developed. The study identified three additional areas to be reserved for aeronautical development. Area 2 (81 acres) and Area 3 (246 acres) currently have no development while Area 4 (64 acres) has existing non-aeronautical development and was proposed to continue as non-aeronautical in the short term.

Natrona County adopted an Airport Overlay District as part of the county’s 2000 Zoning Resolution of Natrona County, adopted December 19, 2000, and last updated on December 14, 2009 (http://www.natronacounty-wy.gov). The Airport Overlay District is described as follows: rectangular area of land beginning 200 feet beyond the end of all runways, 2,000 feet on each side of the extended centerline of each runway in width by 10,000 feet in length. Any development or change of land use within this Airport Influence Area must first be reviewed by the Airport’s Board of Trustees and the Airport Manager for land use compatibility issues.

Natrona County’s zoning designation for the Airport is Planned Unit Development (PUD) (http://geosmart.casperwy.gov, 2013). A majority of the land surrounding the Airport is zoned Urban Agriculture with small pockets of various other zoning designations. Adjacent to the northeast portion of Airport property the land is zoned Heavy Industrial. South of the Airport, zoning is a mix of Urban Residential, Commercial, and Light Industrial.

1.6.2 Socioeconomic/Demographic Data
Casper is located in central Wyoming within Natrona County. According to the 2010 U.S. Census (http://www.census.gov, 2013), Natrona County has a population of 75,450 and Casper has a population of 55,316. Casper was documented to have an average household income of $53,064 in 2011. Casper’s central location makes it a focal point for regional, financial, retail, and medical services for many Wyoming residents. The Wyoming Medical Center offers many medical services unavailable in other parts of the State of Wyoming. Casper boasts a stable economy, with a long history as an oil boomtown and a center for resource development.
1.7 ENVIRONMENTAL DATA

FAA Order 1050.1E, Policies and Procedures for Considering Environmental Impacts, and 5050.4B, National Environmental Policy Act (NEPA Implementing Instructions for Airports), requires the evaluation of airport development projects as they relate to specific environmental impact categories by outlining types of impacts and the thresholds at which the impacts are considered significant. For some impact categories, this determination can be made through calculations, measurements, or observations. However, other impact categories require that the determination be established through correspondence with appropriate federal, state, and/or local agencies. A complete evaluation of the impact categories identified in FAA Order 1050.1E and 5050.4B is required during an environmental assessment or environmental impact statement.

Future development plans at the Airport should take into consideration of those environmental issues that are known to exist in the vicinity of the Airport. Early identification of these environmental factors may help to avoid impeding development plans in the future.

This section provides an overview of resource categories defined in FAA Orders 1050.1E and 5050.4B, as it applies to the environs surrounding the Airport. The environmental resource categories listed in Table 1-3 are not currently present on or near the immediate vicinity of the Airport. The categories that are currently present are discussed in further detail following the table.

<table>
<thead>
<tr>
<th>Category</th>
<th>Justification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Quality</td>
<td>The Airport is located in an attainment area.</td>
</tr>
<tr>
<td>Coastal Resources</td>
<td>The State of Wyoming has no coastal zone management programs in place.</td>
</tr>
<tr>
<td>Compatible Land Use</td>
<td>The compatibility of existing and planned land uses in the vicinity of an airport is usually associated with the extent of the airport’s noise impacts. The Airport currently does not have noise impacts necessitating additional analyses.</td>
</tr>
<tr>
<td>Construction Impacts</td>
<td>The Airport has not identified any development projects. All construction related to future airport development projects will comply with guidelines set forth in FAA AC 150/5370-10A, Standards for Specifying the Construction of Airports.</td>
</tr>
<tr>
<td>Farmlands</td>
<td>The local branch of the United States Department of Agriculture (USDA) determines if prime or unique farmland exists in the vicinity of the Airport. No prime or unique farmland exists in the vicinity of the Airport.</td>
</tr>
<tr>
<td>Floodplains</td>
<td>According to the Natrona Regional Geospatial Cooperative Online Map (<a href="http://www.natronacounty-wy.gov">www.natronacounty-wy.gov</a>), no flood risk exists at the Airport.</td>
</tr>
</tbody>
</table>
**Light Emissions and Visual Impacts**

Normally improvements or relocations to lighting systems used at the Airport will not have a negative impact on people or property located in the vicinity of the Airport. Consideration of aesthetics in the future at the Airport should attempt to adhere to existing design, art, and architecture at the Airport and in the vicinity in order to minimize any perceived negative impacts.

**Natural Resources and Energy Supply**

Coordination with natural resource and energy supply companies is recommended prior to the construction of new facilities requiring these services.

**Noise**

The Airport’s 65 and 70 Day-Night Level (DNL) noise contours are located within Airport property. There are no noise sensitive land uses located within the 65 and 70 DNL contours.

**Secondary (Induced)**

The Airport has not identified any development projects. The Council on Environmental Quality’s NEPA implementing regulations (40 CFR 1500 et. seq.) requires FAA to consider project-induced indirect effects in its NEPA evaluations. All future Airport development projects will comply with NEPA regulations.

**Socioeconomic Impacts/Environmental Justice/Children’s Health and Safety Risks**

The Airport has not identified any development projects that require land acquisition. It will be necessary to evaluate the impacts of future projects on surrounding communities.

**Wild and Scenic Rivers**

Based on the location of the two wild and scenic rivers in Wyoming, future development at the Airport would not affect those included in the National Wild and Scenic River System.

Source: RS&H Analysis, 2014

### 1.7.1 Endangered Species/Flora/Fauna/Essential Fish Habitat/Migratory Bird Act

The Endangered Species Act of 1973 (ESA) is administered by the U.S. Fish and Wildlife Service (FWS) for the Casper area, where terrestrial and freshwater organisms are found. Under the act, species may be listed as either endangered or threatened. The EPA defines “endangered” species as those plants and animals that have been designated as being rare enough that they are in danger of becoming extinct. "Threatened" species are those plants and animals that are likely to become endangered within the foreseeable future. According to the U.S. Fish and Wildlife Services (USFWS) and the Wyoming Ecological Services (Mountain-Prairie Region), the following are listed as threatened, endangered, and species of concern in Natrona County:

- **Platte River Species**: Least Tern - Interior Population (*Sterna antillarum*), Pallid Sturgeon (*Scaphirhynchus albus*), Piping Plover (*Charadrius melodus*), Western Prairie Fringed Orchid (*Platanthera praeclara*), and Whooping Crane (*Grus americana*)
- **Plants**: Ute Ladies' tresses(*Spiranthes diluvialis*)
The following species are listed as a candidate for threatened and endangered species:

» Greater Sage-grouse (*Centrocercus urophasianus*)

Species of concern include:

» Black-tailed Prairie Dog (*Cynomys ludovicianus*)
» Bald Eagle (*Haliaeetus leucocephalus*)
» Mountain Plover (*Charadrius montanus*)
» White-tailed Prairie Dog (*Cynomys leucurus*)

Essential Fish Habitat (EFH) are those waters and substrate necessary for fish spawning, breeding, feeding, and growth to maturity as defined under the Magnuson-Stevens Fishery Conservation and Management Act (MSA). The MSA requires the National Marine Fisheries Service (NOAA Fisheries) and regional fishery management councils to minimize, to the extent practicable, adverse effects to EFH caused by fishing activities. The MSA also requires Federal agencies to consult with NOAA Fisheries about actions that could damage EFH. There is no fish species currently protected under the MSA in Natrona County.

The Migratory Bird Treaty Act (MBTA), enacted in 1918, prohibits the taking of any migratory birds, their parts, nests, or eggs except as permitted by regulations, and does not require intent to be proven. Section 703 of the MBTA states, "Unless and except as permitted by regulations ... it shall be unlawful at any time, by any means or in any manner, to ... take, capture, kill, attempt to take, capture, or kill, or possess ... any migratory bird, any part, nest, or eggs of any such bird...." The Bald and Golden Eagle Protection Act (BGEPA) prohibits knowingly taking, or taking with wanton disregard for the consequences of an activity, any bald or golden eagles or their body parts, nests, or eggs, which includes collection, molestation, disturbance, or killing. The Bald Eagle's habitat includes the entire State of Wyoming.

According to the Airport’s Midterm Wildlife Hazard Assessment, which was completed in November 2013, no species mentioned above had been found within Airport property.

1.7.2 Hazardous Materials, Pollution Prevention, and Solid Waste

An airport’s airside and landside operations use, transport, or generate various kinds of hazardous materials. These substances include hazardous wastes and hazardous substances as well as petroleum and natural gas substances and materials.
1.7.2.1 Hazardous Materials
Aircraft deicing facilities are recommended at airports where icing conditions are expected. Deicing activities at the Airport are conducted by the individual airlines and Atlantic Aviation. Deicing operations utilize Type I or Type IV propylene glycol. All deicing fluid is stored within deicing vehicles, double wall aboveground storage tanks, or small volume glycol storage totes. Typically, deicing occurs on the aprons, and most runoff flows west along the aprons until it enters the storm sewer. A small amount at Atlantic Aviation flows east into the storm sewer and outfalls at Commerce Drive. Within the storm sewer system, the glycol mixture enters a diversion structure where it is diverted into an irrigation pond and allowed to breakdown before being discharged.

Multiple above ground fuel tanks exist on the Airport containing Avgas, Jet A, unleaded fuel, and diesel fuel, as described in 1.5.5 Fuel Facilities. The fuel farm is regulated by the Wyoming Department of Environmental Quality (WDEQ).

Lastly, environmental remediation of hazardous materials includes two sites: Natrona County and Delta – West Casper Laust Remediation Project South of the terminal building and Wyoming DEQ West Casper Laust on Allen Street. These sites are not on the Environmental Protection Agency’s (EPA) National Priority List (NPL). Monitoring wells are installed and regularly monitored by a contractor.

1.7.2.2 Pollution Prevention
The Airport is required under the Airport’s Wyoming Pollutant Discharge Elimination System (WYPDES) stormwater discharge permit (WYPDES Permit #WYR10-0000), to have a Stormwater Pollution Prevention Plan (SWPPP). This plan, as well as the Airport’s Spill Prevention and Countermeasure Plan (SPCC), were both updated and approved in 2011. The SPCC is required to satisfy the federal requirements for facilities that have aboveground oil storage tanks with a capacity greater than 1,320 gallons.

1.7.2.3 Solid Waste Disposal
Airport solid waste is currently disposed of at the City of Casper Regional Solid Waste Facility 12 miles east of the Airport. The Airport does not currently have a recycling plan and based on the FAA Modernization and Reform Act of 2012 (FMRA) Section 132 (b) this planning study should include a plan for recycling to minimize the generation of Airport solid waste. The Airport is outside of the City limits; therefore, recycling pickup is not currently available; however, the Airport has discussed with the City the possibility of establishing a recycling location at the Airport with contract pickup in order to reduce the solid waste generated at the Airport.

1.7.3 Historic, Architectural, Archaeological, and Cultural Resources
Due to the historical significance of many of the Airport’s buildings, which were constructed during World War II, the Airport entered into a Programmatic Agreement (PA) in the late 1990’s with the State Historic Preservation Office (SHPO), the Advisory Council on Historic Preservation, and the FAA to delineate a historic district. The historic district extends from Werner Street and angles back through the C/NCIA Business Park from Bell Avenue to Schulte Avenue and southeast to Commerce Drive. Originally the Historic District contained 109 structures, of which approximately 95 exist today.
The Historic District designation limits the type of development in and around the district. As part of this Master Plan Update, the PA will be updated to contain areas of importance within the district. These areas of importance are categorized and include the Heritage Area (area of high potential effect to integrity), the Transition Area (area of medium potential effect to integrity), and the Remaining Areas (areas of low potential effect to integrity).

1.7.4 Water Quality

Given the natural topography at the Airport, water generally drains from the north to the southeast as illustrated in Figure 1-9. The exception is north of Runway 8/26 that drains to the northeast and southwest. The middle south of Runway 8/26 is picked up by the storm sewer system.

At the high point in the General Aviation Apron, in the midpoint of the ramp close to the FedEx operations, the storm sewer is divided going northeast and southwest parallel to Runway 3/21. The northeast half has an outfall on the east side of Commerce Drive and goes overland to Casper Creek. The storm sewer system going southwest directs storm water from the sides of Runway 3/21, southwest of Taxiway Charlie, and combines with the apron storm water. This storm water is directed to a control structure and during winter months this storm water is directed to a holding/irrigation pond were deicing fluid and storm water are held until the irrigation season starts.

The Airport terminal area has a separate storm water collection system that directs the storm water from the Airport Parkway to a retention area to prevent flooding downstream. This retention area combines the storm water from the control structure when the irrigation pond is not in use for the apron storm water system. The storm water in the retention area is piped via a 36” CRP under Highway 20/26, and then through a ditch to 6 Mile Draw which joins Casper Creek approximately 1.25 miles downstream.

The storm water northwest of the Alcova Irrigation Siphon and northwest of the approach of Runway 8/26 flows overland to an Alcova Irrigation catchment area.
1.7.5 Wetlands

Executive Order 11990, *Protection of Wetlands*, requires the FAA to protect, preserve, or enhance wetlands. This order is often called the “no net loss” provision for wetlands and is the source for how mitigation programs are developed. According to the U.S. Fish and Wildlife Service National Wetlands Inventory (www.fws.gov/wetlands/) the Airport has freshwater emergent wetlands and freshwater ponds, which are illustrated in Figure 1-10.
A Wildlife Hazard Assessment (WHA) began at the Airport in March 2013. The WHA is being conducted by a qualified wildlife biologist who meets the requirements in Advisory Circular 150/5200-36, *Qualifications for Wildlife Biologists Conducting Wildlife Hazard Assessments and Training Curriculums for Airport Personnel Involved in Controlling Wildlife Hazards at Airports*. In addition, the WHA is being conducted in accordance with Advisory Circular 150/5200-33B, *Hazardous Wildlife Attractants On or Near Airports* and the *Wildlife Hazard Management Manual*. The WHA will include:

- An analysis of the events or circumstances that prompted the assessment;
- Identification of the wildlife species observed and their numbers, locations, local movements, and daily and seasonal occurrences;
- Identification and location of features on and near the Airport that attract wildlife;
- A description of wildlife hazards to air carrier operations; and
- Recommended actions for reducing identified wildlife hazards to air carrier.

Recommendations from the WHA will be provided after the completion of the analysis, which is expected to occur in May 2014.
This chapter presents the forecast for passenger, based aircraft, and aircraft operations for the Casper/Natrona County International Airport. The objective of the forecast is to identify the long-term trends for the types and levels of future aviation activity. In some instances, multiple forecast scenarios have been created which take into account a broad spectrum of influencing factors. From these scenarios, a comprehensive forecast is carried forward to be used in subsequent chapters of this study in identifying future facility requirements.

Multiple resources were used in the analysis of this forecast including the FAA Terminal Area Forecast (TAF), the FAA Aerospace Forecast, and prior and current studies related to passenger enplanements and operations, cargo volume and operations, and aircraft operations. The forecast is presented in five and ten year increments beginning with a base year of 2012 with projections outward to 2017, 2022, and 2032. It should be noted that this type of forecast is intended to be used for long-term planning purposes, and as such, individual forecast years are less important than trends.

This chapter is organized into sections, as follows:

- Regional Base for Aviation Activity;
- Historical Passenger Activity;
- Significant Factors Influencing Passenger Air Service;
- Passenger Forecast;
- Aviation Activity Demand Forecasts;
- Design Aircraft Identification; and
- Forecast Comparison.

### 2.1 THE REGIONAL BASE FOR AVIATION ACTIVITY

This section identifies the geographic area served by the Airport and that region’s characteristics influencing aviation demand. Based on experience, it is known that passengers come to the Airport from communities outside the primary catchment area and residents in the primary catchment area utilize other airports. This regional analysis provides a basis for identifying and understanding the Airport’s service area and its ability to support aviation activity.

#### 2.1.1 Identification of the Air Trade Area and Population

The primary catchment area for the Airport includes Natrona County and Converse County, which is denoted within the inner circle of Figure 2-1. This area accounts for over 92,000 people and 15.9 percent of the total population of the State of Wyoming. The secondary catchment area, represented between the inner and outer circles in the figure, include ten other counties within a two-hour drive of Casper/Natrona County International Airport (CPR). These counties account for over 174,000 people, approximately 30.2 percent of the total population of the State of Wyoming. The total 12 county market comprises over 46 percent of the total population of the State. Of the 10 secondary counties, four of them...
have their own commercial passenger airports – Gillette (GCC), Riverton (RIW), Sheridan (SHR), and Worland (WRL).

**FIGURE 2-1 PRIMARY AND SECONDARY CATCHMENT AREA FOR CPR**

Source: RS&H Team, 2013

2.1.2 Air Trade Area Demographic and Economic Conditions

This section identifies the key demographic characteristics for the primary and secondary (total) catchment area and key sources of employment of the air trade area (Natrona County).

2.1.2.1 Economic Conditions

According to the 2012 US Bureau of Economic Analysis report, Wyoming’s gross state product was $38.4 billion. The State’s unemployment rate is just 4.6 percent compared to the US national average of 7.6 percent. The key components of Wyoming’s economy differ significantly from those of other states. The two key components in Wyoming’s economy are the mineral extraction business and the travel and tourism business. The federal government owns about 50 percent of the land in the State, while 6 percent is controlled by the state itself. The total taxable value of mining and mineral extraction in Wyoming in 2011 was almost $7 billion. The travel and tourism sector contributed another $2 billion in revenue for the State.
Approximately 92,600 people are located in the Casper/Natrona County International Airport primary market area and the expanded market area contains over 267,000 people. As shown in Table 2-1, Natrona County has 78,621 people and is equal to 29.4 percent of the total catchment area and 13.6 percent of the population for the State of Wyoming.

The level of education attained by local residents is a key factor in the ability to attract high-skilled and high paying jobs. In this regard, Casper and Natrona County are at a competitive disadvantage compared to the metro markets of Denver and Salt Lake City. Only 21.6 percent of the residents of Natrona County have a bachelor’s degree or higher. The cost of living for Natrona County is somewhat lower than other markets in Wyoming and considerably lower than competitive metro markets in other states.

### TABLE 2-1
ECONOMIC DATA FOR AIRPORT CATCHMENT AREA

<table>
<thead>
<tr>
<th>County</th>
<th>Major City</th>
<th>Population</th>
<th>Housing Units</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natrona</td>
<td>Casper</td>
<td>78,621</td>
<td>34,400</td>
<td>29.4%</td>
</tr>
<tr>
<td>Converse</td>
<td>Douglas</td>
<td>14,008</td>
<td>6,466</td>
<td>5.5%</td>
</tr>
<tr>
<td><strong>Primary Catchment Area</strong></td>
<td></td>
<td><strong>92,629</strong></td>
<td><strong>40,866</strong></td>
<td><strong>34.6%</strong></td>
</tr>
<tr>
<td>Campbell</td>
<td>Gillette</td>
<td>47,874</td>
<td>19,743</td>
<td>17.9%</td>
</tr>
<tr>
<td>Carbon</td>
<td>Rawlins</td>
<td>15,666</td>
<td>8,563</td>
<td>5.9%</td>
</tr>
<tr>
<td>Fremont</td>
<td>Riverton</td>
<td>41,110</td>
<td>17,974</td>
<td>15.4%</td>
</tr>
<tr>
<td>Hot Springs</td>
<td>Thermopolis</td>
<td>4,822</td>
<td>2,575</td>
<td>1.8%</td>
</tr>
<tr>
<td>Johnson</td>
<td>Buffalo</td>
<td>8,615</td>
<td>4,646</td>
<td>3.2%</td>
</tr>
<tr>
<td>Niobrara</td>
<td>Lusk</td>
<td>2,456</td>
<td>1,335</td>
<td>0.9%</td>
</tr>
<tr>
<td>Platte</td>
<td>Wheatland</td>
<td>8,756</td>
<td>4,657</td>
<td>3.3%</td>
</tr>
<tr>
<td>Sheridan</td>
<td>Sheridan</td>
<td>29,596</td>
<td>13,949</td>
<td>11.1%</td>
</tr>
<tr>
<td>Washakie</td>
<td>Worland</td>
<td>8,464</td>
<td>3,843</td>
<td>3.2%</td>
</tr>
<tr>
<td>Weston</td>
<td>Newcastle</td>
<td>7,082</td>
<td>3,553</td>
<td>2.7%</td>
</tr>
</tbody>
</table>

**Total Catchment Area**

<table>
<thead>
<tr>
<th>County</th>
<th>Populations</th>
<th>Housing Units</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total State of Wyoming</td>
<td>267,070</td>
<td>121,704</td>
<td>46.3%</td>
</tr>
<tr>
<td>Airport Area as % of total state</td>
<td>576,412</td>
<td>265,528</td>
<td>45.8%</td>
</tr>
</tbody>
</table>

Source: US Census Data for 2012 and 2011

Natrona County is the largest county in the 12 county total catchment area. As shown in Table 2-2, it has a population of 78,621. The city of Casper has a population of 58,800. The population of the County increased from 1970 to 1980 by over 40 percent. In the 1980’s, the energy and natural resource industries saw a sharp drop in business and the population dropped 14 percent. Business has responded positively since 1990 and the population has increased over 25 percent surpassing the population in 1980.
The median household income for Casper and Natrona County is $53,519 and the median family income is $64,885. The median income for the State of Wyoming is $53,802. The total labor force for Natrona County is 44,447 with 42,310 employed, or 95.2 percent. Unemployment for Natrona County is listed at 4.3 percent in April of 2013, much lower than the U.S. average of 7.2 percent.

2.1.2.2 Major Employers and Other Economic Indicators
The economy is based on extractive industries – energy and natural resources, and it is expected to grow at a strong pace for the next five years. Environmental constraints have lowered the production of coal but this has been replaced by the development of natural gas. Casper is an energy related community and the majority of its top employers (shown in Table 2-3) work within the energy industry.

<table>
<thead>
<tr>
<th>Year</th>
<th>Population</th>
<th>Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960</td>
<td>49,623</td>
<td>-</td>
</tr>
<tr>
<td>1970</td>
<td>51,264</td>
<td>3.3%</td>
</tr>
<tr>
<td>1980</td>
<td>71,856</td>
<td>40.7%</td>
</tr>
<tr>
<td>1990</td>
<td>61,226</td>
<td>-14.8%</td>
</tr>
<tr>
<td>2000</td>
<td>66,533</td>
<td>8.7%</td>
</tr>
<tr>
<td>2012</td>
<td>78,621</td>
<td>16.5%</td>
</tr>
</tbody>
</table>

Source: Casper Area Economic Development Alliance, 2013

<table>
<thead>
<tr>
<th>Company</th>
<th>Service/Products</th>
<th>Employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wyoming Medical Center</td>
<td>Healthcare</td>
<td>1,540</td>
</tr>
<tr>
<td>Wyoming Machinery</td>
<td>Manufacturing</td>
<td>330</td>
</tr>
<tr>
<td>Unit Drilling Co.</td>
<td>Energy</td>
<td>330</td>
</tr>
<tr>
<td>SST Energy Corp.</td>
<td>Energy</td>
<td>275</td>
</tr>
<tr>
<td>True Company</td>
<td>Energy</td>
<td>165</td>
</tr>
<tr>
<td>Halliburton</td>
<td>Energy</td>
<td>165</td>
</tr>
<tr>
<td>Toolpushers Supply</td>
<td>Energy</td>
<td>165</td>
</tr>
<tr>
<td>Howell Petroleum</td>
<td>Energy</td>
<td>94</td>
</tr>
<tr>
<td>Sinclair Trucking</td>
<td>Transportation</td>
<td>83</td>
</tr>
<tr>
<td>Little America Trucking</td>
<td>Transportation</td>
<td>75</td>
</tr>
</tbody>
</table>

Source: Casper Area Economic Development Alliance, 2013
When energy prices are good, business is good. There is no new exploration in the Casper area but Casper is the regional hub for energy corporations. The workforce distribution among various industries is shown in Figure 2-2.

**FIGURE 2-2**
**WORK FORCE DISTRIBUTION FOR NATRONA COUNTY**

When energy prices are good, business is good. There is no new exploration in the Casper area but Casper is the regional hub for energy corporations. The workforce distribution among various industries is shown in Figure 2-2.

Natrona County has a low cost tax structure to help business. The sales tax in Wyoming is four percent and Natrona County adds another 1 percent. There is no personal income tax, corporate tax, or inventory tax. The property tax rate is also very low and based on 9.5 percent multiplied on a mill rate of .07. Commercial property also has a similar tax structure. The local lodging tax is 3 percent. Goods in transit receive an exemption on manufactured equipment.

Local ground transportation is excellent with rail and highway utilizing Casper as a hub. The BNSF has a rail transfer yard and the C-Tran operation for the transfer of petroleum and other goods located near the Airport. The motor carriers utilize Interstate 25 and U.S. Highways 20/26, 87, and 220.

Natrona County is also center for recreation with many outdoor activities including hunting, fishing, camping, skiing, and snowmobiling. The community has an events center that seats over 10,000 and host concerts, sporting events, and rodeos. A new convention center is planned to be completed in the next couple of years.
The community leaders of Casper and Natrona County have been seeking new business opportunities that meet the overall characteristics for the community. They have supported agencies for economic development and have supported the development of land for industrial business parks and the development of the Airport. The Airport has over 2,000 acres available for development. There is property inside the fence that may be attractive to the recruitment of aviation related businesses. The Airport has prime property outside the fence that may be attractive to the recruitment of aviation related business that does not need ramp access and non-aviation business that find the Airport land to be attractive.

The Convention and Visitors Bureau states that the community is working to expand tourism by developing a new convention center and additional sports teams. There are currently over 2,700 sleeping rooms in the Casper area. According to the Convention and Visitors Bureau, the occupancy factors run in the 80 percent level during the high season and in the 60 percent range during the off-season. The average stay is 3.5 days with an average expenditure of $185 per day for leisure travelers and $250 per day for business travelers. The Casper/Natrona County International Airport can be a positive attribute in developing inbound tourism.
2.2 HISTORICAL PASSENGER ACTIVITY

This section identifies the historical passenger enplanement activity at the Casper/Natrona County International Airport.

From the 1950’s to the mid 1980’s, Casper was a key market on the Western Airlines route system. During the era of regulation, Casper was part of two separate “routes” for Western Airlines. One route operated was Denver-Casper-Billings-Great Falls-Calgary-Edmonton. The other route operated was Salt Lake City-Casper-Rapid City-Pierre-Minneapolis. The airline had to serve every city on the “route” with one trip per day and then it could overfly certain points. The most traveled routes were Denver-Casper-Billings-Calgary and Salt Lake City-Casper-Minneapolis.

Western Airlines was acquired by Delta Air Lines in 1986 and as a result the airline dropped service on the Denver-Casper route. This service was replaced by Continental Airlines and later United Airlines. The Salt Lake City-Casper-Minneapolis route was initially operated by Delta but the Casper-Minneapolis portion of the routing was dropped in the late 1980’s. Northwest Airlines added service in the Casper-Minneapolis route segment in 2004, but service was terminated in 2009 when Northwest was acquired by Delta Air Lines. United Airlines provided summer service in the Casper-Chicago market in 2008.

Allegiant Airlines started service from Casper to Las Vegas in the fall of 2008. The Casper-Las Vegas market quickly became the largest market in terms of local passengers, more than three times the passengers compared to the number two local market. This was accomplished by expanding the airport catchment area from the two primary counties to a total of 12 counties. It was found that low fare nonstop service would capture passengers from other airport market areas. Allegiant initiated nonstop service to Phoenix-Mesa Airport in December of 2012, but terminated the service in the spring of 2013.

2.2.1 Historical Enplaned Passenger Activity

In reviewing the Casper/Natrona County International Airport enplaned passenger data from 1954 to 2013, it is found that there are five distinct periods of air service.

» The first period was from 1954 to 1964. It was the local service prop era when Casper was served with Convair 440’s and Martin 404’s, propeller aircraft that carried approximately 40 to 45 passengers. The nonstop routes to Denver, Salt Lake City, Billings, and Rapid City and the points beyond were short and these aircraft were acceptable for these routes. Enplaned passengers at Casper increased from 23,844 in 1954 to 34,773 in 1964, an increase of 46 percent.

» The second period was the turbo-prop era and ran from 1964 to 1974. Western Airlines flew the 96 seat Lockheed Electra in the nonstop markets, listed above, and Continental Airlines offered 44 seat Viscount Aircraft to Denver. Enplaned passengers increased from 34,773 in 1964 to 82,076 when the turbo props were replaced by 115 seat Boeing 737 jet aircraft.
The third period was from 1975 to 1988 when the airlines offered all jet service to all markets with Boeing 737 and DC-9 aircraft. Enplaned passengers increased from 82,076 in 1974 to 142,097 in 1979 and leveled off to an average of approximately 116,000 from 1980 to 1987.

The fourth period started in 1986 when Western Airlines was acquired by Delta Airlines, and the Boeing 737 aircraft were replaced by 30 seat EMB-120 aircraft to Salt Lake City. United Airlines took over the Casper-Denver route and also operated 30 seat EMB-120 aircraft. Passenger enplanements dropped to an average of approximately 70,400 enplaned passengers per year from 1989 to 2001.

The last historical period for enplaned passengers started in 2002 with 54,607. The events of September 11th 2001, impacted the next year’s passenger market which caused a low traffic period.

Passenger demand has increased from 54,607 in 2002 to 88,013 enplaned passengers in 2012, which is an increase of 61.1 percent.

Based on the FAA Terminal Area Forecast (TAF) published in January 2012, enplaned passengers in the 1990 to 2000 time period experienced a decline of 9 percent. Enplaned passengers in the 2000 to 2010 time period experienced an increase of 24.3 percent, which is depicted in Figure 2-3. Combining both time periods, there was an overall increase of 13 percent from 1990 to 2010. This equates to an average annual increase of 0.7 percent. Table 2-4 shows the total amount of growth within each five year period from 1990 to 2013. Overall, there was very little growth in passengers over the twenty year period.

**Figure 2-3**

**HISTORICAL ENPLANED PASSENGERS**

Sources: FAA 2012 Terminal Area Forecast, Airport Records, 2013
In looking at the enplaned passengers for the past 22 years, it seems that airline capacity seems to drive the amount of passengers for each year. When the airlines reduce capacity, reduce frequency, or drop service to a route, the enplaned passengers are reduced. The opposite occurs when the airlines add larger aircraft, add frequency, or add a new route.

The Casper/Natrona County International Airport has experienced strong growth in enplaned revenue passengers from 2008 to 2013. This is due primarily to the strong marketing programs implemented by the Airport and the recruitment of new service to Las Vegas and an upgrade to all regional jet service to Salt Lake City and Denver. Revenue enplaned passengers were 87,486 for 2012 and 98,198 for 2013. It is interesting to note that the TAF does not show the Airport reaching 98,000 enplaned passengers until 2022.

### 2.2.2 Monthly and Other Seasonal Trends

The scheduled air carrier monthly enplaned passenger activity at the Airport is somewhat skewed. Allegiant Airlines suspends its service to Las Vegas in late August and resumes this service in early November. The suspended service reduces the monthly enplaned passengers by approximately 1,350 per month. United Express and Delta Connection operate the same schedule year round. With this type of air service, the Airport finds that its enplaned passengers for each quarter do not vary far from the simple average of 25 percent, which is depicted in Figure 2-4.

In December of 2012, Allegiant Airlines started service to Phoenix-Mesa Airport in Mesa Arizona. The airline operated two MD-83 flights per week until early May and then terminated the service for the summer. Allegiant Airlines indicated that they will not offer this service for the 2014 season.

**TABLE 2-4**

GROWTH IN ENPLANED PASSENGERS

<table>
<thead>
<tr>
<th>Period</th>
<th>Total Growth</th>
<th>Average Annual Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990-1995</td>
<td>-15.7%</td>
<td>-3.0%</td>
</tr>
<tr>
<td>1995-2000</td>
<td>8.0%</td>
<td>1.6%</td>
</tr>
<tr>
<td>2000-2005</td>
<td>33.5%</td>
<td>6.0%</td>
</tr>
<tr>
<td>2005-2010</td>
<td>-7.0%</td>
<td>-1.4%</td>
</tr>
<tr>
<td>2010-2013</td>
<td>17.8%</td>
<td>5.6%</td>
</tr>
</tbody>
</table>

Source: RS&H Team Analysis, 2013
2.2.3 Airlines Providing Service

Casper/Natrona County International Airport is currently served by three passenger airlines. United Express operates 33 flights per week with 50 seat CRJ-200 regional jets to Denver. Delta Connection operates 14 flights per week with 50 seat CRJ-200 regional jets to Salt Lake City. Allegiant Airlines operates two flights per week to Las Vegas with 166 seat MD-83 aircraft.

2.2.4 Current Flight Schedule

The flight schedule, shown below in Table 2-5, was effective in October of 2013. The schedule for United Express and for Delta Connection is nearly the same for the entire year. Allegiant Airlines suspends service to Las Vegas for 11 weeks in the late summer.

<table>
<thead>
<tr>
<th>Market</th>
<th>Airline</th>
<th>Depart</th>
<th>Arrive</th>
<th>Aircraft</th>
<th>Freq.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPR-Denver</td>
<td>United Express</td>
<td>6:00 AM</td>
<td>7:10 AM</td>
<td>CRJ-200</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>United Express</td>
<td>8:27 AM</td>
<td>10:35 AM</td>
<td>CRJ-200</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>United Express</td>
<td>12:19 PM</td>
<td>1:22 PM</td>
<td>CRJ-200</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>United Express</td>
<td>5:06 PM</td>
<td>6:10 PM</td>
<td>CRJ-200</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>United Express</td>
<td>8:11 PM</td>
<td>9:19 PM</td>
<td>CRJ-200</td>
<td>xTu,We,Sa</td>
</tr>
<tr>
<td>CPR-Salt Lake City</td>
<td>Delta Connection</td>
<td>6:00 AM</td>
<td>7:16 AM</td>
<td>CRJ-200</td>
<td>Daily</td>
</tr>
<tr>
<td></td>
<td>Delta Connection</td>
<td>11:35 AM</td>
<td>12:55 PM</td>
<td>CRJ-200</td>
<td>Su</td>
</tr>
<tr>
<td></td>
<td>Delta Connection</td>
<td>12:54 PM</td>
<td>2:12 PM</td>
<td>CRJ-200</td>
<td>x Su</td>
</tr>
<tr>
<td>CPR-Las Vegas</td>
<td>Allegiant</td>
<td>6:15 PM</td>
<td>7:05 PM</td>
<td>MD-83</td>
<td>Mo, Fr</td>
</tr>
</tbody>
</table>

Source: Airport Data, 2013
2.3 SIGNIFICANT FACTORS INFLUENCING PASSENGER AIR SERVICE

This section identifies the most significant factors expected to influence regional air service demand. Competition among airports and airlines results in a situation where regional passengers have multiple choices for air travel.

2.3.1 Location and Other Characteristics of Regional Airports

There are ten commercial service airports in Wyoming, which are listed in Table 2-6. Within the National Plan of Integrated Airport Systems (NPIAS), eight out of ten airports are categorized as Primary Airports. A Primary Airport is defined as a commercial service airport that has more than 10,000 annual enplaned passengers. Furthermore by definition each of these airports are considered non-hub airports. A non-hub airport is defined as having at least 2,500 annual passenger boardings with the annual total accounting for less than 0.05 percent of the total passenger boardings within the United States. Jackson Hole Airport is the busiest in the State in terms of enplaned passengers, and Casper/Natrona County International Airport is the second busiest.

TABLE 2-6
COMMERCIAL SERVICE AIRPORTS IN WYOMING

<table>
<thead>
<tr>
<th>Airport</th>
<th>Classification</th>
<th>2012 Passenger Enplanements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jackson Hole Airport</td>
<td>Primary</td>
<td>274,343</td>
</tr>
<tr>
<td>Casper/Natrona County Int’l Airport</td>
<td>Primary</td>
<td>88,013</td>
</tr>
<tr>
<td>Gillette/Campbell/County Airport</td>
<td>Primary</td>
<td>32,714</td>
</tr>
<tr>
<td>Cody/Yellowstone Airport</td>
<td>Primary</td>
<td>28,551</td>
</tr>
<tr>
<td>Rock Springs/Sweetwater County Airport</td>
<td>Primary</td>
<td>28,270</td>
</tr>
<tr>
<td>Cheyenne Regional Airport</td>
<td>Primary</td>
<td>15,010</td>
</tr>
<tr>
<td>Riverton Regional Airport</td>
<td>Primary</td>
<td>13,189</td>
</tr>
<tr>
<td>Sheridan County Airport</td>
<td>Primary</td>
<td>12,889</td>
</tr>
<tr>
<td>Laramie Regional Airport</td>
<td>Non-Primary</td>
<td>8,131</td>
</tr>
<tr>
<td>Worland Municipal Airport</td>
<td>Non-Primary</td>
<td>2,795</td>
</tr>
</tbody>
</table>

Source: FAA Data, 2012

The closest commercial airports to the Casper/Natrona County International Airport are a two to three hour drive. These include regional-commuter air service at Cheyenne, Gillette, Laramie, Riverton, Rock Springs, Sheridan, and Worland. The driving distance between Casper and these airports are listed below in Table 2-7. The closest major hub airport is Denver International Airport, a four-hour drive from Casper.
The regional air service at seven of these eight airports is subsidized through state and federal air service enhancement programs. Table 2-8 lists the Wyoming airports with service to Denver. Great Lakes Airlines (ZK) provides the service at Cheyenne, Riverton, Sheridan, and Worland. SkyWest operating as United Express (*UA) provides the service at Gillette, Rock Springs, and Laramie.

**TABLE 2-8**

<table>
<thead>
<tr>
<th>Market</th>
<th>Airline</th>
<th>Aircraft</th>
<th>Flights/Week</th>
<th>Seats/Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Casper-Denver</td>
<td>*UA</td>
<td>CRJ-200</td>
<td>33</td>
<td>1,650</td>
</tr>
<tr>
<td>Cheyenne-Denver</td>
<td>ZK</td>
<td>EMB-120</td>
<td>38</td>
<td>1,140</td>
</tr>
<tr>
<td>Cody-Denver</td>
<td>*UA</td>
<td>CRJ-200</td>
<td>6</td>
<td>300</td>
</tr>
<tr>
<td>Gillette-Denver</td>
<td>*UA</td>
<td>EMB-120</td>
<td>19</td>
<td>570</td>
</tr>
<tr>
<td>Laramie-Denver</td>
<td>*UA</td>
<td>EMB-120</td>
<td>14</td>
<td>420</td>
</tr>
<tr>
<td>Riverton-Denver</td>
<td>ZK</td>
<td>EMB-120</td>
<td>20</td>
<td>600</td>
</tr>
<tr>
<td>Rock Springs-Denver</td>
<td>ZK</td>
<td>EMB-120</td>
<td>14</td>
<td>420</td>
</tr>
<tr>
<td>Sheridan-Denver</td>
<td>ZK</td>
<td>EMB-120</td>
<td>19</td>
<td>570</td>
</tr>
<tr>
<td>Worland-Denver</td>
<td>ZK</td>
<td>B-1900</td>
<td>12</td>
<td>228</td>
</tr>
</tbody>
</table>

Source: Official Airline Guide, September 2013

Due to state and federal programs including Essential Air Service (EAS), the Small Community Air Service Development Program, and the Wyoming Air Service Enhancement Program, that subsidize air service in these markets, these competitive Airport are able to control lower fares for the passengers flying to Denver.
In contrast, the Casper-Denver service is provided by United Express and is not subsidized resulting in one of the highest fares in the United States, which is shown in Table 2-9.

**TABLE 2-9**

**COMPARISON OF LOWEST ONE WAY FARE TO DENVER**

<table>
<thead>
<tr>
<th>Market</th>
<th>Airline</th>
<th>One Way Fare</th>
</tr>
</thead>
<tbody>
<tr>
<td>Casper-Denver</td>
<td>*UA</td>
<td>$496.00</td>
</tr>
<tr>
<td>Cheyenne-Denver</td>
<td>ZK</td>
<td>$129.00</td>
</tr>
<tr>
<td>Cody-Denver</td>
<td>*UA</td>
<td>$403.00</td>
</tr>
<tr>
<td>Gillette-Denver</td>
<td>*UA</td>
<td>$208.00</td>
</tr>
<tr>
<td>Laramie-Denver **</td>
<td>*UA</td>
<td>$84.00</td>
</tr>
<tr>
<td>Riverton-Denver</td>
<td>ZK</td>
<td>$129.00</td>
</tr>
<tr>
<td>Rock Springs-Denver</td>
<td>*UA</td>
<td>$208.00</td>
</tr>
<tr>
<td>Sheridan-Denver</td>
<td>ZK</td>
<td>$139.00</td>
</tr>
<tr>
<td>Worland-Denver **</td>
<td>ZK</td>
<td>$99.00</td>
</tr>
</tbody>
</table>

**Source:** Airline web sites, 2013

**EAS Subsidized**

Even though there is a long distance between Casper/Natrona County International Airport and the other airports in Wyoming and Denver, Colorado, the Casper/Natrona County International Airport experiences a large amount of passenger leakage to other airports, primarily Denver. The leakage is due primarily to the high fares at Casper versus fares at Denver International Airport.

The Casper/Natrona County International Airport has conducted three Market Assessment Analysis and Leakage Studies to determine the amount of passengers from the primary airport catchment area that are using other airports and determine the amount of passengers from other airport catchment areas that are using Casper/Natrona County International Airport.

Studies were conducted in 2008, 2010, and 2012. In all three cases, passenger booking data from Sabre Airline Solutions data base (known as ADI) was utilized. This data provides passenger booking data from all of the global distribution systems and from the online travel agencies by zip code. While the Sabre data does not capture all of the traffic, it does capture a significant sample which can be used to determine travel patterns, origin of bookings, airport of choice, airline of choice, and passenger leakage. It is considered the best source of data in the industry for leakage analysis.
As illustrated in Figure 2-5, the leakage analysis for the recent study showed that 53.4 percent of the passengers in the CPR primary catchment area were using CPR while 42.3 percent of the passengers were using Denver International Airport and 4.3 percent were using other airports in Wyoming. The share of passengers using Denver International Airport (DEN) was a considerable increase over the 31 percent of the passengers using DEN in 2010. United Airlines is the dominant airline at CPR with 59 percent of the total passengers booked. Delta ranks second at 24 percent and Allegiant captured 14 percent of the booked passengers.

The market with the largest amount of leakage was the Casper-Denver market. Based on the actual origin and destination passengers and the booking data for the market, it is estimated that approximately 26,900 passengers drove between the two markets instead of using the nonstop air service. This is 84.5 percent of the total market. The primary reason for this diversion of passengers to the automobile is the extremely high fare in the local Casper-Denver market.

For the total 12 county catchment area, the leakage analysis showed that 25 percent of the total airline passengers were using Casper/Natrona County International Airport while 38 percent were using Denver International Airport. United is the dominant airline with 59 percent market share followed by Delta with 16 percent and Frontier (Great Lakes) with 14 percent.

2.3.2 Airport Efforts to Improve Air Service

The Casper/Natrona County International Airport has been actively involved in air service development and recruitment since 2006. At that time, there was turboprop service to Denver by United Express, turbo-prop service to Salt Lake City by Delta Connection and regional jet service to Minneapolis/St. Paul by Northwest
Airlines. The acquisition of Northwest Airlines by Delta Air Lines resulted in the termination of the regional jet service to Minneapolis in 2009.

As previously mentioned, the Airport has conducted studies for air service assessment and for passenger leakage. A Strategic Business Plan has been developed along with an Air Cargo Study to determine potential business for the Airport. Airport management and a member of the Airport Board of Trustees have attended various conferences and meetings with the airlines.

This effort has produced new air service and upgrades of existing air service. Allegiant Airlines started service to Las Vegas with MD-83 aircraft in the Fall of 2008 and this service still continues. Allegiant Airlines initiated service to Phoenix-Mesa Airport in December of 2012 and suspended service in May of 2013. United Airlines upgraded its flights to Denver during the past two years from 30 seat EMB-120 and 37 seat Dash 8-200 series aircraft to 50 seat CRJ-200 regional jet aircraft. SkyWest Airlines upgraded the Delta Connection flights to Salt Lake City in 2012 from 30 seat EMB-120 aircraft to 50 seat CRJ-200 aircraft.

Meetings have been held with United Airlines regarding new air service to Chicago/O’Hare and to Houston Intercontinental. Discussions were also held with United regarding upgrade of service to Denver to 64 seat CRJ-700 aircraft. Meetings have been held with American Airlines and US Airways regarding new air service to Chicago O’Hare, Dallas/Ft. Worth, and Phoenix Sky Harbor. Meetings have been held with SkyWest regarding marketing and advertising programs for existing flights and new service to Minneapolis/St. Paul. All of the meetings were very positive and it is estimated that new air service will be implemented to some of these markets in the next five years.
2.4 PASSENGER FORECAST

This section presents the enplaned passenger forecast. The passenger enplanement analysis is based on the FAA TAF published in January 2012 and an adjustment to the TAF that includes actual passenger enplanements for 2012 and 2013. Two alternate forecasts will also be presented: (1) an Economic Analysis based on Casper share of the U.S. economy and an analysis of leaked passengers from CPR to other airports; and (2) an analysis based on aircraft capacity in current markets and new markets. All three forecast scenarios are used in the Master Plan for comparative purposes to give an estimate of low, mid, and high enplaned passenger numbers.

2.4.1 FAA Terminal Area Forecast Base Case

This Master Plan will utilize the FAA 2012 Terminal Area Forecast (TAF) as the foundation for the Base Case. The TAF utilizes historical enplaned passengers for Casper/Natrona County International Airport for the period 1990 to 2010. During this time period, the enplaned passengers increased from 72,373 to 81,905. This was a total increase of 13.0 percent or an annual increase of 0.7 percent. As shown in Figure 2-6, enplaned passengers in 2000 were 65,912 and increased to 81,905 in 2010, an increase of 24.3 percent or an annual increase of 2.2 percent. Based on this historical trend, the FAA projected enplaned passengers from 2010 to 2040 at a growth rate of approximately 2.0 percent per year. In reviewing the historical “peaks and valleys” in enplaned passengers experienced by CPR over the past 20 years, this projected growth rate seems reasonable and will be used for the FAA TAF and the adjusted TAF.

However, an adjustment to the TAF was required as recent FAA Air Carrier Activity Information System (ACAIS) reported that CPR enplaned 88,013 passengers in 2012. The TAF projection starting at 2012, forecasted only 80,732 enplanements for 2012. To account for this recent data, the TAF was adjusted upward so that the 2.0 percent growth rate was projected out from 2012. Additionally, Airport data shows that the enplaned revenue passengers for 2013 increased to 98,198. The forecast based on data ending 2010, shows CPR reaching 98,000 enplanements in 2022.
The passengers in 2013 may be an unusual peak situation with Allegiant Airlines operating fights between Casper and Phoenix-Mesa (AZA) from December 2012 to May 2013. It is estimated that these flights accounted for approximately 5,300 enplaned revenue passengers in 2013. There has been no indications that Allegiant Airlines plans to bring this service back in the future. The other passenger increases were driven by the upgrade of flights from turboprop aircraft to larger regional jets to Denver and Salt Lake City. If the passengers from the CPR-AZA flights are eliminated, the adjusted revenue enplaned passengers are 92,898, a 6.1 percent increase over 2012.

Consequently, the TAF Base Case will have a low and high forecast. The scenarios are separate from the TAF and are manipulations of it. The low forecast is from the TAF published in January of 2012 and uses 2011 as the last year of actual passengers. It reaches a forecast level of 141,341 enplaned revenue passengers by 2040. The high TAF is an adjusted forecast utilizing current revenue enplaned passengers for 2012 and 2013. As shown in Table 2-10, it reaches a forecast level of 132,132 revenue enplaned passengers in 2032. The difference between the two forecasts is 1,122 passengers per month, enough to support a daily CRJ-200 flight with a 75 percent load factor.
Alternate Forecast Scenarios

For comparison purposes, additional enplaned passenger forecast scenarios were developed to present an alternative case based on defined assumptions for future passenger activity and growth. The alternative scenarios will produce an increased number of passengers over the TAF.

As demonstrated, the Casper/Natrona County International Airport has experienced large peaks and valleys in enplaned passengers. In the late 1970’s and early 1980’s, the Airport generated passenger numbers with a peak of 142,000 enplaned passengers in 1979, the first year of deregulation. These passenger enplanements dropped to a low of 57,660 in 2002. In reviewing the historical trends for the Airport, it seems that the highs and lows were caused by the state of the local economy and the air service and fares offered by the airlines serving the Airport.

The local economy has been very strong for the past few years and is projected to remain so for the immediate future. The airlines have added seats in the Denver and Salt Lake City markets and have added nonstop service to Las Vegas. Passenger traffic has responded well to the additional capacity. High fares at CPR have pushed passengers to other airports, primarily Denver.

The TAFs do not show the potential passengers for CPR, they show long-term historical trend analysis and estimates of passengers based on these trends. The alternate forecast will show the potential passengers for CPR based on two methods – (1) Economic Share Analysis and Passenger Leakage; and (2) Airline Capacity Analysis.

### Table 2-10

**Comparison of Forecast of Revenue Enplaned Passengers**

<table>
<thead>
<tr>
<th>Year</th>
<th>FAA TAF</th>
<th>Adjusted TAF</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Historical</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1990</td>
<td>72,373</td>
<td></td>
</tr>
<tr>
<td>1995</td>
<td>61,032</td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>65,912</td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td>88,021</td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>81,905</td>
<td></td>
</tr>
<tr>
<td>2012</td>
<td>*80,732</td>
<td>88,013</td>
</tr>
<tr>
<td><strong>Projected</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td>88,917</td>
<td>98,176</td>
</tr>
<tr>
<td>2022</td>
<td>98,100</td>
<td>108,394</td>
</tr>
<tr>
<td>2027</td>
<td>108,392</td>
<td>119,676</td>
</tr>
<tr>
<td>2032</td>
<td>119,924</td>
<td>132,132</td>
</tr>
</tbody>
</table>

Sources: FAA 2012 Terminal Area Forecast, RS&H Team Analysis, 2013

* 2012 TAF Forecasted number
2.4.2.1 Forecast based on Economic Share Analysis and Passenger Leakage

Potential passengers for a given airport can be derived by utilizing the economic share of the airport market area of the total U.S. economy and then factoring this share against the total enplaned revenue passengers for the United States. To determine the economic share of an airport catchment area, data from the Survey of Buying Power is utilized. This Survey tabulates the “Buying Power Index” for every county in the United States. The total of all of the counties is equal to 100 percent. Each county’s Buying Power Index is assumed to be its share of the U.S. economy.

In the case of Casper/Natrona County International Airport, the Buying Power Index for the two county primary catchment area is .0320 and the buying power for the total 12 county catchment area is .0860. When these two indexes are factored against the total enplaned revenue passengers for the U.S., the total represents the potential passengers for this Airport, which is detailed in Table 2-11.

Table 2-11

<table>
<thead>
<tr>
<th>Market</th>
<th>Primary</th>
<th>Total 12 County</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total U.S. Enplaned Passengers</td>
<td>642,289,000</td>
<td>642,289,000</td>
</tr>
<tr>
<td>Buying Power Index</td>
<td>0.0320</td>
<td>0.0860</td>
</tr>
<tr>
<td>Potential CPR Passengers</td>
<td>205,530</td>
<td>552,370</td>
</tr>
</tbody>
</table>

Source: RS&H Team Analysis, 2013

The potential passengers are much greater than the actual passengers of 98,198 that utilized CPR in 2013. The difference can be qualified as travelers that did not use Casper/Natrona County International Airport and travelers that did not use any air service. The Airport has commissioned three Passenger Leakage Studies that have estimated the amount of passengers utilizing other airports. This data will be key in estimating the total potential passengers currently available.

The most recent Passenger Leakage Study completed in November of 2012 indicated that 42.3 percent of the primary catchment area outbound bookings are using Denver International Airport as their originating airport and 4.3 percent of the local outbound bookings are using other airports in Wyoming. The primary reason for this diversion of passengers to the automobile and then to Denver and other airports is the high fare at Casper versus the much lower fares at Denver and at the other airports. The low fares at DEN are due primarily to the ultra-low fares offered by Frontier Airlines to a network of destinations served by Frontier, and the large presence of Southwest Airlines at Denver International Airport.

Since Casper/Natrona County International Airport has a rather large challenge with passengers being diverted or leaked to Denver, another method to forecast potential passengers for the Airport is to use passenger reservation bookings instead of historical passengers. This will capture the passengers lost to Denver and create “true passengers” for Casper. This booking data is available from the global distribution...
systems like Sabre, and provides the outbound passenger booking data on a zip code basis for the total Airport catchment area. In the case of Casper/Natrona County International Airport, the catchment area includes all of the zip codes for a 12 county market.

An analysis of passenger bookings was developed using Sabre Airline Solutions passenger booking data for the 12 months ending November 2012. This analysis showed that there were 164,800 “true outbound passengers” from the Casper primary catchment area for 2012. Of this total, 87,496 were passengers that actually utilized Casper/Natrona County International Airport and 77,304 passengers that used other airports.

**Table 2-12** shows a comparison of actual origin and destination passengers for the top Casper markets and catchment area bookings. The booked passengers are the potential passengers for the market area and the origin and destination passengers are the passengers that utilized Casper/Natrona County International Airport. This shows the “capture rate” for the Airport to the key markets. The Casper-Las Vegas market had nonstop, low fare service with large jet aircraft by Allegiant Airlines in 2012 and had a capture rate of 93.6 percent. On the other hand, the Casper-Denver market had high fare regional jet service by United Express in 2012 and had a capture rate of 13.9 percent.

**TABLE 2-12**
**COMPARISON OF HISTORICAL PASSENGERS AND BOOKED PASSENGERS**

<table>
<thead>
<tr>
<th>Market</th>
<th>Historical CPR O&amp;D</th>
<th>Catchment Area Booked</th>
</tr>
</thead>
<tbody>
<tr>
<td>Casper-Denver</td>
<td>4,460</td>
<td>32,150</td>
</tr>
<tr>
<td><strong>Casper-Las Vegas</strong></td>
<td><strong>27,810</strong></td>
<td><strong>29,710</strong></td>
</tr>
<tr>
<td>Casper-Houston</td>
<td>8,770</td>
<td>16,700</td>
</tr>
<tr>
<td>Casper-Salt Lake City</td>
<td>5,140</td>
<td>12,920</td>
</tr>
<tr>
<td>Casper-Dallas</td>
<td>4,630</td>
<td>10,730</td>
</tr>
<tr>
<td>Casper-Phoenix</td>
<td>7,640</td>
<td>7,880</td>
</tr>
<tr>
<td>Casper-Minneapolis</td>
<td>3,100</td>
<td>8,395</td>
</tr>
<tr>
<td>Casper-Seattle</td>
<td>3,330</td>
<td>5,990</td>
</tr>
<tr>
<td>Casper-Chicago</td>
<td>2,050</td>
<td>4,160</td>
</tr>
</tbody>
</table>

Sources: Sabre Airline Solutions, RS&H Team Analysis, 2013

The passenger numbers from the Leakage Study showed that there is a strong demand for air service from Casper to markets to the east and markets to the south. The markets to the east include major business centers in Chicago, Minneapolis, Boston, New York City area, Detroit, Washington DC, and Philadelphia. As detailed in **Table 2-13**, it is estimated that the markets to the east have the potential to produce over 37,800 outbound passengers or 75,000 annual passengers via service to either Chicago O’Hare or Minneapolis St. Paul. Both of these airports are excellent connecting hubs to major markets to the east and to international markets.
The markets to the south are projected to produce over 48,000 outbound passengers or 97,462 annual passengers. Service to the south will be dominated by destinations that are important in the energy and resources business. These include Houston, Dallas, Midland, Oklahoma City, San Antonio, and Tulsa. The best hub airports for service to the south are Dallas/Ft. Worth International Airport (DFW) and Houston Intercontinental Airport (IAH). American Airlines is the dominant Airport for DFW and United for IAH.

The markets to the west are projected to produce over 51,290 outbound passengers or 102,580 annual passengers. The key markets include Las Vegas, Phoenix, Salt Lake City, airports in the Los Angeles area and airports in the San Francisco area. The best hub airport for these markets is Salt Lake City International Airport.

<table>
<thead>
<tr>
<th>Region</th>
<th>Outbound Passengers</th>
<th>Hub Airports</th>
</tr>
</thead>
<tbody>
<tr>
<td>East</td>
<td>37,876</td>
<td>ORD, MSP</td>
</tr>
<tr>
<td>South</td>
<td>48,731</td>
<td>DFW, IAH</td>
</tr>
<tr>
<td>West</td>
<td>51,290</td>
<td>SLC, PHX</td>
</tr>
<tr>
<td>North</td>
<td>26,903</td>
<td>SEA</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>164,800</strong></td>
<td></td>
</tr>
</tbody>
</table>

Source: RS&H Team Analysis, 2013

Capturing the leaked passenger traffic will support new nonstop flights to new markets. Based on the passenger forecast developed herein, passenger demand is large enough to support daily nonstop service to Chicago with CRJ-700 or ERJ-175 aircraft. Passenger demand is large enough to support daily service to Dallas/Ft. Worth or Houston with CRJ-700 or ERJ-175 aircraft.

The actual enplaned passengers for Casper/Natrona County International Airport under the TAF are approximately 58 percent of the total booked passengers for the primary catchment area and 43 percent of the potential passenger based on economic share. This difference is the amount of passengers that can be accommodated on flights to new markets if the Airport can recruit the new air service. As shown in Figure 2-7, the TAF and the passenger bookings are projected to grow at an average annual rate of 2 percent while the economic share is projected to increase at a rate of 1 percent.
2.4.2.2 Forecast Based on Airline Capacity

Over the past few years, the existing airlines at Casper/Natrona County International Airport have been increasing capacity by adding more flights and upgrading from 30 seat EMB-120 turboprop aircraft to 50 seat CRJ-200 regional jets. New air service was added by Allegiant Airlines with 150 seat MD-83 aircraft (now 166 seats) to Las Vegas and Phoenix-Mesa Airport. The passenger response has been excellent and this has led to a strong growth in passenger demand since 2009. Based on the information from the “Leakage Studies”, it is apparent that CPR has an unmet demand for passenger traffic to the existing markets and to other markets.

Forecasts have been developed and presented to key airlines regarding air service to new markets. These presentations and forecast have been well received and it is believed that certain airlines will take action and add new flights to a hub airport to the east, a hub airport to the south and a hub airport to the west. The two primary hub airports to the east are Chicago/O’Hare International Airport and Minneapolis/St. Paul International Airport. The two hub airports to the south are Dallas/Ft. Worth International Airport and Houston Intercontinental Airport. The hub airport to the west is Phoenix Sky Harbor International Airport.

It is estimated at this time that either American Airlines or United Airlines will add one flight per day with 64 seat CRJ-700 aircraft between Casper and Chicago/O’Hare. Service to Minneapolis/St. Paul by Delta Air Lines could be an alternative possibility. To the south, it is estimated that United Airlines is the prime candidate for service to Houston, the top Casper market without nonstop service. It is estimated that United will operate 64 seat CRJ-700 aircraft starting with one flight per day. Service to Dallas/Ft. Worth by American Airlines could be an alternative possibility. To the west, it is estimated that American Airlines (ex. US Airways)
could be the prime candidate with service to Phoenix-Sky Harbor. Allegiant Airlines service to Phoenix-Mesa could be an alternative possibility.

The passenger demand based on passenger bookings from the Casper/Natrona County International Airport primary catchment area indicates that there are enough passengers to support new air service to Chicago, Houston, and Phoenix. In the case of Phoenix, the new air service would actually be a delayed replacement of the 2013 service to Phoenix-Mesa Airport.

Table 2-14, listed below, sets forth the estimates of enplaned passengers to destinations based on airline capacity.

<table>
<thead>
<tr>
<th>Year</th>
<th>LAS</th>
<th>DEN</th>
<th>SLC</th>
<th>Sub</th>
<th>ORD</th>
<th>IAH</th>
<th>PHX</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>16,840</td>
<td>55,870</td>
<td>24,290</td>
<td>97,000</td>
<td>97,000</td>
<td>2,880</td>
<td>100,480</td>
<td></td>
</tr>
<tr>
<td>2014</td>
<td>12,550</td>
<td>59,500</td>
<td>25,550</td>
<td>97,600</td>
<td>16,350</td>
<td>16,350</td>
<td>2,880</td>
<td>146,620</td>
</tr>
<tr>
<td>2015</td>
<td>14,674</td>
<td>63,700</td>
<td>26,330</td>
<td>104,704</td>
<td>16,350</td>
<td>16,350</td>
<td>9,216</td>
<td>150,441</td>
</tr>
<tr>
<td>2016</td>
<td>14,847</td>
<td>65,228</td>
<td>27,510</td>
<td>107,585</td>
<td>16,820</td>
<td>16,820</td>
<td>9,216</td>
<td>154,559</td>
</tr>
<tr>
<td>2017</td>
<td>15,020</td>
<td>67,275</td>
<td>28,475</td>
<td>110,770</td>
<td>17,286</td>
<td>17,286</td>
<td>9,216</td>
<td>158,358</td>
</tr>
<tr>
<td>2018</td>
<td>15,192</td>
<td>69,145</td>
<td>29,750</td>
<td>114,087</td>
<td>17,754</td>
<td>17,754</td>
<td>12,960</td>
<td>162,555</td>
</tr>
<tr>
<td>2019</td>
<td>15,364</td>
<td>71,148</td>
<td>30,550</td>
<td>117,062</td>
<td>17,988</td>
<td>18,616</td>
<td>12,960</td>
<td>166,626</td>
</tr>
<tr>
<td>2020</td>
<td>15,538</td>
<td>73,120</td>
<td>31,920</td>
<td>120,578</td>
<td>18,220</td>
<td>19,133</td>
<td>14,376</td>
<td>170,370</td>
</tr>
<tr>
<td>2021</td>
<td>16,135</td>
<td>74,004</td>
<td>33,165</td>
<td>123,304</td>
<td>20,966</td>
<td>20,966</td>
<td>14,376</td>
<td>174,612</td>
</tr>
<tr>
<td>2022</td>
<td>16,493</td>
<td>76,060</td>
<td>34,650</td>
<td>127,203</td>
<td>21,565</td>
<td>21,565</td>
<td>16,819</td>
<td>178,152</td>
</tr>
</tbody>
</table>

Source: RS&H Team Analysis, 2013
* Includes passengers to AZA
Note: Does not include other airline charters

The current markets are projected to have an increase of 30.3 percent from 2013 to 2022, going from 97,428 enplaned passengers to over 127,000 enplaned passengers. This equates to an average annual growth rate of 3.0 percent, somewhat higher than the TAF rate of 2.0 percent. As illustrated in Figure 2-8, if the Airport is successful in recruiting the new air service to Chicago, Houston, and Phoenix, then it is projected that the Airport can generate 187,152 enplaned passengers. This is a total increase of 93 percent or an annual average increase of 7.6 percent. This growth rate is similar to the growth rate experience in the 2009 to 2013 period.
The existing air service generates 52 percent of the total booked passengers for the Airport Catchment Area. With new air service to Chicago, Houston, and Phoenix, it is estimated that the Airport can generate up to 93 percent of the booked passengers from the Airport Catchment area.

### 2.4.2.3 Forecast of Flight Departures

The forecast of flight departures based on airline capacity is shown in Table 2-15 and is derived from passengers and aircraft schedules. The airlines have indicated that they intend to upgrade to larger aircraft in markets where the demand will support the capacity. In the case of CPR, there has been an upgrade by SkyWest operating as the Delta Connection from 30 seat EMB-120 aircraft in the CPR-SLC market to 50 seat CRJ-200 aircraft. It is estimated that United Express will upgrade from the 50 seat CRJ-200 aircraft in the CPR-DEN market to the 64 seat CRJ-700 aircraft. If Allegiant continues to acquire the A-319 and the A-320 aircraft, the Airport may see an upgrade to this aircraft from the MD-83. All new routes will be operated with either CRJ-700 aircraft or the new EMB-175 aircraft.
### TABLE 2-15
**FORECAST OF FLIGHT DEPARTURES**

<table>
<thead>
<tr>
<th>Year</th>
<th>EMB-120</th>
<th>MD-83</th>
<th>CRJ-200</th>
<th>CRJ-700</th>
<th>Existing Markets</th>
<th>New Routes CRJ-700</th>
<th>Total All Markets</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>70</td>
<td>126</td>
<td>2,254</td>
<td>-</td>
<td>2,450</td>
<td>-</td>
<td>2,450</td>
</tr>
<tr>
<td>2014</td>
<td>-</td>
<td>84</td>
<td>2,430</td>
<td>-</td>
<td>2,514</td>
<td>60</td>
<td>2,574</td>
</tr>
<tr>
<td>2015</td>
<td>-</td>
<td>104</td>
<td>2,606</td>
<td>-</td>
<td>2,710</td>
<td>910</td>
<td>3,620</td>
</tr>
<tr>
<td>2016</td>
<td>-</td>
<td>104</td>
<td>786</td>
<td>1,456</td>
<td>2,346</td>
<td>910</td>
<td>3,256</td>
</tr>
<tr>
<td>2017</td>
<td>-</td>
<td>104</td>
<td>850</td>
<td>1,460</td>
<td>2,414</td>
<td>910</td>
<td>3,324</td>
</tr>
<tr>
<td>2018</td>
<td>-</td>
<td>104</td>
<td>850</td>
<td>1,460</td>
<td>2,414</td>
<td>1,000</td>
<td>3,414</td>
</tr>
<tr>
<td>2019</td>
<td>-</td>
<td>104</td>
<td>912</td>
<td>1,544</td>
<td>2,560</td>
<td>1,039</td>
<td>3,599</td>
</tr>
<tr>
<td>2020</td>
<td>-</td>
<td>104</td>
<td>912</td>
<td>1,544</td>
<td>2,560</td>
<td>1,039</td>
<td>3,599</td>
</tr>
<tr>
<td>2021</td>
<td>-</td>
<td>115</td>
<td>-</td>
<td>2,287</td>
<td>2,402</td>
<td>1,155</td>
<td>3,557</td>
</tr>
<tr>
<td>2022</td>
<td>-</td>
<td>117</td>
<td>-</td>
<td>2,330</td>
<td>2,447</td>
<td>1,224</td>
<td>3,671</td>
</tr>
<tr>
<td>2023</td>
<td>-</td>
<td>120</td>
<td>-</td>
<td>2,346</td>
<td>2,466</td>
<td>1,235</td>
<td>3,700</td>
</tr>
<tr>
<td>2024</td>
<td>-</td>
<td>122</td>
<td>-</td>
<td>2,362</td>
<td>2,485</td>
<td>1,245</td>
<td>3,730</td>
</tr>
<tr>
<td>2025</td>
<td>-</td>
<td>125</td>
<td>-</td>
<td>2,379</td>
<td>2,504</td>
<td>1,256</td>
<td>3,760</td>
</tr>
<tr>
<td>2026</td>
<td>-</td>
<td>127</td>
<td>-</td>
<td>2,395</td>
<td>2,523</td>
<td>1,267</td>
<td>3,790</td>
</tr>
<tr>
<td>2027</td>
<td>-</td>
<td>130</td>
<td>-</td>
<td>2,412</td>
<td>2,542</td>
<td>1,278</td>
<td>3,820</td>
</tr>
<tr>
<td>2028</td>
<td>-</td>
<td>133</td>
<td>-</td>
<td>2,428</td>
<td>2,562</td>
<td>1,289</td>
<td>3,850</td>
</tr>
<tr>
<td>2029</td>
<td>-</td>
<td>136</td>
<td>-</td>
<td>2,445</td>
<td>2,581</td>
<td>1,300</td>
<td>3,881</td>
</tr>
<tr>
<td>2030</td>
<td>-</td>
<td>139</td>
<td>-</td>
<td>2,462</td>
<td>2,601</td>
<td>1,311</td>
<td>3,912</td>
</tr>
<tr>
<td>2031</td>
<td>-</td>
<td>142</td>
<td>-</td>
<td>2,479</td>
<td>2,621</td>
<td>1,323</td>
<td>3,943</td>
</tr>
<tr>
<td>2032</td>
<td>-</td>
<td>145</td>
<td>-</td>
<td>2,496</td>
<td>2,641</td>
<td>1,334</td>
<td>3,975</td>
</tr>
</tbody>
</table>

Source: RS&H Team Analysis, 2013

### 2.4.3 Passenger Enplanement Forecast Summary

The five passenger forecasts contained herein, and illustrated in Figure 2-9, can be condensed into three forecast scenarios; (1) TAF and TAF Adjusted; (2) Economic Share and Leakage; and (3) Airline Capacity. The TAF has been adjusted for the recent increase in enplaned passengers since the FAA published its report and forecast in January of 2012. This is a conservative estimate based on the experience of passengers at the Airport since 1992. It is the lowest passenger forecast of the various scenarios and can be considered the baseline forecast.

The Economic Share forecast and the Leakage Analysis present the number of potential passengers that could fly out of Casper. This forecast may be achieved if the Airport is able to attract larger aircraft to existing markets, more flights to other markets, and lower fares to existing markets. This is the highest passenger forecast.

The Airline Capacity forecast is based on recent flight changes and proposed flight changes by the airlines on existing routes and the implementation of air service to new routes. The presentations by the Airport to the airlines for new air service to Chicago, Houston, Dallas, and Phoenix have been well received. All three
scenarios conclude that Casper/Natrona County International Airport will see continued increases in passenger enplanements over the next twenty years.

**FIGURE 2-9**
**COMPARISON OF ENPLANED PASSENGER FORECAST**

![Graph showing passenger forecast scenarios](image)

Sources: FAA Terminal Area Forecast, RS&H Team Analysis, 2013

As shown in Table 2-16, the forecast for enplaned revenue passengers for calendar year 2032 (20 years from the base year) ranges from a low of 119,924 to a high of 244,480. The low number is the TAF and does not take into consideration the most recent experience for 2012 and 2013. The high number is based on the passenger bookings for the airport catchment area for 2012 and then continues at the same growth rate from the TAF. This number should be considered as the potential passengers for the Airport if all passengers use Casper/Natrona County International Airport. This is unlikely since Denver International Airport and some of the other Wyoming airports will have lower fares, in some cases, compared to Casper/Natrona County International Airport.

The most reasonable forecast number is probably the capacity forecast based on the existing routes and the new routes. Air service to Denver, Las Vegas, and Salt Lake City seems to be solid with little chance of termination of service in any of the three markets. Passenger data supports service to Chicago, Dallas/Ft. Worth, Houston, and Phoenix. Implementation will depend on the available aircraft for the target airlines and the incentive program provided by the Airport.
### TABLE 2-16
SUMMARY OF ENPLANED PASSENGER FORECAST

<table>
<thead>
<tr>
<th>Year</th>
<th>FAA TAF</th>
<th>Adjusted TAF</th>
<th>Existing Routes</th>
<th>With New Routes</th>
<th>Booking Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>88,917</td>
<td>98,176</td>
<td>110,770</td>
<td>154,560</td>
<td>181,850</td>
</tr>
<tr>
<td>2022</td>
<td>98,100</td>
<td>108,394</td>
<td>127,200</td>
<td>187,150</td>
<td>200,890</td>
</tr>
<tr>
<td>2027</td>
<td>108,392</td>
<td>119,676</td>
<td>140,440</td>
<td>206,630</td>
<td>221,800</td>
</tr>
<tr>
<td>2032</td>
<td>119,924</td>
<td>132,132</td>
<td>155,060</td>
<td>228,130</td>
<td>244,480</td>
</tr>
</tbody>
</table>

Source: RS&H Team Analysis, 2013
2.5 AVIATION ACTIVITY DEMAND FORECASTS

The following sections outline multiple scenarios and forecasts related to the demand of various aviation activities. Aviation activities include Customs and Border Protection operations, cargo operations, aircraft operations, and instrument operations. In addition, a forecast for based aircraft was generated.

2.5.1 Cargo Operations

The Airport serves as a regional cargo facility serving the cargo demands of Wyoming as well as portions of Colorado and Nebraska. The current air cargo market is served almost exclusively by FedEx Express and UPS. For this Master Plan Update, the April 2010 Airport Cargo Study (Cargo Study) forecast was validated and carried forward. The following is a summary of that cargo forecast.

The Cargo Study classified cargo operations as take-offs and landings by integrated express operators and their contract carriers. The Study determined that belly cargo transported by passenger airlines, contract flights, and charter cargo flights was minimal and on the decline. As such, passenger aircraft operations were not considered or included in the forecast.

To include the most recent historical cargo operations counts in this Master Plan Update, Airport records of monthly cargo carrier operations were tallied and then validated with FAA Enhanced Traffic Management System Counts (ETMSC) data. As illustrated in Figure 2-10, it was found that operations had declined since the Cargo Study was published, which is a result of the global recession and reduction in cargo volume.

It is important to note that due to the structuring of the air cargo industry, air cargo operations do not directly correlate with air cargo volume. Typically, if there is an increase in demand for cargo transport, larger aircraft will be utilized instead of adding additional flights. Evidence of this is the fact that over the past three years, cargo volume has increased while operations have remained flat. The Cargo Study estimated cargo operations would grow annually at 0.7 percent. This growth rate was projected out from 2012, the most recent historical year, and was extrapolated through the planning period. It indicates that the Airport will have roughly 5,200 cargo operations by 2032.

Air cargo volume forecasts are used as the primary metric in determining airport cargo facility requirements. To derive a forecast for cargo volume, the Cargo Study used the FAA Aerospace Forecast 2008–2025 forecast methodology. The study’s forecast included considerations for the global recession which began while the study was being conducted. The recession proved to be more detrimental and prolonged than the Cargo Study had accounted for. Only 19.4 million pounds of cargo was handled in 2012 as opposed to the Cargo Study’s projection of 21.2 million pounds.

That said, current economic indicators suggest that the national economy is strengthening and pulling out of recession. Since cargo volume bottomed out in 2009, it has been growing at nearly 6 percent annually and has returned to pre-recession levels. The Cargo Study projected long term volume growth at 3.2 percent, which would equate to 38.8 million pounds of cargo by 2032. It should be noted that the average annual growth rate (AAGR) for total volume shown in the table in Figure 2-10 is 3.5 percent, which is slightly higher than the AAGR the Cargo Study forecasted. This represents the use of current 2012 volume data as the baseline while still maintaining the Cargo Study’s long term projection.
Taking into account the recent growth and the strengthening of the global economy, it was determined that the Cargo Study’s long term forecast is on track, and thus was carried forward in this Master Plan Update.

**FIGURE 2-10**

AIR CARGO OPERATIONS AND FORECAST

<table>
<thead>
<tr>
<th>Year</th>
<th>Operations</th>
<th>Total Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Jet</td>
<td>Non-Jet</td>
</tr>
<tr>
<td></td>
<td>2012</td>
<td>2017</td>
</tr>
<tr>
<td>Historical</td>
<td>1,052</td>
<td>1,090</td>
</tr>
<tr>
<td></td>
<td>3,486</td>
<td>3,600</td>
</tr>
<tr>
<td></td>
<td><strong>4,537</strong></td>
<td><strong>4,700</strong></td>
</tr>
<tr>
<td>Projected</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>19,392,097</td>
<td>24,200,000</td>
</tr>
<tr>
<td>Average Annual Growth Rate</td>
<td>0.0%</td>
<td>-1.8%</td>
</tr>
</tbody>
</table>

Sources: FAA ETMSC Data, Airport Records, RS&H Team Analysis, 2010 Airport Cargo Study
2.5.2 Annual Aircraft Operations

This section presents a general overview of the historical trends in annual aircraft operations at the Airport along with multiple forecast scenarios.

An aircraft operation is defined as either a takeoff or a landing. Therefore, the typical air carrier flight consists of a landing and a takeoff for a total of two operations. The FAA records annual aircraft operations in the following four categories:

- **Air Carrier** - An air carrier operation involves an aircraft with a seating capacity of more than 60 seats or a cargo payload capacity of more than 18,000 pounds. Additionally, air carrier operations are those carrying passengers or cargo for hire or compensation.

- **Air Taxi** - Air Taxi operations represent scheduled commercial flights, nonscheduled commercial flights, and charter flights with aircraft with 60 seats or fewer or a cargo payload capacity of 18,000 pounds or less. Additionally, air taxi operations are those carrying passengers or cargo for hire or compensation.

- **Military** - Military operations include all classes of U.S. military or federal government aircraft.

- **General Aviation** - General aviation (GA) operations are any type of operation that is not included in one of the previous defined categories. These are typically privately owned aircraft used for training, recreation, business, or personal use.

Historically, the Airport has experienced relatively large fluctuations in airport operations. These fluctuations were primarily driven by increases and decreases in local and itinerant GA operations, which can be attributed to the economic climate within the City of Casper and Natrona County. The Casper region’s economy is largely supported by the energy industry. Many companies within the region specialize in or support extraction and refinement operations of natural gas, uranium, coal, wind, and oil. When a particular energy’s price and demand is high, that sector flourishes. Similarly, when energy industries are doing well, Casper prospers and aviation activity typically increases. Depending on local economic conditions, fuel prices, and the demand for local aviation related businesses, the Airport has accommodated between 35,000 and 60,000 annual operations.

At Casper/Natrona County International Airport, annual aircraft operations are tallied by the ATCT staff and recorded in the FAA Operations Network (OPSNET) database. OPSNET is the official source of the national airspace system air traffic operations and delay data. The data collected through OPSNET is used to analyze the performance of the FAA’s air traffic control facilities and to generate the next year’s FAA Terminal Area Forecast (TAF).

At the time of this study, the FAA 2012 TAF included a forecast of annual operations from 2012 through 2040. However, FAA Operations Network (OPSNET) provided historical annual operations data up to fiscal year 2013. The recent OPSNET data was especially important because it revealed that the Airport had 43,206
annual operations in FY 2013, which is more than the TAF had projected throughout the entire planning period. This factor prompted the creation of an adjusted TAF for operations, in which the original TAF’s rate of growth was projected out from fiscal year 2013 historic data.

It is important to note that OPSNET only accounts for aircraft operations that occur while the ATCT is open. As discussed in Section 1.5.1, the Airport’s ATCT is only open for 16 hours. Based on the analysis, approximately 1,050 annual operations of Air Carrier, Air Taxi and General Aviation operators occur “after hours,” which are not accounted for in the OPSNET historical data. These operations account for 2.4 percent of the recorded total and are well within the generally accepted parameters outlined by the FAA for forecasting aviation activity by airports. Therefore, OPSNET data will be used to represent historical aircraft operations at the Airport and these “after hour” operations will be accounted for in all forecast scenarios.

Four scenario forecasts, depicted in Figure 2-11, were used to establish a range of annual aircraft operations that could be expected within the planning period. These four scenarios and their specifics are presented below:

- **2009 State Plan for CPR:** The Wyoming Statewide Airport Inventory and Implementation Plan (State Plan) presented a forecast scenario which suggested CPR would accommodate 68,132 annual operations by 2027. The computed AAGR for this scenario was 2.7 percent, which equates to 77,000 annual operations by 2032.

- **2004 Master Plan Update:** This study projected annual operations would grow to 54,132 by 2023. This computes to a 1.3 percent AAGR, which when extrapolated, suggests roughly 60,000 annual operations could be expected by 2032.

- **FAA 2012 Terminal Area Forecast:** At the time of this study, the TAF provided a forecast of annual operations from 2012-2040. It projects operations to grow by 2.64 percent from 2012 - 2013 and then grow by 0.47 percent every year after that through the planning period. This equates to a 0.6 percent AAGR and 43,107 annual operations by 2032.

- **Adjusted 2012 FAA Terminal Area Forecast:** The FAA TAF was adjusted for this study by beginning the TAF’s projections of 0.6 percent AAGR in fiscal year 2014 instead of 2012. This allowed for the historical data from fiscal year 2012 and 2013 to be accounted for. Using this methodology, the TAF forecast indicates annual operations will grow to 48,032 by 2032.

Current economic conditions within Casper and the region are favorable, and economic indicators, such as sustained increases in population and decreases in unemployment, point toward the likelihood of future growth. Discussions with airport management and other airport business managers indicate the local community is expecting additional growth. The fact that within four years (2010-2013), operations at the Airport grew 6.9 percent, demonstrates CPR is on an upward trend, the duration of which is unknown but expected to continue over the short term.
Taking these factors into consideration, the 2009 State Plan was used as the preferred scenario to be carried forward throughout this study. This scenario is broken out between types of operations in the table in Figure 2-11. Note that Air Taxi operations are shown to decrease slightly during the planning period. This is largely attributed to the projected switch in commercial passenger aircraft from air taxi classified aircraft to air carrier aircraft.

By examining the current Airport facilities ability to meet the demand associated with this scenario, this study will ensure the Airport is “future ready” with the capability to meet the aviation demands of a growing and prosperous region. If economic conditions in Casper and the region continue to progress, annual operations will likely trend upward toward the State Plan’s forecast. However, if economic conditions don’t progress further, the adjusted TAF represents a likely scenario that matches the forecasted trend for general operations nationally.

It is important to consider airfield capacity when discussing the forecasted scenarios presented above (and will be discussed further in the next chapter, Facility Requirements). Airfield Capacity is an estimate of the number of aircraft that can be processed through the airfield system during a specific period without unacceptable delay, and is referred to as Annual Service Volume (ASV). The ASV for the Airport is estimated at 225,000 annual operations. Based on this analysis, the Airport’s runways, taxiways, and airspace have sufficient capacity to accommodate the preferred operations forecast scenario without undue delay or congestion.
**PREFERRED OPERATIONS FORECAST**

<table>
<thead>
<tr>
<th>Year</th>
<th>Commercial Service</th>
<th>General Aviation</th>
<th>Military</th>
<th>Total Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Air Carrier</td>
<td>Air Taxi</td>
<td>Total</td>
<td>Itinerant</td>
</tr>
<tr>
<td>Historical</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2012</td>
<td>1,260</td>
<td>10,720</td>
<td>11,980</td>
<td>16,585</td>
</tr>
<tr>
<td>2013</td>
<td>1,371</td>
<td>11,302</td>
<td>12,673</td>
<td>16,359</td>
</tr>
<tr>
<td>Projected</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td>4,180</td>
<td>10,980</td>
<td>15,000</td>
<td>21,900</td>
</tr>
<tr>
<td>2022</td>
<td>5,980</td>
<td>9,490</td>
<td>15,500</td>
<td>25,800</td>
</tr>
<tr>
<td>2032</td>
<td>6,470</td>
<td>10,190</td>
<td>16,500</td>
<td>36,000</td>
</tr>
<tr>
<td><strong>Average Annual Growth Rate</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2002-2012</td>
<td>5.5%</td>
<td>-3.8%</td>
<td>-3.1%</td>
<td>0.9%</td>
</tr>
<tr>
<td>2012-2032</td>
<td>8.5%</td>
<td>-0.3%</td>
<td>1.6%</td>
<td>4.0%</td>
</tr>
</tbody>
</table>

Sources: FAA 2012 Terminal Area Forecast, FAA OPSNET 2013, RS&H Team Analysis, 2013
2.5.3 Instrument Operations Forecast

The instrument operations count is a reflection of workload for FAA facilities that are controlling aircraft at airports. An instrument operation is defined as an arrival or departure of an aircraft in accordance with an Instrument Flight Rule (IFR) flight plan or an operation where IFR separation between aircraft is provided by Air Traffic Control. Instrument operations are used in part by the FAA to determine an airport’s eligibility for enhanced approach capability and additional navigational aids.

According to the FAA Aerospace Forecast 2012-2032, TRACON operations are projected to grow at an average of 1.2 percent annually through 2032. TRACON operations are defined as all itinerant IFR and VFR flights, including overflights. By counting only IFR itinerant operations, true airport IFR operations can be determined.

A share analysis was used to forecast the number of IFR operations throughout the planning period. The average percentage of historical data (1993-2012) indicated that IFR operations consisted of roughly 50 percent of total airport operations. As shown in Table 2-17, this percentage was carried forward through the planning period, equating to an estimated 36,710 IFR operations in 2032. IFR approaches were estimated as one half of total IFR operations. It should be noted that due to year to year fluctuations in operations, the AAGR shown for 2002-2012 only illustrates a comparison between two specific years, and should not be misconstrued as representing a long term decline in operations.

This forecast is based off the preferred scenario of total operations and represents a 3.8 percent AAGR in IFR operations from 2012 to 2032. In this forecast, the growth in IFR operations is greater than the growth projected nationally. This is attributed to the large amount of growth forecasted by the preferred total operations scenario. If total operations grow at a lower rate, so will IFR operations.
Based aircraft represent the total number of active, civil aircraft permanently located at an airport. Categories of based aircraft include; single-engine piston, multi-engine piston, turboprop, jet, and helicopter. Three forecast scenarios were developed to project the number of based aircraft at the Airport in the future, and are depicted in Figure 2-12.

At the time of this study, the FAA TAF began its forecast in 2012 and projected out through 2040. However, the FAA 5010 Report provided historical data for 2012 which acknowledged the Airport had 107 based aircraft in 2012. The 5010 Report is based on annual airport reported data and is used as a tool to generate the TAF. As part of a comprehensive GA analysis, an independent based aircraft count was conducted by airport staff and the consultant team in November and December of 2013. The new count affirmed that 123 aircraft are currently based at the Airport.

When comparing the 5010 Report data and the most recent count to the TAF, it was evident that the TAF had already been exceeded. For that reason, the TAF was adjusted by projecting the original TAF’s AAGR outward from the 2013 data. The three scenarios and their specifics are presented below:

- **Adjusted 2012 FAA Terminal Area Forecast:** The TAF was adjusted for this study by beginning the TAF’s forecast of 0.4 percent AAGR using actual 2013 based aircraft instead of the TAF’s 2012 number. Using this methodology, the adjusted TAF indicates the Airport will have 132 based aircraft by 2032.

- **Adjusted 2009 State Plan for Wyoming:** The 2009 State Plan forecasted the State of Wyoming’s based aircraft would collectively grow at 1.92 percent annually. This was the State Plan’s high scenario which suggested the majority of growth would take place at commercial service airports. Because Casper is a leading commercial service airport within the State, this rate was applied as a
scenario which provided the number of based aircraft possible if growth matched that of the state as a whole. With a 1.92 percent AAGR projected from 2013, this scenario indicates the Casper has the potential to reach 177 based aircraft by 2032.

» **Linear Trend:** Analysis of historical data indicated based aircraft had grown at 1.86 percent annually since 1993. This growth rate is indicative of the historical twenty year trend. With a 1.86 AAGR projected outward from 2013, this scenario indicates the Airport would have 175 based aircraft by 2032.

The Linear Trend scenario was chosen as the preferred scenario for this study and is broken out into specific aircraft types in the table below. This scenario utilizes a trend analysis which takes into account the most current verified data. The scenario also aligns with the State Plan scenario, which is appropriate seeing as Casper is one of Wyoming’s most active airports and is within a fast growing region with a strong economy.

In comparison to national trends, the FAA Aerospace Forecast 2012-2032 reports that the general aviation fleet will grow at 0.6 percent annually. The preferred scenario, suggesting 1.86 percent growth annually, is higher than the national trend which is associated with the overall economic conditions of the region as described in *Section 2.1.2.1 Economic Conditions.*
## Based Aircraft Scenarios

### Based Aircraft Forecast

<table>
<thead>
<tr>
<th>Year</th>
<th>Single-Engine</th>
<th>Multi-Engine Pistion</th>
<th>Turboprop</th>
<th>Turbine Jet</th>
<th>Helicopter</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Historical</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2012</td>
<td>89</td>
<td>2</td>
<td>5</td>
<td>7</td>
<td>4</td>
<td>107</td>
</tr>
<tr>
<td>2013</td>
<td>94</td>
<td>3</td>
<td>16</td>
<td>6</td>
<td>4</td>
<td>123</td>
</tr>
<tr>
<td><strong>Projected</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td>101</td>
<td>3</td>
<td>17</td>
<td>7</td>
<td>4</td>
<td>132</td>
</tr>
<tr>
<td>2022</td>
<td>110</td>
<td>3</td>
<td>19</td>
<td>8</td>
<td>5</td>
<td>145</td>
</tr>
<tr>
<td>2032</td>
<td>133</td>
<td>4</td>
<td>23</td>
<td>9</td>
<td>6</td>
<td>175</td>
</tr>
</tbody>
</table>

**Average Annual Growth Rate**

<table>
<thead>
<tr>
<th>Period</th>
<th>Single-Engine</th>
<th>Multi-Engine Pistion</th>
<th>Turboprop</th>
<th>Turbine Jet</th>
<th>Helicopter</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002-2012</td>
<td>7%</td>
<td>-12%</td>
<td>-7%</td>
<td>9%</td>
<td>0%</td>
<td>4%</td>
</tr>
<tr>
<td>2012-2032</td>
<td>2%</td>
<td>4%</td>
<td>8%</td>
<td>1%</td>
<td>2%</td>
<td>2%</td>
</tr>
</tbody>
</table>

Sources: FAA Terminal Area Forecast, FAA 5010, Airport Records, RS&H Team Analysis, 2013
2.5.5 Forecast Summary

In summary, this forecast assumes continuation of the current types of aviation activity with growth in line with historical and current economic trends. A summary of the aviation demand forecast for passenger enplanements, operations, and based aircraft is presented in Table 2-18. As demonstrated within this chapter, the data included in this summary was collected from many different sources, and was reconciled with actual Airport records. This process aided in determining a baseline for which all the scenarios and forecasts were built upon.

This compressive Airport activity forecast will be used in the next chapters of the Master Plan Update to assess the capacity of existing facilities and determine the facility expansions or improvements needed to satisfy future activity levels.

**TABLE 2-18**
**FORECAST SUMMARY**

<table>
<thead>
<tr>
<th></th>
<th>Base Year : 2012</th>
<th>2012</th>
<th>2017</th>
<th>2022</th>
<th>2032</th>
<th>2017</th>
<th>2022</th>
<th>2032</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Base Yr. Level</td>
<td>Base Yr. + 5 yrs.</td>
<td>Base Yr. + 10 yrs.</td>
<td>Base Yr. + 20 yrs.</td>
<td>Growth Rates</td>
<td>Base Yr. + 5 yrs.</td>
<td>Base Yr. + 10 yrs.</td>
<td>Base Yr. + 20 yrs.</td>
</tr>
<tr>
<td>Scheduled Passenger Enplanements</td>
<td>Scheduled Air Carrier</td>
<td>13,564</td>
<td>80,563</td>
<td>127,200</td>
<td>155,060</td>
<td>42.8%</td>
<td>25.1%</td>
<td>13.0%</td>
</tr>
<tr>
<td></td>
<td>Scheduled Commuter</td>
<td>74,449</td>
<td>30,207</td>
<td>0</td>
<td>0</td>
<td>-16.5%</td>
<td>-100.0%</td>
<td>-100.0%</td>
</tr>
<tr>
<td></td>
<td>Total Scheduled Enplanements</td>
<td>88,013</td>
<td>110,770</td>
<td>127,200</td>
<td>155,060</td>
<td>4.7%</td>
<td>3.8%</td>
<td>2.9%</td>
</tr>
<tr>
<td>Operations</td>
<td>Itinerant</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Air Carrier</td>
<td>1,260</td>
<td>4,180</td>
<td>5,980</td>
<td>6,470</td>
<td>27.1%</td>
<td>16.9%</td>
<td>8.5%</td>
</tr>
<tr>
<td></td>
<td>Commuter/ Air Taxi</td>
<td>10,720</td>
<td>10,980</td>
<td>9,490</td>
<td>10,190</td>
<td>0.5%</td>
<td>-1.2%</td>
<td>-0.3%</td>
</tr>
<tr>
<td></td>
<td>Total Commercial Operations</td>
<td>11,980</td>
<td>15,000</td>
<td>15,500</td>
<td>16,500</td>
<td>4.6%</td>
<td>2.6%</td>
<td>1.6%</td>
</tr>
<tr>
<td></td>
<td>General Aviation</td>
<td>16,585</td>
<td>21,900</td>
<td>25,800</td>
<td>36,000</td>
<td>5.7%</td>
<td>4.5%</td>
<td>4.0%</td>
</tr>
<tr>
<td></td>
<td>Military</td>
<td>470</td>
<td>490</td>
<td>490</td>
<td>490</td>
<td>0.8%</td>
<td>0.4%</td>
<td>0.2%</td>
</tr>
<tr>
<td></td>
<td>Local</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>General Aviation</td>
<td>9,380</td>
<td>14,400</td>
<td>17,000</td>
<td>23,600</td>
<td>9.0%</td>
<td>6.1%</td>
<td>4.7%</td>
</tr>
<tr>
<td></td>
<td>Military</td>
<td>179</td>
<td>190</td>
<td>190</td>
<td>190</td>
<td>1.2%</td>
<td>0.6%</td>
<td>0.3%</td>
</tr>
<tr>
<td></td>
<td>Total Operations</td>
<td>38,594</td>
<td>52,000</td>
<td>59,000</td>
<td>77,000</td>
<td>6.1%</td>
<td>4.3%</td>
<td>3.5%</td>
</tr>
<tr>
<td>Instrument Operations</td>
<td></td>
<td>8,781</td>
<td>12,396</td>
<td>14,064</td>
<td>18,355</td>
<td>7.14%</td>
<td>4.82%</td>
<td>3.76%</td>
</tr>
<tr>
<td>Cargo/Mail (enplaned + deplaned tons)</td>
<td>19,392,097</td>
<td>24,179,300</td>
<td>28,303,500</td>
<td>38,782,700</td>
<td>4.5%</td>
<td>3.9%</td>
<td>3.5%</td>
<td></td>
</tr>
<tr>
<td>Based Aircraft</td>
<td>Single Engine</td>
<td>89</td>
<td>101</td>
<td>110</td>
<td>133</td>
<td>2.6%</td>
<td>2.1%</td>
<td>2.0%</td>
</tr>
<tr>
<td></td>
<td>Multi Engine</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>4</td>
<td>8.4%</td>
<td>4.1%</td>
<td>3.5%</td>
</tr>
<tr>
<td></td>
<td>Turboprop</td>
<td>5</td>
<td>17</td>
<td>19</td>
<td>23</td>
<td>27.7%</td>
<td>14.3%</td>
<td>7.9%</td>
</tr>
<tr>
<td></td>
<td>Jet Engine</td>
<td>7</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>0.0%</td>
<td>1.3%</td>
<td>1.3%</td>
</tr>
<tr>
<td></td>
<td>Helicopter</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>0.0%</td>
<td>2.3%</td>
<td>2.0%</td>
</tr>
<tr>
<td></td>
<td>Total Based Aircraft</td>
<td>107</td>
<td>132</td>
<td>145</td>
<td>175</td>
<td>4.3%</td>
<td>3.1%</td>
<td>2.5%</td>
</tr>
</tbody>
</table>

Sources: FAA Terminal Area Forecast, FAA OPSNET, Airport Records, RS&H Analysis, 2013
2.6 DESIGN AIRCRAFT IDENTIFICATION

The FAA recommends the identification of the existing and future design aircraft for airport planning purposes. In many cases the design aircraft is made from a family or collection of aircraft that are planned to be accommodated by the airport. For airports with multiple runways, design aircraft are identified for each runway. In regards to CPR, both runways share the same design aircraft.

Three parameters are used to classify the design aircraft: Aircraft Approach Category (AAC), Airplane Design Group (ADG), and Taxiway Design Group (TDG). The ACC, depicted by a letter, relates to aircraft landing speeds. The ADG, depicted by a Roman numeral, relates to airplane wingspan and height. The TDG, classified by number, relates to the outer to outer main gear width and the distance between the cockpit and main gear. These parameters serve as the basis of the design and construction of airport infrastructure.

The 2004 Airport Master Plan Update defined the current design aircraft as a Boeing 727-F and a Bombardier CRJ-100. These aircraft are D-III and C-II aircraft, respectively, and were the largest commercial service aircraft in service at the time. That study recommended the Airport change to a D-IV design aircraft in the future. At the present time, the largest commercial service aircraft operating at the Airport are the Boeing MD-83 (D-III) operated by Allegiant Air, and the Airbus A300/310 and Boeing 757-200 (C-IV) operated by FedEx. These aircraft are all TDG 5 aircraft.

The forecast analysis indicates that the requirements have been meet for the Airport to have a design aircraft with an AAC D, ADG IV, and TDG 5. This is primarily due to the high frequency of operations of both the A300/310 and the MD-83, illustrated in Figure 2-13. In addition, the Airport accommodates numerous D-IV aircraft each year, including military, charter, business, and mission specific aircraft. The Airport is unique in that contains the only Port of Entry in Wyoming and has been frequently used as a firefighting air tanker base serving a DC-10 (D-IV aircraft) air tanker.

Additionally, CPR’s long runways, location, and unique climatic conditions make the Airport a prime location to test and train pilots in large civil and military aircraft. The Boeing 787 Dreamliner and B-1 Bomber have
frequented CPR in 2013 multiple times to perform touch and go’s and crosswind landings. These unique features require the Airport maintain the ability to accommodate a large variety of aircraft types, which the suggested design aircraft standards will preserve.

In summary, the design aircraft chosen for the Casper/Natrona County International Airport is an Airbus A310 and a Boeing MD-83. These aircraft require airport standards be designed for:

» Aircraft Approach Category D
» Aircraft Design Group IV
» Taxiway Design Group 5

2.7 FORECAST COMPARISON
As proposed aviation activity forecasts are submitted to the FAA for review and approval, forecasts are generally considered acceptable if they differ by less than 10 percent in the 5-year forecast period, and less than 15 percent in the 10-year forecast period. Generally speaking, each category is within 2 percent of the acceptable range in the 10-year forecast. The forecast for total operations does exceed the 10-year percentage threshold by 14 percent; however, the forecast does not exceed 100,000 operations, and will not affect the capacity of the existing airfield or the role of the Casper/Natrona County International Airport within the National Plan of Integrated Airport System (NPIAS).

Once the FAA validates the forecast, the study continues and the FAA utilizes the new forecast, if approved, to generate the next TAF. A comparison between the adjusted TAF and the forecasts being carried forward for use in this study is presented in Table 2-19. The adjusted TAF, as opposed to the original TAF, was used for comparison to take into account recent growth.
### TABLE 2-19
**FORECAST COMPARISON**

<table>
<thead>
<tr>
<th>Description</th>
<th>Year</th>
<th>Forecast</th>
<th>Adjusted TAF</th>
<th>AF/TAF (% Difference)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Passenger Enplanements</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Base Yr</td>
<td>2012</td>
<td>88,013</td>
<td>88,013</td>
<td>0%</td>
</tr>
<tr>
<td>Base Yr + 5 yrs</td>
<td>2017</td>
<td>110,770</td>
<td>98,176</td>
<td>13%</td>
</tr>
<tr>
<td>Base Yr + 10 yrs</td>
<td>2022</td>
<td>127,200</td>
<td>108,394</td>
<td>17%</td>
</tr>
<tr>
<td>Base Yr + 20 yrs</td>
<td>2032</td>
<td>155,060</td>
<td>132,132</td>
<td>17%</td>
</tr>
<tr>
<td><strong>Commercial Operations</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Base Yr</td>
<td>2012</td>
<td>11,980</td>
<td>11,980</td>
<td>0%</td>
</tr>
<tr>
<td>Base Yr + 5 yrs</td>
<td>2017</td>
<td>15,000</td>
<td>12,664</td>
<td>18%</td>
</tr>
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<td>Base Yr + 10 yrs</td>
<td>2022</td>
<td>15,500</td>
<td>13,385</td>
<td>16%</td>
</tr>
<tr>
<td>Base Yr + 20 yrs</td>
<td>2032</td>
<td>16,500</td>
<td>14,973</td>
<td>10%</td>
</tr>
<tr>
<td><strong>Total Operations</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Base Yr</td>
<td>2012</td>
<td>38,594</td>
<td>38,594</td>
<td>0%</td>
</tr>
<tr>
<td>Base Yr + 5 yrs</td>
<td>2017</td>
<td>52,000</td>
<td>44,918</td>
<td>16%</td>
</tr>
<tr>
<td>Base Yr + 10 yrs</td>
<td>2022</td>
<td>59,000</td>
<td>45,900</td>
<td>29%</td>
</tr>
<tr>
<td>Base Yr + 20 yrs</td>
<td>2032</td>
<td>77,000</td>
<td>48,032</td>
<td>60%</td>
</tr>
<tr>
<td><strong>Based Aircraft</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Base Yr</td>
<td>2012</td>
<td>107</td>
<td>107</td>
<td>0%</td>
</tr>
<tr>
<td>Base Yr + 5 yrs</td>
<td>2017</td>
<td>132</td>
<td>125</td>
<td>6%</td>
</tr>
<tr>
<td>Base Yr + 10 yrs</td>
<td>2022</td>
<td>145</td>
<td>127</td>
<td>14%</td>
</tr>
<tr>
<td>Base Yr + 20 yrs</td>
<td>2032</td>
<td>175</td>
<td>132</td>
<td>33%</td>
</tr>
</tbody>
</table>

**Sources:** FAA 2012 TERMINAL AREA FORECAST, FAA OPSNET, AIRPORT RECORDS, RS&H TEAM ANALYSIS, 2013
CHAPTER 3

FACILITY REQUIREMENTS
To properly plan for the future requirements of Casper/Natrona County International Airport (CPR or Airport), it is necessary to translate the forecasts of aviation demand into the specific types and quantities of facilities that are needed. The demand for new or expanded facilities is often driven by capacity shortfalls that leave an airport unable to accommodate forecast growth with existing facilities. However, the requirements for new or improved facilities can also be driven by other circumstances. For example, facilities may be needed to comply with updated standards developed and adopted by the FAA or other regulatory agencies to accommodate the strategic vision for the Airport, or replace outdated or inefficient facilities that are fiscally prohibitively costly to maintain or modernize. These circumstances can have a significant impact on future needs and have been considered in this analysis for the Airport.

The findings of the capacity analyses and facility requirement determinations, as well as other circumstantial criteria specific to CPR, form the foundation for the identification of development alternatives. Evaluation of those alternatives defines a development plan to meet future demand. As such, critical future investment decisions will be based on these analyses.

This chapter is devoted to assessments in each of the following categories that effect the Airport:

» Meteorological Conditions
» Airport Design and Classification
» Airfield Design
» Airspace, Navigational and Visual Aids
» Commercial Passenger Terminal Facility
» Aviation Support Facilities

This chapter concludes with a section that summarizes the key findings of the facility requirement assessments that will be carried forward to the identification and evaluation of alternatives.
3.1 METEOROLOGICAL CONDITIONS

Climate conditions have an influence on aircraft performance, as well as airfield dimensional and separation standards. Temperature, precipitation, winds, visibility, and cloud ceiling heights are important climate factors that must be assessed for operational impacts associated with the use of Runways 03/21 and 08/26.

3.1.1 Climate Summary

Casper, Wyoming has a semi-arid climate with winters that are dry, cold and windy. Summers are typically dry and hot with cool evenings. The mean annual temperature at the Airport is 45.9 degrees Fahrenheit, with an average annual precipitation of 12.55 inches. The average annual high temperature is 59.7 degrees and the hottest month, July, has an average high temperature of 88.5 degrees. The average annual low temperature is 32.1 degrees, and the coldest month, December, has an average low temperature of 14.2 degrees.

3.1.2 Runway Orientation and Wind Analysis

Runway wind coverage analysis was conducted using the FAA’s Airports GIS Airport Design Tools Wind Analysis with data supplied by the National Climatic Data Center from the weather reporting station at the Casper/Natrona County International Airport during the period from 2004 through 2013. FAA planning standards recommend that the runway system provide a minimum of 95 percent wind coverage. If a single runway cannot provide this level of coverage, then a crosswind runway is warranted.

As shown in Figure 3-1, Runway 03/21 provides 93.69 percent or better wind coverage for all-weather conditions with a 10.5 knot crosswind component, while Runway 08/26 provides 76.79 percent or better wind coverage. When combined, Runway 03/21 and Runway 08/26 provide 97.67 percent wind coverage during all-weather conditions with a 10.5 knot crosswind component. During inclement weather conditions, Runway 03/21 provides 92.83 percent or better instrument flight rules (IFR) wind coverage with a 10.5 knot crosswind component, while Runway 08/26 provides at least 76.22 percent.

The current runway configuration is adequate in respect to providing sufficient wind coverage; however, neither Runway 03/21 nor Runway 08/26 can independently provide the FAA recommended 95 percent all-weather or IFR wind coverage for the 10.5 knot crosswind component. Consequently, both runways are important to ensure adequate wind coverage.

---

1 Instrument Flight Rules (IFR) is a cloud coverage ceiling less than 1,000 feet Above Ground Level (AGL) and/or visibility less than three miles, FAA
FIGURE 3-1
ALL WEATHER WIND ROSE AND WIND COVERAGE DATA

<table>
<thead>
<tr>
<th>Runway</th>
<th>10.5 Knots (%) Component</th>
<th>13 Knots (%) Component</th>
<th>16 Knots (%) Component</th>
<th>20 Knots (%) Component</th>
</tr>
</thead>
<tbody>
<tr>
<td>Runway 3/21</td>
<td>93.69%</td>
<td>96.68%</td>
<td>98.76%</td>
<td>99.65%</td>
</tr>
<tr>
<td>Runway 8/26</td>
<td>76.79%</td>
<td>85.39%</td>
<td>93.36%</td>
<td>98.14%</td>
</tr>
<tr>
<td>Combined Runway</td>
<td>97.67%</td>
<td>99.04%</td>
<td>99.69%</td>
<td>99.93%</td>
</tr>
</tbody>
</table>

Wind Coverage Provided Under IFR Conditions

<table>
<thead>
<tr>
<th>Runway</th>
<th>10.5 Knots (%) Component</th>
<th>13 Knots (%) Component</th>
<th>16 Knots (%) Component</th>
<th>20 Knots (%) Component</th>
</tr>
</thead>
<tbody>
<tr>
<td>Runway 3/21</td>
<td>92.83%</td>
<td>96.47%</td>
<td>98.64%</td>
<td>99.58%</td>
</tr>
<tr>
<td>Runway 8/26</td>
<td>76.22%</td>
<td>85.07%</td>
<td>93.50%</td>
<td>98.00%</td>
</tr>
<tr>
<td>Combined Runway</td>
<td>94.97%</td>
<td>97.84%</td>
<td>99.29%</td>
<td>99.87%</td>
</tr>
</tbody>
</table>

Source: FAA Airport Design Tools - Wind Analysis, Station 725690 Casper/Natrona County Annual Period Record 2004-2013
3.2 AIRPORT DESIGN AND CLASSIFICATION

This section identifies the Airport’s national role and service level, the Airport’s design aircraft, and the related airport design standards.

3.2.1 Airport Role and Service Level

Casper/Natrona County International Airport is identified in the FAA’s National Plan of Integrated Airports System (NPIAS) as a Primary/Non-Hub commercial service facility. A Primary/Non-Hub facility, as defined by the FAA, is a commercial service airport that accommodates more than 10,000 annual passenger enplanements, but less than 0.05 percent of total annual U.S. passenger enplanements. This classification is used for FAA planning and funding purposes.

Currently, within the NPIAS there are 239 Non-Hub airports in the U.S. according to the 2013-2017 NPIAS Report. The Airport enplaned 98,198 revenue passengers in 2013 according to Airport records, and is projected to remain a Non-Hub facility throughout the 20-year planning period. In 2013 the smallest Small-Hub airport enplaned 364,521 passengers and the base forecast indicates the Airport will not reach that level of passenger service. Thus, the Airport will not be reclassified as Small-Hub within the planning period.

3.2.2 Airport Design Aircraft

The airport design aircraft determines the geometric design of an airport. The design is critical to maintaining the highest level of safety for that aircraft. In many cases, the design aircraft is made from a family or collection of aircraft that include the most demanding aircraft that must be accommodated by the airport. For airports with multiple runways, design aircraft are identified for each runway. At CPR, both runways share the same design aircraft.

As identified in Chapter 2, Aviation Forecasts, the design aircraft parameters for CPR is made up from a compilation of aircraft including the Airbus A310, Boeing 757, and Boeing MD-83 aircraft. The design standards meant to accommodate these aircraft are driven by the following three parameters:

- Aircraft Approach Category D
- Aircraft Design Group IV
- Taxiway Design Group 5

The forecast suggests that the design aircraft will remain the same throughout the planning period. Figure 3-2 below illustrates the representative aircraft for each Airplane Design Group (ADG). The ADG and aircraft types shown in bold denote the most demanding aircraft that frequently operate at the Airport.
### FACILITY REQUIREMENTS

#### FIGURE 3-2

**AIRPLANE DESIGN GROUP TYPE AND REPRESENTATIVE AIRCRAFT**

<table>
<thead>
<tr>
<th>FAA Airplane Design Group</th>
<th>Aircraft Type</th>
<th>Representative Aircraft</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Single/Twin-Engine Piston</td>
<td>Cessna 150/210, Baron 55/58</td>
</tr>
<tr>
<td></td>
<td>Turboprops</td>
<td>Beechcraft King Air B100, Rockwell Turbo Commander</td>
</tr>
<tr>
<td></td>
<td>Small Cabin Business Jets</td>
<td>BeechJet 400A, Learjet 25</td>
</tr>
<tr>
<td>II</td>
<td>Turboprops</td>
<td>Beechcraft Super King Air, Embraer EMB-120</td>
</tr>
<tr>
<td></td>
<td>Business Jets</td>
<td>Cessna Citation, Gulfstream II/III/IV</td>
</tr>
<tr>
<td></td>
<td>Smaller Airline Regional Jets</td>
<td>Embraer ERJ-135, Bombardier CRJ-200</td>
</tr>
<tr>
<td>III</td>
<td>Large Regional Jets</td>
<td>Embraer ERJ-170/195</td>
</tr>
<tr>
<td></td>
<td>Short-Haul Narrowbody Transports</td>
<td>DHC Dash 7/8, Boeing MD-83, Airbus A319/20</td>
</tr>
<tr>
<td></td>
<td>Large Corporate Jets</td>
<td>Bombardier Global Express, Gulfstream V</td>
</tr>
<tr>
<td>IV</td>
<td><strong>Large Long-Haul Narrowbody Transports</strong></td>
<td><strong>Boeing 757</strong></td>
</tr>
<tr>
<td></td>
<td>Widebody Transports</td>
<td>Airbus A310, Boeing 767</td>
</tr>
<tr>
<td>V</td>
<td>Large Widebody Transports</td>
<td>Boeing 777, Boeing 747, Airbus A340</td>
</tr>
<tr>
<td>VI</td>
<td>Large Heavy Lifting Transports</td>
<td>Boeing 747-8F, Airbus A380, Lockheed C-5 Galaxy</td>
</tr>
</tbody>
</table>

Sources: FAA Advisory Circular 150/5300-13, www.airliners.net, Airport photos
3.3 AIRFIELD DESIGN

This section describes the airfield facility needs, as well as the methods and planned timing upon which the facility requirements have been determined. Areas examined include the airfield capacity, runway designation, runway length/width, taxiway systems, lighting aids, airfield safety areas, separation standards, and pavement strength. Figure 3-3 provides an illustration of the airfield geometric design and layout.

FIGURE 3-3
FAA AIRPORT DIAGRAM

Source: FAA Airport Diagram, 2014
3.3.1 Airport Capacity

Airfield capacity is an estimate of the number of aircraft that can be processed through the airfield system during a specific period without unacceptable delays. The airfield capacity analysis identifies the annual capacity of the airfield, referred to as the annual service volume, and the hourly capacity based on the current operational characteristics.

Major factors that affect airfield capacity include the runway configuration, air traffic control processes, weather conditions, and aircraft fleet mix. For example, required separations between aircraft are greatly increased during inclement weather. As a result, the number of aircraft that can operate at an airport under instrument meteorological conditions will be much less than during visual meteorological conditions.

The goal of the analysis is to determine the airfield capacity and the ability of the runways to handle peak hour and annual demand. This was done using methodologies outlined in FAA Advisory Circular 150/5060-5, *Airport Capacity and Delay*, which accounts for factors such as aircraft mix index, runway use configuration, Airport meteorology, and the percentage of touch-and-go operations.

Airfield capacity is measured as annual service volume and hourly capacity for a particular runway configuration. As shown in Table 3-1, the annual service volume of the Airport is approximately 230,000 operations. The ratio of annual demand to annual capacity ranges from 23 percent in 2017 to 33 percent in 2032. Percentages in this range typically equate to peak hour volumes that do not exceed capacity. At CPR, operations are not expected to exceed peak hour capacity within the planning period.

<table>
<thead>
<tr>
<th>TABLE 3-1</th>
<th>COMPARISON OF FORECAST OPERATIONS AND AIRFIELD CAPACITY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Existing 2012</td>
</tr>
<tr>
<td>Forecast Operations</td>
<td>43,206</td>
</tr>
<tr>
<td>Existing ASV</td>
<td>230,000</td>
</tr>
<tr>
<td>ASV Ratio</td>
<td>19%</td>
</tr>
</tbody>
</table>

Source: RS&H Forecast Demand, FAA AC 150/5060-5 *Airport Capacity and Delay*

A generally accepted benchmark is to plan for additional runway capacity when demand reaches 60 percent of the annual service volume. By this measure, the capacity of the Airport is more than sufficient to accommodate the forecasted growth of aircraft operations.

3.3.2 Airfield Deficiencies

Airfield geometric design standards and preferred site layout are determined by the application of airport design guidance contained in FAA Advisory Circular (AC) 150/5300-13A Change 1, *Airport Design*. The AC was updated in 2012 and incorporated FAA Engineering Brief 75, *Incorporation of Runway Incursion Prevention into Taxiway Design*, along with multiple other new standards and technical requirements. According to the FAA Northwest Mountain Region, implementing these design standards is a twofold process. It includes identifying...
and remedying problematic airfield configurations through development projects, and planning future
development that is designed to minimize confusing airfield configurations.

An additional update, Change 1, was incorporated in the beginning of 2014. The update replaced the Runway
Reference Code with a new Approach and Departure Reference Code, made changes to taxiway design, and
changed standards for instrument approach procedures.

Analysis of the airfield was conducted to determine if airfield compliance deficiencies existed as measured to
the new standards. The deficiencies that were found are described below and are referenced to specific
paragraphs within AC 150/5300-13A Change 1 (herein called the AC). Figure 3-4 illustrates the location of each
deficiency described. It should be noted that many of the geometric deficiencies that were found are related
to the recent changes in the AC. Those deficiencies are not safety critical and should be addressed in the next
major rehabilitation project for each respective piece of pavement. The safety critical deficiencies are identified
as such in the deficiency description.

The design deficiencies are based on the design requirements for Airport Approach Category (AAC) D, Airplane

**Runway Design Deficiencies**

1. The Runway 8 blast pad is roughly 3 feet short of the 200-foot length required per section A3-5.

2. The shoulders of Runway 8-26 range in width between 10 feet and 12 feet. Per paragraph 304.c, the
shoulders should be 25 feet wide.

**Taxiway Design Deficiencies**

3. The Taxiway A1 hold line is approximately 300 feet from the runway centerline. To account for the
elevation of the Airport, 304-foot spacing is required as described in paragraph 315.a. Additionally,
the Taxiway does not meet the new AC’s geometric design requirements for an exit taxiway as detailed
in section 409. It also does not have 30-foot paved shoulders, which are required per section 417.

4. The Taxiway A2 hold line is approximately 300 feet from the runway centerline. To account for the
elevation of the Airport, 304-foot spacing is required as described in paragraph 315.a. Additionally,
the Taxiway does not meet the new AC’s geometric design requirements for an exit taxiway as detailed
in section 409. It also does not have 30-foot paved shoulders, which are required per section 417.

5. Taxiway A does not have paved shoulders. According to section 417, 30-foot paved shoulders are
required.

6. Taxiway A3 does not meet the new AC’s geometric design requirements for an exit taxiway as detailed
in section 409. Furthermore, the Taxiway only has partially paved shoulders on the Runway side of the
hold bar, which fail to meet the requirement for 30-foot paved shoulders per section 417.
7. Taxiway A6 does not meet the new AC’s geometric design requirements for an exit taxiway as detailed in section 409. It also does not have 30-foot paved shoulders, which are required per section 417.

8. Taxiway C2 does not meet the new AC’s geometric design requirements for an exit taxiway as detailed in section 409. It also does not have 30-foot paved shoulders, which are required per section 417.

9. Taxiway A4 allows direct access from the south ramp to Runway 3-21 which is not recommended per paragraph 401.b(5)(g). Additionally, the Taxiway does not meet the new AC’s geometric design requirements for an exit taxiway as detailed in section 409. It also does not have 30-foot paved shoulders, which are required per section 417. The direct access of A4 is a safety critical deficiency and will be addressed in the alternatives section of this master plan.

10. Taxiway A5 allows direct access from the ramp to Runway 3-21 which is not recommended per paragraph 401.b(5)(g). It also is considered a “Hot Spot” because it crosses the middle third of Runway 3-21, which should be avoided per paragraph 401.b(5)(d). In addition, the Taxiway does not meet the new AC’s geometric design requirements for an exit taxiway as detailed in section 409. It also does not have 30-foot paved shoulders, which are required per section 417. The direct access of A5 is a safety critical deficiency and will be addressed in the alternatives section of this master plan.

11. Taxiway C crosses the middle third of Runway 3-21, which should be avoided according to paragraph 401.b(5)(d). It also does not have 30-foot paved shoulders, which are required per section 417. Lastly, the hold line is approximately 300’ from the runway centerline. Per paragraph 315.a, 304-foot spacing is required to account for the elevation of the Airport. The runway crossing location of Taxiway C is a safety critical deficiency and will be addressed in the alternatives section of this master plan.

12. Taxiway A7 does not meet the new AC’s geometric design requirements for an exit taxiway as detailed in section 409. It also does not have 30-foot paved shoulders, which are required per section 417. Finally, because Taxiway A7 is an entrance taxiway, the outer edge is required to be curved as detailed in paragraph 408.b.

13. Taxiway C1 does not meet the new AC’s geometric design requirements for an exit taxiway as detailed in section 408. It also does not have 30-foot paved shoulders, which are required per section 417.

14. The intersection of Runway 3-21, Runway 8-26, and Taxiway A6 is considered by the FAA as a “Hot Spot.” This type of intersection should be avoided per paragraph 401.b(5). The intersection also has wide expanses of pavement, which is not recommended according to paragraph 401.b(5)(b). These deficiencies are safety critical and will be addressed in the alternatives section of this master plan.

15. The intersections of Taxiway A/Taxiway B, and Taxiway B/Taxiway B1 do not have the proper fillet geometry to comply with the standards for connector taxiways per section 411. In addition, Taxiway B does not have 30-foot paved shoulders, which is required per section 417.

16. Taxiway B1 is not at a 90 degree angle to Runway 8-26, and therefore does not meet the requirement for entrance taxiways per paragraph 408.a. Additionally, the hold line is approximately 300’ from the
runway centerline. Per paragraph 315.a, 304-foot spacing is required to account for the elevation of the Airport.

**Airfield Marking Deficiencies**

The current airfield markings were analyzed to determine deficiencies based on AC 150/5340-1L, *Standards for Airport Markings*. The following deficiencies were identified:

- All the runway threshold markings were found to be placed 30 feet from the runway threshold, which exceeds the 20 foot requirement as detailed in paragraph 2.5.c. Moving the markings back to the standard will impact the location of the runway designator, centerline, touchdown zone and aiming point markings.
- The Taxiway A1, A2, A3 and A4 enhanced centerlines are roughly 140 feet in length. They must all be extended to the required length of 150 feet, as detailed in paragraph 4.3.b.
- According to paragraphs 5.6.c and 5.6.d, the painted yellow “X’s” used to delineate closed runways should be placed near the sides of the open intersecting runway. It is recommended that these markings be moved closer to the active pavement areas.
- The non-movement line along Taxiway A and Taxiway B is located inside the taxiway OFA. It is recommended that this line be moved to the OFA to prevent aircraft or vehicles from parking within the OFA limits.
Airfield Deficiencies

1. Runway 8 blast pad
2. Runway 9-26 shoulders
3. Taxiway A1 hold line, shoulders, geometric design
4. Taxiway A2 hold line, shoulders, geometric design
5. Taxiway A shoulders
6. Taxiway A3 shoulders, geometric design
7. Taxiway A6 shoulders, geometric design
8. Taxiway C2 shoulders, geometric design
9. Taxiway A4 ramp access, shoulders, geometric design
10. Taxiway A5 “Hot Spot”, shoulders, geometric design
11. Taxiway C runway crossing, shoulders, hold line
12. Taxiway A7 shoulders, outer edge, geometric design
13. Taxiway C1 shoulders, geometric design
14. Multi-node “Hot Spot” intersection
15. Intersection A/B3 and B/B1 fillet geometry, shoulders
16. Taxiway B1 hold line, entrance taxiway geometry

Source: RS&H Analysis, 2013
3.3.3 Runway Design

The runway analysis addresses the ability of the existing runways at the Airport to accommodate the current and forecast demand. At a minimum, runways must have the proper length, width, and strength to meet FAA recommended design standards to safely accommodate the design aircraft. This section analyzes specific runway criteria and makes recommendations based on the forecast. Elements to be examined in this section include runway designation, runway length, runway width, and runway protection zones.

3.3.3.1 Runway Designation

Runway designations provided on each runway indicate the runway orientation according to the magnetic compass bearing. Runway designations can change due to the slow drift of the magnetic poles on the Earth's surface, which over time change the runway's magnetic bearing. Magnetic declination relates to the degree of drift that must be accounted for. Depending on an airport's location and how much drift takes place, it may be necessary to change the runway designation. It is recommended that runway designations be changed if there is more than a 5° difference from the runway's true bearing.

As of June 2, 2014, the magnetic declination at the Airport was 9° 36' 17" E and was changing by 8.5' W per year. Based upon this, it was determined that the magnetic bearing for Runway 3-21 and 8-26 are within the 5° tolerance. As illustrated in Table 3-2, all the runways have a magnetic bearing and runway designation with less than a 5° difference from their true bearing. As such, the runways will not need re-designation within the planning period.

**TABLE 3-2 TRUE RUNWAY BEARING**

<table>
<thead>
<tr>
<th>Runway Designation</th>
<th>Existing Heading</th>
<th>True Bearing</th>
<th>Declination</th>
<th>Magnetic Bearing</th>
<th>Future Heading</th>
<th>Runway Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Runway 3</td>
<td>032°</td>
<td>43°53’ 16.66551&quot;</td>
<td>9°36’ 17&quot; E</td>
<td>34° 16’ 59.66551&quot;</td>
<td>032°</td>
<td>Runway 3</td>
</tr>
<tr>
<td>Runway 21</td>
<td>212°</td>
<td>223°54’ 21.11640&quot;</td>
<td>9°36’ 17&quot; E</td>
<td>214° 18’ 4.11640&quot;</td>
<td>212°</td>
<td>Runway 21</td>
</tr>
<tr>
<td>Runway 8</td>
<td>077°</td>
<td>88°53’ 4.58744&quot;</td>
<td>9°36’ 17&quot; E</td>
<td>79° 16’ 47.58744&quot;</td>
<td>077°</td>
<td>Runway 8</td>
</tr>
<tr>
<td>Runway 26</td>
<td>257°</td>
<td>268°54’ 23.94997&quot;</td>
<td>9°36’ 17&quot; E</td>
<td>259° 18’ 6.94997&quot;</td>
<td>257°</td>
<td>Runway 26</td>
</tr>
</tbody>
</table>

Source: National Geophysical Data Center, 2014

3.3.3.2 Runway Length

Runway length is determined by the greater of the takeoff or landing performance characteristics of the existing and future design aircraft operating at Casper/Natrona County International Airport, or the composite family of airplanes as represented by the design aircraft. The takeoff length, including takeoff run, takeoff distance, and accelerate-stop distance, is typically the more demanding of the runway length requirements.

As described below, there are two primary means for determining the Airport’s recommended runway lengths:
Guidance A  FAA Recommended Runway Length: General runway length guidance based on FAA computer modeling software and Advisory Circular performance graphs for composite aircraft groups, as adjusted for Casper/Natrona County International Airport mean maximum temperature\(^2\) (88.1°F), field elevation (5,350 feet above mean sea level), difference in runway centerline elevations\(^3\) (20.54 feet for Runway 8-26, 5.57 feet for Runway 3-21) and aircraft flight range of greater than 500 nautical miles.

Guidance B  Critical Aircraft Planning Manual (Performance Curves): Determines runway length for specific aircraft models and engines based on data from the aircraft manufacturer, as adjusted for Casper/Natrona County International Airport to the extent possible based on aircraft operating (payload) weights, flight range, non-standard temperatures, and field elevation.

Guidance A provides sufficient information to recommend no additional runway length is needed throughout the planning period. Thus, Guidance B is unnecessary at this time. This is based on the 10,165 foot length of Runway 3-21, the forecast of aircraft operations, and the expected aircraft stage lengths. Table 3-3 provides the FAA recommended runway length requirements.

**TABLE 3-3**

FAA AIRCRAFT RUNWAY LENGTH REQUIREMENTS

<table>
<thead>
<tr>
<th>Aircraft Category</th>
<th>FAA Recommended Runway Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing Runway 3/21 Length</td>
<td>10,165’</td>
</tr>
<tr>
<td>Existing Runway 8-26 Length</td>
<td>8,679’</td>
</tr>
<tr>
<td>Small Airplanes with approach speeds of less than 50 knots</td>
<td>1,230’</td>
</tr>
<tr>
<td>Small Airplanes (&lt; 12,500 lbs)</td>
<td></td>
</tr>
<tr>
<td>100% of Fleet (&lt; 10 seats)</td>
<td>6,680’</td>
</tr>
<tr>
<td>100% of Fleet (&gt; 10 seats)</td>
<td>6,680’</td>
</tr>
<tr>
<td>Large Airplanes (12,501 lbs - 60,000 lbs)</td>
<td></td>
</tr>
<tr>
<td>75% of Fleet @ 60% Useful Load</td>
<td>6,960’</td>
</tr>
<tr>
<td>75% of Fleet @ 90% Useful Load</td>
<td>8,810’</td>
</tr>
<tr>
<td>100% of Fleet @ 60% Useful Load</td>
<td>11,210’</td>
</tr>
<tr>
<td>100% of Fleet @ 90% Useful Load</td>
<td>11,210’</td>
</tr>
<tr>
<td>Large Airplanes (&gt; 60,000 lbs)</td>
<td></td>
</tr>
<tr>
<td>500 Mile Stage Length</td>
<td>6,890’</td>
</tr>
<tr>
<td>1,000 Mile Stage Length (e.g. Atlanta, Georgia)</td>
<td>8,180’</td>
</tr>
<tr>
<td>1,500 Mile Stage Length (e.g. New York City, New York)</td>
<td>9,360’</td>
</tr>
<tr>
<td>2,000 Mile Stage Length (e.g. Cancun, Mexico)</td>
<td>10,450’</td>
</tr>
</tbody>
</table>

Sources: FAA Advisory Circular 150/5325-4, Runway Length Requirements for Airport Design, FAA Airport Design Microcomputer Program 4.2D


\(^3\)2013 RTK GPS runway survey
3.3.3.3 Runway Widths

Runway 3-21 is 150 feet wide with 25 foot wide paved shoulders. Runway 8-26 is 150 wide with 10 foot paved shoulders. As illustrated in Table 3-4, runways have a width sufficient for meeting FAA runway standards for ADG IV aircraft; however, only Runway 3-21 is designed with the required 25 foot wide paved shoulders (noted with a checkmark). With only 10 feet currently, Runway 8-26 requires 25 foot paved shoulders to meet ADG IV design requirements (noted with an “X”).

<table>
<thead>
<tr>
<th>Runway Width and Shoulders</th>
<th>ADG IV Requirement</th>
<th>Runway 3-21 Width</th>
<th>Meets Requirement</th>
<th>Runway 8-26 Width</th>
<th>Meets Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width</td>
<td>150’</td>
<td>150’</td>
<td>✓</td>
<td>150’</td>
<td>✓</td>
</tr>
<tr>
<td>Shoulders</td>
<td>25’</td>
<td>25’</td>
<td>✓</td>
<td>10’</td>
<td>X</td>
</tr>
</tbody>
</table>

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

3.3.3.4 Runway Protection Zone

For the protection of people and property on the ground, the FAA has identified an area of land located off each runway end as the Runway Protection Zone (RPZ). The size of the zones varies according to the design aircraft characteristics, visual approaches, and the lowest instrument approach visibility minimum defined for each runway.

It is desirable to have all areas within the RPZ cleared and owned by the Airport. Except for the right-of-way for U.S Highway 20/26, the Airport owns all the land within the RPZs, and all but the Runway 3 RPZ is completely cleared of any non-conforming land uses. In 2012, FAA provided additional guidance on the appropriate land uses within an RPZ. The guidance listed public roads as an incompatible land use. However, the policy was intended to address the introduction of new or modified land uses. Thus, because the road existed prior to the 2012 guidance, it is acceptable and does not need to be relocated.

The list below illustrates the existing approaches (with the lowest visibility minimum) that serve CPR.

» Runway 3 ILS/LOC and RNAV (1/2 mile minimum)
» Runway 21 RNAV (3/4 mile minimum)
» Runway 8 RNAV (1/2 mile minimum)
» Runway 26 RNAV (1 mile minimum)

As illustrated in Table 3-5, all but the Runway 21 RPZ are currently sufficient. The Runway 21 RPZ needs to be increased to the size adequate for an RNAV approach with visibility not lower than ¾ miles. The RPZ will require an inner width of 1,000 feet, an outer width of 1,510 feet, and a length of 1,700 feet. No incompatible land uses were identified within the area of the larger Runway 21 RPZ.
TABLE 3-5
RUNWAY PROTECTION ZONE DIMENSIONS

<table>
<thead>
<tr>
<th>Runway</th>
<th>Existing 3</th>
<th>Existing 21</th>
<th>Existing 8</th>
<th>Existing 26</th>
<th>Requirement Met 3</th>
<th>Requirement Met 21</th>
<th>Requirement Met 8</th>
<th>Requirement Met 26</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>2,500'</td>
<td>1,700'</td>
<td>2,500'</td>
<td>1,700'</td>
<td>✓</td>
<td>X</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Inner Width</td>
<td>1,000'</td>
<td>500'</td>
<td>1,000'</td>
<td>500'</td>
<td>✓</td>
<td>X</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Outer Width</td>
<td>1,750'</td>
<td>1,010'</td>
<td>1,750'</td>
<td>1,010'</td>
<td>✓</td>
<td>X</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Acreage</td>
<td>78.914</td>
<td>29.465</td>
<td>78.914</td>
<td>29.465</td>
<td>✓</td>
<td>X</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

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

3.3.3.5 Runway Strength

Pavement strength is an important criterion in determining the usability of the airfield. General aviation business jets typically range from 12,000 to 50,000 pounds. Those that have a maximum takeoff weight of more than 20,000 pounds have a dual-wheel gear (DWG) configuration. Air carrier turboprop and regional jet aircraft range from 22,000 to 85,000 pounds, while narrow body domestic passenger jets weigh up to 280,000 pounds and are equipped with dual-tandem wheel gear (DTW). Table 3-6 details typical maximum take-off weights for general aviation and air carrier aircraft that operate at CPR.

TABLE 3-6
AIRCRAFT WEIGHT AND GEAR CONFIGURATION

<table>
<thead>
<tr>
<th>Aircraft</th>
<th>Aircraft Size (Passengers)</th>
<th>ARC</th>
<th>Gear Type</th>
<th>Maximum Take-Off Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Aviation Aircraft</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Light/Small Business Jet</td>
<td>4 to 6 Passengers</td>
<td>B-I to B-II</td>
<td>Single-Wheel</td>
<td>8,000 to 20,000 lbs.</td>
</tr>
<tr>
<td>Medium Business Jet</td>
<td>6 to 10 Passengers</td>
<td>B-II to C-II</td>
<td>Dual-Wheel</td>
<td>20,000 to 50,000 lbs.</td>
</tr>
<tr>
<td>Large Business Jet</td>
<td>10 to 16 Passengers</td>
<td>C-II to D-III</td>
<td>Dual-Wheel</td>
<td>45,000 to 95,000 lbs.</td>
</tr>
<tr>
<td>Boeing Business Jet</td>
<td>126 to 150 Passengers</td>
<td>C-III</td>
<td>Dual Tandem-Wheel</td>
<td>145,000 to 188,000 lbs.</td>
</tr>
<tr>
<td>Air Carrier Aircraft</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turboprop</td>
<td>19 to 40 Passengers</td>
<td>B-II to A-III</td>
<td>Dual-Wheel</td>
<td>26,000 to 65,000 lbs.</td>
</tr>
<tr>
<td>Regional Jet</td>
<td>50 to 90 Passengers</td>
<td>C-II</td>
<td>Dual-Wheel</td>
<td>53,000 to 85,000 lbs.</td>
</tr>
<tr>
<td>Design Air Carrier Aircraft</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MD-83</td>
<td>166 Passengers</td>
<td>D-III</td>
<td>Dual-Wheel</td>
<td>160,000 lbs.</td>
</tr>
<tr>
<td>757-200</td>
<td>Cargo Only</td>
<td>C-IV</td>
<td>Dual-Tandem-Wheel</td>
<td>255,000 lbs.</td>
</tr>
<tr>
<td>A300/310</td>
<td>Cargo Only</td>
<td>C-IV</td>
<td>Dual-Tandem-Wheel</td>
<td>364,000 lbs.</td>
</tr>
</tbody>
</table>

Source: RS&H 2014, FAA AC 150/5300 13 A Change 1, Airport Design

The Airport’s design aircraft, the MD-83, A310/A300, and 757-200 are the most demanding aircraft that operate regularly at the Airport. The MD-83 has a dual-wheel configuration with a maximum take-off weight (MTOW) of 160,000 pounds. The 757-200 and A310/A300 have a dual-tandem-wheel configuration with a maximum take-off weight of 255,000 and 364,000 pounds, respectively.
At 170,000 pounds DWG and 270,000 DTW, Runway 3-21 has a weight bearing capacity above what is necessary for the MD-83 and 757-200. However, the A310/A300 MTOW exceeds the runway’s published weight bearing capacity. Runway 8-26 has a weight bearing capacity necessary to accommodate the 757-200, but has a published DWG and DTW rating less than required for the MD-83 and A310/A300 MTOW.

As for aircraft aprons, the 2000 Pavement Strength Inventory completed by Toothman-Orton Engineering was referenced. The general aviation and commercial passenger service aprons were identified in the inventory as being adequate for the current and future aircraft fleet mix. The pavement strength of the FedEx cargo apron was not identified because the inventory was completed prior to that apron’s construction.

Due to the fact that the pavement inventory is outdated and the published runway weight bearing capacities are, in some cases, less than the MTOW of the design aircraft, it is recommended that a new pavement strength inventory be completed. Additionally, analysis by a qualified engineer is necessary to determine if the existing runway weight bearing capacity is adequate for the number of operations that can be expected of the design aircraft.

Based on the design aircraft for the Airport, Table 3-7 illustrates the recommended pavement strength for the each runway/taxiway system and for aircraft aprons.

**Table 3-7
Existing and Recommended Pavement Strength**

<table>
<thead>
<tr>
<th>Pavement Area</th>
<th>Existing Pavement Strength (Gear Type)</th>
<th>Recommended Pavement Strength (Gear Type)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Runway 3-21</td>
<td>130,000 lbs. (SWG)</td>
<td>130,000 lbs. (SWG)</td>
</tr>
<tr>
<td>&amp; Parallel Taxiway System</td>
<td>170,000 lbs. (DWG)</td>
<td>170,000 lbs. (DWG)</td>
</tr>
<tr>
<td></td>
<td>270,000 lbs. (DTW)</td>
<td>364,000 lbs. (DTW)</td>
</tr>
<tr>
<td>Runway 8-26</td>
<td>85,000 lbs. (SWG)</td>
<td>85,000 lbs. (SWG)</td>
</tr>
<tr>
<td>&amp; Parallel Taxiway System</td>
<td>140,000 lbs. (DWG)</td>
<td>160,000 lbs. (DWG)</td>
</tr>
<tr>
<td></td>
<td>260,000 lbs. (DTW)</td>
<td>364,000 lbs. (DTW)</td>
</tr>
<tr>
<td>Apron (Air Carrier)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Passenger Apron</td>
<td>&gt;125,000 lbs. (DWG)*</td>
<td>160,000 lbs. (DWG)</td>
</tr>
<tr>
<td>Cargo Apron</td>
<td>unknown (DTW)*</td>
<td>364,000 lbs. (DTW)</td>
</tr>
<tr>
<td>Apron (General Aviation)</td>
<td>125,000 lbs. (DWG)*</td>
<td>125,000 lbs. (DWG)</td>
</tr>
</tbody>
</table>

*Toothman-Orton Engineering Pavement Strength Inventory, 2000
3.3.3.6 Runway Geometric and Separation Standards

This section analyzes the existing runway geometric and separation distances against the dimensional standards that arise from the critical aircraft category designated for each runway. Compliance with FAA airport geometric and separation standards, without modification to standards, is intended to meet a minimum level of airport operational safety and efficiency.

Table 3-8 compares the FAA airport design standards for both runways, based on the recommend and existing design.

**TABLE 3-8**

**GEOMETRIC AND SEPARATION STANDARDS**

<table>
<thead>
<tr>
<th>AIRFIELD COMPONENTS</th>
<th>ADG D-IV Requirement</th>
<th>Runway 3-21</th>
<th>Runway 8-26</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Existing Future Met</td>
<td>Existing Future Met</td>
<td></td>
</tr>
<tr>
<td>Runway Design</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rwy Width</td>
<td>150'</td>
<td>150 ✓</td>
<td>150 ✓</td>
</tr>
<tr>
<td>Rwy Shoulder Width</td>
<td>25'</td>
<td>25 ✓</td>
<td>10 X</td>
</tr>
<tr>
<td>Rwy Blast Pad Width</td>
<td>200'</td>
<td>200 ✓</td>
<td>200 ✓</td>
</tr>
<tr>
<td>Rwy Blast Pad Length</td>
<td>200'</td>
<td>200 ✓</td>
<td>197 X</td>
</tr>
<tr>
<td>Runway Safety Area (RSA)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length Beyond Rwy End</td>
<td>1000'</td>
<td>1000 ✓</td>
<td>1000 ✓</td>
</tr>
<tr>
<td>Length Prior to Threshold</td>
<td>600'</td>
<td>1000 ✓</td>
<td>1000 ✓</td>
</tr>
<tr>
<td>Width</td>
<td>500'</td>
<td>500 ✓</td>
<td>500 ✓</td>
</tr>
<tr>
<td>Runway Object Free Area (ROFA)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length beyond runway end</td>
<td>1000'</td>
<td>1000 ✓</td>
<td>1000 ✓</td>
</tr>
<tr>
<td>Length prior to threshold</td>
<td>600'</td>
<td>1000 ✓</td>
<td>1000 ✓</td>
</tr>
<tr>
<td>Width</td>
<td>800</td>
<td>800 ✓</td>
<td>800 ✓</td>
</tr>
<tr>
<td>Runway Obstacle Free Zone (ROFZ)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length</td>
<td>200</td>
<td>200 ✓</td>
<td>200 ✓</td>
</tr>
<tr>
<td>Width</td>
<td>400</td>
<td>400 ✓</td>
<td>400 ✓</td>
</tr>
<tr>
<td>Precision Obstacle Free Zone (POFZ)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length</td>
<td>200</td>
<td>200 ✓</td>
<td>200 ✓</td>
</tr>
<tr>
<td>Width</td>
<td>800</td>
<td>800 ✓</td>
<td>800 ✓</td>
</tr>
<tr>
<td>Runway Separation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Runway centerline to:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Holding Position</td>
<td>304</td>
<td>300-304 X</td>
<td>304 ✓</td>
</tr>
<tr>
<td>Parallel Taxiway/Taxilane Centerline</td>
<td>400</td>
<td>538 ✓</td>
<td>538 ✓</td>
</tr>
<tr>
<td>Aircraft Parking Area</td>
<td>500</td>
<td>730 ✓</td>
<td>730 ✓</td>
</tr>
<tr>
<td>Building Restriction Line</td>
<td>-</td>
<td>750 ✓</td>
<td>NA NA</td>
</tr>
</tbody>
</table>

Source: FAA Advisory Circular 150/5300-13A Change 1, Airport Design
The design standards not met are denoted by a bold “X” and are detailed in Section 3.5.2 Airfield Deficiencies. Specifically, Runway 8-26 lacks full width 25 foot paved shoulders, Runway 8 has a blast pad that is three feet short of the requirement, and Taxiway A1, A2, C, and B1 hold lines are positioned four feet too close to the Runway 3-21 centerline.

3.3.3.7 Turf Runway Considerations
In the early phases of the Master Plan, Airport management informed the consultant team that users of the Airport had expressed a desire for a turf runway. Turf runways are typically found in rural areas and on private property such as farms and ranches. They are usually built to accommodate small single engine aircraft, and are less expensive to construct and maintain than a paved runway.

A high-level analysis was conducted to determine the basic requirements for a turf strip at CPR. The Airport’s two closed runways were identified as being excellent options for a turf runway. These runways have existing infrastructure and a portion of one could be converted into a functional turf runway. A wind analysis determined that Runway 17-35 would provide the best overall wind coverage of the two closed runways. According to AC 150/5300-13A, Airport Design, a turf strip should be designed with a length of 1.2 times what would be required for a hard surface runway. As illustrated previously in Section 3.5.3.2., small airplanes landing at CPR with approach speeds of less than 50 knots require a hard surface runway that is at least 1,230 feet long. Applying the multiplier of 1.2 equates to a turf runway length requirement of roughly 1,500 feet. Additional analysis is required to determine the length of the runway needed for aircraft with approach speeds above 50 knots.

Placement of a turf runway will be addressed in the completion of the Airport Layout Plan. Final site selection and a runway length analysis is beyond the purview of this study. Additionally, it should be noted that a turf runway at CPR may not be eligible for federal Airport Improvement Program funding.

3.3.4 Taxiway Design
This taxiway analysis addresses specific requirements relative to FAA design criteria and the ability of the existing taxiways to accommodate the current and projected demand. At a minimum, taxiways must provide efficient circulation, have proper pavement strength, and meet recommended FAA design standards to safely accommodate the design aircraft. Airport runways should be supported by a system of taxiways that provides an access interface between the runways and the aircraft parking and hangar areas.

The Airport’s design aircraft determines taxiway design standards and dimensional criteria. Taxiway pavement width is determined by the Taxiway Design Group (TDG) of the Airport’s design aircraft. Separation standards are determined by the Aircraft Design Group (ADG) of the design aircraft. To accommodate the Airport’s design aircraft, it is recommended that critical airfield taxiways be designed and built to ADG IV/TDG 5 standards.

Depending upon demand, portions of an airfield may be designed for one specific aircraft type while other portions are designed for other aircraft types. At Casper/Natrona County International Airport, all of the taxiways serving Runway 3-21 and Runway 8-26 should meet the recommended design standards for D-IV aircraft.
The FAA recommended design standards for taxiways built for ADG IV/TDG 5 aircraft are provided in Table 3-9. The Airport’s existing taxiways and associated connectors were compared to the current design standard in an effort to find deficiencies, which are denoted with a bold “X.”

**TABLE 3-9**

**TAXIWAY GEOMETRIC AND SEPARATION STANDARDS**

<table>
<thead>
<tr>
<th>Airfield Component</th>
<th>Requirement (ADG IV TDG 5)</th>
<th>Taxiway A</th>
<th>Taxiway B</th>
<th>Taxiway C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Existing</td>
<td>Existing Met (✓)</td>
<td>Existing Met (✓)</td>
<td>Existing Met (✓)</td>
</tr>
<tr>
<td>Taxiway Width</td>
<td>75</td>
<td>75</td>
<td>75</td>
<td>75</td>
</tr>
<tr>
<td>Taxiway Shoulder Width</td>
<td>30</td>
<td>0</td>
<td>X</td>
<td>0-10</td>
</tr>
<tr>
<td>Taxiway Safety Area Width</td>
<td>171</td>
<td>171</td>
<td>✓</td>
<td>171</td>
</tr>
<tr>
<td>Taxiway Object Free Area</td>
<td>129.5</td>
<td>88</td>
<td>X</td>
<td>88</td>
</tr>
</tbody>
</table>

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

The analysis concluded that all three taxiways lack the required 30-foot paved shoulders. Additionally, Taxiway A and Taxiway B do not have the required taxiway object free area (OFA) width adjacent to the Airport’s aprons. Likewise, the taxiways do not have adequate separation between the taxiway centerline and moveable objects that might be parked or placed on the edge of the apron. For example, the FedEx clearance envelope for their large cargo aircraft (757/A300/A310) extends into the Taxiway A OFA. Though cargo aircraft parked in the clearance envelope are clear of the OFA, GSE equipment parked within the envelope have the potential of penetrating the OFA.

In addition to the design deficiencies, two taxiway intersections have been identified by the FAA as Hot Spots. A Hot Spot is defined as a location on an airport movement area with a history of runway incursions or one where analysis indicates a heightened probability of collision. Hot Spots are identified to alert pilots and drivers that heightened attention is necessary in that area. The Hot Spots identified at Casper/Natrona County International Airport are defined by the Federal Aviation Administration as follows:

» **Hot Spot No. 1** – Wide, complex intersection including large paved area. Among the potential hazards is the risk of a wrong runway departure due to the Runway 26 and Runway 21 intersection.

» **Hot Spot No. 2** – Pilots leaving the apron sometimes taxi past Taxiway A and onto Runway 03/21 without authorization. Taxiway A is located on the edge of the ramp and is inadequately marked. Taxiway A5 gives direct access to the Runway from the ramp.
Hot Spot No. 1 was analyzed at the onset of this Master Plan Update due to pressing need and a solution is currently being implemented. For reference, discussion of that analysis is described in the alternatives chapter along with potential solutions to correct Hot Spot No. 2.

### 3.4 NAVIGATIONAL AND VISUAL AIDS

Navigational and visual aids consist of equipment that helps pilots locate the Airport and provides information to pilots about the aircraft’s horizontal alignment, height above the ground, the location of airport facilities, and the aircraft’s position on the airfield.

As part of this Master Plan Update, a comprehensive Electrical Assessment was conducted which evaluated the airfields lighting system, electrical vault, wind cones and navigational aids. The assessment, which is included in Appendix A, inventoried the airfields electrical components, determined required improvements on a priority level basis, and provided probable construction costs. This section provides a brief summary of the findings of the assessment.

#### 3.4.1 Navigation Aids

Navigational Aids (NAVAIDS) on the Airport include visual approach slope indicators (VASI), windsocks, a rotating beacon, and components that support the Instrument Landing System (ILS). These components help facilitate safe flight operations and enhance safety.

Equipment used to support the ILS include a glide slope and localizer for Runways 3 and 8. This equipment is owned and maintained by the Federal Aviation Administration (FAA). The FAA also owns and maintains the Runway 21 VASI. That equipment is in working condition and was not included in the Electrical Assessment.

The Airport owned NAVAIDS include three VASIs, one primary wind cone with segmented circle, four supplemental wind cones, and a rotating beacon. The Electrical Assessment indicated that the VASI systems are old and a few had componentry inside the runway safety area. Due to their old age and runway safety area violations, it is recommended that all VASIs be replaced with Precision Approach Path Indictor (PAPI) systems. The rotating beacon was also identified as being near the end of its anticipated service life and is recommended for replacement.

In regards to the wind cones, it is recommended that the primary wind cone and segmented circle be relocated to ensure visibility from the air traffic control tower and the flight line. The supplemental wind cone between Taxiway A3 and A4 was found to be redundant and is recommended for removal. All the wind cones are presently located within the runway object free area (ROFA), and two exceed the longitudinal limits from the runway end. It is recommended that these wind cones be relocated outside the ROFA and placed within the longitudinal limits.
3.4.2 Visual Aids

The visual aids at the Airport include airfield lights, signs, and all associated componentry including cables, isolation transformers and connectors. The Electrical Assessment’s recommendations regarding the Airport’s runway lights, taxiway lights, and airfield signs are discussed below.

The runway light fixtures for Runway 3-21 and 8-26 were installed in 1996 and are in good condition. However, the installed cables, isolation transformers, and connectors are approximately 17 years old and have failed in several locations. Due to the overall age and condition of the runway lighting systems, it is recommended that the fixtures, base cans, isolation transformers, conduit, connectors, and cable for each runway be replaced as a complete project to minimize construction costs. While the fixtures, base cans, and conduit are not an immediate need, the cables, connectors, and isolation transformers should be replaced as soon as possible to avoid potential outages and reduce maintenance costs.

The taxiway light fixtures installed in 2010 along Taxiway A and associated connectors and C2 are in good condition; however, settling of the fixtures was observed. To prevent the potential for foreign object debris (FOD) and light alignment problems, it is recommended that the base cans for Taxiway A lights be replaced. The fixtures installed in the early 1970’s along Taxiways B, B1, C, and C1 are in poor condition. It is recommended that these light fixtures, base cans, isolation transformers, conduit, connectors, and cable be replaced as a complete project to minimize construction costs. This should be completed as soon as possible to avoid potential outages and reduce maintenance costs.

The majority of airfield signs were found to be in good condition. It was observed that signs installed in 1996 do not have tethers. Tethers were not required at the time of design under outdated FAA AC 150/5345-44F, Specification for Taxiway and Runway Signs. However, it is now recommended that tethers be provided to ensure that a broken sign does not become a FOD hazard. Additionally, it is recommended that faded sign frames be repainted in accordance with the manufacturer’s recommendations.

The Electrical Assessment also identified that every sign with black panels had a reflective white and orange strip installed. These strips are not an FAA standard and should be removed. In addition, it was found that certain sign circuits were failing. It is recommended that the isolation transformers, conduit, connectors, and cable be replaced for each guidance sign installed in 1996 that has a failing circuit. Replacement should be part of an associated runway or taxiway project to minimize construction costs. For the guidance signs installed in 1996 where the circuit is not failing, it is recommended that the isolation transformers, conduit, connectors, and cable for each sign be replaced based on the age and condition of the equipment.
3.5 COMMERCIAL PASSENGER TERMINAL FACILITY

The commercial passenger terminal at the Casper/Natrona County International Airport includes the terminal building, commercial aircraft apron, terminal curb front parking, and vehicle parking. These areas are specifically designed to serve commercial passengers. This section details the analysis that was conducted to determine the capacity of the terminal facility and the facility requirements based on the FAA approved commercial passenger forecast.

The terminal facility requirements were estimated based upon airport terminal planning best practices and recommended methodologies. The methodologies and best practices used for the analysis within this section are outlined within the following resources:

- Airport Passenger Terminal Planning and Design – Airport Cooperative Research Program Report 25, 2010, Volumes 1 and 2
- Checkpoint Design Guide, Revision 4, Transportation Security Administration (TSA), 2012
- Federal Aviation Administration (FAA) Advisory Circular, AC No: 150/5360-13, Planning and Design Guidelines for Airport Terminal Facilities 1988

3.5.1 Demand Level Terminal Planning

To analyze the terminal facilities future needs, a peak hour methodology was used based on the future passenger demand levels estimated in Chapter 2, Aviation Forecasts. Three different levels of demand were established, which for the remainder of this section will be referred to as Near Term, Future Growth-Low, and Future Growth-High. Near Term is based on the preferred passenger forecast and is focused on the 0-5 year planning horizon.

The Future Growth demand levels are based on demand at the end of the 20 year planning period. Future Growth-Low correlates to the optimal passenger forecast, while Future Growth-High is based on the forecast that includes the addition of passenger service to new markets. As discussed in Chapter 2, Aviation Forecasts, passenger data was found to support service to Chicago, Dallas/Ft. Worth, Houston, and Phoenix. Future Growth-High includes the increased passenger demand that would result from these new routes, and thus accounts for the maximum amount of demand that could be reasonably expected within the planning period.

For each of the three demand levels, peak hour passenger (PHP) levels were determined. Peak hour passengers, or peak hour, as outlined in ACRP Report 25 Volume 1, is a basic planning tool to determine the passenger loadings that the terminal system will experience in the future. Essentially, it is an estimate of the number of passengers processing through the terminal within 60 minutes, during an average day of the
busiest month of the year. The peak hour can be derived using two methodologies: by applying percentage
factors to the amount of passengers processing during the average day of the busiest month, or by using
a flight schedule. For this analysis, the current 2014 flight schedule was used to analyze Near Term demand.
Flights were then added to the schedule based on the two Future Growth demand levels indicated by the
passenger forecasts. The additional flights were grouped with existing banks of aircraft based on historical
airline operations at CPR. Note that the flight schedule that was used is that of the busiest day of an average
week, and includes an Allegiant MD-83 flight.

To establish a peak hour, passenger arrival distributions were applied to each flight schedule. The arrival
distributions are based on passenger behavior; specifically how much time prior to a flight’s departure a
passenger may process through the terminal. The peak hour was calculated in ten minute increments,
making it a “rolling peak hour.” Because of this, the peak hour often does not correspond to “clock hours,”
such as 9:00-9:59. Instead, the peak hour may be correlated to an hour such as 9:20-10:19.

For each of the three demand levels, a static passenger load was also determined so that the terminal
facilities past the security checkpoint, such as the departure lounge, could be analyzed. This is necessary
because unlike those facilities, like the ticket counter, where demand is staggered as passengers arrive, the
facilities past the security checkpoint must be able to accommodate all the passengers for each flight
simultaneously. To determine the static load, 90 percent of each flights total available seats were used in
the analysis to represent a 90 percent aircraft load factor. The 90 percent load factor is referenced in ACRP
Report 25 as a planning factor which plans for a high level of passenger service in the departure lounge.

Despite the 90 percent load factor being an industry standard for Airports of all sizes, including the
largest in the world, and was determined based on an average amount of total space, including concessions,
that accommodates passengers past the security checkpoint. Because CPR does not, and is not predicted
to have large concessions, the 90 percent was used to identify an appropriate amount of departure lounge
space to comfortably accommodate passengers without relying on the additional space of large
concessions. Additionally, Allegiant flights typically operate at a 90 percent load factor, which further
necessitates the need to plan to accommodate 90 percent of total available seats during the peak hour.

The following is a detailed overview of the analysis conducted for each of the three demand levels: Near
Term; Future Growth-Low; Future Growth-High.

3.5.1.1 Near Term
This analysis is based upon the preferred passenger forecast approved by the FAA and is a representation
of existing conditions. The existing summer schedule for 2014, as illustrated in Table 3-10, was used as the
basis for the analysis. An estimated 110,770 annual enplanements correlates to the anticipated daily
demand associated with this schedule.
By applying a typical passenger arrival distribution to the daily flight schedule, the average day peak hour for Near Term demand levels was determined to be between 8:40 AM and 9:39 AM. As illustrated in Figure 3-5, the peak hour contains a total of 120 passengers, and is generated by the 9:30 AM United Airlines flight and the 10:35 AM Allegiant Airlines flight.

**TABLE 3-10**

**NEAR TERM DEPARTURE FLIGHT SCHEDULE (EXISTING SUMMER 2014)**

<table>
<thead>
<tr>
<th>CITY</th>
<th>CARRIER</th>
<th>DEPARTS</th>
<th>AIRCRAFT</th>
<th>SEATS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DENVER, CO (DEN)</td>
<td>UNITED</td>
<td>6:00 AM</td>
<td>CRJ 200</td>
<td>50</td>
</tr>
<tr>
<td>SALT LAKE CITY, UT (SLC)</td>
<td>DELTA</td>
<td>6:00 AM</td>
<td>CRJ 200</td>
<td>50</td>
</tr>
<tr>
<td>DENVER, CO (DEN)</td>
<td>UNITED</td>
<td>9:30 AM</td>
<td>CRJ 200</td>
<td>50</td>
</tr>
<tr>
<td>LAS VEGAS, NV (LAS)</td>
<td>ALLEGIANT</td>
<td>10:35 AM</td>
<td>MD 83</td>
<td>166</td>
</tr>
<tr>
<td>DENVER, CO (DEN)</td>
<td>UNITED</td>
<td>12:45 PM</td>
<td>CRJ 200</td>
<td>50</td>
</tr>
<tr>
<td>SALT LAKE CITY, UT (SLC)</td>
<td>DELTA</td>
<td>12:55 PM</td>
<td>CRJ 200</td>
<td>50</td>
</tr>
<tr>
<td>DENVER, CO (DEN)</td>
<td>UNITED</td>
<td>4:55 PM</td>
<td>CRJ 200</td>
<td>50</td>
</tr>
<tr>
<td>DENVER, CO (DEN)</td>
<td>UNITED</td>
<td>8:15 PM</td>
<td>CRJ 200</td>
<td>50</td>
</tr>
</tbody>
</table>

Source: http://www.iflycasper.com

Based on the flight schedule, a minimum of two gates are required to accommodate the simultaneous United and Delta morning departures. The greatest static passenger load is placed on the departure lounge during the peak hour. During that time, a static load of roughly 200 passengers will be waiting in the airside (post security) portion of the terminal building in the departure lounge area. To aid in comparison between the different demand levels, a breakdown of the primary planning metrics is provided below in Table 3-11.
### TABLE 3-11
**NEAR TERM PLANNING METRICS**

<table>
<thead>
<tr>
<th>Description</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Annual Passenger Enplanements</td>
<td>110,770</td>
</tr>
<tr>
<td>Peak Hour</td>
<td>8:40 AM to 9:39 AM</td>
</tr>
<tr>
<td>Peak Hour Passengers</td>
<td>120</td>
</tr>
<tr>
<td>Departure Lounge Static Load</td>
<td>200</td>
</tr>
<tr>
<td>Gates Required</td>
<td>2</td>
</tr>
</tbody>
</table>

Source: RS&H Analysis, 2014

#### 3.5.1.2 Future Growth – Low

This analysis is based upon the preferred passenger forecast approved by the FAA, and is a representation of conditions at the end of the twenty year planning period. A flight schedule was developed with a higher frequency of daily flights to align with the forecasted 155,060 annual enplanements. The additional flights added to the schedule are those in **Table 3-12** without a colored row. These flights were added into the existing 2014 schedule based on historical airline operations at CPR and expected future airline trends. For planning purposes, it was estimated that Delta would increase frequency to Salt Lake City with another flight in the late morning and one in the evening, better matching the flight offerings of United Airlines.

### TABLE 3-12
**FUTURE GROWTH-LOW DEPARTURE FLIGHT SCHEDULE**

<table>
<thead>
<tr>
<th>CITY</th>
<th>CARRIER</th>
<th>DEPARTS</th>
<th>AIRCRAFT</th>
<th>SEATS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DENVER, CO (DEN)</td>
<td>UNITED</td>
<td>6:00 AM</td>
<td>CRJ 700</td>
<td>64</td>
</tr>
<tr>
<td>SALT LAKE CITY, UT (SLC)</td>
<td>DELTA</td>
<td>6:00 AM</td>
<td>CRJ 700</td>
<td>64</td>
</tr>
<tr>
<td>DENVER, CO (DEN)</td>
<td>UNITED</td>
<td>9:30 AM</td>
<td>CRJ 700</td>
<td>64</td>
</tr>
<tr>
<td>SALT LAKE CITY, UT (SLC)</td>
<td>DELTA</td>
<td>9:55 AM</td>
<td>CRJ 700</td>
<td>64</td>
</tr>
<tr>
<td>LAS VEGAS, NV (LAS)</td>
<td>ALLEGIANT</td>
<td>10:00 AM</td>
<td>MD 83</td>
<td>166</td>
</tr>
<tr>
<td>DENVER, CO (DEN)</td>
<td>UNITED</td>
<td>12:45 PM</td>
<td>CRJ 700</td>
<td>64</td>
</tr>
<tr>
<td>SALT LAKE CITY, UT (SLC)</td>
<td>DELTA</td>
<td>12:55 PM</td>
<td>CRJ 700</td>
<td>64</td>
</tr>
<tr>
<td>DENVER, CO (DEN)</td>
<td>UNITED</td>
<td>4:55 PM</td>
<td>CRJ 700</td>
<td>64</td>
</tr>
<tr>
<td>SALT LAKE CITY, UT (SLC)</td>
<td>DELTA</td>
<td>5:00 PM</td>
<td>CRJ 700</td>
<td>64</td>
</tr>
<tr>
<td>DENVER, CO (DEN)</td>
<td>UNITED</td>
<td>8:15 PM</td>
<td>CRJ 700</td>
<td>64</td>
</tr>
</tbody>
</table>

Source: RS&H Analysis, 2014

By applying a typical passenger arrival distribution to the flight schedule, the peak hour for Future Growth-Low was determined to be between 8:10 AM and 9:09 AM. As illustrated in **Figure 3-6**, the peak hour contains a total of 180 passengers, and is generated by the United, Delta, and Allegiant flights that depart between 9:30 AM and 10:00 AM.
Based on the flight schedule, a minimum of three gates are required to accommodate the United, Delta, and Allegiant flights that make up the peak hour. This same group of aircraft also drive the maximum static passenger load placed on the departure lounge. A static load of roughly 260 passengers will be waiting in the airside portion of the terminal building in the departure lounge area during the peak hour. A breakdown of the primary planning metrics is provided below in Table 3.13.

### TABLE 3.13
**FUTURE GROWTH-LOW PLANNING METRICS**

<table>
<thead>
<tr>
<th>Description</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Annual Passenger Enplanements</td>
<td>155,060</td>
</tr>
<tr>
<td>Peak Hour</td>
<td>8:10 AM to 9:09 AM</td>
</tr>
<tr>
<td>Peak Hour Passengers</td>
<td>180</td>
</tr>
<tr>
<td>Departure Lounge Static Load</td>
<td>260</td>
</tr>
<tr>
<td>Gates Required</td>
<td>3</td>
</tr>
</tbody>
</table>

Source: RS&H Analysis, 2014

### 3.5.1.3 Future Growth – High

This analysis is based upon the passenger forecast that includes routes to new markets. It is a representation of the maximum potential passenger demand at the end of the planning period, which is estimated to be approximately 228,130 annual enplanements. The primary driver for the potential of this demand level is the fact that CPR’s catchment area is becoming larger as many of Wyoming’s smaller commercial service airports are experiencing reduced commercial service offerings.

This was taken into consideration when developing a flight schedule that correlates with the amount of passenger enplanements predicted by Future Growth-High demand levels. The flight schedule was simulated under the pretense that Delta would increase frequency to Salt Lake City to better match flight offerings of United Airlines, United would begin service to Houston, and US Air/American Airlines would begin service to new markets. It accounts for a higher frequency of daily flights as well as flights to new markets. The additional flights are identified as those without a colored row in Table 3.14.
By applying a typical passenger arrival distribution to the flight schedule, the peak hour for Future Growth-High demand levels was determined to be between 7:50 AM to 8:49 AM. As illustrated in Figure 3-7, the peak hour contains a total of 260 passengers, and is generated by the United, Delta, US Air/American, and Allegiant flights that depart at 9:30 AM.

**FIGURE 3-7**
**FUTURE GROWTH-HIGH DEPARTING PASSENGER DISTRIBUTION**

Based on the flight schedule, a minimum of four gates are required to accommodate the United, Delta, US Air/American, and Allegiant flights that make up the peak hour. This same group of aircraft also drive the maximum static passenger load placed on the departure lounge. A static load of roughly 320 passengers will be waiting in the airside portion of the terminal building in the departure lounge area during the peak hour. A breakdown of the primary planning metrics is provided below in Table 3-15.
### 3.5.2 Demand Level Terminal Planning Summary

The analysis of the three demand levels determined that the Allegiant flight was the primary driver of peak hour passengers and static load of the departure lounge. This is due to the Allegiant MD-83 seating capacity of 166 people, which is considerably greater than the CRJ 200 or CRJ 700 which hold 50 and 64 people respectively.

The findings of these three demand based evaluations are used in the remainder of this section as a tool to analyze and address the terminal facility’s immediate needs, long term needs based on continued growth, and needs based on the full potential of air service at the end of the twenty year planning period.

### 3.5.3 Terminal Building Programmatic Requirements

The terminal building programmatic requirements were determined based on the three demand levels studied; Near Term, Future Growth–Low, and Future Growth–High. They were separated into the same program areas as illustrated in Figure 1-5 in Chapter 1, Inventory of Existing Conditions. Those program areas were evaluated and the existing square footage was defined for each area, as illustrated in Table 3-16. An analysis was conducted to determine if a delta existed between the amount of existing space and the space required to maintain an adequate Level of Service (LOS) for each of the studied demand levels.

LOS is a qualitative and quantitative measurement of passenger flows, level of delay, and level of passenger comfort. For this study, the Airports Council International (ACI)/International Air Transport Association (IATA) Guidelines for Airport Capacity/Demand Management rating system and definition is used. The ACI/IATA LOS is rated on a scale from A to F, with A being excellent service and F a complete terminal system breakdown. A general planning standard for terminal buildings is to plan for LOS C, because C provides good LOS at a reasonable cost to the Airport operator. Additionally, by planning for LOS C during peak times, a greater LOS will be experienced when passenger demand is lower than peak.

To determine the programmatic requirements, planning factors and industry best practices were used according to guidance outlined in the reference documents that are listed in the beginning of this section. Some of the planning factors mentioned in the guiding documents were established more for very large airports. As such, planning factors that have been proven at airports similar in size to CPR were used. Though the use of these planning factors and best practices, the areas in the terminal that are or will become space deficient in the future were identified.

### Table 3-15

**FUTURE GROWTH-HIGH PLANNING METRICS**

<table>
<thead>
<tr>
<th>Description</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Annual Passenger Enplanements</td>
<td>228,130</td>
</tr>
<tr>
<td>Peak Hour</td>
<td>7:50 AM to 8:49 AM</td>
</tr>
<tr>
<td>Peak Hour Passengers</td>
<td>260</td>
</tr>
<tr>
<td>Departure Lounge Static Load</td>
<td>320</td>
</tr>
<tr>
<td>Gates Required</td>
<td>4</td>
</tr>
</tbody>
</table>

Source: RS&H Analysis, 2014
### TABLE 3-16
**TERMINAL PROGRAMMATIC REQUIREMENTS**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Existing</td>
<td>Near Term</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Annual Enplaned Passengers</td>
<td>98,198</td>
<td>110,770</td>
<td>155,060</td>
<td>228,130</td>
</tr>
<tr>
<td>Passenger Static Load</td>
<td>200</td>
<td>260</td>
<td>320</td>
<td></td>
</tr>
<tr>
<td>Number of Gates Required</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td><strong>Airline Space</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ticketing Area &amp; Support Spaces</td>
<td>6,667 sf</td>
<td>2,330 sf</td>
<td>3,400 sf</td>
<td>4,480 sf</td>
</tr>
<tr>
<td>Ticket Counter Length</td>
<td>79 if</td>
<td>30 if</td>
<td>50 if</td>
<td>60 if</td>
</tr>
<tr>
<td>Baggage Claim &amp; Support Space</td>
<td>3,200 sf</td>
<td>2,640 sf</td>
<td>4,100 sf</td>
<td>5,400 sf</td>
</tr>
<tr>
<td>Baggage Claim Length</td>
<td>85 if</td>
<td>70 if</td>
<td>100 if</td>
<td>140 if</td>
</tr>
<tr>
<td>Outbound Baggage Area</td>
<td>2,972 sf</td>
<td>1,600 sf</td>
<td>2,400 sf</td>
<td>3,200 sf</td>
</tr>
<tr>
<td>Passenger Departure Lounges</td>
<td>4,260 sf</td>
<td>5,100 sf</td>
<td>7,200 sf</td>
<td>9,000 sf</td>
</tr>
<tr>
<td>Operations Facilities</td>
<td>994 sf</td>
<td>1,200 sf</td>
<td>1,600 sf</td>
<td>2,300 sf</td>
</tr>
<tr>
<td><strong>TSA Spaces</strong></td>
<td>8,353 sf</td>
<td>10,520 sf</td>
<td>11,060 sf</td>
<td>13,030 sf</td>
</tr>
<tr>
<td>Security Screening Checkpoint</td>
<td>2,308 sf</td>
<td>7,100 sf</td>
<td>7,500 sf</td>
<td>8,000 sf</td>
</tr>
<tr>
<td>Baggage Screening &amp; Inspection</td>
<td>0 sf</td>
<td>3,420 sf</td>
<td>3,560 sf</td>
<td>5,030 sf</td>
</tr>
<tr>
<td>Administration offices (TSA)</td>
<td>6,045 sf</td>
<td>0 sf</td>
<td>0 sf</td>
<td>0 sf</td>
</tr>
<tr>
<td><strong>Concession Space</strong></td>
<td>6,118 sf</td>
<td>1,600 sf</td>
<td>2,300 sf</td>
<td>3,400 sf</td>
</tr>
<tr>
<td>General Concessions (Storage, Gift)</td>
<td>704 sf</td>
<td>200 sf</td>
<td>300 sf</td>
<td>500 sf</td>
</tr>
<tr>
<td>Ground Transportation</td>
<td>1,212 sf</td>
<td>600 sf</td>
<td>900 sf</td>
<td>1,300 sf</td>
</tr>
<tr>
<td>Food and Drink</td>
<td>4,202 sf</td>
<td>800 sf</td>
<td>1,100 sf</td>
<td>1,600 sf</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td>9,650 sf</td>
<td>1,200 sf</td>
<td>1,600 sf</td>
<td>2,300 sf</td>
</tr>
<tr>
<td>Leasable Conference / Future CBI</td>
<td>4,105 sf</td>
<td>1,200 sf</td>
<td>1,600 sf</td>
<td>2,300 sf</td>
</tr>
<tr>
<td>Second Floor Multi-Purpose Space</td>
<td>5,245 sf</td>
<td>500 sf</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vacant Space</td>
<td>300 sf</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Public Space</strong></td>
<td>16,179 sf</td>
<td>15,890 sf</td>
<td>22,190 sf</td>
<td>32,010 sf</td>
</tr>
<tr>
<td>Airside Circulation</td>
<td>2,846 sf</td>
<td>6,100 sf</td>
<td>8,600 sf</td>
<td>12,600 sf</td>
</tr>
<tr>
<td>Landside Circulation</td>
<td>11,845 sf</td>
<td>7,800 sf</td>
<td>10,900 sf</td>
<td>16,000 sf</td>
</tr>
<tr>
<td>First Floor</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Landside Restrooms</td>
<td>989 sf</td>
<td>1,320 sf</td>
<td>1,720 sf</td>
<td>2,440 sf</td>
</tr>
<tr>
<td>Airside Restrooms</td>
<td>196 sf</td>
<td>670 sf</td>
<td>970 sf</td>
<td>970 sf</td>
</tr>
<tr>
<td>Second Floor</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Office Restrooms</td>
<td>73 sf</td>
<td>0 sf</td>
<td>0 sf</td>
<td>0 sf</td>
</tr>
<tr>
<td>Public Restrooms</td>
<td>230 sf</td>
<td>0 sf</td>
<td>0 sf</td>
<td>0 sf</td>
</tr>
<tr>
<td><strong>Airport Management</strong></td>
<td>3,597 sf</td>
<td>1,000 sf</td>
<td>1,300 sf</td>
<td>1,900 sf</td>
</tr>
<tr>
<td>Administrative Area</td>
<td>1,945 sf</td>
<td>790 sf</td>
<td>980 sf</td>
<td>1,400 sf</td>
</tr>
<tr>
<td>Custodial</td>
<td>152 sf</td>
<td>260 sf</td>
<td>330 sf</td>
<td>480 sf</td>
</tr>
<tr>
<td>Maintenance</td>
<td>1,000 sf</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage</td>
<td>500 sf</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Utilities</strong></td>
<td>2,919 sf</td>
<td>2,100 sf</td>
<td>2,600 sf</td>
<td>3,800 sf</td>
</tr>
<tr>
<td><strong>Total Terminal Area</strong></td>
<td>65,113 sf</td>
<td>54,180 sf</td>
<td>68,750 sf</td>
<td>89,820 sf</td>
</tr>
</tbody>
</table>

**Source:** RS&H Analysis, 2014
The programmatic space requirements analysis indicated six specific areas of the terminal that were notably space deficient for accommodating the Near Term and Future Growth passenger demand levels. These areas are highlighted in the table above. It should be noted that circulation, which is included under ‘Public Space,’ is calculated as a percentage of the total airside or landside spaces. Thus, the airside and landside circulation deficiencies are associated with the other deficient programs. The deficient spaces, as illustrated in Figure 3-8, include:

» Baggage Claim
» TSA Baggage Screening
» Landside Restrooms
» TSA Security Screening Checkpoint
» Airside Restrooms
» Passenger Departure Lounges
Terminal Building Deficiencies

1. Baggage Claim
2. TSA Baggage Screening
3. Landside Restroom
4. TSA Passenger Security Screening Checkpoint
5. Airside Restroom
6. Passenger Departure Lounge

Source: RS&H Analysis, 2014

FIGURE 3-8
TERMINAL BUILDING DEFICIENCIES
The six deficient areas of the terminal were discussed with Airport management, and were validated as being areas that had become increasingly noticeable for not adequately meeting passenger demand and/or creating operational challenges. It should be noted that each of these areas of the terminal are interrelated and cannot be examined independently. As passengers flow through the building, each area will have an impact on the next area downstream in the process.

Passenger flows are a critical factor at Casper/Natrona County International Airport because passenger enplanements are nearing, and are forecasted to exceed, a threshold at which operational considerations will have large impacts that will spread through each area of the terminal building. At current passenger levels, processing elements such as ticketing and the TSA security checkpoint provide service only during certain times of the day when they are most needed.

For example, TSA currently opens the security screening checkpoint (SSCP), essentially, just prior to when passengers are due to depart, then closes the checkpoint until the next scheduled flight. Passengers are accustomed to this and as such, passenger flows are akin to a batch process. As flight frequency increases in the future, a more continuous type of passenger flow will start to form. When this transformation takes place, terminal processes will begin to have greater effects on one another, deficiencies will become more noticeable, and the terminal's overall Level of Service will decrease.

The following is a description of each of the six deficient areas in the terminal. Each description includes an explanation of those operational considerations that must be considered.

### 3.5.3.1 Baggage Claim

The baggage claim is the area in the terminal where arriving passengers retrieve their checked baggage. At CPR, this area includes one revolving baggage claim device and the area surrounding the device. As evidenced in Table 3-17, the programmatic analysis for this space identified a future need of 900 to 2,200 additional square feet and an additional 55 linear feet of baggage claim length.

**TABLE 3-17**

**BAGGAGE CLAIM SPACE REQUIREMENTS**

<table>
<thead>
<tr>
<th>Description</th>
<th>Today (2013)</th>
<th>Current Need</th>
<th>Future Growth</th>
<th>Space Deficiencies</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Existing</td>
<td>Near Term</td>
<td>Low High</td>
<td>Near Term Low High</td>
</tr>
<tr>
<td>Baggage Claim &amp; Support Spaces</td>
<td>3,200 sf</td>
<td>2,640 sf</td>
<td>4,100 sf</td>
<td>5,400 sf</td>
</tr>
<tr>
<td>Baggage Claim Length</td>
<td>85 lf</td>
<td>70 lf</td>
<td>100 lf</td>
<td>140 lf</td>
</tr>
</tbody>
</table>

Source: RS&H Analysis, 2014

Factors for consideration in properly sizing future modifications to the baggage claim area include the average number of passengers checking bags, the number of passengers per flight, and operational considerations based on flight schedules. Operational factors stem from the forecasted increase in air service frequency. As frequency is increased, it is likely that multiple flights will arrive to CPR within a relatively small time frame. This will require an additional baggage claim device to prevent delay in transferring baggage from aircraft to passengers.
An additional operational factor is redundancy, which has become more critical with the addition of the MD-83 Allegiant flights which hold up to 166 passengers. The number of bags associated with those flights will cause operational challenges if the baggage claim device is out of service. Add to that factor the additional flights forecasted in the future, and the worst case scenario becomes a back-up in service creating delay for multiple flights throughout the day.

The LOS desired must be considered when evaluating solutions to meet future need. Industry standard to achieve LOS A and B, is to allow enough space for every passenger claiming their bag to stand near the claim device. LOS C is to allow enough space for every passenger to be at least one person away from the device. This equates to a claim frontage of 2 to 3 feet per person for LOS A and B, or 1 to 1.5 feet per person for LOS C. This analysis planned for LOS C.

Options to remedy the baggage claim deficiencies will be presented in the alternatives chapter. These options will take into consideration typical operational procedures, predicted passenger demand, and the LOS the Airport desires to achieve.

### 3.5.3.2 TSA Baggage Screening

At CPR, passengers check in for their flights at a staffed check-in counter. There, they check their bags that they are not carrying onboard the aircraft themselves. The checked bags are then screened by TSA officers for explosives and other incendiary devices. Currently, the screening process is conducted manually in front of the ticket counters, which utilizes space normally reserved for passenger queuing and circulation in the ticket lobby.

This process is effective for screening small amounts of passenger baggage. However, considering the forecasted passenger demand levels at CPR, baggage screening will need to be automated with machines placed behind the ticket counter. The primary reasons for automating and moving the baggage screening process are twofold. The first is to ensure demand can be met. With increased frequency of larger aircraft, a manual screening process will not be able to keep up with demand which will result in undue delay and a significantly lower the LOS of the ticketing area.

The second reason is to increase the available space in the ticket lobby. The existing ticket lobby, while currently sufficient, does not have the depth preferred for a ticket lobby to accommodate the active area, ticket queueing, and circulation. The existing lobby’s depth is roughly 35 feet, while industry standard is 50 to 60 feet. By keeping the baggage screening in the ticket lobby, the space is further reduced. Because the ticket lobby is situated between the landside loop road and the ‘back of house’ baggage make up area, it is one of the most difficult to expand.

Considering these factors, by moving baggage screening to the back of the ticket counters, the available ticket lobby space is increased and an automated baggage system can be employed. As shown in Table 3-18, it is estimated that between roughly 4,500 to 5,000 square feet would be required for an automated baggage system. The alternatives analysis will evaluate the best options for implementing the additional space and facilities required of an automated baggage screening process.
3.5.3.3 Landside Restrooms

The landside restrooms in the terminal building are located within the terminal lobby in the non-secured portion of the terminal. These restrooms are used by passengers and meeters and greeters. Due to the short walk from the airside to the landside portion of the terminal building, the restrooms are also used heavily by deplaning passengers. The landside restrooms were calculated to be sufficient in the near term in regard to the number of fixtures in each facility, however the space is constrained and provides a low LOS when at maximum capacity. To accommodate Future Growth Low and High passenger demand, roughly 700 to 1,500 additional square feet will be required for additional toilet fixtures and circulation, as shown in Table 3-19.

In addition to the need for more space and fixtures, a second restroom facility is needed to provide redundancy. As passenger demand increases and begins to spread throughout the day, closing the restroom for maintenance and cleaning will lower the LOS of the terminal. A second facility will allow for a continuation of service during those periods of time, and could be built large enough to meet future demand.

The alternatives analysis will explore options for increasing the capacity of the landside restrooms. This will include examining the implementation of a second landside restroom.

3.5.3.4 TSA Passenger Security Screening Checkpoint

The Airport terminal currently has one TSA passenger security screening checkpoint (SSCP), which includes two screening lanes. The SSCP is the access point into the secured airside portion of the terminal building from the non-secured landside portion. The different zones within the checkpoint include areas for queuing, security screening, and a secured deplaning corridor. Within the security screening area, various screening technologies are typically used, included Advanced Imaging Technology (AIT) scanners, Walk Through Metal Detectors (WTMD), and baggage x-ray machines. These technologies and their space requirements are ever changing, and are a component of the TSA SSCP design standards.

The existing SSCP is not built to TSA standards, and has been adjusted in size to fit the space available within the terminal building. The SSCP, including the deplaning sterile corridor, use roughly 2,300 square feet of space today. According to TSA specifications, the SSCP space requirements for the forecasted
number of future enplanements ranges from 7,100 to 8,000 square feet, as shown in Table 3-20. The wide gap between existing space and required space illustrates the SSCP deficiency. To date, TSA officers have been successful in carrying out their operations within the existing confined space. However, as enplanements and flight frequency increase, the existing space will not be adequate to provide a good passenger LOS and will potentially limit the use of future screening technologies.

**TABLE 3-20**

<table>
<thead>
<tr>
<th>Description</th>
<th>Today (2013) Existing</th>
<th>Current Need Near Term</th>
<th>Future Growth Low</th>
<th>Future Growth High</th>
<th>Space Deficiencies Near Term Low</th>
<th>Space Deficiencies High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Security Screening Checkpoint</td>
<td>2,308 sf</td>
<td>7,100 sf</td>
<td>7,500 sf</td>
<td>8,000 sf</td>
<td>(4,792) sf</td>
<td>(5,192) sf</td>
</tr>
</tbody>
</table>

Source: RS&H Analysis, 2014

Redundancy and operational factors must also be considered when evaluating the requirements of the SSCP. Currently, the SSCP has two screening lanes. These lanes were identified as sufficient to meet typical demand, but a third lane should be implemented for system redundancy and to help meet demand associated with extreme peak times during the year. Operationally, to accommodate the forecasted increase in flight schedules and enplanements, the SSCP will need to be open for longer period of times, and have a formal queuing area.

Options to increase the space of the SSCP to meet TSA design requirements will be evaluated in the alternatives analysis.

### 3.5.3.5 Airside Restrooms

Public airside restrooms at CPR include those in the secured portion of the terminal building, adjacent to the passenger departure lounge. The airside restrooms are used by passengers waiting in the departure lounge prior to boarding their flight. These facilities were identified as being undersized with less than an adequate number of toilet fixtures. The facility’s deficiencies are especially evident during peak times or delay events when passengers of two or more flights are waiting in the departure lounge. The analysis indicates that between roughly 500 and 800 square feet of additional space will be required to meet the Future Growth demand levels, as shown in Table 3-21.

**TABLE 3-21**

<table>
<thead>
<tr>
<th>Description</th>
<th>Today (2013) Existing</th>
<th>Current Need Near Term</th>
<th>Future Growth Low</th>
<th>Future Growth High</th>
<th>Space Deficiencies Near Term Low</th>
<th>Space Deficiencies High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airside Restrooms</td>
<td>196 sf</td>
<td>670 sf</td>
<td>970 sf</td>
<td>970 sf</td>
<td>(474) sf</td>
<td>(774) sf</td>
</tr>
</tbody>
</table>

Source: RS&H Analysis, 2014

Operational factors must be considered when planning for additional airside restroom space. The primary factors are related to the SSCP and concessions. Since the SSCP opens just prior to each flight departure, passengers today typically do not wait in the departure lounge for long periods of time; thus demand for the airside restrooms somewhat limited. As flight schedules increase, the SSCP will likely need to remain open through most of the day which will allow passengers access to the departure lounge well before their flight. That change in passenger flow will increase use of the airside restrooms.
The actual timing of passengers processing through the SSCP into the departure lounge will also correlate with the type of concession options that exist post security. If a restaurant type concession is put into the departure lounge, passengers will want to move through the SSCP into the secured side of the Airport earlier so they can relax and take advantage of the concession options. This will increase overall demand on the airside restrooms.

The alternatives analysis will evaluate the options for increasing the size and capacity of the airside restrooms, and take into consideration the operational factors discussed.

3.5.3.6 Passenger Departure Lounge

Passenger departure lounges are those areas located after the passenger security checkpoint and adjacent to departure gates where passengers congregate to wait for their flight to be called and board their plane. Departure lounge space was analyzed according to the passenger static load. As opposed to peak hour, static load is used to account for every passenger that will be in the departure lounge at the same time. The maximum static load is computed by adding the expected passengers from each flight that are expected to be within the departure lounge at the same time.

Space requirements for a departure lounge are based on the LOS that is desired to be achieved. Industry standards for quantifying the LOS of a departure lounge are based on the percentage of passengers seated versus standing and the amount of area provided for each of these passengers. For example, per ACRP Report 25, LOS B would provide seats for 80% of all passengers with 15 square feet of space per seated passenger and 10 square feet of space per standing passenger. As seats and square footage per passenger decreases, so does the LOS of the departure lounge.

The Airport has three departure lounges within the airside portion of the terminal building. They are not separated from each other by any definitive means, and as such were analyzed as one consolidated departure lounge which currently has a total of 4,260 square feet of space. Based on the deficiency analysis, approximately 840 square feet of space is needed to meet Near Term demand, as shown in Table 3-22. To accommodate Future Growth demand levels, roughly 3,000 to 5,000 additional square feet will be required.

<table>
<thead>
<tr>
<th>Description</th>
<th>Today (2013) Existing</th>
<th>Current Need Near Term</th>
<th>Future Growth Low</th>
<th>Future Growth High</th>
<th>Space Deficiencies Near Term Low</th>
<th>Space Deficiencies Near Term High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger Departure Lounges</td>
<td>4,260 sf</td>
<td>5,100 sf</td>
<td>7,200 sf</td>
<td>9,000 sf</td>
<td>(840) sf</td>
<td>(2,940) sf</td>
</tr>
</tbody>
</table>

Source: RS&H Analysis, 2014

The deficiency analysis identified the existing departure lounge as undersized. However, due to the current configuration of the interior fixtures and components, the lack of space is intensified. This is especially noticeable when Allegiant passengers are mixed with passengers waiting for a CRJ served flight. Depending on circumstances, those events require passengers be escorted to a room above the departure lounge until the lounge area becomes less congested. During those times, it is not uncommon for the departure lounge to reach LOS E, which is an unacceptable LOS. The low LOS is a result of the decreased number of square
feet per passenger in the lounge area and the inconvenience put upon passengers who are required to transfer upstairs.

In analyzing the space required to meet forecasted demand, consideration must be given to various operational factors. One operational factor relates to the number of gates that will be required to meet the needs of airline flight schedules. Future Growth High demand levels are expected to require an additional gate to accommodate the increase in flight frequency. The addition of a new gate will necessitate another departure lounge and corresponding space.

Another operational factor for consideration is concessions. Currently, airside concession offerings are limited to vending machines. If a food and beverage type concession was added to the airside portion of the terminal, the LOS would be increased and passenger flow patterns would change. With better concession offerings, passengers would likely choose to process through security earlier before their flight. That change in space usage could increase the static load of the departure lounge as flight frequency increases.

The alternatives analysis will evaluate options to increase the size of the departure lounge to meet current and future demand. The alternatives will target options that will increase the overall LOS of the departure lounge and provide a better passenger experience. Consideration will be given to the operational factors and the best industry practices for achieving the Airport’s desired LOS.

3.5.4 Terminal Regulatory Requirements

Understanding the possible effects of terminal regulatory requirements on the Airport terminal building begins with determining the current applicable building code and how it relates to the code under which each portion of the existing terminal was built. At the time of this report, both the City of Casper and Natrona County have adopted the 2012 International Building Code (IBC 2012). Although the building code under which the existing portions of the terminal were built is not currently known, the process of understanding the building code requirements remains the same.

Building code requirements determine how and to what extent a building can be modified or expanded. The scope of these requirements is largely dependent on two conditions, stated in the code as occupancy classification and construction type. An occupancy classification is applied based on the building’s use or purpose. The construction type is determined by the building’s structural system, as well as the materials and assemblies that make up its walls, floors, and roof.

In the case of the Casper Terminal Building, prior to any design, an assessment of the existing terminal construction will need to be conducted to clearly define its construction type. With this information, the overall area, maximum height, number of stories, and life safety requirements for not only the existing terminal building, but any expansions or renovations can be established.

Of primary concern in the building code are life safety requirements such as fire & smoke protection, means of egress, and accessibility. As terminal additions and renovations are developed, close coordination with local building code officials will be required to ensure the appropriate life safety requirements are
These requirements will be considered not only for new construction, but for the entire facility.

### 3.5.5 Terminal Apron Area

The existing terminal apron area is approximately 24,500 square feet and is used for aircraft parking and ground service equipment (GSE). The apron area includes a secured identification display area (SIDA), which is required for commercial passenger service airline operations. There are currently four aircraft parking positions on the terminal apron, with a jet bridge used at one of them. These four parking positions and the associated apron space have been evaluated as being adequate to meet the future need of commercial passenger operations.

The apron area presents operational constraints that must be considered in the alternatives analysis. The existing SIDA extends into the Taxiway A object free area (OFA). The northern portion of the SIDA marking will need to be toward the terminal building so it does not penetrate the OFA. In addition, a vehicle service road (VSR) is recommended to be implemented between the SIDA and OFA to allow fuel trucks and other vehicles access between the GA ramps without having to enter the SIDA. Additionally, the current gate layout allows power-out operations. If future gates are reconfigured and new gates are added, push back operations may be necessary.

The terminal apron was also evaluated for CFR Part 77 airspace considerations. As demonstrated in Figure 3-9, the apron has a relatively low tail height clearance. However, with tail heights of 31 feet and 25 feet, the MD-83 and CRJ-700 tails sit below the Part 77 surfaces when the aircraft are parked in their designated positions. The forecast indicates that Allegiant will transition to using A319/320 aircraft, which have a 40 foot tail height. This aircraft, illustrated in the figure with a red outline, will require a parking position that is closer toward the terminal building. Additional consideration of jet bridge capability with the Airbus will be required as the door sill height is higher than the MD-83 door sill.
3.5.6 Airport Access

Access to the Airport’s passenger terminal is served by Airport Parkway, which is a loop road that begins and ends at U.S. Highway 20-26. This road provides access to the commercial passenger terminal building, the C/NCIA Business Park, and all of the Airport’s aeronautical facilities and businesses. It consists of two lanes in each direction at the intersection of U.S. Highway 20-26, and becomes three lanes at the intersection of Skinner Avenue. The loop portion of the road provides direct access to the terminal building.

Airport Parkway provides excellent vehicle access to the passenger terminal and parking lots, as well as the rest of the airport. Typical capacity of a loop road such as Airport Parkway is 700 to 800 vehicles per-lane, per-hour. Thus, with two lanes, the loop road can accommodate roughly 1,400 vehicles per hour. Conservatively, if every passenger arrived and departed in their own vehicle, the roadway would have excess capacity based on the 240 peak hour passengers of Future Growth - High. The loop road also consists of a one-way, single lane, recirculation road that allows vehicles access to the start of the loop at the intersection of Skinner Avenue. This single lane is sufficient for current and future demand, and has an adequate emergency shoulder area to prevent blockages.

Overall, Airport Parkway serves the access needs of the Airport very well and will meet the demand suggested in the low and high growth forecasts.
3.5.7 Terminal Parking Lots

Casper/Natrona County International Airport currently provides paved surface parking lots for short-term, long-term, rental car, and employee parking. This parking is consolidated in one parking lot that is divided between private (rental car and employee) and public parking (short and long term). Additionally, per Wyoming Statute 315-5-501(d), free public parking is provided along Coffman Drive and in a designated area adjacent to Commerce Drive.

3.5.7.1 Public Parking

Discussions with Airport management revealed that the Airport’s public parking lot was reaching capacity during peak times of the years, such as the December holiday season. Typically, parking lots are planned with 20 percent more parking spaces than required to meet those peak demand time periods and to allow enough extra spots to allow drivers to find empty spots in the lot within a reasonable amount of time.

To evaluate future public parking needs, a planning factor of 2.5 spaces per peak hour passenger was used. This number is greater than one space per passenger to account for the long-term parked vehicles that typically stay in the parking lot for multiple days. Using this planning factor, a total number of spots was determined. The total number was then increased by 20 percent to account for those peak periods in which the parking lot must accommodate an influx of long-term vehicles.

The analysis was based on current conditions and the fact that the public parking lots were reaching capacity during peak periods. It was determined that the Airport will require 35 additional parking spaces to accommodate the near term demand, 439 spaces for future low growth demand, and 842 spaces for future high growth demand. The total additional area required ranges from roughly 30,304 square feet to 320,608 square feet, as shown in Table 3-23.

It should be noted that the free public parking was included in this analysis with all other types of public parking. Additionally, because short-term and long-term public parking is combined at CPR, these two types of parking were also combined for this analysis.
3.5.7.2 Rental Car Parking and Facilities

The Airport is served by Hertz, Avis, and Budget in the terminal building, and Enterprise from an offsite location. The three on-site companies currently share a rental car ready/return parking area in the north east portion of the Airport’s main parking lot. Additionally, Hertz and Avis both have carwash/service facilities operated out of buildings in the Airport business park. These buildings were not built with the intention to accommodate carwash and maintenance operations. Additionally, one of the buildings is an old WWII barrack that has aged beyond its intended life expectancy. The facilities are also nearly a quarter mile away from the rental car lot, which creates operational challenges and inconvenience for rental car employees.

Considering the forecasted passenger growth at the Airport and the increase in use of rental cars, these facilities will require eventual expansion and replacement. These factors prompt consideration of implementing a rental car quick-turn-around (QTA) wash and maintenance facility that is nearer to the rental car ready/return parking lot. A QTA facility would provide greater efficiencies and provide additional revenue potential for the Airport.

In regard to rental car parking requirements, the analysis identified an existing surplus of 22 spaces, which will continue to exist in the near term. However, based on future low and high demand, 19 to 86 additional rental car parking spaces will be required as shown in Table 3-24. For this analysis, a planning factor was used that estimated 15 percent of passengers during an average day in the peak month (PMAD) would rent or return a car.

### Table 3-23

**PUBLIC PARKING FACILITY REQUIREMENTS**

<table>
<thead>
<tr>
<th>Description</th>
<th>Existing 2013</th>
<th>Near Term Current Need</th>
<th>Future Growth Low</th>
<th>Future Growth High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak Hour Passenger</td>
<td>230</td>
<td>240</td>
<td>360</td>
<td>480</td>
</tr>
<tr>
<td>Existing Public Parking Spaces</td>
<td>771</td>
<td>771</td>
<td>771</td>
<td>771</td>
</tr>
<tr>
<td>Existing Public Parking Area (SF)</td>
<td>260,000</td>
<td>260,000</td>
<td>260,000</td>
<td>260,000</td>
</tr>
<tr>
<td><strong>Public Parking Spaces Required</strong></td>
<td>-</td>
<td>806</td>
<td>1,210</td>
<td>1,613</td>
</tr>
<tr>
<td>Public Parking Spaces Surplus/Deficit</td>
<td>-</td>
<td>(35)</td>
<td>(439)</td>
<td>(842)</td>
</tr>
<tr>
<td>Public Parking Area Required (SF)</td>
<td>-</td>
<td>290,304</td>
<td>435,456</td>
<td>580,608</td>
</tr>
<tr>
<td>Public Parking Area Surplus/Deficit (SF)</td>
<td>-</td>
<td>(30,304)</td>
<td>(175,456)</td>
<td>(320,608)</td>
</tr>
</tbody>
</table>

* 20 Percent of parking spaces must be available for free per State of Wyoming Statue.

Source: RS&H Analysis, 2014

**Description**

**Future Growth**

- **Peak Hour Passenger**: 230, 240, 360, 480
- **Existing Public Parking Spaces**: 771, 771, 771, 771
- **Existing Public Parking Area (SF)**: 260,000, 260,000, 260,000, 260,000
- **Public Parking Spaces Required**: -806, 1,210, 1,613
- **Public Parking Spaces Surplus/Deficit**: -35, 439, 842
- **Public Parking Area Required (SF)**: -290,304, 435,456, 580,608
- **Public Parking Area Surplus/Deficit (SF)**: -30,304, 175,456, 320,608

Source: RS&H Analysis, 2014
### TABLE 3-24
**RENTAL CAR PARKING FACILITY REQUIREMENTS**

<table>
<thead>
<tr>
<th>Description</th>
<th>Existing 2013</th>
<th>Near Term Current Need</th>
<th>Future Growth Low</th>
<th>Future Growth High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak Month Average Day Passengers</td>
<td>604</td>
<td>682</td>
<td>954</td>
<td>1,402</td>
</tr>
<tr>
<td>Existing Rental Car Spaces</td>
<td>124</td>
<td>124</td>
<td>124</td>
<td>124</td>
</tr>
<tr>
<td>Existing Rental Car Area (SF)</td>
<td>46,500</td>
<td>46,500</td>
<td>46,500</td>
<td>46,500</td>
</tr>
<tr>
<td><strong>Rental Car Spaces Required</strong></td>
<td>-</td>
<td>102</td>
<td>143</td>
<td>210</td>
</tr>
<tr>
<td>Rental Car Spaces Surplus/(Deficit)</td>
<td>-</td>
<td>22</td>
<td>(19)</td>
<td>(86)</td>
</tr>
<tr>
<td>Rental Car Parking Area Required (SF)</td>
<td>-</td>
<td>36,828</td>
<td>50,085</td>
<td>73,605</td>
</tr>
<tr>
<td>Rental Car Spaces Area Surplus/(Deficit) (SF)</td>
<td>-</td>
<td>9,672</td>
<td>(3,585)</td>
<td>(27,105)</td>
</tr>
</tbody>
</table>

Source: RS&H Analysis, 2014

#### 3.5.7.3 Employee Parking
Employees parking at the Airport include, but are not limited to: Airport staff, TSA employees, rental car employees, and airline employees. Employee parking spaces are located in the same parking lot as the rental car ready/return parking. As illustrated in Table 3-25, employee parking is currently sufficient. At the end of the planning period, 3 to 13 additional spaces will be needed.

### TABLE 3-25
**EMPLOYEE PARKING FACILITY REQUIREMENTS**

<table>
<thead>
<tr>
<th>Description</th>
<th>Existing 2013</th>
<th>Near Term Current Need</th>
<th>Future Growth Low</th>
<th>Future Growth High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual Enplaned Passengers</td>
<td>98,198</td>
<td>110,770</td>
<td>155,060</td>
<td>228,130</td>
</tr>
<tr>
<td>Existing Employee Parking Space</td>
<td>32</td>
<td>32</td>
<td>32</td>
<td>32</td>
</tr>
<tr>
<td>Existing Employee Parking Area (SF)</td>
<td>11,500</td>
<td>11,500</td>
<td>11,500</td>
<td>11,500</td>
</tr>
<tr>
<td><strong>Employee Parking Spaces Required</strong></td>
<td>-</td>
<td>30</td>
<td>35</td>
<td>45</td>
</tr>
<tr>
<td>Employee Parking Spaces Surplus/(Deficit)</td>
<td>-</td>
<td>2</td>
<td>(3)</td>
<td>(13)</td>
</tr>
<tr>
<td>Employee Parking Area Required (SF)</td>
<td>-</td>
<td>10,652</td>
<td>12,648</td>
<td>16,181</td>
</tr>
<tr>
<td>Employee Parking Area Surplus/(Deficit) (SF)</td>
<td>-</td>
<td>848</td>
<td>(1,148)</td>
<td>(4,681)</td>
</tr>
</tbody>
</table>

Source: RS&H Analysis, 2014

#### 3.5.7.4 Terminal Curbfront
The terminal building’s curbfront is used for passenger pick-up and drop-off. At CPR, the curbfront area consists of five lanes with the innermost lane having a length of 417 linear feet along the terminal buildings curb. The curbfront is simply configured and is not divided into sections serving different vehicle types. Estimating the required length of the curbfront requires consideration of the types of vehicles that park on the curb, their average length, and the amount of time they spend parked (dwell time).

Various methods exist to determine curbfront requirements. Surveys can be conducted on location, data from similar airports can be used, or industry planning factors can be applied. For this analysis, the latter
approach was used using the most conservative planning factors detailed in ACRP 25, *Airport Passenger Terminal Planning and Design Volume 1*. The terminal curbfront was found to be adequate using this approach and thus further analysis using survey and comparison efforts was not required.

Currently, there is an exceedingly limited amount of bus, taxi, and limousine service to and from the Airport. The primary mode of transportation is by automobile. Thus, to continue with a conservative approach, a 1:1 ratio of airline passengers to private automobiles was used. Each vehicle was factored as being twenty-five feet in length with a dwell time of four minutes, which is the upper threshold of industry standard. The results of the analysis are shown in Table 3-26. As illustrated, the current terminal curb is sufficient through the planning period.

**Table 3-26**

**Terminal Curbfront Facility Requirements**

<table>
<thead>
<tr>
<th>Description</th>
<th>Existing 2013</th>
<th>Near Term Current Need</th>
<th>Future Growth Low</th>
<th>Future Growth High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design Hour Passengers</td>
<td>230</td>
<td>240</td>
<td>360</td>
<td>480</td>
</tr>
<tr>
<td>Vehicles Entering Loop Road</td>
<td>230</td>
<td>240</td>
<td>360</td>
<td>480</td>
</tr>
<tr>
<td>Vehicles Parking on Curb</td>
<td>115</td>
<td>120</td>
<td>180</td>
<td>240</td>
</tr>
<tr>
<td>Car Curb Spaces Required</td>
<td>8</td>
<td>8</td>
<td>12</td>
<td>16</td>
</tr>
<tr>
<td><strong>Curb Frontage Required (Linear Feet)</strong></td>
<td><strong>192</strong></td>
<td><strong>200</strong></td>
<td><strong>300</strong></td>
<td><strong>400</strong></td>
</tr>
<tr>
<td>Existing Curb Frontage (Linear Feet)</td>
<td>417</td>
<td>417</td>
<td>417</td>
<td>417</td>
</tr>
<tr>
<td>Surplus/(Deficit) (Linear Feet)</td>
<td>225</td>
<td>217</td>
<td>117</td>
<td>17</td>
</tr>
</tbody>
</table>

Source: RS&H Analysis, 2014
3.6 AVIATION SUPPORT FACILITIES

Support facilities at an airport encompass a broad set of functions that exist to ensure the smooth and efficient operations of the airport’s primary role and mission. The support facilities at Casper/Natrona County International Airport which were evaluated in this Master Plan Update include:

» Aircraft Rescue and Fire Fighting Equipment and Facility
» Air Traffic Control Tower
» Snow Removal Equipment and Maintenance Facility
» Commercial Spaceport
» Air Cargo Facilities
» Aircraft Fuel
» Deicing
» Utilities
» Apron
» Aircraft Hangars
» Aircraft Tie-Downs
» Fixed Based Operators (FBO)

3.6.1 Aircraft Rescue and Fire Fighting Equipment and Facility

Airports that serve scheduled and unscheduled air carrier flights are required to provide firefighting facilities and equipment. ARFF equipment requirements for FAR Part 139 airports are determined by an index ranking based on aircraft size, number and type of emergency vehicles, and number of scheduled daily aircraft departures.

The largest scheduled passenger aircraft operating at Casper/Natrona County International Airport is Allegiant’s MD-83. Per CFR Title 14 Part 139.315, this aircraft falls into Index C requirements; however, because it operates less than an average of five times per day, only Index B requirements are required. As published by the FAA, the Casper/Natrona County International Airport is FAR Part 139 Class I, with an ARFF Index B.

The Airport has three ARFF vehicles including a 1995 E-One Titan in good condition, a 2009 Rosenbauer Panther in excellent condition, and a Becker Fastak 500 in good condition. ARFF Index B can be met by either the E-One Titan or the Rosenbauer. Combining both the E-One and the Rosenbauer, ARFF Index C requirements are met.

The ARFF vehicles are housed in an 8,029 square foot building that functions as the base of operations for the Public Safety Department. In addition to ARFF response, the Public Safety Department is responsible for airport operations as well as police and structure firefighting functions. The building is in fair condition and is adequate for ARFF specific functions throughout the planning period with minimal building and mechanical upgrades. Discussions with Airport staff indicated that the building is currently beyond capacity.
as it relates to the whole of the Public Safety Department. Additional space is required to meet the needs of the non-ARFF related functions.

The number and type of ARFF vehicles are currently adequate. It is recommended that as the vehicles age and become more costly to operate and maintain, they be replaced by newer vehicles with the same or greater capability. Typically, the end-of-useful-life for an ARFF vehicle is 15 years. The primary ARFF vehicle used to meet Index B, in this case the Rosenbauer Panther, should be replaced before that time.

3.6.2 Air Traffic Control Tower
The Air Traffic Control Tower facility at CPR consists of a non-standard functional shaft/tower cab combination with an attached base building. The tower was constructed in 1954 and the one story base building was constructed in 1992.

A Condition Assessment and 6480.17 Facility Evaluation Report was completed in 2012 to assess the overall condition of the facility with respect to structural and mechanical issues, as well as issues relating to the 2009 International Building Code, the 2009 National Fire Protection Association Code, and Air Traffic Control facility requirements as defined in FAA Order 6480.17. The study identified a variety of discrepancies that carried an estimated cost of resolution of $1,765,439. For comparison purposes, the study identified a replacement cost of $4,964,667, based on costs estimated at the time of the study.

However, the Condition Assessment did not address one primary shortcoming of the existing facility. The ATCT’s current controller eye height of 44’6” results in an angle of incidence of 0.42 degrees at the Runway 3 end and 0.27 degrees at the Runway 8 end, when a minimum acceptable angle is defined by FAA as 0.80 degrees; therefore, at the current location, the controller eye height should be at least 85 feet to provide a proper lookdown angle for the Runway 3 end and 109 feet to provide the proper lookdown angle for the Runway 8 end.

Assessing both the feasibility and desirability of replacing the ATCT with a more efficient, modern, and taller structure at its current location or at alternate locations will require an ATCT Siting Study, which would be conducted following the provisions in FAA Order 6480.4B Airport Traffic Control Tower Siting Process. The process outlined in the Order involves analyzing a minimum of three viable locations, conducting a Comparative Safety Assessment and completing a Safety Risk Management Document on the selection process and the preferred site. Subsequently, an Environmental Assessment would be required before the project could be constructed.

3.6.3 Snow Removal Equipment and Maintenance Facility
The need for airport snow removal equipment (SRE) and maintenance facilities correlates to the amount of pavement, buildings, and overall grounds maintained by an Airport. Currently, the Airport’s SRE and maintenance facility is comprised of multiple buildings in the northeast section of the Airport’s business park. A primary 17,928 square foot building and four supplemental buildings are used to house

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4 Jacob Engineering, 2012
maintenance equipment, workshops, and snow removal equipment. The current facility is extremely undersized, is inefficiently designed, and is in poor condition.

In 2013, the Snow Removal Equipment Facility Concept and Budget Report prepared by Mead and Hunt was completed. The study addressed the shortfalls of the current facility. It quantified the FAA required snow removal requirements and analyzed space requirements and siting alternatives for a new SRE and maintenance facility that would fulfill the Airport’s needs. As illustrated in Table 3-27, the study found that a new 75,000 square foot facility is required. The Study’s findings and alternative analysis was validated and will be carried forward in this Master Plan Update in the Alternatives and Implementation chapters.

### Table 3-27
**SRE Equipment and Maintenance Building Requirements**

<table>
<thead>
<tr>
<th></th>
<th>Existing</th>
<th>2017</th>
<th>2022</th>
<th>2032</th>
</tr>
</thead>
<tbody>
<tr>
<td>SRE Facility Size</td>
<td>28,000* sf</td>
<td>75,000 sf</td>
<td>75,000 sf</td>
<td>75,000 sf</td>
</tr>
<tr>
<td>Surplus/(Deficit)</td>
<td>(47,000) sf</td>
<td>(47,000) sf</td>
<td>(47,000) sf</td>
<td>(47,000) sf</td>
</tr>
</tbody>
</table>

* Facility size estimated based on exterior footprint

Source: 2013 SRE Facility Concept and Budget Report, Mead and Hunt/Jviation

3.6.4 Commercial Spaceport

In an effort to consider all potential operations and tenants that may be compatible with CPR, a high-level consideration of the Airport’s suitability for operations of horizontal takeoff/landing Reusable Launch Vehicles should be undertaken. Such a study would determine the feasibility of pursuing a Launch Site Operator License from the FAA Office of Commercial Space Transportation (FAA/AST) to enable CPR to offer the site to the operators of reusable space vehicles that take off and land on runways. Of the five airports currently licensed as commercial spaceports, all of them are coastal. CPR’s location may offer a competitive advantage to some operators, which could be further refined during a feasibility study.

The regulations that govern spaceport licensing can be found in Chapter III of Title 14 of the Code of Federal Regulations (CFR) Part 420 – License to Operate a Launch Site, also known as 14 CFR Part 420. These regulations ensure that the operation of the commercial launch site will not jeopardize public health, safety, the safety of property, United States national security, foreign policy interests, and or international obligations of the United States. A feasibility study would determine if CPR is a viable candidate for licensing as a commercial spaceport through an analysis that considers the following items:

- Identification of potential launch vehicles and payloads
- Evaluation of existing facilities at Casper/Natrona County International Airport
- Preliminary airspace evaluation and flight corridor
- Preliminary explosive site plan
- Preliminary environmental review
- Rough order of magnitude (ROM) cost estimate and schedule
3.6.5 Air Cargo Facilities

The 2010 Airport Cargo Study\(^5\) outlined the facility requirements for cargo facilities at Casper/Natrona County International Airport. The findings of that study were validated and are being carried forward within this Master Plan Update. The recommendations made in the study were based on air cargo forecasts, operator needs, and guidelines outlined in the Air Transport Association’s *Facility Planning Guidelines – Air Cargo Facilities* and the Airport Council International – North America’s *Air Cargo Guide*.

Air cargo operators at the Airport include FedEx Express and UPS. FedEx Express operates a stand-alone 9,600 square foot building used for cargo handling, storage, administration and equipment maintenance. This building is a World War II military hangar and is at the end of its useful life. At the time of the Cargo Study, the building was determined to be 30% to 50% undersized. UPS does not currently operate out of a dedicated facility. Instead, packages are brought by truck to the Airport for loading directly onto aircraft, which takes place on Atlantic Aviation’s apron.

Air cargo volume determines the amount of warehouse and maintenance space required. The Cargo Study found that a ratio of 1.5 square feet of warehouse space per ton of cargo lifted is an appropriate planning factor in determining the required size of facilities. As shown in Table 3-28, this ratio was applied to the cargo volume forecast to determine the required amount of warehouse/maintenance space necessary to accommodate future growth. Based on this analysis, the amount of cargo warehouse/maintenance space which is needed within the near term, including 15% extra space for administration, restrooms and break rooms, is roughly 2,000 to 6,000 square feet more than currently exists. Based on the cargo forecast, by 2032 the Airport will require roughly 19,000 square feet more warehouse/maintenance space.

<table>
<thead>
<tr>
<th>Description</th>
<th>Existing</th>
<th>2013</th>
<th>2017</th>
<th>2022</th>
<th>2032</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume</td>
<td>19,392,097 lbs</td>
<td>24,200,000 lbs</td>
<td>28,300,000 lbs</td>
<td>38,800,000 lbs</td>
<td></td>
</tr>
<tr>
<td>Warehouse/Maintenance Space</td>
<td>14,545 sf</td>
<td>18,150 sf</td>
<td>21,225 sf</td>
<td>29,100 sf</td>
<td></td>
</tr>
<tr>
<td>15% additional for admin/other space</td>
<td>2,723 sf</td>
<td>3,184 sf</td>
<td>4,365 sf</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Area SF</td>
<td>14,545 sf</td>
<td>20,873 sf</td>
<td>24,409 sf</td>
<td>33,465 sf</td>
<td></td>
</tr>
<tr>
<td>Total Area SF Surplus / (Deficit)</td>
<td>(6,328 sf)</td>
<td>(9,864 sf)</td>
<td>(18,920 sf)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ground Service Equipment Storage Area</td>
<td>24,000 sf</td>
<td>30,250 sf</td>
<td>35,375 sf</td>
<td>48,500 sf</td>
<td></td>
</tr>
<tr>
<td>Employee/Customer Parking Area</td>
<td>8,727 sf</td>
<td>12,524 sf</td>
<td>14,645 sf</td>
<td>20,079 sf</td>
<td></td>
</tr>
</tbody>
</table>

Source: 2010 Cargo Study, Mead and Hunt, RS&H Analysis, 2014

Facility requirements for ground service equipment (GSE) storage areas and employee/customer parking areas are also necessary for consideration, as these areas must be positioned adjacent to air cargo building facilities. The Cargo Study identified that 2.5 square feet of GSE storage area should be provided for every one ton of annual air cargo. For parking considerations, one space should be provided for every 500 square feet of cargo building, and each parking space is 300 square feet. Using these planning factors, the Airport

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\(^5\) Mead and Hunt, 2010
will require 48,500 square feet of GSE storage space and 67 parking spaces (20,079 square feet) by 2032, as based on the cargo forecast.

Lastly, the FedEx cargo apron requires reconfiguration. Specifically, the current clearance envelope marking around the FedEx parking position is within the Taxiway A OFA. Though aircraft parked in that position remain clear of the OFA, GSE equipment within the envelope could penetrate the OFA. A new clearance envelope is required to ensure GSE equipment and cargo are not placed within the OFA.

3.6.6 Aircraft Fuel Storage

Fuel storage requirements at the Airport depend on the level of aircraft traffic, fleet mix, and fuel delivery schedules. Changes in aircraft fleet mix, for example, air carrier turboprops being replaced by jets, or piston twins being replaced by turboprops, will likely increase demand for Jet-A. Table 3-29 outlines fuel storage requirements for the 20-year planning period for both Jet A Fuel and 100LL Avgas.

### TABLE 3-29
**FUEL FACILITY REQUIREMENTS**

<table>
<thead>
<tr>
<th></th>
<th>Existing</th>
<th>Forecast</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2013  2017  2022  2032</td>
<td></td>
</tr>
<tr>
<td>Peak Month Average Day (PMAD) Operations</td>
<td>140  169  191  249</td>
<td></td>
</tr>
<tr>
<td>100 LL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PMAD Operations</td>
<td>68  85  100  140</td>
<td></td>
</tr>
<tr>
<td>5-Day Fuel Need (Gallons)</td>
<td>3,949  5,521  6,509  9,064</td>
<td></td>
</tr>
<tr>
<td>Available Storage (Gallons)</td>
<td>24,000  24,000  24,000  24,000</td>
<td></td>
</tr>
<tr>
<td>Total Storage for 5 Day Need: Surplus / (Deficit)</td>
<td>20,051  18,479  17,491  14,936</td>
<td></td>
</tr>
<tr>
<td>Jet A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PMAD Operations</td>
<td>72  84  91  109</td>
<td></td>
</tr>
<tr>
<td>5-Day Fuel Need (Gallons)</td>
<td>35,622  44,602  46,089  49,062</td>
<td></td>
</tr>
<tr>
<td>Available Storage (Gallons)</td>
<td>120,000  120,000  120,000  120,000</td>
<td></td>
</tr>
<tr>
<td>Total Storage for 5 Day Need: Surplus / (Deficit)</td>
<td>84,378  75,398  73,911  70,938</td>
<td></td>
</tr>
</tbody>
</table>

Source: RS&H Analysis 2014

As indicated in the inventory chapter, CPR constructed a new fuel farm in 2009 that has capacity for 120,000 gallons of Jet A Fuel and 24,000 gallons of 100LL Avgas. The fuel farm facility was found to have adequate secondary containment, which is provided by a concrete dike. In addition to the fuel farm's 100LL Avgas storage capacity, the Airport also has a 10,000 gallon self-serve station. This station's capacity was not included in this analysis due to its functioning more akin to a stationary fuel truck and not bulk storage.

Analysis of the existing fuel storage capacity was completed to determine the amount of fuel required to satisfy a five day demand. A five day supply of fuel is desirable to ensure there are no gaps in fueling services. The analysis to determine fuel capacity requirements was based on the average amount of annual demand. The analysis indicated that the fuel farm's current Jet A and 100LL capacity will meet the Airport's needs throughout the 20-year planning period.
It should be noted that demand for fuel at CPR typically peaks during the summer season. During those peak times, fuel storage has the potential for dwindling below the amount required to meet 5-days of heavy demand, and fuel deliveries may need to be increased to meet demand. Considering that the forecast indicates an increase in operations by those aircraft that require Jet A, those peak times should be continuously monitored throughout the planning period to ensure Jet A peak demand is adequately met by existing capacity.

In regard to fuel truck parking, the approximately 25,000 square foot cement pad immediately north of the fuel farm is anticipated to meet the demand for fuel truck storage. This area has parking available for 8 fuel trucks with circulation.

3.6.7 Deicing

Aircraft deicing facilities are recommended at airports where icing conditions are anticipated. Deicing activities at the CPR are conducted by Atlantic Aviation using both Type I and Type IV propylene glycol mixtures. The commercial airlines also conduct deicing with Type I. Deicing activities take place on the commercial passenger apron, the FedEx cargo apron, and on the apron in-between the passenger and cargo apron, adjacent to the Warbird Hangar. These areas have drains that flow to a diversion structure where the fluid is diverted into an irrigation pond and allowed to breakdown before being discharged.

The configuration of these designated deicing areas presents operational challenges when deicing general aviation aircraft. Atlantic Aviation is permitted to deice aircraft on the FedEx apron on occasion, but most times must transition to the passenger apron or the Warbird Hangar apron. This requires that aircraft and deice trucks enter the movement area to transition around the FedEx SIDA area. This configuration is not efficient, and it is recommended that the cargo apron and SIDA area be reconfigured to allow better flow for aircraft and equipment transitioning from Atlantic Aviation to the deicing areas.

In regard to deicing fluid, all fluid is stored within vehicles, double wall aboveground storage tanks, or small volume glycol storage totes. The Airport has in place a Stormwater Pollution Prevention Plan (SWPPP) that addresses the containment and outflows of deice chemical and a Spill Prevention, Control, and Countermeasure (SPCC) plan which addresses measures to minimize the potential for unintended discharges. It is recommended that these plans be continually updated and take into account current best practices and current regulations.

For existing airports, aircraft deicing discharge needs to meet requirements in the general National Pollutant Discharge Elimination System (NPDES) permits. CPR must remain under the maximum water discharge guidelines established in the State of Wyoming’s general permit. As operations continue to increase, deicing material runoff will need to be assessed. As the quantity of deicing material runoff increases closer to the guidelines established in the permit, capturing material runoff may become necessary.

3.6.8 Utilities

Utilities at CPR consist of water, sanitary sewer, drainage, storm water, communication, electric, and gas. Utility lines must be continually maintained to meet demand throughout the planning period. The water distribution system, replaced most recently in 1979, is reaching its useful life. With the aging system, water
pressure and quality has frequently been an issue. The Central Wyoming Regional Water System Joint Powers Board is planning to construct a new water tank in 2014. No additional land will be required as the new tank will take the place of the existing water system. This new water system will meet Airport needs during the planning period.

The sanitary sewer system was constructed in 1940. This system’s condition should be assessed during the planning period, as rehabilitation or reconstruction may become necessary. The remaining utility systems should continue to meet demand during the planning period with continued maintenance. As the Airport continues to grow and new facilities are constructed, the utility system will need to be evaluated to determine if additional trunk lines are necessary.

Overall, the Airport’s utilities vary greatly in age and condition. Some utilities are old and require replacement, while some are either in good condition with a mixture of old and new sections. Due to the variances of utility conditions at the Airport, it is recommended that a utility master plan be conducted. A utility master plan would locate and identify each component and section of the existing infrastructure. This data would enable effective replacement planning and would allow for greater efficiencies during future development projects.

3.6.9 Apron
The apron areas at the Airport are located adjacent to Taxiway A and include general aviation (GA) aircraft aprons, a commercial passenger aircraft apron, and commercial cargo aircraft apron. The commercial aprons divide the general aviation aprons into three portions. The far west GA apron is secluded from any GA facilities, and serves as space for firefighting air tanker operations. Because of the limited access and seclusion of this apron, the 15,000 square yard area was not included in the total calculations for apron.

During the apron analysis, it was discovered that all the aprons extend through the Taxiway A object free area (OFA). That part of the apron, between the Taxiway A OFA and the movement area boundary line, was not included in the analysis. Additionally, it should be noted that the measurements used for the apron analysis are approximate, and areas that are used only for circulation were not included.

The FAA Apron Size Calculator and FAA Advisory Circular 150/5300-13A, Appendix 5, was used to determine future GA apron requirements. FAA planning criteria recommends that the amount of GA itinerant aircraft parking positions needed at one time is approximately 50 percent of the peak day itinerant operating aircraft. In regard to the cargo apron, the Cargo Study’s analysis and findings are carried forward, as previously discussed.

As illustrated in Table 3-30, the existing apron has an adequate amount of area to accommodate itinerant aircraft though the planning period. The surplus area of the apron allows for good circulation and traffic flow; however, it is recommended that a painted vehicle service road (VSR) be considered in the future to minimize vehicle disruptions to aircraft operations.

In the near term, the movement area boundary line should be moved further away from Taxiway A and placed outside of the taxiway OFA. Currently, the placement of the movement area boundary line allows
aircraft and vehicles to proceed into the taxiway OFA without getting clearance from the ATCT. This situation creates greater risk for aircraft wing tip collisions and should be rectified.

**TABLE 3-30**

<table>
<thead>
<tr>
<th>Apron Area</th>
<th>Existing 2013</th>
<th>2017</th>
<th>2022</th>
<th>2032</th>
</tr>
</thead>
<tbody>
<tr>
<td>Existing General Aviation Apron (sy)</td>
<td>116,500</td>
<td>116,500</td>
<td>116,500</td>
<td>116,500</td>
</tr>
<tr>
<td>Local Aircraft Apron Requirements (sy)</td>
<td>3,688</td>
<td>4,768</td>
<td>6,667</td>
<td></td>
</tr>
<tr>
<td>Transient Aircraft Apron Requirements (sy)</td>
<td>33,253</td>
<td>36,996</td>
<td>48,991</td>
<td></td>
</tr>
<tr>
<td>General Aviation Apron Surplus / (Deficit)</td>
<td>79,559 sy</td>
<td>74,736 sy</td>
<td>60,842 sy</td>
<td></td>
</tr>
<tr>
<td>Existing Air Cargo Apron (sy)</td>
<td>27,100</td>
<td>27,178</td>
<td>27,178</td>
<td>27,178</td>
</tr>
<tr>
<td>Air Cargo Apron Requirements (sy)</td>
<td>17,200</td>
<td>17,200</td>
<td>22,700</td>
<td></td>
</tr>
<tr>
<td>Air Cargo Apron Surplus / (Deficit)</td>
<td>9,978 sy</td>
<td>9,978 sy</td>
<td>4,478 sy</td>
<td></td>
</tr>
<tr>
<td>Existing Commercial Passenger Apron (sy)</td>
<td>24,500</td>
<td>24,500</td>
<td>24,500</td>
<td>24,500</td>
</tr>
<tr>
<td>Commercial Passenger Apron Requirements (sy)</td>
<td>24,500</td>
<td>24,500</td>
<td>24,500</td>
<td></td>
</tr>
<tr>
<td>Commercial Passenger Apron Surplus / (Deficit)</td>
<td>0 sy</td>
<td>0 sy</td>
<td>0 sy</td>
<td></td>
</tr>
<tr>
<td>Existing Total Apron Area (sy)</td>
<td>168,100</td>
<td>168,178</td>
<td>168,178</td>
<td>168,178</td>
</tr>
<tr>
<td>Total Apron Area Surplus / (Deficit)</td>
<td>89,537 sy</td>
<td>84,714 sy</td>
<td>65,320 sy</td>
<td></td>
</tr>
</tbody>
</table>


### 3.6.10 Aircraft Hangars

The quantity of general aviation hangar space required at an airport depends on the total number of based aircraft, local weather conditions, aircraft fleet mix, airport security, and user preference. Operators of single-engine aircraft and light twins are likely to opt for T-hangars or small box hangars, while general aviation business operators often use large box and corporate hangars for larger twin and jet aircraft.

Due to the climate at CPR, most aircraft are stored in hangars to protect them from wind, cold, and high intensity UV sunlight. There are currently eighty-seven hangars on the Airport, which range in size from small T-hangars to very large WWII era military hangars. T-hangars account for roughly 97,000 square feet of hangar space, and conventional hangars about 207,000 square feet. Conventional hangars include all hangar types larger than a T-hangar.

Note that not all of the 207,000 square feet of conventional hangar space is used for aircraft storage. Much of this space is dedicated to maintenance and storage areas. This factor decreases the total amount of conventional hangar space that is available for aircraft storage.

Discussions with Airport and FBO management has indicated the hangars at the Airport are near and/or at capacity. There is currently a strong demand for new hangar space. This is evidenced by the Airport’s 26-person and Atlantic Aviation’s 18-person waitlist for T-hangars as well as recent requests to Airport management for new corporate hangars. Considering these factors, analysis was conducted to determine
future hangar requirements. Using the forecast of based aircraft, it was determined that 51 new hangars, or 102,225 square feet, would be required within the planning period, as illustrated in Table 3-31.

<table>
<thead>
<tr>
<th>Description</th>
<th>Existing</th>
<th>Forecast</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2013</td>
<td>2017</td>
</tr>
<tr>
<td>Total Based Aircraft</td>
<td>123</td>
<td>132</td>
</tr>
<tr>
<td><strong>T-Hangars (Existing: 76 Hangars, 97,000 SF)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Additional T Hangars Needed</td>
<td>-</td>
<td>7</td>
</tr>
<tr>
<td>Additional T-Hangars SF Needed</td>
<td>-</td>
<td>8,925</td>
</tr>
<tr>
<td><strong>Conventional Hangars (Existing: 11 Hangars, 207,000 SF)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Additional Box Hangars Needed</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Additional Box Hangars SF Needed</td>
<td>-</td>
<td>2,500</td>
</tr>
<tr>
<td>Additional Corporate Hangars Needed</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Additional Corporate Hangar SF Needed</td>
<td>-</td>
<td>10,000</td>
</tr>
</tbody>
</table>

Source: RS&H Analysis, 2014

The hangar requirements account for newly based helicopters sharing a box style hangar. Furthermore, all multi-engine and turbo-prop aircraft were planned to require individual box hangars. Jet aircraft were planned to require individual corporate hangars, and single engine aircraft planned to require T-hangars. These planning factors were used to ensure an adequate amount of land is preserved for future development.

### 3.6.11 Aircraft Tie-Downs

Aircraft tie-downs are used primarily by transient aircraft. Typically, single engine aircraft and small multi-engine aircraft use tie-downs when parked outside during windy days or when they remain overnight. In order to develop demand for aircraft tie-downs, a transient aircraft peak was developed. The peak was used to determine the number of single engine and small multi-engine aircraft that would be using tie-downs, which is illustrated in Table 3-32. For planning purposes, 50 percent of the traffic on the peak day was assumed to use the general aviation ramp, and 40 percent of those aircraft were assumed to be on the ground using the tie-downs at the same time. With consideration to frequency of high wind events in Casper Wyoming, the planning factors used were conservative to ensure tie-down demand would be met throughout the planning period.
Due to the anticipated increase in itinerant aircraft over the next 20 years, the analysis indicated a need for three additional tie-downs by the end of the planning period. If the fleet mix continues to trend toward an increase of larger multi-engine and jet aircraft that do not require tie-downs, or additional short-term hangar storage expands, the current tie-downs may be sufficient through the planning period.

### 3.6.12 Fixed Based Operators (FBO)

Fixed Based Operators (FBO) provide a range of aeronautical services that can include fueling, hangar facilities, aircraft rental, aircraft maintenance, flight instruction and terminal facilities. FBO’s are either full service or limited service facilities. Atlantic Aviation is currently the only full service FBO at the Airport, and it provides aircraft fueling services, aircraft ground handling, oxygen services, aircraft parking, hangar rental, power units, and aircraft maintenance. The FBO also offers both 100LL Avgas and Jet A fuel.

There are also multiple limited service FBOs in operation at CPR. Crosswind Aviation, Natrona Aviation, M&N Aviation and Imperial Aviation provide other services including flight instruction, aircraft rental, aerial photography, charter services, avionics installation, and aircraft maintenance services. Crosswind Aviation is a flight school which provides both ground and flight instruction. Mechanical services are provided by Natrona Avionics. These companies provide heavy airframe and power plant maintenance along with cockpit avionics, maintenance, and installation.

The general aviation support facilities at CPR were compared to other airports in the region that are similar in size to the Airport. Operations, enplanements, and based aircraft were used to define the size of comparable airports. The analysis also included a comparison of services at airports that have annual operations similar to the forecasted number of operations at CPR.

The Airport’s operations in 2013 were 43,206 with 77,000 forecasted operations by the end of the 20-year planning period. The comparative airport analysis indicated that current FBO services meet or exceed other airports of similar size. In addition, in discussions with the Airport’s FBOs, it was established that the existing aeronautical support services are adequate to meet current demand. However, it was noted that the Airport currently lacks a Part 61 flight school as Crosswind Aviation operates only as a Part 141 flight school. Having a Part 61 school at CPR would provide additional pilot training options for new and learning pilots. As operations increase through the planning period, demand for services will also increase. As such, existing FBOs will need to grow and/or new FBOs may be needed to meet demand. Locations for new facilities should be reserved.
3.7 SUMMARY OF AIRPORT FACILITY NEEDS

The airport facilities requirements needed to adequately accommodate the forecast activity, address FAA design standards, and meet the strategic goals for the Airport have been addressed within this chapter. Certain facility requirements identified in this chapter will require further analysis to determine the optimum layout and potential, which will be evaluated in Chapter 4, Identification and Evaluation of Alternatives. A summary of the Airport’s facility needs are listed below in Table 3-33.

### Table 3-33
SUMMARY OF AIRPORT FACILITY NEEDS

<table>
<thead>
<tr>
<th>Item</th>
<th>Identified Need</th>
</tr>
</thead>
<tbody>
<tr>
<td>Runway 8 Blast Pad</td>
<td>Add 3 feet in length to Runway 8 blast pad</td>
</tr>
<tr>
<td>Runway 8-26 Shoulders</td>
<td>Add 25 foot wide paved shoulders on Runway 8-26</td>
</tr>
<tr>
<td>Runway Protection Zones (RPZs)</td>
<td>Upgrade Runway 21 RPZ dimensions to that required for RNAV approach</td>
</tr>
<tr>
<td>Taxiways (all taxiways)</td>
<td>Add 30 foot wide paved shoulders to all taxiways</td>
</tr>
<tr>
<td>Taxiway A1, A2, C, B1</td>
<td>Move hold line an additional 4 feet back from runway centerline</td>
</tr>
<tr>
<td>Taxiway A1, A2, A3, A4, A5, A6, A7, C1, C2</td>
<td>Reconfigure fillets to comply with new FAA specifications</td>
</tr>
<tr>
<td>Taxiway A4</td>
<td>Prevent direct access from the aircraft apron to the runway</td>
</tr>
<tr>
<td>Taxiway C / A5</td>
<td>Reconfigure taxiways to address FAA designated “Hot Spot”</td>
</tr>
<tr>
<td>Taxiway A7</td>
<td>Remove pavement so that the outer edge of the turn is curved</td>
</tr>
<tr>
<td>Intersection Runway / Taxiway A6</td>
<td>Reconfigure intersection to address FAA designated “Hot Spot”</td>
</tr>
<tr>
<td>Intersection: Taxiway A / B and B / B1</td>
<td>Reconfigure fillet geometry to comply with new FAA specifications</td>
</tr>
<tr>
<td>Pavement: Runway / Taxiway / Apron</td>
<td>Conduct a pavement strength survey to identify pavement in need of strengthening</td>
</tr>
<tr>
<td>Visual Aids</td>
<td>Replace Runway 3-21 and 8-26 lighting electrical components</td>
</tr>
<tr>
<td>Visual Aids</td>
<td>Replace Taxiway A light base cans</td>
</tr>
<tr>
<td>Visual Aids</td>
<td>Replace Taxiway B, B1, C, and C1 lighting electrical components</td>
</tr>
<tr>
<td>Visual Aids</td>
<td>Install tethers to all airfield signs, repaint faded frames, and remove non-standard panels</td>
</tr>
<tr>
<td>Navigational Aids</td>
<td>Replace all VASI systems with PAPI systems</td>
</tr>
<tr>
<td>Navigational Aids</td>
<td>Replace roofs</td>
</tr>
<tr>
<td>Navigational Aids</td>
<td>Relocate primary wind cone and segmented circle</td>
</tr>
<tr>
<td>Navigational Aids</td>
<td>Remove wind cone between Taxiway A3 and A4</td>
</tr>
<tr>
<td>Navigational Aids</td>
<td>Relocate wind cones outside the runway OFA and place within longitudinal limits</td>
</tr>
<tr>
<td>Commercial Passenger Terminal</td>
<td>Modify facility to accommodate future passenger demand</td>
</tr>
<tr>
<td>Public Parking</td>
<td>Preserve 320,608 sf of land for future public parking</td>
</tr>
<tr>
<td>Rental Car Parking and Facilities</td>
<td>Reserve 27,105 sf of land for future rental car parking and Quick-Turn facility</td>
</tr>
<tr>
<td>Air Traffic Control Tower</td>
<td>Replace ATCT</td>
</tr>
<tr>
<td>Snow Removal Equipment Building</td>
<td>Replace snow removal equipment and maintenance building</td>
</tr>
<tr>
<td>Public Safety Department/ARFF Facility</td>
<td>Expand Public Safety Department/ARFF Facility</td>
</tr>
<tr>
<td>Utilities</td>
<td>Conduct utility master plan to inventory and assess existing utility infrastructure</td>
</tr>
<tr>
<td>Movement Area Boundary</td>
<td>Repaint movement area boundary line outside of Taxiway A and B Object Free Area</td>
</tr>
<tr>
<td>Deicing</td>
<td>Reconfigure apron area for more efficient deicing operations</td>
</tr>
<tr>
<td>Air Cargo</td>
<td>Preserve land for an additional 18,920 sf of warehouse space, 24,500 sf of GSE storage, and 11,352 sf of parking</td>
</tr>
<tr>
<td>Hangars</td>
<td>Preserve land for an additional 102,225 sf of hangar space</td>
</tr>
</tbody>
</table>

Source: RS&H Analysis, 2014
CHAPTER 4

ALTERNATIVES ANALYSIS
This chapter consolidates the preferred development solutions determined within previous planning studies, and identifies and evaluates additional facility development alternatives for Casper/Natrona County International Airport. These alternatives are designed to meet the following objectives:

» Adhere to safe operational standards set by the FAA, State of Wyoming, and the Airport Board of Trustees.

» Meet the facility demand requirements outlined in the Chapter 3, Facility Requirements

» Satisfy the strategic objectives and goals of the Airport Board of Trustees

The result of this analysis is a cohesive plan for Airport development that functionally combines all recommended improvements. This plan will enable the Airport Board of Trustees to effectively develop the Airport facilities so that they remain a leading transportation asset for Natrona County and the State of Wyoming.

As identified in Chapter 3, Facility Requirements, certain facility needs require further analysis to determine the optimum layout. A summary of the major Airport facilities to be addressed within this chapter is listed in Table 4-1. The alternatives are divided into two groups: leading elements and trailing elements. Leading elements are primary facilities that require significant amounts of land and/or capital investment to implement and whose placement and configuration must take precedence when formulating alternatives. Trailing elements are those whose placement and configuration are influenced by, and dependent on, the decisions made for primary facilities. This division allows the initial focus of analysis to be on determining solutions for the primary facilities which will later influence less critical facilities. Subsequent to defining the preferred alternative of the leading elements, the trailing elements can then be analyzed.

Leading elements are typically facilities such as runways and taxiways, terminal buildings, and other high cost assets that other facilities must be built around. Trailing elements are those facilities that have greater flexibility regarding their location and land area requirements. For this master plan, some leading elements did not require multiple alternatives because they had either been selected as a preferred alternative in a prior study, or their function was such that no other alternative was necessary.
### TABLE 4-1
**ALTERNATIVE ELEMENTS**

<table>
<thead>
<tr>
<th>Item</th>
<th>Identified Need</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>LEADING ELEMENTS</strong></td>
<td></td>
</tr>
<tr>
<td>Airfield</td>
<td></td>
</tr>
<tr>
<td>Intersection: Runway / Taxiway A6</td>
<td>Reconfigure intersection to address FAA designated &quot;Hot Spot&quot;</td>
</tr>
<tr>
<td>Intersection: Taxiway A / B and B / B1</td>
<td>Reconfigure fillet geometry to comply with new FAA specifications</td>
</tr>
<tr>
<td>Runway 8 Blast Pad</td>
<td>Add 3 feet in length to Runway 8 blast pad</td>
</tr>
<tr>
<td>Runway 8-26 Shoulders</td>
<td>Add 25 foot wide paved shoulders on Runway 8-26</td>
</tr>
<tr>
<td>Taxiways (all taxiways)</td>
<td>Add 30 foot wide paved shoulders to all taxiways</td>
</tr>
<tr>
<td>Taxiway A1, A2, C, B1</td>
<td>Move hold line an additional 4 feet back from runway centerline</td>
</tr>
<tr>
<td>Taxiway A1, A2, A3, A4, A5, A6, A7, C1, C2</td>
<td>Reconfigure fillets to comply with new FAA specifications</td>
</tr>
<tr>
<td>Taxiway A4</td>
<td>Prevent direct access from the aircraft apron the runway</td>
</tr>
<tr>
<td>Taxiway C / A5</td>
<td>Reconfigure taxiways to address FAA designated &quot;Hot Spot&quot;</td>
</tr>
<tr>
<td>Taxiway A7</td>
<td>Remove pavement so that the outer edge of the turn is curved</td>
</tr>
<tr>
<td>Taxiway B1</td>
<td>Reconfigure Taxiway B1 to enter Runway 8-26 at a 90 degree angle</td>
</tr>
<tr>
<td><strong>Commercial Terminal</strong></td>
<td></td>
</tr>
<tr>
<td>Commercial Passenger Terminal</td>
<td>Modify facility to accommodate future passenger demand</td>
</tr>
<tr>
<td><strong>Airport Traffic Control Tower</strong></td>
<td></td>
</tr>
<tr>
<td>Airport Traffic Control Tower</td>
<td>Replace the existing Airport Traffic Control Tower (ATCT)</td>
</tr>
<tr>
<td><strong>TRAILING ELEMENTS</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Air Cargo</strong></td>
<td></td>
</tr>
<tr>
<td>Air Cargo Facilities</td>
<td>Preserve land for an additional 18,920 sf of interior warehouse space, 24,500 sf of exterior GSE storage, and 11,352 sf of vehicle parking</td>
</tr>
<tr>
<td><strong>Hangars</strong></td>
<td></td>
</tr>
<tr>
<td>General Aviation Hangars</td>
<td>Preserve land for an additional 102,225 sf of hangar space</td>
</tr>
<tr>
<td><strong>Snow Removal Equipment</strong></td>
<td></td>
</tr>
<tr>
<td>Snow Removal Equipment Building</td>
<td>Replace snow removal equipment and maintenance building</td>
</tr>
<tr>
<td><strong>Rental Car</strong></td>
<td></td>
</tr>
<tr>
<td>Rental Car Parking and Facilities</td>
<td>Preserve 27,105 sf of land for future rental car parking and Quick-Turn facility</td>
</tr>
<tr>
<td><strong>Vehicle Terminal Parking</strong></td>
<td></td>
</tr>
<tr>
<td>Public Parking</td>
<td>Preserve 320,608 sf of land for future public parking</td>
</tr>
</tbody>
</table>

Source: RS&H Analysis, 2014

#### 4.1 ALTERNATIVE DEVELOPMENT AND EVALUATION

The process of determining viable alternatives, and the preferred development plan, was performed in a series of steps. First, preferred development alternatives identified within previous studies were consolidated so they could be integrated within this master plan. Next, preliminary alternatives were created to address the requirements detailed within the Facility Requirements Chapter. These were then put through an initial screening process. Those that failed to meet the minimum facility requirements were eliminated. The remaining preliminary alternatives were then refined into conceptual alternatives which would meet facility needs through the 20-year planning period. These were then evaluated against each other in effort to determine a preferred alternative that would be carried forward into a comprehensive development plan.
4.1.1 Identification of Alternatives

The process of determining viable alternatives and ultimately the preferred development plan is performed in a series of interrelated steps. The first step creates conceptual derivatives based upon Airport management’s strategic vision. Factors that drive the alternative development process are directly related to current infrastructure limitations identified from the facility requirement analysis. Further, the process was designed to meet the forecasted aviation demand for the 20-year planning horizon. A number of factors that influence development options were considered during the alternatives process and are outlined below:

» FAA Airport Design Standards
» Passenger Enplanements
» Aircraft Operations
» Land Development Strategies
» Fiscal Factors
» Operational Performance
» Environmental Factors

These factors provided the framework necessary to formulate feasible development alternatives to meet future growth at the Airport. The factors were used to evaluate each of the preliminary alternatives to assess the degree to which each alternative would meet the minimum airport requirements. Objectives for each of the factors were established to define the criteria from which each alternative would be compared.

4.1.2 Evaluation of Alternatives

The evaluation of the alternatives is guided by a combination of general planning criteria and client goals. Based upon the development factors previously identified, the following objectives were established for the evaluation of the alternatives:

» FAA Airport Design Standards
   Conforms to best practices for safety and security
   Conforms to the FAA design standards and other appropriate planning guidelines

» Passenger Enplanements
   Allows for incremental growth beyond the planning period

» Aircraft Operations
   Meets operational needs today and within the planning period

» Land Development Strategies
   Provides for the highest and best on- and off-Airport land use

» Fiscal Factors
   Project costs have a realistic potential for funding
Operational Performance

Functions well as part of the Airport system

Environmental Factors

Minimizes environmental effects and can meet environmental requirements

These guiding objectives and criteria have been applied to each potential development alternative within each main airport area of study (airfield, terminal, and support facilities). Alternatives were then reviewed and analyzed by the planning team, Airport management, and Airport stakeholders. This process led to a determination of a preferred alternative for each element.

Not all identified solutions warranted a review of alternatives within each area of study. In some cases, it is clear that alternatives addressing specified needs do not require further evaluation. This is true for improvements that are essential to meet FAA design standards, and to establish airport infrastructure that supports the preferred alternatives. These improvements are discussed throughout this chapter.

4.2 LEADING ELEMENTS

The leading elements for this study include the airfield, commercial passenger terminal, and airport traffic control tower. The following is an overview of the various alternatives for each element.

4.2.1 Airfield

The airfield is the Airport’s primary asset, and as such, requires first consideration when planning for future facilities. Multiple elements were identified for analysis within this section. Some of these elements were identified in the Facility Requirements Chapter, while others were studied outside the master plan process. For clarity, the airfield elements requiring attention in this chapter were broken down into four sub-categories: Taxiway A6 Hot Spot, Taxiway A5 Hot Spot, bypass taxiway, and airfield enhancements.

4.2.1.1 Taxiway A6 Hot Spot

The FAA has identified two locations on the airfield as Hot Spots. These included the intersection of Taxiway A6 and the Airport’s two runways, and Taxiway A5 and Runway 3-21. The FAA defines a Hot Spot as “a location on an airport movement area with a history of potential risk of collision or runway incursion.” Figure 4-1 shows the locations of several hot spots on the airfield which require mitigation and their proposed solutions. Additionally, the figure illustrates numerous airfield upgrades, which will be discussed in this Chapter. Prior to the onset of the Master Plan, RS&H completed an analysis of the Taxiway A6 Hot Spot, which is included in Appendix B. The preferred solution, illustrated in Figure 4-1, included the removal of Taxiway A6 and the extension of Taxiway C to the full length of Runway 3-21. Since that study was completed in the beginning of 2013, the old Taxiway A6 has been removed and a new Taxiway A6 has been constructed. All other improvements remain conceptual.

4.2.1.2 Taxiway A5 Hot Spot and Direct Apron-Runway Access

The Taxiway A5 Hot Spot remained an issue to be evaluated within this Master Plan Update. The FAA’s primary concern with Taxiway A5 is the direct access it provides from the apron to Runway 3-21. Advisory Circular 150/5300-13A Change 1 (referred to as “AC” within this section) discourages direct access from an
apron to a runway. The alternative analysis was limited due to the number of potential options available that can solve the problem of direct access. Options include removing the associated connector taxiways, removing the apron, or creating an island barrier to prevent direct access. An evaluation of these three options concluded with a preferred solution, shown in Figure 4-1, which integrates the use of no-taxi island barriers. No-taxi islands can be created through lighting and painted markings or with grass/dirt turf. This solution has been successfully implemented at numerous airports around the country in an effort to address direct apron-to-runway access issues. At CPR, the analysis indicated that this solution is feasible; however further consideration is required for future aircraft parking and taxi lane configurations. These considerations were brought forward in the creation and evaluation of all other affected leading elements. Taxiway A4 has the same problem as Taxiway A5, and thus requires a similar solution.

It should be noted that Taxiway A5 (A5/C) is also deficient according to the AC due to its crossing of Runway 3-21 within the middle third portion of the runway. The middle third of a runway is considered a “high energy” zone where aircraft have the lowest ability to stop or maneuver. As such, runway crossings in that zone can pose safety issues. This is a complex issue at CPR because the A5/C crossing is the primary access to Taxiway C and the northern section of Runway 8-26. The connection cannot easily be replaced or substituted.

The preferred solution proposes that the Taxiway A5/C crossing remain through the planning period. Once the Taxiway A6 solution is fully implemented and Taxiway C extends the full length of Runway 8-26, the decommissioning of the existing portion of Taxiway C should be examined. The analysis determined four primary arguments supporting this recommendation:

» The intersection has not previously been identified by FAA or the Airport as creating safety issues due to the mid-runway crossing.
» Because Runway 8-26 is a secondary crosswind runway, it is likely that only that runway will be in use when aircraft are crossing Runway 3-21 at the Taxiway A5/C intersection.
» A majority of operations at the Airport are by aircraft that will be either airborne or slowed to taxi speed by the time they reach Taxiway A5/C when landing on Runway 3-21. This negates the basis of the “high energy” related safety concerns.
» The ATCT is in very close proximity to the intersection, allowing controllers the ability to closely monitor aircraft in vicinity of Taxiway A5 and Runway 3-21.
**Source:** RS&H Analysis, 2014

**Airfield Enhancements**

<table>
<thead>
<tr>
<th>Description of Enhancements</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. 25 foot wide shoulders on Runway 8-26</td>
</tr>
<tr>
<td>2. 30 foot wide shoulders on all taxiways</td>
</tr>
<tr>
<td>3. Fillet geometry reconfigured on all intersections to meet FAA standards</td>
</tr>
<tr>
<td>4. Relocate movement area boundary line</td>
</tr>
<tr>
<td>5. A7 outer edge of pavement removed</td>
</tr>
</tbody>
</table>

**Legend:**
- New Pavement
- Pavement to be Removed
- Island
- FAA Hot Spot
4.2.1.3  Bypass Taxiway

During the master planning process, the FAA runway safety action team (RSAT) determined that an evaluation was warranted to determine if the Airport required run-up areas adjacent to the Runway 26 and Runway 21 thresholds. A standalone analysis was conducted, and is included as Appendix C. Based on capacity, the analysis indicated the Airport may require a run-up area by the end of the planning period, however the new AC requirements for run-up areas (or holding bays) demand a configuration that is in excess of the Airport’s needs. In discussions with the Denver FAA Airport District Office (ADO), a bypass taxiway was determined to be the preferred solution. The analysis indicated that only Runway 21 would require the bypass taxiway, as Runway 26 is benefited by Taxiway A that can be used as a bypass taxiway. The future bypass taxiway for Runway 21 is illustrated in Figure 4-2.

![Bypass Taxiway Diagram]

Source: RS&H Analysis, 2014

4.2.1.4  Airfield Enhancements

The facility requirements identified deficiencies within the airfield of pavement sections that do not meet AC 150/5300-13A Change 1. These elements include taxiway fillet geometry, entrance taxiway design, and taxiway and runway shoulders. Additionally, the existing movement area boundary line was found to be within the
Taxiway A Object Free Area (OFA). To be compliant, the boundary line must be relocated to the south of its current location. All of these elements, except for the movement area boundary line, are not safety critical and should be remedied during future rehabilitation projects. Figure 4-1 shows the geometry and location of the solutions to these deficiencies.

The analysis and evaluation of the airfield alternatives and solutions provided consideration for how each element would integrate into the airfield system as a whole. Therefore, the impacts of the no-taxi islands and the relocation of the movement area boundary line were also assessed. Through this process it was determined that a vehicle service road (VSR) along the southern edge of the movement area boundary line should be implemented in the future.

In discussions with members of the Technical Advisory Committee (TAC), a future VSR was supported. The TAC agreed that without a consolidated lane for vehicles traversing the apron, the risk of aircraft collision is increased, and SIDA’s are more likely to be breached. These issues will likely increase when the movement area boundary line is relocated and the apron becomes more constricted. Thus, the preferred alternative includes a VSR to help operational flows and minimize the potential for vehicle related incidents on the apron.

4.2.2 Commercial Passenger Terminal

This section describes the three alternatives developed to address the passenger terminal’s space deficiencies. For the purpose of this section, the alternatives are defined as solutions because each includes components that can be integrated independently. As opposed to having to choose one preferred alternative with all its proposed improvements, this approach allows for actual implementation to include a blend of each solution’s components based on funding levels and demand.

At the onset of the master plan study, Airport management provided the project team input in regards to functional areas of the terminal that were providing a lower level of service than the Airport deemed acceptable. During the development of the facility requirements chapter of this study, a programmatic space analysis of the terminal was conducted based on ACI/IATA planning factors to obtain an overall Level of Service (LOS) ‘C’ in each space. The analysis quantified the space deficiencies of those areas noted by Airport management as well as other areas that would become deficient based on the three demand level forecasts outlined in the Facility Requirements Chapter: Near Term; Future Growth-Low; and Future Growth-High. The deficient spaces identified include baggage claim, Transportation Security Administration (TSA) baggage screening, airside and landside restrooms, TSA passenger screening, and passenger departure lounges.

4.2.2.1 Consideration for Customs and Border Protection

In addition to the deficient spaces identified in the Facility Requirements Chapter, it was determined that terminal configurations should include considerations for Customs and Border Protection (CBP) operations. Currently, Casper is the only Airport within the State of Wyoming with CBP services. The CBP Port at Casper accommodates “informal entry” which includes general aviation flights. CBP staff operate out of an office within Atlantic Aviation and a small office within the terminal building. With the existing staff and facilities, no commercial service passenger flights can currently be accommodated.

As of the writing of this document, the Airport was in the process of working with CPB to design a new General Aviation Facility (GAF) which would provide the CBP specified amount of space for general aviation processing.
operations. A GAF is essentially the core of a Federal Inspection Service (FIS) facility, which is the facility necessary to process commercial airline passengers. A study conducted in 2013\(^1\) provided a high level analysis of the prospects of international commercial passenger service at CPR. The study found that due to CPR’s market share and location, there is potential demand for tourist driven commercial flights from CPR to vacation destinations such as Mexico. For this demand to materialize into actual service, an FIS facility would be required at CPR. As such, each solution offers different sizes and level of CBP processing facilities. These include a GAF, an FIS to accommodate one flight, and an FIS to accommodate two flights. No matter what the future holds in regard to CBP services at Casper, the solutions proposed all serve to retain space for future CBP needs.

4.2.2.2 Solution Based Approach

Subsequent to the analysis being completed, a design workshop was held with Airport management. With Airport management’s direct input, the project team was able to develop three concept based solutions. These included a solution that would address the terminal buildings existing deficiencies with annual enplanements around 110,000; a solution that would address the low forecast of approximately 155,000 annual enplanements; and a solution that would accommodate the full potential of the CPR market which is forecasted to be approximately 230,000 annual enplanements.

Each solution features specific functional components that can be applied interchangeably. Additionally, the concepts build upon each other to meet the forecasted increasing demand levels. The advantage of this approach is that it allows Airport management and the project team to better understand economies that can be gained by implementing a level of build out over that which would be required to meet immediate or short-term demand. It also allows for an implementation plan which combines components in a custom tailored fashion to best meet the Airport’s desired level of service with consideration to funding levels available.

The following subsections provide an overview of each solution. Each overview is broken into airside and landside components, and includes phasing and constructability considerations. It should be noted too that each of the solutions provides space for use by the Airport’s Law Enforcement Officers (LEO), as well as space for Customs and Border Projection (CBP) operations. Like the other functional spaces, the CBP space proposed in each solution can be implemented independently. As such, the CBP spaces shown in these solutions are each different in regards to their capability to serve general aviation and commercial service passengers.

4.2.2.2.1 Near Term Solution

The Near Term solution, illustrated in Figure 4-3, is based on the facility requirements for accommodating 110,000 annual passenger enplanements, a need for two gates during peak times of the day, and a holdroom that accommodates 200 passengers. The existing terminal is deficient, does not accommodate the forecast demand, and requires immediate attention. The solution provides the most minimal adjustment to the functional spaces. The functional landside and airside elements are described in detail below.

\(^1\) CPR Federal Inspection Service Facility, Trillion Aviation, 2013
LANDSIDE ELEMENTS

Deficient landside elements to be remedied in this solution include baggage claim, Customs and Border Protection (CBP), and law enforcement officer (LEO) spaces. These are described below.

**Baggage Claim** – While the existing baggage claim satisfies the facility requirements in regard to quantity of space, its location is such that space allocations between other functions overlap and create congestion. Additionally, the baggage belt system has reached its maximum life span. In this solution, the three rental car offices which are currently adjacent to ticketing are relocated to a small addition east of the bag claim lobby. The space provided by this allows the existing baggage claim lobby and the adjacent inbound baggage area to expand toward ticketing. A new baggage carousel is also added to the bag claim lobby as part of this renovation. The rental car office addition would be constructed first, allowing the existing rental car companies to relocate. The existing rental car offices and adjacent support spaces would then be demolished, and the area would be renovated. The bag claim lobby and inbound baggage area, while constricted, would continue to operate through construction. However, some vehicle parking spots north of the bag claim lobby would be relocated to accommodate the expansion.

**CBP Facility** – In this solution, the western end of the terminal’s landside is renovated to accommodate a general aviation (GA) facility with customs and border protection (CBP) capabilities. GA passengers enter the facility from the apron at the west end of the terminal on the airside. Once processed, the passengers exit out the west end of the terminal on the landside. All existing functions in this portion of the terminal would be relocated, allowing the space to be fully converted to CBP space. Concurrently, two new vestibules on the west side of the space would be constructed; an entrance on the airside and exit on the landside.

**LEO Room** – The LEO room is a space required by the airport’s law enforcement officers to temporarily detain passengers who pose a potential threat. In order to serve its purpose, the LEO room is required to be centrally located near the security screening checkpoint in the landside portion of the terminal. While there is not a specific facility requirement for the LEO Room, Airport Management and law enforcement staff provided a recommended office size. This space would be built out during renovations to the airline ticket office (ATO) spaces. This new room is carried forward exactly in all the solutions.

AIRSIDE ELEMENTS

Deficient airside elements to be remedied include TSA screening, departure lounge, and restroom spaces. These are described below.

**TSA Baggage Screening** – Currently, baggage screening is conducted in the ticket lobby and requires its own secure space in order to conform to TSA standards. Additionally, although the existing terminal has enough area for ticketing and support space, it is recommended that these areas be reconfigured and right-sized in order to operate more efficiently. In this solution, the area behind ticketing is renovated to accommodate a new in-line baggage screening system. Two baggage belts will be installed, running along the back wall of ticketing through baggage screening to an interior outbound baggage space. In order to complete this portion of work, the airline functions behind ticketing must be temporarily relocated and the ticket counters shifted into the ticket lobby. The area behind ticketing will then be renovated and new baggage equipment installed.
This work will temporarily impact the operations of ticketing and baggage screening, but can be phased to minimize this impact.

**Passenger Departure Lounges** – At peak times, the existing departure lounge exceeds capacity, and Airport staff must escort passengers to an upstairs room. When these events take place, the departure lounge reaches a LOS E, which is an unacceptable LOS. This solution provides a remedy by renovating the upstairs room, converting it to a dedicated, secure, passenger lounge. Access to the second floor lounge is provided by a new stair and elevator core added to the southwest corner of the existing lounge. Additionally, a new airside concession space and passenger boarding bridge gate is added to the second floor. In regards to construction of the additions, the western end of the existing departure lounge and a portion of the adjacent aircraft apron will be blocked temporarily. During construction the departure lounge will be partially reduced in size, but will remain fully operational.

**Airside Restrooms** – The terminal’s existing airside restrooms on the ground floor, though slightly smaller than the recommended size, were identified as being sufficient in regard to the required number of fixtures. However, with the second floor being converted into dedicated holdroom space, the second floor restrooms will need enhancements. In this solution, the existing second floor restrooms remain in their current location, but are renovated and expanded. This portion of work would begin after the addition to the south side of the departure lounge is complete. Once complete, the storage space adjacent to the second floor restrooms will be relocated to the newly added first floor storage space. The second floor restrooms will then be renovated and expanded. During this renovation, the existing first floor airside restrooms will remain operational to minimize the impact to airside passengers.

**SUMMARY**

Overall, this solution provides immediate relief for those spaces in the terminal that are currently congested and offer low levels of service to passengers during busy peak times of the day. The holdroom LOS is greatly enhanced with the use of the second floor and added concession options. However, the split level configuration is not optimal as it will deter some passengers from taking advantage of concession offerings.

The baggage claim renovation provides the space necessary for the activities of departing passengers queuing in the ticket lobby to be separated from those of the arriving passengers at the bag claim belts and rental car counters, increasing the overall level of service for the landside lobby. The TSA baggage screening renovations will provide the required secured bag screening room, right-size the ATO spaces, and allow for a linear outbound baggage space with tug pull-through capability. However, only one tug at a time will be able to access the outbound and inbound baggage spaces.

The primary cost impacts of the landside projects will result from the additional baggage claim equipment as well as the rental car addition, which will require an expansion of the terminal's structure, exterior envelope, and roof. The primary cost impacts of the airside projects will be the construction of the departure lounge addition and new elevator, as well as the new passenger boarding bridge and baggage belt equipment.
FIGURE 4-3
NEAR TERM TERMINAL SOLUTION

Source: RS&H Analysis, 2014
4.2.2.2 Future Growth – Low Scenario Solution

The Future Growth – Low solution, illustrated in Figure 4-4, is based on the facility requirements for accommodating 155,000 annual passenger enplanements, a need for three gates during peak times of the day, and a holdroom that accommodates 260 passengers. The solution grows and adds upon the expansions and renovations proposed in the Near Term Solution. Specifically, this solution adds a concourse jet bridge from the second floor, another TSA passenger screening lane, expanded rental car space, and a mini-inline baggage screening system. The functional landside and airside elements are described in detail below.

**LANDSIDE ELEMENTS**

Deficient landside elements to be remedied in this solution are baggage claim, CBP, and LEO spaces. These are described below.

**Baggage Claim** – This solution expands upon that proposal for the Near Term solution. The rental car offices are further expanded with additional queue space provided. This configuration provides additional dedicated space for both the baggage claim and rental car offices, and prevents passengers from spilling into each adjacent space during peak times. The LOS of both spaces is enhanced and will hold LOS ‘C’ during peak periods. In addition, a small entry/exit vestibule is provided to the south of the new rental car office, which allows for better flow of passengers picking up their bags, getting their rental car, and exiting the building. The construction would be completed in the same manner as the Near Term solution, and would have a similar impact on existing operations.

**CBP Facility** – The CBP Facility in this solution is similar to that of the Near Term solution, but will require additional space to accommodate additional commercial service (CS) operations. Space is adequate to serve general aviation operations as well as one commercial service passenger flight per hour. As in the Near Term solution, passengers enter the facility from the apron at the west end of the terminal on the airside. Once processed however, passengers will exit through the terminal’s landside lobby.

**LEO Room** – The LEO Room proposed is the same as that in the Near Term solution.

**AIRSIDE ELEMENTS**

Deficient airside elements to be remedied include TSA screening, departure lounge, and restroom spaces. These are described below.

**TSA Baggage Screening** – Similar to the Near Term solution, this reconfigures and right-sizes the ATO space. It includes a new and extended baggage belt. A mini-inline baggage screening system would be implemented to increase operational efficiency and provide greater capacity for peak hour operations. This portion of work would be completed in a similar manner to that required for the Near Term solution, and would have similar impacts to existing ticketing and bag screening operations.

**TSA Screening Checkpoint** – The demand levels associated with this solution require additional capacity of the TSA passenger screening checkpoint. Thus, the checkpoint is expanded to the east to allow for one additional screening lane and a new secured deplaning corridor. The third screening lane provides additional
capacity as well as redundancy. In addition to the extra screening lane, a portion of the landside lobby space in front of the checkpoint will become dedicated passenger queueing. Essentially, this entails a queuing lane be set up which, by creating a formal and organized line, will increase capacity of that space. In order to complete this portion of work, the western edge of the existing checkpoint will be demolished and expanded. As a result, a temporary alternative path will need to be established for deplaning passengers.

**Passenger Departure Lounges** – For this solution, the same vertical circulation core and airside concession is proposed as was in the Near Term solution. A concourse bridge is included, extending west from the departure lounge and linking to a new stair and elevator core west of the terminal. This concourse bridge includes two additional passenger boarding bridges which will allow for all three required gates to be on the second level. Additionally, the gate at the south end of the concourse bridge could be utilized as a swing gate, allowing international flights to exit the concourse via the new stair and elevator core. This portion of work would be completed in a similar manner as the Near Term solution, albeit with a longer construction time.

**Airside Restrooms** – The airside restroom expansion is the same as that proposed in the Near Term solution.

**SUMMARY**

Overall, this solution improves the functions and capabilities of the existing terminal, provides opportunities for future growth, and enhances level of service. The baggage claim modifications further the benefits of the Near Term solution by providing additional office space for future rental car companies as well as a dedicated rental car queue space, which will significantly improve level of service. With the renovation of the landside’s west end into a GA / CS / CBP Facility, the Airport will expand its ability to accommodate international general aviation and commercial service passengers.

The concourse bridge allows for two additional jet bridges on the second floor. This addition provides the ability to serve every aircraft with a boarding bridge throughout the day, including during peak times. The holdroom configuration remains divided between two floors, which is not optimal. The TSA screening renovations (passenger and baggage) increase overall capacity and streamline operations. The outbound baggage addition will provide a more efficient tug pull-through operation capable of accommodating two tugs at once. The inbound baggage will be limited to one tug. Finally, the landside restrooms remain confined to one location at the west end of the landside lobby, away from the bag claim area.

The primary cost impacts of the landside projects will result from the additional baggage claim equipment as well as the rental car addition, which will require an expansion of the terminal’s structure, exterior envelope and roof. The cost impacts of the airside projects will be the construction of the departure lounge and screening checkpoint additions, as well as the new elevators. Additional cost considerations include the new passenger boarding bridges as well as the baggage belt equipment and associated infrastructure.
FIGURE 4-4
FUTURE GROWTH – LOW TERMINAL SOLUTION

Source: RS&H Analysis, 2014
4.2.2.3  Future Growth – High Scenario Solution

The Future Growth – High solution, illustrated in Figure 4-5, is based on the facility requirements to accommodate 228,000 annual passenger enplanements, a need for four gates during peak times of the day, and a holdroom that accommodates 320 passengers. The level of passenger demand associated with this scenario represents the full potential of air service at CPR over the planning period. This level of passenger demand requires greater changes and enhancements to the terminal which go beyond small renovations. As such, there is opportunity for the terminal expansion projects to not only address capacity needs, but to greatly enhance the look, feel, and passenger experience of the terminal overall.

The solution that was developed to address the needs of the high growth scenario builds upon the previously described solutions, and includes a reconfiguration of the departure lounge and passenger screening components of the building. Other major enhancements provided in this solution are baggage claim carousels, a second landside restroom, and further expansion of inbound and outbound baggage spaces. A detailed description of the proposed improvements is provided below.

**LANDSIDE ELEMENTS**

Deficient landside elements to be remedied include in this solution are baggage claim, landside restrooms, CBP, and LEO spaces. These are described below.

**Baggage Claim** – Similar to the previous solutions, this solution proposes the rental car offices be relocated into an addition east of the baggage claim lobby. The expansion fills the eastern end to the terminal’s landside, allowing space for five rental car offices with dedicated queue space, an additional landside restroom, and a new exit / entry vestibule aligned with the rental car parking lot. The expansion also provides the space required for two circular baggage carousels, served from belts below, allowing maximum circulation around each carrousel. The inbound baggage space will also be expanded and reoriented to allow for a more efficient baggage tug pull-through operation.

While the baggage claim renovation would be completed in a manner similar to the previous solutions, additional phasing is required. The installation of the new baggage carousels would be phased to maintain existing operation by keeping a portion of the existing system intact as the first carousel is installed. Additionally, the inbound baggage area will require the relocation of functions currently residing north of the existing bag claim.

**Landside Restrooms** – This solution features the addition of a second landside restroom constructed adjacent to the rental car facilities. The second restroom provides additional capacity as well as redundancy for those instances where one of the restrooms is out of service for maintenance or cleaning. Additionally, the location of this restroom provides greater convenience for those passengers who are waiting at baggage claim or car rental.

**CBP Facility** – To accommodate international commercial service and GA customs and border protection operations, the majority of the western portion of the terminal will be renovated, including the landside concession space. Space is adequate to serve general aviation operations as well as two simultaneous commercial passenger flights per hour. Additional first floor space for the CBP Facility is provided northwest of
the terminal as part of the second floor departure lounge expansion. As in the other solutions, any existing operations in the western portion of the terminal are relocated, allowing the space to be renovated. Once the departure lounge project is completed, the CBP Facility will reach its full expansion.

**LEO Room** – The LEO Room is developed in the same manner as in the previous solutions.

**AIRSIDE ELEMENTS**

Airside elements include TSA screening, departure lounge, and restroom spaces. These are described below.

**TSA Baggage Screening** – This solution builds upon the previous solutions baggage screening renovations and includes additional outbound baggage space sized to accommodate three baggage tugs simultaneously. Behind ticketing, the ATO and Baggage Screening Room would be arranged similar to the configuration proposed in the Near Term solution. However, with the outbound baggage operation accommodated in this addition, the baggage screening and ATO spaces can utilize the full extent of the renovated space behind ticketing. This portion of work would be completed in a similar manner as the previous solutions, and would have comparable operational impacts.

**TSA Screening Checkpoint** – Three screening lanes will be included, similar to the Future Growth – Low solution. However, in this solution, the passenger screening checkpoint lanes are rotated 90 degrees to allow for additional screening equipment space. The former checkpoint area is renovated into an enlarged passenger queue. A corridor after the security checkpoint allows passengers to circulate north to the existing passenger departure lounge, or south to a new stair/escalator/elevator core leading to the new second floor departure lounge. The work of expanding the checkpoint will need to occur in conjunction with the passenger departure lounge project, and will be phased in order to allow a portion of the existing checkpoint to remain operational while the addition is under construction.

**Passenger Departure Lounges** – The passenger demand levels associated with this solution require greater holdroom space than can fit within the terminal's existing envelope. As such, this solution includes a large second floor addition between the proposed concourse bridge and the southern face of the terminal. The existing second floor space will be connected to the new area allowing for all holdrooms and gates to be moved to the second level. The expansion will also include a second restroom and another concession space.

The passenger departure lounge addition will be phased and constructed with the security checkpoint and CBP expansion on the first floor. The renovation of the existing second floor space would be completed first to ensure uninterrupted operations. The rest of the expansion will take place concurrently with the construction of the new second floor departure lounge, first floor screening checkpoint, and CBP expansion. Once completed, all four gates will be on the second floor and will be served by passenger boarding bridges.

**Airside Restrooms** – For this solution, the existing airside restrooms are renovated in the same manner as the previous solution. As mentioned, an additional set of restrooms will be constructed within the new second floor holdroom expansion.
SUMMARY

This solution provides the space required to meet the future demand levels associated with the High Growth forecast scenario. Moreover, the solution greatly enhances the passenger experience at CPR. Passenger flows though the terminal are improved, baggage and passenger screening systems are enhanced, and all passenger departure lounge functions are brought upstairs to a space that will be constructed in a manner similar to all modern terminal facilities.

In regard to functionality, the baggage claim provides more circulation and rental counter queue space as well as an additional restroom, significantly improving level of service. The expanded inbound baggage space provides for greater efficiencies, which equates to arriving passengers receiving their bags faster. The outbound baggage addition will provide a more efficient tug pull-through operation capable of accommodating three tugs at once. Finally, the passenger departure lounge allows for purpose built concession areas, panoramic views of the airfield, and modern amenities such as electronic device charging stations.

As in the previous solutions, there appears to be adequate space available for the landside renovations and additions proposed. The main cost impacts of these projects will result from the baggage claim and rental car addition, which will require an expansion of the terminal's structure, exterior envelope and roof. Additionally, the cost of the new baggage claim carousels and associated equipment and infrastructure will also be a consideration.

The scale the projects, both landside and airside, necessitate a series of phases. Although this phasing will be temporary, it will significantly impact passenger and airport operations. Also, due to the extent of the interior renovations, such as the inbound baggage expansion and CBP Facility, numerous office, storage and other support spaces will need to be permanently relocated.
FIGURE 4-5
FUTURE GROWTH – HIGH TERMINAL SOLUTION

Source: RS&H Analysis, 2014
4.2.2.3 Considerations for Implementation

The solutions presented each solve the space deficiencies identified based on specific demand levels. Every functional component included in the solutions can be implemented independently, or together. The challenge for all Airport operators is in determining when and how to implement new terminal expansions to solve today’s issues while planning for future growth. Because these solutions are based on a tiered approach, efficiencies in phasing can be obtained.

For example, when evaluating the level at which the rental car area should be expanded, an understanding of how each phase effects the rest of the terminal functions can more easily be determined. In this instance, the high growth based solution might be a better immediate option for implementation because it will provide additional space in the lobby that could be utilized for continuing operations during other projects.

For all the work represented in these solutions, further analysis of the existing terminal’s structure and building systems (electric, HVAC, plumbing, fire safety, etc.) will be required prior to construction to determine more clearly the ease with which the work can be accomplished. It is estimated that adequate space (building and aircraft apron space) is available for all renovations and additions proposed.

In the next chapter, Implementation, a plan is presented that details the short and long term build out of the terminal.

4.2.3 Airport Traffic Control Tower

The Facility Requirements Chapter provided an overview of the current condition of the Airport’s Air Traffic Control Tower (ATCT). That chapter discussed the previous condition assessment that was conducted on the facility which outlined numerous upgrades and rehabilitation elements that will be required within the planning period. Additionally, it was noted that the current tower cab is not high enough to meet FAA requirements for the ATCT controller eye height. It was determined that the tower will either need to be replaced, or numerous structural and mechanical improvements will be required within the planning period.

As part of this master plan, an ATCT siting study was conducted in accordance with Federal Aviation Administration Order 6480.4B Airport Traffic Control Tower Siting Process. The process entailed a detailed analysis and evaluation of potential sites around the Airport in an effort to identify three sites that are preferable and suitable for a future ATCT. The three preferred sites were included on the Airport Layout Plan so that the land is preserved in the future. The following is a general overview of the siting study’s process and findings. Refer to Appendix D for the detailed report.

4.2.3.1 Siting Study Process

At the beginning of the siting study, a total of eight sites were chosen for analysis and evaluation. The sites chosen for the initial evaluation were based on areas of the Airport that would provide a reasonable location and vantage point for an ATCT. Each was evaluated on their ability to best meet specific criteria outlined in Chapter 8- Alternate Siting Process of Order 6480.4B. The criteria includes visibility performance requirements; instrument approach procedures with vertical guidance; impacts to communications, navigation, and surveillance equipment; operational requirements; and overall cost. To evaluate visibility performance, a shadow study was conducted to determine the areas of the Airport that would be blocked from view by
buildings or other structures. The overall cost of each site was heavily influenced by the height required for the tower cab and infrastructure requirements.

All eight sites were vetted by CPR ATCT staff and Airport staff, and the alternatives were narrowed to four sites. The ATCT controllers and tower management further examined each site for its ability to enhance safety and best serve the needs of controllers. The four sites were culled down to three final sites, which were moved forward in the siting study process. This included a Form 7460-1 Notice of Proposed Construction or Alteration being filed with the FAA for each site location. Each site will be included on the Airport Layout Plan, and the FAA will make a final determination of which site to use prior to construction.

4.2.3.2 Preferred Site Descriptions

The final three sites chosen in the siting study, illustrated in Figure 4-6, each have advantages and disadvantages, which are discussed below. As mentioned, all three sites were included as land use reservations on the Airport Layout Plan. Note that these three sites are all preferred at this time, and that no one site was determined to perform better than the others at this stage in the process.

FIGURE 4-6
AIR TRAFFIC CONTROL TOWER SITES

Source: RS&H Analysis, 2014
**Site 1** – This site proposes a tower height of 156 feet with 12 floors. The preliminary cost estimate for this option is $7.3M. The site is in very close proximity to the existing ATCT, and thus roadway infrastructure and utilities are already in place to serve a new building. The site is in an area designated for aeronautical development, which makes an ATCT an applicable land use. Additionally, the ATCT controllers are accustomed to and enjoy the existing location of the ATCT. As such, the controllers have a comfort level attributed to the familiarity of the location, which is an advantage over the other sites.

The site has two primary disadvantages. One disadvantage is that the height of the ATCT tower cab needed to meet the required controller eye height adds additional cost. Second, the site’s location behind the aircraft hangars prevents controllers from seeing the entire aircraft apron. Visibility issues, caused by what is referred to as shadowing, were also found all along the apron and on a section of Taxiway B. Taxiway B is a controlled surface, and shadowing of a controlled surface is not acceptable. The section of Taxiway B that is shadowed is planned for future removal, which would eliminate the issue. However, if the shadowed section is not removed, then the hangar creating the visual obstruction would need to be removed.

**Site 2** – This site proposes a tower height of 128 feet with nine floors. The preliminary cost estimate for this option is $7.4M. The site is located between the two runways and west of Taxiway C. The site’s location allows for a moderate height, which reduces the cost of the structure. The site appropriately uses the land, does not detract from any other land use, and could act as a catalyst for new aeronautical development near the site in the future. The site also provides an unobstructed view of all aircraft operating areas.

Because the site is a greenfield area, a new roadway must be constructed from Highway 20/26 to the new site. Additionally, all utilities will be required to be brought into the new location, which is why the costs are higher than Site 1. An analysis of the existing utility infrastructure identified water and power lines adjacent to the site. However, natural gas was identified as a potential challenge to bring to the site.

**Site 3** – This site proposes a tower height of 109 feet with seven floors. The preliminary cost estimate for this option is $7.8M. The site is located north of Runway 8-26 and east of Johnson Lateral Road. The site’s elevation allows for a tower that is lower in height than all the other preferred sites. This site also does not use land that could be used otherwise for aeronautical development. Additionally, the site provides an unobstructed view of all aircraft operating areas.

The site is a greenfield, and will require new roadway infrastructure and utilities to be brought into the site. These factors are what drive the overall cost higher than the other two options. An analysis of existing utilities determined that water and three phase power is available near the site. Like Site 2, natural gas will be more difficult to bring into the area. The site also may prove challenging to access during the winter time due to its distance off primary roadways.
4.3 TRAILING ELEMENTS

The trailing elements in this study include air cargo facilities, aircraft hangars, the snow removal equipment storage facility, rental car parking and facilities, and vehicle parking in the terminal area. The following is an overview of the analysis and chosen preferred solution for each element.

4.3.1 Air Cargo

The 2010 Airport Cargo Study, outlined the facility requirements for cargo facilities at Casper/Natrona County International Airport. The findings of that study were validated and carried forward within this Master Plan Update. The study identified three alternatives that would accommodate the cargo operator’s future growth. These three alternatives are depicted and discussed below.

4.3.1.1 Air Cargo Facility Alternative 1A

Alternative 1A, shown in Figure 4-7, proposes the construction of a new air cargo building southwest of the current FedEx Express building. This alternative places the new building 50 feet closer to the apron and flight-line than the existing building which allows for additional truck movement on the landside. The new location is not anticipated to reduce apron space. However, Part 77 surfaces dictate a reconfiguration of parking positions so that the Boeing 757 and Airbus 300/310 tails do not penetrate the transitional surface. The long term solution proposes that the cargo building would expand to the west which will require removal of the Warbird Hangar.

The taxilane that provides access to the T-hangars behind the existing FedEx building would be relocated west of the Warbird Hangar. This configuration can facilitate new hangar development, but will have additional costs associated with construction. The current taxilane divides the air cargo apron and SIDA area which creates operational challenges. The new taxilane configuration would allow for a consolidated, un-divided air cargo apron and SIDA area.

In the illustrated configuration, the airfield and apron enhancements identified in Section 4.2.1 are depicted to better understand the apron’s operating area. The need for these enhancements are detailed in the Facility Requirement’s Chapter and include a VSR, the relocation of the movement area boundary to the south, and no-taxi island barriers in front of Taxiway A4 and Taxiway A5. If these enhancements are implemented, the new taxilane configuration of Alternative 1A would aid in ensuring operational efficiencies and the maximum amount of un-interrupted cargo apron.

4.3.1.2 Air Cargo Facility Alternative 1B

Alternative 1B, shown in Figure 4-8, is similar to 1A, albeit the new cargo building is proposed to be constructed east of the taxilane that separates the Warbird Hangar from the existing FedEx building. The configuration necessitates the removal of the old Atlantic Aviation building to provide room for ground service equipment and vehicle parking. Because the taxilane adjacent to the Warbird Hangar does not require relocation, as in Alternative 1A, the aircraft apron and SIDA area remain divided. In addition, future airfield enhancements could require further reconfiguration of the taxilane’s geometry to access the movement area. Fiscally, this alternative is the least expensive because no new taxilane construction is required. The final layout would be dependent on air-cargo operator’s needs and the future design of the no-taxi islands.

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2 Mead & Hunt, 2010
4.3.1.3 Air Cargo Facility Alternative 2

Alternative 2, shown in Figure 4-9, proposed a new site for the air cargo facility on the southeastern portion of the Airport’s landside. The cargo study eliminated this option due to the cost associated for building a new ramp and a new cargo building. Since that study was completed, the Airport has started design for a new snow removal equipment facility that will be built on the Alternative 2 site (see Section 4.3.3). However, the advantages of the site should be noted. These include: separation of cargo operations from other aircraft operators; a large area for future facility expansion; a SIDA separated from public and commercial apron; and the space to accommodate consolidation with cargo ground operations.

4.3.1.4 Evaluation of the Air Cargo Alternatives

Alternative 1A had been selected as the preferred at the conclusion of the Air Cargo Study. The alternative was evaluated independently as part of the master plan study, and was found to effectively meet the evaluation criteria listed in Section 4.1.2. The alternative was thus carried forward as the preferred alternative for this master plan. It was noted that the location of the new cargo building could be adjusted to the east to allow expansion without the need to remove the Warbird Hangar. However, in the long term, the Warbird Hangar will need to be relocated to allow for additional GSE and vehicle parking.
FIGURE 4-7
CARGO ALTERNATIVE 1A

Cargo Alternative 1A

- New Cargo Building
- Ground Service Equipment (GSE)
- Vehicle Parking
- Existing Structures
- Structures Removed

Aircraft
- Airbus A300
- ATR 42
- Fairchild Swearingen Metroliner
- Cessna 208 Grand Caravan
Cargo Alternative 1B

- New Cargo Building
- Ground Service Equipment (GSE)
- Vehicle Parking
- Existing Structures
- Structures Removed

Aircraft
- Airbus A300
- ATR 42
- Fairchild Swearingen Metroliner
- Cessna 208 Grand Caravan

Concept from Airport Cargo Study, Mead & Hunt, 2010

FIGURE 4-8 CARGO ALTERNATIVE 1B
Cargo Alternative 2

Concept from Airport Cargo Study, Mead & Hunt, 2010
4.3.2 Aircraft Hangars

The Facility Requirements Chapter indicated that by 2032 the Airport would need an additional 39 T-hangars (49,725 square feet), nine medium sized box hangars (22,500 square feet), and three large corporate hangars (30,000 square feet).

Preliminary alternatives were created, each accommodating some or all of the hangar requirements in various locations around the Airport. The alternatives were presented to the Technical Advisory Committee (TAC) and Public Advisory Committee (PAC) to garner feedback and additional recommendations. The primary recommendation from that meeting was the need for flexibility in regard to the type, location, and quantity of future development. It was evident that aircraft storage demand exists; however, demand alone does not bring development to fruition. Instead, private investment based on proven financial feasibility is required. For this reason, it was deemed critical that all areas which are chosen for future development have the ability to accommodate any of the three types of hangars, as needed.

Subsequent to the PAC and TAC meetings, the preliminary alternatives were refined into a final set of preferred alternatives. Each of these work together to meet the Airport’s hangar facility requirements. Flexibility is built into each alternative, in that any of the concepts can be adjusted in the future to accommodate a different type of hangar development. Albeit, some alternatives, based on their location, better accommodate specific types of development.

The preferred alternatives are named based on their proximity on the Airport, and include: West Development; Infill Development; Werner Street Development; East Development, and South Development.

4.3.2.1 West Development

This development encompasses the area of undeveloped land immediately west of the commercial passenger terminal. The alternative proposes the extension of the aircraft apron to the west and a new taxiway connector to Taxiway A. As illustrated in Figure 4-10, this area is reserved for large hangar development. The area is optimal for large aircraft storage, aircraft manufactures, air cargo operations, or any other aeronautical use that requires a large quantity of land. Consolidating large aircraft to the west of the terminal building helps the Airport segregate large from small aircraft that are affected by jet blast.

The alternative proposes access be provided in the near term via Airport Parkway. Long term access will be provided by a collector road that will link the new development to the intersection of Michie Drive and Skinner Avenue. Aeronautical uses would remain along the flight-line, and immediately south of the proposed east/west access road. Non-aeronautical development would be encouraged further south of the east/west access road. The configuration of the development allows for on-demand expansion of both aeronautical and non-aeronautical facilities, allowing growth to take place from Airport Parkway, westward.

Overall, the development would be an appropriate land use and would aid in enhancing safety and operational efficiencies in the apron areas.
West Hangar Development

Source: RS&H Analysis, 2014

FIGURE 4-10
WEST HANGAR DEVELOPMENT
4.3.2.2 Infill Development

The existing flight-line at CPR was found to have potential opportunities for future large hangar development. Two sites were identified: The existing site of the Airport Traffic Control Tower (ATCT), and another site to the east of the ATCT. Each of these sites, as shown in Figure 4-11, are located within the Airport’s primary general aviation flight-line. As such, it is recommended that these sites eventually be re-developed with high quality structures that require access to the aircraft apron and benefit from high visibility. This could include FBO services that benefit from close proximity to GA activities, corporate hangars, and other types of hangar development that accommodate large aircraft. This type of development has been determined to be the highest and best use for these sites.

Timing is a challenge as it relates to the ATCT site. As discussed earlier in this chapter, the existing ATCT is slated for eventual relocation; However it is unknown if the tower will be relocated within the planning period. As such, this infill option cannot be counted upon to help in meeting the future hangar facility requirements. The other site to the east of the ATCT is currently available for development. As of this writing, the Airport has reserved this space for large hangar development, which is anticipated to occur in the near future.

*FIGURE 4-11
INFILL HANGAR DEVELOPMENT*
4.3.2.3 Warner Street Development

In 2012, the Airport commissioned a 30 percent design for a future hangar development along the east end of Warner Street. The development took into account the future cargo building location and the relocation of the taxi lane, that provides access to the existing T-hangars behind the cargo facility. The development, as shown in Figure 4-12, requires the removal of one of the antiquated T-hangar rows west of the Warbird Hangar to allow for an Aircraft Design Group (ADG) II object free area along the taxi lane.

The development features one 100 foot x 100 foot corporate hangar, eleven 50 foot x 50 foot box hangars, and nine T-hangars. The area offers a large degree of flexibility, in that multiple T-hangar rows or large corporate hangars could substitute the box hangars if demand warranted. Once the taxi lane is reconfigured, a phased approach can be used to accommodate demand as needed. If demand shifts over the course of the planning period, and a different type of hangar is demanded, a new reconfigured design can be completed for the next phase of development.

Consideration should be given to the layout of future utility infrastructure to maximize the flexibility of the next phases of development for the site. Additionally, the development, as shown, has one entrance/exit which may create congestion and operational difficulties as more hangars, and aircraft, are added into the area. This situation is dependent on how future hangars are used and by what types of aircraft. Congestion at the entrance/exit could be remedied by adding an additional taxi lane to the west of the one proposed. This would require the removal of another old T-hangar row, and would prevent the large corporate hangar from being constructed in the location shown. To account for the potential need for a second taxi lane access point, it is recommended that the area around the entrance/exit be the last developed. This will allow the Airport to determine if another access point is needed based on the actual operations taking place in the new development area.

Overall, this development alternative maintains a consolidated general aviation area that is close to other services, such as the terminal’s restaurant and the FBO. It makes good use of the land, and provides the flexibility to accommodate box hangars, T-hangars, and corporate hangars.
Werner Street Development

- New Hangars/Buildings
- New Apron Pavement
- Proposed Vehicle Roadway and Parking
- Existing Structures
- Structures Removed
- Island Barrier
- Existing Cargo Area

Concept from General Aviation Hangar Development Area (CPFA-45A), Aviation, 2012

FIGURE 4-12
WERNER STREET DEVELOPMENT
4.3.2.4 East Development

This alternative proposes a new hangar development on the east side of the Airport, south of Taxiway B. The development, as shown in Figure 4-13, is configured to accommodate all the hangars anticipated to be required by 2032. The development takes advantage of the large amount of undeveloped land within the southeastern portion of Airport property. Though the development is primarily on a greenfield site, some existing pavement infrastructure can be used including the taxilane south of Taxiway B and a portion of decommissioned Runway 30.

Access to the development is via two north/south roadways that would converge, turn to the west, and then intersect with Allen Avenue. The roads could also be extended to the south to meet Commerce Drive. The roadway configuration shown is designed to prevent vehicles from having to cross either of the primary north/south taxilanes. A vehicle service road will allow access from the box hangars to the T-hangar development. The roadway configuration shown is recommended as a long term solution. In the near term, access can be provided via Werner Street, which would decrease initial infrastructure related costs.

Aircraft access to the airfield is via the north/south taxilanes that intersect Taxiway B. As part of the Taxiway A6 solution discussed in Section 4.2.1.1, Taxiway B is slated for future removal. At that point, this alternative proposes that the pavement surface remain and become a non-movement taxilane. Until Taxiway B becomes an uncontrolled surface, consideration of operational procedures will be necessary as the western taxilane will intersect a movement area (Taxiway B), while the eastern taxilane will intersect the uncontrolled aircraft apron area. As shown the east taxilane is designed for ADG II, and the west for ADG III. The area provides flexibility for these to be scaled up or down as necessary.

Overall, the development is flexible and highly expandable. The dual taxilane configuration enhances safety and the operational performance of the development. The concept can be phased from Taxiway B south. The primary constraint is the Part 77 transitional surface which will limit the northern most development opportunities. Otherwise, the area can be expanded south and east down to Commerce Drive, allowing for small to very large hangar development.
East Hangar Development

Source: RS&H Analysis, 2014
4.3.2.5 South Development

This alternative proposes a new hangar development south of the existing general aviation flight line. As illustrated in Figure 4-14, the taxi lane on the east side of Atlantic Aviation would be extended to the south to connect the currently undeveloped land adjacent to Jourgensen Avenue. The northern section of Jourgensen Avenue would be converted into a taxi lane. This would divide Werner Street, which was the largest impact identified with the configuration. The alternative did consider fuel farm operations, and adequate space was provided for the movement of large tanker trucks.

The existing taxiway that connects the apron to the T-hangar row behind Atlantic Aviation is built to accommodate ADG I aircraft. This factor limits the type of hangars that are appropriate in the proposed development area. Only box hangars holding multiple aircraft or single aircraft T-hangars would be built in the development area. The illustration of the alternative depicts five T-hangar rows to demonstrate the amount of area available at the site. T-hangars could be substituted for box hangars as demand warranted.

It should be noted that the layout, as proposed, has a single exit/entry taxi lane into the new development area. Conflict between aircraft entering and exiting the hangars is possible. To help mitigate this conflict, a bypass area was included in the northern section of the layout to allow departing aircraft to give way to aircraft entering the development. Additionally, circulation is provided on the east and west sides of the hangar rows.

This alternative required consideration of the Airport’s Historic District requirements because the development is within the District boundary, and six historic structures currently sit within the proposed development area. The location of the development was found to offer an opportunity to enhance the Historic District. This includes densifying the heart of the Historic District through the relocation of various historic buildings around the Airport, including the six within the development area. This effort would help restore the historic layout and feeling of the District.

The development also provides the opportunity for a static aircraft display to be built adjacent to the Veterans Museum. The Warbird Hangar and two other historic buildings could be relocated adjacent to the development, with the new taxi lane allowing historical aircraft to be taxied to the display. These undertakings would create a greatly enhanced experience for visitors to the historical museum, while also opening up additional development opportunities on the flight line where the Warbird Hangar sits today.

Overall, the development provides enough area for all the T-hangar requirements with the flexibility for box hangars. It can be scaled in size to meet demand and makes use of undeveloped land. The development does divide Werner Street; however it opens up the possibility for densification of the Historic District, and a static aircraft display adjacent to the historical museum. The development has the potential for conflicts caused by congestion at the entry/exit portion of the taxi lane. The number of hangars built at the site should be determined by the expected activity levels of tenants; the higher the expected activity, the fewer number of hangars should be developed.
FIGURE 4.14
SOUTH HANGAR DEVELOPMENT

Source: RS&H Analysis, 2014
4.3.3 Snow Removal Equipment Building

The 2013 *Snow Removal Equipment (SRE) Facility Concept and Budget Report* addressed the shortfalls of the current facility. It quantified the FAA required snow removal requirements and analyzed space requirements and siting alternatives for a new SRE and maintenance facility that would fulfill the Airport’s needs. In the report, seven sites were evaluated as alternatives. As illustrated in Figure 4-15, Site 2B was chosen in the study as the preferred alternative. That alternative is being carried forward in this Master Plan Update. The location of the building was considered in the final evaluation of all other alternatives brought forth to be included in the development plan.

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Figure 4-15

SNOW REMOVAL EQUIPMENT BUILDING

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\[1\] Mead & Hunt, 2013
4.3.4 Rental Car Parking and Facilities

The Facility Requirements Chapter analysis identified the potential for a future rental car quick-turn-around (QTA) wash and maintenance facility. The alternatives analysis proposed four possible sites for a QTA facility, which are identified in Figure 4-16. The footprint of the QTA facility was based on the size and configuration of a QTA facility recently implemented at an Airport with similar rental car needs as CPR.

A QTA facility can range significantly in size, configuration, and amenities based on the needs of the local rental car companies and the fiscal factors involved in leasing and usage. Final configuration and space requirements for a facility will depend on conversations and agreements with the rental car companies. Some QTA facilities have shared maintenance facilities and fuel tanks for on-site fueling. During discussions with the PAC and TAC, Airport management expressed the desire for a QTA facility that has the ability to accommodate on-site fueling and maintenance, as well as the ability for expansion. Thus, each alternative was evaluated for its ability to expand, as well as for functionality with and without on-site fueling.

The four sites were evaluated based on the evaluation criteria identified in Section 4.1.2. Site B was determined as the preferred alternative for the QTA facility. The site was found to exceed the others in the operational advantages it offered, while maintaining a reasonable cost of implementation and providing the best use of the land. Site B provides a good balance between maintaining flexibility to modify or expand the parking facilities in the vicinity of the terminal as well providing close proximity and immediate access to the existing rental car ready/return lot. It should be noted that for Site B, the location of the existing fuel tanks would require that rental cars cross the main terminal entrance road, which could pose safety concerns. In the long term, it is recommended that fuel tanks be co-located with the rental car QTA facility to provide a single location for cleaning and refueling vehicles.

The following is an overview of the advantages and disadvantages determined from the evaluation of the four sites.

4.3.4.1 QTA Site A

Site A is located immediately to the east of the current rental car ready/return parking lot. This site had the most impact as it would require the removal of a small building that currently occupies the area, and a new roadway access. Overall, the site was determined to have the most disadvantages of all the sites evaluated.

The primary advantage of the site is its close proximity to the rental car ready/return lot, which would reduce workload for rental car employees who shuttle cars between the QTA and the parking lot. Additionally, the short drive to the parking lot would reduce environmental impacts from vehicle emissions. However, it was determined that the site can serve a better use than a QTA facility. Although Site A has close proximity to the rental car ready/return lot, the site is also very visible to airport patrons as they arrive at the terminal building. Car wash and refueling facilities are generally not desirable in highly visible locations where aesthetics are important. A QTA facility does not directly improve the passenger experience but is used by the rental car agencies, therefore it can be moved further away from rental car parking without undo challenges. It was determined that because of site’s immediate proximity to the terminal building, the land would be better used as additional passenger parking or another use that directly enhances the passenger experience.
Lastly, the site is constrained by the terminal loop roadway and rental car parking, making future expansion and implementation of onsite fuel storage tanks difficult and more costly. In addition, during meetings with the PAC and TAC, it was noted that the site would likely not provide enough rental car storage. Because the site cannot be expanded to an adequate size for the Airport’s needs, it was ruled out of contention.

4.3.4.2 QTA Site B
Site B is located south of the rental car ready/return lot and to the east of Michie Drive. The site is further away from the rental car ready/return lot than Site A, yet still close enough to provide employees a short walk between the ready/return lot and the QTA facility. Additionally, the site was judged to have a cost for implementation that is less than Site A, and similar to sites C and D. A potential disadvantage of Site B is that the land is near the passenger terminal and could be used for other purposes, such as passenger parking. However, the site was determined to be far enough away from the terminal building that the land is acceptable for a QTA facility.

The site’s location can be adjusted and expanded as needed to provide space to accommodate additional rental car storage and onsite fuel storage tanks. The site also provides easy access to Werner Street, which is the roadway to the fuel tanks that serve the rental cars. Overall, rental car employees would be centrally located to both the fuel facility and the rental car ready/return parking lot. The central location of the site was determined to provide the QTA the best location to enhance rental car operational performance while also allowing for future expansion.

Site B was evaluated as the most advantageous site of all four sites. Additionally, in meetings with the PAC and TAC, all agreed that Site B was their preferred alternative. As such, Site B was selected as the location to be carried forward into the development plan.

4.3.4.3 QTA Site C
Site C is located south of Airport Parkway and east of Skinner Drive. The location provides ample room for expansion and rental car storage. The site’s distance away from the rental car ready/return parking lot requires employees to shuttle cars between the lot and the QTA facility along the terminal loop roadway, which is not ideal. Additionally, the site is further from the existing fuel storage tanks at the fuel farm on Werner Street, which would require further shuttling distance for rental car employees. The evaluation determined that the site would not enhance the operational performance of a QTA facility, and would increase long term environmental impacts associated with increased vehicle emissions from shuttling between fuel tanks and parking areas.

Though the site offers a large area of land that could be expanded for rental car storage and onsite fuel storage, it is not anticipated that storage requirements would be any greater than sites B and D can accommodate. As such, the location does not prove to have an advantage over the other sites. Additionally, in meetings with the PAC and TAC, it was determined that the long distance between the site and the rental car ready/return lot was not favorable. As such, this alternative was eliminated from further consideration.
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FIGURE 4-16
RENTAL CAR QTA FACILITY

Source: RS&H Analysis, 2014
4.3.4.4 QTA Site D
Site D is located on the southeast corner of Werner Street and Haigler Avenue. The site is within the Airport Historic District, and future development would need to comply with any stipulations outlined in the most current programmatic agreement in place at the time.

The site was selected for evaluation because of its immediate proximity to the Airport’s fuel station. The close proximity allows for the QTA facility to be constructed without on-site fueling. Instead, employees would only need to drive across Werner Street to fuel vehicles. The site also offers expandability. However, the site’s distance away from the rental car ready/return parking lot requires that cars be shuttled between the lot and the facility. This would require rental cars to cross the main terminal entrance road, which could pose safety concerns. This factor made the site score poorly in regard to its ability to increase rental car operational performance and minimize its environmental impact. Additionally, implementation of the site would require approval by the FAA and the Wyoming State Historic Preservation Office (SHPO), and potentially include a Section 106 process.

Overall, this site was evaluated to be a better location for a QTA then sites A and C, but not as good as B. Considering that any of the other sites would likely have fuel storage tanks installed sometime in the future, the primary advantage of Site D is negated. Though the site offers expandability and close proximity to exiting fuel tanks, the distance between it and rental car ready/return lot will never be overcome. Additionally, Site D is the only one of the four that would require extra steps in implementation to satisfy the requirements of the Historic District. These factors combined eliminated Site D from further consideration.

4.3.5 Passenger Terminal Vehicle Parking
In discussions with Airport management, vehicle parking for the terminal building was identified as an issue requiring a prompt solution. The existing parking area is nearing capacity, and at peak times, a turf area off of Werner Street is needed to provide overflow parking. These factors required the preferred alternative to be able to address today’s demand as well as the demand forecasted. The Facility Requirements chapter determined the long term need for approximately 500 and 1,000 additional spaces, respectively, to accommodate the low and high levels of forecasted demand.

Because of the immediate need to expand, and due to the large variance of potential space requirements over the planning period, the preferred alternative necessitated a high degree of flexibility, and a design that offered options for phased expansion. As illustrated in Figure 4-17, the preferred alternative meets these requirements by allowing on-demand expansion that can be integrated into the existing infrastructure. The conceptual layout shown is large enough to accommodate the parking requirements associated with the high-growth passenger forecast, at the end of the planning period. Based on the parking analysis, it was determined that the land within the terminal loop road is large enough to accommodate all future parking needs.

4.3.5.1 Design Elements
The configuration of the parking areas is based on industry best practices and recommendations described in Airport Cooperative Research Program (ACRP) Report 25 Airport Terminal Planning and Design Vol. 1. This includes maintaining short term and rental car ready parking lots within the shortest possible walking distance from the terminal, consolidating parking lot exits to a single payment booth, and creating a tiered structure
where the highest revenue producing lots are placed closest to the terminal building. The layout shown includes the majority of parking within 1,000 feet of the terminal, which is the ACRP recommended maximum walking distance. The southern portions of the long term lots are slightly outside that threshold, but would only be used during seasonal peak times such as the December holiday season. Additionally, these southern-most parking spaces would only be needed by at the end of the planning period based on the high-growth passenger forecast. Employee parking is provided in a secluded lot that allows convenient access to the terminal building. The employee parking lot is offset to the south west of the terminal building to allow for future terminal expansion and additional GSE storage if needed. Employees will have separate access to the lot via the service road adjacent to the terminal loop road.

The public parking layout was designed with all passenger and rental car parking remaining inside the terminal loop road. This type of configuration reduces the number of parking lot entrances and exits, thereby also reducing both the number of access gates and payment booths. This helps minimize the cost of operations, allows for a consolidated payment booth, and decreases passenger confusion that could occur with multiple lots in different locations. Future public parking could be placed outside the loop road in the future if desired, but priority should be given to businesses or other more demanding land uses. The proposed layout of the parking areas also incorporates the existing trees within the area. The trees provide a wind break, shade, and enhance the esthetic quality of the area. They are an asset to the Airport and should be retained if possible. The preferred alternative retains the majority of the trees, and features pedestrian walkways under the trees’ canopy.

The rental car ready/return lot is proposed to be relocated to the interior northeast corner of the terminal loop road. This requires the removal of a small building in the north portion of the site. The site was chosen for its close proximity to the east entrance of the terminal building, which is where the rental car counters are located. The site is expandable and is adjacent to the preferred location of the QTA facility. The expanse of area between the QTA and the rental car lot allows for expansion and additional parking for rental car storage and/or public parking. Overall, the preferred alternative is expandable, adjustable, and allows near term parking expansion projects to be easily integrated into the long term plan.

4.3.5.2 Short Term and Long Term Parking Configuration

In the existing parking lot, short term and long term paid parking are combined. It is recommend that these two types of parking areas eventually be separated to ensure that an adequate amount of short term parking is available within close proximity to the terminal building, and to maximize parking revenues. The preferred alternative features a separation of paid parking based on the ACRP Report 25 standard allocation of 80 percent long term and 20 percent short term. It should be noted that this is a conservative standard, and does not necessarily account for CPR’s specific needs. It is likely that by the time the Airport’s parking lot is divided, enplanement levels will be greater and passenger characteristics will have changed. At that time, it is recommended that an advanced parking development study be conducted to determine the ratio that will best fit the Airport’s goals.

The total parking requirement is estimated to be approximately 1,600 spaces. Currently the State of Wyoming requires the Airport to provide 20 percent of all public parking free of charge. This equates to roughly 320 free spaces. The remaining 1,280 spaces were then divided into long and short term based on the 80/20 ratio. This equates to roughly 1,030 long term and 250 short term spaces.
Future expansion of the public parking can continue with a phased approach by expanding to the south. When the parking lots are to be divided, a barrier can be placed or constructed as a means to separate the parking areas into short term and long term. Consideration at that time will be needed in regards to vehicle flows and the need for one or multiple payment booths.
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FIGURE 4-17
TERMINAL VEHICLE PARKING

Source: RS&H Analysis, 2014
4.4  RECOMMENDED AIRPORT DEVELOPMENT PLAN

The recommended airport development plan, illustrated in Figure 4-18, is a combination of the preferred alternatives and solutions for each element discussed in this chapter. The leading and trailing elements in the development plan all work independently to best satisfy the Airport’s future facility requirements. They also were determined to work in an integrated manner as part of the comprehensive Airport system. The development plan helps to provide a visual demonstration of how each element fits with the others within the overall system.

The next chapters include Implementation and Airport Layout Plan. The implementation chapter will detail how and when each element discussed in this chapter will be brought into the Airport’s capital improvement program. Each element will be designated for immediate, near term, long term, or ultimate implementation. Implementation will be based upon the need, cost, and funding feasibility of each element. Finally, in the Airport Layout Plan chapter, each element from the development plan will be brought together on final Airport Layout Plan based on the determined implementation time frame.
CHAPTER 5

AIRPORT LAYOUT PLAN
This chapter presents the Airport Layout Plan (ALP) drawings, which have been updated as part of this Airport Master Plan Update process. The components of this chapter include the purpose of the ALP drawings, compliance with FAA design standards, revisions to the ALP since the previous ALP, and reduced-sized inserts of the preliminary ALP drawing set approved by Casper/Natrona County International Airport.

### 5.1 INTRODUCTION

The ALP drawing set serves as a visual representation of the Airport’s existing facilities and planned future development. The preferred alternatives and the overall development plan that was derived in the Alternatives Chapter is included in the ALP, along with any other facility changes that have taken place since the last ALP was created. The drawing set was prepared using several FAA guidelines and checklists, which included the following:

- FAA Advisory Circular 150/5300-13A Change 1, *Airport Design*
- FAA Advisory Circular 150/5070-6B Change 2, *Airport Master Plans*
- FAA Northwest Mountain Region *Airport Layout Plan (ALP) Checklist*, (revised May 2007)

The ALP requires FAA approval independent of the Master Plan. As such, review of the ALP drawing set is accomplished through several intermediate steps, including reviews by the Airport, the FAA Airports District Office (ADO), and several other FAA offices involved in the associated airspace review.

The ALP drawing set serves several needs for the Airport, the City of Casper, Natrona County, and the FAA. As presented in the FAA Advisory Circular 150/5070-6B, *Airport Master Plans*, there are five primary functions of the Airport Layout Plan (ALP) that define its purpose:

- FAA-approved ALPs are necessary in order to receive financial assistance under the terms of the Airport and Airway Improvement Act of 1982 (AIP), and specific passenger facility charge actions. The maintenance of, and conformity to the plan is a grant assurance requirement upon which Federal funds have been provided to CPR under the AIP program and previous programs. Previous programs include the 1970 Airport Development Aid Program (ADAP) and Federal Aid Airports Program (FAAP) of 1946.

- The ALP creates a blueprint for airport development by depicting proposed facility improvements that are consistent with the strategic vision of the Airport sponsor. They also provide a guideline by which the sponsor can assure that development maintains airport design standards and safety requirements, and is consistent with airport and community land use plans.

- The ALP serves as a public document that is a record of aeronautical requirements, both present and future, and as a reference for community deliberations on land use proposals and budget resource planning.

- The approved ALP provides the FAA with a plan for airport development. This will allow compatible planning for FAA-owned facility improvements at the Airport, and help FAA to anticipate budgetary and procedural needs. The approved ALP will also give the FAA the information it needs to ensure airspace is protected for planned facility or approach procedure improvements.

- The ALP provides a working tool for use by the Airport sponsor, including development and maintenance staff.
5.2 FAA MODIFICATION OF STANDARDS
There are no current modifications to FAA standards at the Airport. Additionally, the Master Plan process did not identify any noncompliance issues that would require a Modification to Standard.

5.3 AIRPORT LAYOUT PLAN DRAWING SET
The ALP drawing set graphically illustrates the development proposed at the Airport over the 20-year planning period. The ALP serves as a critical planning tool that depicts both existing facilities and planned development for an airport. By definition, the ALP is a plan that shows:

» Boundaries and proposed additions to all areas owned or controlled by the sponsor for Airport purposes
» The location and nature of existing and proposed Airport facilities and structures
» The location on the Airport of existing and proposed non-aviation areas and improvements.

An ALP set is required by the FAA to be considered for future funding and to be compliant with the Airport’s Federal Grant Assurances. Any sponsor who has received a grant for airport development is obligated by grant assurance to “keep the ALP up-to-date at all times.” The complete ALP set for the Casper/Natrona County International Airport consists of the following drawings:

» Sheet 1 Title Sheet
» Sheet 2 Airport Data Sheet
» Sheet 3 Facilities Layout Plan
» Sheet 4 Airport Layout Plan
» Sheet 5 Airport Airspace Drawing (Part 77) Outer
» Sheet 6 Airport Airspace Drawing (Part 77) Inner
» Sheet 7 Airport Airspace Drawing (Part 77) Runway 3
» Sheet 8 Airport Airspace Drawing (Part 77) Runway 21
» Sheet 9 Airport Airspace Drawing (Part 77) Runway 8
» Sheet 10 Airport Airspace Drawing (Part 77) Runway 26
» Sheet 11 Airport Airspace Obstruction Tables
» Sheet 12 Runway 3 Inner Approach Plan and Profile
» Sheet 13 Runway 21 Inner Approach Plan and Profile
» Sheet 14 Runway 8 Inner Approach Plan and Profile
» Sheet 15 Runway 26 Inner Approach Plan and Profile
» Sheet 16 Terminal Area Plan
» Sheet 17 General Aviation Area Plan
» Sheet 18 Terminal Building Drawing – First Floor
» Sheet 19 Terminal Building Drawing – Second Floor
» Sheet 20 Airport Historic District
The purpose of each sheet is presented in this section.

5.3.1 Sheet 1 – Title Sheet
This sheet denotes the Airport name and an index chronicling the ALP drawing sheets contained in the drawing set. This sheet also provides an Airport location and vicinity map, as well as a title block organized to include approval signatures and a history of ALP revisions.

5.3.2 Sheet 2 – Technical Data Sheet
This sheet provides various data tables containing detailed information about the Airport’s existing and anticipated conditions. This sheet also provides critical information about the Airport’s runways and safety area dimensions. Major components on this sheet include:
- Airport Data Table
- Runway Data Table
- NGS Monument Data Table
- Declared Distance Table
- Wind Rose Data

5.3.3 Sheet 3 – Facilities Layout Plan
The Facilities Layout Plan provides an uncomplicated view of existing and future Airport features including runways and taxiways, runway protection zones, roadways, and boundaries. The limited amount of data included on the sheet allows better visibility and understanding of the primary facilities and their relation to other key features.

5.3.4 Sheet 4 – Airport Layout Plan Drawing
The Airport Layout Plan Drawing is a key document which serves as a graphic representation of existing and future Airport facilities. The future Airport facilities include those that are scheduled to be completed during the planning period, as well as those that make up the Airport’s ultimate development. One of the primary purposes of this drawing is to depict those areas at which future facilities are planned to be constructed so that the associated land can be reserved for future use.

The drawing also reflects changes to physical features on and in the vicinity of the Airport that may affect navigable airspace or the ability of the Airport to operate. Development shown on the ALP corresponds to the Airport’s Capital Improvement Program (CIP) for the 20-year period. Specifically, the sheet depicts the limits of the Airport property interests, land uses, and configuration of facilities in compliance with geometric design separation and clearance standards. It also includes airspace and navigational aid (NAVAID) facilities.
Additionally, the ALP includes the dimensional information in order for recommended development to be designed in accordance with FAA planning and design specifications outlined in FAA Advisory Circular 150/5300-13A – Change 1 Airport Design and 150/5070-6B - Change 2, Airport Master Plans. Dimensional information aids users of the ALP to determine and plan for adequate separation between future development and existing and future runways, taxiways, taxilanes, and associated airspace. Lastly, the sheet provides a location to chronicle the ALP reviewer and approval stamps/letter(s).

5.3.5 Sheet 5 through 10 – Airport Airspace Drawings (Part 77)
These scaled drawings identify obstacle identification surfaces for the full extent of all Airport development. The surfaces define the limits of recommended land use control for the height of objects surrounding the Airport based upon the Airport’s Part 77 surfaces. Airspace features correspond with the ultimate runway dimensions as depicted on the ALP Drawing. A digital USGS map is used as the base map for the drawings in which each of the Federal Aviation Regulations (FAR) Part 77, Subpart C imaginary surfaces (primary, horizontal, conical, approach, and transitional) are depicted.

Sheet 5 serves to illustrate the full extent of the Airport’s Part 77 surfaces, including 50:1 precision approaches for each runway. This sheet also features an isometric cut-away view of the Part 77 surfaces to be used as a reference. Sheet 6 is similar to Sheet 5 but with a smaller scale. It depicts all the obstructions that are currently penetrating one or multiple surfaces. Each runway end has its own sheet (Sheets 7 through 10) with a plan view of the Part 77 surfaces and a profile view of the runway’s entire approach surface. The profile view serves to depict any obstructions or terrain that may be penetrating the Airport’s precision approach surface for that runway. The penetrating obstructions are labeled with their top elevation. Because the approach surface extends out roughly 50,000 feet from the runway, the scale is relatively small. A closer view of the approach surface near the runway, where penetrations by manmade obstacles are more likely, is provided in sheets 12 through 15.

5.3.6 Sheet 11 – Airport Airspace Obstruction Tables
This sheet provides data for all the obstructions that were visually depicted in the Airport Airspace Drawings. Each obstruction is identified with a description, a top elevation, the surface it is penetrating and that surfaces’ elevation at the penetrating point, the amount of penetration, and a mitigation recommendation if applicable. Obstructions include various types of vegetation, which can be mitigated through removal or trimming. Because vegetation typically continues upward growth over time, the data sheet includes vegetation that is not yet an obstruction, but is within 10 feet of the nearest Part 77 surface. These potential obstructions are identified by a negative number in the “Part 77 Surface Penetration (+)” column. These are included so that the Airport can proactively monitor and/or mitigate the vegetation prior to it penetrating a surface.

5.3.7 Sheet 12 through 15 – Runway Inner Approach Plan and Profile
Sheets 12 through 15 provide a plan and profile view of each of the Airport’s runway approach surfaces (including precision and non-precision approaches). These sheets provide a more detailed view of the first 4,200 feet off of each runway end, where manmade penetrating obstructions are typically found. Similar to previous sheets, any penetrating obstruction is depicted in blue and identified with its top elevation.
Additionally, the runway protection zone, navigational aids, and roadways are identified, and applicable data is provided.

5.3.8 Sheet 16 – Terminal Area Plan
The Terminal Area Plan is a large-scale view centered on the area surrounding the commercial passenger terminal building. The sheet depicts existing and future facilities as well as dimensional criteria involving runway and taxiway surfaces. Key facilities shown on the Terminal Area Plan include:
- Apron configuration and aircraft parking positions
- Existing terminal building and future building expansion
- Terminal roadway circulation and vehicle parking
- General aviation aircraft hangars adjacent to the commercial passenger terminal
- Rental car facilities

5.3.9 Sheet 17 – General Aviation Area Plan
The General Aviation Area Plan is a large-scale drawing depicting existing and future general aviation facilities on the northern portion of the Airport’s developed landside area. Key existing and future facilities shown on the General Aviation Area Plan include:
- Apron configuration and aircraft parking positions
- General aviation hangars and access taxilanes
- Potential future air traffic control tower site No.1
- Future Snow Removal Equipment (SRE) building

5.3.10 Sheet 18 and 19 – Terminal Building Drawing – First and Second Floor
The Terminal Building Drawings illustrate the future first and second floor expansions of the Airport’s commercial passenger terminal building. Depicted in each sheet is the existing and future floor plan of the terminal including the future building expansion, building renovation, and aircraft parking layout.

5.3.11 Sheet 20 – Airport Historic District
The Airport Historic District drawing provides details about the Casper Air Army Base Historic District (CAABHD). It includes the district’s boundary and a detailed list of every contributing historic building within the district. Additionally, the sheet depicts the three different zones that were established in the latest revised Programmatic Agreement (PA). As detailed on the sheet, the zones are each related to the level of importance as it relates to historical preservation efforts. Within the PA, certain buildings in the district were noted for their potential to be relocated or demolished in the future. These buildings, and their specifics, are called out within the sheet. It should be noted that the buildings slated for relocation are depicted in a proposed new location in Sheets 4, 16, and 17.

5.3.12 Sheet 21 and 22 – Existing and Future Airport Land-Use Plan
The Existing Airport Land-Use Plan drawing depicts existing land use within the airport property boundary. The Future Airport Land-Use Plan is based on a report completed in 2013 which was submitted to the FAA.

1 Airport Land Use Review, Jviation, 2013
with the intent of creating new land use designations at the Airport. This Master Plan is carrying forward this land use plan and is incorporating it as the Airport’s future land use drawing. The future land use designations are focused on areas of the Airport that are currently viable for development. Within the plan, these areas have been separated into current and future aeronautical and non-aeronautical development areas. This is unlike the existing land use plan that broadly defines these areas as “aeronautical and compatible non-aeronautical as approved by FAA.”

5.3.13 Sheet 23 – Airport Property Map
The Airport Property Map depicts the airport property boundary and the property interests consistent with the existing and future Airport Layout Plan drawing. This drawing documents past Airport land acquisition by individual tracts of land, and the method of acquisition. Both fee-simple and easement acquisitions as well as property disposed of since 2004 are shown.

5.3.14 Sheet 24 – Airport Development Phasing Plan
The Airport Development Phasing Plan provides a visual depiction of the proposed phasing of enhancements and additions over the course of the planning period. The phasing plan directly correlates with the implementation plan provided in the next chapter. This sheet helps to visibly tie together the Airport’s CIP to the timing and location of future projects and enhancements.

5.4 AIRPORT LAYOUT PLAN HIGHLIGHTS AND MODIFICATIONS
This section highlights the key elements and modifications that have been made since the Airport’s last ALP update. The modifications to the plan are based either on the Master Plan’s analyses which identified a future need, a change in FAA design criteria, or a combination of both.

» Runway Improvements – Future runway improvements include adding 25 foot wide paved shoulders to Runway 8-26 and upgrading the Runway 21 runway protection zone (RPZ) dimensions that are required for an RNAV approach. It should be noted that since the last ALP update, Runway 12-30 and Runway 17-35 have been decommissioned. As such, they are not included as a usable airfield component on this ALP.

» Runway 8 – At the conclusion of the master plan process, the precision instrument approach to Runway 8 was decommissioned by the FAA. The approach went from a precision instrument approach with a 50:1 approach surface to a non-precision instrument approach with a 34:1 approach surface. The ALP reflects this change, and includes an approach surface and runway protection zone for a non-precision instrument runway. In effort to protect the airspace for any possible return of a precision approach for Runway 8, a future condition for a precision instrument runway was included on the ALP for Runway 8.

» Taxiway Improvements – Future taxiway improvements include adding 30 foot wide paved shoulders to all taxiways and reconfiguring taxiway fillets to comply with the new FAA design specifications. These modifications are shown in this ALP with blue coloring on the outside of the affected pavement surfaces. The required reconfiguration of some of the Airport’s taxiway fillets is a result of changes of design specifications in AC 150/5300-13A Change 1, Airport Design. The fillet design changes required at CPR are not safety critical, and do not constitute the need for immediate reconstruction projects. However,
any pavement reconstruction or rehabilitation project should include modifications to bring associated fillets into compliance with new standards.

Other future taxiway modifications include those needed to address FAA designated “Hot Spots,” and to prevent direct access from the aircraft apron to the runway. One of the FAA’s identified Hot Spots was the intersection of Taxiway A6 at the crossing of the two runways. Prior to the start of this Master Plan, a study was conducted on that intersection which lead to the removal of Taxiway A6 and the creation of a new Taxiway A6 to the southwest that intersects perpendicular to the runway. The ALP reflects these recent changes. Long term plans call for the extension of Taxiway C, to the Runway 8 end (Runway 26 threshold). This will lead to the removal of the existing Taxiway B1, which fails to intersect the runway at a 90 degree angle, as required per FAA specifications.

The issue of direct access from the runway to the apron, which is a leading issue for the Taxiway A5 hot spot, is proposed to be solved with no-taxi islands (grass or marked pavement) placed in between the apron and the taxiway. These solutions are included in the ALP, and are described in greater detail in the Alternatives Chapter.

**Commercial Passenger Terminal** – The Airport’s commercial passenger terminal is in need of future expansion and renovation. This ALP includes two sheets dedicated to illustrating the future long term expansion of the facility, as well as those areas that will be renovated. It should be noted that the ALP shows the long term expansion footprint of the terminal building. Construction will take a phased approach and work towards the depicted future configuration.

**Rental Car Facilities** – This ALP includes an area reserved for a rental car quick-turn-around (QTA) facility within the northeast quadrant of the terminal loop road interior. This facility is located near the rental car ready parking lot, which is shown in an expanded parking lot on the northern portion of the loop road interior. A QTA facility can vary in size depending on the layout and types of operations that are carried out at the facility. The area shown on the ALP includes land adequate for a facility larger or smaller than what was used as the basis for the facility requirements analysis.

**Passenger Terminal Vehicle Parking** – Vehicle parking for the terminal including public parking and employee parking, is planned for within this ALP. The land within the terminal loop road is reserved for future passenger parking needs. A separate employee parking lot is shown to the west of the terminal building, outside of the loop road.

**Air Traffic Control Tower** – Part of the scope of this Master Plan was to conduct an Air Traffic Control Tower (ATCT) siting study. That study identified three locations on the Airport that are ideal for a new ATCT to be constructed. These sites are featured on the ALP and labeled as future development. The FAA will choose the final site when a new tower is ready to be built. Until that point, the ALP serves to reserve the land at all three sites for future use.

**Cargo Facility** – Prior to the start of this Master Plan, a previous study\(^2\) had evaluated the Airport’s cargo facilities. That study identified future apron, building, and vehicle parking requirements, and determined a preferred long term alternative to meet those requirements. The study found that in order to meet cargo needs in the future, the Airport would need a new, larger sorting facility, as well as

\(^2\) 2010 Airport Cargo Study, Mead & Hunt, 2010
additional vehicle and GSE parking areas. The conclusions of that study were validated, and carried forward in this Master Plan. The studies’ preferred alternative was integrated into the Airport Development Plan, and is included in this ALP.

**General Aviation Areas** – The facility requirements analyses determined the need to reserve land for future general aviation development. The Alternatives Chapter developed conceptual layouts in multiple areas of the Airport that would serve future general aviation needs. These layouts are included in this ALP. For the purpose of describing the layouts, the development areas are broken into three categories based on location: West; Central; and East.

- **West General Aviation Area** – This area is on the west side of the commercial passenger terminal building. Greater detail can be seen on Sheet 16 – Terminal Area Plan. The area is an ideal location for large corporate style hangars, or other hangars that serve large aircraft. The existing apron will be expanded to the west as demand warrants.

- **Central General Aviation Area** – This area is shown on the east side of the commercial passenger terminal building, adjacent to the cargo facility. This area can also be seen in greater detail on Sheet 16 – Terminal Area Plan. The layout shown is carried forward from a pre-design effort completed prior to the kick-off of the master plan study. The development is designed to be connected to the main apron via a new taxilane that will run adjacent to the Good Warbird hangar. The area is ideal for box hangars and T-hangars, but is flexible, and can accommodate a variable mix of hangar types based on demand and economic feasibility.

- **East General Aviation Area** – This area is shown entirely on Sheet 17 – General Aviation Area Plan. The area includes development south of the fuel farm and a development on the far northeast side of the apron. The area south of the fuel farm is ideal for T-hangar development. Additionally, the taxilane serving this area has the potential of also serving a historic aircraft static display and museum. The area on the northeast side of the apron has enough land to accommodate the Airport’s entire future general aviation needs. Thus, the area can accommodate every hangar type and is highly flexible. Hangar development in this area can begin as infill on the north side of Allen Avenue, and then work into the infield. The ALP sheets show a layout with T-hangars on the north side of the development and box and corporate hangars to the south. The corporate hangar zone is ideal for corporate sized hangars up to the largest manufacturing/service type of hangar.

**Future Land Uses** – As previously noted, this Master Plan is carrying forward the future land use designations developed in a study completed in 2012. The land use change is meant to distinguish aeronautical verses non-aeronautical land uses within the developable areas of the Airport. The new land use plan is detailed in Sheet 22 – Future Airport Land-Use Plan.

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3 *General Aviation Hangar Development Area (CPR-46A)*, Jviation, 2012
» **Historic District** – An effort to revise the existing Programmatic Agreement (PA) was included as part of this Master Plan effort. The new PA details three zones within the CAABHD that will receive different levels of focus as it relates to historic preservation. Those levels are detailed within Sheet 20. The new PA also provided details about the ability for specific buildings to be demolished or relocated. The specifics of those buildings are noted on the sheet as well.

» **Snow Removal Equipment Facility** – A location for a new Snow Removal Equipment (SRE) facility was determined in a previous study completed in 2013. This location was carried forward in this Master Plan and is shown on the ALP. At the time of this writing, the facility was in a pre-design stage, and the building is expected to be constructed in the very near term.

» **Public Safety Facility** – The Facility Requirements chapter included an analysis of the ARFF component of the Public Safety Facility. The analysis determined that the sizing for ARFF space was adequate for the planning period. However, Airport management and staff expressed the need for additional space within other portions of the facility. These comments were incorporated into the ALP, and a future expansion of the Public Safety building is shown in the drawing.

### 5.5 AIRPORT LAYOUT PLAN DRAWING SET

The Airport Layout Plan drawing set inserted as part of this report is a reduced-size version of the 24-inch by 36-inch drawings that have been reviewed and approved by the FAA, Wyoming Aeronautics Division, and the Airport Boards of Trustees.

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AIRPORT LAYOUT PLAN
FOR
CASPER / NATRONA COUNTY INTERNATIONAL AIRPORT (CPR)
CASPER, WYOMING

AIP#: 3-56-0004-54
STATE PROJECT #: CPR-51A

JANUARY 2016
CHAPTER 6

IMPLEMENTATION PLAN
The preceding chapters of this Master Plan Update identified future facility needs based on projected and existing demand, and FAA design standards. Chapter 4, Identification and Evaluation of Alternatives, outlined a comprehensive Development Plan that includes projects needed to ensure the Airport continues to comply with FAA standards and recommendations, as well as projects to meet demand for aeronautical related services. These projects are divided into time-related implementation phases based on anticipated need and projected activity demand levels. The Master Plan also brought together numerous independent planning studies, validated their findings, and incorporated them into the final documentation.

The projects outlined in the Development Plan are incorporated into the Airport Layout Plan, as described in the previous chapter. The projects are separated into three implementation time periods: 5-year short-term; 10-year intermediate-term; and 20-year long-term. The purpose of this chapter is to update the Airport’s existing Capital Improvement Program (CIP) to include the projects outlined in the Development Plan. This chapter describes the phasing, trigger points, and financial requirements for implementing these specific projects. Additionally, non-aviation development projects are discussed, and an in-depth funding analysis is provided. The funding analysis discusses unique opportunities that are specifically targeted to fund the non-aviation projects listed in this chapter.

Overall, this chapter will:

» Update the Airport’s Capital Improvement Program to include those projects related to the Airport’s new development plan
» Discuss non-aviation development projects and provide trigger points and estimated costs
» Discuss potential funding sources for implementing the projects discussed in this chapter

Many projects have interrelated components that must be implemented in a sequential manner for the project to move forward. The first section of this chapter discusses the required development sequence at the individual project level. The middle sections will present the specific projects by short-, intermediate-, and long-term phases and include funding options. Other potential strategic and non-aviation related projects are also discussed. The last section will describe the potential sources of funds for each project. Planning-level cost estimates are provided for each project.

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1 Airport Cargo Study, Mead & Hunt, 2010
General Aviation Hangar Development Area (CPR-46A), Jviation, 2012
Airport Land Use Review, Jviation, 2013
SRE Concept & Budget Report, Mead & Hunt and Jviation, 2013
6.1 IMPLEMENTATION PROCESS
To implement each capital project, a number of specific steps are necessary, many beginning up to four years before the facility is needed. This time is necessary in order to coordinate the funding, environmental documentation, and design, as well as complete the actual construction. Below is the sequence of events necessary to complete a complex airport project per FAA guidance.

Typical Steps Four Years Prior To Construction
» Identify the project in the approved Airport Layout Plan
» Validate project justification and funding eligibility
» Determine probable level of environmental review (If an environmental impact statement is required, planning may need to begin much earlier)
» Identify if flight procedure modifications will be required
» Coordinate with local officials and airport users

Typical Steps Three Years Prior To Construction
» Identify funding sources
» Determine if a Benefit/Cost Analysis is necessary
» Determine if a reimbursable agreement is necessary for affected NAVAIDs
» Begin purchase or assembly of all necessary land for the project

Typical Steps Two Years Prior To Construction
» Refine project scope
» Solicit professional design services
» Prepare preliminary design, site plan, and cost estimates
» Initiate reimbursable agreements and coordinate any NAVAID requirements with the FAA
» Submit requests for new/modified flight procedures with the FAA
» Submit a request for airspace review of projects under non-rulemaking authority (NRA)
» Begin Benefit/Cost Analysis if determined to be necessary
» Submit environmental assessment or categorical exclusion documentation for FAA review and funding.
» Coordinate with local officials and airport users on refined project scope and schedule

Typical Steps One Year Prior To Construction
» Complete airspace study
» Complete significant environmental documentation
» Complete 90 percent design, plans, and specifications after FAA environmental findings are made
» Execute reimbursable agreements to support NAVAIDs, if relevant
» Prepare and coordinate Construction Safety Phasing Plan
» Secure all necessary local funding
» Secure environmental and other necessary permits
» Submit Benefit/Cost Analysis
» Coordinate Safety Risk Management Panel with FAA-ATO or FAA-ARP, as necessary
» Finalize construction bidding, grant application, and acceptance schedules

Year of Construction

» Complete 100 percent design, plans, and specifications
» Complete FAA environmental documentation for current fiscal year
» Advertise and secure bids according to acceptance schedules
» Accept federal grants
» Coordinate with local officials and airport users on the progress and schedule
» Issue notice-to-proceed
» Monitor environmental mitigation requirements during construction

After Construction

» Submit final report and close any accepted federal grants
» Monitor environmental mitigation measures
» Update Airport Layout Plan drawing set

6.1.1 Environmental Considerations
The environmental processing for projects within each development phase will need to be completed in advance of the design and construction to allow for project completion in accordance with applicable federal rules and regulations. In the short- and intermediate-term, a five-year developmental environmental assessment may be appropriate to analyze the potential environmental consequences associated with the proposed action prior to construction beginning.

FAA Order 1050.1F, *Policies and Procedures for Considering Environmental Impacts*, and 5050.4B, *National Environmental Policy Act (NEPA) Implementing Instructions for Airports*, require the evaluation of airport development projects as they relate to specific environmental impact categories. A complete evaluation of the impact categories identified in FAA Orders 1050.1E and 5050.4B is required during an environmental assessment (EA) or environmental impact statement (EIS). Categorical exclusions (CE) require evaluations of extraordinary circumstances to ensure that projects, typically causing minimal environmental effects, would not cause effects requiring more analyses in an EA, or possibly, an EIS.
Environmental consideration will be required for the terminal related projects proposed in this Master Plan Update. The Terminal Improvements Passenger Departure Lounge Phase I and II are expected to occur within two to five years from the writing of this report, and will not substantially expand the footprint of the building. Therefore, it is expected that they can be categorically excluded per Order 1050.1F. The remaining terminal improvements may occur 8-12 years from the completion of this study, and will substantially expand the footprint of the building. It is anticipated that these projects will require an environmental assessment prior to construction.

In preparing for implementation of these projects, discussion with FAA environmental staff should take place to determine the best course of action for environmental processing. Due to the type and number of future capital projects that will likely require environmental documentation, it is recommended that the Airport consider developing an overall strategic environmental plan. This effort should determine the scale of environmental compliance needed for each future project, and examine opportunities to group environmental projects together to minimize project costs and maximize efficiency.

6.1.2 Project Responsibilities
Airport projects are typically closely coordinated with the FAA, particularly when Airport Improvement Program (AIP) funding or NEPA documentation is required. In general, the Airport will be responsible for justifying each project and working closely with the FAA and WYDOT staff to secure funding and identify any necessary environmental processing and documentation. The Airport will also be responsible for submitting grant applications to WYDOT and the FAA, selecting a consultant including issuing a Request for Qualifications for project planning, design, construction administration, and environmental analysis, issuing any necessary Request for Bid Proposal(s), and managing grants.

6.2 AIRPORT CAPITAL IMPROVEMENT PLAN
The Airport’s Capital Improvement Plan (CIP) is divided into three phases; 5-year short-term, 10-year intermediate-term, and 20-year long-term. This section presents the projects that should be included in each of the short-, intermediate-, and long-term phases of the CIP. The Airport recently updated the 5 year Wyoming Aviation Capital Improvement Plan (WACIP, July 2015) which details the existing planned Airport capital projects. The projects included in the WACIP have already been programmed and vetted by Airport management, Wyoming Aeronautics Division, and FAA.

Projects contained within the WACIP range in cost from multimillion dollar infrastructure improvement/maintenance projects to smaller capital investments that are less than $100,000, such as operating support for the ARFF Facility and acquisition of vehicles. The existing Airport CIP includes the projects outlined in the WACIP. As such, the CIP is comprehensive, and includes all the planned capital investments necessary for the Airport to maintain its facility and operations. This includes projects that were identified in previously completed independent studies which are now incorporated into this master plan, such as the new SRE facility.

This chapter updates the Airport’s CIP by incorporating those projects outlined in the Development Plan, which is illustrated in **Figure 6-1**. The following subsections provide detailed descriptions of each new
project that is being added to the CIP. Rough order-of-magnitude cost estimates are provided for each project. These planning-level cost estimates were developed using gross areas multiplied by unit costs from actual 2015 Airport projects.

Costs estimates for the anticipated projects were developed using estimated quantities for the major work items (e.g. asphalt, base course, dirt work, and associated electrical items) and adding a 30% design contingency to account for other project costs such as mobilization, seeding, erosion control, and other minor bid items. A 10% construction contingency factor was also added to account for unforeseen conditions and additional work that may present itself during construction. Soft costs, such as consultant services (engineering design and construction phase services) are added in at 30% for projects less than $1,000,000, 20% for projects less than $10,000,000, and 18% for projects more than $10,000,000.

It should be noted that the projects within this updated CIP related to the commercial passenger terminal are demand driven. The Airport’s terminal was a major focus within this master plan; therefore, extra effort was placed on terminal related projects, including outlining justification and trigger points. The proposed timing for projects being included in the CIP is based on the forecast of passenger enplanements and future demand. As such, the appropriate time for construction should be reviewed periodically, and project priorities should be adjusted as needed to account for deviations from the forecast. Implementation of these demand driven projects will be based on specific trigger points. These trigger points are described within the description of each project.
6.2.1 Short-Term Development Projects
Short-term (federal fiscal year 2016 – 2020) capital improvements include those development items that are expected to begin within the next five years. Table 6-1 outlines the short-term capital projects.
already programmed. The added projects which have been identified in this Master Plan Update are highlighted in bold text.

Each of the added projects is described in detail following Table 6-1. Details including project description, cost, and trigger points are provided. Additionally, the justification for the project is described, along with key implementation steps.

### TABLE 6-1
SHORT TERM CAPITAL IMPROVEMENT PLAN (2016-2020)

<table>
<thead>
<tr>
<th>Year</th>
<th>Project Title</th>
<th>Total Project Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016*</td>
<td>Construct Snow Removal Equipment Building (Phase II)</td>
<td>$1,253,333</td>
</tr>
<tr>
<td>2016*</td>
<td>Acquire Operations and Maintenance Vehicles</td>
<td>$100,000</td>
</tr>
<tr>
<td>2016*</td>
<td>ARFF Training Facility Annual Operating Support</td>
<td>$60,000</td>
</tr>
<tr>
<td>2016*</td>
<td>Group Crack Seal, Seal Coat and Marking Project (Design, Const. &amp; CM)</td>
<td>$725,000</td>
</tr>
<tr>
<td>2016*</td>
<td>Acquire Snow Removal/Maintenance Equipment</td>
<td>$395,500</td>
</tr>
<tr>
<td>2016</td>
<td>Utility Master Plan</td>
<td>$200,000</td>
</tr>
<tr>
<td>2017</td>
<td>Terminal Improvements - Passenger Departure Lounge (Phase I)</td>
<td>$2,100,000</td>
</tr>
<tr>
<td>2017*</td>
<td>Rehabilitate Runway 3/21 (Design &amp; Construction)</td>
<td>$8,200,000</td>
</tr>
<tr>
<td>2017*</td>
<td>ARFF Training Facility Annual Operating Support</td>
<td>$760,000</td>
</tr>
<tr>
<td>2018*</td>
<td>Apron ASR Repair</td>
<td>$2,895,000</td>
</tr>
<tr>
<td>2018*</td>
<td>Reconstruct/Rehab Parking Lot (Construction &amp; CM)</td>
<td>$2,450,000</td>
</tr>
<tr>
<td>2018*</td>
<td>Acquire Operations and Maintenance Vehicle</td>
<td>$60,000</td>
</tr>
<tr>
<td>2018*</td>
<td>ARFF Training Facility Annual Operating Support</td>
<td>$60,000</td>
</tr>
<tr>
<td>2018*</td>
<td>ARFF Training Facility Perimeter Fence and Monitoring Wells (Design &amp; Construction)</td>
<td>$126,000</td>
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<tr>
<td>2018*</td>
<td>Remedial Crack Repair and Marking Project (Design, Const. &amp; CM)</td>
<td>$185,000</td>
</tr>
<tr>
<td>2019</td>
<td>Terminal Improvements - Baggage Claim</td>
<td>$8,400,000</td>
</tr>
<tr>
<td>2019*</td>
<td>Rehabilitate Taxiway Charlie (Design, Const. &amp; CM)</td>
<td>$2,895,000</td>
</tr>
<tr>
<td>2019*</td>
<td>Construct General Aviation Apron (Phase II)</td>
<td>$815,000</td>
</tr>
<tr>
<td>2019*</td>
<td>ARFF Training Facility Annual Operating Support</td>
<td>$60,000</td>
</tr>
<tr>
<td>2020</td>
<td>Terminal Improvements - Baggage Makeup</td>
<td>$5,600,000</td>
</tr>
<tr>
<td>2020*</td>
<td>Acquire Operations and Maintenance Vehicles</td>
<td>$100,000</td>
</tr>
<tr>
<td>2020*</td>
<td>Group Crack Seal, Seal Coat and Marking Project (Design, Const. &amp; CM)</td>
<td>$2,120,000</td>
</tr>
<tr>
<td>2020*</td>
<td>Replace Taxiway B &amp; C Lighting */LED</td>
<td>$1,253,333</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>$48,068,166</td>
</tr>
</tbody>
</table>

*Projects approved in the WACIP
## Key Implementation Steps

**Preparation for Utility Master Plan**
- Determine scope of effort
- Coordinate with city and county
- Secure funding
- Advertise for services
- Initiate work order

---

### Description

This project will evaluate the landside utility infrastructure (water, natural gas, electric, and sewer systems) and identify upgrades that are needed to support future projects. The utility infrastructure upgrades will be implemented in multiple phases, as project timing and funding allows. The utility master plan will assess existing conditions, quantify existing capacities, determine future size requirements, provide GIS maps for existing utility locations, and recommend a phasing plan to replace or install utilities to meet utility requirements.

### Cost

$200,000

### Funding

The utility master plan can be funded through a combination of local funding and various grants such as Wyoming Business Council grant funds. This project is also eligible for the State Revolving Fund loans at up to a 2.5% interest rate, and may be eligible for forgiveness.

### Trigger Point

The Airport has already met the trigger point to upgrade the existing utility infrastructure. The utility infrastructure has met its useful life and the condition and capacity of several systems are unknown. In addition, the Airport's water system has known pressure and flow issues, which will likely impact the Terminal Improvement projects.

### Justifications

The Airport’s utilities vary greatly in age and condition. Some utilities are old and require replacement, while others are newer sections that are in good condition. A utility master plan will locate and identify each utility component and determine the condition and recommended actions for improvement. This data will enable effective replacement planning and will allow for greater efficiencies during future development projects.
**Terminal Improvements - Passenger Departure Lounge (Phase I)**

### Description
Two-story addition to the south end of the existing departure lounge. This addition includes a stair and elevator core to provide access between the first and second floor holdroom areas. Additionally, the first floor includes additional passenger movement area and support space for storage/janitorial, while the second floor provides space for concessions. A passenger boarding bridge is also added to the second floor and the restrooms adjacent to the departure lounge will be renovated and expanded as part of this project.

### Cost
$2,100,000

### Funding
Combination of entitlement, discretionary, state, PFC, and local funds.

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**Trigger Point**

The Airport reached the trigger of peak hour passengers ranging from 100 - 150 and annual enplanements of 100,000 in 2014, resulting in the need to expand the passenger holdroom.

**Justifications**

Based on the flight schedule, a minimum of two gates are required to accommodate the simultaneous United and Delta morning departures. The greatest static passenger load is placed on the departure lounge during the peak hour. During this time, a static load of roughly 200 passengers are waiting in the airside (post security) departure lounge. This amount of people exceeds the departure lounge's capacity. Additionally, when irregular operations occur, it is common that Airport staff must escort passengers to an upstairs and vacant room. When this occurs, the departure lounge reaches a level of service (LOS) "E", which is regarded as unacceptable. The project advances AIP policy by improving airport safety, security, adding needed capacity, preserving infrastructure through renovation. Airport safety is improved by allowing passenger a level of service (LOS) improvement above the existing LOS "E". The project will improve security by keeping screened passenger airside and eliminating the need for passenger escorts which lessens the potential for a security breach.

**Key Implementation Steps**

**Preparation for Architectural Design and Construction**

› Consider efficiencies for future build-out phases
› Complete schematic design
› Refine schematic design through design development process
› Create construction documents and specifications
› Complete bidding and contractor selection process
› Initiate construction

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Notes: Refer to Chapter 3 Facility Requirements page 3-28 for definition and specifics in regard to level of service (LOS).
Notes: Refer to Chapter 3 Facility Requirements page 3-28 for definition and specifics in regard to level of service (LOS).

The baggage claim operates with a single belt, which does not provide redundancy in the event that this belt malfunctions or multiple flights arrive simultaneously. This impacts level of service (LOS) for baggage claim and adjacent areas. Additionally, the existing baggage belt has reached its maximum useful life. This project advances AIP policy by improving airport safety, security, adding needed capacity, preserving infrastructure through renovation. This project enhances security by upgrading a single belt baggage claim device with two new carousels fed from below (or above) removing the direct, through-wall connection between landside and airside.

Key Implementation Steps

Preparation for Architectural Design and Construction

› Complete schematic design
› Refine schematic design through design development process
› Create construction documents and specifications
› Complete bidding and contractor selection process
› Initiate construction
The current passenger demand levels at Casper justify the need for an efficient and secure automated baggage screening system placed behind the ticket counter and out of the passenger queuing and circulation area. This will ensure demand can be met and avoid undue delay which would significantly lower the LOS of the ticketing area. By moving baggage screening behind passenger ticketing, this project increases the available space in the ticket lobby for passenger circulation. The existing lobby's depth is roughly 35 feet, while the industry recommendation is 50 to 60 feet. By keeping the baggage screening in the ticket lobby, the space is further reduced. This project advances AIP policy by improving airport safety, security, adding needed capacity, and preserving infrastructure through renovation.

### Key Implementation Steps

#### Preparation for Architectural Design and Construction

- Complete schematic design
- Refine schematic design through design development process
- Create construction documents and specifications
- Complete bidding and contractor selection process
- Initiate construction

### Trigger Point

Baggage screening is currently preformed in front of the passenger ticketing area. At current passenger and checked baggage levels, this activity should be placed behind the passenger ticketing area in a more secure area. Outbound baggage area and baggage delivery system improvements should be implemented when peak hour passengers reach 150 - 200 pax/hr, or as the total annual passenger enplanements approach 150,000 or as third aircraft arrives during the peak hour.

### Justifications

The current passenger demand levels at Casper justify the need for an efficient and secure automated baggage screening system placed behind the ticket counter and out of the passenger queuing and circulation area. This will ensure demand can be met and avoid undue delay which would significantly lower the LOS of the ticketing area. By moving baggage screening behind passenger ticketing, this project increases the available space in the ticket lobby for passenger circulation. The existing lobby's depth is roughly 35 feet, while the industry recommendation is 50 to 60 feet. By keeping the baggage screening in the ticket lobby, the space is further reduced. This project advances AIP policy by improving airport safety, security, adding needed capacity, and preserving infrastructure through renovation.

### Funding

Combination of entitlement, discretionary, state, PFC, local, and TSA funds.

### Project Title

Terminal Improvements - Baggage Make-up

<table>
<thead>
<tr>
<th>Project Title</th>
<th>Terminal Improvements - Baggage Make-up</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
<td>A single-story addition to the north of the existing baggage make-up area is proposed to provide space for three (3) outbound baggage belts fed from below (or above) to allow for a baggage tug pull-through operation. The existing airline ticket offices will be renovated and rearranged to provide space for a central, secured TSA baggage screening room, containing a mini in-line checked baggage inspection system (CBIS). Two (2) standard baggage belts and one (1) baggage belt for oversized luggage are proposed along the back wall of ticketing, running from behind ticketing, through the central TSA baggage screening room, connecting to the outbound baggage belts. A Law Enforcement Office (LEO) is constructed adjacent to the renovated ATO space.</td>
<td></td>
</tr>
<tr>
<td><strong>Cost</strong></td>
<td>$5,600,000</td>
<td></td>
</tr>
</tbody>
</table>
6.2.2 Intermediate-Term Development Projects

Intermediate-term development improvements include projects that are within the second five-year planning period (2021-2025). **Table 6-2** outlines the intermediate-term capital projects already programed. The added projects which have been identified in this Master Plan Update are highlighted in bold text. The projects that the Development Plan includes in the intermediate phase are terminal expansion projects. These projects are anticipated to require environmental analysis which will need to be completed in advance to allow for timely project completion.

Detailed descriptions of these projects are included following **Table 6-2**.

**TABLE 6-2**
INTERMEDIATE TERM CAPITAL IMPROVEMENT PLAN (2021-2025)

<table>
<thead>
<tr>
<th>Year</th>
<th>Project Title</th>
<th>FAA AIP</th>
<th>Discretionary</th>
<th>State Aeronautics</th>
<th>Local/Other</th>
<th>Total Project Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Entitlement</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2021*</td>
<td>Acquire Snow Removal Equipment</td>
<td>$500,000</td>
<td>$20,000</td>
<td>$13,333</td>
<td></td>
<td>$533,333</td>
</tr>
<tr>
<td>2021*</td>
<td>ARFF Training Facility Annual Operating Support</td>
<td>$54,000</td>
<td>$6,000</td>
<td></td>
<td></td>
<td>$60,000</td>
</tr>
<tr>
<td>2021*</td>
<td>Cargo Area Improvements Phase I (Design &amp; Construction)</td>
<td>$1,175,000</td>
<td>$47,000</td>
<td>$31,333</td>
<td></td>
<td>$1,253,333</td>
</tr>
<tr>
<td>2022*</td>
<td>Acquire Snow Removal/Maintenance Equipment</td>
<td>$30,000</td>
<td>$30,000</td>
<td></td>
<td></td>
<td>$60,000</td>
</tr>
<tr>
<td>2022*</td>
<td>ARFF Training Facility Annual Operating Support</td>
<td>$66,960</td>
<td>$7,440</td>
<td></td>
<td></td>
<td>$74,400</td>
</tr>
<tr>
<td>2022*</td>
<td>Remedial Crack Repair and Marking Project (Design, Const. &amp; CM)</td>
<td>$166,500</td>
<td>$18,500</td>
<td></td>
<td></td>
<td>$185,000</td>
</tr>
<tr>
<td>2022*</td>
<td>Terminal Improvements - Passenger Departure Lounge (Phase II)</td>
<td>$1,175,000</td>
<td>$2,000,000</td>
<td>$127,000</td>
<td>$2,298,000</td>
<td>$5,600,000</td>
</tr>
<tr>
<td>2022*</td>
<td>Cargo Area Improvements Phase II (Construction)</td>
<td>$1,175,000</td>
<td>$47,000</td>
<td>$31,333</td>
<td></td>
<td>$1,253,333</td>
</tr>
<tr>
<td>2022*</td>
<td>Seal Coat and Markings Project (Design, Construction &amp; CM)</td>
<td>$157,500</td>
<td>$17,500</td>
<td></td>
<td></td>
<td>$175,000</td>
</tr>
<tr>
<td>2022*</td>
<td>ARFF Training Facility Annual Operating Support</td>
<td>$54,000</td>
<td>$6,000</td>
<td></td>
<td></td>
<td>$60,000</td>
</tr>
<tr>
<td>2024*</td>
<td>Snow Removal Equipment Building (Ultimate Expansion)</td>
<td>$1,175,000</td>
<td>$1,168,750</td>
<td>$93,750</td>
<td></td>
<td>$2,353,500</td>
</tr>
<tr>
<td>2024*</td>
<td>Group Crack Seal, Seal Coat and Marking Project (Design, Const. &amp; CM)</td>
<td>$1,089,000</td>
<td>$121,000</td>
<td>$1,210,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2024*</td>
<td>ARFF Training Facility Annual Operating Support</td>
<td>$54,000</td>
<td>$6,000</td>
<td></td>
<td></td>
<td>$60,000</td>
</tr>
<tr>
<td>2024*</td>
<td>Acquire Operations and Maintenance Vehicles</td>
<td>$50,000</td>
<td>$50,000</td>
<td></td>
<td></td>
<td>$100,000</td>
</tr>
<tr>
<td>2025*</td>
<td>Terminal Improvements - Passenger Departure Lounge (Phase III)</td>
<td>$1,175,000</td>
<td>$8,000,000</td>
<td>$367,000</td>
<td>$2,358,000</td>
<td>$11,900,000</td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td>$6,375,000</td>
<td>$11,168,750</td>
<td>$2,423,710</td>
<td>$5,056,939</td>
<td>$25,024,399</td>
</tr>
</tbody>
</table>

*Projects approved in the WACIP
**Trigger Point**

Phase II of the terminal improvements should be implemented when annual passenger enplanement approach 155,000 or when three aircraft gates are needed during the peak hour and the departure lounge must accommodate 260 passengers during the peak hour.

**Justifications**

Based on flight schedules, a minimum of three gates are required to accommodate the United, Delta, and Allegiant flights that make up the peak hour. This same group of aircraft also drives the maximum static passenger load placed on the departure lounge. A static load of roughly 260 passengers are waiting in the airside departure lounge during the peak hour. This project accommodates 155,000 annual passenger enplanements and provides three available gates on the second level during the peak hour which will provide a holding area for 260 passengers.

**Key Implementation Steps**

**Preparation for Architectural Design and Construction**

- Consider efficiencies for future build-out phases
- Complete schematic design
- Refine schematic design through design development process
- Create construction documents and specifications
- Complete bidding and contractor selection process
- Initiate construction
Based on the flight schedule, a minimum of four gates are required to accommodate the United, Delta, American, and Allegiant flights that make up the peak hour. This group of aircraft will raise the maximum static passenger load placed on the departure lounge to roughly 320 passengers waiting in the airside portion of the terminal building during the peak hour. This project is the final phase (Phase III) of the long-term terminal expansion program. The phases strategically build upon each other providing a more cost effective implementation. The project advances AIP policy by improving airport safety, security, adding needed airside capacity.

**Key Implementation Steps**

**Preparation for Architectural Design and Construction**
- Consider efficiencies for future build-out phases
- Complete schematic design
- Refine schematic design through design development process
- Create construction documents and specifications
- Complete bidding and contractor selection process
- Initiate construction

**Trigger Point**

Phase III of the terminal improvements should occur when annual passenger enplanement approach 200,000 or when four aircraft gates are required during the peak hour and the departure lounge must accommodate 320 passengers during the peak hour.

**Justifications**

Based on the flight schedule, a minimum of four gates are required to accommodate the United, Delta, American, and Allegiant flights that make up the peak hour. This group of aircraft will raise the maximum static passenger load placed on the departure lounge to roughly 320 passengers waiting in the airside portion of the terminal building during the peak hour. This project is the final phase (Phase III) of the long-term terminal expansion program. The phases strategically build upon each other providing a more cost effective implementation. The project advances AIP policy by improving airport safety, security, adding needed airside capacity.
6.2.3 Long-Term/Ultimate Development Projects

Long-term/ultimate development improvements include those projects that are warranted by demand after the first 10 years of the planning period (2026+). The timing of these projects is less certain and are dependent upon availability of funding. Not all of these projects will likely be completed within the 20 year planning period. No projects are programmed within the WAICP this far into the future. As such, the updated CIP includes only those projects related to the Development Plan, as illustrated in Table 6-3.

**TABLE 6-3**
**LONG TERM/ULTIMATE CAPITAL IMPROVEMENT PLAN (2026+)

<table>
<thead>
<tr>
<th>Year</th>
<th>Project Title</th>
<th>Funding Source</th>
<th>Total Project Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>FAA AIP Entitlement</td>
<td>FAA AIP Discretion</td>
</tr>
<tr>
<td>2026+</td>
<td>Design and Construct Expansion of Public Safety Department/ARFF Facility</td>
<td>$1,175,000</td>
<td>$47,000</td>
</tr>
<tr>
<td>2026+</td>
<td>Taxiway Charlie Improvements (Phase I, II &amp; III)</td>
<td>$9,400,000</td>
<td>$11,300,000</td>
</tr>
<tr>
<td>2026+</td>
<td>Airport Master Plan Update</td>
<td>$750,000</td>
<td>$30,000</td>
</tr>
<tr>
<td>2026+</td>
<td>Taxiway Alpha Improvements (Phase I &amp; II)</td>
<td>$5,875,000</td>
<td>$2,412,500</td>
</tr>
<tr>
<td>2026+</td>
<td>Runway 8/26 Improvements</td>
<td>$3,525,000</td>
<td>$1,350,000</td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td>$20,725,000</td>
<td>$15,062,500</td>
</tr>
</tbody>
</table>

The following bullets provide details for each of the long-term projects:

» **Design and Construct Expansion of ARFF Facility**
   **Description:** This project will expand the classroom and office area of the ARFF Facility. This space will become necessary as operations, enplanements, and land side development continue to grow and require additional public safety related services.

» **Taxiway C Improvements Phase I, II, III**
   **Description:** This project constructs a full length parallel taxiway to Runway 8/26, adds 30’ paved shoulders to existing Taxiway C taxiways, and reconfigures the taxiway fillets on C1 and C2 to comply with FAA standards. This project should be designed and constructed in three separate phases, as funding allows.

» **Taxiway A Improvements Phase I and II**
   **Description:** This project includes construction of 30 foot paved shoulders along the entire length of Taxiway A and all connectors and reconfiguration of fillet geometry at the intersection of Taxiway A/B and B/B1, A1, A2, A3, A4, and A7 to comply with AC 150/5300-13A - Change 1 standards. Taxiway A7 pavement is removed, so that the outer edge is curved to meet FAA design standards. A new by-pass taxiway parallel to A7 is also constructed to enhance capacity. Painted or grass no-taxi islands are installed at Taxiways A4 and A5 to meet design standards and prevent inadvertent access directly to the runway. This project should be designed and constructed in two separate phases, as funding allows.
Runway 8/26 Improvements
Description: This project includes the addition of 25 foot paved shoulders on Runway 8/26 and replacement of the lighting system components on the entire length of Runway 8/26. The project also includes installation of new PAPI’s and a supplemental wind cone and addition of three feet of pavement to the Runway 8 blast pad to meet design standards.

6.3 NON-AVIATION CAPITAL IMPROVEMENT PLAN
The Casper/Natrona County International Airport has numerous assets, including a business park (C/NCIA Business Park) adjacent to the Airport’s existing aeronautical facilities, and a large amount of undeveloped land. Additionally, the business park is mixed with a Historic District, which features many World War II era historical structures as well as the Wyoming Veterans Memorial Museum. With aeronautical, business, and historical uses combined within the Business Park, numerous opportunities exist to further develop the area and enhance the historical elements of the Historic District. Future investments and improvements in this area are expected to provide a positive economic impact for the community and the Airport, and aid multiple local industries. Historical preservation efforts will benefit from future investment, and in return, provide increased economic impact to the region.

This master plan study closely examined the business park to identify projects that would enhance the area, blend historical preservation with future development, and support the overall objectives of the Airport and the community. Four projects were identified. A description of these projects is provided in the bullets below. Additionally, proposed funding sources for these projects are described in detail in Section 6.5.5 Other Funding Sources.

Schulte Avenue Reconstruction - $1,230,000
Description: Schulte Avenue serves as a primary access road to the business park, and also provides an important alternative access to the terminal building. As a secondary access road to the terminal, Schulte receives significant traffic by Airport employees, business park tenants, passengers, and visitors. The roadway has exceeded its useful life and was not constructed to carry the current mode and volume of traffic. This project would bring Schulte Avenue up to current design and capacity standards to accommodate the volume of traffic it is experiencing, and ensure safe and convenient access to the terminal building.
Funding: This project is eligible for funding under the Wyoming Business Council’s Community Readiness Grant program.

Historic Hangar Relocation and Preservation Feasibility Study- $140,000
Description: Two hangars at the Airport are part of the Historic District – the Good Warbird Hangar and the FedEx Hangar. This study would examine the feasibility and determine the costs of relocating the Good Warbird Hangar to an area near the current Wyoming Veteran’s Museum. The feasibility study would also determine the cost, phasing, and feasibility of renovating the FedEx Hangar to meet current and long-term needs of FedEx. Relocating the Good Warbird Hangar is necessary for the FedEx cargo operation to be expanded and would ensure this historical hangar is preserved for future generations.
Funding: This project is eligible for numerous grant programs. Eligible programs include the Transportation Alternatives Program, Wyoming Cultural Trust Fund, Wyoming Business Council Community Readiness Grant program, and Wyoming Historic Architecture Assistance Fund.

» **Werner Street Reconstruction - $1,230,000**

*Description:* Werner Street serves as the primary access road to most of the aviation support properties and facilities, as well as to all properties within the Business Park and Historic District. As such, the roadway sees regular use and is a vital transportation corridor on the Airport, including access to the fuel farm. The roadway has exceeded its useful life and is now in poor condition. This project would reconstruct Werner Street from Airport Parkway to Allen Street. This project would bring Werner Street up to current design and capacity standards for the volume of traffic it is currently experiencing and is forecasted to receive, and ensure safe and convenient access to the most vital areas of the business park, aviation support facilities, and the fuel farm.

*Funding:* This project is eligible for funding under the Wyoming Mineral Royalty Grants and Wyoming Business Council Community Readiness grant program.

» **Historic District Walking Tour and Interpretive Signage - $100,000**

*Description:* As the former Casper Army Air Base, the Airport has many historic buildings and serves as the home to the Wyoming Veteran’s Museum. As the Historic District is consolidated, visitors will be more focused in a central area to learn about the Base. Many of the current buildings do not have signage educating visitors about its significance. The current roadways, constructed as part of Base construction, do not offer pedestrian pathways for safe pedestrian travel around the Historic District. This project would construct a pedestrian pathway, with interpretive signs from the Wyoming Veteran’s Museum to various historic buildings throughout the historic district. Enhancing the Historic District will bring additional visitor traffic to the Wyoming Veteran’s Museum and allow visitors to safely experience the rich history of the Airport and the Base.

*Funding:* This project is eligible for numerous grant programs. Eligible programs include the Transportation Alternatives Program, Wyoming Cultural Trust Fund, and Wyoming Office of Tourism Technical Assistance Co-op Program.

### 6.4 STRATEGIC OPPORTUNITIES

Strategic Opportunities include those projects that were identified during the Master Plan study as projects that would enhance Airport services through upgraded facilities. These facilities include the vehicle parking lot, air cargo facility, aircraft storage facilities, and rental car facilities. These projects can all be completed at the discretion of the Airport, but implementation will be determined foremost by the Airport’s financial state. These projects are not affected by the other projects contained within the Development Plan. Each project categorized as a Strategic Opportunity is summarized below, and a description, cost, and trigger point is provided.
Vehicle Terminal Parking – $4,270,000

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short Term</td>
<td>$270,000</td>
</tr>
<tr>
<td>Intermediate Term</td>
<td>$2,230,000</td>
</tr>
<tr>
<td>Long Term</td>
<td>$1,770,000</td>
</tr>
</tbody>
</table>

**Description:** As passenger growth continues, demand for parking at the terminal building will continue to grow requiring expansion of public auto parking. In the short-term, 35 additional auto parking spaces should be constructed. In the intermediate-term, 404 additional auto parking spaces are needed to accommodate forecasted demand. In the long-term, 368 additional parking spots are forecasted to be needed. The land for the intermediate- and long-term auto parking needs should be designated and reserved for future auto parking demand.

**Trigger:** The Facility Requirements chapter identified a need to add 35 additional public parking spaces when peak hour passengers reached 240. Existing conditions indicate that this project is needed immediately, as the Airport has already experienced parking overflow issues during peak periods. This parking project could easily be integrated into the 2018 Reconstruct/Rehabilitation Parking Lot project. The intermediate- trigger is 360 passengers in the peak hour and the long-term parking trigger is 480 peak hour passengers. It is recommended that Airport management continue to monitor parking capacity as it relates to monthly enplanements. This effort will help management identify timing and scope for new parking construction. The parking expansion should occur simultaneously with the terminal building expansion.

Air Cargo Expansion - $2,500,000 (included in the intermediate-term)

**Description:** Construction of roughly 2,000 to 6,000 square feet or 15% additional space for administration, restrooms, and break rooms in the air cargo facility is needed in the short-term. By 2032, it is estimated that the cargo facility will require roughly 19,000 square feet more warehouse/maintenance space, with a total of 48,500 square feet of GSE storage space, and 67 parking spaces (20,079 square feet). The facility requirements are based on an update to the forecasted demand determined by the 2010 Airport Cargo Study. The Airport’s current WACIP, as shown in Table 6-2, has two phases of cargo improvements planned for a total of $2.5 million in the intermediate-term. These improvements have not yet been scoped, however these two phases should help the Airport meet current 2017 demand.

**Trigger:** A 15% increase in additional space for administration, restrooms, and break rooms will be needed by 2017 based on current forecasted demand. A need for additional warehouse/maintenance space, GSE storage, and auto parking spaces also exists. The trigger to implement cargo facility expansion will depend on Airport and tenant financial standing, and strategic business decisions related to the goals of the tenant and the Airport. The existing facility is constrained at its current location. If the Good Warbird Hangar is relocated it will allow for greater expansion of the cargo facility. The Airport will need to work closely with cargo tenants, especially FedEx to ensure the Airport can accommodate demand.
Aircraft Storage – $40,149,000

Description: To meet the increasing demand for general aviation aircraft storage, several areas for hangar development were identified. Potential hangar development areas are discussed in Chapter 4 Identification and Evaluation of Alternatives and include the West Hangar Development, Werner Street Development, East Hangar Development, and South Hangar Development, plus infill hangar development along the flight line.

The Airport needs to preserve enough land for hangar development in each of these areas. The need for approximately 39 T-hangars (49,725 square feet in size), nine medium sized (22,500 square feet in size) box hangars, and three large corporate hangars (30,000 square feet in size) was identified through the Master Plan Update.

Even though most hangars will likely be developed by a third party, the Airport must construct taxilane, apron, and utility infrastructure to the sites. Therefore, the total cost to develop the various hangar areas are divided into hangar building costs which are borne by third-party developers and site development costs that are the responsibility of the Airport. The costs for taxilane and apron development are estimated below by development area. The scope of this Master Plan did not allow for a detailed cost estimate for elements such as utility infrastructure and relocation of existing buildings. Therefore, the Airport should evaluate these additional costs for each individual development area in more detail.

The West Hangar Development area identifies three corporate hangars. As of early 2016, a 10,000 square feet hangar is under construction in the easternmost part of the site adjoining the existing commercial apron. As part of this construction, an access road is being constructed from Airport Parkway to the new hangar. To complete the two proposed additional hangars, additional apron expansion is needed. Additionally, a new connector taxilane is proposed west of existing Taxiway A3. The estimated cost for the taxilane and apron expansion is $2,240,000.

The Werner Street Development area, as proposed in this master plan, includes nine nested T-hangars, one large corporate hangar, and 11 medium sized box hangars. This development would require removal of one set of Airport owned T-hangars, which have met their useful life, to allow for the new taxilane’s object free area. The taxilane would be constructed from the apron to the southeast, with apron construction from Airport Parkway to adjoin the existing T-hangar apron near the FedEx Hangar. Estimated cost for the taxilane and apron is $1,575,000. This cost is currently listed in the Airport’s WACIP in two phases, Phase I in 2018 and Phase II in 2019.

The East Hangar Development area, as proposed in this master plan, includes three rows of 13 nested T-hangars, four large corporate hangars, and nine medium sized box hangars. Two taxilanes and numerous apron areas would need to be constructed. Two vehicle access roads from the hangars to Allen Avenue are also proposed. The estimated cost for the taxilanes and apron construction is $6,720,000. This development area would likely need to be constructed in three phases.

The South Hangar Development area, as proposed in this master plan, includes five rows of nested T-hangars. This development would require the relocation of six existing buildings and would cross an existing roadway. These buildings are proposed be relocated to an area within the Historic
District to restore the historical look and feel. Taxilanes and aprons would need to be constructed to access the development area. The estimated cost for the taxilane and apron construction is $2,884,000.

A breakout of estimated site and building construction costs are provided below. Funding sources are expected to be a combination of Federal, State and local dollars.

**Hangar Site Development Costs**

<table>
<thead>
<tr>
<th>Development</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>West Hangar Development</td>
<td>$2,240,000</td>
</tr>
<tr>
<td>Werner Street Development</td>
<td>$1,575,000</td>
</tr>
<tr>
<td>South Hangar Development</td>
<td>$2,884,000</td>
</tr>
<tr>
<td>East Hangar Development</td>
<td>$6,720,000</td>
</tr>
<tr>
<td><strong>Total Project Costs</strong></td>
<td><strong>$13,419,000</strong></td>
</tr>
</tbody>
</table>

**Hangar Building Costs**

<table>
<thead>
<tr>
<th>Hangar Type</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>T-Hangs – $100,000 per unit</td>
<td>$3,900,000</td>
</tr>
<tr>
<td>Medium Sized Box Hangars (22,500 square feet) – Approximately $75/square foot</td>
<td>$15,180,000</td>
</tr>
<tr>
<td>Large Corporate Hangars (30,000 square feet) - Approximately $85/square foot</td>
<td>$7,650,000</td>
</tr>
<tr>
<td><strong>Total Third Party Costs</strong></td>
<td><strong>$26,730,000</strong></td>
</tr>
</tbody>
</table>

**Trigger:** Each development area can be scaled in size to meet demand. All hangar development is flexible in location, size, and type of hangar. Hangar development is demand driven and construction will most likely be a result of tenant improvements or a large increase in the hangar wait list, resulting in Airport owned improvements. The Airport is currently working to develop the Werner Street Development area first. If other areas are developed privately, the Airport should work closely with the developer to ensure placement of new hangars does not restrict future development within the area. To be prepared for future demand, the Airport should invest in infrastructure such as taxilanes, aprons, and utilities as described in each hangar development area. Additionally, the Airport should closely monitor hangar demand, phase infrastructure improvements proactively, and complete any required environmental documentation well in advance of demand materializing.

**Quick-Turn-Around Rental Car Facility - $3,307,000**

**Description:** This project includes construction of a Quick-Turn-Around (QTA) Rental Car Facility, located adjacent to Airport Parkway, across from Intermountain Record Center. This project does not include fuel storage or dispensing, which is expected to remain at the existing fuel farm. A QTA at the Airport would offer consolidated maintenance and vehicle cleaning facilities, and easy access to the future rental car ready lot. This facility will increase rental car company efficiencies, provide enhanced passenger service, and consolidate rental car operations, which are currently spread throughout the landside areas of the Airport. The facility will also provide the Airport an opportunity to capture non-aeronautical revenues. With rental car operations consolidated, the existing areas of operation can be used for new businesses uses.

**Trigger:** The trigger point for this project is related to Airport business decisions, financial standing, and goals for Airport tenants and commercial passengers.
6.5 SOURCES OF CAPITAL FUNDING

The Airport receives funding from various sources such as the FAA Airport Improvement Program (AIP), Wyoming Department of Transportation (WYDOT) Division of Aeronautics, Passenger Facility Charges (PFCs), airport/local funds, and through other grants such as the State of Wyoming Business Council. It is expected that the proposed projects in the Master Plan Update capital improvement plan would be funded through a combination of these funding sources, which is further detailed below.

6.5.1 Federal Funding

The FAA AIP funds projects at airports that are included in the National Plan of Integrated Airport Systems (NPIAS) through the Airport and Airway Trust Fund, authorized by Congress. Eligible projects for AIP grants include land acquisition, noise mitigation, airfield improvements, Airport roadways, public areas of terminal building projects, safety and security systems, planning, environmental, and equipment. As a NPIAS Airport, the Airport receives up to 93.75% of eligible development costs with the remaining balance shared between the WYDOT Aeronautics Division and the Airport through a 3.75%/2.5% split. Under the AIP, the Airport is eligible to receive both entitlement grants and discretionary grants. Entitlement grants are offered annually based on the number of passenger enplanements and the amount of enplaned cargo. Discretionary grants are offered depending on the availability of funds and the FAA’s assessment of need and priority ranking. When the AIP has more than $3.2 billion available in a fiscal year, the Airport is eligible for additional discretionary funding.

As it relates to terminal construction for the projects proposed in this chapter, FAA AIP eligible projects can include modifications for both non-revenue producing and revenue-producing public-use areas that are directly related to the movement of passengers and baggage within the terminal building. Typical eligible items include public-use baggage claim delivery areas, automated baggage handling equipment, public-use corridors to boarding areas, central waiting rooms, restrooms, holding areas, foyers and entryways, as well as passenger loading bridges and handicapped boarding assistance devices. In addition, revenue-producing areas as restaurants, concession stands, and airline ticketing areas are eligible items for a non-hub airport.

For non-hub airports, funds from the discretionary or small airport fund may be used for terminal development. For non-hub primary airports, passenger entitlements may be used as well. Statutorily, there is a limit of $20 million from the discretionary fund and by policy, the FAA has extended the limitation to include the small airport fund.

The Facilities and Equipment Funds appropriations under the FAA Reauthorization and Reform Act of 2012 are also available. Within the FAA’s budget appropriation, money is available in the Facilities and Equipment Fund to purchase navigational aids and air safety-related technical equipment, including Air Traffic Control Towers for use at commercial service airports in the National Airport System. Each Facilities & Equipment development project is evaluated independently through a cost-benefit analysis to determine funding eligibility and priority ranking. The qualified projects are totally funded (i.e., 100 percent) by the FAA, with the remaining projects likely being AIP or PFC eligible. It is possible that the proposed navigational aid-related development projects for the Airport would qualify for Facility & Equipment funding, if money is...
available at the national level. In addition, the airport can apply for NAVAID maintenance funding through the F&E program for those facilities that are not F&E funded. In FY2015, $2.6 billion was authorized in the Facilities and Equipment account for the FAA nationwide.

6.5.2 State Funding
The Airport is also eligible to receive funding through the WYDOT Aeronautics Division to assist with the AIP grant match requirement. WYDOT will contribute up to 80% of the AIP grant match amount with the remaining 20% being the Airport’s responsibility for the following types of State/Local projects: safety and security, pavement maintenance, NAVAID maintenance, and NAVAIDs and weather equipment for the purpose of safety. WYDOT Aeronautics Division provides 60% funding of the grant match requirement with a 40% local share for planning, capacity, structures, standards, and non-pavement maintenance projects. In addition, WYDOT Aeronautics Division will provide 50% funding of the grant match with a $50% local share for the following project types: landside, marketing and promotional, non-safety equipment, and utilities. All project applications for federal or state funding are evaluated using the Wyoming Priority Rating Model for Project Evaluation, which was updated in 2014.

The purpose of the Wyoming Priority Rating Model for Project Evaluation is to evaluate and rank projects for planning, budgeting, and grant allocation by using objective information to make decisions considering the collective needs of the state’s aviation system. The Wyoming Priority Rating Model for Project Evaluation uses six weighted categories which represent evaluation criteria. The six categories are weighted to recognize differing levels of importance in an overall evaluation and ranking of eligible projects. The six categories include: purpose of project, project component, type of federal funding, system impact, airport usage and status of airport protection.

Using each of these six categories, the Wyoming Priority Rating Model will result in a numerical rating for each project; the process of matching a project proposal to a numerical rating is later defined for each category. The numerical rating is assigned, and then multiplied by the category weight to determine a final category numerical value. The six category values are then summed to conclude the final priority model ranking for those projects proposed for state or federal funding. A maximum of 97 points are available for a project that meets the highest value for each of the six categories.

WYDOT Aeronautics Division also offers a loan program for revenue or user fee producing facilities. The loan program may fund the construction, development, and/or improvement of revenue producing facilities. Examples of these facilities include fuel systems, hangars, FBO facilities, terminal improvements, and deicing facilities. The loans are funded through the Permanent Mineral Trust Fund and are issued with a 5% interest and a payback period of 20 years.

6.5.3 Passenger Facility Charge
The Passenger Facility Charge (PFC) Program allows the collection of PFC fees up to $4.50 for every enplaned passenger at commercial airports controlled by public agencies. PFCs are currently at a maximum of $4.50 per flight segment with a maximum of two PFCs charged on a one-way trip or four PFCs on a round trip, for a maximum of $18 total. The Airport has historically charged from $3.00 to $4.50 for every enplaned passenger. Airports can choose to impose less than the $4.50 maximum, and as part of the most recent application the Airport chose to collect $3.00 per passenger. To collect PFC fees an airport must submit a
PFC application to the FAA and seek public comment. The funds can be used for approved projects that enhance safety, security, or capacity, reduce noise, or increase air carrier competition. The Airport expects to receive approximately $6 million to $9 million in PFC funding over the next 20 years.

6.5.4 Airport Funding

The Airport is a self-sustaining entity and does not receive financial assistance from Natrona County. The Airport generates revenues from user fees, and a variety of rates and charges associated with auto parking, fuel sales, landing fees, hangar rents, building and land leases, and concession sales. These revenues, after being used to pay airport operational and maintenance expenses, are used to fund the local portion of capital projects and as available, additional maintenance projects. Over the next 20 years the ability of the Airport to cover their portion of capital projects will be vital. As such the Airport should periodically evaluate rates and charges.

Commercial passenger and related activities account for a majority of the Airport’s revenue, receiving 41% of revenue through the terminal building and the associated leases and concession fees. The Airport also receives non-aeronautical revenue accounting for over 20%, from the Airport Business Park. This diversification helps the Airport to have a steady income that does not rely on commercial passengers, which can fluctuate. A breakdown of major revenue sources received in FY 2015 are described below and listed in Figure 6-2.

The Airport also collects fees such as a percentage of gross revenue from rental cars and fees for counter space. However, the Airport has not historically charged a Customer Facility Charge for rental car customers. In the future, the Airport could explore this option to help fund terminal expansion for additional rental car offices, rental car ready parking, and a QTA facility.

The Airport owns and operates the passenger auto parking lot. The first three hours of parking are free and the charge is $5 per day thereafter. The Airport also receives some revenue from monthly passenger parking passes. The last parking lot fee increase occurred in 2009. An increase in fees should be examined as a funding mechanism for future parking lot expansions, and rehabilitation projects.

The Airport receives revenue from general aviation tenants, including Atlantic Aviation, the Airport’s full-service FBO. Atlantic Aviation currently leases four hangars and ramp space from the Airport. The FBO also holds a ground lease with the Airport, and pays fees for use of the fuel farm. The Airport also owns and manages various hangars and receives monthly revenue from tenants which adds to general aviation revenue. Aviation ground leases account for the remainder of general aviation revenue at the airport.

The Airport constructed a new fuel farm in 2009. As an Airport owned facility, the Airport receives a fuel flowage and storage fee for all Avgas and Jet A fuel sold. The Airport also sells non-aviation fuel to rental car providers and employees.

The Airport owns an Airport Business Park, which encompasses almost 200 acres of land and generates nearly $1 million in revenue per year. The Airport owns many of the buildings within the Business Park and receives monthly revenue from the building and land leases. Additional land is leased for agricultural purposes, providing revenue from land that would likely be unused.
6.5.5 Other Funding Sources

Other funding sources include various state and federal programs that provide funds for projects that met specific criteria. Many of these funding sources are funded through the State Loan and Investment Board. Additional eligibility requirements and relevant dates are found in Appendix E. Funding sources proposed for non-aviation CIP projects are detailed in the following sections.

6.5.5.1 Transportation Alternative Program:

This US Department of Transportation program provides funding for programs and projects defined as transportation alternatives. Grant application and distribution of funds is handled by the State of Wyoming. As a county owned entity, the Airport is eligible for Transportation Alternative Program grants. Eligible projects include:

» On- and off-road pedestrian and bicycle facilities
» Infrastructure projects for improving non-driver access to public transportation and enhanced mobility
» Community improvement activities and environmental mitigation
» Recreational trail program projects
» Safe routes to school projects
» Projects for planning, designing, or constructing boulevards and other roadways largely in the right-of-way of former Interstate System routes or other divided highways
Potential projects for the Transportation Alternative Program include the Historic Hangar Relocation and Preservation Feasibility Study and the Historic District Walking Tour and Interpretive Signage.

6.5.5.2 **Wyoming Office of Tourism Technical Assistance Co-op Program:**
This program provides funding for projects that contribute to the development of tourism in the State of Wyoming. The intent is to fund a variety of projects that support the strategic focus areas of the Office of Tourism, which include Grow Wyoming’s Visitor Economy; Maximize the Impact of Partnerships; and Champion the Destination and the Brand. Eligible projects include wayfinding, signage, and brochures. The program awards up to $5,000, requiring a cash match of 50%. Prior to applying, the Airport would need to consult with the Casper Area Convention and Visitors Bureau and receive a letter of support. Applications are due between August 7, 2015 and April 1, 2016.

The Historic District Walking Tour and Interpretive Signage project is a potential project that could use the Wyoming Office of Tourism Technical Assistance Co-op Program.

6.5.5.3 **Wyoming Cultural Trust Fund:**
This fund was established in 1998 by the Wyoming Legislature to support Wyoming’s culture and heritage through grant funding of innovative projects for the enjoyment, appreciation, preservation, and protection of the State’s arts, cultural, and historic resources; and to support and invest in Wyoming’s institutions that help further this mission. As a county owned entity, the Airport is eligible to participate in the program. Grant requests may not exceed $50,000, and previous awards have averaged approximately $15,000. All grants require a dollar for dollar match, although in-kind matches can be considered. Only projects that are not eligible for funding under the State Historic Preservation Office are eligible. In 2015, the Wyoming Cultural Trust Fund had two deadlines: April 1, for projects/events/activities that begin after July 1; and October 1, for projects/events/activities that begin after January 1, 2016. The Wyoming Cultural Trust Fund can provide grant funding for all forms of arts and culture, including but not limited to:

- Visual Art – photography, sculpture, painting, experimental, graphics
- Performing Arts – theatre, dance, music
- Crafts – clay, fiber, glass, leather, wood, jewelry, mixed-media
- Design Arts – architecture, fashion, industrial, landscape
- Media Arts – film, audio, video, technology/experimental
- Literature – fiction, non-fiction, poetry, criticism
- Folk/Traditional Arts – dance, music, crafts, oral traditions
- Humanities – history, folklore/folklife, languages, anthropology, sociology
- Historic and Architectural Preservation – conservation, survey, preservation planning, restoration or rehabilitation
- Community Cultural Celebrations
- Cultural Tourism
Potential projects for this funding source include the Historic Hangar Relocation and Preservation Feasibility Study and the Historic District Walking Tour and Interpretive Signage project.

6.5.5.4 Historic Architecture Assistance Fund:
This program provides the services of architects and engineers to the owners of historic buildings to address issues involved with the rehabilitation and use of such properties. The Historic Architecture Assistance Fund was established to provide assistance to properties that are historic, which is generally understood to be over 50 years of age. The fund is not intended to provide assistance with remodeling projects that would change the character of the historic building or address common utility system questions. The fund cannot support the entire architectural or engineering services needed for a complete rehabilitation project, but can fund a building assessment, structural analysis, analysis of building code and ADA requirements, and façade and signage schematic design. As a county owned agency, the Airport is eligible to apply and these funds can be combined with Cultural Trust Fund grants. Application deadlines are January 15, April 15, July 15, and October 15 of each year and all funding is managed by Main Street/Alliance for Historic Wyoming and paid directly to the consultant.

The Historic Hangar Relocation and Preservation Feasibility Study is a potential eligible project for funding through the Historic Architecture Assistance Fund.

6.5.5.5 Transportation Enhancement Activities-Local:
Transportation Enhancement Activities are a sub-component of the federal Surface Transportation Program. In authorizing the enhancement program, Congress expressly provided certain streamlining provisions, innovative finance, and cost share provisions for enhancement projects. Guidelines can be found on the Federal Highway Administration website. Approximately $2 million is allocated per year for distribution in Wyoming. Projects are selected through an annual project application and review process, which is selected by a five (5) member Advisory Selection Committee, which has membership representing cities, towns and counties, federal agencies and pedestrian/bicyclist interests. Applications require information such as project description, public participation, planning effort, funding match and long-term maintenance commitment. Locally sponsored Transportation Enhancement Activities projects have 80% federal and 20% local match funding; with prior approval, WYDOT can authorize the use of “in-kind” match for items such as land and interest in real estate, labor, materials, and equipment. Eligible applicants include any tax supported governmental entity. A list of qualifying Transportation Enhancement Activities (revised 1/19/2006) includes:

- Provision of facilities for pedestrians and bicyclists
- Provision of safety and educational activities for pedestrians and bicyclists
- Acquisition of scenic easements and scenic or historic sites (including historic battlefields)
- Scenic or historic highway programs (including the provision of tourist and welcome center facilities)
- Landscaping and other scenic beautification
- Historic preservation
» Rehabilitation and operation of historic transportation buildings, structures, or facilities (including historic railroad facilities and canals)
» Preservation of abandoned railway corridors (including the conversion and use of the corridors for pedestrian or bicycle trails)
» Inventory, control, and removal of outdoor advertising
» Archaeological planning and research
» Environmental mitigation
» To address water pollution due to highway runoff
» Reduce vehicle-caused wildlife mortality while maintaining habitat connectivity
» Establishment of transportation museums

Potential projects for funding under the Transportation Enhancement Activities–Local program include future relocation of Historic Hangars and the Historic District Walking Tour and Interpretive Signage project.

6.5.5.6 Mineral Royalty Grants:
This program, managed by the State Land Investment Board, awards grants to three types of projects: projects to alleviate an emergency situation which poses a direct and immediate threat to public health, safety or welfare, projects to comply with federal or state mandates, or projects to provide an essential public service. Eligible projects at the Airport would include roads and utilities. Eligible applicants include incorporated cities and towns, counties, special districts and joint powers boards. The State Land Investment Board meets on the Third Thursday of each January and June to consider applications for Mineral Royalty Grants. Applicants are allowed to submit multiple applications for fifty percent (50%) grants and up to two seventy-five percent (75%) grants for different projects at one grant meeting.

Mineral Royalty grant potential projects include Schulte Avenue and Werner Street Reconstruction projects.

6.5.5.7 Business Ready Community Program:
This is a State of Wyoming program that provides financing for publicly owned infrastructure that serves the needs of businesses and promotes economic development within Wyoming communities. Grants that fall under this program include:

» Business Committed Projects – Infrastructure to facilitate the start-up, retention, expansion, or location of a specific committed business. Maximum award is $3 million with a 10-30% match.
» Community Readiness Projects – No specific business is committed to expand or locate in the community. Infrastructure to prepare a community for future business development under a specific community plan. Maximum award is $3 million with a 15-30% match.
» Community Enhancement Projects - Infrastructure to improve aesthetics or quality of life to make a community attractive for business development. No specific business is committed to expand or locate in the applicant’s community. Maximum award is $500,000 with a 50% match.
Business Ready Community Planning Projects – Eligible projects include economic development plans, feasibility studies, and promotional plans. Tourism Plans or regional targeted industry plans.

Potential projects for the Business Ready Community Program include Schulte Avenue and Werner Street Reconstruction projects and the Historic Hangar Relocation and Feasibility Study.

6.5.6 Private Funding Sources
In addition to the “traditional” sources of airport capital funds listed above, there are other potential suppliers of money to construct capital improvements. These include tenants, users, and investors. Tenants often construct their own facilities, particularly hangar and air cargo facilities. Many airports use private third-party financing when the planned improvements will be primarily used by a private business or other organizations. Such projects are not ordinarily eligible or have very low priority for Federal funding. Private capital can also be used for facilities such as cargo buildings or hangars. In a similar manner, vehicle parking lots or other revenue generating facilities can be privatized with the use of outside capital. Due to the shortage of public capital, as well as the desire of investors to seek more innovative uses for their funds, airports are seeing increased use of external funding for capital projects.
6.6 CAPITAL IMPROVEMENT PLAN SUMMARY

Based on the identification of capital improvement projects and their eligibility for funding, the overall financing breakdown of the Master Plan Update is shown in Table 6-4. Total project costs added to the CIP as a result of this master plan is approximately $20 million. The total CIP, including all previously programmed projects, and the new projects added in this chapter, is roughly $73 million over the course of the 10 year planning period, with an additional $38 million in the long-term/ultimate development period beyond 2026. There are additional projects including snow removal equipment, ARFF vehicle replacement, pavement maintenance, and others not addressed by this master plan that will need to be integrated into the CIP over time.

The majority of the total costs associated with these projects are eligible for FAA funding. These totals do not take into account any necessary implementation steps, including environmental documentation required. As previously noted, it is recommended a study be conducted to examine what types of environmental work will be required over the planning period, and develop a plan to address that need in a systematic way.

The following bullets outline the assumptions and factors included in the creation of the capital improvement plan.

» 90% of the total is FAA eligible, with projects funded at 93.75%. The funding breakdown assumes that the Airport will receive $1,175,000 in entitlement money each year.

» 9.6% of the total CIP is eligible for WYDOT Division of Aeronautics grants. Projects will be scored using the recently updated Wyoming Priority Rating Model for Project Evaluation and funded at various levels from 3.75% to 90% depending on the individual project.

» The remaining funding will be funded through a combination of local, PFC, and other grant funds.

» Strategic opportunities are expected to be funded through a combination of FAA, WYDOT Division of Aeronautics grants, local, other grant funds, and private developers.

» Non-Aviation capital improvement plan projects are eligible for a variety of Federal and State funding programs.

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<td>Non-Aviation Capital Improvement Plan</td>
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APPENDIX A

AIRFIELD ELECTRICAL ASSESSMENT
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**Appendixes**

Appendix A – Maintenance Test Records
Appendix B – Load Calculations
1. INTRODUCTION AND PURPOSE

Casper/Natrona County International Airport (Airport), Federal Aviation Administration (FAA) designation CPR, is a commercial service airport serving central Wyoming. The airfield dates back to the 1940’s when it was first utilized by the United States Army as a heavy bomber training facility. The Airport consists of two active runways, Runway 3-21 and Runway 8-26, which are shown in Figure 1. All four approaches have global positioning system (GPS) instrument approaches, while Runways 3 and 8 also include instrument landing system (ILS) approaches.

Over the years, several capital improvement projects have been completed to aid in the conversion to a civil airport. The most recent projects impacting the airfield electrical systems were completed in 1996 and 2010. The 1996 project replaced the runway lights and cable, and the 2010 project replaced Taxiway A’s lights and cable and refurbished the existing guidance sign system on the airfield.

Figure 1
AIRFIELD LAYOUT
1.1 **Purpose**

Casper/Natrona County International Airport has contracted with RS&H, Inc. to provide an assessment of the airfield electrical system as part of a comprehensive master plan update. The purpose of this report is to:

- assess the condition of the airfield electrical system, including the vault distribution system and airfield lighting control system;
- determine recommended improvements;
- prioritize recommendations; and
- provide probable construction costs.

Data for this report was gathered by visual inspection performed on November 12, 2013, examination of available as-built drawings, and maintenance records from Airport personnel. An assessment of the FAA owned and operated navigational aids is not included in this report.
2. **AIRFIELD LIGHTING SYSTEM**

This section reviews the existing lighting for runways and taxiways, as well as guidance signs on the airfield. Recommendations for each system are also discussed.

2.1 **Runway Lighting**

The runway lighting system for both Runways 3-21 and 8-26 includes elevated and in-pavement fixtures with clear lenses that allow for a white colored light. The system includes fixtures, base cans, conduit, cables, connectors, and isolation transformers.

2.1.1 **Existing Conditions**

Runways 3-21 and 8-26 are lit with high intensity edge and threshold/end lights that were installed in 1996 through AIP project No. 3-56-0004-27 (AIP 27). The project consisted of installing new fixtures on the existing base cans and replacing the respective circuitry with new L-824, 5kV, type C cable installed in the existing conduit. The runway edge lighting system is a combination of elevated and in-pavement fixtures, as illustrated in Figure 2. The fixtures are base mounted, with the elevated lights having an overall height of 18 inches. The lamps for the fixtures are quartz type.

![Elevated Runway Edge Light](image1)

![In-Pavement Runway Edge Light](image2)

*Figure 2
RUNWAY EDGE LIGHTS*

The fixtures for Runway 3-21 are connected together on one series circuit originating from a 30kW, 5 step constant current regulator located in the airfield lighting vault. The fixtures for Runway 8-26 are also connected together on one series circuit originating from a 30kW, 5 step constant current regulator located in the airfield lighting vault.
The total length of the Runway 3-21 circuit is approximately 23,500 feet, and its routing is illustrated in Figure 3.

Figure 3
RUNWAY 3-21 CIRCUIT

The total length of the Runway 8-26 is approximately 23,000 feet, and its routing is illustrated in Figure 4.

Figure 4
RUNWAY CIRCUIT 8-26
2.1.2 Analysis

The fixtures installed in 1996 along the runways are in good condition. The base cans have been reused multiple times and are in fair condition. However, there appears to be significant settling of the fixtures at various locations along the runways as demonstrated by the elevated runway light shown in Figure 2. This condition allows water to pond in these locations which, during freeze/thaw cycles, causes the concrete base and the asphalt around the base to continually deteriorate. This condition may also cause foreign object debris/damage (FOD) issues, as well as the continued sinking of the fixture, which can result in the vertical and horizontal misalignment of the light.

The typical life span for airfield lighting equipment is approximately 20 years. The installed cables, isolation transformers, and connectors are approximately 17 years old and have failed in several locations. Maintenance personnel are constantly replacing old connectors and sections of cable in an effort to extend the life span of the system. Megger testing was conducted using an insulation resistance meter to verify the condition of electrical insulation. According to the data history of the megger tests, the circuits for both runways have consistently failed to meet the suggested minimum value of 30 megohms (MΩ) as recommended by FAA (AC) 150/5340-26B, Maintenance of Airport Visual Aid Facilities. Within the last year, Runway Circuit 8-26 has seen a 66% decline in insulation resistance values and Runway Circuit 3-21 has seen an 83% decline. These significant drops in the insulation resistance values typically indicate that there is either a high resistance ground or a serious deterioration of the cable insulation. See Appendix A for maintenance test records.

2.1.3 Recommendation

Due to the age and condition of the runway lighting systems, it is recommended that the fixtures, base cans, isolation transformers, conduit, connectors, and cable for each runway be replaced as a complete project to minimize construction costs. While the fixtures, base cans, and conduit are not an immediate need, the cables, connectors, and isolation transformers should be replaced as soon as possible to avoid potential outages and reduce maintenance costs.

The recommendations and estimated construction costs are prioritized in Section 6.

2.2 Taxiway Lighting

The taxiway lighting system includes elevated lights on Taxiways A, B, C, and associated connectors. The fixtures include blue lenses to produce a blue light which is the standard for taxiways and apron areas. The system includes fixtures, base cans, conduit, cables, connectors, and isolation transformers.

2.2.1 Existing Conditions

Taxiway A, associated Taxiway A connectors, and Taxiway C2 are lit with medium intensity lights (MITL) that were installed in 2010 during AIP Project No. 3-56-0004-47 (AIP 47). The project consisted of installing new fixtures on the existing base cans and replacing the respective circuitry with new L-824, 5kV, type C cable installed in the existing conduit. The fixtures are base mounted with an overall height of 24 inches. The lamps for the fixtures are LED type and have arctic kits.
Taxiways B, B1, C, and C1 are lit with MITLs that were installed in the early 1970’s. The fixtures are base mounted with an overall height of 18 inches. The lamps for the fixtures are quartz type as shown in Figure 5.

![Image of LED Taxiway Light and Quartz Taxiway Light]

The fixtures associated with Taxiways A, A1, A2, A3, and A7 are connected together on two series circuits originating from a 20kW, 3 step constant current regulator located in the airfield lighting vault. The total length of the circuit is approximately 33,000 feet as illustrated in Figure 6.

![Image of Taxiway Circuit A, A1, A2, A3, A7]
The fixtures for Taxiways A4, A5, A6 and the apron areas are connected together on two series circuits originating from a 10kW, 3 step constant current regulator located in the airfield lighting vault. The total length of the circuit is approximately 20,500 feet as illustrated in Figure 7.

**Figure 7**

**TAXIWAY CIRCUIT APRON, A4, A5, A6**
The fixtures for Taxiways C, C1, C2, B, and B1 are connected together on three series circuits originating from a 20kW, 3 step constant current regulator located in the airfield lighting vault. The total length of the circuit is approximately 40,000 feet as illustrated in Figure 8.

Figure 8
TAXIWAY CIRCUIT C, C1, C2, B, B1
2.2.2 Analysis

The fixtures installed in 2010 along Taxiways A and associated connectors, and C2 are in good condition. The fixtures installed in the early 1970’s along Taxiways B, B1, C, and C1 are in poor condition with significant pitting/chipping of the lenses, peeling of the yellow enamel paint, and missing bolts as can be seen in Figure 9. The base cans, which have been reused multiple times, are in fair condition; however, there appears to be significant settling of the fixtures at various locations along the taxiways and in some cases the base is completely below grade. As mentioned earlier, this condition allows ponding which will cause continued deterioration, as well as FOD and light alignment issues.

![Figure 9](image)

TAXIWAY EDGE LIGHTS – POOR CONDITION

Along Taxiway B1 where Runway 12-30 has been abandoned, there are varying distances, 57 feet to 170 feet, between the taxiway lights. It appears that when Runway 12-30 was abandoned, the spacing of the taxiway lights was not updated to reflect uniform spacing as required by FAA AC 150/5340-30G, Design and Installation Details for Airport Visual Aids.

The typical life span for airfield lighting equipment is approximately 20 years. The installed cables, isolation transformers, and connectors along Taxiway A are approximately three years old and in good condition. The megger test results available at the time of this report, taken on November 15, 2013 for the circuits along Taxiway A, indicated the system is in good condition and the insulation resistance is sufficient. The results of the test are shown below.

**Taxiways A1, A2, A3, A7, and Taxiway A associated with these areas**

- A, A1, A2, A3 - 90 MΩ
- A, A7 - 1000 MΩ
  - Total - 85 MΩ

**Taxiways A4, A5, A6 and Apron area**

- A4, A5 - 150 MΩ
- Apron, A6 - 2000 MΩ
  - Total - 140 MΩ
While the installed cables, isolation transformers, and connectors along Taxiway C2 are approximately three years old, they are installed within a taxiway lighting system (Taxiways B and C) whose equipment is approximately 17 years old and has failed in several locations. Maintenance personnel are constantly replacing old connectors and sections of cable in an effort to extend the life span of the system. According to the data history of the megger tests, the circuits for Taxiways B and C have consistently failed to meet the suggested minimum value of 30 MΩ as recommended by FAA AC 150/5340-26B, Maintenance of Airport Visual Aid Facilities. Within the last year, Taxiway Circuit C1 has seen a 97% decline in insulation resistance values, Taxiway Circuit C2 has seen a 92% decline, and Taxiway Circuit B1 has seen a 60% decline. These significant drops in the insulation resistance values typically indicate that there is either a high resistance ground or a serious deterioration of the cable insulation. See Appendix A for maintenance test records.

2.2.3 Recommendation

Even though the taxiway lighting system along Taxiway A is in good condition, it is recommended that the base cans be replaced to help eliminate potential FOD issues and light alignment problems, and to provide maintenance access.

Due to the age and condition of the taxiway lighting system along Taxiways B and C, with the exception of Taxiway C2, it is recommended that the fixtures, base cans, isolation transformers, conduit, connectors, and cable for each taxiway be replaced as a complete project to minimize construction costs and be completed as soon as possible to avoid potential outages and reduce maintenance costs.

When replacing the taxiway edge lights, it is recommended that the quartz fixtures be replaced with LED fixtures to match the lights replaced in 2010. See Appendix B for load calculations.

The recommendations and estimated construction costs are prioritized in Section 6.

2.3 Guidance Signs

Guidance signs are located on runways, taxiways, and taxiway connectors. The signs are arranged in various configurations based on specific FAA requirements. Each is either tied into an existing circuit or is part of an independent circuit that includes fixtures, conduit, cables, connectors, and isolation transformers.

2.3.1 Existing Conditions

The guidance signs for the airfield were originally installed in 1996 under AIP 27. Approximately 27% of the existing guidance signs were replaced and the remaining were re-paneled in 2010 under AIP 47. The guidance signs associated with the taxiways are a Size 1, Style 2 type, while those associated with the runways are a Size 1, Style 3 type. The distance remaining signs, illustrated in Figure 10, are a Size 5, Style 3 type.
The guidance signs for the taxiways are connected to the nearest taxiway edge light circuit. The guidance signs for the runways and the distance remaining signs are connected to the nearest runway edge light circuit. The guidance signs located in the area where Runway 8-26 and Runway 3-21 intersect, also known as the main intersection, are connected together on one series circuit originating from a 10kW, 3 step constant current regulator located in the airfield lighting vault. The total length of the circuit is approximately 11,000 feet as illustrated Figure 11.
2.3.2 Analysis

The signs and panels installed in 2010 and the foundations which have been reused multiple times are in good condition. A majority of the sign frames which have been reused multiple times are also in good condition. However at various locations, the black paint on sign frames installed in 1996 is faded or completely gone as evident in Figure 12.

All blank sign panels have been retrofitted with a reflective white and orange stripe, which is non-standard. Per FAA AC 150/5345-44J, Specification for Runway and Taxiway Signs, if the sign panel viewable horizontal length exceeds the maximum spacing allowable for the message elements, then the overage on the panel must be blanked out (black).

![Figure 12](image)

**EXAMPLE OF GUIDANCE SIGNS REQUIRING REPAIR**

The typical life span for airfield lighting equipment is approximately 20 years. A majority of the installed cables, isolation transformers, and connectors for the signs are approximately 17 years old and are connected to the failing respective runway and taxiway circuits indicated in Sections 2 and 3. The signs installed in 2010 have equipment that is approximately three years old, but they are also installed within the respective runway or taxiway lighting system whose equipment is approximately 17 years old and has failed in several locations. Maintenance personnel are continuously replacing old connectors and sections of cable in an effort to extend the life span of the system as indicated by the analysis in Sections 2 and 3.

While the installed cables, isolation transformers, and connectors for signs connected to the sign circuit vary in age, the circuit is in good condition. According to the most recent megger test results available at the time of this report taken on November 15, 2013, the insulation resistance value for the Sign Circuit is 300MΩ. See Appendix A for maintenance test records.

2.3.3 Recommendation

It was visually observed that signs installed in 1996 do not have tethers and while not required under outdated FAA AC 150/5345-44F, Specification for Taxiway and Runway Signs, at the time of
design, it is recommended that tethers be provided to ensure that if a sign breaks, it does not become a FOD issue.

Due to the fading of the black finish, it is recommended to repaint the sign frames in accordance with the manufacturer’s recommendations.

Where blank panels have the reflective white and orange strip installed, it is recommended to be removed. The white and orange stripe is typically used for barricades and to delineate work areas. Should the guidance sign fail and not be illuminated, the white and orange stripe may appear to be a barricade, causing confusion. FAA AC 150/5345-44J, Specification for Runway and Taxiway Signs, does not allow the use non-standard symbols in the sign message. Use of the white and orange stripe is a non-standard symbol which should be removed.

It is recommended that the isolation transformers, conduit, connectors, and cable be replaced for each guidance sign installed in 1996 that has a failing circuit. Replacement should be part of the associated runway or taxiway project to minimize construction costs.

For the guidance signs installed in 1996 where the circuit is not failing, it is recommended that the isolation transformers, conduit, connectors, and cable for each sign be replaced based on the age and condition of the equipment. It is anticipated that the insulation resistance values will see a significant increase and the system will be more reliable with the replacement of these components.

The recommendations and estimated construction costs are prioritized in Section 6.

3. **NAVIGATIONAL AIDS**

Navigational aids at the Airport include visual approach slope indicators (VASI), windsocks, and a rotating beacon. These components help facilitate safe flights operations and enhance safety.

3.1 **Visual Approach Slope Indicator**

Each runway has an existing VASI system. All of the VASI’s are owned and maintained by the Airport with the exception of the Runway 21 VASI, which is owned and maintained by the FAA and excluded from this report. The VASI provides pilots on approach a visual indicator of their decent rate which aids in safe landing operations.

3.1.1 **Existing Conditions**

The VASI systems were installed in the 1970’s, with new L-824, 5kV, type C cable installed in the existing conduit in 1996 during AIP 27. Each VASI, illustrated in Figure 13, is considered a 4-box system consisting of two light bars, each with two lamp housing units with three lamps.

The VASI systems operate on 120/240V provided from a panelboard located in the airfield lighting vault, which is then routed to step-up transformers at 600V to each VASI location. At each VASI location, the 600V is routed to a 120/240V step-down transformer then to each VASI power and control unit (PCU). The VASI’s are controlled manually by the Air Traffic Control Tower (ATCT) and remotely by the L-854 Radio Control Unit. The intensity of the lamps is controlled by a photocell located at each VASI PCU.
3.1.2 Analysis

The VASI's are approximately 40 years old and maintenance has indicated that the VASI’s constantly need repair. During the field investigation, it was noticed that one of the fuses in the Runway 26 VASI PCU was blown, resulting in the VASI being out of tolerance.

Per FAA AC 150/5345-30G, *Design and Installation Details for Airport Visual Aids*, the PCU must be located outside the Runway Safety Area (RSA). As shown in Figure 13, the PCU for each VASI system is clearly located within the RSA identified for both runways as 250 feet from the centerline of the runway.

According to the data history of the megger tests, the Runway 26 VASI circuit has consistently failed to meet the suggested minimum value of 50 MΩ as recommended by FAA AC 150/5340-26B, *Maintenance of Airport Visual Aid Facilities*. Within the last year, Runway 26 VASI circuit has seen an 86% decline in insulation resistance values. This significant drop in the insulation resistance value typically indicates that there is either a high resistance ground or a serious deterioration of the cable insulation. The cables for Runway 3 VASI and Runway 8 VASI circuit are in good condition. According to the most recent megger test results available at the time of this report taken, the insulation resistance value for Runway 3 VASI circuit is 250MΩ and Runway 8 VASI circuit is 450MΩ. See Appendix A for maintenance test records.
3.1.3 Recommendation

Due to the age and condition of the VASI’s, as well as the RSA violation, it is recommended the VASI systems be replaced with Precision Approach Path Indicator (PAPI) systems. The existing VASI systems are obsolete and parts are not readily available for maintenance. Replacing the cable for each VASI system when switching over to a PAPI system is also recommended.

The recommendations and estimated construction costs are prioritized in Section 6.

3.2 Wind Cones

The Airport currently has five wind cones: one primary wind cone and four supplemental wind cones. Supplemental wind cones are typically placed near runway ends to provide a visual reference of wind conditions for landing aircraft.

3.2.1 Existing Conditions

The primary wind cone is a type L-807 which was installed in 1996 during AIP 27 and is located in a segmented circle between Taxiways A5 and A6, approximately 320 feet from Runway 3-21. It is mounted on a 16 foot pole and is powered from a dedicated 120V circuit identified as Wind Cone #3 provided from a panelboard located in the airfield lighting vault. The primary wind cone is controlled manually by an on-off switch located in the vault and remotely by a photocell located at the wind cone.

Two of the supplemental wind cones are a type L-806 and two are a type L-807, which are shown in Figure 14. The type L-806 supplemental wind cones were installed in 1973 and are located near the end of Runways 3 and 21. The type L-807 supplemental wind cone located near the end of Runway 8 was installed in 1996 during AIP 27, and the type L-807 supplemental wind cone located between Taxiways A3 and A4 was installed in 1973.

The type L-806 supplemental wind cone at the end of Runway 3 is powered from the Runway 3 VASI circuit, with remote control of the lights by a photocell located at the wind cone. The type L-806 supplemental wind cone at the end of Runway 21 is powered and controlled from the Taxiway A, A1, A2, A3, and A7 circuit.

The type L-807 supplemental wind cone located at the end of Runway 8 is powered from the Runway 8 VASI circuit, with remote control of the lights by a photocell located at the wind cone. The type L-807 supplemental wind cone located between Taxiways A3 and A4 is powered from a dedicated 120/240V circuit identified as Wind Cone #2 provided from a panelboard located in the airfield lighting vault. This supplemental wind cone is controlled manually by the same on-off switch that controls the primary wind cone and remotely by a photocell located at the wind cone.
3.2.2 Analysis

The primary wind cone and circuit are in good condition. The wind cone is to be relocated outside of the Runway Object Free Area (ROFA) in the near future. According to the most recent megger test results available at the time of this report, the insulation resistance value for Wind Cone #3 circuit is 2000MΩ. See Appendix A for maintenance test records.

The secondary wind cones and circuits are in good condition. According to the most recent megger test results available at the time of this report, the insulation resistance value for Wind Cone #2 circuit is 5000MΩ. See the previous sections for cable megger information regarding other wind cone respective circuits. See Appendix A for maintenance test records.

Per FAA AC 150/5345-30G, Design and Installation Details for Airport Visual Aids, the supplemental wind cones mounting structure must be frangible and the structure must be located outside of the ROFA unless there is an operational need. The supplemental wind cones must also be located within 1,000 ± 500 feet of the runway end. Presently, all of the supplemental wind cones are installed within the ROFA. Of these, the supplemental wind cone at the end of Runway 8 exceeds the longitudinal tolerance by 425 feet and does not have a frangible base, and the supplemental wind cone between Taxiways A3 and A4 exceeds the longitudinal tolerance by 1,208 feet and does not have a frangible base.

3.2.3 Recommendation

It is recommended that the primary wind cone and segmented circle be relocated to the middle of the area bordered by Taxiway C, Runway 3-21, and abandoned Runway 17-35 to ensure visibility from the ATCT and most buildings along the apron.

It is recommended that the supplemental wind cone located between Taxiways A3 and A4 be removed. This wind cone is too far from the end of Runway 3 and is redundant. It is also recommended that the remaining supplemental wind cones be relocated outside the ROFA.
The recommendations and estimated construction costs are prioritized in Section 6. Note that costs for an LED wind cone replacement option has been included, as well as a cost for wind cone relocation.

3.3 **Rotating Beacon**

The rotating beacon aids pilots in identifying where the Airport is located. The beacon has two sides: one with a clear lens and one with a green lens. This configuration produces a flashing white and green light which indicates a civilian land airport.

3.3.1 **Existing Conditions**

The rotating beacon is mounted on top of the ATCT. The beacon is a 36” L-802A type installed in 1973 and is powered from a dedicated 120V circuit provided from a panelboard located in the airfield lighting vault. The rotating beacon is controlled manually by an on-off switch located in the ATCT and remotely by a photocell located at the beacon.

3.3.2 **Analysis**

The beacon has been operating with little required maintenance and is in good condition.

3.3.3 **Recommendation**

Beacon replacement is recommended due to the age of the equipment.
4. **INFRASTRUCTURE**

Infrastructure, as it relates to airfield lighting and navigational aid systems, includes the conduit and the duct which connect each piece of equipment to a power source.

4.1 **Existing Conditions**

The infrastructure for the airfield lighting and navigational aid systems was originally installed in the 1970’s. Minor improvements for new equipment only was completed in 1996 in AIP 27 under and again in 2010 in AIP 47. The infrastructure consists of direct buried 2 inch PVC conduit. It is installed between the airfield lighting equipment and concrete encased duct banks for the homerun circuits and where the ducts cross under pavement. The duct banks are connected together with electrical manholes, handholes, and pull boxes at various locations. **Figure 15** illustrates the interior of one of the electrical manholes on the airfield.

![Figure 15 ELECTRICAL MANHOLE](image)

4.2 **Analysis**

The infrastructure appears to be in fair condition.

4.3 **Recommendation**

It cannot be determined visually if the existing ducts can be reused without either mandreling or video inspection. Due to the age of the existing conduit, it is recommended that new conduit be installed for any improvements on the airfield. It is recommended that a more in-depth inspection of the duct banks be performed to determine if they can be reused. It is preferable to reuse the existing duct banks where applicable to minimize the costs associated with cutting and patching or directional boring new duct.

It is recommended to remove debris within the electrical structures for maintenance purposes during projects that impact the individual structures. As projects take place, it is also recommended that any new electrical structures be provided with spring assist lids to reduce the risk of injury.
5. **AIRFIELD ELECTRICAL VAULT**

The airfield electrical vault is the building used to house regulators, control panels, switches, and a backup generator.

5.1 **Vault**

The vault serves essentially as a distribution station where electrical power from the utility enters the vault and then is transferred to multiple circuits to power various components in the airfield.

5.1.1 **Existing Conditions**

The existing airfield electrical vault is a slab on grade, cinder block, two-room building with a brick façade built in 1973. The two rooms of the vault are illustrated in Figure 16. The main room houses the airfield lighting equipment, navigational aid equipment, panelboards, and the Airfield Lighting Control System (ALCS). The second room houses the backup generator, engine generator control panel, automatic transfer switch, and service entrance switch. Adjacent to the vault is an above ground fuel tank for the generator.

*Figure 16  INTERIOR ELECTRICAL VAULT*

5.1.2 **Analysis**

The vault is clean and in good condition. The main room has sufficient space for future upgrades and expansion.

5.1.3 **Recommendation**

Vault upgrades are not recommended at this time.

5.2 **Service**

As it relates to this report, service is defined as the supply of electrical power from the utility company.
5.2.1 **Existing Conditions**

The airfield electrical vault is fed overhead by three utility owned pole mounted transformers that provide a 240V, 3-phase, 4-wire, delta service. The service enters the generator room and is connected to a service entrance rated disconnect switch fused at a 500A main breaker. The switch feeds the normal power side of an automatic transfer switch (ATS). A diesel powered emergency generator provides backup power to the ATS. The ATS provides power to a 240V, 3-phase, 500A panelboard identified as Power Panel #1 and located in the main room. Power Panel #1 provides power to four of the six constant current regulators (CCR’s) and a 75KVA, 240V – 120/240V step-up single phase transformer. The transformer then provides power to a 120/240V, 1-phase, 350A panelboard. This panelboard provides power to the remaining two CCR’s, the navigational aid equipment, and the vault interior.

5.2.2 **Analysis**

The typical useful life of electrical distribution equipment is approximately 30 years. The service entrance switch and Power Panel #1 were installed in the 1970’s and are manufactured by Zinsco. Zinsco is no longer in business, the product line is discontinued, and the equipment is considered obsolete due to a design flaw. This flaw can cause a circuit breaker’s connection to the bus bar to become loose resulting in arcing, overheating, and preventing the breaker from tripping in the event of an overcurrent scenario. The ATS was installed in 1973/1974 and is manufactured by Russelectric. Parts for the ATS are no longer available and maintenance personnel have to search for reconditioned parts, which typically extends the down time of the equipment and greatly increases maintenance costs. The 350A panelboard installed in 1973/1974 is manufactured by GE and appears to be in good condition. The 75KVA transformer was installed in the 1970’s, was manufactured by Zinsco, and appears to be in good condition.

5.2.3 **Recommendation**

Due to the age of the service entrance disconnect switch, it is recommended the equipment be replaced. A fused disconnect switch is approximately 40% less expensive than a circuit breaker switch but takes up 20% more space. Further analysis is required to determine the space available.

Due to the age and lack of spare parts for Power Panel #1, it is recommended this equipment be replaced.

Due to the age and lack of spare parts for the ATS, it is recommended this equipment be replaced. A new ATS with microprocessor control system can eliminate the need for a separate generator control panel.

The recommendations and estimated construction costs are prioritized in Section 6.
5.3 **Backup Power System**

Backup power systems are critical to ensure that airfield lighting and navigational aids can remain operational if there is a power outage. The Airport uses a diesel driven generator to provide backup power, which ensures the Airport is not forced to close during nighttime if there is a utility power outage.

5.3.1 **Existing Conditions**

A 150kW diesel driven standby generator installed in the 1970’s provides emergency power when the utility source is unavailable. The generator is controlled by a generator control panel mounted on the wall adjacent to the ATS.

5.3.2 **Analysis**

The total connected load on the generator is approximately 115kW, with 35kW or 23% available for future capacity. If LED taxiway lights are installed in the future, the demand would decrease creating an under loaded condition. If a generator is under loaded it does not reach its correct operating temperature creating an improper air-to-fuel ratio resulting in unburned fuel or carbon build-up within the exhaust system. This condition is known as “wet stacking” and will reduce the life span, efficiency, and rated power output of the generator.

5.3.3 **Recommendation**

The generator is near the end of its life and is recommended to be replaced. Depending on future load conditions, the generator should incorporate a load bank to eliminate wet stacking issues. The proposed generator is recommended to have an integrated control panel that can interface with the recommended ATS.

5.4 **Airfield Lighting Equipment**

Airfield lighting equipment within the airfield electrical vault includes eight constant current regulators, or CCR’s. CCR’s regulate the electrical current that powers the airfield lights and signs. The CCR’s allow for various steps in output, which allows for multiple light intensities.

5.4.1 **Existing Conditions**

All of the CCR’s operate from dedicated 240V circuits from either Power Panel #1 or the 350A panelboard. The typical CCR’s at the Airport are illustrated in Figure 17.
Two of the CCR’s are 5-step providing 6.6A power to each respective runway circuit. Four of the CCR’s are 3-step providing 6.6A power to the respective taxiways and a dedicated sign circuit. Two of the CCR’s are 3-step with a 6.6A output and are identified as spare. **Table 1** provides a summary of the existing CCR information.

**Table 1**

<table>
<thead>
<tr>
<th>Powered From</th>
<th>Area Served</th>
<th>Output (A)</th>
<th>Capacity (kW)</th>
<th>Steps</th>
<th>Input Voltage</th>
<th>Model Number</th>
<th>Age (Years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Panel #1</td>
<td>RWY 3-21</td>
<td>6.6</td>
<td>30</td>
<td>5</td>
<td>240</td>
<td>Crouse-Hinds L-828</td>
<td>17</td>
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<td></td>
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<td>82860-D-30-4-66-05-16</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>S/N 1120</td>
<td></td>
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<tr>
<td>Power Panel #1</td>
<td>RWY 8-26</td>
<td>6.6</td>
<td>30</td>
<td>5</td>
<td>240</td>
<td>Crouse-Hinds L-828</td>
<td>17</td>
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<tr>
<td></td>
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<td></td>
<td>S/N 1111</td>
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<td>Power Panel #1</td>
<td>TWY C, C1, C2</td>
<td>6.6</td>
<td>20</td>
<td>3</td>
<td>240</td>
<td>ADB-Alnaco L-828</td>
<td>14</td>
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<td></td>
<td></td>
<td>S/N K960217</td>
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<td>Power Panel #1</td>
<td>TWY A, A1, A2, A3, A7</td>
<td>6.6</td>
<td>20</td>
<td>3</td>
<td>240</td>
<td>ADB-Alnaco L-828</td>
<td>14</td>
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<td></td>
<td></td>
<td>S/N K960218</td>
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<tr>
<td>350A Panel, Ckt.</td>
<td>Apron, TWY A4, A5, A6</td>
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<td>10</td>
<td>3</td>
<td>240</td>
<td>ADB-Alnaco L-828</td>
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<td>S/N K920142</td>
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<td>350A Panel, Ckt.</td>
<td>Signs</td>
<td>6.6</td>
<td>10</td>
<td>3</td>
<td>240</td>
<td>ADB-Alnaco L-828</td>
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<td></td>
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<td>350A Panel, Ckt.</td>
<td>Spare 1</td>
<td>6.6</td>
<td>7.5</td>
<td>3</td>
<td>240</td>
<td>Hevi-Duty L-812</td>
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<td>350A Panel, Ckt.</td>
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<td>350A Panel, Ckt.</td>
<td>Spare 2</td>
<td>6.6</td>
<td>7.5</td>
<td>3</td>
<td>240</td>
<td>Hevi-Duty L-812</td>
<td>30</td>
</tr>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td>S/N 92WM545163-2</td>
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</tr>
</tbody>
</table>

Source: RS&H Analysis
5.4.2 Analysis

The useful life of a CCR is approximately 20 years. The CCR’s vary in age from 14 to 30 years old. All of the CCR’s appear to be in good condition. Based on estimated load, the taxiway and sign CCR’s are approximately 50% loaded. This is due in part to the installation of LED taxiway fixtures in 2010 in lieu of quartz lamps which have a higher load. See Appendix B for load calculations.

It was visually observed that the S-1 cutout typically provided on the output side of a CCR is not installed. While not required per the FAA, the S-1 cutouts isolate the series circuit from the CCR for maintenance and testing purposes. The cutouts are minor, but increase safety for maintenance personnel by providing a visible means of isolation.

5.4.3 Recommendation

When the remaining taxiway lights are switched over to LED lamps, the load should be analyzed to determine if smaller size CCR’s can be provided. Reducing the size of the CCR’s ultimately results in reduced costs associated with energizing the airfield lighting system. It is recommended to replace the CCR’s as they continue to age and as projects allow.

It is also recommended to install S-1 cutouts on the output side of the CCR’s. The S-1 cutout will provide a maintenance friendly test point as well as increased safety within the vault.

5.5 Airfield Lighting Control System

The airfield lighting control system includes those components that allow external control of the lighting settings.

5.5.1 Existing Conditions

Presently, the ATCT is manned from 5 AM to 9 PM and the controllers operate the airfield lighting systems during these hours. When the tower is closed, the airfield lighting systems are radio controlled by the pilot. Radio control is accomplished by keying the aircraft’s microphone to the designated frequency of 118.3 MHz. The intensity of the lights is based on the number of clicks received within a five second interval. Once energized, the airfield lighting system will stay on for 15 minutes. At the end of the 15 minute cycle they will turn off.

The ALCS consists of an L-821 control panel located in the ATCT and an L-854 radio controller and an interface panel installed in the vault. These panels are illustrated in Figure 18. The L-821 control panel was installed in 1996 and the L-854 radio controller and interface panel were installed in 1999.
5.5.2 **Analysis**

The ALCS appears to be in good condition and is functioning as intended.

5.5.3 **Recommendation**

The Airport has recently installed a fiber optic cable which terminates in a wall mounted patch panel adjacent to the existing interface panel and has expressed a desire to transfer the copper ALCS communication cable to the fiber. It is recommended to upgrade the ALCS to operate over fiber as the fiber is a more reliable means of communication.

It is also recommended to replace the interface panel in the vault with a system that uses programmable logic controller and microprocessor based technologies and to replace the L-821 control panel in the ATCT with a touch screen monitor. This equipment will provide the Airport with an expandable open architecture type of system that will allow the Airport to modify the system as operational requirements change. This will eliminate the need to rewire and re-label mechanical switches and indicators and will allow for additional control and monitoring of newer systems (generator, ATS, CCR's, PAPI's, etc.) as they are installed or become available.
6. PROJECT PRIORITY AND ESTIMATED CONSTRUCTION COST

Recommendations resulting from this study and their probable costs are listed below. The prioritization is based on test results, field conditions, history of failures, and the age of the system. The projects are split up into three priority levels:

- **Priority 1** - These projects are high priority and the Airport should consider these within the next two years, see Table 2.

- **Priority 2** - These projects are medium priority and the Airport should consider these within the next two to five years, see Table 3.

- **Priority 3** - These projects are low priority with no immediate need to implement, but should be considered as funding allows or when other capital improvement projects are implemented, see Table 4.

### Table 2
**PRIORITY 1 PROJECTS (0-2 YEARS)**

<table>
<thead>
<tr>
<th>Airfield Component</th>
<th>Description</th>
<th>Estimated Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replace Runway 3-21 Cable</td>
<td>Very low megger reading; approaching 20 year life span</td>
<td>$75,000</td>
</tr>
<tr>
<td>Replace Runway 8-26 Cable</td>
<td>Very low megger reading; approaching 20 year life span</td>
<td>$73,000</td>
</tr>
<tr>
<td>Replace Taxiway B &amp; C Lighting System</td>
<td>Very low megger reading; equipment is past life span</td>
<td>$775,000</td>
</tr>
<tr>
<td>Replace Runway 3 VASI System</td>
<td>Equipment is past life span; power and control unit is within RSA</td>
<td>$185,000</td>
</tr>
<tr>
<td>Replace Runway 8 VASI System</td>
<td>Equipment is past life span; power and control unit is within RSA</td>
<td>$175,000</td>
</tr>
<tr>
<td>Replace Runway 26 VASI System</td>
<td>Equipment is past life span; power and control unit is within RSA; very low megger reading</td>
<td>$140,000</td>
</tr>
<tr>
<td>Relocate Supplemental Wind Cones</td>
<td>Equipment is within ROFA</td>
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<tr>
<td>Replace Supplemental Wind Cones (LED Option)</td>
<td></td>
<td>$150,000 (LED Option)</td>
</tr>
</tbody>
</table>

Source: RS&H Analysis
### Table 3
**PRIORITY 2 PROJECTS (2-5 YEARS)**

<table>
<thead>
<tr>
<th>Airfield Component</th>
<th>Description</th>
<th>Estimated Cost</th>
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</thead>
<tbody>
<tr>
<td>Replace Runway 3-21 Lighting System (includes cable from priority 1 project)</td>
<td>Very low megger reading; approaching 20 year life span</td>
<td>$775,000</td>
</tr>
<tr>
<td>Replace Runway 8-26 Lighting System (includes cable from priority 1 project)</td>
<td>Very low megger reading; approaching 20 year life span</td>
<td>$683,000</td>
</tr>
<tr>
<td>Replace Service Equipment (Disconnect, ATS, Power Panel #1)</td>
<td>Equipment is past life span; lack of available spare parts</td>
<td>$125,000</td>
</tr>
<tr>
<td>Replace Emergency Equipment (Generator, Load Bank)</td>
<td>Equipment is approaching end of life</td>
<td>$200,000</td>
</tr>
<tr>
<td>Replace Rotating Beacon</td>
<td>Equipment is approaching end of life</td>
<td>$40,000</td>
</tr>
</tbody>
</table>

Source: RS&H Analysis

### Table 4
**PRIORITY 3 PROJECT (AS FUNDING ALLOWS)**

<table>
<thead>
<tr>
<th>Airfield Component</th>
<th>Description</th>
<th>Estimated Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replace Guidance Signs (excludes signs associated with lighting system replacement from priority 1 and 2)</td>
<td>Approaching 20 year life span; fading of equipment frame</td>
<td>$300,000</td>
</tr>
<tr>
<td>Replace Taxiway A Base Cans</td>
<td>Bases are deteriorating/settling</td>
<td>$350,000</td>
</tr>
<tr>
<td>Replace CCR’s</td>
<td>Equipment is approaching end of life</td>
<td>$150,000</td>
</tr>
<tr>
<td>Replace ALCS</td>
<td>Upgrade equipment to operate over fiber and replace interface panel to allow for additional control/monitoring</td>
<td>$75,000</td>
</tr>
</tbody>
</table>

Source: RS&H Analysis
AIRFIELD CIRCUIT GROUND TEST READINGS

Date 1/36/12

<table>
<thead>
<tr>
<th>BREAKER</th>
<th>CIRCUIT</th>
<th>READING</th>
</tr>
</thead>
<tbody>
<tr>
<td>PP 1</td>
<td>3-21</td>
<td>30 mH</td>
</tr>
<tr>
<td>PP 1</td>
<td>8-26</td>
<td>25 mH</td>
</tr>
<tr>
<td>35-37</td>
<td>SIGN CIRCUIT 16 (MAIN INTERSECTION)</td>
<td>300 mH</td>
</tr>
<tr>
<td>PP 1</td>
<td>A1, A2, A3</td>
<td>125 mH</td>
</tr>
<tr>
<td>32-34</td>
<td>APRON, A6</td>
<td>50 mH</td>
</tr>
<tr>
<td>PP 1</td>
<td>C-C1</td>
<td>150 mH</td>
</tr>
<tr>
<td></td>
<td>C-C2</td>
<td>50 mH</td>
</tr>
<tr>
<td></td>
<td>B-B1</td>
<td>50 mH</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>150 mH</td>
</tr>
</tbody>
</table>

*********

2, 28-30 | VASI R/W 3 | 150 mH
2, 24-26 | VASI R/W 8 | 400 mH
2, 20-22 | VASI R/W 26 | 16 mH

*********

17-19 | WIND CONE #2 NEAR TERMINAL | 5 mH
15    | WIND CONE #3 SEGMENTED CIRCLE | 500 mH

For Wind Cone test:

Turn power off to circuits 15 & 17-19.
Open neutral at lighting contactor box.
Read load side of lighting contactor for each circuit.
Wind cone #2 is 240 volts.
Wind cone #3 is 120 volts.
Close neutral at junction box.

Signature
AIRFIELD CIRCUIT GROUND TEST READINGS

Date 3/5/12

<table>
<thead>
<tr>
<th>BREAKER</th>
<th>CIRCUIT</th>
<th>READING</th>
</tr>
</thead>
<tbody>
<tr>
<td>PP 1</td>
<td>3-21</td>
<td>25 mR's</td>
</tr>
<tr>
<td>PP 1</td>
<td>8-26</td>
<td>30 mR's</td>
</tr>
<tr>
<td>PP 1</td>
<td>A1, A2, A3, A7, A8, K1, K2</td>
<td>Total 105 mR's</td>
</tr>
<tr>
<td>PP 1</td>
<td>A4, A5</td>
<td>1 KMr Total 1 KMr</td>
</tr>
<tr>
<td>PP 1</td>
<td>C-C1, C-C2, 7Mr, B-B1</td>
<td>5 Mr Total 15 Mr</td>
</tr>
</tbody>
</table>

**********

2, 28-30 VASI R/W 3 300 mR's
2, 24-26 VASI R/W 8 410 mR's
2, 20-22 VASI R/W 26 12 mR's

**********

17-19 WIND CONE #2 NEAR TERMINAL 8 inches
15 WIND CONE #3 SEGMENTED CIRCLE 1 KMr's

For Wind Cone test:
- Turn power off to circuits 15 & 17-19.
- Open neutral at lighting contactor box.
- Read load side of lighting contactor for each circuit.
  - Wind cone #2 is 240 volts.
  - Wind cone #3 is 120 volts.
- Close neutral at junction box.

Signature:

[Signature]

AIRFIELD CIRCUIT GROUND TEST READINGS

Date: 16 May 2012

<table>
<thead>
<tr>
<th>BREAKER</th>
<th>CIRCUIT</th>
<th>READING</th>
</tr>
</thead>
<tbody>
<tr>
<td>PP 1</td>
<td>3-21</td>
<td>13 mΩ</td>
</tr>
<tr>
<td>PP 1</td>
<td>8-26</td>
<td>19 mΩ</td>
</tr>
</tbody>
</table>

35-37 SIGN CIRCUIT 16 (MAIN INTERSECTION) 200 mΩ

PP 1    A1, A2, A3 145 mΩ, A7, A8 14 mΩ Total 13 mΩ

32-34 APRON, A6 1 kΩ, A4, A5 500 Ω Total 400 mΩ

PP 1    C-C1, O, D, E, A, C-C2 10 mΩ, B-B1 1.5 mΩ Total 0.06 mΩ

**********

2, 28-30 VASI R/W 3 200 mΩ

2, 24-26 VASI R/W 8 300 mΩ

2, 20-22 VASI R/W 26 19 mΩ

**********

17-19 WIND CONE #2 NEAR TERMINAL 200 mΩ

15 WIND CONE #3 SEGMENTED CIRCLE 2 k mΩ

For Wind Cone test:
Turn power off to circuits 15 & 17-19.
Open neutral at lighting contactor box.
Read load side of lighting contactor for each circuit.
Wind cone #2 is 240 volts.
Wind cone #3 is 120 volts.
Close neutral at junction box.

Signature: [Signature]
# Airfield Circuit Ground Test Readings

**Date**: 28 Sept 12

<table>
<thead>
<tr>
<th>Breaker</th>
<th>Circuit</th>
<th>Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>PP 1</td>
<td>3-21</td>
<td>19 mΩ</td>
</tr>
<tr>
<td>PP 1</td>
<td>8-26</td>
<td>6 mΩ</td>
</tr>
<tr>
<td>PP 1</td>
<td>A1, A2, A3</td>
<td>100 mΩ</td>
</tr>
<tr>
<td>PP 1</td>
<td>32-34</td>
<td>APRON, A6</td>
</tr>
<tr>
<td>PP 1</td>
<td>C-C1, C-C2</td>
<td>18 mΩ</td>
</tr>
</tbody>
</table>

**Notes**

**2, 28-30**: VASI R/W 3 | 200 mΩ

**2, 24-26**: VASI R/W 8 | 200 mΩ

**2, 20-22**: VASI R/W 26 | 240 mΩ

**17-19**: WIND CONE #2 NEAR TERMINAL | 55 mΩ

**15**: WIND CONE #3 SEGMENTED CIRCLE | 2k mΩ

For Wind Cone Test:
- Turn power off to circuits 15 & 17-19.
- Open neutral at lighting contactor box.
- Read load side of lighting contactor for each circuit.
- Wind cone #2 is 240 volts.
- Wind cone #3 is 120 volts.
- Close neutral at junction box.

Signature: [Signature]
AIRFIELD CIRCUIT GROUND TEST READINGS

Date 12/18/12

BREAKER CIRCUIT

PP 1 R/W 3-21 30 mag ohms
PP 1 R/W 8-26 30 mag ohms

35-37 SIGN CIRCUIT (hold short signs on 3-21 & 8-26 intersection)

PP 1 A1, A2, A3 125 mA A-A7 1KmΩ Total 100 mA

32-34 APRON, A6 2KmΩ A4, A5 250 mA Total 500 mA

PP 1 C-C1 2mA C-C2 15mA B-B1 20mA Total 1mA

********

2, 28-30 VASI R/W 3 300 mag ohms
2, 24-26 VASI R/W 8 300 mag ohms
2, 20-22 VASI R/W 26 75 mag ohms

********

17-19 WIND CONE #2 NEAR TERMINAL

15 WIND CONE #3 SEGMENTED CIRCLE

For Wind Cone test:
   Turn power off to circuits 15 & 17-19.
   Open neutral at lighting contactor box.
   Read load side of lighting contactor for each circuit.
      Wind cone #2 is 240 volts.
      Wind cone #3 is 120 volts.
   Close neutral at junction box.

Signature DR
AIRFIELD CIRCUIT GROUND TEST READINGS

Date __7 Mar 13__

BREAKER CIRCUIT

PP 1 R/W 3-21 __22 mΩ__

PP 1 R/W 8-26 __33 mΩ__

35-37 SIGN CIRCUIT (hold short signs on 3-21 & 8-26 intersection) __450 mΩ__

PP 1 A1, A2, A3 __250 mΩ__ A-A7 __1K mΩ__ Total __200 mΩ__

32-34 APRON, A __20 K mΩ__ A4, A5 __2K mΩ__ Total __1K mΩ__ all bouncing to __Ω__

PP 1 C-C1 __15 mΩ__ C-C2 __12 mΩ__ B-B1 __6 mΩ__ Total __1.7 mΩ__

********

2, 28-30 VASI R/W 3 __400 mΩ__

2, 24-26 VASI R/W 8 __700 mΩ__

2, 20-22 VASI R/W 26 __99 mΩ__

********

17-19 WIND CONE #2 NEAR TERMINAL __90 mΩ__

15 WIND CONE #3 SEGMENTED CIRCLE __1K mΩ__

For Wind Cone test:

- Turn power off to circuits 15 & 17-19.
- Open neutral at lighting contactor box.
- Read load side of lighting contactor for each circuit.
  - Wind cone #2 is 240 volts.
  - Wind cone #3 is 120 volts.
- Close neutral at junction box.

Signature __Kuhme__
AIRFIELD CIRCUIT GROUND TEST READINGS

Date 20 June 2013

<table>
<thead>
<tr>
<th>BREAKER</th>
<th>CIRCUIT</th>
<th>READING</th>
</tr>
</thead>
<tbody>
<tr>
<td>PP 1</td>
<td>3-21</td>
<td>10 mΩ</td>
</tr>
<tr>
<td>PP 1</td>
<td>8-26</td>
<td>9 mΩ</td>
</tr>
<tr>
<td>35-37</td>
<td>SIGN CIRCUIT 16 (MAIN INTERSECTION)</td>
<td>225 mΩ</td>
</tr>
<tr>
<td>PP 1</td>
<td>A1, A2, A3</td>
<td>95 mΩ A7, A8</td>
</tr>
<tr>
<td>32-34</td>
<td>APRON, A6</td>
<td>175 mΩ A4, A5</td>
</tr>
<tr>
<td>PP 1</td>
<td>C-C1, C-C2</td>
<td>58 mΩ B-B1</td>
</tr>
</tbody>
</table>

**********

| 2, 28-30 | VASI R/W 3 | 795 mΩ |
| 2, 24-26 | VASI R/W 8 | 300 mΩ |
| 2, 20-22 | VASI R/W 26 | 14 mΩ |

**********

17-19 WIND CONE #2 NEAR TERMINAL | 200 mΩ |
15 WIND CONE #3 SEGMENTED CIRCLE | 18 mΩ |

For Wind Cone test:

Turn power off to circuits 15 & 17-19.
Open neutral at lighting contactor box.
Read load side of lighting contactor for each circuit.
Wind cone #2 is 240 volts.
Wind cone #3 is 120 volts.
Close neutral at junction box.

Signature

[Signature]
# Insulation Resistance Test Record

For use with "Megger" Insulation Testers up to 2,000 Megohms

**Apparatus:** Runway lighting NO. 1

**Rating:** New 1/97

**Location:** 3/21

**Date Installed:**

<table>
<thead>
<tr>
<th>Date</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infinity Megohms</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>0</td>
<td>10</td>
<td>20</td>
<td>30</td>
<td>40</td>
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<td>100</td>
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<tr>
<td>1000</td>
<td>2000</td>
<td>3000</td>
<td>4000</td>
<td>5000</td>
<td>6000</td>
<td>7000</td>
</tr>
</tbody>
</table>

---

**Cat. No. 210949**

**Trade Mark Reg. U.S. Pat. Off.**

Biddle Instruments, Blue Bell, Pa.

---

**Cat. No. 310969**

**Trade Mark Reg. U.S. Pat. Off.**

Biddle Instruments, Blue Bell, Pa.
**INSULATION RESISTANCE TEST RECORD**

For use with "Megger" insulation testers up to 2,000 Megohms

**APPARATUS**

Taxiway Lighting NO #1

**LOCATION**

A4 - A5

<table>
<thead>
<tr>
<th>DATE</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
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<tbody>
<tr>
<td>DATE INSTALLED</td>
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<td></td>
<td></td>
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</table>

**INSULATION RESISTANCE**

<table>
<thead>
<tr>
<th>MEGOHMS</th>
<th>INFINITY</th>
<th>2000</th>
<th>1000</th>
<th>500</th>
<th>200</th>
<th>50</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZERO</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**MARK**

TRADE MARK U.S. PAT. OFF.

DIDOLE INSTRUMENTS, BLUE HELL, PA. 19427

**MARK**

TRADE MARK U.S. PAT. OFF.

DIDOLE INSTRUMENTS, BLUE HELL, PA. 19427
APPENDIX B
LOAD CALCULATIONS
**AIRFIELD LIGHTING LOAD CALCULATION**

**Airport:** Natrona County International Airport

**CCR Circuit Designation:** C, C1,C2,B,B1 (LED)

**Project:** Airfield Electrical Assessment Report

**Project No.:** 224-2844-002

**Designer:** C. Twibell

---

### AIRFIELD CABLE LOAD

- **Series Circuit Ampacity =** 6.6 A
- **Date:** 03/11/14
- **Revised:**
- **Measured Cable Length =** 40,770 FT
- **Cable Size =** 8 AWG
- **Subtotal Cable Load =** 1,137 W

---

### AIRFIELD EQUIPMENT LOAD

<table>
<thead>
<tr>
<th>Equipment Description</th>
<th>Additional Information</th>
<th>Load (W)</th>
<th>Quantity</th>
<th>Total Load (W)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Subtotal Equipment Load = 0 W

---

### AIRFIELD LIGHTING LOAD

<table>
<thead>
<tr>
<th>Fixture Description</th>
<th>Lamp Wattage (W)</th>
<th>Number of Lamps</th>
<th>Transformer Size (W)</th>
<th>Transformer Loss (W)</th>
<th>Quantity</th>
<th>Load (W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>L-861T(L)</td>
<td>22.5</td>
<td>1</td>
<td>30/45</td>
<td>5.40</td>
<td>200</td>
<td>5580</td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Subtotal Lighting Load = 5,580 W

---

### AIRFIELD SIGN LOAD

<table>
<thead>
<tr>
<th>Guidance Sign Description</th>
<th>FAA Sign Size</th>
<th>Number of Modules</th>
<th>FAA Style</th>
<th>Type of Lamps</th>
<th>Quantity</th>
<th>Load (W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guidance Sign</td>
<td>1</td>
<td>2</td>
<td>I</td>
<td>2</td>
<td>12</td>
<td>2004</td>
</tr>
<tr>
<td>Guidance Sign</td>
<td>1</td>
<td>3</td>
<td>I</td>
<td>2</td>
<td>4</td>
<td>784</td>
</tr>
<tr>
<td>Guidance Sign</td>
<td>1</td>
<td>4</td>
<td>I</td>
<td>2</td>
<td>2</td>
<td>518</td>
</tr>
</tbody>
</table>

Subtotal Sign Load = 3,306 W

<table>
<thead>
<tr>
<th>Calculated Total Circuit Load</th>
<th>Sign Voltage @ 6.6A:</th>
<th>500.91 V</th>
</tr>
</thead>
<tbody>
<tr>
<td>10,023 W</td>
<td>688.75 V</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Constant Current Regulator Size:</th>
<th>15 kW</th>
<th>CCR Voltage @ 6.6A:</th>
<th>2,272.73 V</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Desired Spare CCR Capacity = 20 %</th>
<th>Is CCR Size Larger than CCR Load?</th>
<th>Yes</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Recommended CCR Size:</th>
<th>15 kW</th>
<th>Is CCR Voltage Larger than Sign Voltage?</th>
<th>Yes</th>
</tr>
</thead>
</table>
## AIRFIELD LIGHTING LOAD CALCULATION

**Airport:** Natrona County National Airport  
**Project:** Airfield Electrical Assessment  
**Project No.:** 224-2844-002  
**Designer:** C. Twibell

### AIRFIELD CABLE LOAD

<table>
<thead>
<tr>
<th>Series Circuit Ampacity</th>
<th>Date</th>
<th>Revised</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.6 A</td>
<td>03/11/14</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Measured Cable Length</th>
<th>Cable Size</th>
<th>Subtotal Cable Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>40,770 FT</td>
<td>8 AWG</td>
<td>1,137 W</td>
</tr>
</tbody>
</table>

### AIRFIELD EQUIPMENT LOAD

<table>
<thead>
<tr>
<th>Equipment Description</th>
<th>Additional Information</th>
<th>Load (W)</th>
<th>Quantity</th>
<th>Total Load (W)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Subtotal Equipment Load =** 0 W

### AIRFIELD LIGHTING LOAD

<table>
<thead>
<tr>
<th>Fixture Description</th>
<th>Lamp Wattage (W)</th>
<th>Number of Lamps</th>
<th>Transformer Size (W)</th>
<th>Transformer Loss (W)</th>
<th>Quantity</th>
<th>Load (W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>L-861T</td>
<td>45</td>
<td>1</td>
<td>30/45</td>
<td>10.80</td>
<td>200</td>
<td>11160</td>
</tr>
</tbody>
</table>

**Subtotal Lighting Load =** 11,160 W

### AIRFIELD SIGN LOAD

<table>
<thead>
<tr>
<th>Guidance Sign Description</th>
<th>FAA Sign Size</th>
<th>Number of Modules</th>
<th>FAA Style</th>
<th>Type of Lamps</th>
<th>Quantity</th>
<th>Load (W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guidance Sign</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>12</td>
<td>2004</td>
</tr>
<tr>
<td>Guidance Sign</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>784</td>
</tr>
<tr>
<td>Guidance Sign</td>
<td>1</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>518</td>
</tr>
</tbody>
</table>

**Subtotal Sign Load =** 3,306 W  
**Sign Voltage @ 6.6A:** 500.91 V

**Calculated Total Circuit Load =** 15,603 W  
**Sign Voltage @ 4.8A:** 688.75 V

**Constant Current Regulator Size:** 20 kW  
**CCR Voltage @ 6.6A:** 3,030.30 V

**Desired Spare CCR Capacity =** 20%  
**Is CCR Size Larger than CCR Load?** Yes

**Recommended CCR Size:** 20 kW  
**Is CCR Voltage Larger than Sign Voltage?** Yes
APPENDIX B

TAXIWAY A6 SITE PLACEMENT EVALUATION
TAXIWAY A6 SITE PLACEMENT EVALUATION

Prepared for
CASPER/NATRONA COUNTY INTERNATIONAL AIRPORT

March 2013
Version 2.0
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Figure 5 Preferred Placement of Taxiway A6 ............................................................................................ 8
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1. INTRODUCTION

Two Hot Spots have been identified by the Federal Aviation Administration at Casper/Natrona County International Airport. A Hot Spot is defined as a location on an airport movement area with a history of runway incursions or one where analysis indicates a heightened probability of collision. Hot Spots are identified to alert pilots and drivers that heightened attention is necessary in that area. The Hot Spots identified at Casper/Natrona County International Airport are defined by the Federal Aviation Administration as follows and are illustrated in Figure 1.

- Hot Spot No. 1 – Wide, complex intersection including large paved area. Among the potential hazards is the risk of a wrong runway departure due to the Runway 26 and Runway 21 intersection.

- Hot Spot No. 2 - Pilots leaving the apron sometimes taxi past Taxiway A and onto Runway 03/21 without authorization. Taxiway A is located on the edge of the ramp and is inadequately marked. Taxiway A5 gives direct access to the Runway from the ramp.

The Airport staff has been working for several years to improve the safety of these Hot Spots. It has been determined that the relocation of Taxiway A6 is the best course of action to remove Hot Spot No. 1. If Taxiway A6 was not replaced, aircraft arriving on Runway 3 that were unable to exit the runway at Taxiway A5 would be required to cross Runway 8/26 and continue to the end of Runway 3, exit at Taxiway A7, and then taxi back across Runway 8/26 on Taxiway A to arrive at the main aircraft apron. Similarly, removing the existing Taxiway A6 also forces aircraft that are unable to exit Runway 8 at Taxiway C2 to taxi to the threshold of Runway 26 in order to reach the main apron area. The purpose of this analysis is to evaluate and recommend the proper placement of the relocated Taxiway A6. The objective is to place the relocated Taxiway A6 in a location that provides the highest level of safety and aircraft operational efficiency, while providing the Airport the greatest flexibility for future development. The outcome is to construct the preferred placement in the spring of 2013, incorporate the results into the Casper/Natrona County International Airport Master Plan Study, and reflect them on the Updated Airport Layout Plan.

2. EXISTING CONDITIONS

Presently the existing Taxiway A6, does not meet recommendations in FAA Advisory Circular (AC) 150/5300-13A, Airport Design, or FAA Engineering Brief (EB) 75. However, simply removing Taxiway A6 without replacing it elsewhere would force aircraft arriving on Runway 3 that are unable to turn off at Taxiway A5 to continue across Runway 8/26 to the end of the runway, exiting at Taxiway A7, and then taxi back across Runway 8/26 on Taxiway A to arrive at the main aircraft apron. In addition, aircraft arriving on Runway 8 that are unable to turn off at Taxiway C2 would be forced to cross Runway 3/21 and continue to the end of the runway, exiting Taxiway B1 in order to reach the main apron area.

The Airport Staff, in conjunction with the Federal Aviation Administration have determined that removing Taxiway A6 from its current location and relocating it to a new location is the preferred course of action to remove Hot Spot No. 1 entirely. This will improve safety on the Airport movement area and decrease the potential risk of collision or runway incursion.
Figure 1
Existing Hot Spots
3. **AIRFIELD REQUIREMENTS**

To properly consider potential locations of the relocated Taxiway A6, existing and future airfield conditions must be identified. The following section summarizes relevant criteria that were used in the analysis to determine the proper location of Taxiway A6, and to provide planning guidance for potential airfield development.

- **Aviation Demand Forecast** - The forecast of annual aircraft operations was prepared using the 2011 TAF. The total Airport operations are expected to grow in the 20-year forecast period from approximately 38,313 in 2011 to almost 42,905 in 2031.

- **Design Aircraft** - Planning for an airfield improvement requires that a design aircraft be identified. The design aircraft at Casper/Natrona County International Airport is the B-737F and the CRJ-100. The expected fleet mix at the Casper/Natrona County International Airport is expected to change, resulting in the A300 or A310 becoming the long-term design aircraft. For airfield planning purposes the design aircraft has been correlated to an Aircraft Approach Category (AAC), Airplane Design Group (ADG), and Taxiway Design Group (TDG) for the use of airport design standards necessary during the planning period:
  o The existing AAC is D and in the future it will remain D.
  o The existing ADG is III and in the future it will become IV.
  o The existing TDG is 3 and in the future it will become a 5.

- **Runway Geometry** - Compliance with FAA airport geometric and separation standards without modification to standards is intended to meet a minimum level of airport operational safety and efficiency. Therefore, based on the FAA Advisory Circular 150/5300-13A, Airport Design standards for the primary Runway 3/21 and secondary Runway 2/20 are as follows:
  o Runway Safety Area Width = 500 feet
  o Runway Object Free Area Width = 800 feet
  o Runway to Taxiway Centerline = 400 feet

- **Taxiway Geometry** - The taxiway analysis addresses specific requirements relative to the ability of the existing taxiways to accommodate the current and projected demand. At a minimum, taxiways must provide efficient circulation, have the proper strength, and meet recommended FAA design standards to safely accommodate the design aircraft. Airport runways should be supported by a system of taxiways that provides an access interface between the runways and the aircraft parking and hangar areas.
  o Taxiway Width = TDG 3 – 60 feet. TDG 5 – 75 feet.
  o Taxiway Safety Area Width = ADG III – 118 feet. ADG IV – 171 feet.
  o Taxiway Object Free Area Width = ADG III – 186 feet. ADG IV – 259 feet.

- **Exit Taxiway Geometry** - An exit of a runway needs to be placed appropriately to allow pilots to clear a runway as quickly and efficiently as possible. Taxiway geometry, the separation distance between the exit taxiways, distance of exit taxiways from runway thresholds, and taxiway width all contribute to the amount of time the aircraft remains on the runway. The FAA provides the cumulative percentage of aircraft classes observed exiting existing runways at specific exit taxiway locations, this information can be found in Advisory Circular 150/5300-13A, Table 4-9. The FAA recommends when selecting the location and type of exit, both the wet and dry runway conditions along with the occupancy times should be considered.
Furthermore, since peak hour traffic is not expected to exceed 30 operations by the end of the planning period, only right-angled taxiways are recommended as possible alternatives to address the existing taxiway traffic flow.

- **Runway Incursion Prevention** - FAA Engineering Brief No. 75 discourages the use of entrance taxiways that are not at a right angle, which occurs on the entrance of Taxiway A6 onto Runway 8/26. Right-angled taxiways are the recommended standard for all runway-taxiway intersections as they provide the best visual cues in both directions to a pilot approaching a runway intersection. Current FAA guidance is to create taxiway geometry that requires pilots to consciously make turns, an action that promotes situational awareness. FAA Engineering Brief No. 75 states specifically, “Especially troublesome are taxiways from the terminal area that form a straight line to the midsection of a runway.” There are three locations where an aircraft can taxi straight from the ramp to Runway 3/21; these locations are identified as, Taxiways A4, A5, and A6.

4. **FUTURE AIRFIELD DEVELOPMENT**

   Future airfield development is based upon facility requirements and the Airport's strategic vision. A future full-length parallel taxiway to the south of Runway 8/26 is a critical airfield development option that must be considered before selecting a location for Taxiway A6.

   Taxiway C is currently a 3,250-foot long, by 75-foot wide partial parallel to Runway 8/26. Extending Taxiway C another 5,427 feet to the east would complete a full length parallel taxiway for Runway 8/26. This extension should also include two more connections; ideally the first would be two-thirds down Runway 8 (approximately 5,800 feet from the threshold) and the other at the threshold of Runway 26. Completing the full parallel taxiway on the south side of Runway 8/26 improves aircraft operational efficiency by reducing overall taxiway times to and from the apron areas.

5. **TAXIWAY A6 SITE CONSERATIONS**

   The objective is to place the relocated Taxiway A6 in a location that provides the highest level of safety and aircraft operational efficiency, while providing the airport the greatest flexibility for future development. Three site placement options for a new (relocated) Taxiway A6 are described below.
5.1 Taxiway A6 Option 1

The proposed location of this option is 6,550 feet from the threshold of Runway 8 as depicted in Figure 2. At this distance, 48% of large aircraft arriving on Runway 8 would be able to exit the runway during wet conditions, while 92% of large aircraft would be able to exit during dry conditions.

The advantage of placing the new Taxiway A6 in this location would be that when Taxiway C is extended to become a full parallel Taxiway, a new connector Taxiway C3 would extend to meet the new Taxiway A6. This would place the intersection of Taxiway C, Taxiway C3, and Taxiway A6 outside of the combined Runway Object Free Area (ROFA) for Runways 8/26 and 3/21. In addition, at this location any future hold markings could be placed on the straight-section of taxiways, rather than in the center of an intersection.

The disadvantages of this option are that the exit locations for both Taxiways A6 and C3 would be better located farther from their respective arrival ends of Runways 3 and 8 to capture a large percentage of arriving aircraft. Also, this proposed location of Taxiway A6 is located within the middle third of Runway 3/21, a location not recommended for crossing locations by FAA AC 5300-13A2.

Figure 2
Taxiway A6 Option 1
5.2 Taxiway A6 Option 2

The proposed location is 6,887 feet from the threshold of Runway 8 as depicted in Figure 3. At this distance 71% of large aircraft arriving on Runway 8 would be able to exit the runway during wet conditions, while 98% of large aircraft would be able to exit during dry conditions.

Similar to Option 1, this alternative considers the location of an extension to parallel Taxiway C. However unlike Option 1, Option 2 places Taxiway A6 within the “last third” area of Runway 3/21, which is a recommended crossing locations by FAA AC 5300-13A2. In addition, this option captures a larger percentage of arriving aircraft.

The disadvantage with this alternative is that Taxiway Connector C3 is located such that the entire connector remains within the combined ROFA for Runway 8/26 and 3/21. The pavement layout created where Taxiway Connector C3 and Taxiway C intersect is in close proximity to Runway 3/21 and creates expansive pavement areas, as well as placing future hold marking in the center of the intersection. The expansive pavement area and location of the hold marking holds the potential to cause pilot confusion, decreasing the level of safety on the airport, and is not recommended under FAA AC 5300-13A and FAA EB 75.

Figure 3
Taxiway A6 Option 2
5.3 **Taxiway A6 Option 3**

The proposed location is 9,050 feet from the threshold of Runway 8 as depicted in Figure 4. At this distance 100% of large aircraft arriving on Runway 8 would be able to exit the runway during both wet and dry conditions.

The advantage of placing the new Taxiway A6 in this location would be that the configuration would accommodate all large aircraft arriving on Runway 8. This location places Taxiway A6 within the "last third" area of Runway 3/21, which is a recommended crossing location by FAA AC 5300-13A2, while locating Taxiway A6 out of the ROFA for Runway 8/26.

The main disadvantage with this option is the location does not place Taxiway A6 in a location that provides flexibility for future developments to Runway 8/26. Furthermore, aircraft arriving on Runway 3 that were unable to exit the runway at Taxiway A5 would be required to cross Runway 8/26 before they could exit the runway. After exiting the runway here arriving aircraft would be forced to cross Runway 8/26 a second time in order to taxi to the main aircraft apron area, further decreasing the airports operational efficiency.

*Figure 4*

**Taxiway A6 Option 3**

![Diagram of Taxiway A6 Option 3](image-url)
6. **RECOMMENDED PLACEMENT OF TAXIWAY A6**

The optimal placement of the new Taxiway A6 is recommended to be 6,550 feet from the threshold of Runway 8 as depicted in Figure 5.

Immediately this location places Taxiway A6 outside the ROFA of Runway 8/26 while accommodating 48 percent of large aircraft arriving on Runway 8 during wet conditions, and 92 percent of large aircraft during dry conditions without having to cross Runway 8/26. This provides the airport with a high level of airfield safety and additional operational efficiency.

Long-term, if Taxiway C is extended to become a full-length parallel taxiway for Runway 8/26, then Taxiway A6 could be extended across Runway 3/21 to join it, providing the airport greater flexibility to meet future development. In addition, this would place the taxiway intersection outside of the combined Runway Object Free Area (ROFA) for both Runway 8/26 and 3/21 and would allow future hold markings on the straight-section of the taxiways, rather than in the center of an intersection. Placing the hold markings on the straight-section would improve a pilot’s situational awareness and increase the level of safety on the airport.

This analysis and recommendation will be incorporated into the Casper/Natrona County International Airport Master Plan Study, and reflected on the Updated Airport Layout Plan.

*Figure 5*

**Preferred Placement of Taxiway A6**
APPENDIX C

RSAT RUNUP ANALYSIS
RSAT RUNUP ANALYSIS

1. INTRODUCTION

The FAA Runway Safety Action Team (RSAT) is a team of FAA staff that works with airports to address existing and potential runway safety problems and issues. The RSAT that works with the Casper/Natrona County International Airport (CPR) recently determined that the Airport should evaluate the need for run-up areas adjacent to two of the existing runway thresholds. These evaluations were labeled as Action Items, and include:

- CPR-2012-003 - evaluate the need for a run-up area for Runway 26 at the intersection of Taxiway B1 and decommissioned Runway 30; and
- New Action Item – “evaluate the need for a small aircraft run-up area at the approach end of Runway 21.”

Run-up areas are expanses of pavement adjacent to a runway threshold that are used by aircraft to pull off from the taxiway and perform engine run-up procedures prior to takeoff. These areas add capacity to the airfield, and prevent those aircraft needing a run-up from blocking the entrance to the runway from other aircraft. It is recognized that the general aviation (GA) community especially appreciates run-up areas because they allow pilots to perform their pre-flight procedures without worry of holding up other aircraft. Additionally, they allow pilots in training to stage and rehearse flight processes without time sensitivity. For these reasons, multiple GA and commercial airports across the State of Wyoming have run-up areas, including Douglas (DGW) and Worland (WRL).

Run-up areas can range dramatically in size and configuration based on the type of aircraft they are intending to serve. FAA Advisory Circular 150/5300-13A Airport Design, Change 1 (AC) provides guidance for run-up areas under Section 412 Holding bays for runway ends. Note that the term ‘holding bay’ and ‘run-up’ are industry standard terms for the same type of pavement area, and are used interchangeably throughout this document.

To address the Action Items listed, an analysis was conducted to evaluate the need for a run-up area that would accommodate small aircraft at the approach ends of Runway 21 and Runway 26. For the purpose of this study, small aircraft are defined as Aircraft Design Group (ADG) I and II aircraft.

2. METHODOLOGY

According to the AC, a holding bay (run-up area) can increase capacity, and should be implemented when runway operations reach a level of 30 per hour. This equates to 15 departures per hour. To evaluate the need for run-up areas at CPR, the historical average number of daily operations was used to estimate existing and future average operations per hour. The FAA approved operations forecast, provided in the 2014 Master Plan Update, was the basis for future operations used in this analysis.

The Airport Traffic Control Tower (ATCT) tracks the number of aircraft operations performed each day at the Airport. At CPR, the ATCT is operational from 5:00 a.m. to 9:00 p.m., which is a total of 16 hours. Thus the total reported number of daily operations are those that take place within a 16 hour time-frame.

An airport’s operational daily peak hour typically accounts for approximately 10 to 15 percent of the day’s operations. For this analysis, the number of daily operations was compressed evenly into an 8
hour time-frame to derive an estimate of the number of operations per hour during the peak time-period of an average day. The number of operations during the peak hour of the compressed schedule was then compared to the typical peak hour estimates to validate the peak hour estimates.

When the Airport’s historical daily operations are compressed evenly into an 8 hour time-frame, the resulting hourly value was approximately 13 percent of the daily total. That percentage is within a range typical of airports similar to CPR.

3. REQUIREMENTS ANALYSIS

Ten years of operational data was used for the analysis, ranging from 2005 to 2014. The broad majority of operations take place during the weekday at CPR. FAA OPSNET was used to obtain the Airport’s historical average number of daily operations during weekdays. Over the past ten years, average daily weekday operations have accounted for 0.30 to 0.34 percent of annual operations, with a ten year average of 0.31 percent. Figure 1 visually depicts how closely average weekday operations have mirrored annual operations over the last ten years.

Based on the high historical correlation between the two, it is highly likely that this trend will continue through the planning period. Based on that assumption, a projection of daily operations was developed using the average percentage of daily operations to annual operations (0.31 percent), and applying it to the FAA approved operations forecast. This equated to approximately 238 average weekday operations in 2032 when annual operations are forecasted to reach 77,000.

Over the past ten years, the Airport has accommodated an average of 120 operations per day during the work week. Compressing those operations evenly into an eight hour period equates to approximately 15 operations per hour. This level of demand is below the level at which the FAA recommends run-up areas be implemented.

As described above, the analysis indicates that an average of 238 daily operations could be expected in 2032 during the work week. Compressing those operations evenly into an eight hour period equates to 30 operations per hour. Thus, based on the methodology of this analysis, 2032 would be the first year that average daily operations would reach 30 per hour and that run-up areas would be needed.
Figure 1
ANNUAL & AVERAGE WEEKDAY OPERATIONS

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<th>Year</th>
<th>Annual Operations</th>
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Source: FAA OPSNET 2014, 2014 Master Plan Update Forecast, RS&H Analysis
Operations for December 2014 was interpolated
4. **PROPOSED SOLUTION**

Based on the AC’s demand threshold of 30 aircraft operations per hour, there is no current capacity based need for run-up areas at Runway 21 or Runway 26. However, if operations track according to the forecast, run-up areas or other capacity enhancement solutions may be needed by 2032, if not earlier. Additionally, the Airport and the local general aviation community may wish for a run-up area in the near-term because of its operational advantages.

Best management practices for implementing new demand based facilities includes beginning planning for those facilities when demand reaches 60 percent of maximum capacity, and building when demand reaches 80 percent. In regard to run-up areas at CPR, the planning stage should begin when operations reach roughly 50,000 and construction should begin at roughly 60,000.

Based on these metrics, CPR is nearing the planning stage. Accordingly, this study also evaluated what capacity solution would be best for the Master Plan Update to incorporate into the Airport Layout Plan for future implementation. For this effort, it is necessary to provide further discussion as to the specifics of the Airport’s needs and FAA design standards.

Within the most recent change to the Airport Design AC (AC 150/5300-13A Change 1), the historically acceptable run-up area design, as shown in Figure 2, is now not recommended. The preferred design is illustrated in Figure 3.

---

**Figure 2**

**HOLDING BAY - NOT RECOMMENDED DESIGN**

Source: FAA AC 150/5300-13A Airport Design, Change 1
The FAA design illustrated in Figure 3 presents a holding bay configuration primarily intended for large jet aircraft. Smaller, more maneuverable aircraft, have better visibility out of the cockpit than large airliners, and pilots of small aircraft are typically accustomed to maneuvering in confined spaces that lack separation standards. For those reasons, small aircraft, which make up the majority of operations at CPR, do not typically require large complex holding bays such as those shown in Figure 3. However, because the old design (Figure 2) is no longer recommended by FAA, another solution is needed.

In discussions with John Sweeney, the Wyoming State Planner for the Denver FAA ADO, bypass taxiways were identified as a preferred solution. A bypass taxiway is a secondary runway entrance taxiway placed near the runway end. As shown in Figure 4, a bypass taxiway prevents bottlenecks from occurring when a preceding aircraft is not yet ready for takeoff. At CPR, one bypass taxiway is currently used at Runway 3. They have also been implemented within Wyoming in Afton (AFO) and Riverton (RIW).

There are two disadvantages of a bypass taxiway as compared to a holding bay. These include the lack of more than two holding positions, and the fact that aircraft departing from the bypass taxiway have a reduced length of runway available for takeoff. Advantages of bypass taxiways include the ability for aircraft to enter the runway even if another aircraft completely blocking the primary entrance. Additionally, bypass taxiways can maintain separation between all aircraft types, and in many instances, are less expensive to construct than the new standard holding bays.
The analysis of future daily operations indicated that future capacity needs do not necessitate large capacity enhancements. As such, implementation of bypass taxiways is sufficient. After considering typical operational flows at the Airport, Runway 21 is the only runway where a bypass taxiway is recommended.

Runway 8 does not need a run-up area as it is infrequently used as a departure runway and capacity is not anticipated to be an issue. Runway 26, used primarily as a crosswind runway, is intersected by Taxiway A which is only a short distance further down the runway from where a bypass taxiway would intersect. With a runway length of 8,679 feet, most aircraft that operate at CPR do not need the full runway length for takeoff. Thus, Taxiway A is effective in filling the role of a bypass taxiway for Runway 26. Any effort to improve operational efficiencies for Runway 26 should be focused on the extension of Taxiway C.

Figure 5 illustrates the future configuration of Runway 8-26 with Taxiway C extended the full length of Runway 8-26 (including new pavement to meet fillet geometry standards). The figure also illustrates a future bypass taxiway at Runway 21. That runway has a total length of 10,165 feet. As such, a bypass taxiway will provide enough remaining runway to accommodate the vast majority of aircraft that operate at CPR.

It should be noted that a run-up area installed at the intersection of Taxiway B and the decommissioned Runway 30 would eventually need to be removed when Taxiway C is extended. Additionally, future aeronautical development could be hampered if a run-up area was built in that location.
In summary, while a bypass taxiway for Runway 21 may not be necessary to increase capacity in the near term, the value and efficiencies it will provide the GA community and the Airport make it worthwhile for inclusion in the overall preferred Airport Layout Plan. The timing for implementation should be decided by the Airport through discussions with the FAA Denver ADO and RSAT.
APPENDIX D

AIRPORT TRAFFIC CONTROL STUDY
CASPER/NATRONA COUNTY INTERNATIONAL AIRPORT

AIRPORT TRAFFIC CONTROL TOWER SITING STUDY

PRELIMINARY SITING REPORT

DECEMBER 2014
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1.1 OVERVIEW

The Casper/Natrona County International Airport (CPR) is owned by Natrona County, Wyoming and the management is overseen by the Airport Board of Trustees. The Airport consists of approximately 5,131 acres located 6 nautical miles northwest of Casper, WY.

CPR is a public-use Airport and maintains a Class I Part 139 Airport Operating Certificate. It is classified by the FAA in the National Plan of Integrated Airport Systems (NPIAS) as a primary non-hub Airport. The FAA’s Terminal Area Forecast reports that in 2013, the Airport had a total of approximately 97,000 commercial passenger enplanements and 43,000 aircraft operations. Approximately 38 percent of operations are general aviation, 61 percent are air carrier and air taxi, and 1 percent are military. On average, the Airport sees 119 daily aircraft operations.

The Airport features one 10,165-foot primary runway designated as Runway 3-21, and one 8,679-foot crosswind runway designated as Runway 8-26. Both runways are equipped with ILS and RNAV approaches.

This study was conducted as part of the Airport Master Plan Update for the Casper/Natrona County International Airport.

1.2 EXISTING CONTROL TOWER

The existing Airport Traffic Control Tower (ATCT), built in 1954, by the Federal Aviation Administration (FAA) and is obsolete. The building presents discrepancies with regulation requirements and needs to be replaced or renovated. Moreover, the tower height (the current observer’s eye height is 44.5 feet) does not meet the FAA standards for adequate lookdown angle. Exhibit 1 depicts the location of the existing ATCT.

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1 Condition Assessment and 6480.17 Facility Evaluation Report, Jacobs 2012.
2 Current Line-of-Sight (LOS) angle to RWY 8 End is 0.19 degree. FAA regulation requires a minimum of 0.8 degree.
EXHIBIT 1
EXISTING ATCT LOCATION

Legend

• Existing FAA ATCT
1.3 SITE DETERMINATION

RS&H examined the 2004 Airport Master Plan (AMP), Airport Layout Plan (ALP), and additional plans for proposed development projects in order to identify and select potential sites that would be suitable for an ATCT. Existing and proposed land uses and development areas were taken into consideration.

For this study, topographic information was retrieved from LIDAR survey data that was provided by the Wyoming Department of Transportation (WYDOT). Building elevations were taken from existing Airport data. When building elevations were unavailable, the maximum structure height was assumed to be limited by the Part 77 Surfaces. Data on environmentally sensitive areas, including wetlands, were derived from GIS files available from the WYDOT. No additional field survey or geotechnical investigations were conducted as part of this study. Exhibit 2 depicts the four proposed sites for the new ATCT at CPR. Exhibit 3 shows these sites on a preliminary ALP sheet.
EXHIBIT 2
PROPOSED ATCT SITES

Site 1
Site 2
Site 3
Site 4

Source: RS&H 2014, ESRI 2014
EXHIBIT 3
PRELIMINARY ALP SHEET

- Site 1
- Site 2
- Site 3
- Site 4
The four sites selected for further consideration have been identified as Site 1, Site 2, Site 3, and Site 4. Site 1 is located on the east side of the current ATCT. Site 2 is located between the two runways on the west part of the airfield. Site 3 is positioned to the northwest of the airfield, north of Runway 8-26. Site 4 is located to the northeast of the airfield near the intersection of the two runways.

1.4 SITE 1

1.4.1 Description

Site 1 is located approximately 310 feet east of the existing ATCT. It is offset 1,260 feet southeast of the Runway 3-21 centerline and 2,050 feet south of the Runway 8-26 centerline. The site is within the Airport’s property line and has a ground elevation of 5,322 feet above mean sea level (MSL).

The ATCT will have northerly, westerly, and easterly views of the airfield. Site 1 provides unobstructed lines of sight to all current and future movement areas of the Airport, except for a portion of Taxiway B located 1,200 feet northeast of the site.

The proposed controller eye height is 126.1 feet above ground level (AGL) (5,448.1 feet MSL). The overall height of the tower, from the base to the top of the tower’s antennas, is estimated to be 156.1 feet AGL (5,478.1 feet MSL). The proposed controller eye height passes the 0.8-degree threshold for the Line Of Sight (LOS) critical angle of incidence as determined by the FAA’s Air Traffic Control Visibility Analysis Tool (ATCVAT). This angle of incidence is dependent on the distance from the ATCT to a critical point in the movement area, which in this case is the approach end of Runway 8. That distance equates to 7,275 feet.

Site 1 offers a clear view of air traffic in the vicinity of the Airport including to all points of the standard left-hand traffic patterns for both runways. As described in Section 1.4.3, some shadowing would occur on portions of Taxiway B and the apron area. Aircraft parking areas at CPR are non-movement areas, and are not actively controlled by the ATCT. However, the lack of visibility on Taxiway B, which is a controlled surface, presents a safety issue. The demolition of the hangar shadowing Taxiway B has been evaluated.

1.4.2 Site Reference Data

Site 1 is located at Latitude 42° 54’ 11.70” N and Longitude 106° 27’ 20.39” W. The proposed controller eye height is 126.1 feet AGL (5,448.1 feet MSL).

1.4.3 Siting Criteria

The siting criteria that follow are taken from Chapter 8 – Alternative Siting Process of the August 16, 2011, draft version of FAA Order 6480.4B Airport Traffic Control Tower Siting Criteria.

Criteria 1 – Visual Performance

This criteria is used to evaluate the controller’s ability to view all movement areas and air traffic in the vicinity of the airport. The criteria is validated if the site provides adequate look-down angle, line of sight, and object discrimination results as demonstrated by the FAA’s ATCVAT. A shadow study must also ensure the absence of visibility obstructions to movement areas.
**Line-of-Sight Angle of Incidence:**
The "look-down" angle – the LOS angle of incidence – was measured from the proposed eye height of 126.1 feet AGL (5,448.1 feet MSL) at Site 1.

The LOS angle of incidence is the difference in elevation between the controller eye height and a critical point in the movement area. For this analysis, the Runway 8 end is the critical point and is located approximately 7,275 feet from Site 1 at a ground elevation of 5,344 feet MSL. In order to meet the FAA threshold of 0.8° for the LOS angle of incidence to this key point, a minimum eye height of 123.6 feet AGL is required for the ATCT. To account for practical design and construction techniques the controller eye height was set at 126.1 feet AGL.

The adjusted proposed eye height, site elevation, and key point data were entered into the ATCVAT which yielded a “passing” result of 0.82°, as presented in the ATCVAT Print Outs provided at the end of this report.

**Object Discrimination Analysis Results:**
Site 1, with a proposed controller eye height of 126.1 feet AGL (5,448.1 feet MSL), produced “Passing” results for object identification, recognition, and detection as presented in the ATCVAT Print Outs.

**Shadow Study:**
**Exhibit 4** presents the shadow study for the lines of sight from Site 1 at the proposed controller eye height.

Minor shadowing of non-movement areas such as aircraft parking aprons were found. Taxiway B is the only part of the movement area that experiences some shadowing because of a hangar located 640 feet northeast of the site. This shadowing is not acceptable and the demolition of the hangar producing the obstruction is proposed. The costs implied were evaluated.
EXHIBIT 4
SITE 1 SHADOW STUDY

Legend

- Site 1
- Shadow Area Site 1
- Hangar To Remove

Source: RS&H 2014, ESRI 2014
Criteria 2 – TERPS
If this site is chosen as one of the three preferred sites, a Form 7460-1 Notice of Proposed Construction or Alteration will have to be filed with the FAA to perform an Obstruction Evaluation/Airport Airspace Analysis (OE/AAA). That analysis will evaluate impacts to existing instrument procedures at CPR.

Criteria 3 – Part 77
An evaluation was done to examine conflicts with existing and future Part 77 Surfaces. At Site 1, the ATCT, including antennas, would penetrate the Part 77 Transitional Surface of Runway 3-21 by 42 feet.

Air traffic control towers are permitted to penetrate the Part 77 Transitional Surface and must be lit with obstruction lighting. Red FAA L-810 obstruction lighting would be required in accordance with FAA Advisory Circular (AC) 70/7460-1K. Further analysis would be included in the OE/AAA evaluation.

Criteria 4 – Sunlight/Daylight
FAA Order 6480.4B - Airport Traffic Control Tower Siting Process requires documentation that light effects, including sun glare off natural and manmade surfaces or thermal distortion, do not impact the operation of the proposed ATCT.

If Site 1 is chosen as one of the three preferred sites, it will be evaluated for sun glare at the controller eye height at sunrise, midday and sunset. A helicopter will be used to replicate the controller eye height of 126.1 feet AGL (5,448.1 feet MSL), and panoramic photographs of the site at each time of day will be collected and assessed.

A preliminary analysis was conducted for the potential for sun glare when looking at the standard left-hand traffic patterns to the runways – crosswind to downwind, midfield downwind, downwind to base.

Being located southeast of Runway 3-21, Site 1 was determined to have the potential for glare when scanning the final approach to Runway 21 and Runway 26 during sunrise and early morning hours. Sun glare may also be experienced while looking toward the east behind the tower. Midday sun is not expected to produce any glare. During sunset, some sun glare could be experienced while scanning the final approach to Runway 3 and Runway 8. All the sun glare related effects on visibility that were identified could be mitigated with sun shades installed in the tower cab.

Criteria 5 – Artificial Lighting
FAA Order 6480.4B - Airport Traffic Control Tower Siting Process requires documentation of any impacts to nighttime ground and airborne operations caused by airport lighting, background clutter, and municipal and industrial lighting. Those impacts must be identified, and appropriate mitigations described.

If Site 1 is chosen as one of the three preferred sites, then the site will also be evaluated at the proposed controller eye height at night, and panoramic photographs will be collected and assessed.
Criteria 6 – Atmospheric Conditions

FAA Order 6480.4B - Airport Traffic Control Tower Siting Process, requires documentation of any naturally occurring atmospheric conditions that create site limitations from any proposed ATCT site.

To determine the local atmospheric conditions at CPR, the analysis reviewed a total of 122,164 reports\textsuperscript{3} from the Airport’s Automated Weather Observing System (AWOS) dating from January 1, 2004, through December 31, 2013.

The analysis included a review of observations during which reported visibility was equal to or less than the distance from the proposed ATCT to the farthest point of the movement area, and observations during which the reported ceilings were equal to or less than 200 feet. This height encompasses the potential conditions in which the tower could be in the clouds. It was computed by taking the overall tower height rounded up to the next 100 of feet to account for measuring precision. A summary of the weather data is found in Table 1.

For the purposes of this analysis, the visibility requirement was defined to be the distance from Site 1 to the Approach End of Runway 8, which is 1.4 miles. Visibility reported as 1.4 miles or less in the AWOS readings occurred an average of 460 times per year representing 3.89 percent of available visibility observations. The percentage of observations reporting visibility less than or equal to 1.4 miles ranged from 2.60 percent in 2012 to 5.56 percent in 2013.

Ceilings of 200 feet or less were reported an average of 96 times per year from January 2004 to December 2013. This represents 0.83 percent of the available observations. The percentage of observations showing ceilings of 200 feet or less ranged from 0.36 percent in 2008 to 1.68 percent in 2013.

\textsuperscript{3} Visibility reported in 0.1 mile increments. Ceiling reported in hundreds of feet.
### TABLE 1
**SITE 1 LOW WEATHER AWOS OBSERVATIONS**

Percent of Annual Observations for Ceiling and Visibility

<table>
<thead>
<tr>
<th>Year</th>
<th>Ceiling ≤ 200 feet</th>
<th>Visibility ≤ 1.4 miles</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>1.03%</td>
<td>3.50%</td>
</tr>
<tr>
<td>2005</td>
<td>0.5%</td>
<td>3.02%</td>
</tr>
<tr>
<td>2006</td>
<td>0.48%</td>
<td>3.47%</td>
</tr>
<tr>
<td>2007</td>
<td>1.08%</td>
<td>3.86%</td>
</tr>
<tr>
<td>2008</td>
<td>0.36%</td>
<td>3.50%</td>
</tr>
<tr>
<td>2009</td>
<td>1.25%</td>
<td>4.99%</td>
</tr>
<tr>
<td>2010</td>
<td>1.68%</td>
<td>4.40%</td>
</tr>
<tr>
<td>2011</td>
<td>0.70%</td>
<td>3.82%</td>
</tr>
<tr>
<td>2012</td>
<td>0.48%</td>
<td>2.60%</td>
</tr>
<tr>
<td>2013</td>
<td>0.67%</td>
<td>5.56%</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>0.83%</strong></td>
<td><strong>3.89%</strong></td>
</tr>
</tbody>
</table>

Source: NOAA – AWOS ID 24089 – RS&H 2014

### Criteria 7 – Industrial Municipal Discharge

**FAA Order 6480.4B - Airport Traffic Control Tower Siting Process** requires documentation of any municipal or industrial discharges that create site limitations from any proposed ATCT sites. Preliminary analysis indicated that there is currently no municipal or industrial discharge that could affect visibility from Site 1.

### Criteria 8 – Site Access

Ground access to Site 1 would utilize existing access roads on the Airport.

### Criteria 9 – Interior Physical Barriers

**FAA Order 6480.4B - Airport Traffic Control Tower Siting Process** requires identification of any interior physical barriers of an ATCT that could create site limitations. Specifically, mullions and cab equipment cannot impact line of sight from the proposed ATCT to any critical movement areas, including runway approach and departure ends and runway/taxiway intersections.

Using a generic design of an 8-sided tower cab, sight lines were analyzed for interference to critical areas of the airfield by mullions/equipment. A drawing of the cab layout and lines of sight for Site 1 is found in *Exhibit 5*. 
EXHIBIT 5
LINES OF SIGHT AND SAMPLE CAB ORIENTATION, SITE 1

Cab Legend
- Cab
- A4
- B1
- A1
- A5
- C1
- A2
- A6
- C2
- A3
- A7
- Intersection A / RWY 8-26
- Intersection C / RWY 3-21
- RWY 8 End
- RWY 3 End
- RWY 21 End
- RWY 26 End
- RWY Intersection

Main Legend
- Site 1
- Lines of Sight

Source: RS&H 2014, ESR 2014
Criteria 10 – Security

Physical security of the facility would be consistent with, at a minimum, the October 4, 2012, FAA Memorandum *FAA Contract Tower Security Requirements*. This includes:

- A security fence (minimum six feet high) encompassing the ATCT unless the tower is within the operations area or part of the terminal building
- Lighting of area surrounding the base of the ATCT and controller parking area if controller parking is not adjacent to the ATCT
- Tower Cab controlled mechanism for access to the ATCT
- Surveillance camera, with intercom, at the main entrance of the ATCT with monitor/intercom in the tower cab
- Mechanical or electrical push button key pads on main entry door to the ATCT structure
- Warning signage on each entry door to the ATCT

1.4.4 Conclusions

Site 1 is an acceptable location at a controller’s eye height of 126.1 feet AGL (5,448.1 feet MSL) representing a cab floor height of 121.1 feet AGL (5,443.1 feet MSL) and an overall height, including antennas, of 156.1 feet AGL (5,478.1 feet MSL).

Part of Taxiway B will be shadowed by an existing hangar located 640 feet northeast of the site. Shadowing of the movement area is not acceptable and this hangar would have to be removed to solve the issue. Some shadowing would also occur on aircraft aprons identified as non-movement areas.

Site 1 presents good views of aircraft on the remaining parts of the airfield’s movement area, and air traffic in the Airport vicinity. The proximity of existing infrastructure and utilities makes this site a good option.

1.4.5 Estimated Construction Costs

The preliminary cost estimates were developed in August 2014 for budgeting purposes only and are presented in *Table 2*. They are not based on a completed design and are subject to change. Additionally, the construction market may exhibit volatility depending on materials availability and labor resources. Costs were correlated to recently bid ATCT and airport projects.
### TABLE 2
**SITE 1 PRELIMINARY COST ESTIMATES**

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATCT Building &amp; Equipment</td>
<td>$3,336,427</td>
</tr>
<tr>
<td>Site Improvements and Clearing</td>
<td>$31,276</td>
</tr>
<tr>
<td>Hangar Demolition</td>
<td>$908,325</td>
</tr>
<tr>
<td>Access Road and Parking Lot</td>
<td>$61,423</td>
</tr>
<tr>
<td>Utilities Extensions</td>
<td>$155,962</td>
</tr>
<tr>
<td>General Costs</td>
<td>$607,283</td>
</tr>
<tr>
<td>Contingency</td>
<td>$1,275,174</td>
</tr>
<tr>
<td>Administration</td>
<td>$956,380</td>
</tr>
<tr>
<td><strong>Estimated Cost (FY 2014)</strong></td>
<td><strong>$7,332,250</strong></td>
</tr>
</tbody>
</table>

Source: RS&H 2014

1.4.6 **NASWATCH Summary**

If Site 1 is chosen as one of the three preferred sites, a Form 7460-1 will be filed. The FAA will run a NASWatch analysis to evaluate the impacts of the new ATCT on electronic systems surrounding the airports.
1.5 SITE 2

1.5.1 Description

Site 2 is located between the two runways 3,360 feet from the end of Runway 3 and 3,710 feet from the end of Runway 8. It is offset 1,440 feet northwest of the Runway 3-21 centerline and 2,470 feet south of the Runway 8-26 centerline. The site is within the Airport’s property and has a ground elevation of 5,331 feet MSL.

The ATCT will have northerly, southerly, and easterly views of the airfield. Site 2 provides unobstructed lines of sight to all current and future movement areas on the Airport.

The proposed controller eye height is 98.1 feet AGL (5,429.1 feet MSL). The overall height of the tower, from the base to the top of the antennas, is estimated to be 128.1 feet AGL (5,459.1 feet MSL). The distance from the ATCT to the critical point of the movement area used for height determination is 7,253 feet.

The proposed controller eye height passes the 0.8-degree threshold for the Line Of Sight (LOS) critical angle of incidence as determined by the FAA’s Air Traffic Control Visibility Analysis Tool (ATCVAT).

Site 2 also offers a clear view of air traffic in the vicinity of the Airport including to all points of the standard left-hand traffic patterns for both runways. As described in Section 1.5.3, some shadowing would occur on the southeast portion of the Airport, which includes aircraft apron areas. Those areas are non-movement areas and are not controlled by the ATCT.

1.5.2 Site Reference Data

Site 2 is located at Latitude 42° 54’ 07.77” N and Longitude 106° 28’ 15.76” W. The proposed controller eye height is 98.1 feet AGL (5,429.1 feet MSL).

1.5.3 Siting Criteria

The siting criteria that follow are taken from Chapter 8 – Alternative Siting Process in the August 16, 2011, draft version of FAA Order 6480.4B Airport Traffic Control Tower Siting Criteria.
Criteria 1 – Visual Performance
This criteria is used to evaluate the controller’s ability to view all movement areas and air traffic in the vicinity of the Airport. The criteria is validated if the site provides adequate look-down angle, line of sight, and object discrimination results as demonstrated by the FAA’s ATCVAT. A shadow study must also ensure the absence of visibility obstructions to movement areas.

Line-of-Sight Angle of Incidence:
The “look-down” angle – the LOS angle of incidence – was measured from the proposed eye height of 98.1 feet AGL (5,429.1 feet MSL) at Site 2.

The Runway 21 end is the critical point for this analysis and is located approximately 7,253 feet from Site 2 at a ground elevation of 5,326 feet MSL. In order to meet the FAA threshold of 0.8° for the LOS angle of incidence for this critical point, a minimum eye height of 96.3 feet AGL is required for the ATCT. To account for practical design and construction techniques the controller eye height was set at 98.1 feet AGL.

The adjusted proposed eye height, site elevation, and critical point data were entered into the ATCVAT which yielded a “passing” result of 0.81°.

Object Discrimination Analysis Results:
With a proposed controller eye height of 98.1 feet AGL (5,429.1 feet MSL), Site 2 produced “Passing” results for object identification, recognition, and detection. The ATCVAT Print Outs are included at the end of this report.

Shadow Study:
Exhibit 6 presents the shadow study for the lines of sight from Site 2 at the proposed controller eye height. Shadowing of areas located southeast of the airfield were identified. These areas include aircraft aprons adjacent to hangars and a closed runway, all of which are non-movement areas that are not controlled by the ATCT.
Criteria 2 – TERPS
If this site is chosen as one of the three preferred sites, a Form 7460-1 Notice of Proposed Construction or Alteration will have to be filed with the FAA to perform an Obstruction Evaluation/Airport Airspace Analysis (OE/AAA). That analysis will evaluate impacts to existing instrument procedures at CPR.

Criteria 3 – Part 77
An evaluation was conducted to examine conflicts with existing and future Part 77 Surfaces. At Site 2, the ATCT, including antennas, would not penetrate the Part 77 Transitional Surfaces of Runway 3-21 or Runway 8-26.

Criteria 4 – Sunlight/Daylight
FAA Order 6480.4B - Airport Traffic Control Tower Siting Process requires documentation that light effects, including sun glare off natural and manmade surfaces or thermal distortion, do not impact the operation of the proposed ATCT.

If Site 2 is chosen as one of the three preferred sites, it will be evaluated for sun glare at the controller eye height at sunrise, midday, and sunset. A helicopter will be used to replicate the controller eye height of 98.1 feet AGL (5,429.1 feet MSL), and panoramic photographs of the site at each time of day will be collected and assessed.

A preliminary analysis was conducted for the potential for sun glare when looking at the standard left-hand traffic patterns to the runways – crosswind to downwind, midfield downwind, downwind to base.

Site 2, being located between the two runways, might experience issues with sun glare on the airfield at sunrise or during early morning. Glare at this time of day could be expected when scanning the final approach to Runway 21 and Runway 26. Midday sun would not affect visibility. During sunset, some sun glare could be experienced while scanning the final approach to Runway 3 and Runway 8. No sun glare was identified that could not be easily mitigated with the appropriate use of sun shades installed within the tower cab.

Criteria 5 – Artificial Lighting
FAA Order 6480.4B - Airport Traffic Control Tower Siting Process requires documentation of any impacts to nighttime ground and airborne operations caused by airport lighting, background clutter, and municipal and industrial lighting. Those impacts must be identified, and appropriate mitigations described.

If Site 2 is chosen as one of the three preferred sites, then the site will also be evaluated at the proposed controller eye height at night, and panoramic photographs will be collected and assessed.

Criteria 6 – Atmospheric Conditions
FAA Order 6480.4B - Airport Traffic Control Tower Siting Process, requires documentation of any naturally occurring atmospheric conditions that create site limitations from any proposed ATCT site.
To determine the local atmospheric conditions at CPR, the analysis reviewed a total of 122,164 reports\(^4\) from the Airport’s Automated Weather Observing System (AWOS) dating from January 1, 2004, through December 31, 2013.

The analysis assessed observations during which reported visibility was equal to or less than the distance from the proposed ATCT to the farthest point of the movement area, and during times when the reported ceilings were equal to or less than 200 feet. This height accounts for conditions when the tower might be in the clouds. It was computed by taking the overall tower height rounded up to account for measurement precision. A summary of the weather data is found in Table 3.

For the purposes of this analysis, the visibility requirement was defined as the distance from Site 2 to the Taxiway A7 holding position, 1.4 miles away. Visibility reported as 1.4 miles or less in the AWOS readings occurred an average of 460 times per year representing 3.89 percent of available visibility observations. The percentage of observations reporting visibility less than or equal to 1.4 miles ranged from 2.60 percent in 2012 to 5.56 percent in 2013.

Ceilings of 200 feet or less were reported an average of 96 times per year from January 2004 to December 2013. This represents 0.83 percent of the available observations. The percentage of observations showing ceilings of 200 feet or less ranged from 0.36 percent in 2008 to 1.68 percent in 2010.

\(^{4}\) Visibility reported in 0.1 mile increments. Ceiling reported in hundreds of feet.
### TABLE 3
#### SITE 2 LOW WEATHER AWOS OBSERVATIONS
Percent of Annual Observations for Ceiling and Visibility

<table>
<thead>
<tr>
<th>Year</th>
<th>Ceiling ≤ 200 feet</th>
<th>Visibility ≤ 1.4 miles</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>1.03%</td>
<td>3.50%</td>
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<tr>
<td>2005</td>
<td>0.5%</td>
<td>3.02%</td>
</tr>
<tr>
<td>2006</td>
<td>0.48%</td>
<td>3.47%</td>
</tr>
<tr>
<td>2007</td>
<td>1.08%</td>
<td>3.86%</td>
</tr>
<tr>
<td>2008</td>
<td>0.36%</td>
<td>3.50%</td>
</tr>
<tr>
<td>2009</td>
<td>1.25%</td>
<td>4.99%</td>
</tr>
<tr>
<td>2010</td>
<td>1.68%</td>
<td>4.40%</td>
</tr>
<tr>
<td>2011</td>
<td>0.70%</td>
<td>3.82%</td>
</tr>
<tr>
<td>2012</td>
<td>0.48%</td>
<td>2.60%</td>
</tr>
<tr>
<td>2013</td>
<td>0.67%</td>
<td>5.56%</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>0.83%</strong></td>
<td><strong>3.89%</strong></td>
</tr>
</tbody>
</table>

Source: NOAA – AWOS ID 24089 – RS&H 2014

### Criteria 7 – Industrial Municipal Discharge
*FAA Order 6480.4B - Airport Traffic Control Tower Siting Process* requires documentation of any municipal or industrial discharges that create site limitations from any proposed ATCT sites. Preliminary analysis indicated that there is currently no municipal or industrial discharge that could affect visibility from Site 2.

### Criteria 8 – Site Access
Ground access to Site 2 would require the construction of a new access road on Airport property from the ATCT to the Airport’s Gate 21 located at the intersection of the Old Johnson Lateral Road and U.S. Highway 20/26.

### Criteria 9 – Interior Physical Barriers
*FAA Order 6480.4B - Airport Traffic Control Tower Siting Process* requires identification of any interior physical barriers of an ATCT that could create site limitations. Specifically, mullions and cab equipment cannot impact line of sight from the proposed ATCT to any critical movement areas, including runway approach and departure ends and runway/taxiway intersections.

Using a generic design of an 8-sided tower cab, sight lines to critical areas of the airfield were analyzed for interference by mullions/equipment. A drawing of the cab layout and lines of sight for Site 2 is illustrated in *Exhibit 7*. 
EXHIBIT 7
LINES OF SIGHT AND SAMPLE CAB ORIENTATION, SITE 2

Cab Legend

- Cab
- A4
- B1
- A1
- A5
- C1
- A2
- A6
- C2
- A3
- A7
- Intersection A / RWY B-26
- RWY 21 End
- RWY 26 End
- RWY 3 End
- RWY B End
- RWY Intersection
- Intersection C / RWY 3-21

Main Legend

- Site 2
- Lines of Sight
Criteria 10 – Security

Physical security of the facility would be consistent with, at a minimum, the October 4, 2012, FAA Memorandum *FAA Contract Tower Security Requirements*. This includes:

- A security fence (minimum six feet high) encompassing the ATCT unless the tower is within the operations area or part of the terminal building
- Lighting of area surrounding the base of the ATCT and controller parking area if controller parking is not adjacent to the ATCT
- Tower Cab controlled mechanism for access to the ATCT
- Surveillance camera, with intercom, at the main entrance of the ATCT with monitor/intercom in the tower cab
- Mechanical or electrical push button key pads on main entry door to the ATCT structure
- Warning signage on each entry door to the ATCT

1.5.4 Conclusions

Site 2 is an acceptable location at a controller’s eye height of 98.1 feet AGL (5,429.1 feet MSL) representing a cab floor height of 93.1 feet AGL (5,424.1 feet MSL) and an overall height, including antennas, of 128.1 feet AGL (5,459.1 feet MSL).

Slight shadowing would occur on some parts of the aircraft apron identified as a non-movement area. Site 2 presents good views of aircraft on the airfield’s movement areas and air traffic in the Airport vicinity. The tower’s height is driven by the need to meet FAA ATCVAT thresholds and by design considerations.

Site 2 would require the construction of a new access road and the development of utilities in the western portion of the Airport.

1.5.5 Estimated Construction Costs

The preliminary cost estimates were developed in August 2014 for budgeting purposes only and are presented in *Table 4*. They are not based on a completed design and are subject to change. Additionally, the construction market may exhibit volatility depending on materials availability and labor resources. Costs were correlated to recently bid ATCT and airport projects.
TABLE 4
SITE 2 PRELIMINARY COST ESTIMATES

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATCT Building &amp; Equipment</td>
<td>$2,981,467</td>
</tr>
<tr>
<td>Site Improvements and Clearing</td>
<td>$252,801</td>
</tr>
<tr>
<td>Access Road and Parking Lot</td>
<td>$629,901</td>
</tr>
<tr>
<td>Utilities Extensions</td>
<td>$670,394</td>
</tr>
<tr>
<td>General Costs</td>
<td>$620,555</td>
</tr>
<tr>
<td>Contingency</td>
<td>$1,288,779</td>
</tr>
<tr>
<td>Administration</td>
<td>$966,584</td>
</tr>
<tr>
<td><strong>Estimated Cost (FY 2014)</strong></td>
<td><strong>$7,410,481</strong></td>
</tr>
</tbody>
</table>

Source: RS&H 2014

1.5.6 NASWATCH Summary

If Site 2 is chosen as one of the three preferred sites, a Form 7460-1 will be filed. The FAA will run a NASWatch analysis to evaluate the impacts of the new ATCT on electronic systems surrounding the airports.
1.6 SITE 3

1.6.1 Description

Site 3 is located in the northwest portion of the Airport. It is offset 4,060 feet north of the Runway 3-21 centerline and 1,030 feet north of the Runway 8-26 centerline. The site is located on the Airport’s property and has a ground elevation of 5,341 feet MSL.

The ATCT will have southerly, westerly, and easterly views of the airfield. Site 3 provides unobstructed lines of sight to all current and future movement areas of the Airport.

The proposed controller eye height is 79.5 feet AGL (5,420.5 feet MSL). The overall height of the tower to the top of antennas is estimated to be 109.5 feet AGL (5,450.5 feet MSL). The distance from the ATCT to Taxiway A1, which is the critical point of the movement area used for height determination in this analysis, is 6,858 feet.

The proposed controller eye height passes the 0.8-degree threshold for the Line Of Sight (LOS) critical angle of incidence as determined by the FAA’s Air Traffic Control Visibility Analysis Tool (ATCVAT).

Site 3 offers a clear view of air traffic in the vicinity of the Airport including to all points of the standard left-hand traffic patterns for both runways. As described in Section 1.6.3, some shadowing would occur on the extreme southeast portion of the Airport. This area is a non-movement area and is not controlled by the ATCT.

1.6.2 Site Reference Data

Site 3 is located at Latitude 42° 54’ 41.29” N and Longitude 106° 28’ 20.69” W. The proposed controller eye height is 79.5 feet AGL (5,420.5 feet MSL).

1.6.3 Siting Criteria

The siting criteria that follow are taken from Chapter 8 – Alternative Siting Process in the August 16, 2011, draft version of FAA Order 6480.4B Airport Traffic Control Tower Siting Criteria.
Criteria 1 – Visual Performance
This criteria is used to demonstrate the controller’s ability to view all movement areas and air traffic in the vicinity of the Airport. The criteria is validated if the site provides adequate look-down angle, line of sight, and object discrimination results as demonstrated by the FAA’s ATCVAT. A shadow study must also ensure the absence of visibility obstructions to movement areas.

Line-of-Sight Angle of Incidence:
The “look-down” angle – the LOS angle of incidence – was measured from the proposed eye height of 79.5 feet AGL (5,420.5 feet MSL) at Site 3.

Taxiway A1 is the critical point for this analysis and is located approximately 6,858 feet from Site 3 at a ground elevation of 5,322 feet MSL. In order to meet the FAA threshold of 0.8° for the LOS angle of incidence for that point, a minimum eye height of 76.7 feet AGL is required for the ATCT. To account for practical design and construction techniques the controller eye height was set at 79.5 feet AGL.

The adjusted proposed eye height, site elevation and key point data were entered into the ATCVAT which yielded a “passing” result of 0.82°.

Object Discrimination Analysis Results:
Site 3, with a proposed controller eye height of 79.5 feet AGL (5,420.5 feet MSL) produced “Passing” ATCVAT results for object identification, recognition, and detection.

Shadow Study:
Exhibit 8 presents the shadow study for the lines of sight from Site 3 at the proposed controller eye height.

Shadowing of areas located southeast of the airfield were identified, and include aircraft aprons adjacent to hangars as well as a closed runway and taxiway. All of these areas are non-movement areas and are not controlled by the ATCT.
EXHIBIT 8
SITE 3 SHADOW STUDY

Legend
- Site 3
- Shadow Area Site 3

SOURCE: RS&H 2014, ESRI 2014

SHADOW STUDY SITE 3
CASPER/NATRONA COUNTY INTERNATIONAL AIRPORT
AIRPORT TRAFFIC CONTROL TOWER SITING STUDY
Criteria 2 – TERPS
If this site is chosen as one of the three preferred sites, a Form 7460-1 Notice of Proposed Construction or Alteration will have to be filed with the FAA to perform an Obstruction Evaluation/Airport Airspace Analysis (OE/AAA). That analysis will evaluate impacts to existing instrument procedures at CPR.

Criteria 3 – Part 77
An evaluation was conducted to examine conflicts with existing and future Part 77 Surfaces. At Site 3, the ATCT, including antennas, would penetrate the Part 77 Transitional Surface of Runway 8-26 by 34 feet.

Air traffic control towers are permitted to penetrate the Part 77 Transitional Surface and must be lit with obstruction lighting. Red FAA L-810 obstruction lighting would be required in accordance with FAA Advisory Circular (AC) 70/7460-1K. Further analysis would be included in the OE/AAA evaluation.

Criteria 4 – Sunlight/Daylight
FAA Order 6480.4B - Airport Traffic Control Tower Siting Process requires documentation that light effects, including sun glare off natural and manmade surfaces or thermal distortion, do not impact the operation of the proposed ATCT.

If Site 3 is chosen as one of the three preferred sites, it will be evaluated for sun glare at the controller eye height at sunrise, midday and sunset. A helicopter will be used to replicate the controller eye height of 79.5 feet AGL (5,420.5 feet MSL), and panoramic photographs of the site at each time of day will be collected and assessed.

A preliminary analysis was conducted for the potential for sun glare when looking at the standard left-hand traffic patterns to the runways – crosswind to downwind, midfield downwind, downwind to base.

Site 3 may experience issues with sun glare on the airfield at sunrise or during early morning. Glare at this time of day could be expected when scanning the final approach to Runway 21 and Runway 26. Site 3, being oriented to the southeast, could also experience some sun glare during midday. During sunset, some sun glare could be experienced while scanning the final approach to Runway 3 and Runway 8. All potential sun glare identified could be effectively mitigated with the use of sun shades installed in the tower cab.

Criteria 5 – Artificial Lighting
FAA Order 6480.4B - Airport Traffic Control Tower Siting Process requires documentation of any impacts to nighttime ground and airborne operations caused by airport lighting, background clutter, and municipal and industrial lighting. Those impacts must be identified, and appropriate mitigations described.

If Site 3 is chosen as one of the three preferred sites, then the site will also be evaluated at the proposed controller eye height at night, and panoramic photographs will be collected and assessed.
Criteria 6 – Atmospheric Conditions

FAA Order 6480.4B - Airport Traffic Control Tower Siting Process, requires documentation of any naturally occurring atmospheric conditions that create site limitations from any proposed ATCT site.

To determine the local atmospheric conditions at CPR, the analysis reviewed a total of 122,164 reports\(^5\) from the Airport’s Automated Weather Observing System (AWOS) dating from January 1, 2004, through December 31, 2013.

The analysis assessed observations during which reported visibility was equal to or less than the distance from the proposed ATCT to the farthest point of the movement area, and observations during which the reported ceilings were equal to or less than 200 feet. This height encompasses the potential conditions in which the tower could be in the clouds. It was computed taking the overall tower height rounded up to the next 100 feet to account for measuring precision. A summary of the weather data is found in Table 5.

For the purposes of this analysis, the visibility requirement was defined as the distance from Site 3 to the Taxiway A1 holding point, 1.3 miles away. Visibility reported as 1.3 miles or less in the AWOS readings occurred an average of 460 times per year representing 3.89 percent of available visibility observations. The percentage of observations reporting visibility less than or equal to 1.3 miles ranged from 2.60 percent in 2012 to 5.56 percent in 2013.

Ceilings of 200 feet or less were reported an average of 96 times per year from January 2004 to December 2013. This represents 0.83 percent of the available observations. The percentage of observations showing ceilings of 200 feet or less ranged from 0.36 percent in 2008 to 1.68 percent in 2010.

\(^5\) Visibility reported in 0.1 mile increments. Ceiling reported in hundreds of feet.
### TABLE 5
SITE 3 LOW WEATHER AWOS OBSERVATIONS

<table>
<thead>
<tr>
<th>Year</th>
<th>Ceiling ≤ 200 feet</th>
<th>Visibility ≤ 1.3 miles</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>1.03%</td>
<td>3.50%</td>
</tr>
<tr>
<td>2005</td>
<td>0.5%</td>
<td>3.02%</td>
</tr>
<tr>
<td>2006</td>
<td>0.48%</td>
<td>3.47%</td>
</tr>
<tr>
<td>2007</td>
<td>1.08%</td>
<td>3.86%</td>
</tr>
<tr>
<td>2008</td>
<td>0.36%</td>
<td>3.50%</td>
</tr>
<tr>
<td>2009</td>
<td>1.25%</td>
<td>4.99%</td>
</tr>
<tr>
<td>2010</td>
<td>1.68%</td>
<td>4.40%</td>
</tr>
<tr>
<td>2011</td>
<td>0.70%</td>
<td>3.82%</td>
</tr>
<tr>
<td>2012</td>
<td>0.48%</td>
<td>2.60%</td>
</tr>
<tr>
<td>2013</td>
<td>0.67%</td>
<td>5.56%</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>0.83%</strong></td>
<td><strong>3.89%</strong></td>
</tr>
</tbody>
</table>

Source: NOAA – AWOS ID 24089 – RS&H 2014

Criteria 7 – Industrial Municipal Discharge

*FAA Order 6480.4B - Airport Traffic Control Tower Siting Process* requires documentation of any municipal or industrial discharges that create site limitations from any proposed ATCT sites. Preliminary analysis indicated that there is currently no municipal or industrial discharge that could affect visibility from Site 3.

Criteria 8 – Site Access

Ground access to Site 3 would require the construction of a new access road on the Airport property from the ATCT to the intersection of Lockner Road and Johnson Lateral Road, northwest of the Airport.

Criteria 9 – Interior Physical Barriers

*FAA Order 6480.4B - Airport Traffic Control Tower Siting Process* requires identification of any interior physical barriers of an ATCT that could create site limitations. Specifically, mullions and cab equipment cannot impact line of sight from the proposed ATCT to any critical movement areas, including runway approach and departure ends and runway/taxiway intersections.

Using a generic design of an 8-sided tower cab, sight lines were analyzed for interference by mullions/equipment to critical areas of the airfield. A drawing of the cab layout and lines of sight for Site 3 is found in *Exhibit 9*. 

---

*Airport Traffic Control Tower Siting Study*

*Preliminary Siting Report*
EXHIBIT 9
LINES OF SIGHT AND SAMPLE CAB ORIENTATION, SITE 3
Criteria 10 – Security
Physical security of the facility would be consistent with, at a minimum, the October 4, 2012, FAA Memorandum FAA Contract Tower Security Requirements. This includes:

- A security fence (minimum six feet high) encompassing the ATCT unless the tower is within the operations area or part of the terminal building
- Lighting of area surrounding the base of the ATCT and controller parking area if controller parking is not adjacent to the ATCT
- Tower Cab controlled mechanism for access to the ATCT
- Surveillance camera, with intercom, at the main entrance of the ATCT with monitor/intercom in the tower cab
- Mechanical or electrical push button key pads on main entry door to the ATCT structure
- Warning signage on each entry door to the ATCT

1.6.4 Conclusions
Site 3 is an acceptable location at a controller’s eye height of 79.5 feet AGL (5,420.5 feet MSL) representing a cab floor height of 74.5 feet AGL (5,415.5 feet MSL) and an overall height (including antennas) of 109.5 feet AGL (5,450.5 feet MSL).

Some shadowing would occur on some parts of the aircraft apron identified as a non-movement area. Site 3 presents good views of aircraft on the airfield’s movement areas and air traffic in the Airport vicinity. The tower’s height is driven by the need to meet FAA ATCVAT thresholds and by design considerations.

Site 3 would require the construction of a new access road and the development of utilities in the northwest part of the Airport.

1.6.5 Estimated Construction Costs
Preliminary cost estimates were developed in August 2014 for budgeting purposes only and are presented in Table 6. They are not based on a completed design and are subject to change. Additionally, the construction market may exhibit volatility depending on materials availability and labor resources. Costs were correlated with recently bid ATCT and airport projects.
### TABLE 6
SITE 3 PRELIMINARY COST ESTIMATES

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATCT Building &amp; Equipment</td>
<td>$2,784,267</td>
</tr>
<tr>
<td>Site Improvements and Clearing</td>
<td>$570,559</td>
</tr>
<tr>
<td>Access Road and Parking Lot</td>
<td>$744,721</td>
</tr>
<tr>
<td>Utilities Extensions</td>
<td>$665,649</td>
</tr>
<tr>
<td>General Costs</td>
<td>$659,094</td>
</tr>
<tr>
<td>Contingency</td>
<td>$1,356,072</td>
</tr>
<tr>
<td>Administration</td>
<td>$1,017,054</td>
</tr>
<tr>
<td><strong>Estimated Cost (FY 2014)</strong></td>
<td><strong>$7,797,416</strong></td>
</tr>
</tbody>
</table>

Source: RS&H 2014

1.6.6 NASWATCH Summary

If Site 3 is chosen as one of the three preferred sites, a Form 7460-1 will be filed. The FAA will run a NASWatch analysis to evaluate the impacts of the new ATCT on electronic systems surrounding the airports.
1.7 SITE 4

1.7.1 Description

Site 4 is located in the northeast portion of the Airport, near the intersection of Runway 3-21 and Runway 8-26. It is offset 1,160 feet north of the Runway 3-21 centerline and 1,030 feet north of the Runway 8-26 centerline. The site is within the Airport’s property and has a ground elevation of 5,329 feet MSL.

The ATCT will have southerly, westerly, and easterly views of the airfield. Site 4 provides unobstructed lines of sight to all current and future movement areas of the Airport.

The proposed controller eye height is 116.8 feet AGL (5,445.8 feet MSL). The overall height of the tower to the top of antennas is estimated to be 146.8 feet AGL (5,475.8 feet MSL). For this analysis, the approach end of Runway 3 was determined to be the critical point of the movement area used for height determination. The distance from Site 4 to that point is 8,210 feet.

The proposed controller eye height passes the 0.8-degree threshold for the Line Of Sight (LOS) critical angle of incidence as determined by the FAA’s Air Traffic Control Visibility Analysis Tool (ATCVAT).

Site 4 offers a clear view of air traffic in the vicinity of the Airport including to all points of the standard left-hand traffic patterns for both runways. As described in Section 1.7.3, some shadowing would occur on the southeast of the Airport’s ramp. That area is a non-movement area and is not controlled by the ATCT.

1.7.2 Site Reference Data

Site 4 is located at Latitude 42° 54’ 42.09” N and Longitude 106° 27’ 25.70” W. The proposed controller eye height is 116.8 feet AGL (5,445.8 feet MSL).

1.7.3 Siting Criteria

The siting criteria that follow are taken from Chapter 8 – Alternative Siting Process in the August 16, 2011, draft version of FAA Order 6480.4B Air Traffic Control Tower Siting Criteria.
Criteria 1 – Visual Performance
This criteria is used to demonstrate the controller’s ability to view all movement areas and air traffic in the vicinity of the Airport. The criteria is validated if the site provides adequate look-down angle, line of sight, and object discrimination results as demonstrated by the FAA’s ATCVAT. A shadow study must also ensure the absence of visibility obstructions to movement areas.

*Line-of-Sight Angle of Incidence:*
The “look-down” angle – the LOS angle of incidence – was measured from the proposed eye height of 116.8 feet AGL (5,445.8 feet MSL) at Site 4.

The Runway 3 end is the critical point for this analysis and is located approximately 8,210 feet from Site 4 at a ground elevation of 5,324 feet MSL. In order to meet the FAA threshold of 0.8° for the LOS angle of incidence for the critical point, a minimum eye height of 109.6 feet AGL is required for the ATCT. To account for practical design and construction techniques, the controller eye height was set at 116.8 feet AGL.

The adjusted proposed eye height, site elevation and critical point data were entered into the ATCVAT which yielded a “passing” result of 0.85°.

*Object Discrimination Analysis Results:*
Site 4, with a proposed controller eye height of 116.8 feet AGL (5,445.8 feet MSL) produced “Passing” ATCVAT results for object identification, recognition, and detection.

*Shadow Study:*
Exhibit 10 presents the shadow study for the lines of sight from Site 4 at the proposed controller eye height.

Shadowing of areas located southeast of the airfield were identified which include aircraft aprons adjacent to hangars. These areas of the Airport are non-movement areas and are not controlled by the ATCT.
EXHIBIT 10
SITE 4 SHADOW STUDY

Legend
- Site 4
- Shadow Area Site 4

Source: KRSM 2014, ESRI 2014
Criteria 2 – TERPS
If this site is chosen as one of the three preferred sites, a Form 7460-1 *Notice of Proposed Construction or Alteration* will have to be filed with the FAA to perform an Obstruction Evaluation/Airport Airspace Analysis (OE/AAA). That analysis will evaluate impacts to existing instrument procedures at CPR.

Criteria 3 – Part 77
An evaluation was conducted to examine conflicts with existing and future Part 77 Surfaces. At Site 4, the ATCT, including antennas, would penetrate the Part 77 Transitional Surface of Runway 3-21 by 53 feet and the Part 77 Transitional Surface of Runway 8-26 by 71 feet.

Air traffic control towers are permitted to penetrate the Part 77 Transitional Surface and must be lit with obstruction lighting. Red FAA L-810 obstruction lighting would be required in accordance with FAA Advisory Circular (AC) 70/7460-1K. Further analysis would be included in the OE/AAA evaluation.

Criteria 4 – Sunlight/Daylight
*FAA Order 6480.4B - Airport Traffic Control Tower Siting Process* requires documentation that light effects, including sun glare off natural and manmade surfaces or thermal distortion, do not impact the operation of the proposed ATCT.

If Site 4 is chosen as one of the three preferred sites, it will be evaluated for sun glare at the controller eye height at sunrise, midday and sunset. A helicopter will be used to replicate the controller eye height of 116.8 feet AGL (5,445.8 feet MSL), and panoramic photographs of the site at each time of day will be collected and assessed.

A preliminary analysis was conducted to evaluate the potential for sun glare when looking at the standard left-hand traffic patterns to the runways – crosswind to downwind, midfield downwind, downwind to base.

Site 4 may experience issues with sun glare on the airfield at sunrise or during early morning. Glare at this time of day could be expected when scanning the final approach to Runway 21 and Runway 26. Being oriented to the southeast, the site also may experience some sun glare during midday. During sunset, some sun glare could be experienced while scanning the final approach to Runway 3 and Runway 8. All of the sun glare identified could be effectively mitigated with the appropriate use of sun shades installed in the tower cab.

Criteria 5 – Artificial Lighting
*FAA Order 6480.4B - Airport Traffic Control Tower Siting Process* requires documentation of impacts to nighttime ground and airborne operations caused by airport lighting, background clutter, and municipal and industrial lighting. Any impacts must be identified, and appropriate mitigations described.

If Site 4 is chosen as one of the three preferred sites, then the site will also be evaluated at the proposed controller eye height at night, and panoramic photographs will be collected and assessed.
Criteria 6 – Atmospheric Conditions

FAA Order 6480.4B - Airport Traffic Control Tower Siting Process requires documentation of any naturally occurring atmospheric conditions that create site limitations from any proposed ATCT site.

To determine the local atmospheric conditions at CPR, the analysis reviewed a total of 122,164 reports from the Airport’s Automated Weather Observing System (AWOS) dating from January 1, 2004, through December 31, 2013.

The analysis assessed observations during which reported visibility was equal to or less than the distance from the proposed ATCT to the farthest point of the movement area, and observations during which the reported ceilings were equal to or less than 200 feet. This height accounts for conditions in which the tower could be in the clouds. It was computed taking the overall tower height rounded up to the next 100 feet to account for measuring precision. A summary of the weather data is found in Table 7.

For the purposes of this analysis, the visibility requirement was defined as the distance between Site 4 and the Taxiway A1 hold position, 1.6 miles away. Visibility reported as 1.6 miles or less in the AWOS readings occurred an average of 544 times per year representing 4.6 percent of available visibility observations. The percentage of observations reporting visibility less than or equal to 1.6 miles ranged from 2.98 percent in 2012 to 6.24 percent in 2009.

Ceilings of 200 feet or less were reported an average of 96 times per year from January 2004 to December 2013. This represents 0.83 percent of the available observations. The percentage of observations showing ceilings of 200 feet or less ranged from 0.36 percent in 2008 to 1.68 percent in 2010.

---

6 Visibility reported in 0.1 mile increments. Ceiling reported in hundreds of feet.
### TABLE 7
SITE 4 LOW WEATHER AWOS OBSERVATIONS

<table>
<thead>
<tr>
<th>Year</th>
<th>Ceiling ≤ 200 feet</th>
<th>Visibility ≤ 1.6 miles</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>1.03%</td>
<td>4.15%</td>
</tr>
<tr>
<td>2005</td>
<td>0.5%</td>
<td>3.66%</td>
</tr>
<tr>
<td>2006</td>
<td>0.48%</td>
<td>4.15%</td>
</tr>
<tr>
<td>2007</td>
<td>1.08%</td>
<td>4.61%</td>
</tr>
<tr>
<td>2008</td>
<td>0.36%</td>
<td>4.14%</td>
</tr>
<tr>
<td>2009</td>
<td>1.25%</td>
<td>6.24%</td>
</tr>
<tr>
<td>2010</td>
<td>1.68%</td>
<td>5.28%</td>
</tr>
<tr>
<td>2011</td>
<td>0.70%</td>
<td>4.30%</td>
</tr>
<tr>
<td>2012</td>
<td>0.48%</td>
<td>2.98%</td>
</tr>
<tr>
<td>2013</td>
<td>0.67%</td>
<td>6.32%</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td><strong>0.83%</strong></td>
<td><strong>4.60 %</strong></td>
</tr>
</tbody>
</table>

Source: NOAA – AWOS ID 24089 – RS&H 2014

Criteria 7 – Industrial Municipal Discharge

*FAA Order 6480.4B - Airport Traffic Control Tower Siting Process* requires documentation of any municipal or industrial discharges that create site limitations from any proposed ATCT sites. Preliminary analysis indicated that there is currently no municipal or industrial discharge that would affect visibility from Site 3.

Criteria 8 – Site Access

Ground access to Site 4 would require the construction of a new access road on the Airport property from the ATCT to an existing road east of the Airport.

Criteria 9 – Interior Physical Barriers

*FAA Order 6480.4B - Airport Traffic Control Tower Siting Process* requires identification of any interior physical barriers of an ATCT that could create site limitations. Specifically, mullions and cab equipment cannot impact line of sight from the proposed ATCT to any critical movement areas, including runway approach and departure ends and runway/taxiway intersections.

Using a generic design of an 8-sided tower cab, sight lines were analyzed for interference by mullions/equipment with critical areas of the airfield. A drawing of the cab layout and lines of sight for Site 4 is found in *Exhibit 11.*
EXHIBIT 11
LINES OF SIGHT AND SAMPLE CAB ORIENTATION, SITE 4
Criteria 10 – Security
Physical security of the facility would be consistent with, at a minimum, the October 4, 2012, FAA Memorandum FAA Contract Tower Security Requirements. This includes:

- A security fence (minimum six feet high) encompassing the ATCT unless the tower is within the operations area or part of the terminal building
- Lighting of area surrounding the base of the ATCT and controller parking area if controller parking is not adjacent to the ATCT
- Tower Cab controlled mechanism for access to the ATCT
- Surveillance camera, with intercom, at the main entrance of the ATCT with monitor/intercom in the tower cab
- Mechanical or electrical push button key pads on main entry door to the ATCT structure
- Warning signage on each entry door to the ATCT

1.7.4 Conclusions

Site 4 is an acceptable location at a controller’s eye height of 116.8 feet AGL (5,445.8 feet MSL) representing a cab floor height of 111.8 feet AGL (5,440.8 feet MSL) and an overall height (including antennas) of 146.8 feet AGL (5,475.8 feet MSL).

Slight shadowing would occur on some parts of the aircraft apron in the non-movement area. Site 4 presents good views of aircraft in the airfield’s movement area and air traffic in the Airport vicinity. The tower’s height is driven by the need to meet FAA ATCVAT thresholds and by design considerations.

Site 4 would require the construction of a new access road and the development of utilities in the northeast part of the Airport.

1.7.5 Estimated Construction Costs

The preliminary cost estimates were developed in August 2014 for budgeting purposes only and are presented in Table 8. They are not based on a completed design and are subject to change. Additionally, the construction market may exhibit volatility depending on materials availability and labor resources. Costs were correlated to recently bid ATCT and airport projects.
### TABLE 8
SITE 4 PRELIMINARY COST ESTIMATES

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATCT Building &amp; Equipment</td>
<td>$3,277,267</td>
</tr>
<tr>
<td>Site Improvements and Clearing</td>
<td>$321,067</td>
</tr>
<tr>
<td>Access Road and Parking Lot</td>
<td>$656,819</td>
</tr>
<tr>
<td>Utilities Extensions</td>
<td>$609,190</td>
</tr>
<tr>
<td>General Costs</td>
<td>$664,106</td>
</tr>
<tr>
<td>Contingency</td>
<td>$1,382,112</td>
</tr>
<tr>
<td>Administration</td>
<td>$1,036,584</td>
</tr>
<tr>
<td><strong>Estimated Cost (FY 2014)</strong></td>
<td><strong>$7,947,145</strong></td>
</tr>
</tbody>
</table>

Source: RS&H 2014

1.7.6 NASWATCH Summary

If Site 4 is chosen as one of the three preferred sites, a Form 7460-1 will be filed. The FAA will run a NASWatch analysis to evaluate the impacts of the new ATCT on electronic systems surrounding the airports.
SITE COMPARISON CHART
### TABLE 9
SITE COMPARISON CHART

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Site 1</th>
<th>Site 2</th>
<th>Site 3</th>
<th>Site 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eye Level</td>
<td>126.1 ft AGL 5448.1 ft MSL</td>
<td>98.1 ft AGL 5429.1 ft MSL</td>
<td>79.5 ft AGL 5420.5 ft MSL</td>
<td>116.8 ft AGL 5445.8 ft MSL</td>
</tr>
<tr>
<td>Latitude / Longitude</td>
<td>42° 54' 11.70&quot; N 106° 27' 20.39&quot; W</td>
<td>42° 54' 07.77&quot; N 106° 28' 15.76&quot; W</td>
<td>42° 54' 41.29&quot; N 106° 28' 20.69&quot; W</td>
<td>42° 54' 42.09&quot; N 106° 27' 25.70&quot; W</td>
</tr>
<tr>
<td>ATCT Height (incl. antennas)</td>
<td>156.1 ft AGL 5478.1 ft MSL</td>
<td>128.1 ft AGL 5459.1 ft MSL</td>
<td>109.5 ft AGL 5450.5 ft MSL</td>
<td>146.8 ft AGL 5475.8 ft MSL</td>
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<tr>
<td>Maximum Distance to farthest movement area point</td>
<td>7,275 ft (1.4 mi) (Approach end of Runway 8)</td>
<td>7,313 ft (1.4 mi) (Taxiway A7)</td>
<td>6,858 ft (1.3 mi) (Taxiway A1)</td>
<td>8,226 ft (1.6 mi) (Taxiway A1)</td>
</tr>
<tr>
<td>Critical Key Point (Tower Height) Elev. / Distance from Site</td>
<td>RWY 8 End 5,344 ft MSL / 7,275 ft</td>
<td>RWY 21 End 5,326 ft MSL / 7,253 ft</td>
<td>TWY A1 5,322 ft MSL / 6,858 ft</td>
<td>RWY 3 End 5,324 ft MSL / 8,210 ft</td>
</tr>
<tr>
<td>ATCVAT Object Discrimination Percent, Pass/Fail, Front View, Dodge Caravan (Key Point/Farthest Point)</td>
<td>Pass Detection 97.7/97.7 Recognition 18.7/18.7 Identification 1.67/1.67</td>
<td>Pass Detection 97.7/97.6 Recognition 18.9/18.2 Identification 1.7/1.62</td>
<td>Pass Detection 98.2/ 98.2 Recognition 22.8/22.8 Identification 2.13/2.13</td>
<td>Pass Detection 96.1/96 Recognition 12/11.8 Identification 1/0.98</td>
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<tr>
<td>Line of Sight Angle of Incidence (Key Point)</td>
<td>0.82°</td>
<td>0.81°</td>
<td>0.82°</td>
<td>0.85°</td>
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<td>ATCT Orientation Direction</td>
<td>NW</td>
<td>E</td>
<td>SE</td>
<td>SE</td>
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<tr>
<td>2-point lateral discrimination</td>
<td>12° (RWY 21/RWY 26)</td>
<td>11° (RWY 21/RWY 26)</td>
<td>14° (RWY 21/RWY 26)</td>
<td>30° (RWY 21/RWY 26)</td>
</tr>
<tr>
<td>Access to ATCT Site</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Environmental Impacts</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>Potential Impacts to NAVAIDs</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>TERPS Impacts</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
<td>TBD</td>
</tr>
<tr>
<td>Part 77 Impacts</td>
<td>Transitional Surface RWY 3-21 penetrated by 42'</td>
<td>None</td>
<td>Transitional Surface RWY 8-26 penetrated by 34'</td>
<td>Transitional Surface RWY 3-21 penetrated by 53’ RWY 8-26 penetrated by 71’</td>
</tr>
<tr>
<td>Total Construction Cost Estimates (incl. ATC equipment)</td>
<td>$7,332,250</td>
<td>$7,410,481</td>
<td>$7,797,416</td>
<td>$7,947,145</td>
</tr>
</tbody>
</table>

Source: RS&H 2014
Note

Panoramic photographs will be included in the final document. The photographs will be collected and assessed for the final three preferred sites chosen from the sites listed in this document.
Visibility Siting Requirements Human Factors Analyses

Objective: Two human performance metrics, Object Discrimination Analysis and Object Discrimination and Line of Sight (LOS) Angle of Incidence, were used to assess the impact of tower height on air traffic control tower specialist distance perception.

Technical Approach: The tower visibility analysis tool (http://www.hf.faa.gov/visibility) was used to assess the human performance metrics.

Air Traffic Control Tower: **Site 1**
Light Level: **Sunlight Clouds**
Ground Turbulence: **Medium**
Target Object: **Dodge Caravan**, target orientation: **Front View**
Observer Eye Height: **126.1**
Vertical Elevation Change Between Observer and Key Point (feet): **104.1**
Ground Elevation at Tower (MSL): **5322**
Ground Elevation at Key Point (MSL): **5344**
Tower to Key Point Distance: **07275** (feet) **2.22** (km)
Visibility Range: **10** (Miles) **16.09** (km)

1. **Object Discrimination Analysis Results**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Threshold</th>
<th>Tower Results</th>
<th>Pass/Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>probability(detection)</td>
<td>95.5%</td>
<td>97.7%</td>
<td>Pass</td>
</tr>
<tr>
<td>probability(recognition)</td>
<td>11.5%</td>
<td>18.7%</td>
<td>Pass</td>
</tr>
</tbody>
</table>

2. **Line of Sight (LOS) Angle of Incidence**

<table>
<thead>
<tr>
<th>Threshold</th>
<th>Tower Results</th>
<th>Pass/Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.8 degrees or 48 minutes</td>
<td>.82 degrees</td>
<td>PASS: Change in elevation between observer and key point should be no less than 102 feet.</td>
</tr>
</tbody>
</table>
Visibility Siting Requirements Human Factors Analyses

**Objective:** Two human performance metrics, Object Discrimination Analysis and Object Discrimination and Line of Sight (LOS) Angle of Incidence, were used to assess the impact of tower height on air traffic control tower specialist distance perception.

**Technical Approach:** the tower visibility analysis tool ([http://www.hf.faa.gov/visibility](http://www.hf.faa.gov/visibility)) was used to assess the human performance metrics.

Air Traffic Control Tower: **Site 2**  
Light Level: **Sunlight Clouds**  
Ground Turbulence: **Medium**  
Target Object: **Dodge Caravan**, target orientation: **Front View**  
Observer Eye Height: **98.1**  
Vertical Elevation Change Between Observer and Key Point (feet): **103.1**  
Ground Elevation at Tower (MSL): **5331**  
Ground Elevation at Key Point (MSL): **5326**  
Tower to Key Point Distance: **7253** (feet) **2.21** (km)  
Visibility Range: **10** (Miles) **16.09** (km)

3. **Object Discrimination Analysis Results**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Threshold</th>
<th>Tower Results</th>
<th>Pass/Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>probability(detection)</td>
<td>95.5%</td>
<td>97.7%</td>
<td>Pass</td>
</tr>
<tr>
<td>probability(recognition)</td>
<td>11.5%</td>
<td>18.9%</td>
<td>Pass</td>
</tr>
</tbody>
</table>

4. **Line of Sight (LOS) Angle of Incidence**

<table>
<thead>
<tr>
<th>Threshold</th>
<th>Tower Results</th>
<th>Pass/Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.8 degrees or 48 minutes</td>
<td>.81 degrees</td>
<td>PASS: Change in elevation between observer and key point should be no less than 101 feet.</td>
</tr>
</tbody>
</table>
Visibility Siting Requirements Human Factors Analyses

**Objective:** Two human performance metrics, Object Discrimination Analysis and Object Discrimination and Line of Sight (LOS) Angle of Incidence, were used to assess the impact of tower height on air traffic control tower specialist distance perception.

**Technical Approach:** the tower visibility analysis tool ([http://www.hf.faa.gov/visibility](http://www.hf.faa.gov/visibility)) was used to assess the human performance metrics.

Air Traffic Control Tower: **Site 3**  
Light Level: **Sunlight Clouds**  
Ground Turbulence: **Medium**  
Target Object: **Dodge Caravan**, target orientation: **Front View**  
Observer Eye Height: **79.5**  
Vertical Elevation Change Between Observer and Key Point (feet): **98.5**

| Ground Elevation at Tower (MSL): | 5341 |
| Ground Elevation at Key Point (MSL): | 5322 |

Tower to Key Point Distance: **6858** (feet) **2.09** (km)  
Visibility Range: **10** (Miles) **16.09** (km)

5. **Object Discrimination Analysis Results**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Threshold</th>
<th>Tower Results</th>
<th>Pass/Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>probability(detection)</td>
<td>95.5%</td>
<td>98.2%</td>
<td>Pass</td>
</tr>
<tr>
<td>probability(recognition)</td>
<td>11.5%</td>
<td>22.8%</td>
<td>Pass</td>
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6. **Line of Sight (LOS) Angle of Incidence**

<table>
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<th>Tower Results</th>
<th>Pass/Fail</th>
</tr>
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<tbody>
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<td>.82 degrees</td>
<td>PASS: Change in elevation between observer and key point should be no less than 96 feet.</td>
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</table>
Visibility Siting Requirements Human Factors Analyses

**Objective:** Two human performance metrics, Object Discrimination Analysis and Object Discrimination and Line of Sight (LOS) Angle of Incidence, were used to assess the impact of tower height on air traffic control tower specialist distance perception.

**Technical Approach:** the tower visibility analysis tool ([http://www.hf.faa.gov/visibility](http://www.hf.faa.gov/visibility)) was used to assess the human performance metrics.

Air Traffic Control Tower: **Site 4**  
Light Level: **Sunlight Clouds**  
Ground Turbulence: **Medium**  
Target Object: **Dodge Caravan**, target orientation: **Front View**  
Observer Eye Height: **116.8**  
Vertical Elevation Change Between Observer and Key Point (feet): **121.8**  
Ground Elevation at Tower (MSL): **5329**  
Ground Elevation at Key Point (MSL): **5324**  
Tower to Key Point Distance: **8210** (feet) **2.5** (km)  
Visibility Range: **10** (Miles) **16.09** (km)

7. **Object Discrimination Analysis Results**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Threshold</th>
<th>Tower Results</th>
<th>Pass/Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>probability(detection)</td>
<td>95.5%</td>
<td>96.1%</td>
<td>Pass</td>
</tr>
<tr>
<td>probability(recognition)</td>
<td>11.5%</td>
<td>12.0%</td>
<td>Pass</td>
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8. **Line of Sight (LOS) Angle of Incidence**

<table>
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<th>Threshold</th>
<th>Tower Results</th>
<th>Pass/Fail</th>
</tr>
</thead>
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<td>.85 degrees</td>
<td>PASS: Change in elevation between observer and key point should be no less than 115 feet.</td>
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</table>
CONSTRUCTION COST ESTIMATES

Note

The construction cost estimates were developed in August 2014 for preliminary budgeting purposes only. They have not been based on a completed design and are subject to change. Additionally, the construction market may exhibit volatility depending on materials availability and labor resources. Costs were correlated with recently bid ATCT and Airport projects.
### Site 1

<table>
<thead>
<tr>
<th>WORK ITEM DESCRIPTION</th>
<th>UNIT</th>
<th>QUANTITY</th>
<th>Adjusted UNIT PRICE</th>
<th>Adjusted AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Major Work Items</strong></td>
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<td>General</td>
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<td>1.5%</td>
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<tr>
<td>Survey and Stakeout</td>
<td>LS</td>
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<tr>
<td>Temporary Construction Items</td>
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<tr>
<td><strong>Site Improvements</strong></td>
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<td>$939,601</td>
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<tr>
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<td>$9,860.00</td>
<td>$0</td>
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<tr>
<td>Fill &amp; Excavation</td>
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<td>$14.79</td>
<td>$0</td>
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<tr>
<td><strong>Parking Lot</strong></td>
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<tr>
<td><strong>New Road</strong></td>
<td>CY</td>
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<td></td>
<td></td>
</tr>
<tr>
<td><strong>ATCT</strong></td>
<td>CY</td>
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</tr>
<tr>
<td>Wetland</td>
<td>CY</td>
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<td></td>
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<tr>
<td><strong>Storm Pond</strong></td>
<td>CY</td>
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<tr>
<td>Misc. Drainage Improvements</td>
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<td>ACRE</td>
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<td>$0</td>
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</tr>
</tbody>
</table>

**Estimate of Probable Construction Cost**

$5,100,695

**25% CONTINGENCY**

$1,275,174

**15% DESIGN/CONSTRUCTION ADMINISTRATION**

$956,380

**PRELIMINARY COST ESTIMATE (FY 2014)**

$7,332,250

**Note:** Tower connected to existing utilities. No lighting considered for parking lot, no improvement of existing road system to join the ATCT. Connection to existing drainage system. Demolition of hangar because of obstruction issues.
## Site 2

<table>
<thead>
<tr>
<th>WORK ITEM DESCRIPTION</th>
<th>UNIT</th>
<th>QUANTITY</th>
<th>Adjusted UNIT PRICE</th>
<th>Adjusted AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Major Work Items</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General</td>
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<td>Safety and Security</td>
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<td>Survey and Stakeout</td>
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<td>1.5%</td>
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</tr>
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</tr>
<tr>
<td>Wetland</td>
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<td></td>
</tr>
<tr>
<td>Storm Pond</td>
<td>CY</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Misc. Drainage Improvements</td>
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<td>$4,930</td>
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<tr>
<td><strong>ATCT Building and Equipment</strong></td>
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**Estimate of Probable Construction Cost**

- **25% CONTINGENCY**
- **15% DESIGN/CONSTRUCTION ADMINISTRATION**

**PRELIMINARY COST ESTIMATE (FY 2014)**

- **$5,155,117**
- **$1,288,779**
- **$966,584**
- **$7,410,481**

**Note:** No lighting considered for parking lot and new access road, no improvement of existing road system to join the new road. Connection to existing drainage system. Water (sprinkler system), Septic, and Gas Tanks.
## Site 3

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**Estimate of Probable Construction Cost**

- 25% CONTINGENCY: $1,356,072
- 15% DESIGN/CONSTRUCTION ADMINISTRATION: $1,017,054

**PRELIMINARY COST ESTIMATE (FY 2014):** $7,797,416

**Note:** No lighting considered for parking lot and new access road, no improvement of existing road system to join the new road. Connection to existing drainage system. Water (sprinkler system), Septic, and Gas Tanks.

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**Airport Traffic Control Tower Siting Study**

**Preliminary Siting Report**

XII
## Site 4

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<th>WORK ITEM DESCRIPTION</th>
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<th>QUANTITY</th>
<th>Adjusted UNIT PRICE</th>
<th>Adjusted AMOUNT</th>
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**Note:** No lighting considered for parking lot and new access road, no improvement of existing road system to join the new road. Connection to existing drainage system. Water (sprinkler system), Septic, and Gas Tanks. Utilities connected to Radar Site northeast of site.