Chapter 1 – Introduction

Introduction and Purpose

The Airport Master Planning process evaluates an airport's physical facilities, establishes a forecast for future demand, and identifies a development plan to accommodate future growth. Since the aviation industry is not static, periodic updates are needed to revise an airport's master plan to account for local, regional, and national changes. Abilene Regional Airport (ABI) and the aviation industry have had some significant changes since the previous ABI Master Plan was completed in 2003. These changes include airline consolidations/mergers, local and regional socioeconomic changes, changes in security regulations, and improvements to ABI's current airport infrastructure.

This master plan will focus on examining existing facilities, forecasting future aviation demand, identifying the changes necessary to meet that demand, and establishing an infrastructure development plan for the next 20 years. Additionally, this master plan will serve as a tool for ABI's staff in their day-to-day management and decision-making regarding ABI's upkeep and future development.

Public Involvement

An important element in any master planning process is public involvement and feedback. Airports are public assets that play a vital role in the economic development of their community and in meeting the transportation needs of community members. Consequently, public feedback throughout the master planning process is essential to ensuring that the master plan accounts for the needs of the communities the airport serves.

Public engagement during the ABI Master Planning process was accomplished in a number of different ways:

- Public Open House Meetings – Three public open house meetings were held throughout the project. The first one was held at the beginning of the project to collect feedback from the community about the airport. A second open house was held to collect feedback regarding the recommended development alternative and a final open house was held after the completion of the Airport Master Plan.
- Project Website – A public project website (https://abilene.airportplans.com/) was developed and the web address was provided to airport stakeholders, tenants, the public, and local media outlets. Draft copies of every airport master plan chapter were posted to the website, and an opportunity was provided for interested parties to review and comment on the chapters prior to them being finalized.
- Public Survey – A public survey was executed at the beginning of the master planning project. The online survey allowed airport stakeholders and the public to provide feedback on the current operations and condition of the airport and changes they would like to see in the future.

In addition to the items discussed above, two project committees were developed with strong links to the community and airport stakeholders. These committees are discussed in the section below.

Project Committees

Two committees were established to help guide and direct the development of the ABI Airport Master Plan – the Master Plan Steering Committee (MPSC) and the Executive Committee (EC).

The project's EC was composed of the City of Abilene's Transportation Services Director, the Assistant City Manager responsible for ABI, and the FAA Program Manager assigned to ABI. The role of the EC was to provide overall direction for the master planning project and to provide guidance and direction to the MPSC.

The MPSC was composed of numerous airport stakeholders including airport tenants, the ABI Airport Development Board, the Development Corporation of Abilene (DCOA), City of Abilene Public Works, the West Central Texas Council of Governments, the Abilene Chamber of Commerce, and others. The role of the MPSC was to represent airport stakeholders, tenants, and the public throughout the airport master planning process by serving as a conduit for disseminating information about the project to those audiences and by providing feedback and recommendations on the plan as it is being developed.

The EC and MPSC met multiple times throughout the duration of the master planning process to review and provide feedback on the draft chapters of the Airport Master Plan.

Strengths, Weaknesses, Opportunities, and Threats Analysis

During the project kickoff meeting with the MPSC, a Strengths, Weaknesses, Opportunities, and Threats (SWOT) Analysis was conducted. The MPSC was asked a series of questions designed to prompt a discussion regarding each area of the SWOT analysis. **Figure 1-1** shows the ideas generated by the MPSC through the SWOT analysis.

Figure 1-1
MPSC SWAT Analysis

Abilene MPSC SWOT Results

Strengths

Covered Parking
Internal Collaboration with Stakeholders
Frequency of Daily Flights
Convenient Facilities for Passengers
Offset Parallel Runways
Available Acreage for Development
Airport is Easily Accessible
Not Much Competition in GA Market
Airfield Pavement in Excellent Condition
Safe Airfield Layout
24 hr. ATCT Operation
Good Weather
EASI Maintenance Facility
Excellent Airport Staff
Good Community Support
Airport Integrated into Local Eco. Development Strategy
Other Communities Use ABI
TSA PreCheck
Airfield Infrastructure is Sufficient to Allow Aircraft to Fly Anywhere in US

Weaknesses

Community Awareness/Education
Weather (diversions)
Reliability of Flights (Weather/MTC leads to cancellation)
Need for Additional Development at ABI
Lack of Devel. Around Airport (e.g. restaurants, etc.)
Proximity to Other Airports Causes Leakage (45% to 50% to other airports - DFW is the biggest)
Only One Airline Currently
Perception of High Airfares out of ABI
Airline Options/Agreement Issues
Aircraft Boneyard on Airport (being removed)
Restroom Appearance & Size
Dated Look of Terminal
Escalators in Front of Terminal (being removed)
ADA Access
Small Elevator on Non-Secure Side of Terminal
Departing Passenger Flow has Constraints
TSA Checkpoint Constraints (size and hours)
Rental Car Queuing in Terminal Causes Congestion
Rental Car Inventory/Cars Pulled from In-Town

Opportunities

New Aircraft Potentially Coming to Dyess in 10 Years
Fuel is Cheaper Right Now and Airlines Are Looking To Grow
TSTC Developing a Facility North of ABI
ABI is Well Suited for a Pilot Training School Because of Good Weather
Great Economic Partnership with DCOA
Growth of the Airline Industry
Oil Field Growth to the West of Abilene
Growth in Direct-to-Person Shipping (Amazon)
Available Land Close to Airport that ABI Currently Doesn't Own
New Potential Funding Opportunities for Airport Development (e.g. Department of Commerce, etc.)

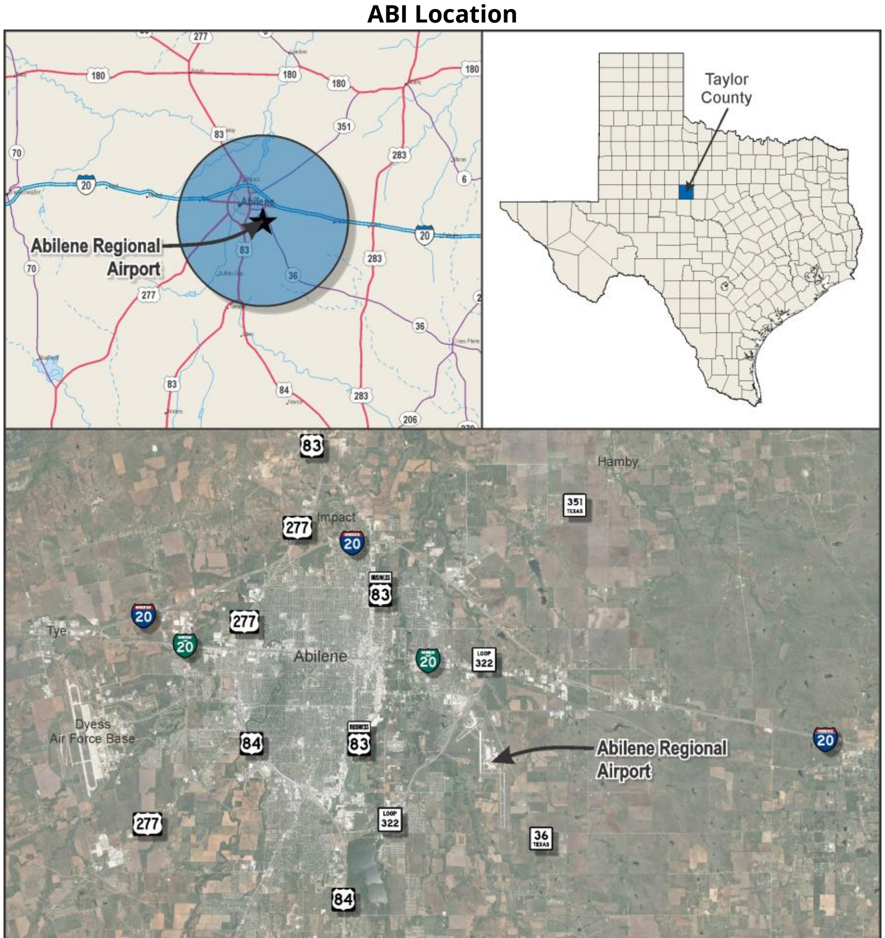
Threats

Nation-wide Pilot Shortage
Ups and Downs of Oil Market
ATC Privatization Bill Could Affect ABI's ATCT and Funding Mechanism Could Affect Aircraft Operations
Reduction in Hours for ABI's ATCT (currently 24/7 but reduced hours have been previously been discussed as part of federal budget cuts)
Potential User Fees on General Aviation Could Hurt Aircraft Activity at ABI
ADSB/NextGen Transition - 46% of GA Fleet Might Not be Ready
Reduced DOT and DOD Spending
Drone Operations in Close Proximity to ABI
Trend to Larger Aircraft Could Affect Flight Frequency
Losing Community Support for Bond Funding

Airport Overview, Location, and History

Abilene Regional Airport (ABI) is located 3 miles southeast of downtown Abilene. It is within the city limits of the City of Abilene and within the limits of Reeves County. The location of ABI is depicted in **Figure 1-2**. The Abilene Metropolitan Statistical Area (MSA) has seen consistent economic growth since 2000 with the exception of 2008 and 2009 when there was a nation-wide economic recession. Currently, the largest industry sector by employment in the Abilene MSA is the Healthcare and Social Assistance industry. The largest employer in the area is Dyess Air Force Base (AFB) with approximately 5,400 employees. Hendrick Health System is the second largest employer with approximately 3,020 employees. Abilene is also home to a number of universities including Abilene Christian University, Hardin-Simmons University, McMurry University, and Texas State Technical College – Abilene Campus.

Figure 1-2
ABI Location



Source: MileByMile.com / Google Earth

ABI is a commercial service airport that currently has one airline (Envoy Air – dba as American Eagle) operating at the airport. ABI also has two primary general aviation developments and a major aircraft maintenance facility located on the field. According to 2010 economic impact estimates provided by the Texas Department of Transportation, ABI's total economic impact was estimated to be close to $150 million annually and the airport was estimated to contribute over 1,400 jobs to the local economy. The main highway access route to/from ABI is via Texas Highway 36. ABI is approximately 4 miles from Interstate 20.

ABI has three runways and an excellent taxiway system that provides access to/from the aircraft parking aprons, hangars, and terminal. Runways 17R/35L and 17L/35R are the primary runways at ABI and they are the only runways available for air carrier use. Runway 4/22 is a crosswind runway that is available for general aviation aircraft operations only. The airport encompasses 1,634 acres. There are approximately 105 aircraft based at the airport, and the airport accommodates approximately 46,000 annual flight operations.

ABI first opened at its current location in November 1953. Prior to 1953, Abilene had a smaller airport called Abilene Municipal Airport that was located north of ABI's current location. When ABI first opened it had only two runways and the terminal building was located along the road currently named Navajo Circle.

Airport Ownership and Management

ABI is owned and operated by the City of Abilene. The day-to-day management and oversight of the facility is handled by the Transportation Services Division of the City of Abilene. The Abilene City Council is the body that is ultimately responsible for ABI. The City Council's responsibilities include the review and approval of all major capital programs, developments, budgets, and leases at ABI. The airport has an Airport Development Board that is appointed by the Abilene City Council. The eleven-member Airport Development Board is an advisory committee that is responsible for providing assistance, information, and support to the City Council to ensure the efficient and effective operation, development, and promotion of the Abilene Regional Airport while maximizing its growth potential. All members of the Airport Development Board are appointed by the Mayor for the City of Abilene with the approval of the City Council.

Chapter 2 – Airport Inventory

Introduction

As the initial step in the airport planning program, the inventory is a systematic data collection process that provides an understanding of past and present aviation factors associated with Abilene Regional Airport (ABI). A comprehensive inventory, including the following major inventory tasks, is used to form the basis for airport recommendations throughout the Airport Master Plan.

- An on-site inspection on July 11th and 12th, 2017 to inventory airport facilities, equipment, and services to assess existing physical conditions.
- Discussions with Airport and local officials, airline personnel, Fixed Base Operators (FBO) staff, and other airport tenants regarding recent airport trends, operations, and services.
- The collection of airport activity data, project records, and aeronautical background information; a review of historical airport information, previous airport layout plans, maps, charts, and photographs of airport facilities; and a records search and review of local airport-related ordinances, policies, operating standards, and lease agreements.
- The collection of regional, county, city, and airport development information to understand regional economic conditions and to determine the surrounding airport service area characteristics.
- Review of current and planned on and off-airport land use development and property information, including surrounding land use patterns, existing and proposed transportation developments, infrastructure, and utilities.
- The collection of regional climatic information, including predominant winds, cloud and visibility conditions, and precipitation levels.

Airport Ownership

ABI is managed and operated by a division of the City of Abilene Transportation Services Department. The division has 26 staff members in total. The Director of Transportation Services Department reports to an Assistant City Manager and the City Manager for the City of Abilene. All major decisions regarding capital improvements and future development plans for ABI are reviewed and approved by the Airport Development Board and the Abilene City Council.

History of the Airport

The current Abilene Regional Airport was officially activated in November 1953. When it opened, it had two runways:

- Runway 4/22 – 3,679 ft. x 100 ft. (still present on the airfield)
- Runway 18/36 which was 5,400 ft. x 100 ft. (present site of Runway 17R/35L)

The original terminal facility was located along present-day Navajo Circle on the north end of the existing ABI complex. In 1967, the City of Abilene passed a major bond election that funded a number of improvements to the airport including the construction of a portion of the existing terminal building as well as other major improvements to the community such as the Civic Center. ABI has had airline service come and go throughout its history from a number of airlines including American Airlines/American Eagle (currently operating at ABI), Pioneer Airlines, Trans-Texas Airways, and Frontier Airlines. Prior to the opening of ABI, the City of Abilene and Taylor County were served by a smaller airport just north of ABI called Abilene Municipal Airport. Remnants of the old airport can still be seen on aerial photographs to the north of ABI.

Historic CIP/Current CIP Projects

Table 2-1, *Historic Airport Projects with Funding Assistance*, shows the airport's development history that involved funding assistance through the FAA's Airport Improvement Program (AIP). According to records, since 2005, the airport has received $78,197,510 from the FAA for various improvement and rehabilitation projects.

Table 2-1
Historic Airport Projects with Funding Assistance

Year	AIP Funds	Project Description
2005	$3,892,010	Extend Taxiway, Improve Terminal Building , Rehabilitate Apron, Rehabilitate Apron, Rehabilitate Taxiway
2006	$4,255,076	Improve Terminal Building , Rehabilitate Apron, Rehabilitate Apron , Rehabilitate Runway Lighting - 17L/35R
2007	$3,264,795	Rehabilitate Runway Lighting - 17L/35R, Rehabilitate Apron
2008	$5,205,547	Improve Terminal Building , Rehabilitate Runway Lighting - 17R/35L, Rehabilitate Apron , Rehabilitate Taxiway
2009	$6,199,838	Rehabilitate Runway Lighting - 17R/35L, Rehabilitate Apron , Rehabilitate Taxiway
2010	$6,399,652	Rehabilitate Airport Beacons, Rehabilitate Taxiway, Acquire Aircraft Rescue & Fire Fighting Vehicle, Rehabilitate Apron, Wildlife Hazard Assessments, SRE Building
2011	$6,562,967	Rehabilitate Taxiway , Rehabilitate Taxiway
2012	$6,336,181	Conduct Miscellaneous Study , Rehabilitate Taxiway
2013	$8,597,558	Rehabilitate Runway 17L/35R , Rehabilitate Taxiway
2014	$8,647,266	Rehabilitate Runway - 17L/35R, Rehabilitate Runway - 17R/35L
2015	$17,602,598	Rehabilitate Runway - 17R/35L
2016	$1,234,022	Rehabilitate Taxiway [Taxiways C, C1, C2, C3, S and T], Rehabilitate Taxiway [Taxiways D, D1, D2 and D3], Rehabilitate Taxiway [Taxiways M, N and P], Security Enhancements, Update Airport Master Plan Study

Source: FAA AIP Database

Airport Role Description

The ABI role is well documented in the FAA's National Plan of Integrated Airport System (NPIAS) and the Texas Airport System Plan (TASP). Highlights include:

- Designated as one of 26 "Primary Commercial Service" airports in the TASP.
- Designated as one of 249 primary commercial service "non-hub" airports in the NPIAS.

The NPIAS defines primary non-hub airports as those that receive less than .05% but more than 10,000 of the annual U.S. commercial enplanements. In 2016, ABI had 84,073 enplanements.

Beyond the NPIAS and the TASP, the FAA identifies design standards for airports and their operating pavements based on FAA Advisory Circular (AC) 150/5300-13 (current edition), *Airport Design*. Pavement categorization is provided for runways through the runway design code (RDC) while taxiway pavements are designated separately through the taxiway design group (TDG). The RDC is defined by three variables: aircraft approach category (AAC), the airplane design group (ADG), and instrument approach procedure (IAP) visibility minimums. Previously, the Airport Reference Code (ARC) and runway design were not classified based on IAP minimum visibilities. **Table 2-2** defines the AAC, **Table 2-3** documents the ADG, and **Table 2-4** describes the various possibilities defining visibility minimums for IAPs.

Table 2-2
Aircraft Approach Category (AAC)

AAC	V_{REF}/Approach Speed [1]
A	Approach speed less than 91 knots
B	Approach speed 91 knots or more but less than 121 knots
C	Approach speed 121 knots or more but less than 141 knots
D	Approach speed 141 knots or more but less than 166 knots
E	Approach speed 166 knots or more

Source: FAA Advisory Circular 150/5300-13 (current edition***), Airport Design***
[1] V_{REF} = Landing Reference Speed or Threshold Crossing Speed

Table 2-3
Airplane Design Group (ADG)

Group #	Tail Height (ft [m])	Wingspan (ft [m])
I	< 20' (< 6 m)	< 49' (< 15 m)
II	20' - < 30' (6 m - < 9 m)	49' - < 79' (15 m - < 24 m)
III	30' - < 45' (9 m - < 13.5 m)	79' - < 118' (24 m - < 36 m)
IV	45' - < 60' (13.5 m - < 18.5 m)	118' - < 171' (36 m - < 52 m)
V	60' - < 66' (18.5 m - < 20 m)	171' - < 214' (52 m - < 65 m)
VI	66' - < 80' (20 m - < 24.5 m)	214' - < 262' (65 m - < 80 m)

Source: FAA Advisory Circular 150/5300-13 (current edition***), Airport Design***

Table 2-4
Visibility Minimums

RVR (ft) *	Instrument Flight Visibility Category (statute mile)
5000	Not lower than 1 mile
4000	Lower than 1 mile but not lower than ¾ mile
2400	Lower than 3/4 mile but not lower than 1/2 mile
1600	Lower than 1/2 mile but not lower than 1/4 mile
1200	Lower than 1/4 mile

Source: FAA Advisory Circular 150/5300-13 (current edition), *Airport Design*
* Runway Visual Range (RVR) values are not exact equivalents.

Based on the application of FAA airport design criteria, a review of the existing facilities, and the current Airport Layout Drawing (ALD), ABI is a Commercial Service Airport with a runway design code (RDC) of C-IV-2400. This designation is consistent with the types of aircraft using the airfield and the instrument approach procedures (IAP) serving ABI.

Inventory of Existing Airport Facilities

This section provides an overview of ABI's existing facilities in the following areas:

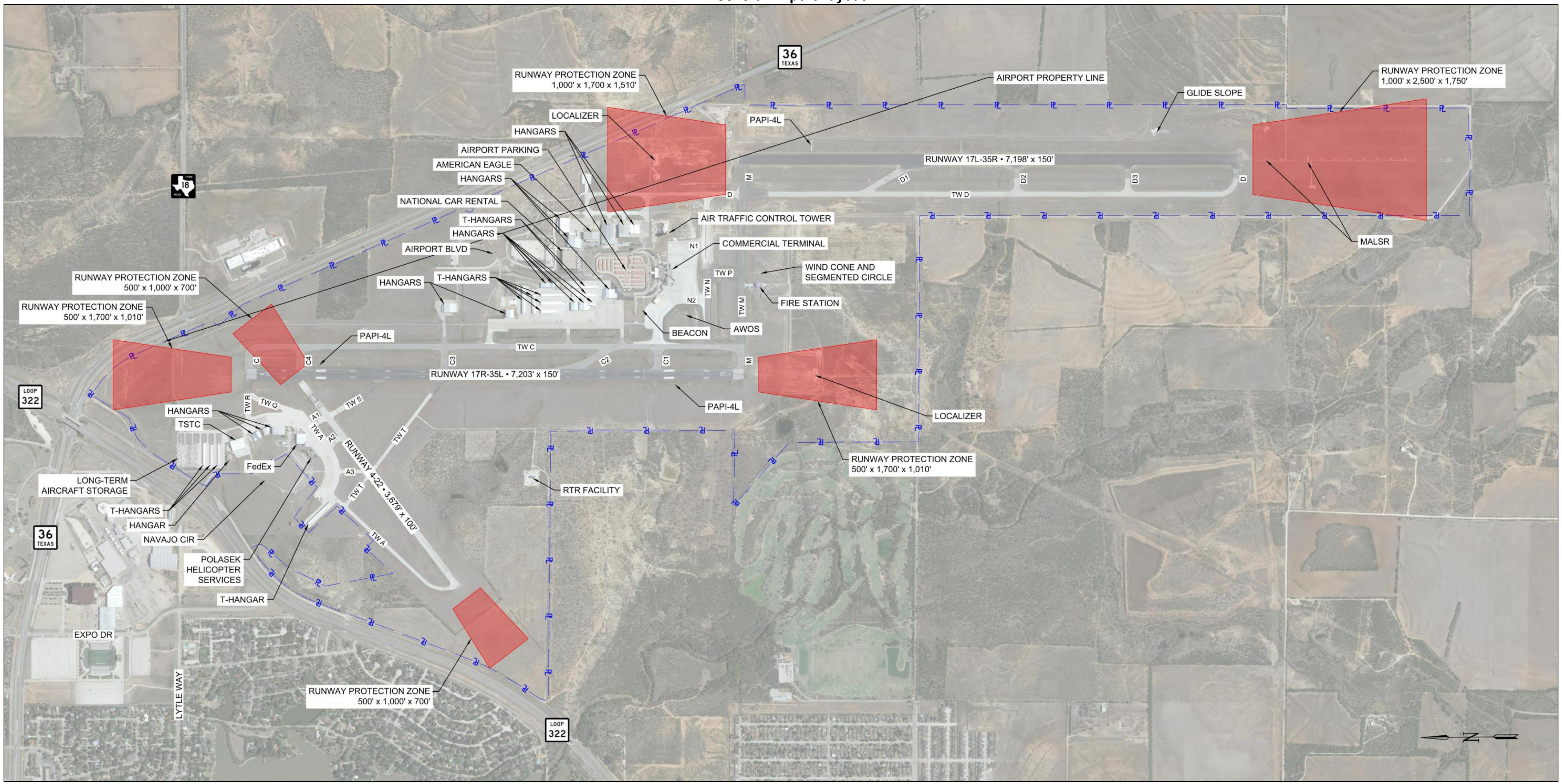
- Airfield
- Terminal
- General Aviation Facilities
- Aircraft Maintenance Facilities
- Cargo Facilities
- Landside Facilities
- Support Facilities
- Potential Future Development Sites

ABI's campus is approximately 1,634 acres in total. As shown in **Figure 2-1**, *General Airport Layout***,** ABI currently has 3 runways, a passenger terminal facility, parking facilities, and several large general aviation development areas on the airfield.

Airfield Facilities

Airfield inventory summarizes ABI's existing airfield facilities including the runways, taxiways, ramp/apron areas, Navigational Aids (NAVAIDs), instrument approaches, weather facilities, and airfield marking/lighting/signage. During the Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis conducted at the beginning of this project, ABI's airfield facilities were highlighted as a major "strength" of the airport.

Figure 2-1
General Airport Layout



Source: Garver, 2017

Runways

ABI has 3 runways. Runway 17L/35R and 17R/35L are parallel runways (3,100 ft. apart) and are both certified for air carrier use. Runway 4/22 is a General Aviation (GA) only runway. **Table 2-5,** *Runway Description,* provides a summary of ABI's runway facilities.

Table 2-5
Runway Description

Item	Runway 04/22	Runway 17L/35R	Runway 17R/35L
Length (feet)	3,679	7,198	7,203
Width (feet)	100	150	150
Surface Material	Asphalt	Asphalt/GRVD	Asphalt/GRVD
Weight Bearing Capacity (pounds)			
Single Wheel Gear (S)	30,000	85,000	85,000
Dual Wheel Gear (D)	60,000	160,000	160,000
Dual Tandem (2D)	N/A	160,000	160,000
PCN	5 /F/D/X/T	57 /F/C/X/T	61 /F/C/X/T
Markings	Non-Precision Instrument	Precision Instrument	Non-Precision Insturment
Runway Lighting	MIRL	HIRL	HIRL
Approach Lighting Sys.	None	MALSR at 35R end	REILs at 35L end
Vertical Guidance Slope Indicators	None	P4L at 17L end	P4L at both ends
Other Visual Aids	None	Lighted Windcone at RWY 35R end	Lighted Windcone at RWY 17R end
Runway RSA	150 ft. x 300 ft.	500 ft. x 1,000 ft.	500 ft. x 1,000 ft.
Runway OFA	500 ft. x 300 ft.	800 ft. x 1,000 ft	800 ft. x 1,000 ft.
Runway OFZ	400 ft. x 200 ft.	400 ft. x 200 ft.	400 ft. x 200 ft.
Instrument Approach Aids	None	ILS for RWY 35R	LOC for RWY 17R
Weather Reporting Aids	ASOS	ASOS	ASOS
Runway Visual Range (RVR)	None	1 - Touchdown Zone RWY 35R	None
Runway Design Code (RDC)	B-II-5,000	C-IV-2,400	C-IV-5,000

Source: FAA 5010 Form for ABI, AC 150/5300-13, Instrument Approach Charts

Runway 17R/35L

Runway 17R/35L is ABI's primary air carrier runway as it is the most frequently used runway. The runway is 7,203 ft. x 150 ft. and is constructed of asphalt. A Localizer (LOC) based Instrument Approach Procedure (IAP) exists to Runway 17R. No other IAPs are published for the runway but ABI does have a VOR/GPS-A approach that can be utilized. The current RDC for the runway is C-IV-5,000. A major rehabilitation project was completed on the runway in 2017. The pavement is in good condition. The RPZ dimensions for the Runway 17R approach are 1,700 ft. x 500 ft. x 1,010 ft. The RPZ dimensions for the Runway 35R approach are 1,700 ft. x 500 ft. x 1,010 ft. A portion of the RPZ for Runway 17R is outside of ABI's existing property limits.

Runway 17L/35R

Runway 17L/35R is ABI's secondary air carrier runway. The runway is 7,198 ft. x 150 ft. and is constructed of asphalt. It is ABI's only runway with an ILS approach (Runway 35R) and has the lowest visibility minimums (1/2 mile) of any runway on the airport. The current RDC for the runway is C-IV-2,400. A major rehabilitation project was just completed on the runway in 2015. The pavement is in good condition. The RPZ dimensions for the Runway 17L approach are 1,700 ft. x 1,000 ft. x 1,510 ft. The RPZ dimensions for the Runway 35R approach are 2,500 ft. x 1,000 ft. x 1,750 ft. A portion of each of the RPZs is outside of ABI's existing property limits.

Runway 4/22

Runway 4/22 is a small general aviation only runway that is part of the original ABI facility when it was constructed in 1953. The runway is 3,679 ft. x 100 ft. and is constructed of asphalt. An RNAV (GPS) approach exists for Runway 22. No other IAPs are published for the runway but ABI does have a VOR/GPS-A approach that can be utilized. The current RDC for the runway is B-II-5000. The runway pavement is in fair condition. The RPZ dimensions for the Runway 4 approach are 1,000 ft. x 500 ft. x 700 ft. The RPZ dimensions for the Runway 22 approach are 1,000 ft. x 500 ft. x 700 ft. Both of the RPZs are completely on airport property. A portion of the Runway 4/22 Runway Safety Area and RPZ intersect Runway 17R/35L and Taxiway Charlie. Runway hold position markings and signs are located on Taxiway Charlie to prevent unauthorized entry into this area. ABI staff and ATCT staff have reported no runway incursion issues at this location.

Magnetic Variation and Runway Designations

The current magnetic variation at ABI as shown on the FAA published airfield diagram is 5.3^{O} East with a 0.1^{O} West annual change. Currently, the established magnetic heading for each runway is shown below:

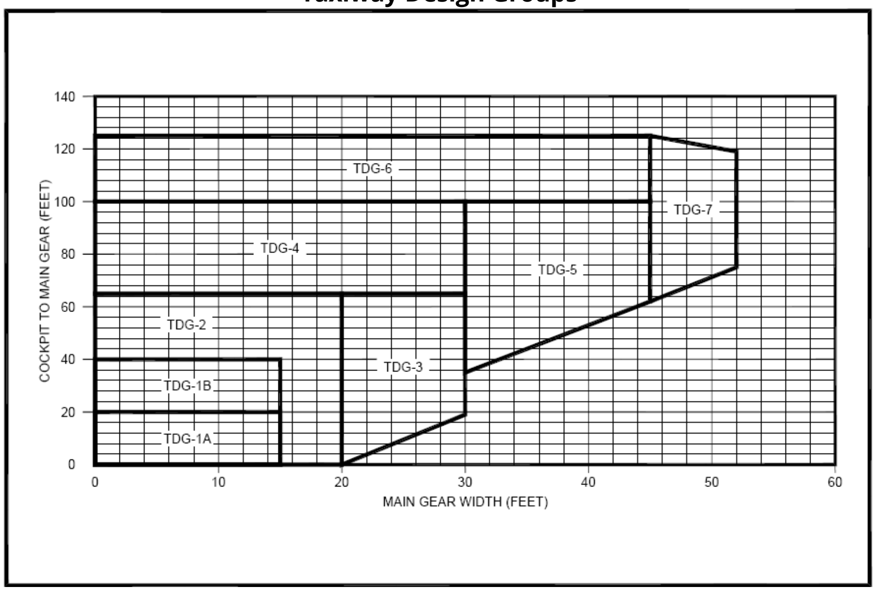
- Runway 17R/35L – 174.5^{O} and 354.5^{O}
- Runway 17L/35R– 174.5^{O} and 354.5^{O}
- Runway 4/22 – 47^{O} and 227^{O}

Based on the established annual rate of change, in approximately 5 years Runways 17R/35L and 17L/35R will have magnetic headings of 175^{O} and 355^{O} and will continue to move closer to magnetic headings that would be more in alignment with Runway 18/36 designations. ABI should discuss the timing of the impending runway designation change with FAA soon as possible as re-designating runways is a lengthy process that requires extensive coordination. Runway 4/22 is already at a point where it could be re-designated to Runway 5/23.

Taxiways

Airport operations are coordinated from the runway to the businesses/hangars on the airfield through the establishment of taxiways and taxilanes. Each taxiway is designated with a unique name and designed to accommodate anticipated aircraft operations based on a Taxiway Design Group (TDG). The TDG is a classification system for taxiways based on an airplane's landing gear dimensions, namely the outer to outer main gear width and the cockpit to main gear distance. The TDG is identified by the use of **Figure 2-2,** then application of the specific safety parameters outlined in AC 150/5300-13 (current edition). **Table 2-6** provides an overview of the taxiway facilities at ABI. Currently, the largest aircraft that operates at ABI on a daily basis is the Embraer Regional Jet (ERJ) 145 which is in the TDG-2 category. Aircraft with higher TDGs operate out of ABI but not on a daily basis.

Figure 2-2
Taxiway Design Groups



Source: FAA AC 150/5300-13 (current edition), *Airport Design*

In the current Airport Certification Manual (ACM), ABI lists the following taxiways as available for air carrier use: Taxiways C, C1, C2, C3, C4, D, D1, D2, D3, M, N, N1, N2, and P**.** The ACM states that the established Taxiway Safety Area (TSA) for all air carrier taxiways is a 150 ft. in width which is non-standard**.** A standard Group III TSA is 118 ft., and a standard Group IV TSA is 171 ft**.** The current TSA being utilized for air carrier taxiways at ABI is in-between those standards**.** Based on a review of taxiway design drawings, it appears that all air carrier taxiways at ABI have been designed to Group IV standards and that a full-size Group IV TSA should be considered for all of ABI's air carrier taxiways**.** This will be investigated further in the facility requirements chapter**.** Taxiways A, A2, A2, A3, R, Q, T, and S are not available for air carrier use**.**

The majority of the taxiways associated with the air carrier runways have been through major rehabilitation projects since 2011**.** The taxiways that have been rehabilitated since 2011 include taxiways C, C1, C2, C3, M, N, N1, N2, P, and small portions of taxiways R, S, and T that are associated with Runway 17R/35L**.**

ABI utilizes two of its taxiways as a "hot cargo" area when they need to locate an aircraft away from the terminal and other operational areas because of concerns regarding items onboard the aircraft**.** The two designated hot cargo areas are Taxiway N east of the Taxiway N1 intersection and Taxiway D south of the Taxiway M intersection.

Additionally, ABI has some designated taxilanes that are associated with the Eagle Aviation Services, Inc. (EASI) facility**.** These taxilanes are described in **Table 2-7,** Taxilane Facilities.

Table 2-6
Taxiway Facilities

Taxiway	Width (ft.)	TSA (ft.)	TOFA (ft.)	Pavement Type	Pavement Condition
A	50	118	186	Asphalt	Poor
A1	75	171	259	Asphalt	Poor
A2	50	118	186	Asphalt	Poor
A3	50	118	186	Asphalt	Poor
C	75	150	259	Asphalt	Good
C1	100	150	259	Asphalt	Good
C2	85	150	259	Asphalt	Good
C3	100	150	259	Asphalt	Good
C4	100	150	259	Asphalt	Good
D (south of TWY M)	75	150	259	Asphalt	Good
D1	80	150	259	Asphalt	Good
D2	75	150	259	Asphalt	Good
D3	75	150	259	Asphalt	Good
M	75	150	259	Asphalt	Good
N	75	150	259	Asphalt	Good
N1	145	150	259	Asphalt	Good
N2	145	150	259	Asphalt	Good
P	95	150	259	Asphalt	Good
Q	75	171	259	Asphalt	Poor
R	75	171	259	Asphalt	Poor
S	75	171	259	Asphalt	Good
T	50	118	186	Asphalt	Good

Source: ABI ACM, Garver, 2017

Table 2-7
Taxilane Facilities

Taxilane	Width (ft.)	TSA (ft.)	TOFA (ft.)	Pavement Type	Pavement Condition
D (north of TWY M)	50	118	162	Concrete	Good
EA	50	118	162	Concrete	Good
EB	50	118	162	Concrete	Good
EASI	50	118	162	Concrete	Good

Source: Garver, 2017

Aircraft Circulation

There are two primary operational configurations for aircraft takeoff and landings at ABI.

Runway 17R and 17L Flow

When the winds are from the south, which they are for the majority of the year, aircraft will typically land on Runway 17R and takeoff on Runway 17L or Runway 17R. When utilizing this configuration aircraft will typically takeoff from the runway that is closest to their parking location. Consequently, most air carrier aircraft will takeoff on Runway 17L because it is closer to the terminal ramp area and many aircraft from Abilene Aero will depart on Runway 17R because it is closer to the Abilene Aero ramp.

Runway 35R and 35L Flow

When winds are from the north aircraft will typically land on Runway 35R and Runway 35L will be used for takeoffs. This configuration is common during the winter and early spring months. This is also the period of the year where Instrument Metrological Conditions (IMC) conditions are more prevalent.

General Airfield Circulation Constraints and Runway 4/22

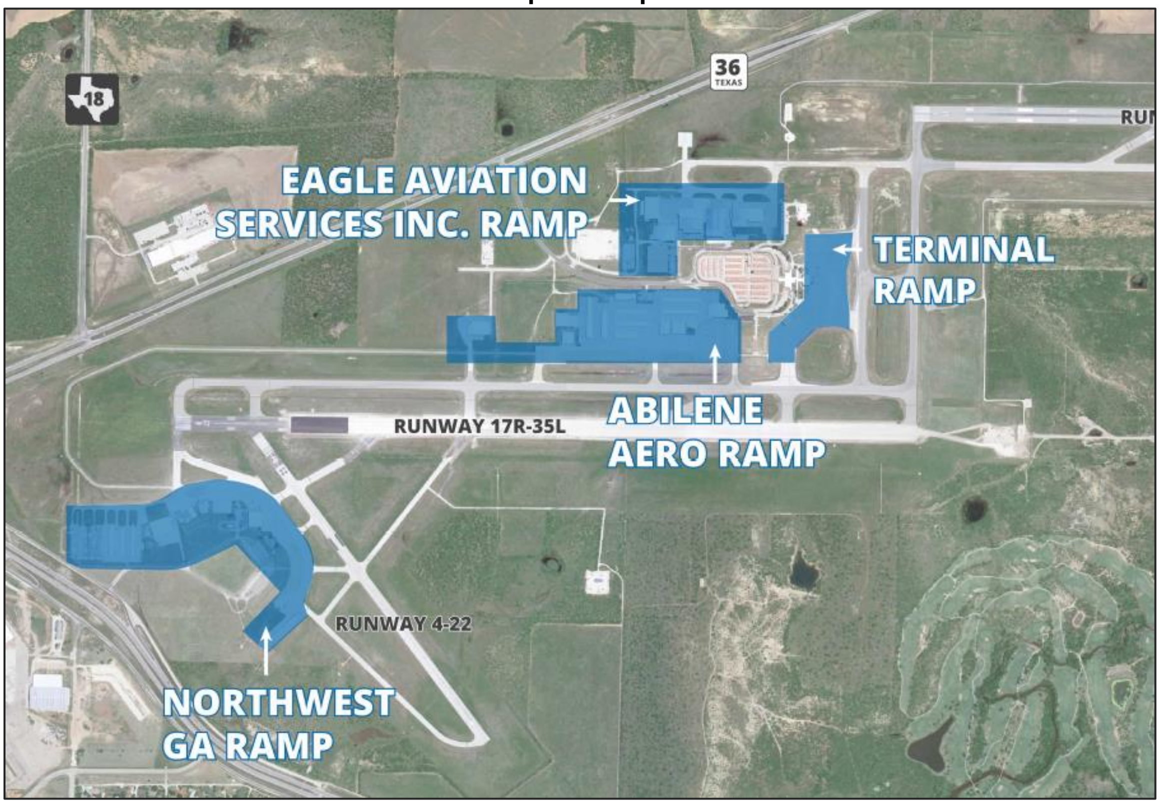
Both runways have full-length parallel taxiway systems and there are multiple entrances to most ramp areas so no aircraft circulation issues exist. Runway 4/22 is the least utilized of the 3 runways at ABI. It is primarily utilized by small aircraft when crosswinds on the primary runway exceed the capabilities of some smaller aircraft. This primarily occurs in the months of February, March, September, and October.

Ramps/Aprons

Aircraft ramps/apron areas are commonly utilized for the parking, storage, and maneuvering of aircraft outside of the control of ATCT. ABI has four primary ramp areas shown in **Figure 2-3**, *Airport Ramps* and described in **Table 2-8**, *Ramp Description.* The north GA Ramp includes a site in front of the Polasek Helicopter hangar that is primarily utilized for helicopter operations. The

EASI Ramp includes a compass calibration pad that is utilized by general aviation aircraft and Eagle Aviation Services as part of their maintenance operation.

Figure 2-3
Airport Ramps



Source: Garver, 2017

Table 2-8
Ramp Description

Ramp Area	Square Yards	Primary Use	Pavement Type	Pavement Condition
Terminal Ramp	55,722	Movement of air carrier aircraft.	Concrete	Good
Northwest GA Ramp	65,011	Small aircraft and helicopter operations.	Aspahlt w/one concrete area	Poor
FBO Ramp	94,111	Recreational, corporate, and military aircraft.	Concrete	Good
EASI Ramp*	41,411	Air carrier aircraft maintenance by Eagle Aviation Services.	Concrete	Good

Source: Garver, 2017
*Includes associated taxilanes utilized by EASI for maneuvering aircraft.

Airfield Signage/Lighting

Sufficient airfield lighting is an important part of maintaining the airfield's operational status during night and inclement weather conditions. **Table 2-5**, on page 8, outline the various airfield lighting systems associated with the runways at ABI. In addition to the runway lighting systems, ABI is also equipped with an airfield signage system, taxiway edge lights, a rotating beacon, and a lighted windsock with a segmented circle.

Rotating Beacon

At night or during poor weather, pilots identify an airport by locating the rotating beacon, a lighting feature designed to provide alternating white and green lights, as it rotates and can be seen for up to ten miles from the airfield. ABI's beacon is located north of the Terminal Ramp and west of the existing terminal building. The rotating beacon is in good condition.

Wind Indicators

ABI's centerfield windsock is located approximately 200 ft. south of the intersection of Taxiway M and P adjacent to the Airport Rescue and Fire Fighting (ARFF) station. The windsock structure and the segmented circle are in good condition. ABI also has supplemental lighted windsocks at the approach ends of Runway 35R and 17R (close to the intersection with Runway 4/22). Both windsocks are in good condition. An unlit windsock is present at the approach end of Runway 35L.

Airfield Signage

ABI has an airfield signage system that provides guidance to aircraft operators regarding their location on the airfield and the location of significant facilities. ABI has an FAA-approved Airfield Signage and Marking Diagram that is part of their Airport Certification Manual (ACM). The airfield signage at ABI is in good condition. ABI staff have not received any inquiries from pilots stating that a portion of the existing signage system is confusing or misleading. There have been no reported runway incursions were airfield signage was listed as a contributing factor.

Airfield Lighting

The runway lighting systems for each runway at ABI are depicted in **Table 2-5**, *Runway Descriptions*. All runway lighting systems are in good condition with the exception of the runway edge lighting system for Runway 4/22 which is out of service. The runway edge lighting systems and supplemental windsocks are maintained by ABI staff. The runway edge lighting system for Runway 17L/35R was rehabilitated in 2007 and the edge lighting system for Runway 17R/35L was rehabilitated in 2009. The edge lighting systems are a "can and conduit" design. All approach lighting systems (e.g. REILs, MALSR, PAPIs, etc.) are maintained by the FAA. Taxiways C, C1, C2, C3, C4, D, D1, D2, D3, R, M, N, N1, N2, and P are illuminated by medium intensity taxiway edge lights. The taxiway edge light circuits have a mixture of LED and incandescent fixtures. The taxiway edge light circuits appear to be in good condition. Taxiways A, A1, A2, A3, Q, S, and T are all unlit, but these taxiways do have taxiway centerline reflectors. All taxiway lighting systems and reflectors are maintained by ABI staff. The regulators for all the airfield lighting systems maintained by ABI staff. With the exception of the regulator for the Runway 4/22 edge lighting system, all lighting regulators are housed in the lighting vault located adjacent to the ABI terminal building. The regulator for Runway 4/22 is located adjacent to the AvFuel office building on the Northwest GA ramp, however, the regulator is inoperative.

Airfield Markings

Accurate and visible airfield markings are essential to ensure the safe operation of aircraft. A description of ABI's runway marking layout is contained in **Table 2-5.**

Runway 17L/35R has precision instrument runway markings. The markings are in good condition. Runway 17R/35L has non-precision instrument runway markings. The markings are in good condition. Runway 4/22 has non-precision instrument runway markings. These markings are in poor condition. The threshold of Runway 22 was previously relocated, and the outline of the old markings can still be seen.

All taxiways have taxiway centerline markings and enhanced taxiway centerline markings where required. These markings all appear to be in good condition. Surface painted runway hold position signs are painted on all runway/taxiway intersections. These markings are in good condition with the exception of the surface painted signs along Runway 4/22 which are faded and are in fair condition.

Runway hold position markings are also painted at all runway/taxiway intersections. These markings are in good condition. In accordance with AC 150/5300-13A, *Airport Design*, the runway hold position markings should be located 268 ft. from the runway centerline on Runway 17R/35L and Runway 17L/35R and 200 ft. from the runway centerline on Runway 4/22. Based on a geometric analysis of these markings it appears that none of the runway hold position markings on the taxiways intersecting Runway 4/22 are located 200 ft. away from the Runway 4/22 centerline. The majority of these markings are located approximately 153 ft. to 167 ft. from the runway centerline. If these markings are relocated, all associated airfield signage (runway hold position signs) and markings (surface painted runway hold position signs) will need to be relocated as well.

Movement Area boundary markings are also present on all ramp areas to delineate the movement from the non-movement area. These markings are in good condition. Taxiway edge markings are present along the terminal ramp area and along portions of Taxiway N, N1, N2, and C to delineate usable from non-usable pavement. These markings are in good condition.

NAVAIDs

NAVAIDs, located on the field or at other locations in the region, are specialized equipment that provide pilots with electronic guidance and visual references in an effort to execute instrument approaches and point-to-point navigation. ABI has a number of NAVAIDs located on the field including:

- 3 – 4 Light Precision Approach Path Indicator (PAPI) system. Located at the approach end of Runway 17L, 17R, and 35L.
- 1 – Instrument Landing System (ILS). The system is composed of a glideslope and a localizer. The ILS is for instrument approaches to Runway 35R.
- 1 – Localizer System (LOC). Located at the departure end of Runway 17R. The LOC is for instrument approaches to Runway 17R

The location of these NAVAIDs is identified in **Figure 2-1**, *General Airport Layout Diagram*.

ABI users also utilize some NAVAIDS located off airport property. The primary NAVAIDs utilized by pilots that are located off property are:

- Abilene VORTAC – The Abilene VORTAC is located approximately 9.3 NM northwest of ABI. It is utilized for the VOR – A approach, the ILS approach for Runway 35R, and the LOC approach for Runway 17R.
- Tuscola VOR/DME – The Tuscola VOR/DME is located approximately 13 NM southwest of ABI. It is utilized for the ILS approach for Runway 35R and the LOC approach for Runway 17R.

Modifications to Standards

ABI currently does not have any airside facilities that are authorized under an FAA approved Modification to Standards.

Weather Observation System

ABI has an Automated Surface Observation System (ASOS) that is the primary source of wind direction, velocity, and altimeter data for weather observation purposes for the airport. The ASOS, which is owned and maintained by the National Weather Service (NWS), is an automated sensor suite that reports weather conditions over a discrete radio frequency for pilots to receive real-time weather information. The ABI ASOS information can be received by tuning to the ATIS frequency 118.25 MHZ or by calling 325-201-9467.

Instrument Approach Procedures (IAP)

Currently, there are 6 published straight-in or circling instrument approach procedures at ABI. Details for these approaches are in **Table 2-9.**

Table 2-9
Instrument Approach Procedures

Runway End	Approach Type	Visibility Minimums	Ceiling Minimum
Runway 17L	RNAV/GPS	LPV DA: Categories A, B, C, D, & E - 3/4 mile LNAV/VNAV DA: Categories A, B, C, D, & E - 1 1/4 miles LNAV MDA: Categories A & B - 1 mile Categories C, D, & E - 1 3/8 miles Circling: Category A - 1 mile Category B - 1 mile Category C - 1 3/4 miles Category D - 2 miles Category E - 2 miles	2,041' MSL/250' AGL 2,171' MSL/380' AGL 2,240' MSL/449' AGL 2,240' MSL/449' AGL 2,300' MSL/509' AGL 2,320' MSL/529' AGL 2,420' MSL/629' AGL 2,460' MSL/669' AGL 2620' MSL/829' AGL
Runway 17R	LOC	S-17R: Category A & B - 1-mile Category C, D, & E - 1 3/8 miles Circling: Category A - 1 mile Category B - 1 mile Category C - 1 3/4 miles Category D - 2 miles Category E - 3 miles	2,280' MSL/509' AGL 2,280' MSL/509' AGL 2,300' MSL/509' AGL 2,320' MSL/529' AGL 2,420' MSL/629' AGL 2,460' MSL/669' AGL 2,620' MSL/829' AGL
Runway 22	RNAV/GPS	LNAV MDA: Categories A & B - 1 mile Categories C, D, & E - 1 1/8 miles Circling: Category A - 1 mile Category B - 1 mile Category C - 1 3/4 miles Category D - 2 miles	2,180' MSL/416' AGL 2,180' MSL/416' AGL 2,300' MSL/509' AGL 2,320' MSL/529' AGL 2,420' MSL/629' AGL 2,460' MSL/669' AGL
Runway 35R	RNAV/GPS	LPV DA: Categories A, B, C, D, & E - 1/2 mile LNAV/VNAV DA: Categories A, B, C, D, & E - 1 mile LNAV MDA: Categories A & B - 1/2 mile Categories C, D, & E - 1 mile Circling: Category A - 1 mile Category B - 1 mile Category C - 1 3/4 miles Category D - 2 miles Category E - 3 miles	1,976' MSL/200' AGL 2,189' MSL/400' AGL 2,260' MSL/484' AGL 2,260' MSL/484' AGL 2,300' MSL/509' AGL 2,320' MSL/529' AGL 2,420' MSL/629' AGL 2,460' MSL/669' AGL 2,620' MSL/829' AGL
Runway 35R	ILS/LOC	S-ILS: Categories A, B, C, D, & E - 1/2 mile S-LOC: Categories A & B - 1/2 mile Categories C, D, & E - 1 mile Circling: Category A - 1 mile Category B - 1 mile Category C - 1 3/4 miles Category D - 2 miles Category E - 3 miles	1,976' MSL/200' AGL 2,260' MSL/484' AGL 2,260' MSL/484' AGL 2,300' MSL/509' AGL 2,320' MSL/529' AGL 2,420' MSL/629' AGL 2,460' MSL/669' AGL 2,620' MSL/829' AGL
Circling	VOR or GPS-A	Circling: Category A & B - 1 mile Category C - 1 1/2 miles Category D - 2 miles	2,300' MSL/510' AGL 2,360' MSL/570' AGL 2,360' MSL/570' AGL

Source: Garver 2017

Landside Facilities

Landside facilities include the airport access roads, curbside areas, and parking facilities that accommodate passenger movement, vehicle parking, and ground transportation services such as car rental, shuttle, cab, and/or transportation network companies (TNC). ABI currently does not have any dedicated functional areas for shuttles. **Figure 2-4** shows the existing terminal area that includes the landside access roads and parking facilities.

Automobile Access/Circulation and Parking Facilities

The passenger terminal at ABI can be accessed via Airport Boulevard coming off state highway TX-36. Upon approaching the terminal, departing passengers experience a mid-century modern terminal building that highlights the exposed aggregate material and use of flare columns. The recently renovated canopy covering the landside parking area adds a modern element with its use of a PVC membrane roof structure.

Roadway Access

The entrance to the terminal area is located on TX-36 north of the terminal building. It is a T-intersection with dedicated turning lanes on the highway to enter Airport Boulevard. A stop sign is present for vehicles approaching TX-36 from Airport Boulevard, to merge onto the highway.

As shown in **Figure 2-4,** Airport Boulevard, going south towards the terminal, allows two-way traffic with a single lane on either side. It turns into Airport Parking Circle as it loops around the parking area located north of the terminal, providing access and exits for parking and the terminal curbside. Airport Parking Circle also provides access to surrounding tenant areas such as Abilene Aero to the west and Eagle Aviation Services, Inc. (EASI) to the east. Access to Abilene Aero is provided through a short driveway that branches out to the west from Airport Parking Circle. Access to the EASI buildings on the east and the Air Traffic Control Tower is provided through Lance Drive that branches out towards the east from Airport Boulevard and runs parallel to the Airport Parking Circle. On approaching the terminal, one smaller access drive branches out from Airport Parking Circle – West Access Drive to the west providing access to the terminal building for service vehicles such as garbage trucks.

Figure 2-4
Existing Terminal Area

Source: Corgan, 2017

The Airport Parking Circle splits in two as it reaches the terminal building as shown in **Figure 2-5**. One branch serves the curbside on the lower level providing access to rental car return and baggage claim whereas the other branch goes up to the upper level serving curbside drop-off/pick-up shown in **Figure 2-6.** The curb on the lower level measures 281 linear feet and the curb on the upper level measures 340 ft. No vehicular congestion is observed on the curb on a regular basis. There is no active curbside management except for chartered flights carrying a large number of passengers. TNC operations are infrequent.

The access and circulation roads at ABI are made of asphalt and are in good condition and devoid of potholes. However, the curvilinear geometry of the roads creates a limited sight distance for vehicles circulating within the landside area. Signage is provided at several locations along the access roads to guide traffic. However, these signs are not consistent in terms of color, size, and overall visual style. Additionally, the location of each sign varies as some are located on the left side of the road while others are located on the right side of the road.

Approaching the Airport Boulevard from TX-36, two signs indicate a turn for merging onto Airport Boulevard: one for vehicles coming from the north and one for the south. Proceeding south towards the terminal on Airport Boulevard and further onto Airport Parking Circle, multiple signs with plain arrows (as shown in **Figure 2-7 a**nd **Figure 2-8**) can be found for access and exit for the terminal, parking area, rental car return, and Abilene Aero.

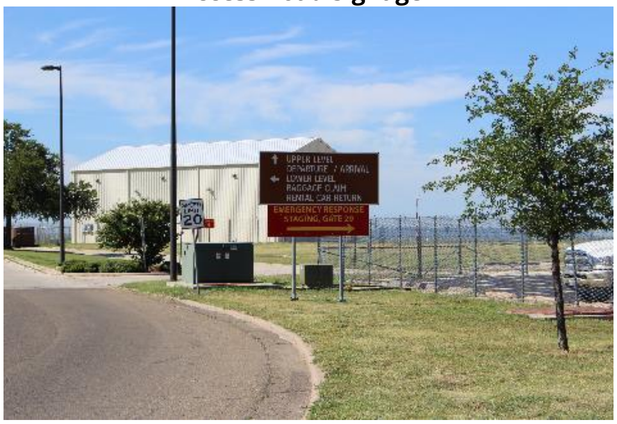
Figure *2*-5
Upper & Lower Level Access Roads

Source: Corgan, 2017

Figure *2*-6
Upper Level Curb

Source: Corgan, 2017

Figure 2-7
Access Road Signage



Source: Corgan, 2017

Figure 2-8
Exit Signage

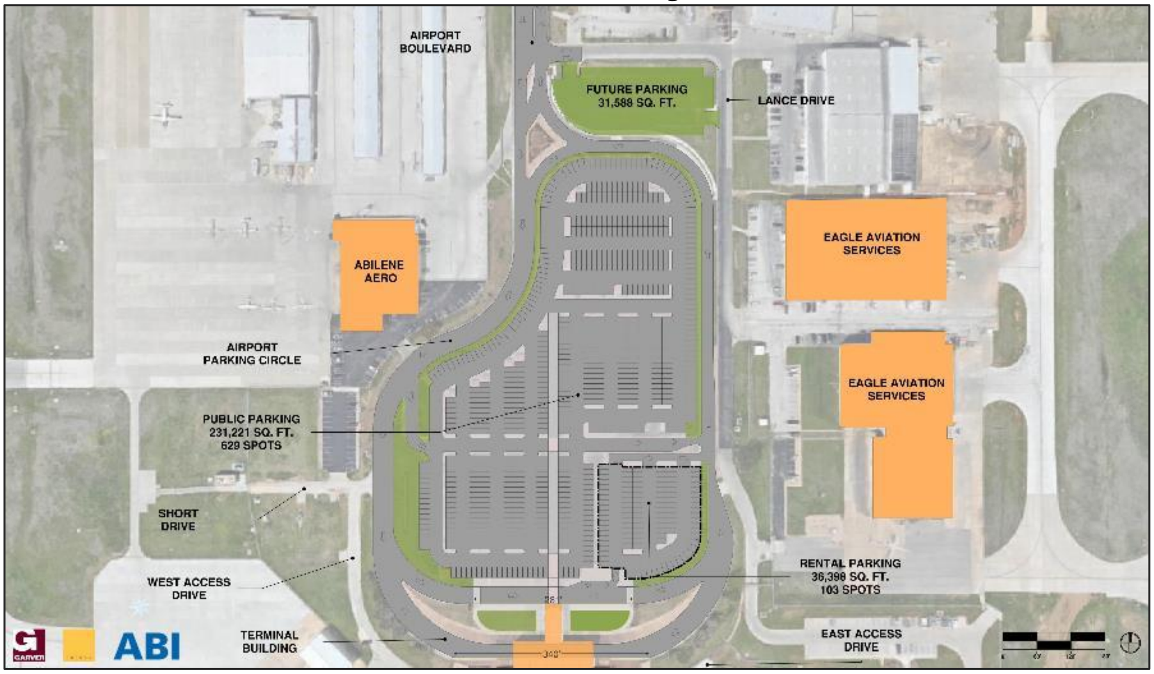
Source: Corgan, 2017

<u>Parking Facilities</u>

The central covered parking area consists of 732 parking spots. **Figure 2-9** presents the central parking area layout. Out of 732 spots, 103 in the southeast section of the area are reserved for rental car companies as a return lot. The remaining 629 parking spots provide long and short-term public parking. Approximately 200 out of these 629 spots are used by airport employees and EASI employees. The parking rate for passengers is $9/day. The parking revenue has been observed to be consistent in the past. Separate dedicated parking lots exist for Abilene Aero, the ATCT and EASI buildings. There are reserved spots for military personnel and those physically handicapped on the southern edge of the parking area, parallel and close to the terminal building. A crosswalk connects the parking area to the lower level curb. An escalator and two staircases, one on each side of the escalator, connect the lower level curb to the upper level curb as shown in **Figure 2-10**. An ongoing plan aims to replace the existing inactive escalator with an elevator.

The central parking area, seen in **Figure 2-9**, measures a total of 267,619 sq. ft. It consists of concrete pavement for parking spots and asphalt pavement for vehicular circulation. Parking islands split the parking area into multiple sections. A central covered parking island, running north-south through the middle of the parking area, serves as a pedestrian walkway towards the terminal. The canopy covering the parking area, shown in **Figure 2-11**, was replaced in 2014 due to hailstorm damage. It has a life expectancy of 15 years. The covered parking area was noted as a major strength of ABI's facilities during the SWOT analysis conducted at the beginning of this project. The grass area between Lance Drive and Airport Parking Circle, just north of the existing parking facility, will be developed into a parking lot if the existing parking facilities utilization nears capacity. The area measures approximately 31,590 sq. ft.

Figure 2-9
Landside Parking



Source: Corgan, 2017

Figure 2-10
Landside Escalator

Source: Corgan, 2017

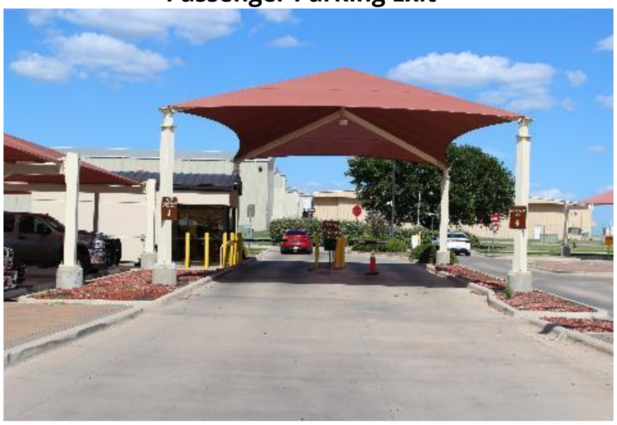
Figure 2-11
Central Parking Area

Source: Corgan, 2017

The entrance to passenger parking is located on the west side of the parking area along Airport Parking Circle. The entrance for the rental car return area is located on the south of the parking area near the lower level curb. There are exits with barrier gates for both passenger parking and rental cars located on the east side of the parking area. These exits, located very close to each other, merge onto a single-lane road creating a three-way conflict with oncoming traffic from the terminal. The gate for the passenger parking exit is operated from a pay booth as shown in **Figure 2-12.**

The parking area is divided into sections for easy wayfinding. There are signs, consisting of white text on a blue background, on the canopy poles that uniquely identify parking sections. However, these signs are small in size and aren't easily noticeable. **Figure 2-13** shows a typical parking sign for section "B5".

Figure 2-12
Passenger Parking Exit



Source: Corgan, 2017

Figure 2-13
Signage for Parking Sections

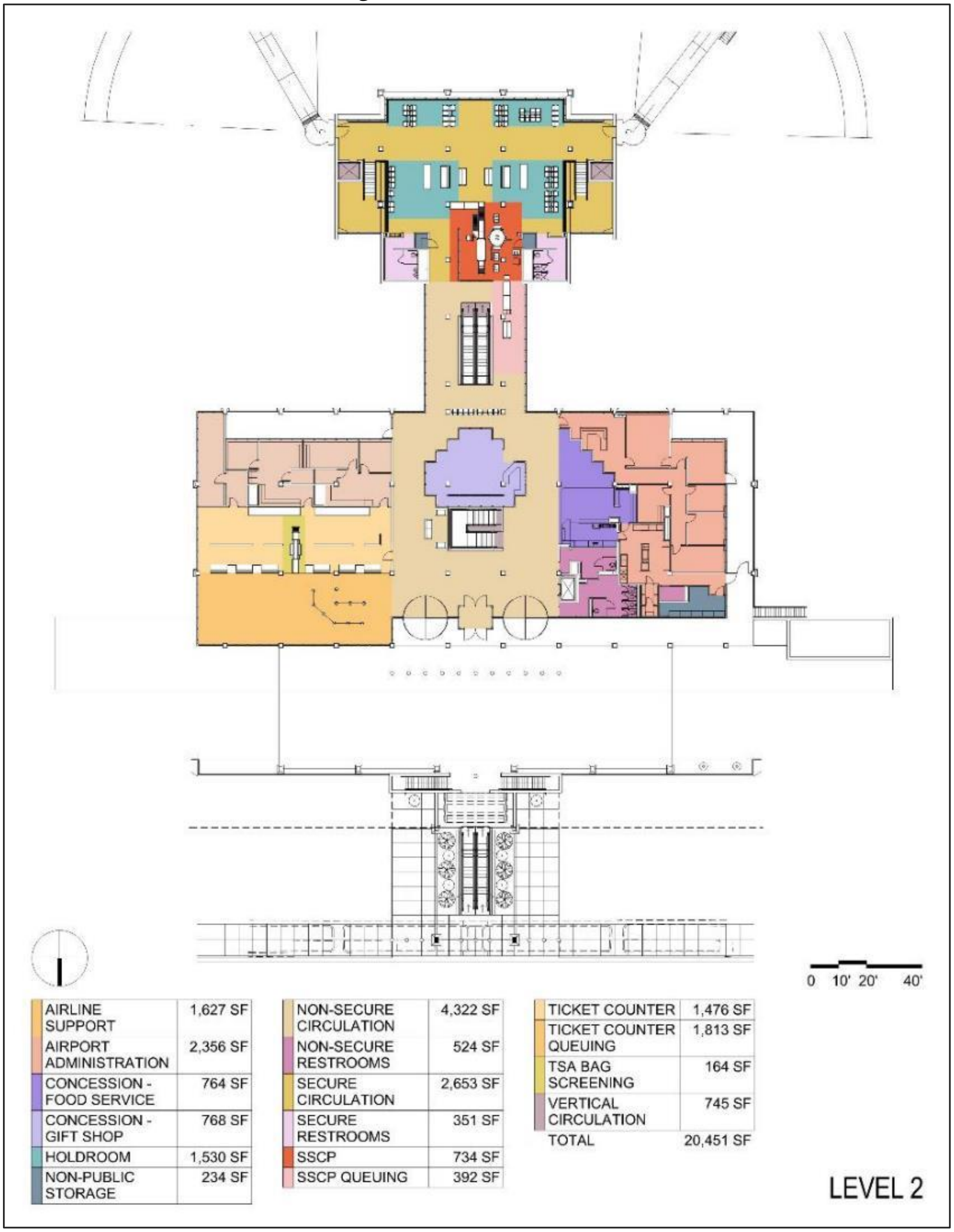
Source: Corgan, 2017

Terminal Facilities

The existing passenger terminal at ABI is located centrally between the airport's two parallel runways 17R/35L and 17L/35R. The terminal building has two levels and has a total floor area of 40,060 sq. ft. The terminal has sheltered 600 passengers on one occasion when diverted aircraft from DFW had to deplane passengers into the terminal.

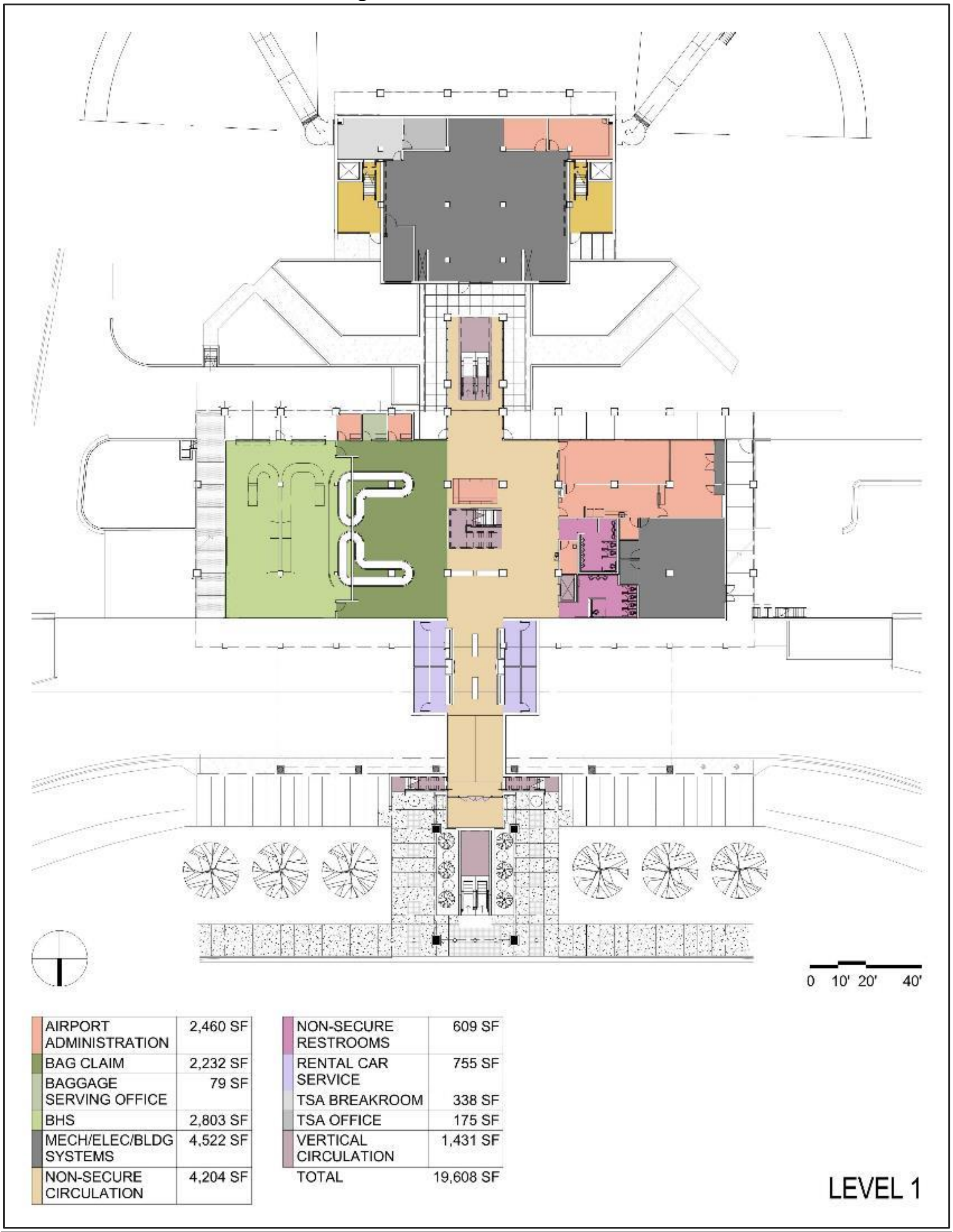
Inside the terminal, passengers experience exposed aggregate material and flare columns that frame a pan-formed ceiling. Strategically placed skylights allow natural light into the building. However, both the levels within the building are not sufficiently lit and may need improvements in lighting. There is terrazzo flooring in the ticketing lobby, concession, and central terminal area; it also extends to the TSA checkpoint. The lower level terrazzo floor is divided by the carpet in the baggage claim. **Figure 2-14** and **Figure 2-15** show various functional areas on the two levels of existing the terminal and present existing square footage for each functional area.

Figure 2-14
Existing Terminal Floor Plan – Level 2



Source: Corgan, 2017

Figure 2-15
Existing Terminal Floor Plan – Level 1



Source: Corgan, 2017

Passenger Access Areas

Overview/Passenger Flow

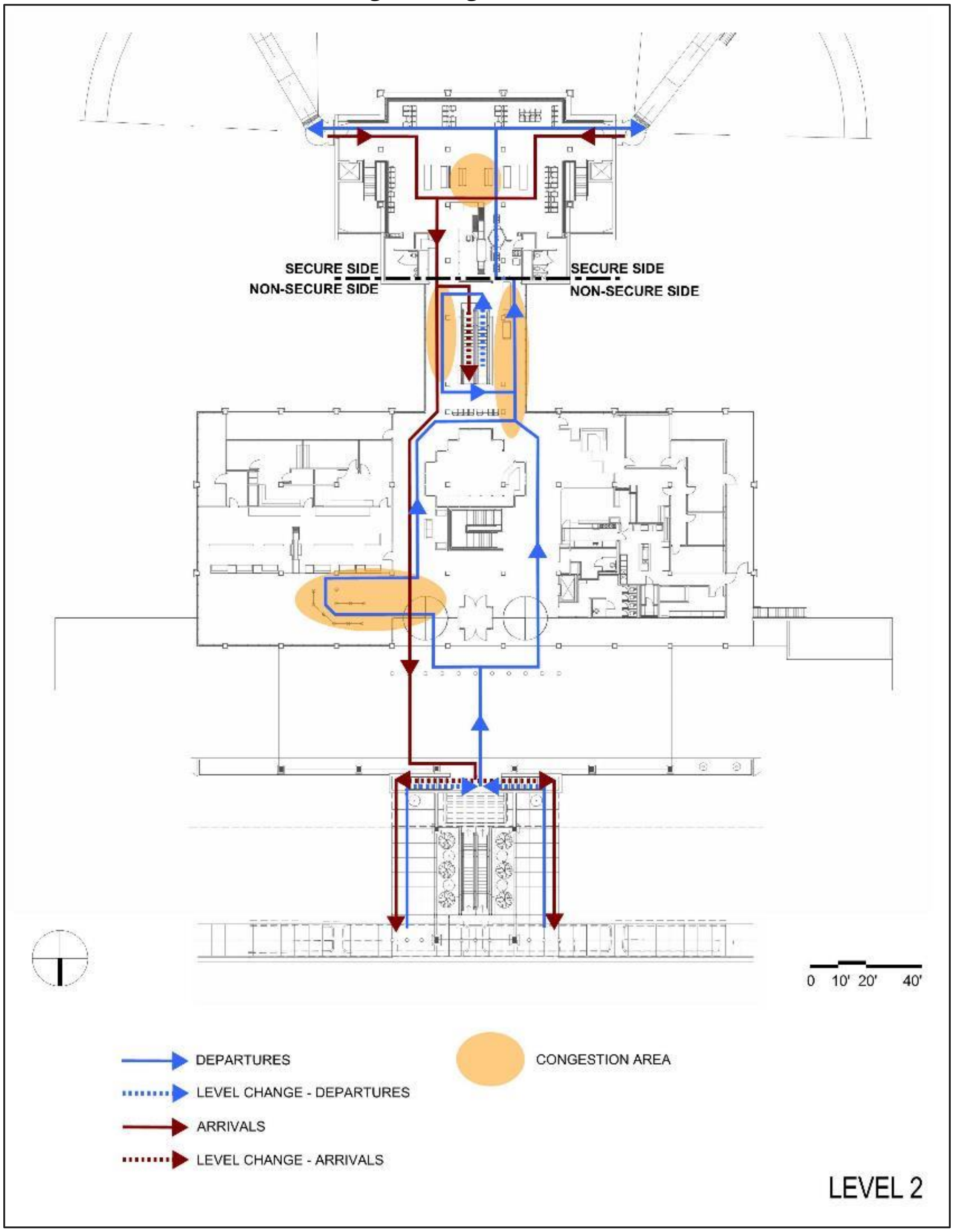
Passenger access areas are the functional areas of the terminal that are accessible to the public. The passenger access areas within ABI terminal include ticketing, security screening checkpoint (SSCP), concessions, holdrooms, restrooms, passenger boarding bridges, baggage claim, and rental car counters. The secure areas are in the southern section of the building and the non-secure areas are in the northern section of the building. The two sides are connected by a 35 ft wide corridor that houses a non-secure escalator. The upper level of the terminal accommodates areas serving mostly departing passengers - ticketing, SSCP, concessions, holdrooms, and restrooms. The lower level accommodates areas mostly serving arriving passengers - baggage claim and rental car counters.

Figure 2-16 and **Figure 2-17** show typical flows of departing and arriving passengers along with areas where congestion was observed. Departing passengers enter the terminal from the upper level through two revolving doors on either side of a centrally located vestibule on the northern end of the building. They turn left for check-in/baggage drop or head straight to the SSCP by going around the gift shop located to the south of the terminal entrance and dwell on the west side of the connector corridor to queue up for SSCP. Departing passengers may also enter the terminal from the lower level and take the non-secure escalator to the upper level. They can also go to the upper level using the stairway located in the center of the non-secure area or the non-secure elevator located on the west side of the terminal, near the non-secure restrooms. After going through the SSCP, they enter directly into the holdroom area.

Arriving passengers deplane into the holdroom area and take the exit lane adjacent to the SSCP to leave the secure side. To access baggage claim, they can take the non-secure escalator down to the lower level or the stairway located in the middle of the non-secure area. If the passengers are unable to or prefer not to use the escalator or stairs, they can take the non-secure elevator down to the lower level. The passengers can exit the building from the lower level walking past the rental car counters, or they can exit the terminal from the upper level walking past the non-secure escalator using the eastern side of the connector corridor and leave the building through the revolving doors or the main entrance vestibule.

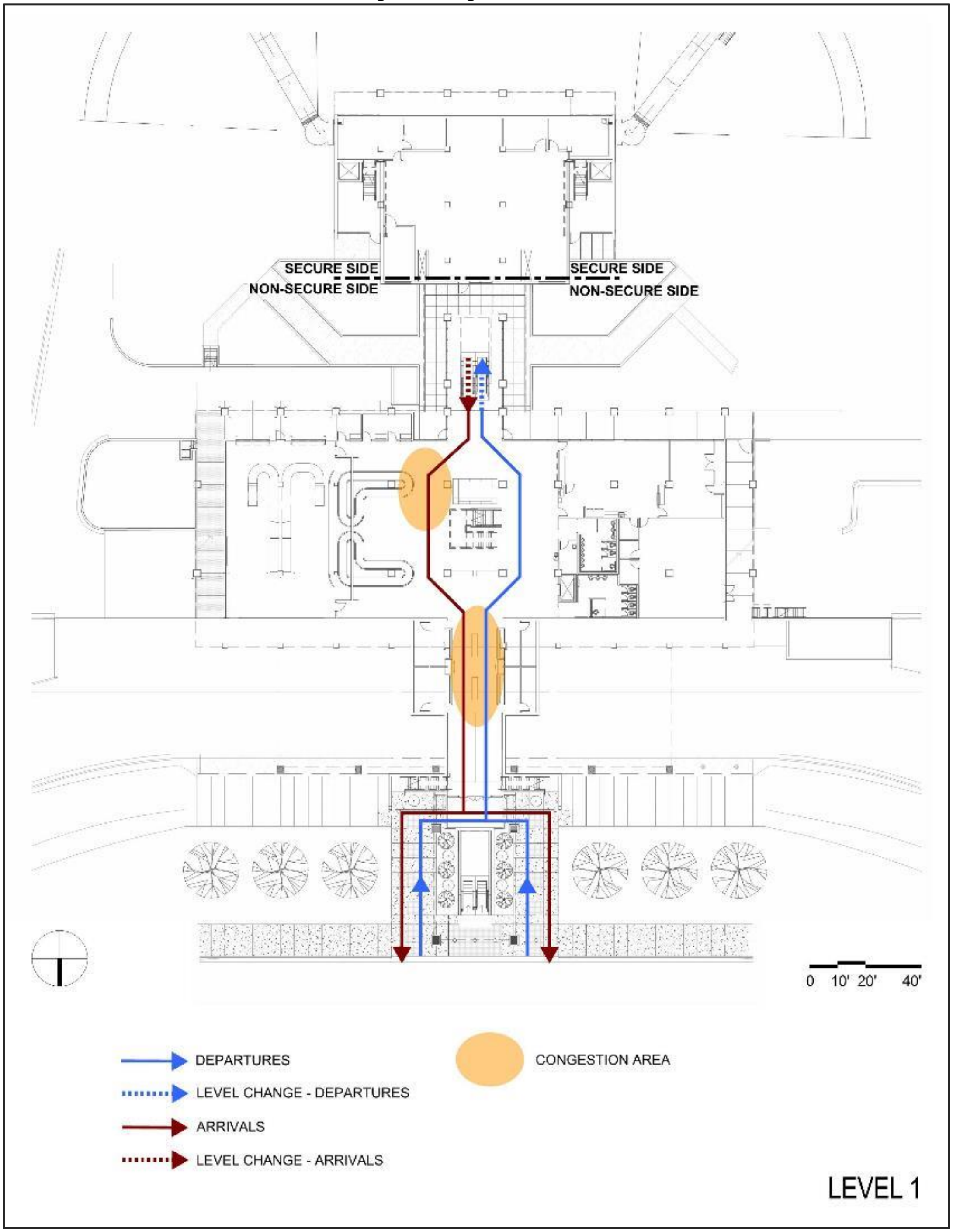
Signage is provided in various areas of the terminal building to guide passengers through the terminal. Most of it is clustered on rectangular boards suspended from the ceiling that follow a consistent visual style of white text, pictograms, and arrows on a blue background as shown in **Figure 2-18**. Nevertheless, the signage is difficult to follow due to various reasons. The arrows do not clearly direct towards the actual location of the functional areas. Several signs are not easily noticeable. In some instances, the same color and style for multiple signs makes it difficult to differentiate them.

Figure 2-16
Existing Passenger Flow – Level 2



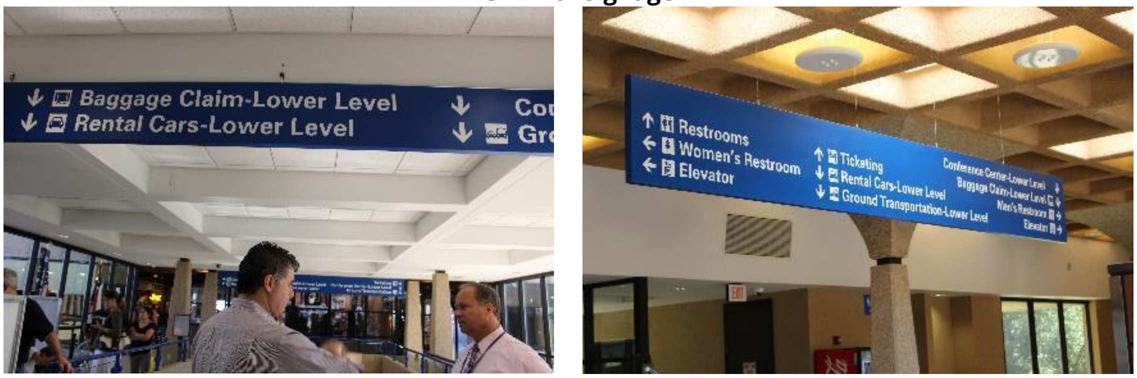
Source: Corgan, 2017

Figure 2-17
Existing Passenger Flow – Level 1



Source: Corgan, 2017

Figure 2-18
Terminal Signage



Source: Corgan, 2017

Ticketing/Lobby Area

Passengers enter the terminal building through a double-door vestibule and two revolving doors on either side of the vestibule as shown in **Figure 2-19**. They face the lobby area housing art installation which includes a vintage airplane model on display hung from the ceiling as shown in **Figure 2-20** and **Figure 2-21**. A staircase is located below the airplane going down to the lower level.

There are restrooms located directly to the west of the terminal entrance. The men's restroom covers 171 sq. ft. and the women's restroom covers 306 sq. ft. An elevator situated between the restrooms allows non-secure vertical circulation between the upper and lower levels. **Figure 2-22** shows the elevator in between the two restroom entrances. It can be used by physically handicapped passengers to access baggage claim and the rental car counters on the lower level from the non-secure side. However, the location of the elevator makes it difficult to find and the existing signage does not provide clear direction towards the elevator.

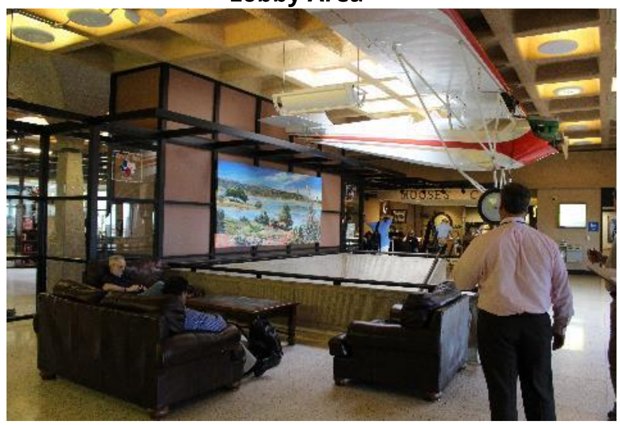
The ticketing area is located in the north-east section of the terminal building, situated to the left as departing passengers enter the upper level of the terminal. It consists of six check-in counters. The counters measure 52 linear feet and the area behind them measures 1,636 sq. ft. The circulation area in front of the counters covers 1,813 sq. ft. The three check-in counters closest to the terminal entrance are active and occupied by American Airlines. A dedicated queuing area is provided in front of the active American Airlines counters utilizing retractable-belt stanchions as shown in **Figure 2-23**. The remaining three counters, shown in **Figure 2-24**, are used for charter flights. The queuing area gets crowded when a regularly scheduled flight and a chartered flight depart around the same time. Due to similar departure times, passengers on both flights check in at the same time creating longer queues that spill into the circulation area directly in front of the terminal entrance vestibule. A Flight Information Display (FID) hangs on the wall west of ticketing counters. It is not easily visible when entering or exiting the ticketing area.

One CT-80 explosive detection systems device for TSA bag screening is located between two central check-in counters as seen in **Figure 2-25.** It is operated by the TSA staff as shown in **Figure 2-26**. When the device is not working, the TSA staff resorts to hand inspection for checked baggage. The CT-80 device has a manufacturer's hourly throughput capacity of 226 bags. ABI has processed up to 220 check-in bags in a single day using the machine.

Figure 2-19
Curbside Terminal Entrance

Source: Corgan, 2017

Figure 2-20
Lobby Area

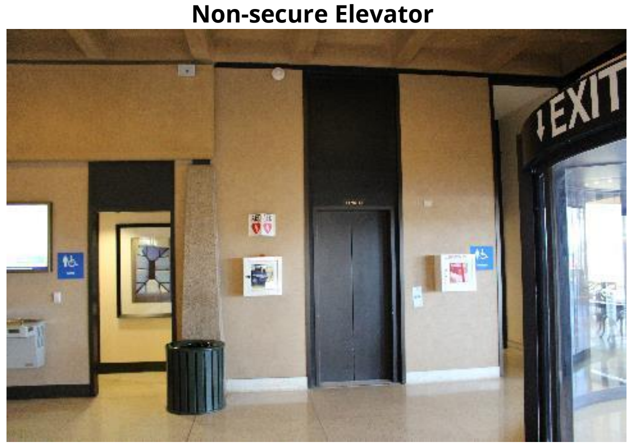


Source: Corgan, 2017

Figure 2-21
Vintage Airplane Model on Display

Source: Corgan, 2017

Figure 2-22
Non-secure Elevator



Source: Corgan, 2017

Figure 2-23
American Airlines Check-in Counters

Source: Corgan, 2017

Figure 2-24
Inactive Check-in Counters

Source: Corgan, 2017

Figure 2-25
Bag screening machine CT-80

Source: Corgan, 2017

Figure 2-26
TSA operating the CT-80 machine

Source: Corgan, 2017

<u>Concessions</u>

Concessions at ABI include a gift shop and a restaurant both located on the upper level in the non-secure area of the terminal. **Figure 2-7** and **Figure 2-28** show the gift shop and the restaurant. There are no concessions on the secure side of the terminal. However, vending machines are present.

The gift shop is located south of the terminal entrance and measures 768 sq. ft. It is enclosed by glass walls with shelves mostly covering the glass wall on the inside of the shop. The northern wall of the gift shop blocks the line of sight towards the SSCP when entering the building through the main terminal entrance north of the gift shop. The restaurant, Moose's Café, is located in the north-west section of the upper level of the terminal building, west of the gift shop. It offers a variety of snacks and beverages. It has an open floor seating area and comprises a total of 764 sq. ft.

Figure 2-27
Concessions - Gift shop

Source: Corgan, 2017

Figure 2-28
Concessions - Restaurant

Source: Corgan, 2017

TSA Security Screening Checkpoint

The SSCP at ABI is in the southern section of the upper level of the building, just north of the holdroom area. The area for the SSCP measures 393 sq. ft. The area north of the checkpoint and to the west of the escalator is allocated for SSCP queuing, as shown in **Figure 2-29**. It queuing area is 392 sq. ft. **Figure 2-30** shows the SSCP layout as seen from the holdroom area.

The SSCP consists of a single hybrid screening lane used by both PreCheck and standard passengers. The lane is equipped with an X-ray machine for carry-on baggage and a Pro Vision 2 people scanner manufactured by L3 Security & Detection Systems. The SSCP layout is not traditional as the divestation table is perpendicular to the conveyor belt for carry-on baggage screening. Also, there is no separate private screening lane or a private screening room adjacent to the SSCP.

50% of passengers processed at ABI are PreCheck. The Pro Vision 2 people scanner has a manufacturer's throughput capacity of 200-300 people per hour depending on application. The existing SSCP at ABI has processed up to 324 passengers in a single day. However, throughput capacity is exceeded when a capacity charter flight and a regularly scheduled flight are departing close to the same time. Since the queuing area for SSCP is limited in a confined space next to the escalator, it is unable to accommodate long queues without spilling out into the airport lobby.

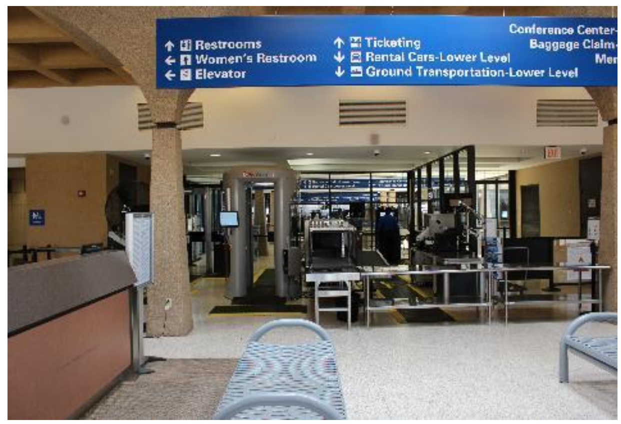
The SSCP is generally open from 5 am to 7 pm. The hours of operations change based on flight schedules. There are currently thirteen TSA staff members. Typically, four staff members work at a time – three at the SSCP and one for bag screening at check-in. The SSCP opens for passengers one and a half hours before the first departing flight of the day. There are instances when passengers have to wait in the non-secure area of the terminal when the SSCP isn't open. Seating is provided on the non-secure side for the waiting passengers.

A revestation area is provided just south of the SSCP that contains two benches. One of the two benches can be seen in **Figure 2-30.** There is an exit lane parallel to the SSCP that allows arriving passengers to exit the secure side. The exit lane has motion detectors to prevent unauthorized entry into the secure area. Additionally, the TSA staff members operating the SSCP do not face the exit lane when screening passengers and therefore, are unable to monitor the lane.

Figure 2-29
SSCP Queueing Area

Source: Corgan, 2017

Figure 2-30
SSCP As Seen From Holdroom



Source: Corgan, 2017

Passenger Holdrooms

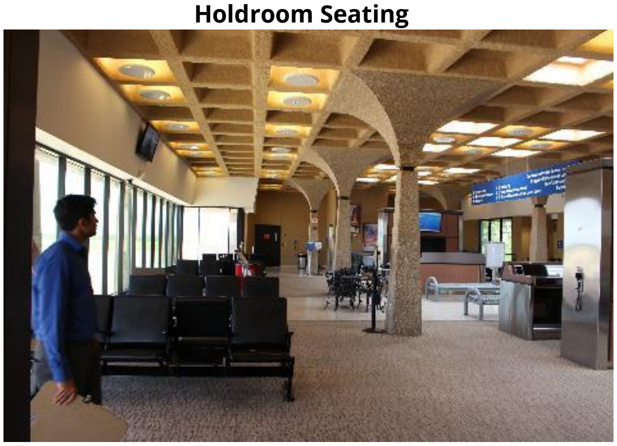
The secure side of the terminal on the upper level consists of holdrooms, passenger circulation areas, and restrooms. The existing holdroom area at ABI measures 1,530 sq. ft. with 53 seats. The airport intends to replace the seating with new furniture in 2018. **Figure 2-31** and **Figure 2-32** show the existing furniture for seating. The holdroom overlooks the airfield through the glass curtain wall on the south side presenting views of distant hills. There are two gate-agent counters located in the center of the holdroom area. The two benches provided for revestation are located just in front of the counters, leaving little room for accessing or queuing at the counters. Both counters have lofty storage cabinets behind them as seen in **Figure 2-33**. The cabinets obstruct the line of sight towards the exit from holdroom area and hinder the natural flow of circulation. They also reduce the sense of openness of the area.

There are two doors that lead to the jet bridges used for loading and unloading passengers. A ticket podium is next to each door. The doors are situated on the south-east and south-west corners of the holdroom area. **Figure 2-34** shows one of the doors along with the ticket podium. A stairway and an elevator are provided next to each door providing access to the apron level below. They also facilitate ground loading of passengers if needed, by serving as a means of vertical circulation from the upper level holdroom area to the apron level below. Signage is provided to direct passengers down to the apron level as seen in **Figure 2-34**. The total area for circulation on the secure side measures 2,653 sq. ft.

A covered walkway on the apron level extends from the west face of the terminal building and to the former ARFF station building located west of the terminal. It can facilitate ground loading of passengers if needed.

There are two secure restrooms located east and west of the SSCP and both measure 175 sq. ft. Existing fixtures in the restrooms were installed in the late 1990s.

Figure 2-31
Holdroom Seating



Source: Corgan, 2017

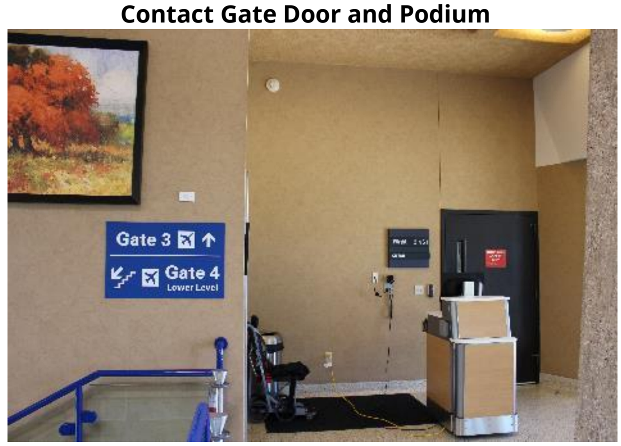
Figure 2-32
Holdroom Circulation

Source: Corgan, 2017

Figure 2-33
Gate-agent Counter

Source: Corgan, 2017

Figure 2-34
Contact Gate Door and Podium



Source: Corgan, 2017

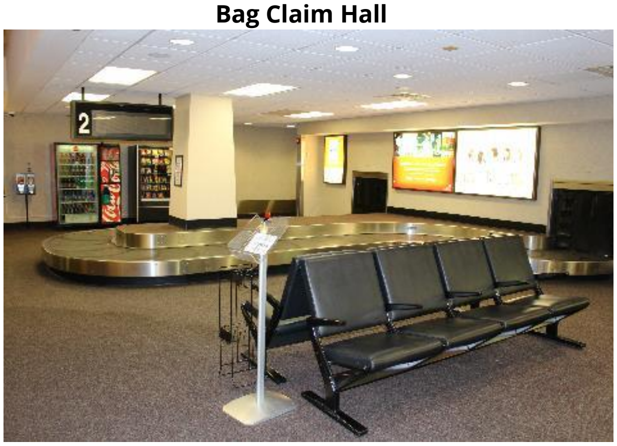
<u>Baggage Claim/Rental Car Area</u>

The baggage claim area is located on the lower level of the terminal in the northern section of the building. **Figure 2-35** shows the bag claim hall. Entering the bag claim hall from the non-secure escalator, passengers face a visitor information booth (currently inactive), shown in **Figure 2-36**, located just south of the central non-secure stairway. Arriving passengers do not have a clear line of sight towards the terminal exit because of the information booth and the stairway. The bag claim hall measures 2,232 sq. ft. and consists of two L-shaped flat-plate baggage claim devices, providing a linear frontage of 58 feet. Seating is provided near the devices for passengers awaiting bags. Vending machines and advertising boards are also present on the walls of the bag claim hall.

Non-secure restrooms are provided on the west side of the baggage claim hall. The men's restroom measures 293 sq. ft. and the women's restrooms measures 317 sq. ft. Three baggage service offices are located south of the baggage claim devices each measuring 79 sq. ft. Currently, one of three offices is used by the airport administration as a space to operate the "Badge and ID" office.

Rental car counters are located north of the baggage claim hall. There are four service counters available – two on both sides of the exit lobby; each measuring a total of 188 sq. ft. Currently, three rental car companies operate at ABI: Hertz, Enterprise, and Avis, each occupying one office. **Figure 2-37** shows the rental car counters and **Figure 2-38** shows the circulation space and queuing area in front of the counters. Congestion is observed in this area as it is too narrow to accommodate multiple rental counter queues and the queues also mix with the crossflow of passengers exiting or entering the building through the same area.

Figure 2-35
Bag Claim Hall



Source: Corgan, 2017

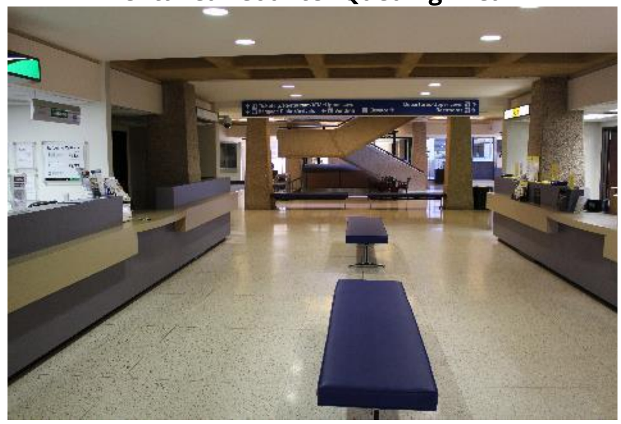
Figure 2-36
Visitor Information Booth

Source: Corgan, 2017

Figure 2-37
Rental Car Counters

Source: Corgan, 2017

Figure 2-38
Rental Car Counter Queuing Area



Source: Corgan, 2017

Non-passenger Access Areas

Overview

Non-passenger access areas are functional areas of the terminal inaccessible to passengers. They include baggage make-up areas, office spaces, breakrooms for airline staff, airport administration and TSA, non-public storage spaces, mechanical and electrical rooms.

Baggage Make-up

Baggage make-up includes manual or automated make-up units for outbound and inbound baggage handling, cart staging areas, baggage tug/cart (baggage train) maneuvering lanes, and related support areas. The baggage make-up room at ABI sits on a level below the apron and is located below the ticketing area and airline offices in the north-east section of the building. **Figure 2-39** and **Figure 2-40** show the existing baggage make-up room.

The room serves both inbound and outbound baggage. The total square footage of the existing baggage make-up room is 2,803 sq. ft. The western side of the room functions as the staging area for dropping off inbound baggage onto the bag claim devices. It allows two carts to stage simultaneously, one behind the other. However, there is no by-pass lane. The claim devices provide a total of 20 lineal ft. for cart staging and are fed by hand.

The eastern part of the room serves outbound baggage. Outbound baggage is fed to the room from two parallel conveyor belts coming in from the ticketing area on the upper level. The parallel belts allow two bag carts to be staged and loaded simultaneously, one staged to the east and the other to the west. Oversized baggage is usually transferred utilizing the non-secure elevator located near the terminal entrance. The space inside the elevator is not sufficient to conveniently move oversized baggage.

Baggage carts enter the make-up room from a roadway coming in from the east and sloping downwards, as shown in **Figure 2-41**. The exit for the carts is located on the south side of the room. It slopes up away from the room. The exit roadway requires carts leaving the room to make a sharp left turn when exiting the facility, creating a tight turning radius. Additionally, there are columns situated just in front of the exit door obstructing the path of the carts. Bollards surround these columns for protection. **Figure 2-42** shows the exit for baggage carts from the baggage make-up room. The sloping roadways cause stormwater coming from apron pavement and terminal rooftops to drain into the room.

<u>Office Areas</u>

The three major office spaces within the terminal - are the airport administration, airlines, and TSA offices. The airport administration office space is primarily located on the upper level in the north-west section of the terminal. It consists of four offices overlooking the airfield, a conference room, and some ancillary spaces such as a reception area, conference room, kitchen, storage room, and restroom. The lower level houses a large conference room, break room, and communication room. The overall floor area for airport administration totals 4,816 sq. ft. The airline office space is on the upper level in the north-east section of the building, behind the ticketing counters. Some of the offices get a view of the airfield. The total area for the airline office space is 1,627 sq. ft. The storage space in the airlines' offices is not sufficient as some of it is used for IT equipment.

Figure 2-39
Inbound Baggage Cart Staging

Source: Corgan, 2017

Figure 2-40
Outbound Baggage Staging & Exit

Source: Corgan, 2017

Figure 2-41
Inbound Baggage Entrance Roadway

Source: Corgan, 2017

Figure 2-42
Outbound Baggage Exit Roadway

Source: Corgan, 2017

A TSA office and breakroom are located on the lower level below the holdroom area. The office measures 175 sq. ft. and the breakroom measures 338 sq. ft. A remote TSA office is located off the airport site on East South 11th Street.

The lower level also houses mechanical and storage functions. The mechanical space covers a total of 4,697 sq. ft.

Apron

The terminal apron is the interface between the terminal building and the airfield. It facilitates aircraft gating/parking for commercial flights as well as ground servicing functions. The apron area of the ABI terminal consists of two contact gates and four remain overnight (RON) positions that are designed to accommodate EMB 145s. The parking positions for airline gates are positioned so that the gated aircraft do not block the view from the holdroom area looking south. A 25’ wide tail stand service road runs parallel to the apron-edge taxilane. The apron area, just south of the terminal and between the two airline gates, is utilized for the staging of ground service equipment (GSE) as shown in **Figure 2-43** and **Figure 2-44.**

The apron can accommodate nine aircraft at once – four EMB 145s on RON positions, three 737-800s along the south edge of the apron, and two regional jets at the contact gates. These positions accommodate diverted flights or flights requiring ground loading of passengers.

During times when Dallas-Fort Worth International Airport (DFW) experiences closures or delays, ABI frequently receives diverted American Airlines regional and mainline aircraft which can quickly fill up the terminal ramp. When this occurs, additional diversions have to be parked on taxiways. Currently, no aircraft Remain Over Night (RON) on the terminal ramp as all overnight aircraft are towed to the Eagle Aviation Services, Inc. (EASI) facility each night for maintenance. The existing terminal ramp area is in good condition and is sufficient to accommodate normal operations. The ramp also has a building that houses ABI's snow removal equipment and the old Airport Rescue and Firefighting (ARFF) station building that is used for general storage.

Figure 2-43
View of Airfield from Holdroom

Source: Corgan, 2017

Figure 2-44
GSE Staged on the Apron

Source: Corgan, 2017

Passenger Boarding Bridges

The terminal is equipped with two passenger boarding bridges (PBB) with rotundas located at the contact gate doors on the south-eastern and south-western corners of the terminal building. Both were manufactured by JBT and installed in 2002. The PBBs can serve small regional jets up to B757. **Figure 2-45** shows the existing gate layout at Gate 3. The existing gate layout for Gate 1 presents a challenge for maneuvering large narrow-body aircraft. When a large narrow-body aircraft powers out of the parking position, it is marshalled by the ground handling crew to ensure that the left wing of the aircraft does not collide with the light pole shown in **Figure 2-46**.

Deicing

There are no dedicated de-icing pads at ABI. De-icing is usually done after the aircraft pushes back from the contact gate. The aircraft may also be escorted by a de-icing truck down to the approach end of the runway to de-ice if needed.

Figure 2-45
PBB at Gate 3 serving a regional jet

Source: Corgan, 2017

Figure 2-46
Light pole at Gate 1 parking position

Source: Corgan, 2017

General Aviation Facilities

This section provides an overview of the Fixed Base Operator (FBO) and General Aviation (GA) facilities established at ABI including their layout, condition, utilization, and existing issues. ABIA has two GA developments on property:

- Abilene Aero Development
- Northwest GA Ramp Development

These areas are depicted on **Figure 2-47**, *ABI General Aviation Developments.*

Figure 2-47
ABI General Aviation Developments

Source: Garver, 2017

Abilene Aero Development

Abilene Aero is the only Fix Based Operator (FBO) at ABI. Their primary location is along Airport Boulevard, northwest of the existing passenger terminal and parking facilities. The Abilene Aero complex along Airport Boulevard consists of a GA terminal building, 7 T-hangar buildings, and 6 box hangars. Abilene Aero also has one additional T-hangar facility and one additional box hangar facility on the Northwest GA Ramp. Those facilities will be discussed in the Northwest GA ramp discussion later in this chapter. Abilene Aero offers a full array of FBO services including aircraft storage, fueling, maintenance, avionics, aircraft sales, meetings rooms, aircraft charter services, and flight instruction. The terminal facility is approximately 8,000 square feet and is in excellent condition.

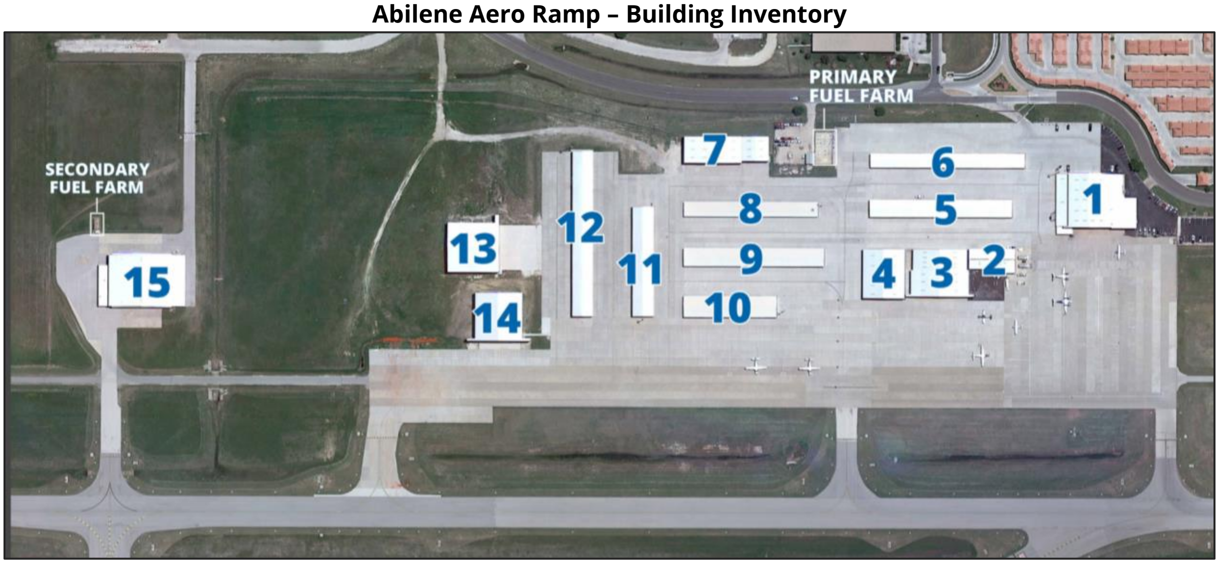
Roadway Access and Vehicle Parking

Abilene Aero has excellent roadway access as it is located along Airport Blvd. The parking lot has 64 parking spots and sufficiently accommodates the existing demand.

Hangar Facilities

Figure 2-48 and **Table 2-10** show and describe the existing hangar space in the area. Abilene Aero has approximately 220,000 sq. ft. of box hangar space and 80 T-hangar bays in total. Currently, they have approximately 36,000 sq. ft. of box hangar space that is vacant and eight T-hangars that are vacant. No waiting list exists for t-hangar or box hangar space.

Figure 2-48
Abilene Aero Ramp – Building Inventory



Source: Garver, 2017

Table 2-10
Abilene Aero Ramp – Building Inventory

Building #	Leaseholder	Primary Function	Dimensions (ft.)	Sq. Footage	Condition
1	Abilene Aero	FBO Terminal	180 x 135	24,334	Good
2	Abilene Aero	Maintenance Hangar	114 x 59	6,120	Good
3	Abilene Aero	Box Hangar	140 x 115	15,802	Good
4	Abilene Aero	Box Hangar	120 x 100	12,078	Good
5	Abilene Aero	T-Hangar	347 x 42	14,570	Good
6	Abilene Aero	T-Hangar	377 x 35	12,977	Good
7	Abilene Aero	Box Hangar	206 x 66	14,052	Good
8	Abilene Aero	T-Hangar	326 x 38	12,448	Good
9	Abilene Aero	T-Hangar	342 x 44	15,011	Good
10	Abilene Aero	T-Hangar	227 x 50	11,343	Good
11	Abilene Aero	T-Hangar	267 x 52	13,817	Good
12	Abilene Aero	T-Hangar	402 x 49	19,524	Good
13	Abilene Aero	Box Hangar	118 x 115	13,570	Good
14	Abilene Aero	Box Hangar	115 x 115	13,465	Good
15	Abilene Aero	Box Hangar	212 x 126	25,917	Good

Source: Garver, 2017

Fuel Farm Facilities

Abilene Aero also has two aircraft fuel farm facilities located within the boundaries of their current facility. The primary facility consists of the following tanks and is located along Airport Blvd adjacent to the existing Hertz rental car service lot:

- 3 – Jet A Tanks
    - 2 - 12,000-gallon underground Jet A tanks
    - 1 – 10,000-gallon underground Jet A tank
- 2 – 10,000-gallon underground 100L tanks.

Additionally, a 500-gallon 100LL self-fueling facility was added in late 2017 at the west end of Hangar 11 shown in **Figure 2-48**.

They also have an additional 15,000-gallon Jet A tank located at a hangar north of their primary ramp across from the current airport maintenance facility. The location of these fuel farms is noted in **Figure 2-48**. The fuel farm facilities are in good condition and have sufficient capacity to meet existing demand. Abilene Aero handles the fueling for ABI's airline operations and has a Department of Defense contract for fueling military aircraft. The only time Abilene Aero has difficulty fueling aircraft quickly is during major airline diversion events when they have multiple airline aircraft to fuel at the same time. Currently, Abilene Aero only offers full-service fueling services.

Ramp

As discussed in the airside section of this chapter, the pavement along the Abilene Aero ramp is in good condition. The weight bearing capacity of the ramp has not been officially established and needs to be determined to ensure the pavement isn't overly stressed. ABI has plans to conduct a pavement study to investigate the weight bearing capacity of the ramp in the near future.

Texas Forestry Service Facility

The Texas Forestry Service has a small tank facility located on the northern portion of the Abilene Aero ramp that is utilized to store the fire suppression agent they use for aerial firefighting applications.

Northwest GA Ramp Development

The northwest GA ramp development is located on the northwest end of the airport and was part of the original ABI footprint when it was constructed in the early 1950s. The area contains a number of airport tenants. The primary tenants in the area are FedEx, Polasek Helicopters, AvFuel, Texas State Technical College (TSTC), the Abilene Experimental Aircraft Association (EAA) Chapter 471, and Abilene Aero.

Hangars

Figure 2-49 and **Table 2-12** show and describe the existing hangar space in the area. The area has four t-hangar buildings, one office building, and six box hangar facilities. All the facilities are in good condition with the exception of two of the older t-hangar buildings that are located on the northern end of the ramp.

Figure 2-49
Northwest GA Ramp – Building Inventory

Source: Garver, 2017

Table 2-12
Northwest GA Ramp – Building Inventory

Building #	Leaseholder	Primary Function	Dimensions (ft.)	Sq. Footage	Condition
1	Abilene Aero	T-Hangar	305 x 36	10,908	Good
2	EAA	T-Hangar	281 x 31	8,724	Fair
3	EAA	T-Hangar	307 x 30	9,031	Fair
4	Saddle Ramp Land & Cattle	Box Hangar	52 x 35	3,276	Fair
5	TSTC	Box Hangar/Offices	200 x 150	30,148	Good
6	EAA	Box Hangar	120 x 100	12,282	Good
7	Polasek Helicopters	Box Hangar	103 x 100	9,630	Good
8	Abilene Aero	Box Hangar	185 x 123	22,677	Good
9	FedEx	Cargo Facility	145 x 130	18,390	Good
10	AvFuel	Office Building	134 x 49	7,401	Good
11	AvFuel	T-Hangar	436 x 35	15,190	Good

Source: Garver, 2017

Roadway Access and Vehicle Parking

Access to the Northwest GA Ramp is via Navajo Circle and Navajo Trail which connects to the Loop 322 frontage road. Roadways access into the area is currently sufficient and vehicle parking is sufficient. Due to the TSTC development occurring adjacent to this area, TxDOT is planning some roadway realignments in the next two to five years. The exact alignment changes that will be made are still being evaluated.

Ramp

The ramp in the area is in fair condition. ABI is currently planning a pavement rehabilitation project to improve the pavement in the area. Additionally, there are concerns regarding whether the ramp lighting is accurate in the area to safely accommodate nighttime operations.

TSTC Development

ABI recently completed a land release and sold approximately 52 acres of property adjacent to the Northwest GA Ramp to TSTC to develop a new Abilene campus. Construction on the campus is already underway and is expected to be completed in increments over the next 12 to 15 years. When fully completed, the new facility will be composed of numerous buildings (9 are currently estimated) and will have the capacity to accommodate approximately 3,000 students. With the development of this facility, roadway access and vehicle congestion could potentially become an issue in this area in the future.

Abilene Fire Department Maintenance Facility

The Abilene Fire Department (AFD) recently opened a new fire maintenance facility in the area that will handle the maintenance of all the AFD fire equipment. This is a non-aeronautical facility and does not have direct access to the airfield.

FedEx Facility

ABI has a small FedEx Cargo facility on the Northwest GA Ramp. The building includes a distribution facility that sorts shipments for delivery or truck transfer. Currently, FedEx only operates Cessna Caravans at ABI. As was mentioned in the "opportunities" section of the SWOT analysis, recently there has been a nationwide increase in direct-to-consumer purchasing and online retail. Consequently, the demand for small package shipping has increased. If this trend continues, expanded cargo facilities might be needed at ABI.

Aircraft Maintenance Facilities

Eagle Aviation Services Development

Eagle Aviation Services, Inc. (EASI) is a subsidiary of Envoy Airlines which operates numerous regional jets under the American Eagle brand. EASI is one of two major maintenance stations for Envoy Airlines and they are responsible for regular and heavy maintenance checks on Envoy's Embraer Regional Jet (ERJ) 140 and 145 fleet. EASI is the largest employer at ABI with close to 500 personnel and they are a FAR Part 145 certified aircraft repair station. They operate 365 days a year, 24 hours per day, 7 days a week. In addition to EASI, there is a corporate tenant in the area called Zee Jet that has a small private fuel farm and occupies a hangar. The location of the EASI Ramp is shown in **Figure 2-50**.

Figure 2-50
EASI Ramp – Building Inventory

Ramp and Hangars

EASI currently has 5 large box hangars in their complex. **Figure 2-51** and **Table 2-11** show and describe the existing hangar space in the area. The existing hangar space is sufficient to accommodate EASI's current demand and is adequate to handle a small increase in demand, if needed. EASI currently has 6 maintenance lines in their existing hangar facilities and they have the ability, without additional expansion, to grow to 8 maintenance lines if demand dictates. The primary infrastructure issue they are facing is the adequacy of the roof on some of their existing hangars. ABI endured a major hailstorm in 2014 that damaged several hangar roofs and the facilities have had water leakage issues ever since. Additionally, EASI believes that they may need to expand their "parts hangar" where they store their spare aircraft parts if they start receiving larger aircraft such as the ERJ 175 or if the number of aircraft they need to perform maintenance on at one time increases. In addition to their ramp area, EASI has a compass calibration pad located to the east of their hangars.

Figure 2-51
EASI Ramp – Building Inventory

Source: Garver, 2017

Table 2-11
EASI Ramp – Building Inventory

Building #	Leaseholder	Primary Function	Dimensions (ft.)	Sq. Footage	Condition
1	Zee Jet, Inc.	Corporate Hangar	150 x 135	19,939	Good
2	Eagle Aviation Services, Inc.	Maintenance Hangar	186 x 154	29,681	Good
3	Eagle Aviation Services, Inc.	Maintenance Hangar	275 x 169	46,211	Good
4	Eagle Aviation Services, Inc.	Maintenance Hangar	230 x 142	31,260	Good
5	Eagle Aviation Services, Inc.	Maintenance Hangar	216 x 132	28,583	Good
6	Eagle Aviation Services, Inc.	Maintenance Hangar	230 x 182	37,120	Good
7	Eagle Aviation Services, Inc.	Office Building	260 x 200	52,640	Good

Source: Garver, 2017

<u>Roadway Access and Vehicle Parking</u>

EASI currently has good roadway access on Lance Drive which connects to Airport Boulevard. EASI has limited parking in front of their facilities so approximately 200 staff members park in the ABI public parking lot that is located on the opposite side of Lance Drive. ABI and EASI staff have agreed that if public parking demand ever reaches a point where the public parking lot will be at capacity, then the grass area located between Lance Drive and Airport Parking Circle will be developed into a parking lot for EASI staff.

Recent and Future Growth

EASI has expanded in recent years, adding two new hangars, due to the growth of passenger traffic nationwide and the demand for more aircraft which has increased the demand for aircraft maintenance. Consequently, it is expected that as Envoy Airlines expands its fleet, EASI will see a demand to expand their facility at ABI at a commiserate rate. It should be noted that Envoy Airlines currently has orders for 45 more ERJ aircraft and that they are bringing older ERJ 140 aircraft out of retirement to be placed into service. The restoration of the ERJ 140 fleet was the catalyst for EASI recently adding an additional maintenance line at their facility. Additional expansion to the EASI facility appears probable in the future.

Support Facilities

Having adequate support facilities is an important part of operating an airport efficiently. While these facilities aren't typically accessed by the traveling public or other airport users, they play a critical role in the airport's daily operation and maintenance.

Utilities

ABI has electrical, water, sewer, and telecommunications infrastructure for all the airport's existing facilities. At this time, ABI staff does not have any concerns regarding the condition, location, or capacity of the existing utility infrastructure. However, a drainage issue does exist along Lance Drive close to the EASI facility. During periods of heavy rain, the drive along Airport Blvd north of Lance Drive and the grass area between the EASI facility and Lance Drive will flood. Additionally, there is a small area on the terminal ramp at the entrance to the baggage make-up/claim facility that will also flood during periods of heavy rain.

ARFF Facility

The existing ARFF facility is located south of the intersection of Taxiway M and P close to the terminal ramp. The facility is occupied 24 hours a day, 7 days a week, 365 days a year. There are 4 firefighters assigned to each shift and 13 on staff in total. The facility currently houses two 1,500-gallon ARFF trucks. ABI is currently an ARFF Index B facility but has the capacity to move up to Index C, if needed. The existing ARFF truck bays in the facility are too short to adequately accommodate newer ARFF trucks. Consequently, a new ARFF Station is now under construction. The existing facility is in fair condition.

Airport Maintenance Facility

The ABI maintenance facility is located on Bonanza Drive, close to the intersection of Bonanza Drive and Airport Blvd. The facility consists of a single small building (approximately 2,000 sq. ft.) and a laydown yard (approximately 28,000 sq. ft.) that is used for the storage of various equipment and materials. ABI would like to expand this facility in the future to provide covered parking for vehicles/equipment and a larger enclosed storage/maintenance area.

Rental Car Services Facilities

Hertz and Avis have light vehicle maintenance/service centers located on airport property away from the terminal and public parking facilities. Enterprise has a facility that is located off airport property.

Hertz Facility

The Hertz facility is located on Airport Blvd. adjacent to Abilene Aero. The facility is approximately 10,000 sq. ft. in total and includes a vehicle parking area and a small facility (approximately 580 sq. ft.) to wash vehicles. Hertz has indicated that they would like to add a heater to the existing wash bay.

Avis Facility

The Avis facility is located along an unnamed road that connects to Airport Boulevard close to the intersection of Airport Boulevard and Bonanza Drive. The facility is approximately 30,000 sq. ft. in total and includes a vehicle parking area and a small facility to wash vehicles (approximately 1,300 sq. ft.).

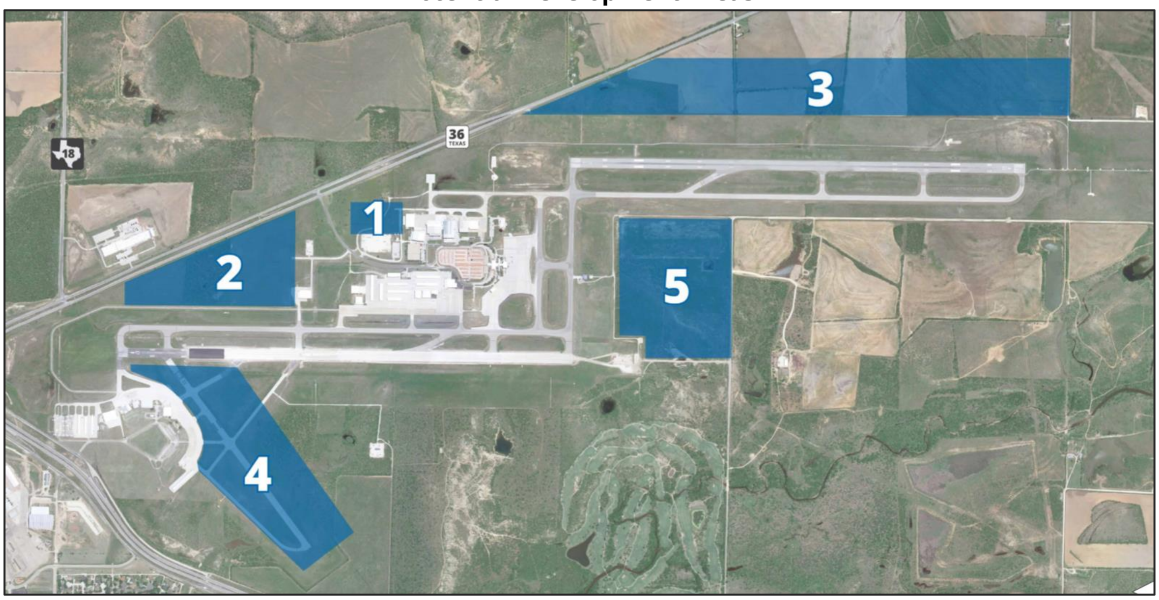
Future Consolidated Facility

ABI is currently collecting a Customer Facility Charge (CFC) to fund the development of a consolidated rental car services facility that could be utilized by all three rental car agencies. There has also been discussion on whether the facility should be utilized for rental car returns and passengers to alleviate the current congestion in the rental car return lot next to the terminal facility. The exact location of the consolidated rental car facility will be explored in the alternatives section of this Master Plan.

Potential Future Development Sites

As part of the SWOT Analysis conducted at the beginning of this Master Planning project, a number of the “strengths” and “opportunities” that were identified related to ABI being well integrated into local and regional economic development efforts, having available land at ABI that could be utilized for future development, and the availability of non-airport owned land around ABI that could be purchased for development. Consequently, as part of the Existing Conditions chapter of this Master Plan, it is prudent to highlight areas that have been considered for future aeronautical or non-aeronautical development. **Figure 2-52** and **Table 2-13** provide an overview of some potential development sites that have been considered. Additional development will increase lease revenue for ABI which will improve its self-sufficiency which was mentioned as a "weakness" during the SWOT analysis. The development and potential layout of these sites will be discussed later in this Master Plan.

Figure 2-52
Potential Development Areas



Source: Garver, 2017

Table 2-13
Potential Development Areas

Development Area	Acreage	Potential Use	Owned by ABI (Y/N)	Location Description
#1	21	Aeronautical	Yes	North of existing EASI Facility and South of Airport Blvd.
#2	66	Aeronautical and Non-aeronautical	Yes	Area north of Airport Blvd and west of HWY 36
#3	100	Aeronautical	No	Area east of Runway 17L/35R
#4	87	Aeronautical	Yes	Runway 4/22 Area
#5	85	Non-aeronautical	No	Area south of ARFF Station

Source: Garver, 2017

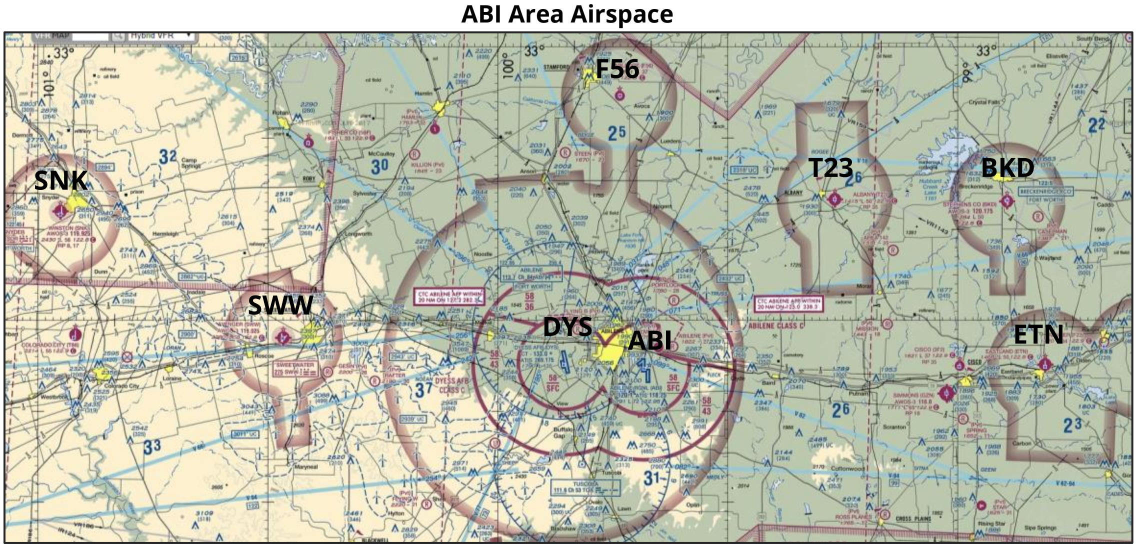
Recycling, Reuse, and Waste Reduction Programs

As airports continue to grow and develop their environmental impact has the potential to increase. Consequently, it will be very important that airports consider their environmental impact and take steps to ensure they are being good environmental partners with the communities in which they reside. The City of Abilene has a recycling program, and there is a recycling center just north of ABI in Grover Nelson Park. ABI currently does not have recycling containers placed in the terminals, but they are available in the ABI administrative office areas for staff to use. In addition to recycling, ABI staff is encouraged to minimize waste (e.g. paper, etc.) and to be conscious of electrical and water consumption to reduce waste.

Area Airspace and Air Traffic Control

ABI operates in a moderately complex airspace environment. There are several small private airports less than 10 NM from ABI, and Dyess Air Force Base is approximately 9 NM to the west of ABI. Due to their close proximity to each other, Dyess AFB and ABI have conjoined Class C airspace. However, operations at each airport have minimal impact on each other because the runways at each facility have a similar alignment. Consequently, the approach and departure paths for the runways at each facility do not cross. Outside of ABI's Class C airspace, there are a number of small GA airports within a 50-mile radius but none of them have an impact on operations in ABI's airspace. ABI is approximately 25 NM north of the Brownwood Military Operations Areas (MOAs) that are utilized for military training activities. **Figure 2-53** shows ABI's airspace and the surrounding area.

Figure 2-53
ABI Area Airspace



Source: FAA VFR Sectional Chart, July 2017

ABI has an FAA operated Air Traffic Control Tower (ATCT) that is open 24 hours a day, 7 days a week, 365 days per year. The tower was constructed in 2012 and is in good condition. ATC controllers have good visibility to all movement area facilities at ABI. The ATCT is located west of the passenger terminal along the terminal ramp.

Airport Service Area/Commercial Catchment Area

An airport's general aviation service area and commercial catchment area can generally be defined as the geographic region the airport serves for general aviation users and commercial passengers, respectively. Numerous factors influence the boundaries of each of these areas including economic trends, demographics, socioeconomic factors, airport services/facilities, competing airport services/facilities, and local/regional/national trends. Once established these areas can be used to identify other factors that influence aviation demand at an airport.

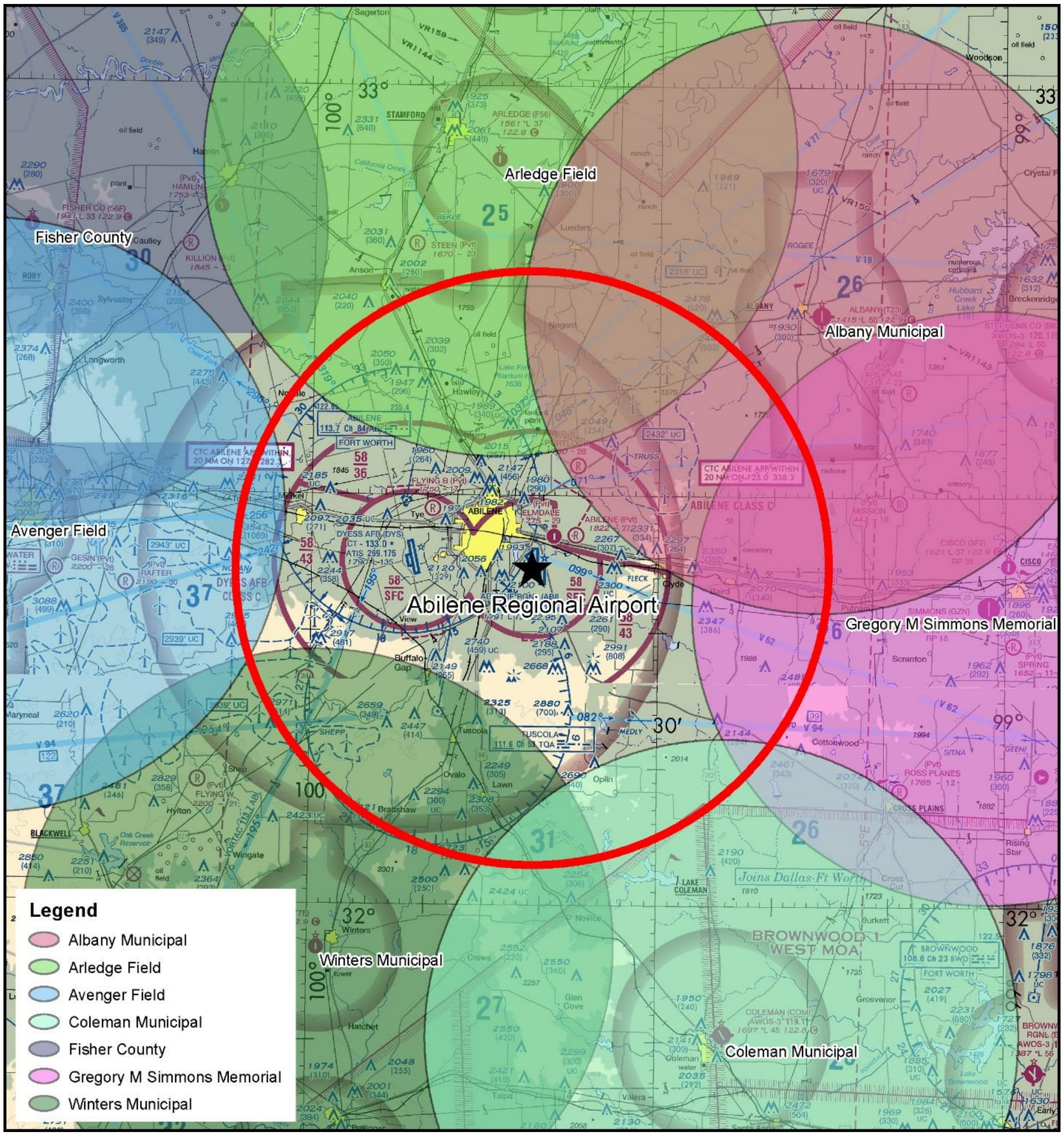
For the purposes of this Airport Master Plan, two different areas will be defined and studied for ABI:

- General Aviation Service Area
- Commercial Passenger Catchment Area

General Aviation Service Area

The NPIAS defines the GA Service Area as the area encompassed by a 25-minute drive time from a given airport. In rural, less densely populated areas, this methodology is sufficient to define a given airport's GA service area. **Figure 2-54** depicts the various airports in the region along with their specified GA service area. ABI is located in the center of the graphic. However, in areas where multiple airports are located in close proximity to each other, an analysis of the competing airports in the region and their facilities/services is required to develop a Composite Service Area for the airport. Surrounding airports have varying degrees of influence on the composite service area based on the competing services they offer (e.g., available hangar rentals, flight training, charters, fuel, maintenance, courtesy car, security, etc., facilities and equipment, navigational aids, and accessibility), their relative distance to population centers, ease of accessibility, and proximity to ABI.

Figure 2-54
NPIAS Service Area



Source: Garver, 2017

Table 2-14 lists the primary airports competing for GA traffic with ABI and the service characteristics of each airport. **Figure 2-55** shows the Composite Service Area for ABI based on the competing airports in the region.

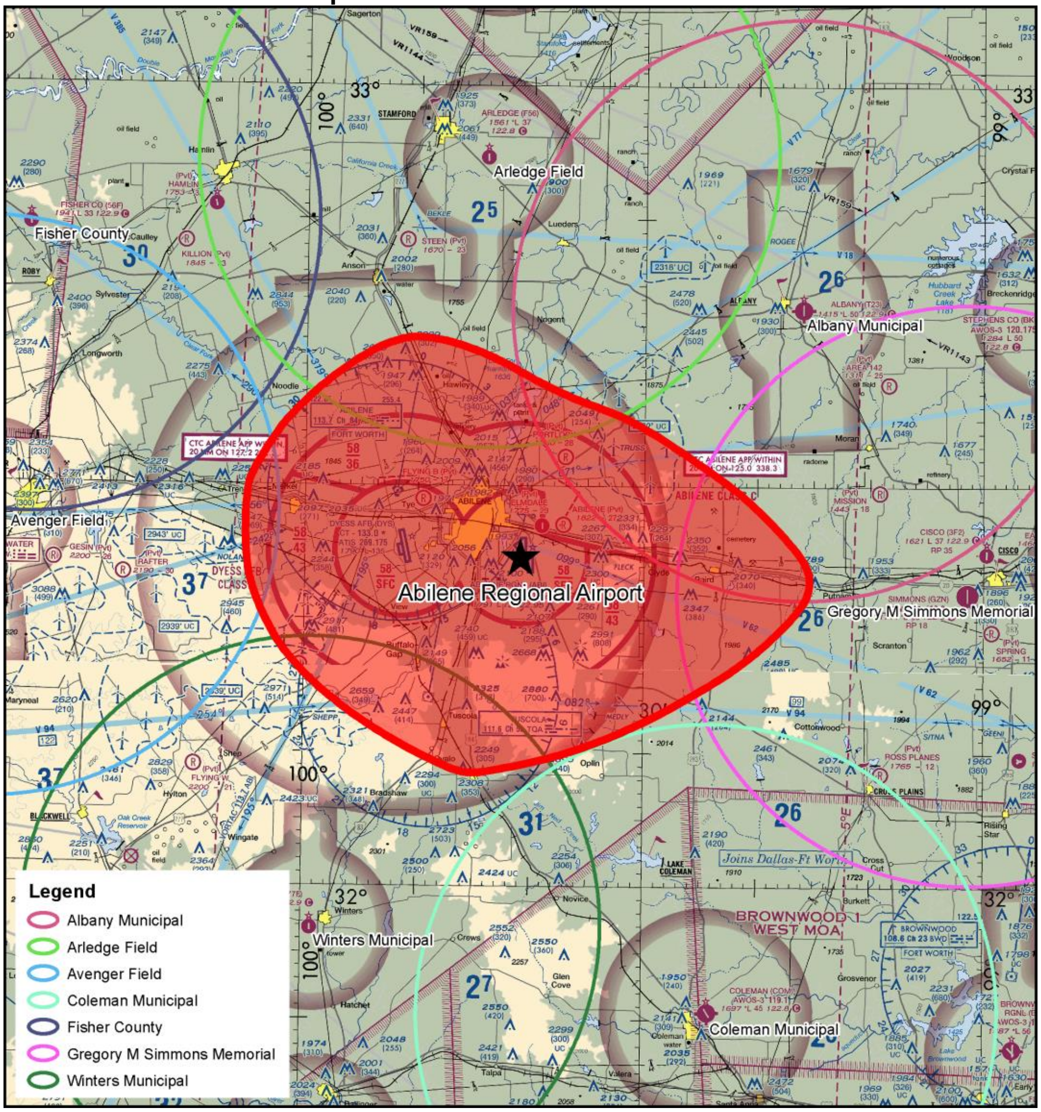
Table 2-14
Area General Aviation Airports

Airport Name Airport Sponsor Distance From ABI	Airport Role: NPIAS/ TASP	Runway Characteristics	Aircraft/ Operations	Airport Services	Repairs: Airframe/ Power Plant
Abilene Regional **CITY OF ABILENE** **N/A**	S/CMS	17R-35L 7203' x 150' (P) 17L-35R 7198' x 150' (P) 4-22 3679' x 100' (P)	117 aircraft 54,390 ops	Fuel/Hangars/ Tie Downs	Major/Major
Albany Municipal **CITY OF ALBANY** **34 miles North East**	UN/CS	17-35 5,000' x 75' (P)	7 aircraft 2,800 ops	Fuel /Tie Downs	None/None
Arledge Field Airport **CITY OF STAMFORD** **35 Miles North**	LB/CS	17-35 3,707' x 60' (P) 26-Aug 2,211' x 50' (T) 13-31 1,702' x 50' (T)	16 aircraft 4,370 ops	Hangars/Tie Downs	Major/Major
Avenger Field **CITY OF SWEETWATER** **46 Miles West**	LB/BC	17-35 5840' x 100' (P) 22-Apr 5658' x 75' (P)	12 aircraft 9,860 ops	Fuel/Hangars/Tie Downs	Major/Major
Coleman Municipal **CITY OF COLEMAN** **42 miles southeast**	LB/CS	15-33 4,506' x 75' (P)	22 aircraft 7,665 ops	Fuel/Hangar/Tie Downs	Major/Major
Fisher County Airport **FISHER COUNTY** **50 miles northwest**	UN/BS	16/34 3,300' x 60' (P) 7-25 2,800' x 50' (P)	6 aircraft 2,400 ops	Tie Downs	None/None
Gregory M. Simmons Memorial **ROBERT EARLY, CFO** **34 MILES EAST**	UN/BS	18-36 6,536' x 100' (P)	6 aircraft, 500 ops	Fuel/Hangars/Tie Downs	Minor/Minor
Winters Municipal **CITY OF WINTERS** **37 Miles Southwest**	UN/BS	17-35 3,204' x 50' (P)	8 aircraft, 3,172 ops	Hangars/ Tie Downs	None/None

Symbols: TSAP- Texas Airport System Plan: State role; BS- Basic Service; CS- Commercial Service; BC- Buisness/ Cooperate; RL- Reliever; CMS- Commercial Service; NPIAS Classification: CS – Commercial Service; NR - National/Regional; LB – Local/Basic Airport; L – Large Hub; M – Medium Hub; S – Small Hub; UN- Unclassified; N – Nonhub; (P) – Paved runway surface; (T) – Turf or gravel runway surface (í) – Control tower; NPI – Non-precision instrument approach; PI – Precision instrument approach, Instrument Landing System (ILS)

Source: FAA Form 5010 Report, Airport Master Records, January 2017; National Plan of Integrated Airport Systems

Figure 2-55
Composite General Aviation Service Area



Source: Garver, 2017

While there are a number of airports within 50 miles of ABI, all of these airports are much smaller than ABI, have fewer based aircraft, shorter runways, instrument approaches with higher minima, and are not as closely located to the City of Abilene which is the only major population center in the immediate area. Consequently, the only aircraft that ABI is probably losing from its NPIAS service area to these other competing airports are the smaller aircraft single-engine piston aircraft and ultra-light aircraft. A search of the FAA aircraft registry database shows that approximately 54% of the aircraft registered in Taylor, Jones, Shackleford, and Callahan Counties are based at ABI.

Commercial Passenger Catchment Area

A commercial airport's catchment area can be defined as the geographic region from which it commonly pulls enplaning passengers. The size of an airport's commercial passenger catchment area will vary depending on numerous factors. However, it is primarily defined by the proximity of other airports providing similar services. Currently, ABI has airline service from Abilene to DFW International Airport which then allows passengers to connect to the rest of the world. No other regularly scheduled non-stop airline service exists from ABI at this time but ABI is actively pursuing additional destinations and airlines.

To define ABI's catchment area, an examination of other commercial service airports in the area is required. For commercial airline passengers, the most important criteria when selecting an airport to fly to or from are the proximity (distance/convenience) and airfare. Travelers will be influenced by these factors in different ways. For the business traveler who prefers expedient travel over costs, higher airfares may be more acceptable. For the leisure traveler, cost may take on a higher priority with a willingness to bypass a closer airport in favor of lower airfare. Level of service or flight frequency, number of airlines, aircraft types, and non-stop destinations will play a factor for both the business and leisure traveler.

Currently, there are seven commercial service airports around ABI that a potential passenger could utilize to fly in/out of rather than using ABI. **Table 2-15** presents a summary of the commercial service airports that ABI competes with.

Table 2-15
Area Commercial Service Airports

Airport Name	Hub	CY 16 Enplanements	% of Statewide Enplanements	CY 15 Enplanements	% of State
Abilene Regional Airport	N	84,073	0.11%	86,000	0.11%
Dallas-Fort Worth International	L	31,274,875	39.16%	31,589,839	39.65%
Lubbock Preston Smith International	S	447,945	0.56%	443,239	0.56%
Midland International	S	471,311	0.59%	518,509	0.65%
San Angelo Regional/Mathis Field	N	60,277	0.08%	63,842	0.08%

Source: Federal Aviation Administration; Hub: (L) Large; (M) Medium; (S) Small; (N) Non-hub primary (EAS) Essential Air Service

As presented, in 2016 ABI was the 5th largest airport in the region in enplanements and ABI's enplanements were slightly down from its 2015 number of 86,000. However, many airports in Texas experienced a decrease in total enplanements from 2015 to 2016 including DFW, Midland, and San Angelo.

Table 2-16 describes each airport and their competing services. Each of these competing commercial service airports are less than four hours away from Abilene.

Table 2-16
Area Airport – Passenger Attributes

Airport	CY 16 Enplanements	Airlines Serving	Daily Departures	Non-Stop Destinations	Drive Time From ABI (Approx. hrs)
Dallas-Fort Work International	31,589,839	27	1853	221	2.5
Lubbock Preston Smith International	443,239	3	18	7	2.5
Midland International	518,509	3	24	7	2.5
San Angelo Regional/Mathis Field	63,842	1	3	1	1.8
Abilene Regional Airport	84,073	1	6	1	N/A

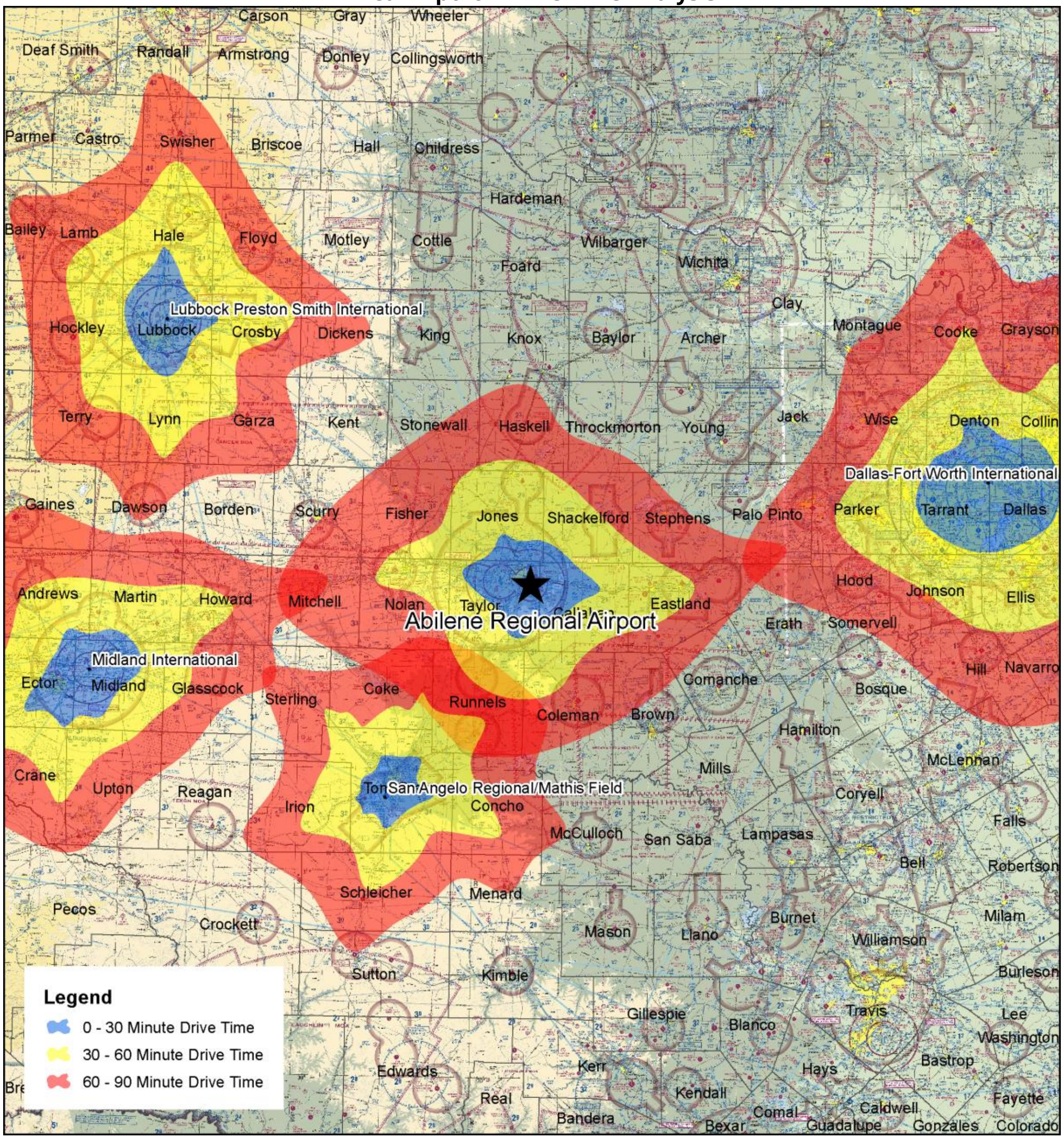
Source: Federal Aviation Administration; Airport Webpages; Airline webpages

Figure 2-56 shows the area within a 90-minute drive of each airport. The dark red area identifies areas where the drive time for both ABI and competing airports overlap. ABI has the most overlap with San Angelo Regional airport and a small amount of overlap with DFW and Midland International Airport. Due to San Angelo's small size and the fact that it only has non-stop service on American Airlines to DFW, it is improbable that many business passengers within the ABI 60 minute drive zone shown on the map are driving to San Angelo to fly. However, if flights to a particular destination are cheaper out of San Angelo as compared to ABI, leisure passengers in the overlapping drive areas may choose San Angelo.

Midland International Airport has the potential to draw passengers out of ABI's 90-minute drive zone because they have three airlines and 24 daily departures to 7 non-stop destinations.

However, the primary competition for ABI regarding commercial passenger service is DFW because it is only 2.5 hours away and offers 221 non-stop destinations which passengers generally prefer. Studies have frequently shown that passengers are willing to drive extra distances for non-stop flights and lower airfares depending on circumstances their particular circumstances. Consequently, it is very likely that potential passengers on the far eastern end of ABI's 90- and 60-minute drive zone may choose to drive to DFW to fly rather than drive a relatively similar amount of time to ABI.

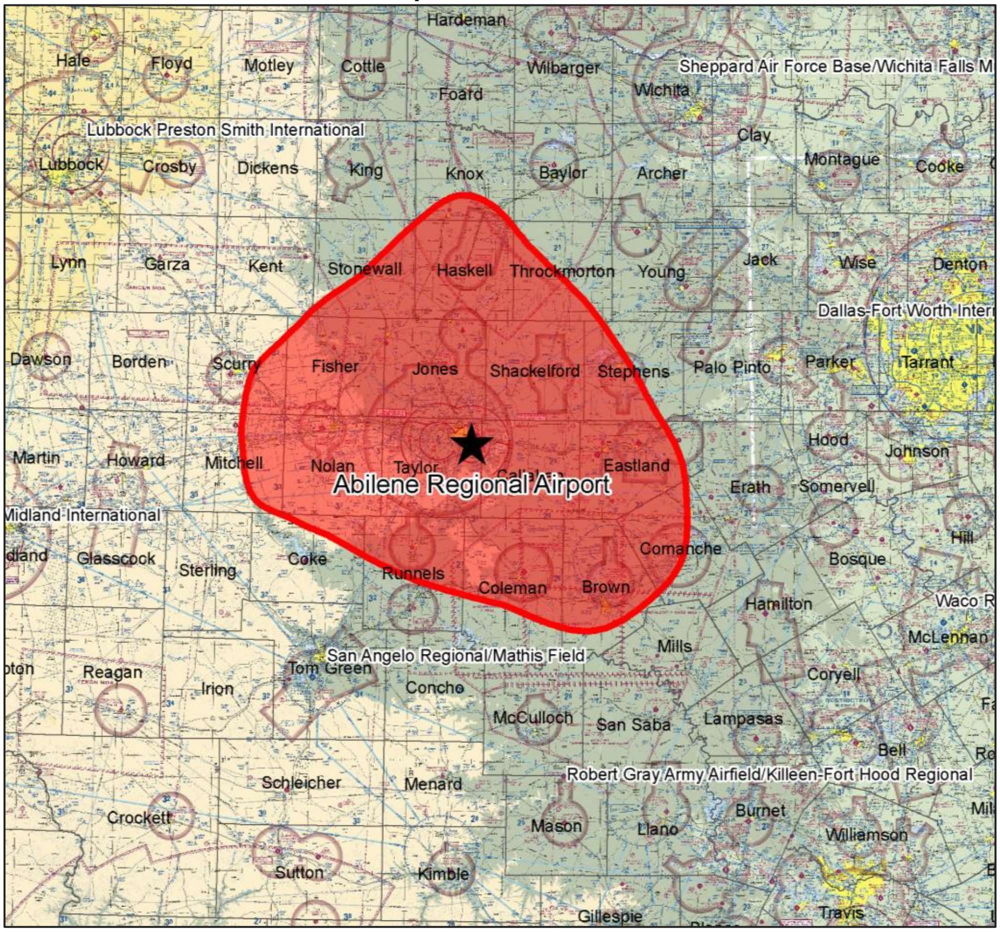
Figure 2-56
Area Airport – Drive Time Analysis



Source: Garver, 2017

Based on these factors, the ABI potential catchment area graphic shown as **Figure 2-57**, was developed. This catchment area is very similar to the catchment area that was defined in the 2011 True Market Estimate study that also estimated the potential size of ABI's catchment area. Based on the potential catchment area and the 2016 population estimate data provided by the Texas Demographic Center (TDC) it is estimated the potential catchment area includes approximately 298,000 people. Approximately 137,438 of the total catchment area is estimated to live in Taylor County.

Figure 2-57
Area Airport – Catchment Area



Source: Garver, 2017

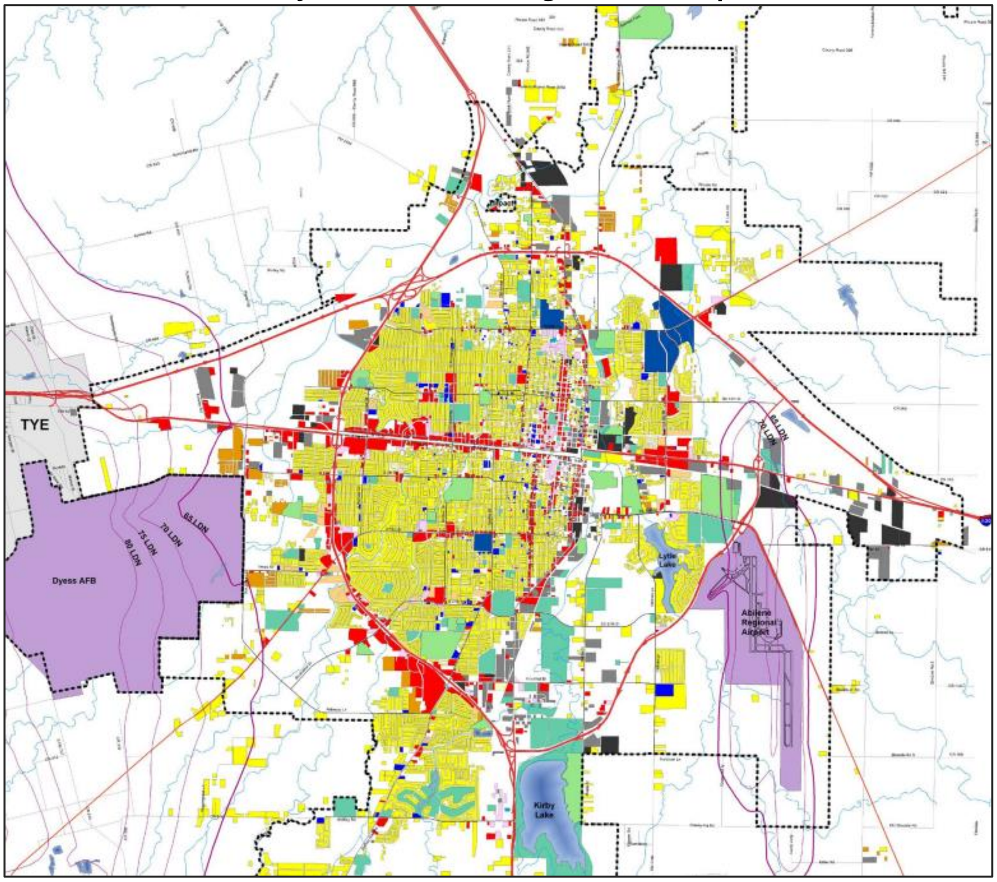
Land-Use and Controls

Land-use and controls in areas surrounding an airport are vital to protecting the continued safety and efficient use of an airport. The following section provides an overview of how property around the airport is currently utilized, zoning ordinances, and other land-use impacts. ABI is zoned as Planned Development according to the City of Abilene's Geographic Information System (GIS). All the land to the south, east, and west of the airport is zoned as Agricultural Open Space.

Existing Land-Use

In 2004, the City of Abilene completed a Comprehensive Plan for the growth of the City. As part of that study, an existing land use map was developed that is shown below as **Figure 2-58.**

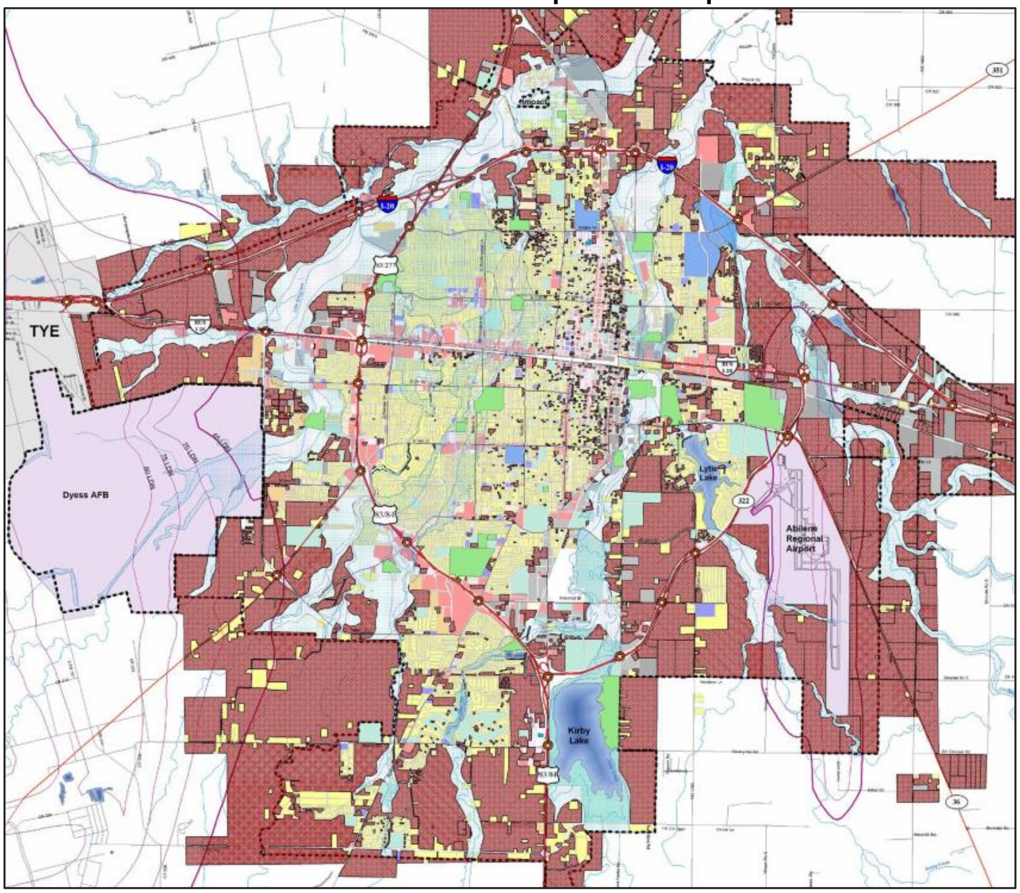
Figure 2-58
City of Abilene – Existing Land-Use Map



Source: City of Abilene Comprehensive Plan

As part of that same study, the City of Abilene also developed a map showing potential areas for future growth and development. This map is depicted as **Figure 2-59.** The areas in reddish-brown are designated for vacant or undeveloped. As shown the vast majority of the property around ABI is vacant or undeveloped.

Figure 2-59
Vacant and Undeveloped Land Map



Source: City of Abilene Comprehensive Plan

In general, most of the land to the east and south of the airport is predominantly undeveloped with the exception of a few single-family residences. To the southwest of ABI, there is a golf course and some additional land that is undeveloped. The most developed area is west of the airport where there are subdivisions and the Taylor County Expo Center on the west side of Highway 322.

As areas around ABI are developed, the City of Abilene should ensure that the lands immediately surrounding the airport are protected from the development of facilities that could pose a hazard to the continued safe and efficient aeronautical use of the airport.

Zoning Ordinance

The City of Abilene has established a comprehensive zoning ordinance that includes the airport. The airport zoning ordinance is partly based on 14 Code of Federal Regulations (CFR) Part 77 – *Safe, Efficient Use, and Preservation of the Navigable Airspace* (FAR Part 77). The ordinance requires a permit to be filed with the City of Abilene's Planning and Development Services

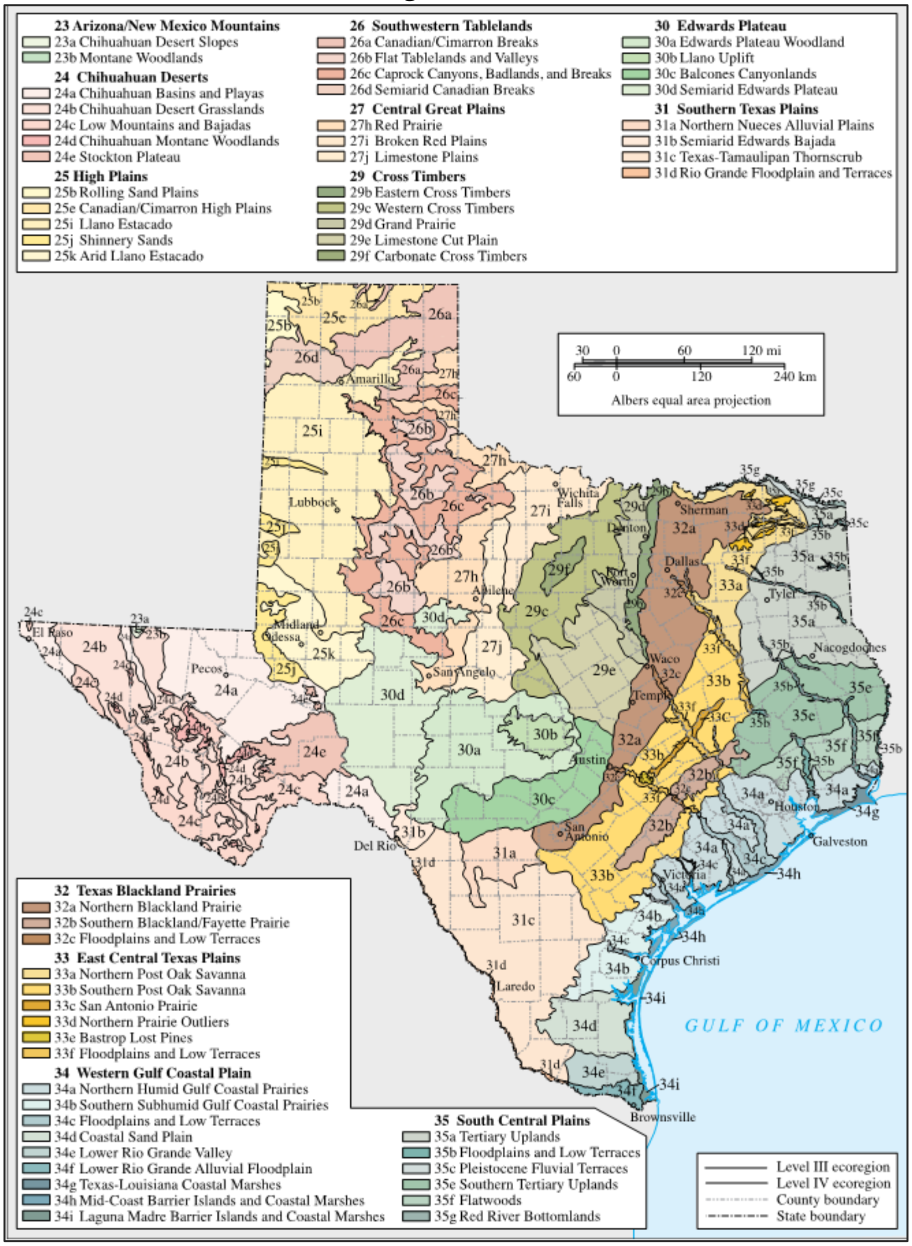
Department to evaluate the impacts of the proposed structure before any action can take place. It should be noted that the ordinance specifically mentions that the permit must be filed regardless of whether or not the development is inside the city limits or if the development is located within the footprint of any of ABI's FAR Part 77 imaginary surfaces. If it is determined that the proposed construction or object will not negatively impact aircraft operations, an Airport Zone Development Permit will be used. Additionally, the ordinance also specifies "noise zones" based on the ABI's current noise contour map. This portion of the ordinance is meant to protect against the establishment of developments inside ABI's noise contours that could be adversely impacted by aircraft noise.

Existing Environmental Conditions

Taylor County and the City of Abilene fall within the Central Great Plains eco-region of Texas and, specifically, in the Red Prairie sub-region. According to a report entitled *Ecoregions of Texas* prepared by the US Department of Agriculture, the Red Prairie sub-region generally consists of level to gently rolling plains with intermittent streams. The vegetation consists of short and mid-grass prairie with a variety of other grasses and shrubbery. The ecoregions of Texas are depicted in **Figure 2-60**.

The topography in the area surrounding the airport has relatively minor elevation changes. In the central and western portions of Taylor County, the topography changes, and some hills are present in the area surrounding Buffalo Gap, the Callahan Divide, and Buzzard Mountain. The highest point is Taylor County is in the western portion of the county and is approximately 2,495 ft. above sea level.

Figure 2-60
Ecoregions of Texas



Source: US Department of Agriculture, Natural Resources Conversation Service.

Climate Overview

The climate of Taylor County is classified as a “hot-humid” climate as defined by the US Department of Energy. A “hot-humid” climate is defined as a region that receives more than 20 inches of annual precipitation and where the monthly average outdoor temperature remains above 45 degrees throughout the year. Cooler temperatures prevail from November through February with January typically being the coldest month. Warmer summer temperatures prevail for about 8 months every year with July typically being the hottest month. Precipitation is heaviest in late May and early June**.** The total annual precipitation averages 24.82 inches. Taylor County has an average of 3 tornadoes annually however most of them are small**.** The average seasonal snowfall is 5 inches**.**

Taylor County has an average of 244 days of sunshine per year. The prevailing wind is from the south from late February to late November and from the north and west for the remainder of the year. Taylor County experiences mild seasonal variations in wind speed throughout the year. Late March and early April tend to be the windiest period of the year. Instrument Meteorological Conditions (IMC) are more common at ABI in the winter and early spring.

Soil Overview

Soil composition is important for airports to consider as it can affect the means and methods utilized for construction on the airport. The soils characterizing the area surrounding ABI are mainly in the Mollisols soil order according to the USDA Web Soil Survey System. Mollisols are soft soils that are common in grassland ecosystems like those found in Taylor County. Mollisols soils are characterized by a thick, dark surface horizon.

Historic/Culture Resources

The National Historic Preservation Act of 1966 requires that an initial review be made to determine if any properties in or eligible for inclusion in the National Register of Historic Places are within the area of a proposed action’s potential environmental impact. The Archaeological and Historic Preservation Act of 1974 provides for the survey, recovery, and preservation of significant scientific, pre-historic, historical, archaeological, or paleontological data when such data may be destroyed or irreparably lost due to a federal, federally funded, or federally licensed project. An online query through the Texas Historical Commission (THC) website revealed that there are not any historic site locations in the immediate airport vicinity. ABI does have a few historic markers on site, but they do not fall under the jurisdiction of the THC. Additionally, there are no known areas of archaeological sensitivity that the ABI staff is aware of at the airport. However, a more thorough investigation and coordination may need to be conducted through both the state and federal cultural resources offices prior to future airfield construction.

Fish, Wildlife, and Plant Overview

The Endangered Species Act requires each federal agency to ensure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of habitat of such species. As provided by the Texas Parks and Wildlife Department, several threatened or endangered species are listed for Taylor County. As defined by the U.S. Fish and

Wildlife Service (USFWS), an Endangered Species is any species of wildlife whose continued existence as a viable component of the state's wild fauna is determined to be in jeopardy, and a Threatened Species is any species of wildlife that appears likely, within the foreseeable future, to become an endangered species. **Table 2-17** lists the threatened and endangered species for Taylor County on both a federal and state status regardless of whether they occur at ABI. At this time ABI staff is not aware that airport property serves as a habitat for any endangered plant or animal species. Future coordination with USFWS and the Texas Parks and Wildlife Department may be necessary prior to commencing any major construction project at ABI to confirm that no hazard to an endangered or threatened species is being created.

Table 2-17
Taylor County – Threatened and Endangered Species

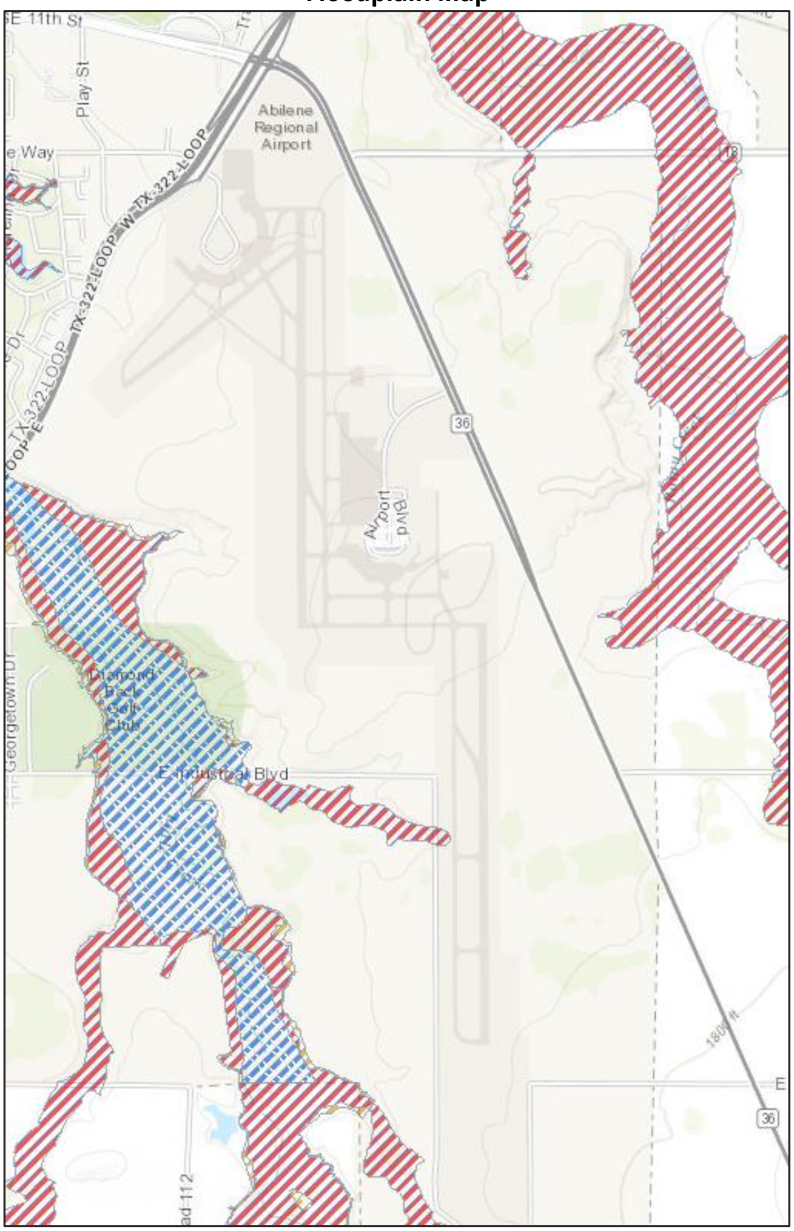
Common Name	Genus/Species	Federal Status	State Status
	BIRDS		
American Peregrine Falcon	*Falco peregrinus anatum*	DL	T
Arctic Peregrine Falcon	*Falco peregrinus tundrius*	DL	N/A
Baird's Sparrow	*Ammodramus bairdii*	N/A	N/A
Bald Eagle	*Haliaeetus leucocephalus*	DL	T
Black-capped Vireo	*Vireo atricapilla*	LE	E
Ferruginous Hawk	*Buteo regalis*	N/A	N/A
Mountain Plover	*Charadrius montanus*	N/A	N/A
Peregrine Falcon	*Falco peregrinus*	DL	T
Snowy Plover	*Charadrius alexandrinus*	N/A	N/A
Sprague's Pipit	*Anthus spragueii*	N/A	N/A
Western Burrowing Owl	*Athene cunicularia hypugaea*	N/A	N/A
Western Snowy Plover	*Charadrius alexandrinus nivosus*	N/A	N/A
Whooping Crane	*Grus americana*	LE	E
	MAMMALS		
Black-tailed prairie dog	*Cynomys ludovicianus*	N/A	N/A
Cave myotis bat	*Myotis velifer*	N/A	N/A
Gray wolf	*Canis lupus*	LE	E
Plains spotted skunk	*Spilogale putorius interrupta*	N/A	N/A
Red wolf	*Canis rufus*	LE	E
	MOLLUSKS		
Texas fatmucket	*Lampsilis bracteata*	C	T
	REPTILES		
Spot-tailed earless lizard	*Holbrookia lacerata*	N/A	N/A
Texas horned lizard	*Phrynosoma cornutum*	N/A	T
	PLANTS		
Cory's evening-primrose	*Oenothera coryi*	N/A	N/A
Glass Mountains coral-root	*Hexalectris nitida*	N/A	N/A
Prairie butterfly-weed	*Gaura triangulata*	N/A	N/A
Rock grape	*Vitis rupestris*	N/A	N/A
Warnock's coral-root	*Hexalectris warnockii*	N/A	N/A

Source: Texas Department of Fish and Wildlife

FEMA Floodplain Overview

Flooding can hamper the safe operation of an airport and make it difficult to develop property on or around an airport. As part of this study, an online inquiry was completed through the City of Abilene GIS site and the Federal Emergency Management Administration (FEMA) 100-year Floodplain does encroach on ABI property immediately to the west of Taxiway Delta. **Figure 2-61** shows the location of the floodplains around ABI. The red hashed areas indicate the location of the 100-year floodplain. The blue hashed area denotes an established regulatory floodway.

Figure 2-61
Floodplain Map

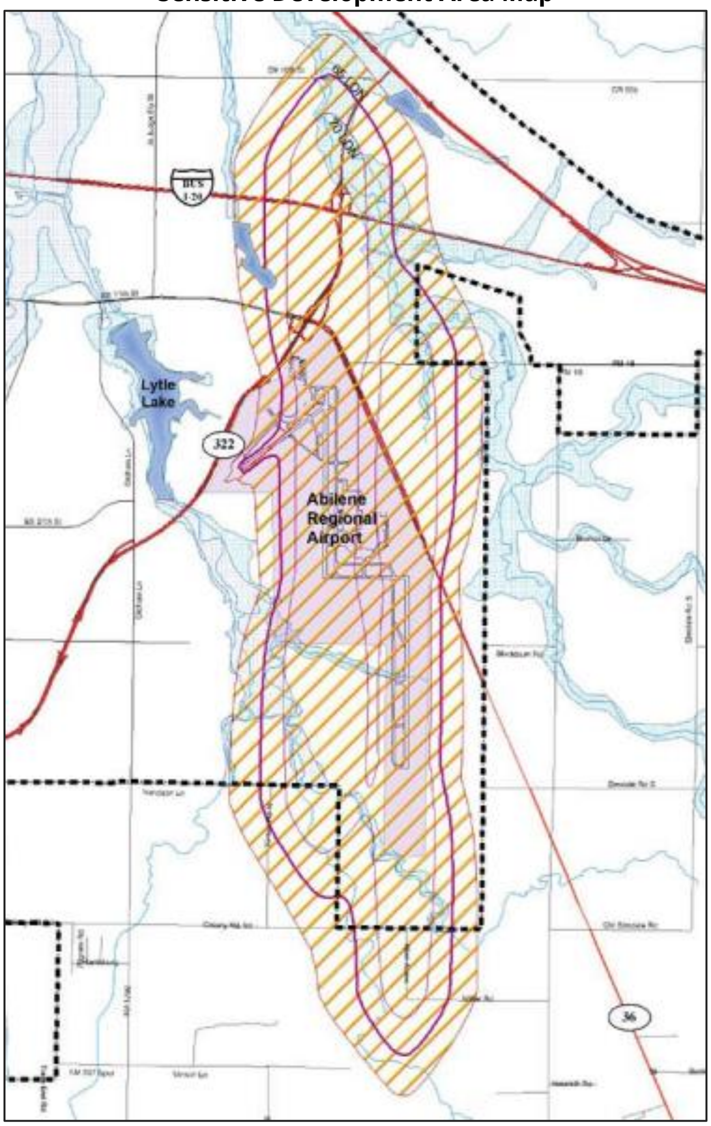


Source: City of Abilene – GIS System

Noise Exposure

Noise is an important environmental concern as it can affect the quality of life for the residences close to an airport. As part of the City of Abilene's 2004 Comprehensive Plan, "sensitive development areas" were established to help prevent developments that could negatively be impacted by aircraft noise from ABI. A copy of the Sensitive Development Area Map from the City of Abilene's Comprehensive Plan is shown as **Figure 2-62**. The orange hashed area denotes the sensitive development area. The purple line surrounding the airport identifies the currently established 65 DNL line. ABI staff reports that they receive very few noise complaints regarding their existing aircraft traffic.

Figure 2-62
Sensitive Development Area Map



Source: City of Abilene – Comprehensive Plan

Air and Water Quality

The impacts that an airport can have on local air and water quality should be a major consideration in the growth and development of an airport. There are no known issues at ABI related to water quality or air and water pollution at this time and the airport does have a current Stormwater Pollution Prevention Plan (SWPPP). ABI does have an EPA registered air quality monitoring and weather station located on airport property that is maintained by the National Weather Service (NWS).

Socioeconomics

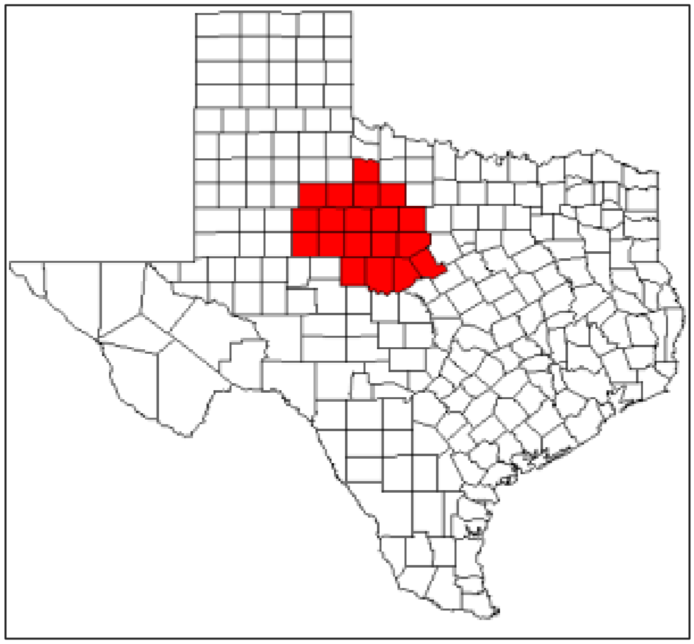
An assessment of regional economic conditions is conducted to gain a better understanding of the relationship between historic and future aviation activity levels within an airport's area of influence. This information is essential and directly influences a region's airport. Therefore, the following socio-economic information, population, median family income, and income distribution has been collected to understand current conditions and influence assumptions involved in the development of the aviation demand forecasts for ABI.

Regional Economy

Understanding the overall regional economy is important to understanding a community/region and potential changes/trends that could affect an airport in the future.

The economy in the region surrounding ABI is currently growing at a slow pace. The majority of the counties in ABI's commercial catchment area defined earlier in this chapter are part of the West Central Texas Council of Governments (WCTCOG). WCTCOG is composed of 19 counties, including Taylor County where ABI resides. The WCTCOG region is depicted below in **Figure 2-63**, *WCTCOG Counties*.

Figure 2-63
WCTCOG Counties



Source: Garver, 2017

WCTCOG oversees the West Central Texas Economic Development District (WCTEDD) which is focused on the economic development of the WCTCOG region. To ensure a focused and comprehensive approach to improving the economic climate in the region WCTEDD has established a Comprehensive Economic Development Strategy (CEDS). The CEDS was established in 2015.

The vision statement for the WCTEDD is:

The West Central Texas Economic Development District shall serve as a catalyst for economic expansion and prosperity while preserving the integrity and character of the Big Country region. Strategic development will occur through creation of sustainable wage jobs, establishment of innovative projects and businesses, strong alliances with local economic development efforts, provision of technical assistance, collection and interpretation of economic data, and vigorous evaluation and procurement of services and resources.

According to the CEDS, the total regional wages for the WCTCOG region totaled approximately $4.4 billion in 2015. The following industry clusters were the primary contributors:

1. Energy (Fossil and renewable) - $1,022,043,778
2. Biomedical/Biotechnical (Life Sciences) - $544,891,702
3. Business and Financial Services - $418,353,105
4. Defense Security - $371,075,366
5. Education and Knowledge Creation - $276,484,899

The predominant industry cluster in the region is energy as it accounts for almost 25% of the total wages for the region. This industry cluster includes both renewable energy (e.g. wind) and non-renewable energy (e.g. oil and gas) exploration, extraction, and production.

Another key aspect of a region's economy is understanding a region's Location Quotient (LQ). Location Quotient is a way of quantifying how concentrated a particular industry or occupation is in a given region compared to the nation as a whole. Unsurprisingly, the occupations with the highest LQs in the WCTCOG region are related to the energy industry. The top 5 are:

- Extraction Workers – Helpers – LQ 18.38
- Roustabouts, Oil and Gas – LQ 16.95
- Derrick Operators, Oil and Gas – LQ 15.00
- Service Unit Operators, Oil and Gas – LQ 12.63
- Wind Turbine Technicians – LQ 11.88

In addition to these energy industry centric occupations, the WCTCOG region also has high LQs in the following areas:

- Forestry Occupations – LQ 2.09
- Construction and Extraction Occupations – LQ 1.52
- Installation, Maintenance, and Repair Occupations – LQ 1.27
- Protective Service Occupations – LQ 1.26
- Healthcare Support Occupations – LQ 1.26
- Healthcare Practitioners and Technical Occupations – LQ 1.08

These labor concentrations demonstrate the skills of the WCTCOG labor force and can be leveraged to market the region to new businesses or to encourage existing businesses to expand related to applicable industry clusters.

Additionally, according to the CEDS, in 2016 the total number of individuals employed in the labor force in the WCTCOG region was 141,494. The unemployment rate was 4.4%, which was slightly up from the 4.0% unemployment mark set in 2015.

One of the region's most significant challenges has been the development and education of the regional workforce. According to the CEDS, the WCTCOG region trails both the national and state averages in educational attainment.

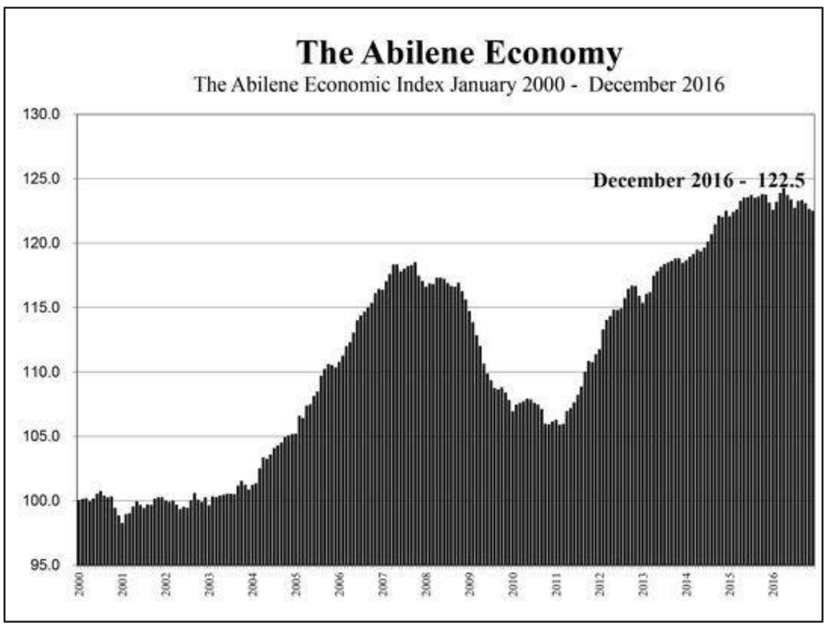
While recent economic indicators have not shown much growth, the WCTEDD and other local economic development partners have been working to improve the trend.

City of Abilene Economy

The City of Abilene is the largest municipality in the WCTCOG region and, consequently, plays a major role in the development and health of the regional economy. The City of Abilene works closely with a number of partner organizations including the Development Corporation of Abilene (DCOA), the Abilene Industrial Foundation (AIF), the Abilene Chamber of Commerce, and others to improve economic development in Abilene.

According to the Abilene Economic Index (AEI), a monthly economic indicator that is prepared by the DCOA and takes into account numerous economic elements, the Abilene economy has grown consistently since 2011 but began to soften in 2016. It is believed that this is primarily due to the low prices for crude oil and natural gas and the subsequent retraction inactivity. **Figure 2-64**, *Abilene AEI*, shows the monthly AEI from January 2000 to December 2016.

Figure 2-64
Abilene AEI



Source: Abilene News Reporter

The Abilene Metropolitan Statistical Area (MSA) – comprised of Taylor, Jones, and Callahan County – saw consistent employment from 2000 to 2008 reaching a peak of 79,811 jobs in 2008. The economic recession in 2008, 2009, and 2010 resulted in some employment losses but employment numbers have been slowly increasing since 2010 and are now close to the 2008 peak. According to the DCOA, most of the recent job growth has been in the restaurants, bar, and hotel industry sector as well as the wholesale trade, and oil, gas, and mining industry sectors. The most substantial losses in recent years have been in the education and federal government (military) industry sectors.

It should also be noted that the composition of the local economy in the Abilene MSA differs from the regional economy in that it is more diverse and less dependent on the historically volatile oil and gas market. However, oil and gas remain a major component of the Abilene economy. According to the Economic Development Strategic Plan prepared by DCOA in March 2016, the largest industry sectors by employment in the Abilene MSA are:

- Healthcare and Social Assistance – 13.2% of the MSA
- Retail Trade – 10.8% of the MSA
- Local Government (Including public education and hospitals) – 9.9% of the MSA
- Lodging, Restaurants, & Bars – 9.1% of the MSA
- Construction – 6.5% of the MSA

The largest employers in the area are listed below:

- Dyess Air Force Base – 5,400 employees
- Hendrick Health System – 3,020 employees
- Abilene Independent School District – 2,450 employees
- Abilene State Supported Living Center – 1,240 employees
- City of Abilene – 1,200 employees

Additionally, the Location Quotients (LQs) for the Abilene MSA indicate that the following industries make up a larger share of the region's job base compared to national averages:

- Mining (including oil and gas) – LQ 4.80
- Federal Government (including military) – LQ 4.46
- Educational Services (Private) – LQ 1.79

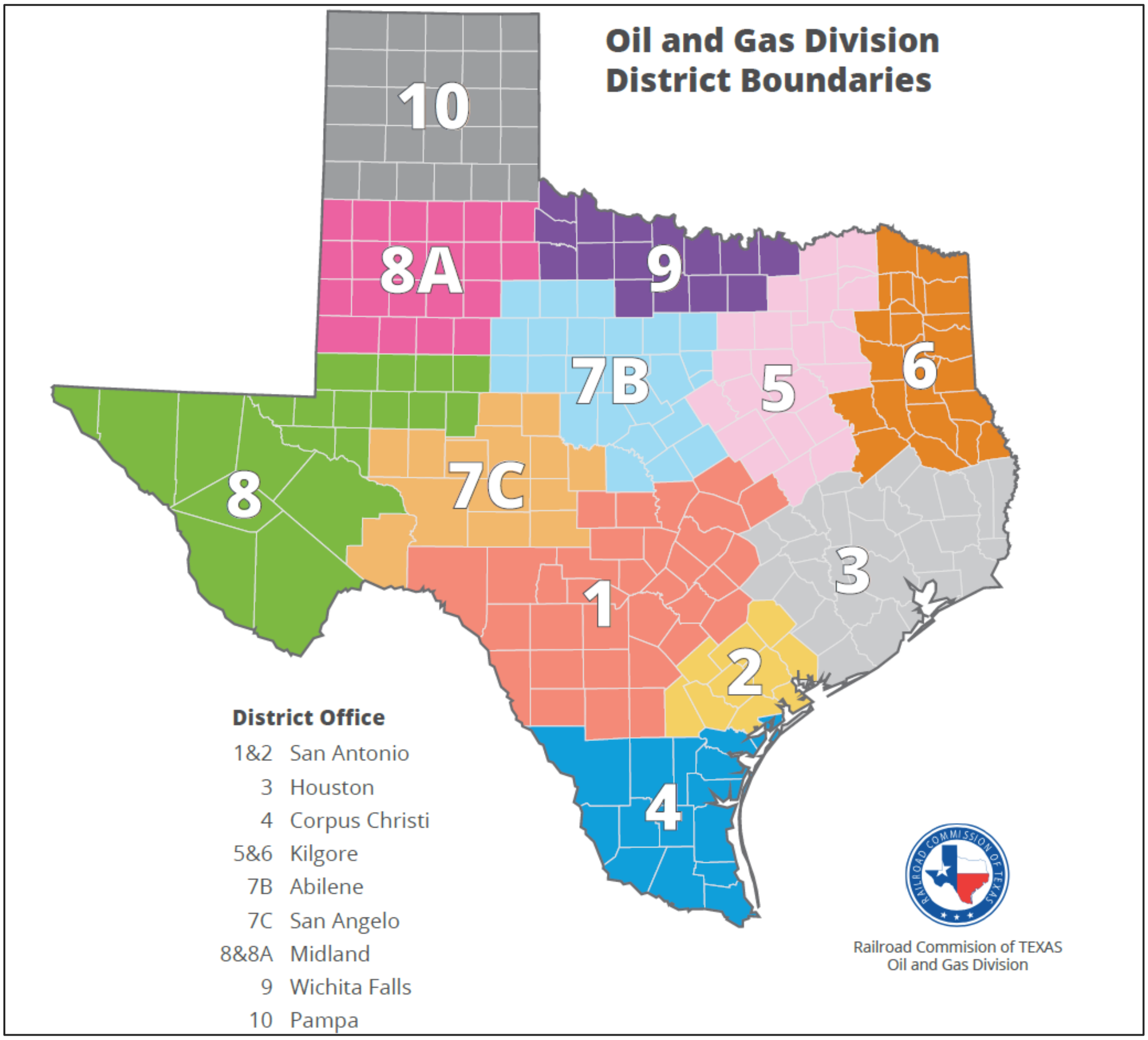
These LQs are unsurprising because of the oil and gas exploration taking place in the region, the presence of Dyess Air Force Base, and the number of private higher education institutions (e.g. Abilene Christian University, Hardin-Simmons University, and McMurry University) within the MSA.

Abilene also ranks as one of the most affordable places to live in the US. Average home sale prices are 35% below the national average. Additionally, other items such as groceries, utilities, transportation, and health care are also below national averages.

Oil and Gas Production

The Texas Railroad Commission is the organization tasked with overseeing and monitoring the exploration and production of oil and natural gas in the State of Texas. The Texas Railroad Commission has segmented the counties in the State of Texas into various districts. Taylor County and the surrounding counties are part of District 7B, which has a total of 24 counties. A map showing the various districts in Texas is shown in **Figure 2-65**, *Texas Oil and Gas Division District Boundaries*.

Figure 2-65
Texas Oil and Gas Division District Boundaries



Source: Railroad Commission of Texas

Since 2000, oil and gas production in District 7B has decreased. The largest declines have been in Casinghead Gas (gas produced along with crude oil from oil wells) and Gas Wells. Oil production has also decreased but the declines are much smaller. **Table 2-18,** *Texas District* 7B *Oil and Gas Production*, displays the annual oil and gas production in District 7B since 2000.

Table 2-18
Texas District 7B Oil and Gas Production

Date	Oil (BBL)	Casinghead (MCF)	GW Gas (MCF)
2000	14,122,019	45,332,107	45,332,107
2001	13,066,915	46,762,531	46,762,531
2002	11,591,308	47,472,568	47,472,568
2003	10,836,610	43,547,887	43,547,887
2004	10,430,039	41,304,380	41,304,380
2005	9,745,582	41,096,140	41,096,140
2006	9,411,805	42,065,026	42,065,026
2007	9,025,461	40,595,600	40,595,600
2008	9,456,980	42,830,824	42,830,824
2009	8,985,966	39,344,840	39,344,840
2010	8,970,248	35,338,592	35,338,592
2011	9,577,422	33,319,622	33,319,622
2012	10,418,682	32,020,310	32,020,310
2013	11,066,655	30,690,788	30,690,788
2014	12,296,871	29,951,638	29,951,638
2015	11,807,894	27,610,918	27,610,918
2016	10,430,042	23,841,080	23,841,080

Source: Railroad Commission of Texas

The western edge of District 7B is located along the edge of the Permian Basin which is forecasted to seeing increasing oil production in the near future. In 2016, it is estimated that oil and gas companies paid over $28 billion on land acquisitions, which is over triple what was spent for land acquisitions in the area in 2015. Additionally, the U.S. Energy Information Administration estimates that oil production in the Permian Basin area will break previous production records in 2017 and again in 2018. However, the recent growth in the Permian Basin region does not seem to have impacted overall oil production numbers in Region 7B. The counties located in the western portion of Region 7B (Fisher, Nolan, Scurry, and Mitchell Counties) are located in the Permian Basin have seen little to no growth in the last 2 to 3 years.

Population

Population growth can be directly tied to the success and growth of an airport supporting a given population set. Additionally, population trends and expected rate of change provide insight into an area's economic potential.

ABI supports a much wider population base than that solely found within the City of Abilene or Taylor County. Consequently, for the purposes of this population analysis, the primary counties comprising the ABI Catchment Area defined earlier in this chapter will be utilized to analyze population trends related to ABI. The counties included in this analysis include: Taylor, Haskell, Fisher, Jones, Shackelford, Mitchell, Nolan, Callahan, Throckmorton, Eastland, Runnels, Coleman, Brown, Comanche, Stonewall, and Stephens. Small portions of the ABI Catchment Area protrude into Knox, Coke, and Scurry Counties. However, due to the small portion of each of these counties that are part of the catchment area they have been excluded from this analysis.

The ABI Catchment Area Counties annual population growth rate from 2000 to 2016 was 0.14% which is well below the growth rate for the State of Texas (1.85%) during the same period. During the forecast period (2017 -2037), the annual growth rate for the ABI Catchment Area Counties is expected to increase to 0.33% annually while the growth rate for the State of Texas is expected to slow to 1.06% annually. **Table 2-19**, *Catchment Area Population Data,* shows a breakdown of the historic and projected population figures for the area compared to Texas.

Table 2-19
Catchment Area Population Data

Historical Growth	Catchment Area Counties	Texas
2000	303,428	20,851,820
2010	305,942	25,145,561
2015	310,624	26,581,256
2016	310,516	27,947,116
Annual Growth Rate	0.14%	1.85%
Forecasted Growth		
2017	317,200	28,634,896
2022	324,564	29,576,078
2027	330,877	31,512,597
2032	335,661	33,456,996
2037	338,833	35,389,580
Forecast Annual Growth Rate	0.33%	1.06%

Source: Texas Demographic Center (TDC)

Note: Data for 2000 and 2010 are based on US Census Data as depicted on the TDC website. All other figures are based on population estimates provided by TDC and assume ½ the migration pattern seen between the 2000 and 2010 census. This model was used because the TDC recommends it as the best model for long-term forecasting.

Table 2-20, *County-Level Population Data*, shows the historic and projected population figures for each county in the ABI Catchment Area. From 2000-2016, Taylor County has been the primary driver in population growth within the region, with a total population growth of approximately 9,000 people and an annual growth rate of 0.52%. This trend is expected to continue during the forecast period as Taylor County is forecasted to account for roughly 50% of the total population growth within the catchment area (approximately 11,000 of the total expected growth of 22,000).

Table 2-20
County-Level Population Data

Counties	2000 Population Census	2010 Population Census	2015 Estimate	2016 Estimate	Annual Growth Rate (2000 - 2016)	2017 Estimate	2022 Estimate	2027 Estimate	2032 Estimate	2037 Estimate	Annual Growth Rate (2017 - 2037)
Brown	37,674	38,106	39,128	39,103	0.23%	39,410	40,252	40,814	41,133	41,189	0.22%
Callahan	12,905	13,544	14,154	14,167	0.58%	13,891	14,220	14,612	14,931	15,126	0.43%
Coleman	9,235	8,895	8,572	8,541	-0.49%	8,914	8,968	9,049	9,094	9,076	0.09%
Comanche	14,026	13,974	13,906	13,876	-0.07%	14,366	14,711	15,054	15,332	15,522	0.39%
Eastland	18,297	18,583	18,419	18,282	-0.01%	19,121	19,450	19,711	19,810	19,828	0.18%
Fisher	4,344	3,974	3,858	3,842	-0.76%	3,984	3,994	3,985	3,972	3,931	-0.07%
Haskel	6,093	5,899	5,716	5,678	-0.44%	5,866	5,887	5,938	5,972	5,963	0.08%
Jones	20,785	20,202	19,938	19,871	-0.28%	21,155	21,860	22,604	23,174	23,629	0.55%
Mitchell	9,698	9,403	8,980	9,013	-0.46%	9,670	9,863	10,047	10,160	10,268	0.30%
Nolan	15,802	15,216	14,756	14,673	-0.46%	15,786	16,224	16,637	16,977	17,158	0.42%
Runnels	11,495	10,501	10,439	10,447	-0.60%	10,678	10,888	11,042	11,152	11,152	0.22%
Shackelford	3,302	3,378	3,410	3,430	0.24%	3,506	3,592	3,667	3,718	3,707	0.28%
Stephens	9,674	9,630	9,340	9,199	-0.31%	9,888	10,110	10,323	10,487	10,558	0.33%
Stonewall	1,693	1,490	1,411	1,391	-1.22%	1,491	1,498	1,501	1,488	1,460	-0.10%
Taylor	126,555	131,506	137,000	137,438	0.52%	137,824	141,409	144,273	146,669	148,704	0.38%
Throckmorton	1,850	1,641	1,597	1,565	-1.04%	1650	1,638	1,620	1,592	1,562	-0.27%
Total	**303,428**	**305,942**	**310,624**	**310,516**	**0.14%**	**317,200**	**324,564**	**330,877**	**335,661**	**338,833**	**0.33%**

Source: Texas Demographic Center (TDC)

Note: Data for 2000 and 2010 are based on US Census Data as depicted on the TDC website. All other figures are based on population estimated provided by TDC and assume ½ the migration pattern seen between the 2000 and 2010 census. This model was used because the TDC recommends it as the best model for long-term forecasting.

Something that should be noted regarding the catchment area's population is that much of the growth since 2011 has come from retirees moving into the region. Abilene has been ranked #1 on Forbes' Best Places to Retire List in 2014, 2015, and 2016 primarily because of its nice weather, low crime, and economical cost of living. The population data shown in **Table 2-21**, *Population Data by Age*, depicts this trend.

Table 2-21
Population Data by Age

	Age Range 16-35		Age Range 36-55		Age Range 56-75		Age Range 76+	
County	**2011**	**2015**	**2011**	**2015**	**2011**	**2015**	**2011**	**2015**
Brown	9,264	9,324	9,687	9,254	8,704	9,737	2,677	2,814
Callahan	2,882	3,140	3,582	3,508	3,290	3,576	975	1,129
Coleman	1,660	1,764	2,299	1,985	2,404	2,385	810	848
Comanche	2,898	3,013	3,508	3,243	3,486	3,599	1,164	1,215
Eastland	4,471	4,458	4,446	3,997	4,446	4,774	1,557	1,588
Fisher	815	835	1,027	886	1,001	1,022	396	426
Haskell	1,320	1,252	1,513	1,391	1,407	1,485	614	567
Jones	5,916	5,890	6,166	5,746	3,828	4,067	1,120	1,147
Mitchell	3,221	3,061	2,419	2,178	1,674	1,709	537	557
Nolan	3,596	3,571	3,774	3,407	3,345	3,446	1,065	1,071
Runnels	2,221	2,389	2,640	2,334	2,469	2,613	913	902
Shackelford	705	737	938	818	778	901	266	277
Stephens	2,373	2,365	2,342	2,143	2,168	2,217	748	732
Stonewall	280	274	369	324	364	372	176	183
Taylor	41,883	43,442	31,162	29,633	22,370	25,093	7,818	8,194
Throckmorton	324	334	407	365	425	424	175	201
Total	**83,829**	**85,849**	**76,279**	**71,212**	**62,159**	**67,420**	**21,011**	**21,851**
Change (2011-2015)	**2,020**		**-5,067**		**5,261**		**840**	
Annual Growth Rate	**0.60%**		**-1.70%**		**2.05%**		**0.98%**	
State of Texas	7,421,092	7,943,975	6,929,843	7,160,528	4,078,083	4,790,634	1,052,433	1,147,862
Change (2011-2015)	**522,883**		**230,685**		**712,551**		**95,429**	
Annual Growth Rate	**1.72%**		**0.82%**		**4.11%**		**2.19%**	

Source: Texas Demographic Center (TDC)

Overall, the population of the ABI Catchment Area is expected to grow during the forecast period at a slow to moderate pace (0.33% annually). However, if the growth continues to come from the retiree population, the economic impact on employment figures in the region may not be substantial. This could also impact passenger utilization characteristics of ABI as the retiree population is typically leisure travelers.

Employment

Table 2-22, *Total Employment-Catchment Area*, and **Table 2-23**, *Unemployment Rate,* provide employment information for the catchment area region. Overall employment in the catchment area has slightly declined since 2012, lagging behind the State of Texas and the United States. However, unemployment rates have fallen in 13 of the 16 counties in the catchment area since 2012 and the 10 counties have lower unemployment rates than the State of Texas.

Table 2-22
Total Employment – Catchment Area

County	2012	2013	2014	2015	2016	Annual Growth Rate
Brown	14,981	14,928	15,008	15,159	15,377	0.65%
Callahan	5,572	5,587	5,564	5,469	5,463	-0.49%
Coleman	3,067	2,924	2,926	2,872	2,879	-1.57%
Comanche	5,421	5,331	5,262	5,115	5,097	-1.53%
Eastland	7,716	8,026	7,946	7,634	6,966	-2.52%
Fisher	1,805	1,786	1,777	1,726	1,675	-1.85%
Haskell	2,627	2,582	2,584	2,484	2,408	-2.15%
Jones	5,480	5,464	5,478	5,340	5,297	-0.85%
Mitchell	2,706	2,724	2,777	2,582	2,412	-2.83%
Nolan	6,672	6,581	6,736	6,612	6,514	-0.60%
Runnels	4,781	4,724	4,754	4,483	4,462	-1.71%
Shackelford	2,136	2,225	2,305	2,017	1,816	-3.98%
Stephens	4,124	3,996	4,098	3,923	3,770	-2.22%
Stonewall	715	675	669	631	597	-4.41%
Taylor	60,834	61,346	61,608	60,834	60,804	-0.01%
Throckmorton	786	757	799	753	736	-1.63%
County Totals	**129,423**	**129,656**	**130,291**	**127,634**	**126,273**	**-0.61%**
State of Texas	**11,818,675**	**12,070,808**	**12,340,567**	**12,463,031**	**12,671,801**	**1.76%**
United States	**142,469,000**	**143,929,000**	**146,305,000**	**148,834,000**	**151,436,000**	**1.54%**

Source: Texas Workforce Commission – TRACER System

Table 2-23
Unemployment Rate

County	2012	2013	2014	2015	2016
Brown	6.80%	6.40%	5.20%	4.30%	4.40%
Callahan	6.10%	5.70%	4.40%	4.30%	4.30%
Coleman	7.50%	7.50%	6.10%	5.60%	5.90%
Comanche	6.40%	5.80%	4.80%	4.20%	4.30%
Eastland	6.70%	6.00%	4.80%	4.70%	5.50%
Fisher	5.40%	5.40%	4.50%	3.80%	4.40%
Haskell	5.30%	4.90%	3.90%	3.50%	4.40%
Jones	7.20%	6.70%	5.50%	5.50%	5.90%
Mitchell	6.00%	5.50%	4.20%	5.60%	7.20%
Nolan	5.90%	5.70%	4.30%	4.00%	4.90%
Runnels	5.50%	5.20%	4.20%	3.70%	4.10%
Shackelford	3.50%	3.30%	2.70%	2.80%	3.90%
Stephens	5.90%	5.20%	4.40%	4.20%	5.30%
Stonewall	4.40%	4.70%	3.90%	4.40%	4.60%
Taylor	5.70%	5.20%	4.20%	3.70%	3.70%
Throckmorton	5.30%	5.00%	4.00%	3.20%	3.70%
State of Texas	**6.70%**	**6.20%**	**5.10%**	**4.50%**	**4.60%**
United States	**8.10%**	**7.40%**	**6.20%**	**5.30%**	**4.90%**

Source: Texas Workforce Commission – TRACER System

This paradoxical blend of an improving unemployment rate reduced overall employment, and growing population can be linked to the influx of retirees into the area and the declining population numbers of individuals in the 36-55 age range.

Additionally, many employable individuals within the area are traveling and working in locations outside of the catchment area. In DCOA's 2016 Strategic Plan, an analysis was conducted of the commuting patterns within the Abilene MSA. The study found that approximately 20,298 individuals that live within the Abilene MSA commute to jobs outside the MSA. While some of these individuals commute to other counties with the catchment area to work, many of them commute to Dallas, Ft. Worth, Austin, Midland, Lubbock, and other areas to work.

Median Household Income

Table 2-24 provides the historic median household income for the region based on estimates from the US Census Bureau's American Community Survey (ACS). Median household income indicates the relative changes between income and population. As the productivity of business and industry increases, median household income also rises. Median household incomes have increased consistently in Texas and the United States since 2010. Thirteen of the sixteen counties in ABI's catchment area have seen growth in median household income since 2010. Most of the counties have seen growth rates similar to those seen in Texas and the United States. However, the overall median income numbers for most counties are significantly lower than the median income averages in Texas and the United States. Taylor and Jones County (2 of the 3 counties in the Abilene MSA) have seen steady increases in median household income at rates higher than the state and national average. Callahan County, the other county in the Abilene MSA, has seen a slight decrease.

Table 2-24
Median Household Income

County	2010	2011	2012	2013	2014	2015	Annual Growth Rate
Brown	$38,832	$39,965	$40,821	$39,776	$40,982	$41,962	1.56%
Callahan	$44,596	$45,933	$46,812	$44,902	$42,102	$40,981	-1.68%
Coleman	$26,951	$27,910	$30,690	$31,373	$34,692	$35,156	5.46%
Comanche	$35,218	$36,326	$36,599	$36,020	$35,692	$37,470	1.25%
Eastland	$32,452	$34,531	$35,044	$34,914	$35,221	$34,888	1.46%
Fisher	$41,458	$43,724	$42,900	$42,125	$42,850	$41,406	-0.03%
Haskell	$35,295	$39,578	$40,247	$36,857	$42,645	$39,850	2.46%
Jones	$39,568	$37,872	$38,896	$41,297	$42,287	$43,897	2.10%
Mitchell	$37,260	$41,281	$41,082	$42,045	$45,769	$49,870	6.00%
Nolan	$37,102	$37,177	$37,671	$36,806	$37,342	$37,102	0.00%
Runnels	$37,823	$38,556	$39,115	$37,667	$38,684	$41,526	1.89%
Shackelford	$46,629	$44,647	$46,181	$47,277	$50,857	$48,750	0.89%
Stephens	$35,691	$37,400	$38,424	$41,728	$43,082	$43,951	4.25%
Stonewall	$52,222	$47,083	$52,917	$42,429	$42,321	$42,155	-4.19%
Taylor	$42,403	$43,065	$44,372	$44,891	$44,695	$45,396	1.37%
Throckmorton	$36,339	$40,380	$41,019	$39,286	$40,833	$41,042	2.46%
Texas	$49,646	$50,920	$51,563	$51,900	$52,576	$53,207	1.40%
United States	$51,914	$52,762	$53,046	$53,046	$53,482	$53,889	0.75%

Source: US Census Bureau American Community Survey 5-Year Estimates.

Income Distribution

Table 2-25 displays the distribution of household income for the counties in the ABI catchment area, the State of Texas, and the United States. Studies completed by the U.S. Department of Commerce have determined that the likelihood of taking a trip by air increases as household income increases. A parallel can be applied to GA market potential. The inclination to own and/or operate a general aviation aircraft or travel via commercial air carriers for business or pleasure is a direct function of income. The income distribution for the catchment area is slightly different from the United States and the State of Texas. There are fewer households in the higher income bracket in the catchment area compared to state and national averages.

Table 2-25
2015 Income Distribution

County	# of Households	Less Than $15,000	$15,000- $24,999	$25,000 - $34,999	$35,000 - $49,999	$50,000 - $74,999	$75,000 +
Brown	13,295	15.70%	13.40%	13.30%	16.40%	18.10%	23.10%
Callahan	5,273	10.40%	8.40%	11.70%	13.60%	21.60%	34.30%
Coleman	3,405	18.90%	18.40%	12.50%	18.10%	14.90%	17.20%
Comanche	5,119	18.40%	13.40%	14.20%	19.20%	16.00%	18.70%
Eastland	6,810	20.20%	18.60%	11.30%	17.50%	16.30%	16.10%
Fisher	1,667	15.20%	9.30%	15.60%	18.30%	19.50%	22.10%
Haskell	2,285	16.90%	17.30%	12.60%	11.80%	21.60%	20.00%
Jones	5,489	16.30%	13.90%	10.10%	16.60%	19.10%	24.10%
Mitchell	2,753	8.60%	13.40%	11.20%	17.10%	23.10%	26.70%
Nolan	5,599	17.50%	15.60%	14.20%	15.50%	15.70%	21.50%
Runnels	3,703	14.60%	16.30%	11.10%	16.70%	16.80%	24.40%
Shackelford	1,377	18.50%	10.00%	9.50%	13.10%	24.80%	24.10%
Stephens	3,447	16.80%	13.70%	11.90%	13.50%	16.90%	27.30%
Stonewall	580	23.00%	9.10%	7.60%	16.60%	15.30%	28.50%
Taylor	49,476	14.20%	11.90%	12.70%	15.00%	19.40%	26.80%
Throckmorton	701	14.50%	18.00%	10.60%	13.00%	16.40%	27.60%
Texas	9,149,196	12.30%	10.70%	10.30%	13.60%	17.80%	35.30%
United States	116,926,305	12.50%	10.60%	10.10%	13.40%	17.80%	35.60%

Source: U.S. Census Bureau, 2011-2015 American Community Survey.

Chapter 3 – Aviation Activity Forecast

Introduction

Forecasting aviation activity helps the local airport sponsor determine future airport infrastructure and equipment needs. The preferred demand forecasts, when compared to existing airport facilities, are used to identify the type, extent, and timing of aviation development at an airport.

Aviation activity at an airport is influenced by numerous factors including socioeconomic trends related to the region's population, tourism demand, local business composition, and travel needs, the local, regional, and national economy, aviation/airline industry trends, the aviation services provided at the airport, and a number of other factors. The aviation activity forecasts developed for ABI take these factors into consideration.

This chapter provides forecasted aviation activity levels for ABI for the next twenty years for passenger enplanements, airline, air taxi, general aviation, military, and cargo tonnage levels. Additionally, derivative forecasts have been developed for instrument approach activity, itinerant vs. local operations, peak period activity, and aircraft fleet mix.

Historical Aviation Activity

Overview

ABI has an air traffic control tower that operates 24 hours per day, 7 days per week, 365 days per year. Consequently, the historic air traffic activity levels at ABI are well documented. **Table 3-1**, *Historic Aviation Activity,* shows the annual aircraft operations data at ABI since 1990. An aircraft operation is defined as an aircraft takeoff or landing.

Table 3-1
Historic Aviation Activity

Calendar Year	Itinerant					Local			Total Operations
	Air Carrier	Air Taxi	General Aviation	Military	Total	Civil	Military	Total	
1990	46	16,078	35,718	3,781	55,623	28,366	11,105	39,471	95,094
1991	75	12,364	35,493	6,330	54,262	26,202	16,119	42,321	96,583
1992	112	15,724	32,393	8,107	56,336	25,478	22,693	48,171	104,507
1993	119	16,554	30,887	9,007	56,567	23,560	21,968	45,528	102,095
1994	345	19,255	30,844	9,237	59,681	19,320	19,416	38,736	98,417
1995	287	18,025	30,237	9,645	58,194	17,286	19,718	37,004	95,198
1996	279	16,327	28,325	10,027	54,958	17,060	17,103	34,163	89,121
1997	290	14,096	26,578	9,340	50,304	12,760	13,719	26,479	76,783
1998	225	14,099	26,709	10,260	51,293	13,911	16,832	30,743	82,036
1999	254	11,905	26,850	10,786	49,795	18,597	20,060	38,657	88,452
2000	277	13,489	23,622	10,680	48,068	13,403	19,080	32,483	80,551
2001	243	12,817	24,376	11,164	48,600	15,047	19,356	34,403	83,003
2002	171	10,992	24,265	10,585	46,013	14,880	19,269	34,149	80,162
2003	136	11,140	22,447	10,958	44,681	18,863	20,439	39,302	83,983
2004	260	11,854	18,634	8,727	39,475	15,773	18,359	34,132	73,607
2005	152	13,226	20,181	8,417	41,976	17,121	16,970	34,091	76,067
2006	353	14,293	22,480	8,662	45,788	16,408	16,448	32,856	78,644
2007	354	14,130	22,682	8,762	45,928	19,253	15,302	34,555	80,483
2008	305	12,872	26,842	14,015	54,034	13,772	17,309	31,081	85,115
2009	363	11,020	20,167	11,256	42,806	9,047	11,622	20,669	63,475
2010	397	10,187	21,055	7,853	39,492	10,398	10,048	20,446	59,938
2011	330	10,456	22,339	8,645	41,770	7,959	10,191	18,150	59,920
2012	225	10,075	22,933	5,913	39,146	10,571	10,738	21,309	60,455
2013	217	10,903	21,426	7,718	40,264	12,649	12,496	25,145	65,409
2014	226	10,317	18,205	8,443	37,191	7,631	10,778	18,409	55,600
2015	289	9,275	17,182	7,344	34,090	10,378	10,170	20,548	54,638
2016	295	8,633	16,211	6,379	31,518	6,286	8,163	14,449	45,967

Source: FAA OPSNET DATABASE, pulled 9/7/17.

ABI has seen a 51.6% decline in total operation since 1990. The majority of the decline has come from reductions in general aviation itinerant operations (a total decrease of 19,507 from 1990 to 2016) and general aviation local (“civil”) operations (a total decrease of 22,080 from 1990 to 2016). There has also been a consistent decline in air taxi operations since 1990 but this has been slightly offset by an increase in air carrier traffic over the same period. The number of annual military operations has also slightly declined since 1990. However, there have been some intermittent periods of growth and retraction during that time.

Air Carrier, Commuter, and Non-Commuter Air Taxi Operations

It should be noted that the “air taxi” category in the FAA OPSNET Database includes airline operations that are classified as “commuter” airline operations. A commuter airline operation is defined as a scheduled air carrier operation with no more than 60 passenger seats. Sometimes commuter airline operations are referred to as “regional” airline operations. The FAA OPSNET Database classifies “air carrier” operations as only those air carrier operations with more than 60 passenger seats. Consequently, what would commonly be referred to as “airline operations” at ABI includes a combination of the air carrier and air taxi figures shown in the FAA OPSNET Database.

To identify the total number of airline operations that have historically occurred at ABI (air carrier and commuter), T-100 data for ABI was pulled from the Bureau of Transportation Statistics (BTS) website. **Table 3-2**, *Airline Operations and Non-Commuter Air Taxi Activity*, provides the total airline operations figures (air carrier and commuter) for ABI and shows the amount of Air Taxi Operations that do not fall into the commuter category.

Table 3-2
Airline Operations and Non-Commuter Air Taxi Activity

Year	T-100 Data - Airline Operations (Air Carrier and Commuter)	Air Carrier Data from FAA OPSNET Database	Commuter Airline Operations	Total Air Taxi Operations from OPSNET Database	Commuter Airline Operations	Total Air Taxi Operations Excluding Commuter Airline Operations	% of Air Taxi Operations Classified as Commuter Airline OPS
2006	8792	353	8439	14,293	5,854	5,536	59.04%
2007	8772	354	8418	14,130	5,712	5,899	59.58%
2008	7872	305	7567	12,872	5,305	6,259	58.79%
2009	6224	363	5861	11,020	5,159	4,967	53.19%
2010	6066	397	5669	10,187	4,518	4,758	55.65%
2011	6004	330	5674	10,456	4,782	4,759	54.27%
2012	6012	225	5787	10,075	4,288	4,313	57.44%
2013	6572	217	6355	10,903	4,548	4,415	58.29%
2014	6680	226	6454	10,317	3,863	4,078	62.56%
2015	6082	289	5793	9,275	3,482	3,627	62.46%
2016	5872	295	5577	8,633	3,056	3,243	64.60%

Source: FAA OPSNET DATABASE, pulled 9/7/17. BTS T-100 data, pulled 10/5/17.

Historic Passenger Enplanements and Load Factor

Table 3-3, *Historic Passenger Enplanements & Load Factor*, provides an overview of the passenger enplanement and outbound load factor history at ABI since 1990. Passenger enplanements have been cyclical at ABI since 1990. Enplanements saw a general declined from 1990 to 1999. However, since 1999 enplanements have increased by 75.2% at ABI reaching a peak in 2014 of almost 94,000 enplanements. Load factor was very low during the mid to late 1990s and early 2000s but has increased since that time.

Table 3-3
Historic Passenger Enplanements & Load Factor

Calendar Year	Enplanements	Average Load Factor
1990	74,063	72.60%
1991	58,141	74.25%
1992	62,370	72.19%
1993	66,287	59.14%
1994	73,328	44.60%
1995	67,631	43.10%
1996	66,775	37.91%
1997	53,826	76.84%
1998	52,418	59.45%
1999	47,984	53.16%
2000	58,447	50.22%
2001	58,206	50.70%
2002	46,176	57.16%
2003	52,021	56.61%
2004	67,773	58.74%
2005	78,269	56.83%
2006	90,918	59.58%
2007	90,369	62.83%
2008	87,682	66.36%
2009	81,172	67.72%
2010	73,605	63.28%
2011	80,434	70.07%
2012	74,523	70.14%
2013	82,758	68.10%
2014	93,656	71.67%
2015	86,000	73.92%
2016	84,073	73.16%

Source: Enplanement data from 2016 to 1999 was FAA Website, pulled 9/7/17. Enplanement data from 1990 to 1998 pulled from TAF. Load factor data from BTS T-100 Domestic Segment Database, pulled 9/8/17

Top ABI Destinations

A True Market Estimate project was conducted for ABI in 2011 by Mead and Hunt. As part of the study, the Top 50 destination markets from ABI were identified based on 2010 data. **Table 3-4**, *Top ABI Destinations*, shows the top 10 destinations that were identified.

Table 3-4
Top ABI Destinations

Destination Rank	Destination Name	True Market Estimate	Passengers Daily Each Way (PDEWs)
1	Dallas, TX (DFW)	11,276	15.4
2	Las Vegas, NV	8,756	12.0
3	Orange County, CA	7,439	10.2
4	Phoenix, AZ	6,389	8.8
5	Seattle, WA	5,992	8.2
6	Orlando, FL	5,881	8.1
7	Atlanta, GA	5,665	7.8
8	Chicago, IL (ORD)	5,629	7.7
9	Los Angeles, CA	5,505	7.5
10	Denver, CO	5,453	7.5

Source: Mead and Hunt – True Market Estimate Study for ABI, 2011. True market estimate numbers and PDEWs are based on the number of individuals in the ABI catchment traveling to these destinations. Some of these passengers are leaked to other airports as discussed in the Catchment Area discussion in the Inventory Chapter.

Historic Based Aircraft

Table 3-5, *Historic Based Aircraft*, provides an overview of the based aircraft history at ABI since 1990. The based aircraft data is erratic with some steep year-to-year increases/decreases and up to 5-year periods with no change. It is assumed that these steep increases and decreases did not occur as suddenly as the data shows but rather the figures were not updated annually. Consequently, when the figures were updated the increases/decreases were very steep.

Table 3-5
Historic Based Aircraft

Calendar Year	Based Aircraft
1990	175
1991	170
1992	174
1993	174
1994	160
1995	159
1996	159
1997	159
1998	159
1999	159
2000	159
2001	75
2002	84
2003	85
2004	145
2005	145
2006	145
2007	98
2008	98
2009	104
2010	105
2011	125
2012	125
2013	125
2014	125
2015	125
2016	117
2017	105

Source: Based on aircraft data from 1990 to 2015 pulled from FAA TAF on 9-7-17. 2016 data was pulled from ABI's 2016 5010 dated 7/28/16. 2017 data was pulled from ABI's 2017 5010 dated 8/8/17.

Historic IFR Operations

Table 3-6, *Historic IFR Operations*, provides an overview of the IFR aircraft operations history at ABI since 1990. In total, from 1990 to 2016, approximately 39.42% of all aircraft operations have been conducted under Instrument Flight Rules (IFR). However, the annual IFR percentage of total operations has increased from less than 30% in 1999 and 2002 to over 40% for every year since 2008. This trend is attributable to the reduced number of VFR operations occurring at ABI rather than an increase in the total number of IFR operations.

Table 3-6
Historic IFR Operations

Calendar Year	Air Carrier	Air Taxi	General Aviation	Military	Total IFR	Total Operations	IFR % of Total Operations
1990	11	15,070	32,492	3,781	51,354	95,094	54.00%
1991	5	8,950	30,894	5,849	45,698	96,583	47.31%
1992	14	13,433	28,220	7,374	49,041	104,507	46.93%
1993	18	14,159	27,094	7,374	48,645	102,095	47.65%
1994	55	15,393	23,034	6,745	45,227	98,417	45.95%
1995	61	13,559	9,887	6,732	30,239	95,198	31.76%
1996	58	12,699	8,408	7,554	28,719	89,121	32.22%
1997	32	9,770	9,307	6,939	26,048	76,783	33.92%
1998	38	9,222	9,627	7,774	26,661	82,036	32.50%
1999	70	8,540	8,763	8,549	25,922	88,452	29.31%
2000	148	11,084	7,790	8,478	27,500	80,551	34.14%
2001	86	9,243	8,140	8,932	26,401	83,003	31.81%
2002	77	7,703	7,983	8,083	23,846	80,162	29.75%
2003	112	8,183	7,639	9,392	25,326	83,983	30.16%
2004	91	9,976	7,907	7,458	25,432	73,607	34.55%
2005	152	11,990	7,445	7,633	27,220	76,067	35.78%
2006	344	12,817	8,450	8,010	29,621	78,644	37.66%
2007	354	12,473	10,195	8,105	31,127	80,483	38.68%
2008	281	10,572	11,103	12,505	34,461	85,115	40.49%
2009	361	9,068	8,744	10,521	28,694	63,475	45.21%
2010	394	8,708	10,615	7,308	27,025	59,938	45.09%
2011	315	8,373	11,188	6,364	26,240	59,920	43.79%
2012	223	8,477	11,936	5,496	26,132	60,455	43.23%
2013	214	9,151	10,391	7,244	27,000	65,409	41.28%
2014	224	9,109	8,059	7,952	25,344	55,600	45.58%
2015	274	8,419	7,841	6,659	23,193	54,638	42.45%
2016	295	8,004	7,543	5,937	21,779	45,967	47.38%
Total:	**4,307**	**284,145**	**340,695**	**204,748**	**833,895**	**2,115,303**	**39.42%**

Source: FAA OPSNET DATABASE, pulled 9/7/17.

Historic Itinerant/Local Operations

Table 3-7, *Historic Itinerant/Local Operations*, provides an overview of the ratio of itinerant aircraft operations to total aircraft operations since 1990. From 1990 to 2007, the percentage of itinerant operations to total operations stayed relatively consistent. However, since 2007 the percentage of itinerant operations to total operations has generally increased when compared to the pre-2007 data and has not dropped below 60% since that time. In total, since 1990, itinerant aircraft operations have made up 59.94% of total operations at ABI.

Table 3-7
Historic Itinerant/Local Operations

Calendar Year	Total Itinerant OPS	Total Local OPS	Total Operations	Itinerant OPS % of Total OPS
1990	55,623	39,471	95,094	58.49%
1991	54,262	42,321	96,583	56.18%
1992	56,336	48,171	104,507	53.91%
1993	56,567	45,528	102,095	55.41%
1994	59,681	38,736	98,417	60.64%
1995	58,194	37,004	95,198	61.13%
1996	54,958	34,163	89,121	61.67%
1997	50,304	26,479	76,783	65.51%
1998	51,293	30,743	82,036	62.52%
1999	49,795	38,657	88,452	56.30%
2000	48,068	32,483	80,551	59.67%
2001	48,600	34,403	83,003	58.55%
2002	46,013	34,149	80,162	57.40%
2003	44,681	39,302	83,983	53.20%
2004	39,475	34,132	73,607	53.63%
2005	41,976	34,091	76,067	55.18%
2006	45,788	32,856	78,644	58.22%
2007	45,928	34,555	80,483	57.07%
2008	54,034	31,081	85,115	63.48%
2009	42,806	20,669	63,475	67.44%
2010	39,492	20,446	59,938	65.89%
2011	41,770	18,150	59,920	69.71%
2012	39,146	21,309	60,455	64.75%
2013	40,264	25,145	65,409	61.56%
2014	37,191	18,409	55,600	66.89%
2015	34,090	20,548	54,638	62.39%
2016	31,518	14,449	45,967	68.57%
Total:	**1,267,853**	**847,450**	**2,115,303**	**59.94%**

Source: FAA OPSNET DATABASE, pulled 9/7/17.

Historic Air Cargo Tonnage

Table 3-8, *Air Cargo Data*, provides an overview of the air cargo tonnage at ABI since 2002. Currently, overall freight tonnage is down from its peak in 2010 and 2013. However, the 2016 freight figures are still 30% higher than they were in 2004 – 2006, the lowest years on record. It should also be noted that the deplaned freight tonnage percentage of total freight tonnage has increased to over 70% in three of the past 4 years.

Table 3-8
Air Cargo Data

Year	Enplaned Cargo Tonnage	Deplaned Cargo Tonnage	Total Air Cargo Tonnage	Deplaned Cargo % of Total Cargo
2002	477.94	831.79	1,309.73	63.51%
2003	369.79	703.51	1,073.30	65.55%
2004	356.15	580.14	936.29	61.96%
2005	322.28	492.83	815.12	60.46%
2006	364.11	588.89	953.00	61.79%
2007	443.68	741.66	1,185.34	62.57%
2008	396.40	698.41	1,094.80	63.79%
2009	514.15	936.06	1,450.21	64.55%
2010	500.57	1,012.59	1,513.15	66.92%
2011	476.74	981.85	1,458.59	67.31%
2012	431.67	984.22	1,415.89	69.51%
2013	419.67	1,045.57	1,466.25	71.31%
2014	435.53	1,011.18	1,446.71	69.90%
2015	363.77	861.69	1,225.45	70.32%
2016	308.74	893.09	1,201.83	74.31%

Source: ABI Cargo/Freight Data

Aircraft Diversions

Due to its close proximity to DFW, ABI receives aircraft diversions on a regular basis when the weather is poor at DFW. These diversions are typically American Eagle or American Airlines mainline flights but other air carriers use ABI as a diversion destination as well. Based on a review of ABI's diversion records from 2015 and 2016, the majority of the diverted aircraft are regional jets, B-737s, MD-80s, A320s, and A321s. However, larger aircraft are sometimes diverted to the airport. In 2015, an all-cargo Boeing 747 diverted into ABI. **Table 3-9**, *Aircraft Diversions*, shows the diversions by month at ABI in 2015 and 2016. The majority of the diversions occur in the late spring and summer months.

Table 3-9
Aircraft Diversions

Year	Destination Rank	# of Diversions
2015	January	2
	February	2
	March	4
	April	33
	May	35
	June	18
	July	2
	August	8
	September	4
	October	11
	November	24
	December	4
	Total	**147**
2016	January	6
	February	2
	March	7
	April	13
	May	6
	June	23
	July	29
	August	11
	September	6
	October	5
	November	4
	December	4
	Total	**116**

Source: ABI Diversion Records

FAA Terminal Area Forecast

Table 3-10, *TAF Forecast*, provides an overview of forecasted growth at ABI from 2017 through 2045 according to the FAA's TAF. According to the TAF, ABI should expect a 0.94% annual increase in enplanements that will primarily be met by increases in commuter airline activity. Aircraft operations numbers are expected to grow slowly (0.23% annually) with most of the growth coming from itinerant commuter/air taxi operations and itinerant general aviation operations. Based aircraft are expected to increase approximately 1.74% annually.

Table 3-10
TAF Forecast

Fiscal Year	Enplanements			Itinerant Operations					Local Operations			Total Ops	Based Aircraft
	Air Carrier	Commuter	Total	Air Carrier	Air Taxi & Commuter	GA	Military	Total	Civil	Military	Total		
2017	1,886	81,329	83,215	338	8,864	15,977	6,553	31,732	6,468	8,277	14,745	46,477	131
2018	1,886	82,125	84,011	338	8,908	16,005	6,553	31,804	6,505	8,277	14,782	46,586	133
2019	1,886	82,944	84,830	338	8,953	16,033	6,553	31,877	6,542	8,277	14,819	46,696	135
2020	1,886	83,763	85,649	338	8,998	16,061	6,553	31,950	6,580	8,277	14,857	46,807	137
2021	1,886	84,594	86,480	338	9,043	16,089	6,553	32,023	6,618	8,277	14,895	46,918	139
2022	1,886	85,436	87,322	338	9,088	16,117	6,553	32,096	6,656	8,277	14,933	47,029	142
2023	1,886	86,278	88,164	338	9,133	16,145	6,553	32,169	6,694	8,277	14,971	47,140	144
2024	1,886	87,132	89,018	338	9,178	16,173	6,553	32,242	6,732	8,277	15,009	47,251	146
2025	1,886	88,003	89,889	338	9,223	16,201	6,553	32,315	6,770	8,277	15,047	47,362	148
2026	1,886	88,884	90,770	338	9,268	16,229	6,553	32,388	6,808	8,277	15,085	47,473	150
2027	1,886	89,773	91,659	338	9,313	16,257	6,553	32,461	6,846	8,277	15,123	47,584	152
2028	1,886	90,673	92,559	338	9,358	16,285	6,553	32,534	6,884	8,277	15,161	47,695	155
2029	1,886	91,578	93,464	338	9,404	16,313	6,553	32,608	6,923	8,277	15,200	47,808	158
2030	1,886	92,494	94,380	338	9,450	16,341	6,553	32,682	6,962	8,277	15,239	47,921	161
2031	1,886	93,418	95,304	338	9,496	16,369	6,553	32,756	7,001	8,277	15,278	48,034	164
2032	1,886	94,353	96,239	338	9,544	16,397	6,553	32,832	7,041	8,277	15,318	48,150	167
2033	1,886	95,296	97,182	338	9,592	16,425	6,553	32,908	7,081	8,277	15,358	48,266	170
2034	1,886	96,248	98,134	338	9,640	16,453	6,553	32,984	7,121	8,277	15,398	48,382	173
2035	1,886	97,208	99,094	338	9,688	16,481	6,553	33,060	7,161	8,277	15,438	48,498	176
2036	1,886	98,179	100,065	338	9,736	16,510	6,553	33,137	7,201	8,277	15,478	48,615	179
2037	1,886	99,161	101,047	338	9,784	16,539	6,553	33,214	7,242	8,277	15,519	48,733	183
2038	1,886	100,152	102,038	338	9,832	16,568	6,553	33,291	7,283	8,277	15,560	48,851	187
2039	1,886	101,151	103,037	338	9,881	16,597	6,553	33,369	7,324	8,277	15,601	48,970	191
2040	1,886	102,162	104,048	338	9,930	16,626	6,553	33,447	7,366	8,277	15,643	49,090	195
2041	1,886	103,183	105,069	338	9,979	16,655	6,553	33,525	7,408	8,277	15,685	49,210	199
2042	1,886	104,215	106,101	338	10,029	16,684	6,553	33,604	7,450	8,277	15,727	49,331	203
2043	1,886	105,257	107,143	338	10,079	16,713	6,553	33,683	7,492	8,277	15,769	49,452	207
2044	1,886	106,309	108,195	338	10,129	16,742	6,553	33,762	7,534	8,277	15,811	49,573	211
2045	1,886	107,372	109,258	338	10,179	16,771	6,553	33,841	7,577	8,277	15,854	49,695	216
Annual Growth Rate	**0.00%**	**0.96%**	**0.94%**	**0.00%**	**0.48%**	**0.17%**	**0.00%**	**0.22%**	**0.55%**	**0.00%**	**0.25%**	**0.23%**	**1.74%**

Source: FAA TAF DATABASE, pulled 9/7/17.

Airline Operations and Passenger Activity Forecast

Airline and passenger activity forecasts are closely linked and both are influenced by numerous factors including airline industry trends, socioeconomic changes, the local business climate, tourism, and many other factors. When forecasting future airline operations and passenger activity levels it is important that the forecasts are properly linked to ensure they are consistent with each other. The enplanement forecast is generally viewed as the forecast that drives the airline activity forecast as airline activity is generally based on passenger travel demands. However, other factors, like airline fleet mix and airline consolidations/mergers, can affect an airline's operational tempo at an airport irrespective of passenger travel demands. Consequently, an airport could have a passenger enplanement forecast that shows increasing enplanements while forecasted airline operations figures decrease because larger aircraft are being used to service the market. These factors and others are discussed in the sections below regarding the passenger enplanement forecast and the airline operations forecast for ABI.

Passenger Activity Forecast

Passenger activity at an airport is primarily measured by enplanements, which is the number of individuals boarding an airline aircraft at an airport to fly to another destination. This includes passengers using an airport as their point of origin for a trip and passengers using the airport as a connection point to transfer to another airline flight. Currently, ABI is only used as an Origin and Designation (O&D) airport. No connecting passenger traffic exists.

To forecast future passenger activity, a number of different forecasting techniques were reviewed and considered including:

- Regression Analysis – A regression analysis is a statistical forecasting methodology that projects the growth or decline of a dependent variable (i.e. Enplanements) based on one or more independent variables (i.e. population, income, employment growth, GDP, etc.). Historic values for both the dependent and independent variables are analyzed to determine whether a sufficient correlation exists between the two for the independent variables to be used to predict future dependent variable values.
- Trend Analysis – A trend analysis is the simplest and most familiar form of forecasting and is also one of the most widely used. Historic data is collected and used to develop a forecast for an aviation activity element (e.g. enplanements, operations, etc.). An assumption of this forecasting methodology is that future aviation activity trends will be similar to those seen in the past. Though this assumption seems broad in its application, it can serve as a reliable forecasting method.
- Share/Market Analysis – Share/Market Analysis forecasts utilize a high-level aggregate forecast (e.g. a national, regional, or state forecast) and utilize the growth rates provided in that forecast as the basis for developing a local forecast for an airport. The FAA's annual Aerospace Forecast is commonly used in these forecast models.

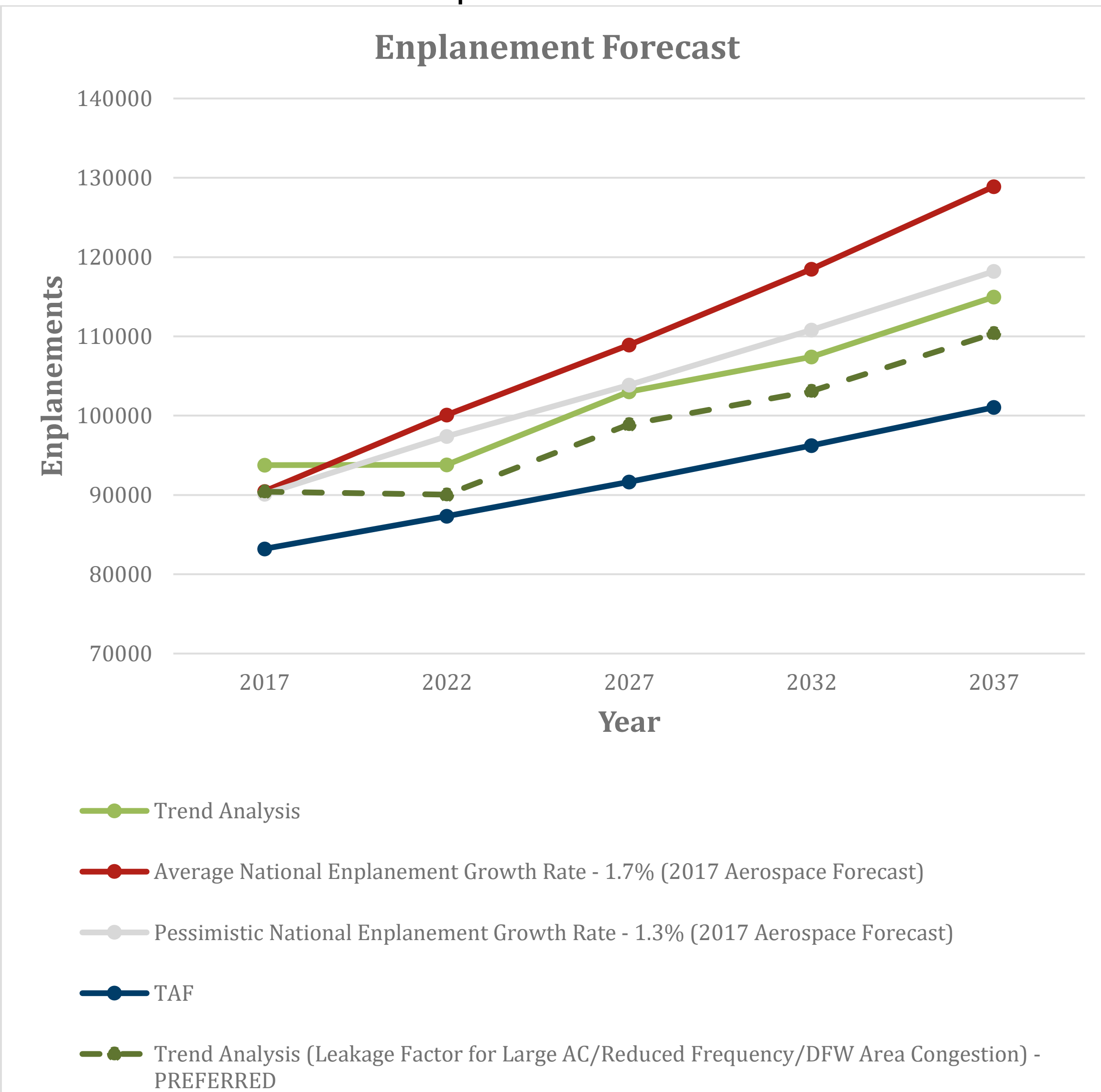
Table 3-11 and **Figure 3-1** show the various enplanement forecasts alternatives that were developed for ABI. Additionally, the FAA's Terminal Area Forecast (TAF) is shown. Multiple draft forecasts were run using both linear and multiple regression forecasting methodologies with various combinations of independent variables. However, none of the draft regression-based forecasts were considered statistically reliable and consequently, they are excluded from the table and graph below.

Table 3-11
Enplanement Forecast

Year	Trend Analysis	Average National Enplanement Growth Rate - 1.7% (2017 Aerospace Forecast)	Pessimistic National Enplanement Growth Rate - 1.3% (2017 Aerospace Forecast)	TAF (Current)	Trend Analysis (Leakage Factor for Large AC/Reduced Frequency/DFW Area Congestion) - PREFERRED
2017	93,766	90,471	90,115	83,215	90,399
2022	93,797	100,101	97,377	87,322	90,045
2027	103,005	108,903	103,873	91,659	98,885
2032	107,405	118,480	110,803	96,239	103,108
2037	114,966	128,899	118,195	101,047	110,367

Source: Garver, 2017

Figure 3-1
Enplanement Forecast



Source: Garver, 2017

The result of each of these forecast alternatives was reviewed with respect to their alignment with the projected economic and population growth in the region, national trends/forecasts regarding enplanement growth, projected airline industry changes, local considerations, and other sociodemographic factors. Based on the review, the trend analysis forecast that includes an increased leakage factor due to reduced flight frequency because of larger aircraft was selected as the preferred passenger enplanement forecast. Envoy Air (dba American Eagle) is purchasing more ERJ-175 aircraft (76 seats per aircraft) and it is expected that Eagle Aviation Services, Inc. (EASI) will be responsible for the maintenance of those aircraft at some point during the forecast period. As a result, it is expected that the EASI maintenance facility will play a major role in determining the airline fleet mix that will serve ABI in the future. When EASI begins handling the maintenance of the larger ERJ-175 aircraft it is expected that Envoy Air will begin utilizing ERJ-175's to serve ABI. Due to the larger size of these aircraft, Envoy could potentially reduce its flight frequency at ABI which could lead to increased passenger leakage to other airports. In surveys, passengers frequently rate flight frequency/times as a key factor in making their travel plans. Consequently, if flight frequency is reduced at ABI, some existing passengers may be inclined to drive to other area airports where more frequent flights or non-stop service exists to their destination. There is no timeline on when the migration to ERJ-175 aircraft will occur. It should also be noted that Envoy Air has started reinstating some ERJ-140 aircraft (44 seats per aircraft) that were previously out of service to accommodate existing demand. EASI is expected to be responsible for the maintenance of these aircraft in the near term.

A factor that could potentially reduce leakage to the Dallas-Fort Worth area airports is the continued growth and congestion in the Dallas-Fort Worth metropolitan area. As the Dallas-Fort Worth area continues to grow, traffic congestion is likely to worsen which will increase the amount of time it will take individuals from the Abilene area to drive to the Dallas-Fort Worth area airports. As it gets more difficult for people to drive to the Dallas-Fort Worth area airports, it is likely that more passengers will choose to fly out of ABI rather than drive to the airports in the Dallas-Fort Worth area.

Based on the preferred enplanement forecast, ABI is expected to see an approximately 30% increase (above their 2016 actual enplanement numbers) in passenger traffic during the 20-year forecast period.

Airline Operations Forecast

The airline operations forecast provides a picture of how air carrier and commuter airline traffic is expected to change at ABI in the future. As previously mentioned, the enplanement forecast is a key consideration in the development of this forecast, but a number of other factors must be considered including local trends/considerations and airline industry changes. Each of these considerations is discussed below.

Local Trends/Considerations

Envoy Air (dba American Eagle) is the only airline currently operating at ABI. As date of publication, Envoy Air offers 5 to 6 daily departures to Dallas-Fort Worth International Airport (DFW) on 50-seat Embraer ERJ-145 aircraft. Envoy Air has a major maintenance facility at ABI – EASI – that handles the maintenance of Envoy Air's Embraer ERJ-145 fleet. The ERJ-145 fleet is older and is expected to be retired at some point in the future. However, there is not a defined timeline for this. As previously discussed, Envoy Air has been purchasing new ERJ-175 aircraft and has been re-activating some of their inactive ERJ-140 aircraft to keep up with increasing air travel demand across their network. If EASI begins handling the maintenance of Envoy Air's growing ERJ-175 fleet, it is expected that those aircraft will begin serving ABI and the number of ERJ-145 operations will decrease as well as the number of airline operations in total.

Additionally, ABI is making a concerted effort to attract additional airlines to the airport. The addition of other airlines and/or new non-stop destinations will increase ABI's airline operations and could potentially increase their enplanement numbers by reducing their leakage to other commercial service airports located within a reasonable driving distance.

Airline Industry Trends

The airline industry has seen a consistent trend of consolidations in the past 10 to 15 years. This has resulted in the development of a number of very large airlines that dominate the domestic air carrier market. In 2000, twelve airlines transported approximately 93.4% of all domestic passengers. Those twelve airlines included TWA, U.S. Airways, America West, Northwest Airlines, Continental Airlines, and AirTran which have all been overtaken in mergers since that time. In 2016, the five major domestic airlines (e.g. Delta, United, Southwest, American, Alaska) carried 87.1% of all domestic passengers. This consolidation has reduced competition on many routes throughout the US resulting in higher airfares, reduced capacity, and higher load factors on many routes. This is an important consideration when developing airline activity forecasts as airlines now have more pricing power and are focused on flying routes that will produce higher profits which can result in some less lucrative markets being under served.

Airline Activity Forecast

A number of different airline activity forecast alternatives were developed based on the considerations previously mentioned. The forecast alternatives included:

- Trend Analysis – A trend analysis was completed using historic air carrier and commuter aircraft operations data to establish a picture of how airline traffic will change in the future.
- Enplanement Ratio Forecast –Since 2010, ABI has had an average load factor of approximately 71% and it was assumed this would stay relatively consistent during the forecast period. Based on an average load factor, the enplanement forecast, and the average size of aircraft serving ABI, the number of forecasted airline operations can be calculated for this planning exercise. However, it should be noted that the airline industry is volatile and is regularly impacted by numerous factors that can affect airline traffic forecasts for a particular airport. These factors include air carrier planning considerations, regional and national economic conditions, fleet size, air-crew availability, aircraft availability and size, and numerous other factors. Two different enplanement ratio forecasts were developed for consideration. The first forecast assumes that ABI will primarily be served by 50 seat aircraft during the forecast period similar to the aircraft that currently serve the airport. The second forecast assumes that

ABI will incrementally see increases to the average size of airline aircraft during the forecast period (e.g. migration from ERJ-145 to ERJ-175 aircraft).

- Share/Market Analysis – The 2017-2037 FAA Aerospace forecast indicates that the average growth rate nationwide for commercial operations (e.g. air carrier, commuter, and air taxi) will be approximately 1.5% annually. This same growth factor was applied to ABI's existing airline traffic data to develop a forecast for future activity.

In addition to the forecasts mentioned above, a number of forecasts were run using linear and multiple regression techniques. However, none of the regressions were found to be sufficiently reliable so they were excluded.

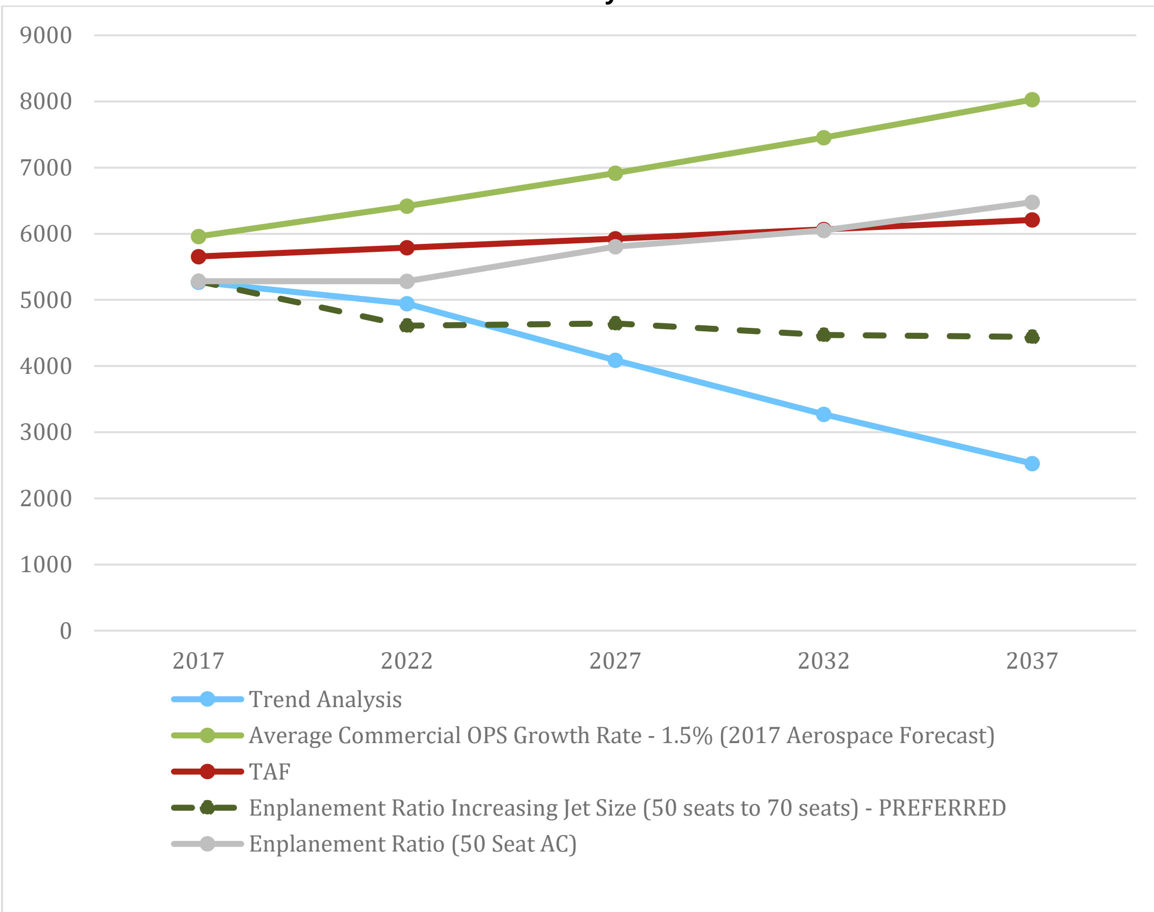
The results of the forecasts described above are shown in **Table 3-12** and **Figure 3-2**.

Table 3-12
Airline Activity Forecast

Year	Trend Analysis	Average Commercial OPS Growth Rate - 1.5% (2017 Aerospace Forecast)	Enplanement Ratio Increasing Jet Size (50 seats to 70 seats) - PREFERRED	Enplanement Ratio (50 Seat AC)	TAF
2017	5,270	5,960	5,283	5,283	5,656
2022	4,943	6,421	4,612	5,020	5,791
2027	4,091	6,917	4,643	5,513	5,926
2032	3,270	7,451	4,468	5,748	6,064
2037	2,528	8,027	4,441	6,153	6,208

Source: Garver, 2017

Figure 3-2
Airline Activity Forecast



Source: Garver, 2017

Based on the enplanement forecast and the local and national considerations previously discussed, the Enplanement Ratio Increasing Jet Size (50 seats to 70 seats) has been selected as the preferred forecast. However, it is not expected that the migration to larger aircraft will be as gradual as depicted in the forecast graphic. It is expected that this shift will occur in a "stair-step" fashion as EASI takes on the maintenance of the ERJ-175 fleet.

Air Taxi, General Aviation, and Military Activity Forecast

This section provides the forecasts that were developed for air taxi, general aviation, and military activity at ABI.

Air Taxi Activity Forecast

The FAA defines Air Taxi operators as companies that operate aircraft originally designed to have no more than 60 passengers seats or a cargo payload of 18,000 lbs. and that carry cargo or mail on either a scheduled or charter basis, and/or carry passengers on an on-demand basis or limited schedule basis (i.e. four or fewer round trips a week on at least one route according to published flight schedules) only. At ABI, non-commuter air taxi operations include the Cessna Caravans that FedEx operates, on demand charter services provided by Abilene Aero, the operation of fractional aircraft ownership companies, the operation of small aircraft air taxi services (e.g. PlaneSmart, Linear Air, etc.), and other for-hire aircraft operations. This forecast excludes airline commuter aircraft operations.

Air taxi operations at ABI have declined consistently since 2008 with a 48% decrease since that time. The FAA Aerospace Forecast estimates that air taxi operations will decrease nationwide by approximately 0.9% annually between 2017 and 2037.

A number of different forecasting techniques were used to estimate future air taxi operations at ABI including:

- TAF (Interpolated) – The FAA's TAF provides a forecast of future air taxi/commuter airline activity at an airport. Historically, approximately 60% of the total air taxi operations recorded in the FAA OPSNET database at ABI have been considered commuter airline operations. That ratio is expected to remain relatively consistent during the forecast period. Consequently, this forecast assumes that approximately 40% of the forecasted TAF air taxi numbers will be for non-commuter air taxi operations.
- Share/Market Analysis – The FAA's Aerospace Forecast predicts that air taxi operations will decrease by an average of 0.9% annually through 2037. This growth rate was applied to ABI's current air taxi operations figures to develop a forecast for the future.

A regression analysis forecast and trend analysis forecast were conducted however both of those statistical models were deemed unreliable because they showed declines beyond what could be considered realistic.

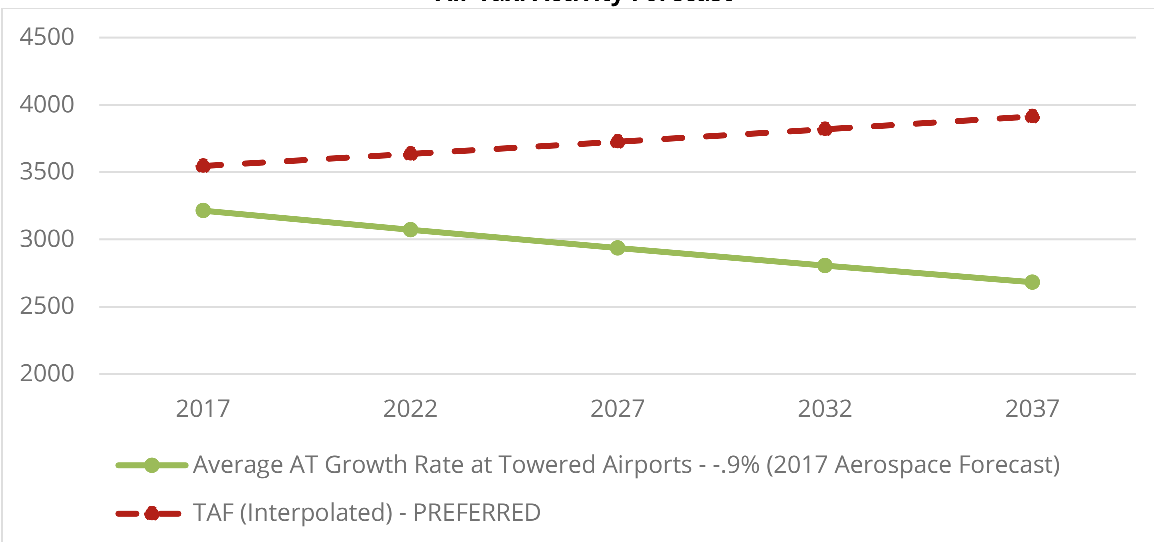
The results of the forecasts described above are shown in **Table 3-13** and **Figure 3-3**.

Table 3-13
Air Taxi Activity Forecast

Year	Average AT Growth Rate at Towered Airports - -.9% (2017 Aerospace Forecast)	TAF (Interpolated) - PREFERRED
2017	3,214	3,546
2022	3,072	3,635
2027	2,936	3,725
2032	2,806	3,818
2037	2,682	3,914

Source: Garver, 2017

Figure 3-3
Air Taxi Activity Forecast



Source: Garver, 2017

The air taxi activity forecast using the interpolated TAF data was selected as the preferred forecast as it shows slow growth which is reasonable for ABI to expect.

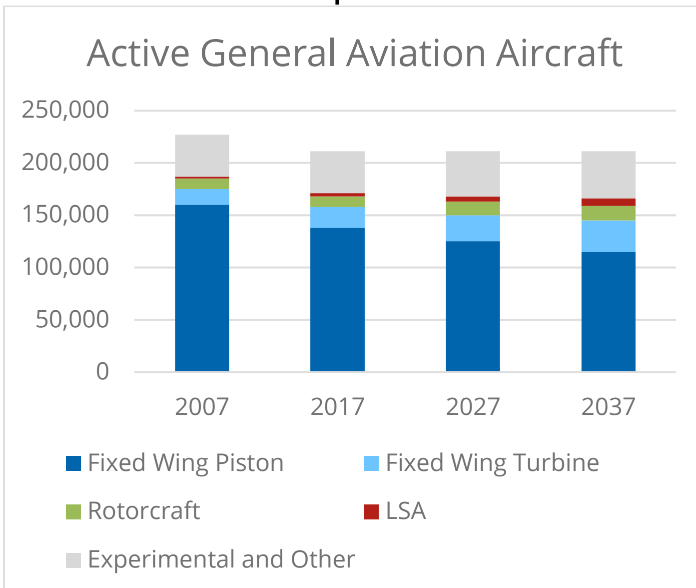
General Aviation Forecasts

General aviation operations are considered to be all aircraft operations other than those classified as air carrier, commuter, air taxi, or military operations. This section will discuss the factors impacting the growth of general aviation and provide a forecast for future GA growth at ABI.

General Aviation Trends

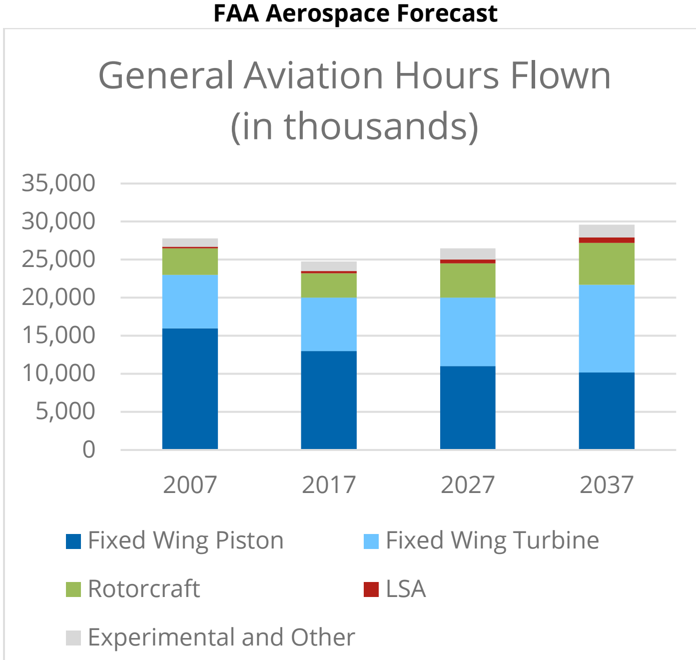
According to the FAA's *2017 – 2037 Aerospace Forecast*, the number of active GA aircraft is forecasted to grow at a rate of 0.1 percent annually between 2017 and 2037, and the number of hours flown is forecasted to grow at a rate of 0.9 percent annually during that same period. This slight growth is expected to primarily come from the growth in the production and utilization of Light Sport Aircraft (LSA), rotorcraft, fixed wing turbine aircraft (turbo-prop and jet), and experimental aircraft. The largest segment of the existing general aviation aircraft fleet, fixed wing piston aircraft, is expected to decline over the forecast period. **Figure 3-4** and **Figure 3-5** depict these forecasted trends. Additionally, the number of pilots (including Airline Transport Pilots - ATPs) is expected to decrease over the forecast period by approximately 0.1% annually.

Figure 3-4
FAA Aerospace Forecast



Source: FAA Aerospace Forecast, 2017 – 2037

Figure 3-5
FAA Aerospace Forecast



Source: FAA Aerospace Forecast, 2017 - 2037

General Aviation Based Aircraft Forecast

The number of GA aircraft that can be expected to base at an airport facility is dependent on several factors, such as available facilities (e.g. hangars), services provided at the airport, airport proximity and access, etc. GA operators are particularly sensitive to both the quality and location of their basing facilities, with proximity to home and work often identified as the primary considerations in choosing where to base an aircraft. Hangars at ABI are close to capacity. A few T-hangars are currently available, and no waiting list currently exists. There are no vacant box hangars. Determining the number and type of general aviation aircraft anticipated to be based at an airport is a vital component in establishing a development plan for an airport.

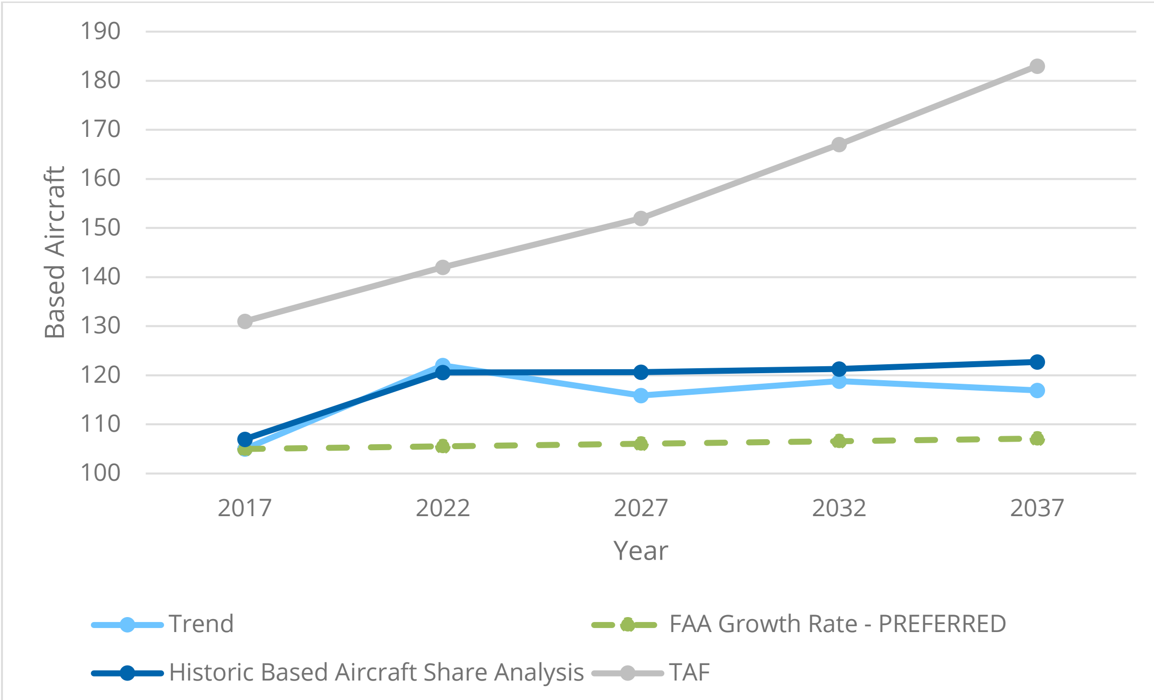
A number of different forecasting techniques were used to forecast future based aircraft activity at ABI. However, after reviewing the potential forecasting options it was determined that the forecast based on the FAA's Aerospace Forecast growth rate for active GA aircraft provided the most realistic and feasible projected growth for based aircraft at ABI. **Table 3-14** and **Figure 3-6** show the various based aircraft forecasts that were considered.

Table 3-14
Based Aircraft Forecast

Year	Trend	FAA Growth Rate - PREFERRED	Historic Based Aircraft Share Analysis	TAF
2017	105	105	105	131
2022	122	106	121	142
2027	116	106	121	152
2032	119	107	121	167
2037	117	107	123	183

Source: Garver, 2017

Figure 3-6
Based Aircraft Forecast



Source: Garver, 2017

Forecast of Aircraft Fleet Mix for Based Aircraft

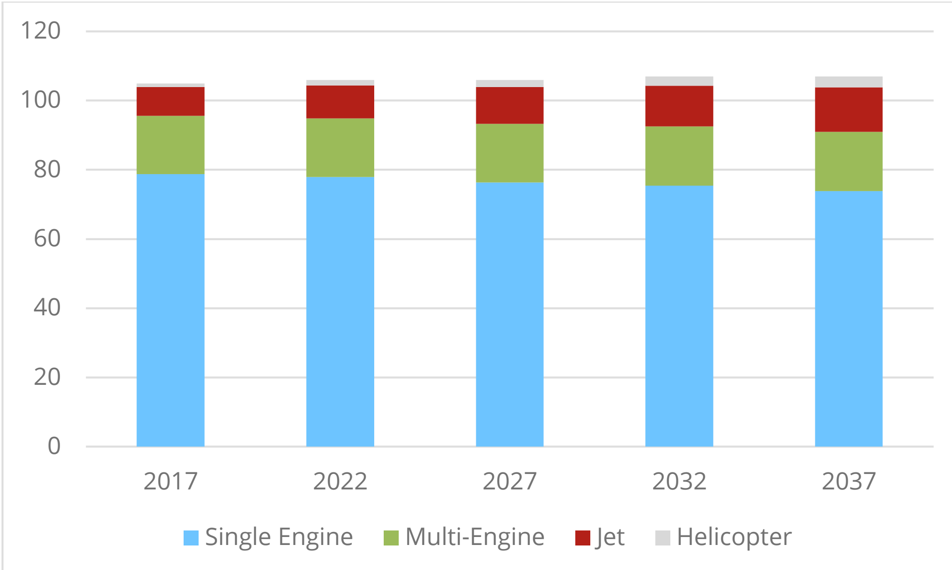
The mix of based aircraft for incremental periods throughout the planning period is illustrated in **Table 3-15** and **Figure 3-7**, *Based Aircraft Fleet Mix, 2017-2037*. Consistent with the FAA's current Aerospace Forecast, it is assumed that the fleet mix percentage of single engine piston aircraft will decrease during the forecast period, but this decrease will be somewhat offset by the expected nationwide increase in light sport aircraft. Both single engine piston aircraft and light sport aircraft are included in the single engine aircraft category in the table below. Additionally, the fleet mix percentage of jet and helicopter aircraft is expected to increase during the forecast period.

Table 3-15
Based Aircraft Fleet Mix, 2017-2037

Aircraft Type	2017	2022	2027	2032	2037
Single Engine	79	78	76	75	74
Multi-Engine	17	17	17	17	17
Jet	8	10	11	12	13
Helicopter	1	2	2	3	3
Total	**105**	**106**	**106**	**107**	**107**

Source: Garver Forecast Data for ABI, 2017

Figure 3-7
Based Aircraft Fleet Mix, 2017-2037



Source: Garver Forecast Data for ABI, 2017

General Aviation Activity Forecast

General Aviation activity has decreased nationwide over the past 20 years and this trend is no different at ABI. ABI has seen relatively consistent declines in GA activity (both itinerant and local) since 1990 according to the FAA OPSNET database. However, as previously discussed, the FAA Aerospace Forecast predicts slow growth in general aviation activity across the United States over the next 20 years.

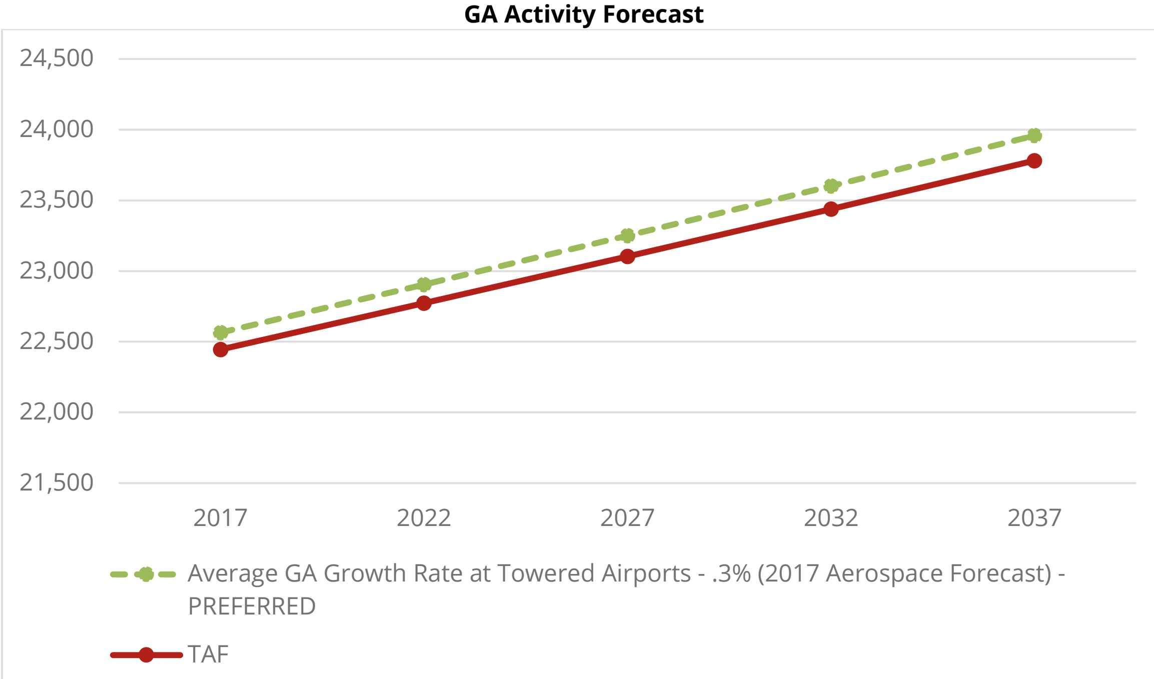
To forecast future GA activity at ABI, a number of forecast alternatives were developed for further evaluation. The regression and trend analysis alternatives that were developed showed declining growth that went beyond a reasonable level. Additionally, the regression forecast showed an R^2 value that was too low for the model to be considered statistically reliable. These factors led to the regression and trend analysis forecasts being excluded. A market/share analysis forecast was conducted using the average growth rate for GA operations at towered airports contained in the FAA Aerospace Forecast (0.3%). **Table 3-16** and **Figure 3-8** show this forecast in comparison to the TAF.

Table 3-16
GA Activity Forecast

Year	Average GA Growth Rate at Towered Airports - .3% (2017 Aerospace Forecast) - PREFERRED	TAF
2017	22,564	22,445
2022	22,905	22,773
2027	23,251	23,103
2032	23,601	23,438
2037	23,958	23,781

Source: Garver, 2017

Figure 3-8
GA Activity Forecast



Source: Garver, 2017

Based on the forecasted economic and population growth in the region, the Average GA Growth Rate at Towered Airports forecast was selected as the preferred alternative.

Military Activity Forecast

Military activity at ABI is common due to its proximity to Dyess Air Force base. Consequently, ABI is commonly used by military aircraft for practice instrument approaches for refueling stops. In 2016, military operations accounted for over 14,500 total aircraft operations at ABI. Military operations are expected to follow the TAF projections during the forecast period. The TAF projects an average of 14,830 military operations per year.

Total Aircraft Operations Forecast

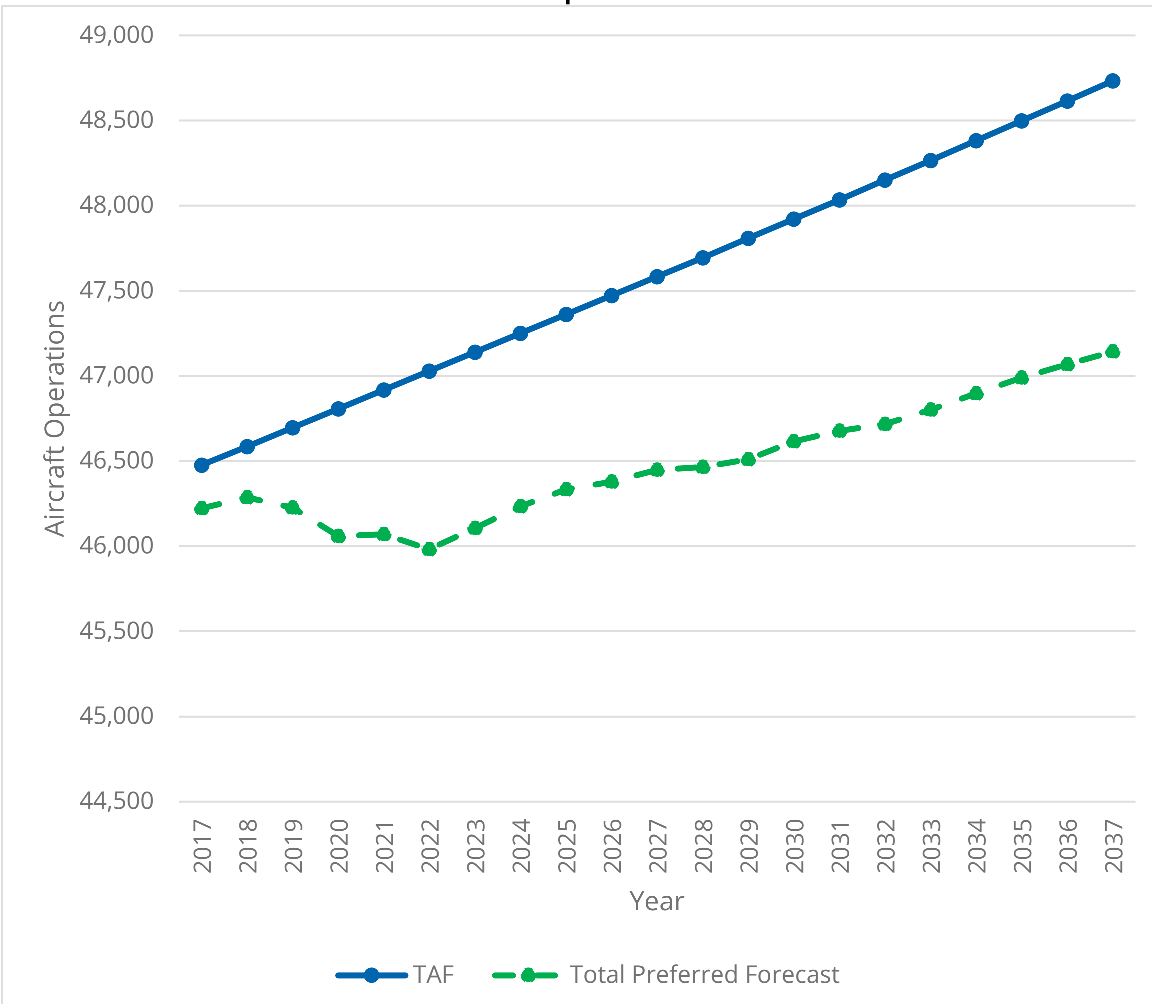
Combining the airline, air taxi, general aviation, and military activity forecasts that were previously discussed, provides a holistic aircraft operations forecast for ABI. Based on the preferred forecasts that were selected, the total aircraft operations forecast for ABI is summarized in **Figure 3-9** and **Table 3-17.**

Table 3-17
Total Aircraft Operations Forecast

Year	AC/ Commuter	AT (non-commuter)	GA OPS	Military	Total Preferred Forecast	TAF	Difference
2017	5,283	3,546	22,564	14,830	46,223	46,477	-254
2018	5,261	3,563	22,632	14,830	46,286	46,586	-300
2019	5,114	3,581	22,700	14,830	46,225	46,696	-471
2020	4,861	3,599	22,768	14,830	46,058	46,807	-749
2021	4,786	3,617	22,836	14,830	46,070	46,918	-848
2022	4,612	3,635	22,905	14,830	45,982	47,029	-1,047
2023	4,649	3,653	22,974	14,830	46,106	47,140	-1,034
2024	4,691	3,671	23,043	14,830	46,235	47,251	-1,016
2025	4,703	3,689	23,112	14,830	46,334	47,362	-1,028
2026	4,660	3,707	23,181	14,830	46,378	47,473	-1,095
2027	4,643	3,725	23,251	14,830	46,448	47,584	-1,136
2028	4,572	3,743	23,320	14,830	46,466	47,695	-1,229
2029	4,528	3,762	23,390	14,830	46,510	47,808	-1,298
2030	4,544	3,780	23,461	14,830	46,615	47,921	-1,306
2031	4,518	3,798	23,531	14,830	46,678	48,034	-1,356
2032	4,468	3,818	23,601	14,830	46,717	48,150	-1,433
2033	4,463	3,837	23,672	14,830	46,802	48,266	-1,464
2034	4,467	3,856	23,743	14,830	46,897	48,382	-1,485
2035	4,470	3,875	23,815	14,830	46,989	48,498	-1,509
2036	4,457	3,894	23,886	14,830	47,068	48,615	-1,547
2037	4,441	3,914	23,958	14,830	47,143	48,733	-1,590

Source: Garver, 2017

Figure 3-9
Total Aircraft Operations Forecast



Source: FAA TAF, Garver, 2017

Air Cargo Tonnage Forecast

FedEx has a cargo operation at ABI that includes a small distribution center. The operation is based on the Northwest GA ramp. Currently, FedEx only operates Cessna Caravan aircraft out of ABI.   No other cargo operators currently utilize the airport on a regular basis.

From a national perspective, the growth of air cargo is closely tied to overall economic growth. Consequently, in its annual Aerospace Forecast, the FAA uses forecasted changes in national Gross Domestic Product (GDP) to predict changes in the cargo industry. According to the 2017 – 2037 FAA Aerospace Forecast, domestic cargo Revenue Ton Miles (RTM) are forecasted to increase by 1.3% annually across the United States. Abilene's economy is expected to grow during the forecast period which should provide a basis for potential growth in air cargo traffic at the airport.

Additionally, it is expected that the growth of air cargo at ABI will be closely tied to the future growth of direct-to-consumer shipping related to the e-commerce industry (e.g. Amazon, etc.) that has grown in recent years with the growth of Amazon and the popularity of their Amazon Prime membership. Amazon Prime membership has grown rapidly in the US in the past 2 years. In the 1st quarter of 2016, Amazon reportedly had approximately 58 million Amazon Prime subscribers. At the end of the 1st quarter of 2017, Amazon reported that there were now over 80 million Amazon Prime subscribers which is a 38% increase in a single year. Amazon Prime adoption rates are the highest among households earning more than $112,000 annually. It is estimated that currently 70% of households that earn more than $112,000 annually are Amazon Prime subscribers. According to Woods and Poole's Socio-Economic forecasts for the Abilene MSA, it is expected that the number of households in the MSA with higher incomes ($100,000 or more) will increase. This growth will also provide a foundation for potential air cargo growth at ABI.

The utilization of drones to transport and deliver cargo is also a factor that could have an effect on cargo tonnage at ABI. The drone industry is growing rapidly and the associated technology is evolving quickly. Consequently, it is difficult to know with any certainty how drones could affect air cargo operations at ABI and nationwide.

A number of air cargo forecast alternatives were developed for consideration. The following forecasting techniques were utilized:

- Trend Analysis – A trend analysis was conducted with ABI's historic air cargo data to determine how it could potentially change in the future.
- Market/Share Forecast – A forecast was developed using the FAA's projected growth rate for RTMs over the forecast period.
- Historic Growth Rate Forecast – ABI's historic annualized air cargo growth rate has been approximately 0.8% annually since 2003. These growth rates were utilized to project future growth.

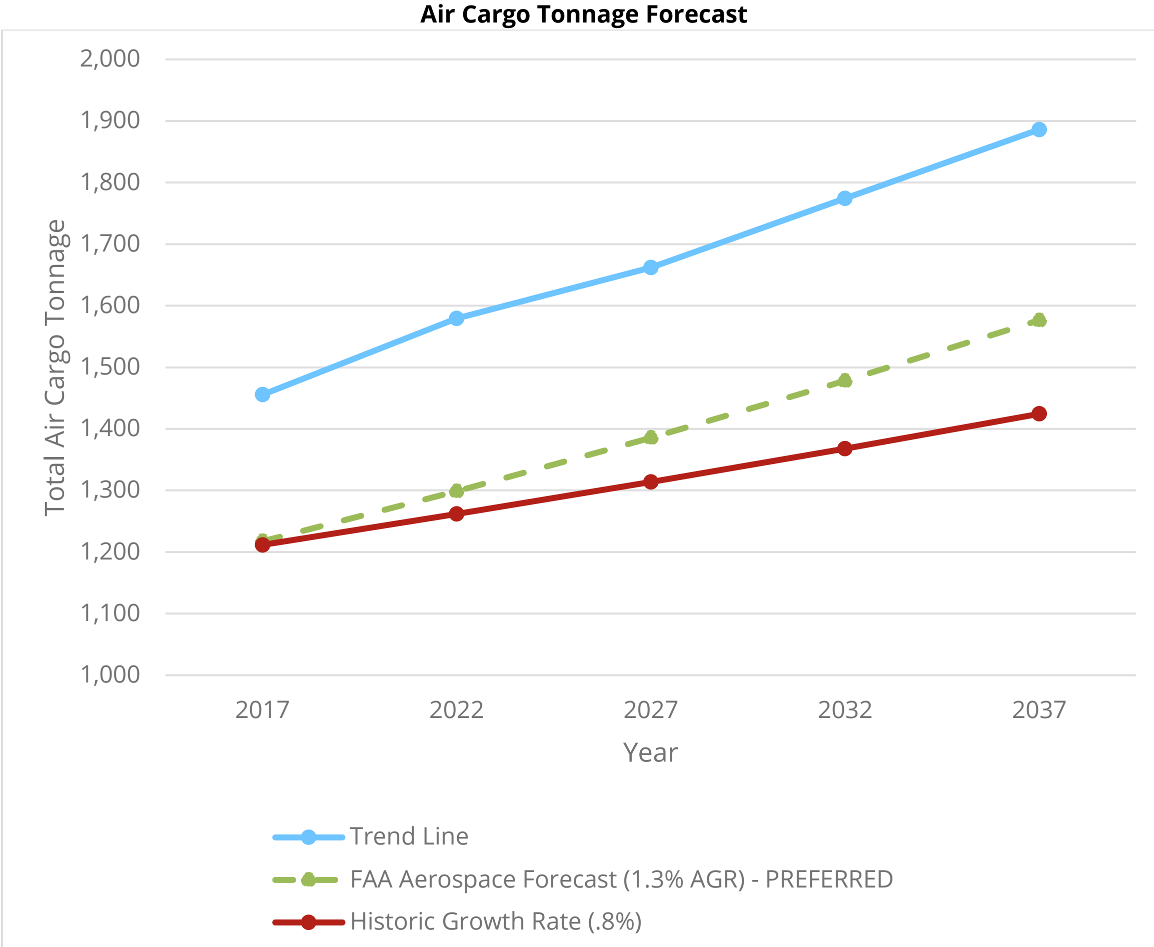
A regression analysis was run using population and a variety of socioeconomic factors as potential independent variables but none of the variations produced a reliable forecast. Consequently, all regression models have been excluded. The air cargo forecast alternatives are shown in **Table 3-18** and **Figure 3-10.**

Table 3-18
Air Cargo Tonnage Forecast

Year	Trend Line	FAA Aerospace Forecast (1.3% AGR) - PREFERRED	Historic Growth Rate (.8%)
2017	1,455	1,217	1,212
2022	1,579	1,299	1,262
2027	1,662	1,385	1,314
2032	1,774	1,478	1,368
2037	1,886	1,576	1,424

Source: Garver, 2017

Figure 3-10
Air Cargo Tonnage Forecast



Source: Garver, 2017

Based on the expected nationwide growth in air cargo, the incremental growth in the Abilene economy, and the increasing number of households with higher incomes, the FAA Aerospace Forecast alternative was selected as the preferred forecast.

Instrument Approach Activity Forecast

Table 3-19, *Instrument Approach Forecasts, 2017-2037*, summarizes the forecast of annual instrument approaches at ABI throughout the planning period. The forecast of annual instrument approaches (AIAs) provides further guidance in determining requirements for the type, extent, and timing of future navigational aid (NAVAID) equipment.

The forecast for instrument approach procedures is based on the IFR flight plan filings for the last nine-year period. During the last nine-year period, an average of 44% of total operations have been conducted under an instrument flight plan. It is assumed that this percentage will grow slightly during the forecast period as it has increased incrementally since 1995 due to the decline in VFR operations which is expected to continue. The predicted decrease in air carrier operations will also be a factor that contributes to the slight growth in IFR operations. Dividing the annual number of forecasted instrument operations in half provides an estimate of the number of instrument approaches conducted at ABI.

Table 3-19
Instrument Approach Forecasts, 2017-2037

Category	2017	2022	2027	2032	2037
Annual Operations	46,223	45,982	46,448	46,717	47,143
Percentage of Annual OPS that are IFR	44%	45%	46%	47%	48%
Forecasted Number of Instrument Approaches	10,169	10,346	10,683	10,979	11,314

Source: Garver, 2017

Itinerant vs Local Operations Forecast

The FAA defines an aircraft operation as an aircraft takeoff or landing at an airport. Aircraft operations can further be divided into local and itinerant operations. According to FAA Order 7210.3AA, *Facility Operation and Administration, October 12, 2017*, a local operation is any operation performed by an aircraft that "remains in the local traffic pattern, performs a simulated instrument approach, or operates to or from the Airport and a practice area within a 20-mile radius of the field or tower." An itinerant operation is any operation that is not considered local. Based on the FAA OPSNET database, since 2008 approximately 34% of the operations conducted at ABI have been considered local operations, and 66% considered itinerant operations. This percentage has stayed relatively consistent since 2008 and is expected to remain consistent throughout the forecast period. **Table 3-20**, *Itinerant vs. Local Activity Forecast*, provides a summary of this information. All types of aircraft operations (e.g. GA, air taxiway, air carrier, and military) are included in these figures.

Table 3-20
Itinerant vs. Local Activity Forecast

Year	2017	2022	2027	2032	2037
Local Operations	15,716	15,634	15,792	15,883	16,029
Itinerant Operations	30,507	30,348	30,656	30,834	31,114
Total	46,223	45,982	46,448	46,717	47,143

Source: Garver, 2017

Peak Period Forecasts

Peak period forecasts are essential for ensuring that an airport is prepared for and capable of handling the peaking characteristics of the aeronautical activity that will take place at the airport. Peak period forecasts were performed in three areas: enplanements, aircraft operations, and cargo tonnage. In each of these areas, the average amount of activity for the peak month is defined, the average day for the peak month, and the peak hour of the average peak month day. **Table 3-21**, *Peak Activity Forecast*, shows the results of the peak forecast analysis. The methodology used to establish values for each of these categories is described below.

Historically, ABI's peak month for passenger enplanements accounts for approximately 9.4% of the total of enplanements occurring at the airport in a year. This is not forecasted to change significantly during the forecast period. Consequently, the Peak Month passenger enplanement calculations assume that approximately 9.4% of the forecasted annual enplanements will be handled in the peak month. The Peak Month Average Day (PMAD) calculations are developed by taking the Peak Month values and dividing them by 30 to reach an average day value. The Peak Hour values were developed by taking the PMAD figures, evaluating the current flight schedule, and calculating the estimated number of enplanements being processed at the airport during the peak hour. Based on ABI's current flight schedule it was determined that the peak hour typically occurs in the morning when two Envoy Air flights depart approximately 1 hour and 15 minutes apart from each other (one at 7 AM and the other at 8:15 AM). Because these flights are less than 1.5 hours apart there is a stronger potential for passengers taking either flight to arrive at the airport around the same time resulting in a peak of activity. Additionally, the expected migration toward larger airline aircraft was taken into consideration for the future peak hour calculations which is why higher peak hour numbers are shown in 2022 even though total annual enplanements are forecasted to be less than in 2017.

Based on ABI's historic aircraft operations data, the peak month of operations usually accounts for approximately 10.3% of the total annual number of aircraft operations at the ABI. This percentage is expected to stay consistent during the forecast period. The PMAD values were developed by taking the peak month activity levels and dividing those figures by 30. It was assumed that approximately 10% of ABI's total daily traffic would occur during the peak hour.

Historically, the peak month for cargo tonnage at ABI accounts for approximately 9.4% of the total annual amount of cargo tonnage passing through the airport. This percentage is expected to remain relatively consistent during the forecast period. PMAD values were developed by dividing the peak month values by 30.

Figure 3-21
Peak Activity Forecast

Category	Forecast	Year 2017	2022	2027	2032	2037
Enplanements	Annual	90,399	90,045	98,885	103,108	110,367
	Peak Month	8,498	8,464	9,295	9,692	10,374
	PMAD	283	282	310	323	346
	Peak Hour	57	71	77	81	86
Aircraft Operations	Annual	46,223	45,982	46,448	46,717	47,143
	Peak Month	4,761	4,736	4,784	4,812	4,856
	PMAD	159	158	159	160	162
	Peak Hour	16	16	16	16	16
Cargo Tonnage	Annual	1,217	1,299	1,385	1,478	1,576
	Peak Month	114	122	130	139	148
	PMAD	4	4	4	5	5

Source: Garver, 2017

In general, the peaking characteristics most likely to affect the long-term development of ABI facilities are the peak day and hour passenger enplanement figures that could be affected by larger aircraft and reduced flight frequency.

Aircraft Mix Forecast

Table 3-22, *Aircraft Operations – Fleet Mix Forecast*, displays the aircraft fleet mix operations forecast for ABI for each phase throughout the 20-year planning period. An examination of IFR operations data at ABI through the FAA's Traffic Flow Management System Counts (TFMSC) database provides some guidance towards developing an accurate fleet mix forecast. The FAA's TFMSC records account for approximately 33% of the total operations that occur at ABI, and the recorded data allows aircraft operations to be segmented by aircraft type. Consequently, the TFMSC counts can provide a good indicator of the type of aircraft that use ABI and the frequency of those aircraft. FAA TFMSC data from 2016 was used for this analysis. It is also assumed that the aircraft not included in the TFMSC data are primarily small aircraft in Aircraft Design Groups (ADG) I and II and Aircraft Approach Categories (AAC) A and B as most aircraft larger than this are rarely flown on VFR flight plans.

Total operations can be broken down into AACs and ADGs. This helps to better define the types of aircraft that will operate at the airport in the future. It also allows for better planning of future facilities and airside needs for the airport and the ability to justify such facilities when the market demands their construction. Based on the 2016 TFMSC information, the following ratios were utilized for the forecast based on historic data:

- Approach Category:
  - A – 55%
  - B – 31.5%
  - C – 13%
  - D - .2%
  - Helicopter – .3%
- Aircraft Design Group:
  - Group 1 – 53.5%
  - Group 2 – 45%
  - Group 3 – 1%
  - Group 4 – .2%
  - Helicopter – .3%

These ratios are expected to remain fairly consistent with the exception of the number of Group II and III aircraft operations. As previously discussed, Envoy Air is purchasing additional ERJ-175 aircraft (a ADG III aircraft) and that will replace the existing ERJ-145 aircraft (a ADG II aircraft). As this change occurs, the total percentage of ADG II aircraft operations will fall and the percentage of ADG III aircraft operations will increase. This change was considered as part of the calculations. Both the ERJ-175 and ERJ-145 are AAC C aircraft so no amendments were made to those ratios for the forecast period.

Table 3-22
Aircraft Operations – Fleet Mix Forecast

Aircraft Approach Category	2017	2022	2027	2032	2037
Category A (Less Than 91 Knots)	25,423	25,290	25,546	25,694	25,929
Category B (92 – 120 Knots)	14,560	14,484	14,631	14,716	14,850
Category C (121 – 140 Knots)	6,009	5,978	6,038	6,073	6,129
Category D (141 – 160 Knots)	92	92	93	93	94
Helicopter	139	138	139	140	141
Airplane Design Group					
Group I (Less Than 49 Feet)	24,729	24,600	24,850	24,994	25,222
Group II (49 Feet To 78 Feet)	20,800	19,692	18,902	18,023	17,214
Group III (79 Feet To 118 Feet) or Larger	462	1,460	2,464	3,467	4,471
Group IV (119 Feet To 171 Feet) or Larger	92	92	93	93	94
Helicopter	139	138	139	140	141
Total	46,223	45,982	46,448	46,717	47,143

Source: Garver, 2017

Critical Aircraft Determination

The "critical" aircraft at an airport is the largest and most demanding aircraft or category of aircraft conducting at least 500 operations per year. Determining the critical aircraft is important for assessing airport design and layout and the structural and equipment needs for both the airfield and terminal area. It is evaluated with respect to aircraft size and speed. The aircraft operating at ABI vary from small piston aircraft to air carrier aircraft. Based on the types of aircraft utilizing the airport, the existing "critical" aircraft at ABI would fall into the C-III-2,400 category. **Table 3-23**, *Critical Aircraft Operations*, shows the most common aircraft operating at ABI that defines its current critical aircraft category. The preferred forecasts confirm this aircraft category to be the critical aircraft during the short-term and maintain it as such throughout the 20-year planning period.

Table 3-23
Critical Aircraft Operations

Aircraft Type and ARC	Aircraft Reference Code (ARC)	# of Operations in 2016
C-130	C-IV	92
Embraer 170	C-III	142
B-737-800	D-III	50
B-737-700	C-III	36
MD-83	C-III	17
MD-82	C-III	12
EMB 135/140	C-II	2,059
EMB 145	C-II	2,939
Gulfstream IV	C-II	67
Gulfstream V	C-III	14
Bombardier Global 5000	C-III	10

Source: FAA TFMSC database, Aircraft Characteristics Diagrams

Forecast Summary

In general, ABI is expected to have slow to flat growth in passenger enplanements, based on aircraft, aircraft operations, and cargo tonnage throughout the forecast period. **Table 3-24**, *Forecast Summary*, summarizes the forecasts for these areas. The most significant outcome of this forecast analysis is the understanding that the probable migration from ERJ-145 to ERJ-175 aircraft by Envoy Air will have a significant impact on ABI and the peaking characteristics of this forecast. This topic will be further evaluated in the Facility Requirements Chapter.

Table 3-24
Forecast Summary

Year	Airline OPS	Air Taxi (non-commuter) OPS	GA OPS	Military OPS	Total OPS	Enplanements	Cargo Tonnage	Based Aircraft
2017	5,283	3,546	22,564	14,830	46,223	90,399	1,217	105
2018	5,261	3,563	22,632	14,830	46,286	93,254	1,233	105
2019	5,114	3,581	22,700	14,830	46,225	94,406	1,249	105
2020	4,861	3,599	22,768	14,830	46,058	91,461	1,266	105
2021	4,786	3,617	22,836	14,830	46,070	91,754	1,282	105
2022	4,612	3,635	22,905	14,830	45,982	90,045	1,299	106
2023	4,649	3,653	22,974	14,830	46,106	92,421	1,316	106
2024	4,691	3,671	23,043	14,830	46,235	94,919	1,333	106
2025	4,703	3,689	23,112	14,830	46,334	96,836	1,350	106
2026	4,660	3,707	23,181	14,830	46,378	97,602	1,368	106
2027	4,643	3,725	23,251	14,830	46,448	98,885	1,385	106
2028	4,572	3,743	23,320	14,830	46,466	99,010	1,403	106
2029	4,528	3,762	23,390	14,830	46,510	99,667	1,422	106
2030	4,544	3,780	23,461	14,830	46,615	101,634	1,440	106
2031	4,518	3,798	23,531	14,830	46,678	102,657	1,459	106
2032	4,468	3,818	23,601	14,830	46,717	103,108	1,478	107
2033	4,463	3,837	23,672	14,830	46,802	104,559	1,497	107
2034	4,467	3,856	23,743	14,830	46,897	106,254	1,516	107
2035	4,470	3,875	23,815	14,830	46,989	107,894	1,536	107
2036	4,457	3,894	23,886	14,830	47,068	109,185	1,556	107
2037	4,441	3,914	23,958	14,830	47,143	110,367	1,576	107

TAF Comparison

In general, the forecasts provided in this chapter meet the requirements stated in AC 150/5070-6 (current series) for generally being in compliance with the existing TAF for ABI (e.g. 10% or less difference in the 5 year forecast and 15% or less difference in the 10 year forecast).

The enplanement forecast is 3.1% and 7.9% higher than the TAF in the 5- and 10-year forecast intervals (2022 and 2027). The total aircraft operations forecast is approximately 2.3% and 2.4% lower than the TAF for 2022 and 2027 respectively.

The only exception is the selected based aircraft forecast for ABI. The TAF provides an aggressive based aircraft forecast that is not realistic for ABI based on recent declines in ABI's based aircraft count and the nationwide declines in the manufacturing of smaller aircraft.

Chapter 4 – Facility Requirements

Introduction

This chapter evaluates the existing airport facilities and identifies improvements needed to effectively meet the forecasted demand levels discussed in the Forecast Chapter in a manner that complies with FAA standards and best practices. Identification of a needed facility or infrastructure improvement does not necessarily constitute a "requirement" in terms of design standards, but an improvement "option" to accommodate future aviation activity levels. Market demand will ultimately drive facility development at Abilene Regional Airport (ABI) and the operational levels defined in the forecast chapter (e.g. enplanements, aircraft operations, based aircraft, etc.) should be used to help guide the timing and need for future developments/improvements.

Airport facilities can be divided into two areas: airside and terminal/landside. The airside/airspace facility components include runways, taxiways, and their associated safety areas, navigational aids (NAVAIDs), airfield marking/signage, and lighting, while terminal/landside area components are comprised of hangars, terminal building, FBO facilities, aircraft parking apron, fuel storage and delivery, vehicular parking, and airport access.

Each of these facilities, including their current condition and forecasted demand, will be discussed in the remainder of this chapter. The results of this chapter will be utilized to drive the alternatives that are developed in Chapter 5.

Airside/Airspace Facilities

Runway Length

Runway length requirements for an airport can be evaluated utilizing a number of methodologies. To ensure a thorough and complete analysis regarding the sufficiency of ABI's current runway length, two evaluation methodologies were used for this analysis:

1. Runway Length Evaluation based on AC 150/5325-4B
2. Runway Length Evaluation Utilizing Forecasted Fleet Mix and Airport Planning Manuals (AMP) for Aircraft Expected to Frequently Use ABI

Runway Length Evaluation Based on AC 150/5325-4B

FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design*, provides guidance to help determine the most appropriate recommended runway lengths for an airport. Runway length is typically predicated upon the category of aircraft using or forecasted to use the airport. By design, the primary runway at an airport is typically the longest runway, with the most favorable wind conditions, the highest pavement strength, and the lowest straight-in instrument approach minimums.

A significant factor to consider when analyzing the generalized runway length requirements for an airport is that aircraft takeoff performance is a function of an airport's elevation, temperature, and the slope of a runway as well as the aircraft's payload vs. fuel load, stage length, and general performance characteristics. As these factors change, the runway length requirements for an aircraft change accordingly. Thus, if a runway is designed to accommodate 75% of the fleet at 60% useful load, this does not prevent larger aircraft at certain times and during specific conditions from utilizing the runway. However, the amount of time such operations can safely occur is limited.

As **Table 4-1**, *Generalized Runway Length Requirements Based on AC 150/5325-4B,* indicates both Runway 17L/35R and Runway 17R/35L meet all the runway length requirements for small aircraft and the runway length requirements for large aircraft in 75% and 100% fleet categories at 60% of the useful load. Runway 4/22 does not meet any of the runway length requirements. The generalized runway length requirements shown in **Table 4-1** were derived from the nomographs contained in AC 150/5325-4B, *Runway Length Requirements for Airport Design*.

Table 4-1
Generalized Runway Length Requirements Based on AC 150/5325-4B

Aircraft Category	Runway Designation	Current Runway Length	Runway Length Requirement	Deficiency
Small Aircraft: 12,500 pounds or less:				
95% GA Fleet	17L/35R	7,198	**3,800**	3,398
	17R/35L	7,203		3,403
	4/22	3,679		-121
100% GA Fleet	17L/35R	7,198	**4,450**	2,748
	17R/35L	7,203		2,753
	4/22	3,679		-771
100% GA Fleet with 10 or more passenger seats	17L/35R	7,198	**4,650**	2,548
	17R/35L	7,203		2,553
	4/22	3,679		-971
Large Aircraft between 12,500 and 60,000 pounds:				
75% of fleet at 60% useful load	17L/35R	7,198	**5,199**	1,999
	17R/35L	7,203	**5,329**	1,874
	4/22	3,679	**5,157**	-1,478
75% of fleet at 90% useful load	17L/35R	7,198	**7,299**	-101
	17R/35L	7,203	**7,429**	-226
	4/22	3,679	**7,257**	-3,578
100% of fleet at 60% useful load	17L/35R	7,198	**6,349**	849
	17R/35L	7,203	**6,479**	724
	4/22	3,679	**6,307**	-2,628
100% of fleet at 90% useful load	17L/35R	7,198	**9,499**	-2,301
	17R/35L	7,203	**9,629**	-2,426
	4/22	3,679	**9,457**	-5,778

Source: AC 150/5325-4B Figures 2-1, 2-2, 3-1 and 3-2. Generalized length only. Actual lengths should be calculated based on the specific aircraft's operational nomographs. Useful load refers to all usable fuel, passengers, and cargo. Calculations based on 1,790.6' airport elevation, mean maximum daily temperature of 95˚F. The runway end elevation differences for ABI are as follows: RWY 17L/35R – 14.6 ft., RWY 17R/35L – 27.9 ft., RWY 4/22 – 10.7 ft. Figures are increased 10 ft. for each foot of elevation difference between high and low points of runway centerline.

Based on this analysis, Runway 4/22 is the only runway at ABI that is insufficient for the majority of the traffic using the airfield. However, since Runway 4/22 is a crosswind runway and it is expected that it will be decommissioned at some point during the forecast period to accommodate additional development, a runway extension does not need to be considered for Runway 4/22.

The majority of the large aircraft departing from ABI, are flying to locations within the continental United States and, consequently, are not required to depart ABI at the Maximum Takeoff Weight (MTOW) with a full load of fuel to reach their destination. This assumption is not expected to change significantly during the forecast period. Therefore, based on this analysis, the length of the existing runways at ABI are expected to be sufficient to meet the vast majority of the airport's existing and forecasted aircraft operations. This conclusion will be further analyzed in the following section that analyzes ABI's runway length requirements based on the operational characteristics of specific aircraft that are expected to operate at ABI during the forecast period.

Runway Length Evaluation Based on Aircraft Planning Manuals

The sufficiency of a runway's length can also be evaluated by reviewing the performance characteristics of aircraft that currently or are forecasted to operate from an airport. Information regarding aircraft performance can typically be obtained by reviewing the Airport Planning Manuals (APM) for the aircraft that are included in the study or by contacting aircraft manufacturers.

Table 4-2, *Published Aircraft Takeoff Distances*, shows some of the larger aircraft that operated out of ABI in 2016 and the published takeoff distances for each aircraft according to the aircraft manufacturer's website.

Table 4-2
Published Aircraft Takeoff Distances

Aircraft Type	Takeoff Distance	2016 Operations #
ERJ-145	7,448	2,939
ERJ-175	5,656	None
B-737-800	6,890	50
B-737-700	5,722	36
A-321-200	6,500	10

Source: Aircraft manufacturer websites.

All takeoff distances are based on the aircraft being loaded to its MTOW, International Standard Atmospheric (ISA) conditions being present, and Sea Level (SL) altitude. While no ERJ-175 operations occurred in 2016, it has been included in this analysis as it is anticipated that this will be the critical aircraft for ABI in the future.

The takeoff distances shown in **Table 4-2** do not take into account the stage length each of these aircraft would fly out of ABI, ABI's elevation, runway slope, and the higher temperatures that ABI experiences during the summer months.

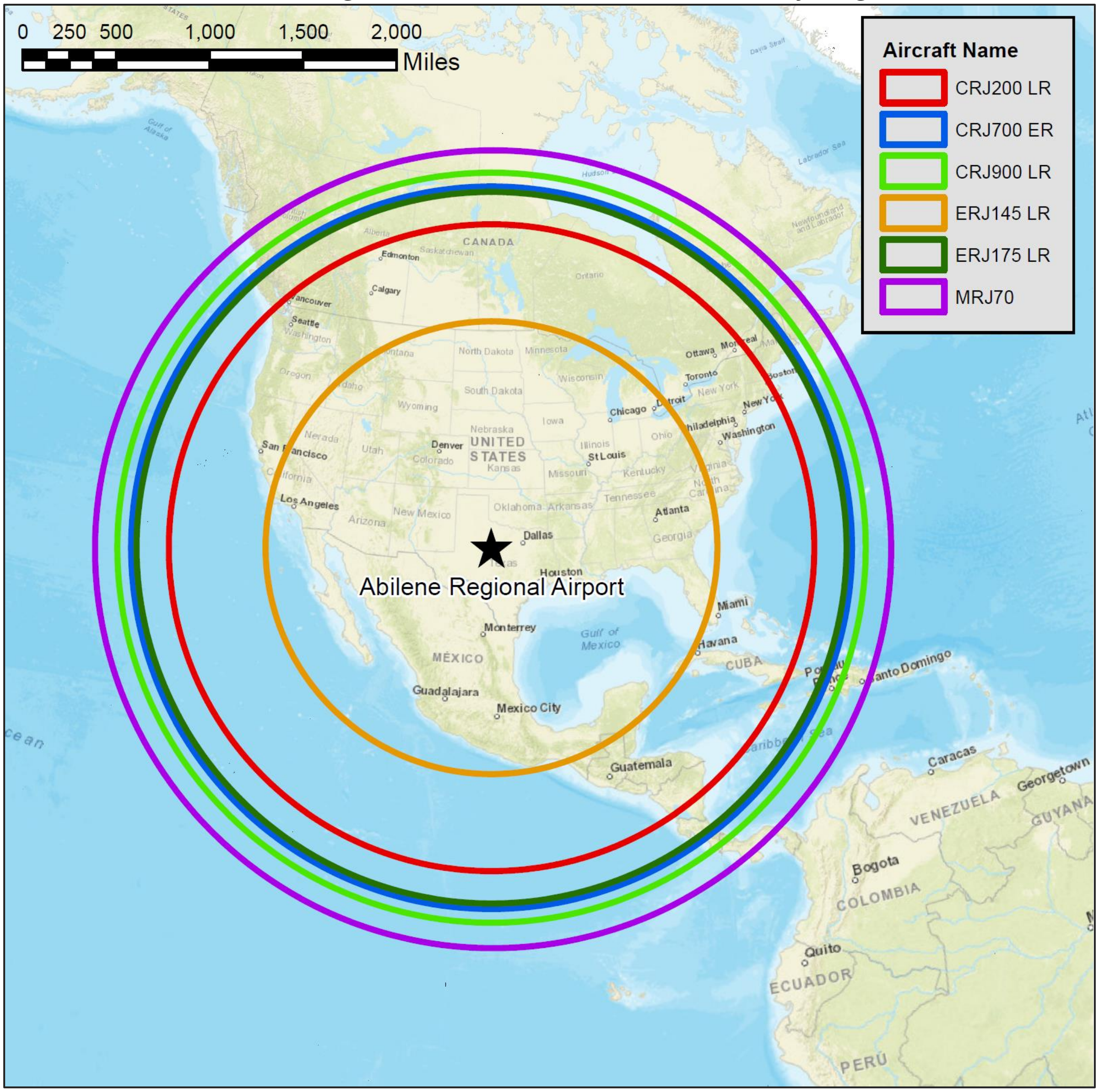
Consequently, to account for these factors, the following six aircraft makes/models were selected for an in-depth analysis to study the sufficiency of ABI's current runway length and the need for a future extension:

- Embraer Regional Jet 145 Long Range (ERJ-145 LR)
- Embraer Regional Jet 175 Long Range (ERJ-175 LR)
- Bombardier Canadair Regional Jet 200 Long Range (CRJ-200 LR)
- Bombardier Canadair Regional Jet 700 Extended Range (CRJ-700 ER)
- Bombardier Canadair Regional Jet 900 Long Range (CRJ-900 LR)
- Mitsubishi Regional Jet 70 Long Range (MRJ-70 LR)

The larger aircraft currently operating out of ABI (B-737, MD-80s) are usually diverted aircraft that fly to DFW (137 nautical miles away) when they depart ABI. Due to their limited stage length and frequency, these larger aircraft were excluded from this analysis.

Figure 4-1, *Aircraft Range Calculations Based on Current Runway Length*, shows the estimated maximum range that each of the six selected aircraft can achieve when departing ABI under International Standard Atmosphere (ISA) +15°C conditions at 85% of the aircraft's total usable payload. ISA +15°C conditions were selected for this analysis as compared to standard ISA conditions to help account for the hot summer temperatures that the Abilene area commonly receives. The range calculations for each of these aircraft were developed using the Airport Planning Manuals (APM) for the aircraft and the calculations were verified by the aircraft manufacturers.

Figure 4-1
Aircraft Range Calculations Based on Current Runway Length



Source: Aircraft Manufacturers – Airport Planning Manuals, Bombardier, Mitsubishi, Embraer

Of the six aircraft included in the evaluation, the MRJ-70 LR, CRJ-700 ER, CRJ-900 LR can all depart ABI at their established MTOW under ISA +15°C conditions at the existing runway lengths. This means that these aircraft can already achieve their maximum range from ABI utilizing the existing runway infrastructure. Consequently, a runway extension would not allow for a range increase for these aircraft when departing out from ABI.

The remaining three aircraft, the ERJ-145 LR, ERJ-175 LR, and CRJ-200 LR cannot depart ABI at their established MTOW under ISA +15°C conditions meaning that a runway extension would enable a range increase for these aircraft. Based on ABI's current runway length, the ERJ-145 LR could achieve a maximum range of 1,050 Nautical Miles (NM), the ERJ-175 LR could achieve a maximum range of 1,650 NM, and the CRJ200 LR could achieve a maximum range of 1,500 NM when departing ABI.

According to the APMs for these three aircraft and based on calculations run by Embraer and Bombardier, ABI's runway length would need to be extended to the following lengths for these aircraft to achieve their maximum range out of ABI under ISA +15°C conditions:

- 8,120 ft. in length for the ERJ-145 LR to depart ABI at its MTOW (assuming 85% payload) to achieve a maximum range of 1,520 NM
- 8,100 ft. in length for the ERJ-175 LR to depart ABI at its MTOW (assuming 85% payload) to achieve a maximum range of 1,950 NM
- 7,392 ft. in length for the CRJ 200 LR to depart ABI at its MTOW (assuming 85% payload) to achieve a maximum range of 1,590 NM

While these aircraft are not able to currently depart ABI at the established MTOW under ISA +15°C conditions, the CRJ-200 LR and ERJ-175 LR can still reach every major hub airport in the United States using the ABI's existing runway length. Also, the ERJ-145 LR can reach most major airline hubs in the United States with the exception of hubs in the northwestern and northeastern portions of the United States using ABI's existing runway length.

It should be noted that the ERJ-175, which is expected to become ABI's critical aircraft in the future, has a shorter Takeoff Field Length (TOFL) than the ERJ-145 that currently operates at the airport. Additionally, the majority of the newer regional jet aircraft that are currently being manufactured or are expected to be manufactured in the near future have airframes and engines that are more efficient than the existing ERJ-145 fleet. Consequently, it is not expected that the TOFL of newer regional jets will be longer than the TOLF for the ERJ-145 or ERJ-175.

Based on this analysis, it is expected that the existing runway length at ABI should be sufficient to accommodate future demand unless ABI's fleet mix and aircraft stage length requirements change.

Runway Length Analysis Conclusions

Based on the runway length analysis it is expected that the length of the existing runways at ABI should be sufficient to handle the anticipated aircraft traffic during the forecast period. However, a runway extension will be considered in the alternatives chapter to ensure sufficient space is reserved to expand the runways at ABI if the need should arise beyond the 20-year planning horizon or if industry/economic conditions dictate a significant change to ABI's future fleet mix.

Runway Strength

FAA AC 150/5320-6E, *Airport Pavement Design and Evaluation*, provides guidance on the structural design of airport pavements. The FAA requires the use of the pavement design program, FAARFIELD, to determine the pavement section that will support the various aircraft gear loadings. The design is be based on a 20-year life cycle. FAARFIELD analyzes the damage to the pavement done by each aircraft and determines the final pavement thickness/structure based on the total cumulative damage of all aircraft.

The published runway pavement strength for each of the runways at ABI is shown in **Table 4-3**, *Existing Runway Weight Bearing Capacity*.

Table 4-3
Existing Runway Weight Bearing Capacity

Gear Configurations	Runway 4/22	Runway 17L/35R	Runway 17R/35L
Single Wheel Gear (S)	30,000	85,000	85,000
Dual Wheel Gear (D)	60,000	160,000	160,000
Dual Tandem (2D)	N/A	160,000	160,000
PCN	5 /F/D/X/T	57 /F/C/X/T	61 /F/C/X/T

Source: ABI 5010

Table 4-4, *Existing Fleet Mix MTOW and Gear Configurations,* shows the landing gear configuration and MTOW of the larger aircraft currently operating at ABI.

Table 4-4
Existing Fleet Mix MTOW and Gear Configurations

Aircraft	Gear Configuration	MTOW (lbs.)
ERJ-145	Dual Wheel	48,502
ERJ-175	Dual Wheel	82,673
B-737-700	Dual Wheel	154,500
B-737-800	Dual Wheel	174,200
A321-200	Dual Wheel	171,961
C-130	Single Tandem	155,000

Source: Aircraft manufacturer websites.

The only aircraft currently operating at ABI on a regular basis that has a gear configuration and MTOW that exceeds the established weight bearing capacity of the air carrier runways (Runway 17R/35L and 17L/35R) is the B-737-800. The B-737-800 aircraft using ABI typically takeoff at a weight under their established MTOW. ABI does not have regular airline service with B-737-800 aircraft. The B-737-800 aircraft that do use ABI are typically diverted aircraft that stop at ABI temporarily until they can fly to DFW. Consequently, these aircraft typically depart ABI without a full load of fuel, resulting in a lower actual takeoff weight.

The frequency of larger aircraft traffic utilizing ABI that could exceed the established runway weight bearing capacity is expected to be primarily driven by aircraft diversion traffic and not aircraft using ABI as a point of origin or destination for scheduled airline service. It is not expected that any modifications to the existing runway pavement will be needed during the forecast period to improve the pavement's weight bearing capacity. However, if ABI attracts a large aircraft Maintenance, Repair, and Overhaul (MRO) operation or an aeronautical business that utilizes larger aircraft, the sufficiency of the current runway pavement strength will need to be revisited.

Runway Alignment

An evaluation of runway alignment is based on crosswind coverage and velocity and is based on the FAA guidance provided in FAA Advisory Circular 150-5300-13 (current series), *Airport Design*. In general, the FAA deems a runway to have sufficient wind coverage when the wind coverage is 95% or better for the runway's allowable crosswind component which is based on the runway's Runway Design Code (RDC).

As discussed in the Forecast Chapter, Chapter 3, the RDC for Runway 17L/35R and 17R/35L is C-III which has an allowable crosswind component of 16 knots. The RDC for Runway 4/22 is B-II which has an allowable crosswind component of 13 knots.

Table 4-5, *Runway Crosswind Coverage,* shows the crosswind coverage percentages for each runway at ABI and the combined runway wind coverage percentage.

Table 4-5
Runway Crosswind Coverage

	All Weather Wind Coverage %			IFR Wind Coverage %			VFR Wind Coverage %		
Runway	10.5 Knots	13 Knots	16 Knots	10.5 Knots	13 Knots	16 Knots	10.5 Knots	13 Knots	16 Knots
17L/35R & 17R/35L	94.53%	97.48%	99.16%	95.26%	97.35%	98.84%	94.38%	97.45%	99.17%
4/22	80.67%	89.29%	96.22%	80.67%	88.70%	95.03%	80.58%	89.26%	96.27%
Both	97.58%	98.99%	99.65%	97.28%	95.56%	99.27%	97.58%	99.02%	99.68%

Source: FAA Airports – GIS Wind Analysis Tool using ABI wind data as generated by the FAA's GIS tool. Completed 11/13/17.

As presented, Runways 17L/35R and 17R/35L meet the FAA wind coverage requirement (95% or more) for their RDC (C-III) crosswind component of 16 knots. A crosswind runway is not required per AC 150/5300-13 (current series). Runway 4/22 does not meet the FAA wind coverage requirement for its design category (B-II).

Instrument Approach Procedures

Instrument Approach Procedures (IAPs) are critical to ensuring the usability of a runway during poor weather conditions. IAPs provide guidance to pilots via land-based equipment or GPS satellites that aid them in executing an approach to land on a runway when a visual approach to the runway is not possible. The types of IAPs vary widely, however, they can generally be segmented into three primary categories: precision, non-precision, and circling approaches. Precision instrument approaches are approaches where a pilot is provided with both vertical and horizontal guidance and the visibility minimums for the approach are below ¾ of a mile. Non-precision instrument approaches are any straight-in instrument approaches with visibility minimums not lower than ¾ of a mile. Circling approaches are instrument approaches that do not provide an aircraft with a straight-in approach to a runway.

ABI currently has one precision instrument approach to Runway 35R, non-precision instrument approaches to Runway 17R, 17L, and 22, and one VOR-based circling approach. No instrument approach currently exists to Runway 35L. Since Runway 35R is the only runway with a precision instrument approach, ABI is subject to reduced operational capacity if Runway 17L/35R has to be closed. The feasibility of developing a precision approach with ½ visibility minimums to Runway 17R will be considered in the alternatives chapter to improve the operational capacity of ABI during poor weather conditions. However, based on historic weather data, weather below the existing Runway 17R LOC IAP minimums and winds favoring a Runway 17L/R flow only occur approximately 0.4% of the year.

The development of a GPS based non-precision approach to Runway 35L with 1 mile visibility minimums will be also considered to ensure instrument approach access to ABI when aircraft traffic is in a south flow pattern and Runway 35R is closed.

Magnetic Declination

As discussed in the inventory chapter, the current magnetic variation at ABI as shown on the FAA published airfield diagram is 5.3^{O} East with a 0.1^{O} West annual change. Currently, the established magnetic heading for each runway is shown below:

- Runway 17R/35L – 174.5^{O} and 354.5^{O}
- Runway 17L/35R– 174.5^{O} and 354.5^{O}
- Runway 4/22 – 47^{O} and 227^{O}

Based on the established annual rate of change, in approximately 5 years Runways 17R/35L and 17L/35R will have magnetic headings of 175^{O} and 355^{O} and will continue to move closer to magnetic headings that would be more in alignment with Runway 18/36 designations. Currently, Runway 4/22 should be more accurately labeled as Runway 5/23. The timing of the runway designation changes will be discussed in the Capital Improvement Chapter of this Master Plan. Since Runway 4/22 is expected to be closed at some point during the forecast period the re-designation of Runway 4/22 may not be required.

Airport Design Considerations

Compliance with airport design standards is vitally important because compliance with these standards aids an airport in maintaining a minimum level of operational safety. The major airport design elements are established by FAA AC 150/5300-13 (current series). Ideally, airports should conform with all established FAA airport design standards without requiring a Modification to Standards (MOS). Frequently this is not possible as many airports have infrastructure that was designed before the current design standards were established. In these cases, airport operators are generally required to improve the facilities to the new design standards if they accept FAA grant funds to rehabilitate or improve that particular facility.

Table 4-6, *Runway Design,* provides an overview of the FAA Design Standards and the current runway facilities at ABI.

Table 4-6
Runway Design

Item	FAA Design Standard (C-III RWY)	Runway 17L/35R	Runway 17R/35L	FAA Design Standard (B-II-5,000 RWY)	Runway 4/22
Runway Design:					
Width (ft)	150	150	150	75	100
RSA Width (ft)	500	500	500	150	150
RSA Length beyond R/W end (ft)	1000	1000	1000	300	300
OFA Width (ft)	800	800	800	500	500
OFA Length beyond R/W end (ft)	1000	1000	1000	300	300
ROFZ Width (ft)	400	400	400	400	153-167
ROFZ Length beyond R/W end (ft)	200	200	200	200	200
Runway Setbacks -Runway Centerline to:					
Parallel Taxiway Centerline (ft)	400	400	500	240	250
Holdline (ft)	268	268	268	200	153-167
Aircraft Parking Area (ft)	500	650	None	250	300

Source: FAA AC 150/5300-13* deficiencies in red.

Currently, ABI has no deficiencies related to its runway width, Runway Safety Areas (RSA), Runway Object Free Areas (ROFA), runway to parallel taxiway separation, and aircraft parking area separation standards. There are some runway design issues with Runway 4/22 related to the runway's Runway Obstacle Free Zone (ROFZ) and the placement of the runway hold position markings for the runway.

Each of these aspects of runway design is discussed in more depth in the subsections below. An analysis of the Runway Protection Zones (RPZs) is also provided later in this chapter.

Runway Width

FAA AC 150/5300-13 (current series delineates the requirements for runway width. At present, both Runway 17R/35L and Runway 17L/35R are 150 ft. wide. This width meets the minimum runway width recommended in AC 150/5300-13 for runways with a C-III RDC which is 150 ft.

Runway 4/22 is 100 ft. wide which is 25 ft. wider than the required width of a runway with a B-II RDC (75 ft.). Runway 4/22 is primarily used by small aircraft when crosswinds for the parallel runways are strong. If Runway 4/22 is ever rehabilitated, reducing the width of Runway 4/22 should be considered.

ABI's critical aircraft is forecasted to remain in the C-III category throughout the forecast period. The existing runway width is expected to be sufficient for the duration of the forecast period.

Runway Safety Area

The Runway Safety Area (RSA) is a two-dimensional area surrounding a runway that is centered along the runway centerline and extends beyond the edges of the useable runway pavement. RSA's are provided to reduce the risk of damage to airplanes in the event of undershoot, overshoot, or excursion from the runway pavement. RSAs must be free of objects, except those required for air navigation, and be graded to transverse and longitudinal standards to prevent water accumulation. Objects located in the RSA that are over 3 inches above grade must be constructed, to the extent practical, on frangible mounted structures with a frangible point no higher than 3 inches above grade. Under dry conditions, the RSA must support Aircraft Rescue and Fire Fighting (ARFF) equipment, snow removal equipment, and the occasional passage of aircraft without causing damage to the aircraft.

The FAA recommends airports own the entire RSA in "fee simple" title. Based on RDC C-III design standards, the RSAs for Runways 17L/35R and 17R/35L should extend beyond the end of the runway for 1,000 ft. and be 500 ft. wide (250 ft. each side of the runway centerline) with a grade not steeper than 3%. These standards are met on both of the parallel runways. Runway 4/22 is a B-II runway that requires an RSA that extends 300 ft. beyond the ends of the runway and that is 150 ft. wide (75 ft. each side of the runway centerline). This standard is met for Runway 4/22.

Since the Forecast Chapter, Chapter 3, identified that ABI is expected to remain in the C-III RDC during the 20-year planning horizon, no improvements to the RSAs at ABI are expected to be necessary during the forecast period.

Runway Object Free Area

The Runway Object Free Area (ROFA) is a two-dimensional area surrounding a runway that is centered along the runway centerline. The ROFA must be clear of objects except those used for air navigation or aircraft ground maneuvering purposes and clear of above-ground objects protruding higher than the elevation of the RSA at the closest adjacent point. An object is considered any terrain, structure, navigational aid, people, equipment, or parked aircraft. The FAA recommends that an airport own the entire ROFA in "fee simple" title.

Currently, FAA Airport Design criteria for an RDC C-III runway requires the ROFA to be 800 ft. wide (400 ft. each side of the runway centerline) and extend 1,000 ft. beyond each runway end. Runway 17R/35L and 17L/35R meet this requirement. FAA Airport Design criteria for an RDC-B-II runway requires the ROFA to be 500 ft. wide and extend 300 ft. beyond each runway end. Runway 4/22 meets these requirements.

Since the Forecast Chapter, Chapter 3, identified that ABI is expected to remain in the C-III RDC during the 20-year planning horizon, no improvements to the ROFAs at ABI are expected to be necessary.

Obstacle Free Zone

The Obstacle Free Zone (OFZ) is a volume of airspace above and centered along the runway centerline. The OFZ precludes taxiing and parked airplanes and object penetrations except for objects required to be located in the OFZ due to their function. OFZs can have a number of different components including a Runway Obstacle Free Zone (ROFZ), inner-transitional OFZ, inner approach OFZ, and a Precision Obstacle Free Zone (POFZ). The ROFZ applies to all the runways at ABI. Currently, the Inner-transitional OFZ, inner-approach OFZ, and POFZ only apply to Runway 35R because it is the only runway with a precision instrument approach and an approach lighting system. The status of all four OFZ surfaces is discussed below.

Runway Obstacle Free Zone (ROFZ)

The length of a ROFZ is fixed at 200 ft. beyond the associated runway end but the width is dependent upon the size of the aircraft using the runway (small – less than 12,500 lbs. or large – greater than 12,500 lbs.) and the visibility minimums for the lowest instrument approach to the runway. The ROFZ width for all three runways at ABI is 400 ft. wide (200 ft. each side of the runway centerline). The elevation of the ROFZ is equal to the closest point along the runway centerline.

Runways 17R/35L and 17L/35R meet the established ROFZ requirements. Runway 4/22 does not meet established ROFZ standards. As mentioned previously, all portions of the OFZ (including the ROFZ) preclude taxiing or parked aircraft. This includes aircraft stopped at a runway hold position markings associated with the runway. The runway hold position markings for Runway 4/22 vary between 153 ft. and 167 ft. from the Runway 4/22 centerline. For Runway 4/22, the runway hold position markings should be set 200 ft. back from the runway centerline to properly protect the ROFZ. Because these runway hold position markings are too close to the Runway 4/22 centerline it is possible for taxing aircraft to penetrate the Runway 4/22 ROFZ while the runway is in use.

Figure 4-2, *Runway 4/22 ROFZ,* displays this issue. This issue will be considered during the development of alternatives.

Figure 4-2
Runway 4/22 ROFZ

Source: Garver, 2017

Inner Approach OFZ

Runway 35R has a MALSR approach lighting system. Consequently, an inner approach OFZ is applicable. The inner approach OFZ begins at the end of the ROFZ (200 ft. beyond the runway end) and extends to a point 200 ft. beyond the last lighting unit the MALSR system (2,600 ft. beyond the runway end). Consequently, the total inner approach OFZ is 2,400 ft. in length. Additionally, the inner approach OFZ rises at a 50:1 slope from the edge of the ROFZ and remains the same width as the ROFZ (400 ft.). The current inner-approach OFZ for Runway 35R meets the established FAA standards.

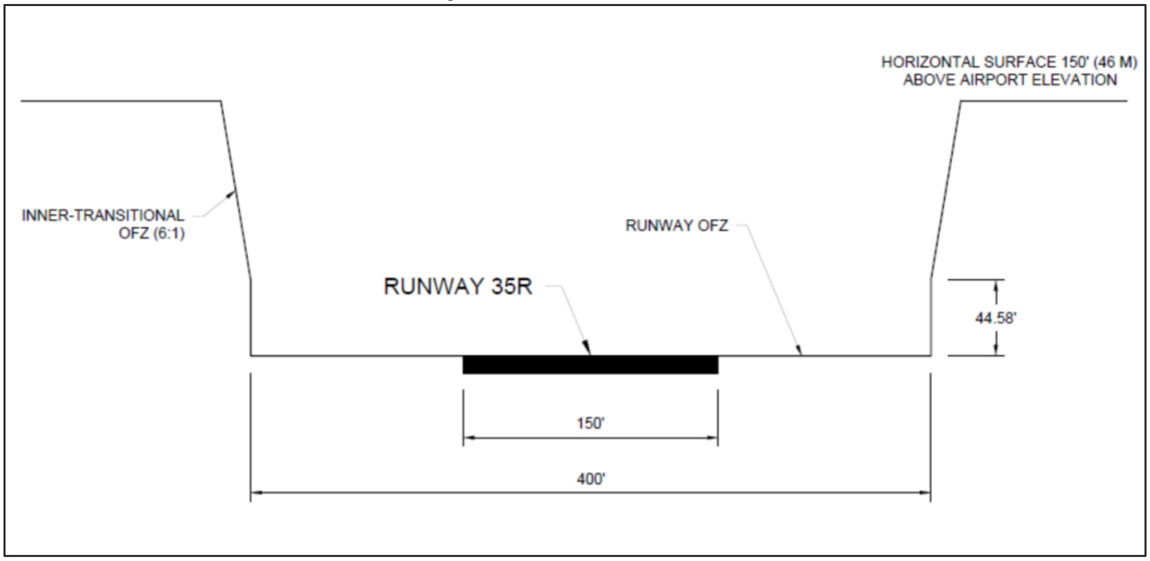
Inner Transitional OFZ

The inner transitional OFZ is a defined volume of airspace along the sides of the ROFZ and inner approach OFZ. It applies only to runways with lower than ¾ statue mile approach visibility minimums.

Runway 35R has an ILS approach with visibility minimums of ½ mile. Since these visibility minimums are below ¾ mile an inner-transitional OFZ is applicable.

Figure 4-3, *Runway 35R Inner Transitional OFZ,* displays the inner approach OFZ configuration for Runway 35R its relationship to the ROFZ and inner transitional OFZ.

Figure 4-3
Runway 35R Inner Transitional OFZ



Source: Garver, 2017

For category 1 ILS runways, the inner transitional OFZ begins at the edges of the ROFZ and inner-approach OFZ and then rises vertically to a height (“H”) which is calculated using the following formula:

H = 61 – 0.094(S) – 0.003(E)

“S” is equal to the most demanding wingspan of the RDC of the runways which, for ABI, is 118 ft. “E” is equal to the runway threshold elevation above sea level which, for ABI, is 1,775.9 ft. MSL. Based on this formula, “H” equals 44.58 ft. for Runway 35R and 44.63 ft. for Runway 17R.

After rising to a height of “H”, the inner transitional OFZ then slops outward at a 6:1 slope until reaching 150 ft. above the established airport elevation (1,790.6 ft. MSL).

The inner transitional OFZ for Runway 35R currently meets all established FAA standards.

Precision OFZ (POFZ)

The final OFZ surface that applies to Runway 35R is the Precision Obstacle Free Zone (POFZ). The POFZ is a defined volume of airspace above an area beginning at the threshold of the runway that extends to 200 ft. beyond the end of the runway and is 800 ft. wide, centered along the extended runway centerline. The volume of airspace begins at the threshold elevation for the applicable runway end. The wing of an aircraft may penetrate the POFZ but penetrations involving an aircraft fuselage or tail are not permitted. Runway 35R is the only runway at ABI that requires a POFZ. The POFZ for Runway 35R begins at the runway threshold elevation for

Runway 35R which is 1,775.9 ft. MSL. The POFZ for Runway 35R meets all established FAA standards.

Runway Hold Position Markings

The runway hold position markings (or holdlines) denote the entrance to the runway from a taxiway and the location where aircraft are supposed to stop when approaching the runway. Their location is prescribed by FAA AC 150/5300-13 (current edition). They are generally located across the centerline of a given taxiway within 10 ft. of an associated runway hold position sign. According to FAA standards, the holdlines for Runway 17R/35L and Runway 17L/35R should be located at least 268 ft. from the runway centerline on both runways. All of the runway hold position markings associated with Runway 17R/35L and Runway 17L/35R are located the proper distance from the runway centerline.

The holdlines for Runway 4/22 should be located 200 ft. from the runway centerline. As discussed in the OFZ section, the runway hold position markings for Runway 4/22 are located too close to the Runway 4/22 centerline allowing aircraft to potentially penetrate the ROFZ. Options to remedy this issue will be discussed in the Alternatives Chapter. If the runway hold position markings are relocated the associated runway hold position signage will have to be relocated as well.

Parallel Runway Separation Standards

AC 150/5300-13 (current edition) discusses parallel runway separation standards and the types of aeronautical operations that can be conducted based on the separation that exists between parallel runways. Runway 17R/35L and Runway 17L/35R currently have 3,100 ft. of separation (centerline to centerline). This separation is sufficient to allow simultaneous takeoffs or landings under Visual Flight Rules (VFR) rules. The ability to conduct simultaneous IFR approach to the runway would have to be studied further and coordinated with the FAA. With the provision of special radar and monitoring equipment, the FAA will allow simultaneous IFR approaches on parallel runways separated by as little as 3,000 ft. Based on the forecast it is not expected that the demand for instrument approaches will reach a level where the need for simultaneous instrument approaches will arise.

Runway to Parallel Taxiway Separation Standards

According to AC 150/5300-13 (current edition), the minimum necessary runway centerline to parallel taxiway centerline separation for a runway with an RDC of C-III is 400 ft. As previously mentioned, both Runway 17R/35L and 17L/35R are C-III runways. Currently, 500 ft. of separation exists between Runway 17L/35R and Taxiway Delta, and 400 ft. of separation exists between Runway 17R/35L and Taxiway Charlie. Both runways meet the current minimum runway to parallel taxiway separation standards established by the FAA. It is not anticipated that the runway to parallel taxiway separation will need to be modified during the forecast period.

Building Restriction Line

According to AC 150/5300-13 (current series), the Building Restriction Line (BRL) represents the boundary where it is generally suitable or unsuitable to develop buildings such as hangars, terminals, or other facilities. The BRL is established based on an airport's FAR Part 77 imaginary surfaces, Runway Protection Zones (RPZs), Obstacle Free Zones (OFZ), Object Free Areas (OFA), runway visibility zones, NAVAID critical areas, and approach surfaces. Based on existing instrument approach procedures, the Runway 17L/35R primary surface is 1,000 ft. wide (500 ft. each side of the runway centerline) and extends 200 ft. beyond each runway end. The primary surface for Runway 17R/35L and Runway 4/22 is 500 ft. wide (250 ft. each side of the runway centerline) and extends 200 ft. beyond each runway end.

The transitional surface slopes up (7:1) from the primary surface to the horizontal surface which is 150 ft. above the airport elevation (airport elevation is 1,790.6 ft. MSL). Buildings should not penetrate the transitional surface at any point. Based on the activity at the field, instrument approach procedures, and RDC, to avoid transitional surface penetrations, the 35.0 ft. BRL should be 745 ft. from the Runway 17L/35R centerline and 495 ft. from the Runway 17R/35L and Runway 4/22 centerline.

Currently, there are no buildings located with the existing BRLs surrounding Runway 17R/35L and Runway 17L/35R. Portions of the FedEx building and the AvFuel building are located within the 35 ft. BRL for Runway 4/22. At its closest point, the FedEx building is approximately 385 ft. from the Runway 4/22 centerline. At this point, the transitional surface is at a height of 19.29 ft. above the elevation of the Runway 4/22 centerline which is slightly above the height of the FedEx Building at this point. At its closest point, the AvFuel building is 490 ft. from the Runway 4/22 centerline. However, its building height is well below 35 ft., so it does not penetrate the transitional surface for Runway 4/22.

All future developments should be located outside of the BRL. Placing buildings inside the BRL is possible if the height of a building is minimized. Locating buildings inside the BRL may hamper the options for expanding ABI in the future.

Runway Line-Of-Sight

To ensure the safety of aircraft operations at an airport it is imperative that proper lines of sight exist along a single runway and amongst intersecting runways. These lines of sight facilitate coordination amongst aircraft and vehicles operating on a runway(s) by allowing them to identify the position of other aircraft or vehicles operating on the same runway or on an intersecting runway.

On a single runway, an acceptable runway profile permits any two points, generally each runway end, 5 ft. above the runway centerline, to be mutually visible for the entire runway length. If the runway offers a full-length parallel taxiway, an unobstructed line of sight should exist from any point 5 ft. above the runway centerline to any other point 5 ft. above the runway centerline for one-half the runway length. There are no single runway line of sight issues for the runways at ABI.

On intersecting runways, an acceptable runway profile permits visibility between established points on each intersecting runway so aircraft operators and vehicle operators can see other aircraft or vehicles operating on the intersecting runway. ABI does not have any intersecting runways, so these standards are not applicable.

Runway Protection Zone

The purpose of the Runway Protection Zone (RPZ) is to enhance the protection of people and property on the ground and to prevent developments that are incompatible with aircraft operations. The FAA recommends that airports own the entire RPZ in "fee simple" title and that the RPZ be clear of any non-aeronautical structure or object that would interfere with the arrival and departure of aircraft. If “fee simple” interest is unachievable, the next option is controlling the heights of objects through an avigation easement and keeping the area clear of any facilities that would support an incompatible activity (e.g., places of public assembly, etc.). An avigation easement is an agreement between the airport sponsor and a landowner that grants the airport sponsor various privileges related to the landowner’s property and limits the potential impact to aircraft operations.

The RPZ is a two-dimensional trapezoidal area that normally begins 200 ft. beyond the paved runway end and extends along the runway centerline. When it begins somewhere other than 200 ft. from a runway end, there is a need for two RPZs, an approach RPZ, and a departure RPZ. The approach RPZ begins 200 ft. from the runway threshold. A departure RPZ begins 200 ft. beyond the end of runway pavement or 200 ft. from the end of the Takeoff Runway Available (TORA), if established.

An FAA Interim Guidance Letter (IGL) (Sept 2012) addressed acceptable property uses within an RPZ. The IGL was released to specify and emphasize existing use standards and indicates that if any of the following parameters are met then the RPZ ownership must be reevaluated:

- An airfield project (e.g., a runway extension, runway shift)
- A change in the critical design of aircraft that increases the RPZ size
- A new or revised instrument approach procedure that increases the RPZ dimensions
- A local development proposal in the RPZ (either new or reconfigured)

Land uses within an RPZ that require specific and direct coordination with the FAA include:

- Buildings and structures
- Recreational land uses
- Transportation facilities
- Rail facilities
- Public road/highways
- Vehicular parking facilities
- Fuel storage facilities
- Hazardous material storage
- Wastewater treatment facilities
- Above-ground utility infrastructure

RPZ dimensions are determined by the type/size of aircraft expected to operate at an airport and the type of approach, existing or planned, for each runway end (visual, precision, or non-precision). The recommended visibility minimums for the runway ends are determined with respect to published instrument approach procedures, the ultimate runway RDC, airfield design standards, instrument meteorological conditions, wind conditions, and physical constraints (approach slope clearance) along the extended runway centerline beyond the runway end. **Table 4-7**, *Runway Protection Zone Dimensions*, delineates the current RPZ requirements at ABI.

Table 4-7
Runway Protection Zone Dimensions

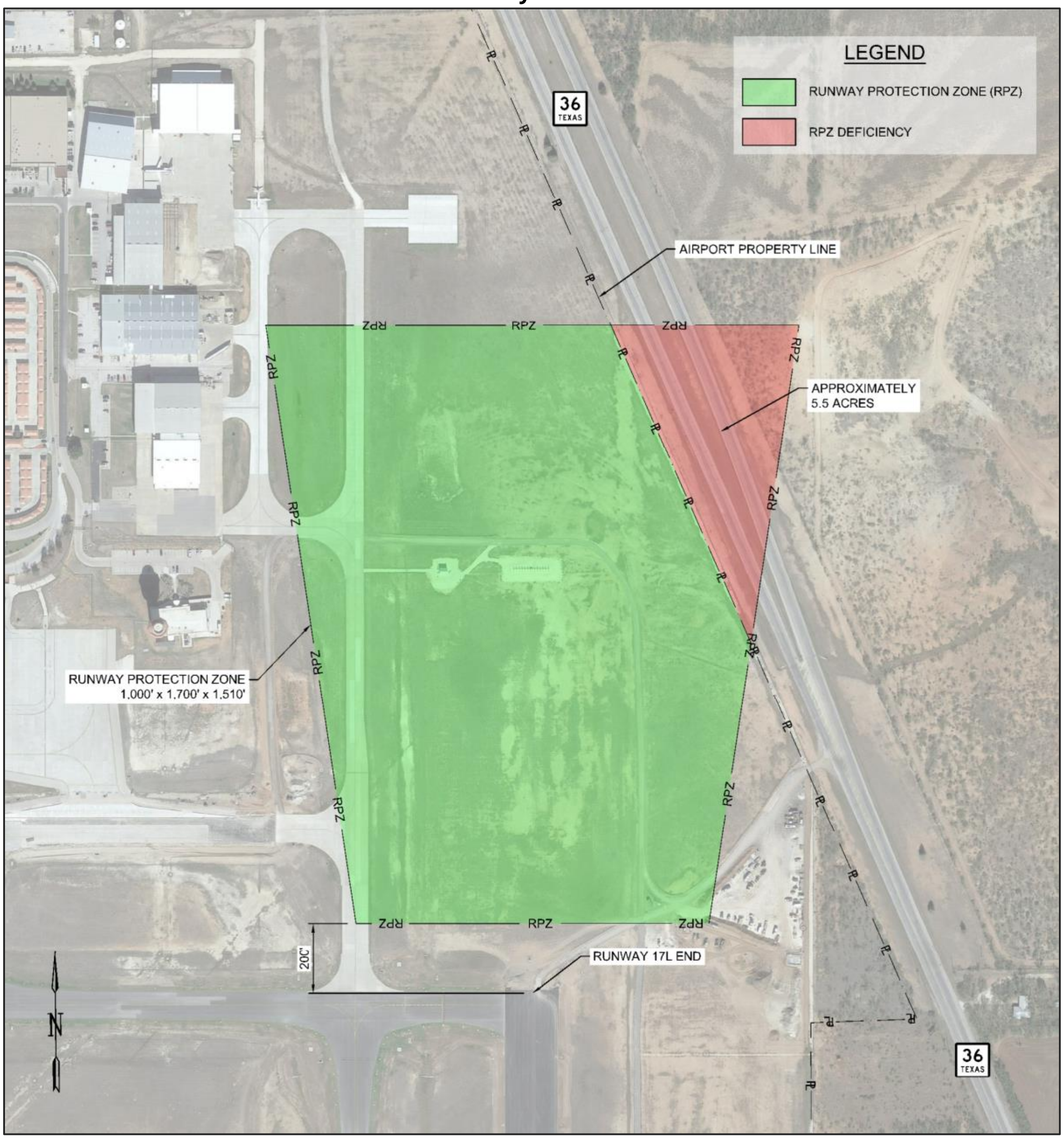
Runway End (s)	Approach Visibility Minimums	Facilities Expected to Serve (AAC - ADG)	Length (ft)	Inner Width (ft)	Outer Width (ft)	Acres
Runway 35R	Lower than 3/4 Mile	C-III	2,500	1000	1750	78.914
Runway 17L	Not Lower than ¾ Mile	C-III	1,700	1,000	1,510	48.978
Runway 35L	Visual	C-III	1,700	500	1,010	29.465
Runway 17R	Not Lower than 1 Mile	C-III	1,700	500	1,010	29.465
Runway 4	Visual	B-II	1000	500	700	13.77
Runway 22	Not Lower than 1 Mile	B-II	1000	500	700	13.77

Source: FAA Advisory Circular 150/5300-13 (current series).

Several of the RPZs at ABI extend outside of airport property. Currently, the RPZ's at the approach ends of Runway 17L, 17R, and 35R all extend outside of the ABI's established property line. Highway TX-36 runs through portions of the RPZ for Runways 17L and 17R. Based on the research performed as part of this master plan, it does not appear that any avigation easements exist on the properties where the RPZ extends outside of airport property. Consequently, where appropriate, property acquisition and avigation easements will be considered in the alternatives section of this master plan. Fortunately, with the exception of TX-36, the segments of the RPZ's outside of ABI's property line are generally undeveloped.

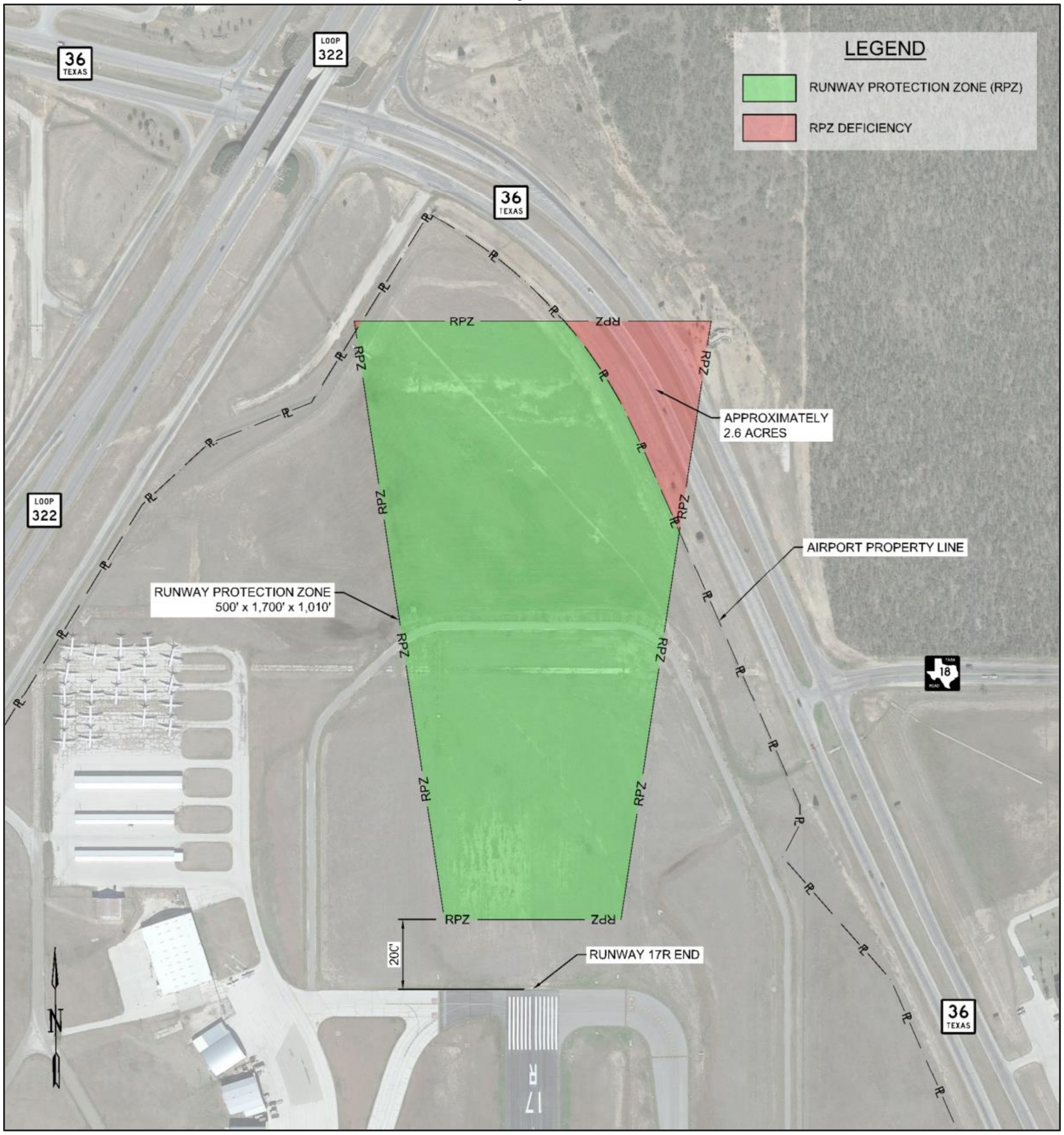
Figure 4-4, *Runway 17L RPZ*, **4-5**, *Runway 17R RPZ,* **and 4-6**, *Runway 35R RPZ,* depict the existing RPZs and highlights the portions outside of airport property.

Figure 4-4
Runway 17L RPZ



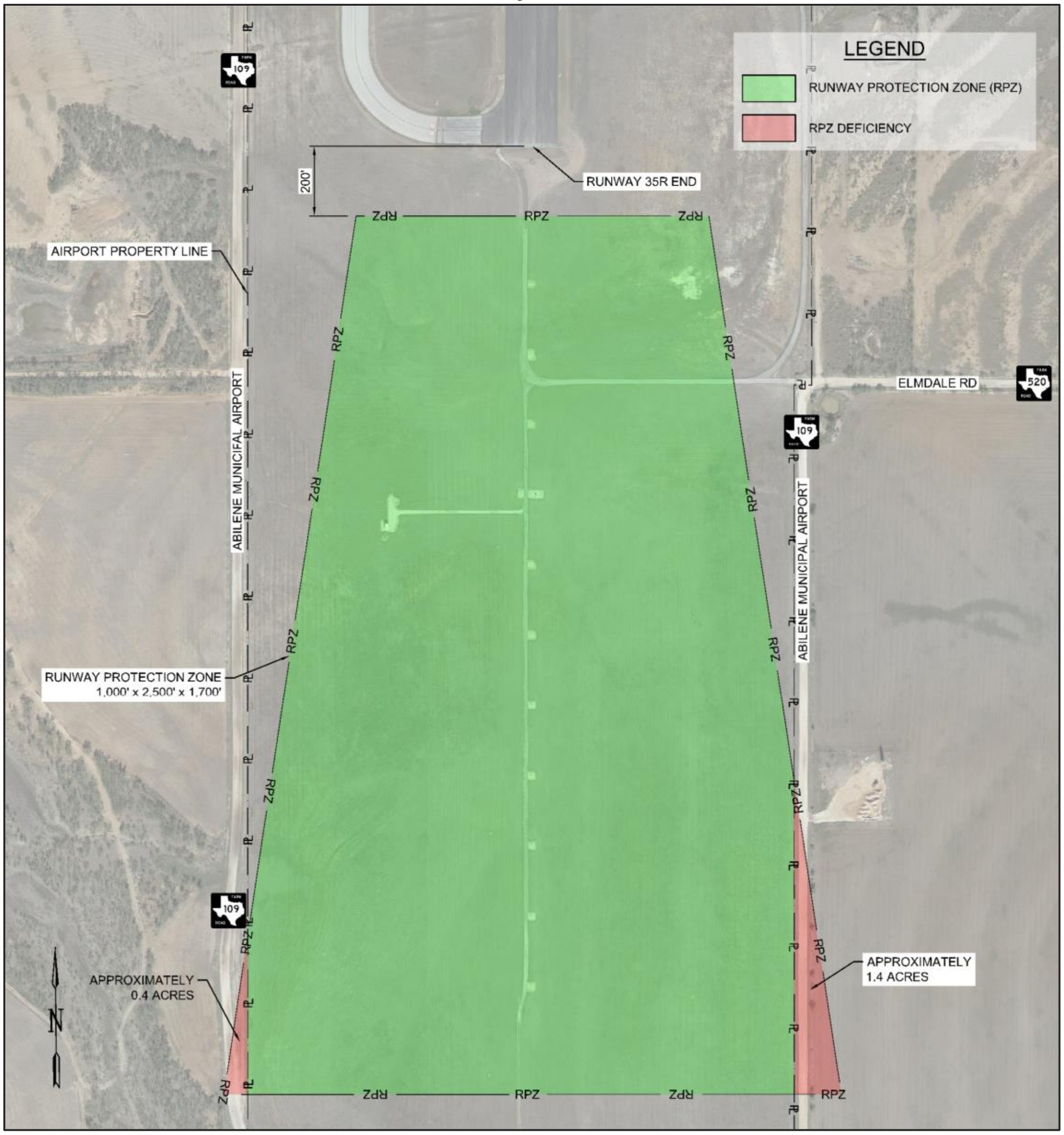
Source: Garver, 2017

Figure 4-5
Runway 17R RPZ



Source: Garver, 2017

Figure 4-6
Runway 35R RPZ



Source: Garver, 2017.

Considerations for ensuring the airport has sufficient control over the existing and ultimate RPZs will be considered in the Alternatives Chapter.

Taxiway Design Standards

In general, taxiway design can be segmented into two general categories:

1. Taxiway Pavement Design
2. Taxiway Layout Based on Aircraft Design Group (ADG)

Each of these design categories plays a critical role in evaluating the sufficiency of taxiway pavements at an airport both now and in the future.

Taxiway Pavement Design

Taxiway pavement design is complex because it is largely based on landing gear configurations which vary widely amongst different aircraft types. The FAA has classified the numerous variations of land gear configurations into eight Taxiway Design Groups (TDG) that now guide taxiway pavement design.

Existing Taxiway Pavement Design

Taxiway pavement design standards have changed significantly over the past 10 years. Prior to 2012, taxiway pavement design was based on Aircraft Design Group (ADG), which categorizes aircraft based on wingspan and tail height. In 2012, when TDG standards came into effect, taxiway pavement design and fillet dimensions changed significantly. These standards went through another minor revision in 2014.

The most significant changes that occurred as a result of the transition from ADG to TDG based pavement design standards; the requirements for taxiway fillet dimensions increased and the general layout for pavement fillets changed. Consequently, at many airports, any taxiway pavements that were designed prior to 2012 do not meet the need of TDG based standards. As a result, as these taxiway pavements are re-constructed they need to be re-designed to current TDG-based standards.

The taxiways at ABI are no different. The taxiways associated with Runway 4/22 and Runway 17L/35R are designed to older pavement design standards that were in effect prior to the new TDG standards being instituted. Consequently, the taxiway fillets in these areas do not follow the existing TDG standards and practices. Many of the taxiway's associated with the air carrier ramp, Runway 17R/35L, and Taxiways N, M, and P were redesigned in 2012 and 2013. Consequently, these taxiways more closely follow the existing TDG based design standards.

It should also be noted that most of the existing taxiway pavements at ABI were designed with a B-757 as the design aircraft. Most of the taxiway segments that were designed prior to 2012 were designed to the previous ADG IV pavement design standards.

Forecasted TDG

Table 4-8, *Existing Fleet Mix MTOW and Gear Configurations,* shows the TDG of some of the large aircraft that operated at ABI in 2016:

Table 4-8
Existing Fleet Mix MTOW and Gear Configurations

Aircraft	TDG	# of 2016 OPS
ERJ-145	2	2,939
ERJ-175	3	None
B-737-700	3	50
B-737-800	3	36
A-321-200	3	10
C-130	1B	92

Source: Aircraft manufacturer websites.

The majority of the large aircraft operations that occurred at ABI in 2016 fall into the TDG II and III categories.

Because ABI receives frequent diversions due to weather at DFW, larger aircraft with higher TDGs regularly use the airport. Consequently, TDG 4 standards should be used for pavement design at ABI during the forecast period. Aircraft in the TDG 4 category include the B-757, MD-82, and MD-83. **Table 4-9**, *TDG 4 Design Standards,* shows the FAA TDG 4 standards for Taxiway Design.

Table 4-9
TDG 4 Design Standards

Design Category	Dimensions (ft.)
Taxiway Width	50
Taxiway Edge Safety Margin	10
Taxiway Shoulder Width	20
Taxiway C/L Radius (90 degree turn)	95

Source: FAA AC 150/5300-13A

The width of most air carrier taxiways at ABI is 75 ft., which is more than the 50 ft. width required according to current TDG 4 standards. Many of the existing taxiway fillets at ABI do not meet the existing TDG 4 fillet design standards if the taxiways are narrowed to 50 ft. Therefore, it is recommended that the air carrier taxiways at ABI be maintained at 75 ft. in width to ensure TDG 4 aircraft have sufficient pavement to use cockpit-over-centerline turning procedures at taxiway/taxiway intersections.

The MTOW of the aircraft using ABI is not expected to change significantly during the forecast period no improvements to taxiway pavement strength are expected to be needed during the forecast period.

As previously mentioned, many of the taxiways at ABI were originally designed prior to the implementation of the new TDG based pavement design standards. As taxiway pavement reconstruction projects are initiated on the taxiways designed to the old ADG based standards, the taxiway fillets should be updated to the current TDG IV standards.

Taxiway Layout Design Standards Based on Aircraft Design Group (ADG)

While taxiway pavement design is based on TDG, Taxiway Safety Areas (TSA), Taxiway Object Free Areas (TOFAs), and separation standards are based on the Aircraft Design Group (ADG) of the critical aircraft for a given taxiway. Unlike a taxiway's TDG which is based on the critical aircraft's landing gear configuration, the ADG is based on aircraft wingspan and tail height.

The vast majority of the taxiways at ABI were originally designed and have been maintained to ADG IV standards (171 ft. wide TSAs and 259 ft. wide TOFA). Taxiways A, A2, A3, and T appear to have been originally designed to ADG III standards (118 ft. wide TSA and 186 ft. wide TOFA) as they are only 50 ft. wide while the other taxiways are 75 ft. or wider.

Based on the Forecast Chapter, the critical aircraft at ABI is in the ADG III category. However, ABI regularly receives C-130's as well as diversions from DFW that are in the ADG IV category or larger. Due to their division traffic and because all of their air carrier taxiways have already been designed to ADG IV standards, ADG IV standards were applied to all the taxiways at ABI for this analysis.

Table 4-10, *Taxiway Standards Based on Aircraft Design Group*, below provides an overview of the ADG IV requirements applicable to ABI and the current TSA and TOFA dimensions.

Table 4-10
Taxiway Standards Based on Aircraft Design Group

Taxiway	Applicable Taxiway ADG	TSA (feet) Current	TSA (feet) FAA Standard	TSA (feet) Standard Met (Y/N)	TOFA (feet) Current	TOFA (feet) FAA Standard	TOFA (feet) Standard Met (Y/N)
A	III	118	118	Y	186	186	Y
A1	III	118	118	Y	186	186	Y
A2	III	118	118	Y	186	186	Y
A3	III	118	118	Y	186	186	Y
C	IV	150	171	Y	259	259	Y
C1	IV	150	171	Y	259	259	Y
C2	IV	150	171	Y	259	259	Y
C3	IV	150	171	Y	259	259	Y
C4	IV	150	171	Y	259	259	Y
D (south of TWY N)	IV	150	171	Y	259	259	Y
D1	IV	150	171	Y	259	259	Y
D2	IV	150	171	Y	259	259	Y
D3	IV	150	171	Y	259	259	Y
M	IV	150	171	Y	259	259	Y
N	IV	150	171	Y	259	259	Y
N1	IV	150	171	Y	259	259	Y
N2	IV	150	171	Y	259	259	Y
P	IV	150	171	Y	259	259	Y
Q	III	118	118	Y	186	186	Y
R	III	118	118	Y	186	186	Y
S	III	118	118	Y	186	186	Y
T	III	118	118	Y	186	186	Y

According to ABI's current FAA approved Airport Certification Manual (ACM), the air carrier taxiways are shown to have a Taxiway Safety Area (TSA) that is 150 ft. in width which is in-between the ADG III (118 ft.) and ADG IV (171 ft.) TSA standards. Based on this analysis it is recommended that ABI apply ADG IV standards to its air carrier taxiways. All the air carrier taxiways at ABI currently meet ADG IV TSA and TOFA standards so no improvements are required to meet the existing standards.

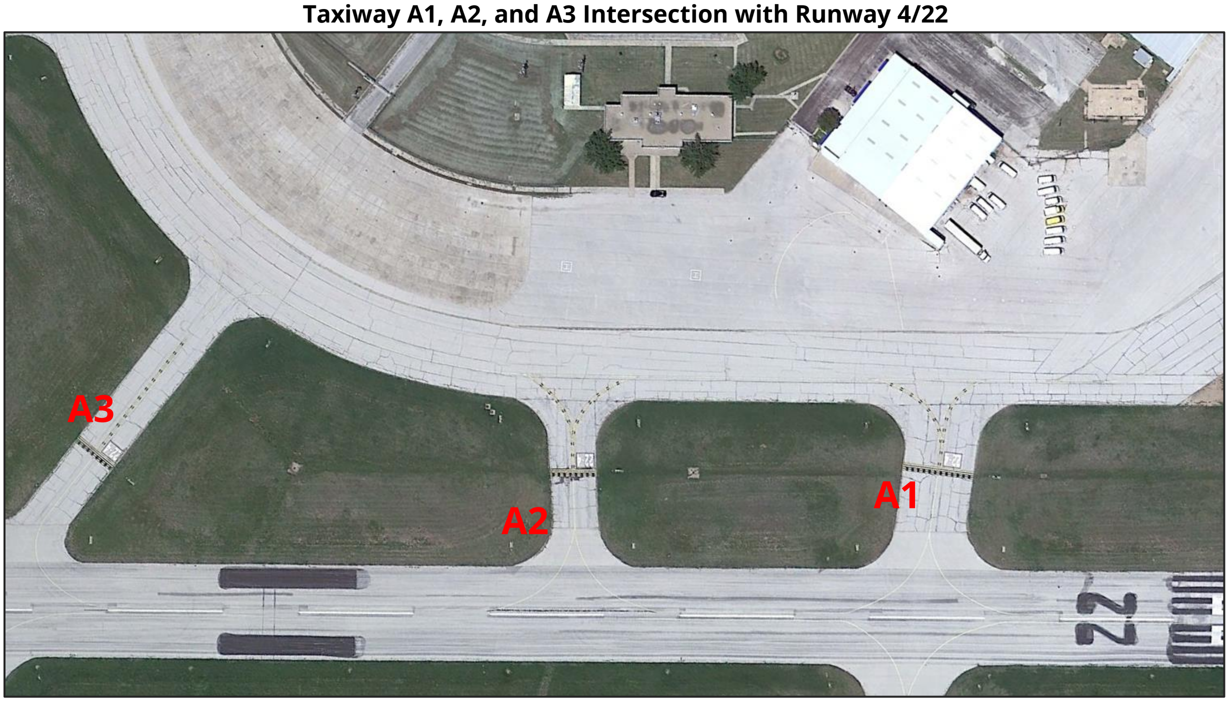
Taxiway Configuration Issues

Based on research, the FAA has identified a number of taxiway layout/configuration issues that have been shown to cause pilot confusion, which can lead to safety issues such as runway incursions. ABI has six existing taxiway configurations that are currently not recommended by the FAA. Each of the six taxiway configurations at ABI allows direct access from a ramp area to a runway without requiring a turn which has been shown to contribute to runway incursions. This issue occurs at the following locations on the airfield:

- Runway 4/22
  - Taxiway A1 intersection with Runway 4/22 (Northwest GA Ramp)
  - Taxiway A2 intersection with Runway 4/22 (Northwest GA Ramp)
  - Taxiway A3 intersection with Runway 4/22 (Northwest GA Ramp)
- Runway 17R/35L
  - Taxiway R intersection with Runway 17R/35L (Northwest GA Ramp)
  - Taxiway C3 Intersection with Runway 17R/35L (Abilene Aero Hangar)
  - Taxiway C1 intersection with Runway 17R/35L (Air Carrier Ramp)

None of these locations are considered "Hot Spots" and there is no history of runway incursions at these locations. Each of these intersections is shown in **Figures 4–7 through 4-10**.

Figure 4-7
Taxiway A1, A2, and A3 Intersection with Runway 4/22



Source: Garver, 2017

Figure 4-8
Taxiway R Intersection with Runway 17R/35L

Source: Garver, 2017

Figure 4-9
Taxiway C3 Intersection with Runway 17R/35L

Source: Garver, 2017

Figure 4-10
Taxiway C1 Intersection with Runway 17R/35L

Source: Garver, 2017

These issues will be addressed in the alternatives section of the document. No other prohibited/not-recommended taxiway configurations exist at ABI.

Airfield Lighting, Marking, and Signage Requirements

Sufficient and accurate airfield marking, lighting, and signage are essential to maintaining a high level of safety in an airport's daily operation. In this section the existing airfield lighting, marking, and signage will be reviewed in light of the established activity forecast to determine where improvements need to be made.

Runway Lighting, Marking, and Signage

Runway marking and lighting requirements vary based on the utilization characteristics of a runway including each runway's critical aircraft and instrument approaches.

Runway 17R/35L and Runway 17L/35R

Currently, Runway 17R/35L and Runway 17L/35R are equipped with high intensity runway edge lights (HIRL) that are controlled by the ATCT. The HIRLs are in good condition and were recently rehabilitated (2007 for Runway 17L/35R and 2009 for Runway 17R/35L). It is not expected that the HIRL system will need to be upgraded or replaced during the forecast period.

Runway Centerline Lightings and Touchdown Zone Lights (TDZ) are required on runways with Category (CAT) II or III Instrument Landing System (ILS) operations or any CAT I ILS runways with operations below 2,400 ft. visibility. The lowest IAP minimum at ABI is currently 2,400 ft. visibility for the CAT I ILS approach to Runway 35R. Based on the forecast it is not anticipated that lower IAP minimums will be needed during the forecast period. It is not anticipated that ABI will need to add runway centerline lights or touchdown zone lights during the forecast period.

Runway 17L/35R has precision instrument runway markings that are in good condition. Runway 17R/35L has non-precision instrument runway markings that are in good condition. If a precision instrument approach is added to Runway 17R/35L the runway markings will need to be upgraded (centerline increased to 36 inches in width, touchdown zone markings added, and side strip markings added).

Runway 17L/35R and Runway 17R/35L have appropriate and sufficient signage. There are no known issues that require modifications to the existing signage system for the runways at this time. As runways and taxiways are modified, changes to the signage system will need to be assessed.

Runway 4/22

Currently, Runway 4/22 is equipped with Medium Intensity Runway Edge Lights (MIRL). However, the circuit is out of service indefinitely. Since the Runway 4/22 area is being considered as a potential aeronautical development site, no improvements to the MIRL system are needed.

Runway 4/22 is also equipped with non-precision instrument runway markings. The markings are in poor condition. It is not expected that any additional instrument approaches will be developed for Runway 4/22. It is not expected that the markings for the runway will need to be changed. If Runway 4/22 is re-designated based on magnetic declination the runway designation markings will need to be changed to correspond to the new runway designation.

The signage for Runway 4/22 is also sufficient. No signage improvements are necessary.

Taxiway Lighting, Marking, and Signage

Lighting

Taxiways C, C1, C2, C3, C4, D, D1, D2, D3, R, M, N, N1, N2, and P are the taxiways available for air carrier use and each of these taxiways is illuminated by medium intensity taxiway edge lights. These taxiway edge light circuits are in good condition. Since ABI does not conduct air carrier operations below 1,200 RVR and there are no reported issues related to aircraft missing taxiways turns, taxiway centerline lights are not required. Additionally, since there are no reported runway incursion issues at ABI, there is no need to install runway guard lights (elevated or in-pavement) at any of the runway/taxiway intersections at this time.

Taxiways A, A1, A2, A3, Q, S, and T are not available for air carrier use. Each of these taxiways is unlit but they do have taxiway centerline reflectors. Since most of these taxiways are associated with Runway 4/22 and the area is being considered as a potential site for an aeronautical development, no lighting improvements are needed.

Markings

All paved taxiways should be painted with standard taxiway markings as prescribed in FAA Advisory Circular 150/5340-1 (current series), *Standards for Airport Markings*. All taxiways at ABI have taxiway centerline markings and enhanced taxiway centerline markings where required. These markings all appear to be in good condition.

Surface painted runway hold position signs and runway hold position markings are painted on all runway/taxiway intersections. These markings are in good condition with the exception of the surface painted signs along Runway 4/22 which are faded and in fair condition.

No major marking modifications are expected to be needed during the forecast period.

Signage

ABI has an airfield signage system that provides guidance to aircraft operators regarding their location on the airfield and the location of significant facilities. ABI has an FAA-approved Airfield Signage and Marking Diagram that is part of their Airport Certification Manual (ACM). The airfield signage at ABI is in good condition. ABI staff have not received any inquiries from pilots stating that a portion of the existing signage system is confusing or misleading. There have been no reported runway incursions were airfield signage was listed as a contributing factor. No major signage changes should be needed during the forecast period.

Approach Lighting Systems

An Approach Lighting System (ALS) provides the basic means to transition from instrument flight to visual flight for landing. ALS is a configuration of signal lights starting at the landing threshold and extending into the approach area a distance of 2400-3000 ft. for precision instrument runways and 1400-1500 ft. for non-precision instrument runways. Some systems include sequenced flashing lights that appear to the pilot as a ball of light traveling towards the runway at high speed blinking twice per second.

Operational requirements dictate the sophistication and configuration of the ALS for a particular runway. Depending on the type of approach, certain ALS are required to aid pilots in the identification of the airport environment during instrument meteorological conditions.

These requirements are found in FAA AC 150/5300-13 (current edition). It should be noted that ALS systems are required for runways with precision instrument approaches.

ABI currently has a 1,400 ft. Medium Intensity Approach Light System with Runway Alignment Indicator Lights (MALSR) for the ILS approach for Runway 35R. The Runway Alignment Indicator Lights for the MALSR extend an additional 1,000 ft. making the total length of the MALSR system 2,400 ft.

Future consideration for a new ALS will be predicated on user needs, instrument approach minimum requirements, and the restrictions of surrounding property and land use. The MALSR for Runway 35R should be sufficient during the forecast period. However, if a precision instrument approach is added to Runway 17R, an ALS for that runway will need to be added. This will be considered in the alternatives chapter.

Runway End Identifier Lights

Runway End Identifier Lights (REILs) provide rapid and positive identification of the approach end of a runway. The system consists of a pair of synchronized flashing white strobes located laterally along the runway threshold. REILs are typically installed along with threshold lights at each runway end. REILs are not commonly needed unless an airport is situated in an area of heavy light pollution where identifying the approach end of the runway may be difficult.

Currently, ABI has a set of REILs at the approach end of Runway 35L. Runway 35L is currently the only air carrier runway at ABI without a straight-in instrument approach. Currently, only a circling instrument approach to the runway can be conducted. REILs can aid pilots in identifying a runway end during circling approaches. It is expected that the REILs to Runway 35L should remain until a straight-in instrument approach is established for the runway.

Wind Cone/Segmented Circle/Airport Beacon

The center-field windsock and segmented circle at ABI are located approximately 200 ft. south of the Intersection of Taxiway M and P, adjacent to the ARFF station. The wind cone apparatus and the segmented circle are in good condition.

There are supplemental lighted windsocks at the approach ends of Runway 35R and 17R (close to the intersection with Runway 4/22) that are in good condition. Additionally, there is an unlighted windsock at the approach end of Runway 35L. As part of the alternatives chapter, the feasibility of adding a lighted windsock to the approach ends of Runway 35L and 17L will be considered.

The airport beacon at ABI is located north of the Terminal Ramp and west of the existing terminal building. The rotating beacon is in good condition and it is not expected that it will need to be replaced during the forecast period.

Airfield Lighting Vault

As stated in the Inventory Chapter, ABI currently has two airfield lighting vaults. The main vault is located adjacent to the terminal building and it houses the regulators for all the airfield lighting circuits except Runway 4/22. The main airfield lighting vault is in good condition, and it is not expected that it will need to be substantially modified during the forecast period.

The regulator for Runway 4/22 is located adjacent to the AvFuel office building on the Northwest GA apron and it is inoperative. Since it is expected that Runway 4/22 will be closed at some point during the forecast period, no improvements or modifications to the existing facility for Runway 4/22 will be considered in the alternatives chapter.

NAVAIDs

Airport Navigation Aids (NAVAIDs) are installed on or near an airport to increase the airport's reliability during night and inclement weather conditions and to provide electronic guidance and visual references for executing an approach to the airport or runway.

FAA Order 7031.2C, *Airport Planning Standard Number One - Terminal Air Navigation Facilities and Air Traffic Control Services*, specifies minimum activity levels to qualify for instrument approach equipment and approach procedures. As forecast in the previous chapter, approximately 11,314 instrument operations (approaches and takeoffs) will be conducted annually under IFR flight rules by the end of the 20-year planning period. The following describes the status of existing and new NAVAIDs used at general aviation airports.

Visual Guidance Slope Indicators

Typical visual guidance slope indicators (VGSI) provide a system of sequenced colored light beams providing continuous visual descent guidance information along the desired final approach descent path (normally at 3 degrees for 3 nautical miles during daytime, and up to 5 nautical miles at night to the runway touchdown point). The system normally consists of two Precision Approach Path Indicator lamp housings (PAPI-2) or four (PAPI-4) lamp housing units installed 600 to 800 ft. from the runway threshold and offset 50 ft. to the left of the runway edge.

Runways 17L, 17R, and 35L are equipped with 4-light PAPI systems. Each of the units is in good condition. Consideration will be given in the alternatives chapter regarding adding a PAPI to Runway 35R.

Very High Frequency Omni-Directional Radio Range

The Very High Frequency Omni-Directional Radio Range (VOR/VORTAC) system emits a very high frequency radio signal utilized for both enroute navigation and non-precision approaches.

It provides the instrument rated pilot with 360 degrees of azimuth information oriented to magnetic north. Due to the recent development of more precise navigational systems, it is planned to be phased-out by the FAA.

ABI is served by the Abilene VORTAC, located 9.3 nautical miles northwest of ABI, and the Tuscola VOR/SME located 13 nautical miles southwest of ABI. The Abilene VORTAC is utilized for the VOR-A approach, the ILS approach for Runway 35, and the LOC approach for Runway 17R. The Tuscola VOR/DME is utilized for the ILS approach for Runway 35R and the LOC approach for Runway 17R. A VOR approach to Runway 14 exists but the minimums for that approach are higher than the established GPS approach. With the FAA's migration toward GPS based approaches and enroute navigation, it is not expected that any additional VOR will be needed in the area.

Global Positioning System

Global positioning system (GPS) is a highly accurate worldwide satellite navigational system that is unaffected by weather and provides point-to-point navigation by encoding transmissions from multiple satellites and ground-based data-link stations using an airborne receiver. GPS is presently FAA-certified for enroute and instrument approaches into numerous airports. The current program provides for GPS stand-alone and overlay approaches where GPS fixes are overlaid on top of an existing approach (typically NDB or VOR approaches). Recently, the selective availability segment of the channel was decommissioned, thereby enhancing the accuracy of the GPS signal. The Wide Area Augmentation System (WAAS) is being installed at or near airports to provide a signal correction enabling GPS precision approaches (commonly called GPS approaches with LPV minimums).

A straight-in area navigation instrument approach is available to Runways 17L, 22, and 35R utilizing GPS signals and on-aircraft receivers to guide aircraft to a safe landing at ABI. No GPS approaches currently exist to Runway 4, 17R, or 35L. GPS based approaches for Runway 17R and 35L will be considered in the alternatives chapter.

Weather Observing System

Automated Weather Observation Systems (AWOS) and Automated Surface Observation Systems (ASOS) consist of various types of sensors, a processor, a computer-generated voice subsystem, and a transmitter to broadcast minute-by-minute weather data from a fixed location directly to the pilot. The information is transmitted over the voice portion of a local NAVAID (VOR or DME), or a discrete VHF radio frequency. The transmission is broadcast in 20-30 second messages in standard format and can be received within 25-nautical miles of the automated weather site.

At airports with instrument procedures, an AWOS/ASOS weather report eliminates the remote altimeter setting penalty, thereby permitting lower minimum descent altitudes (lower approach minimums). These systems should be sited within 500 to 1,000 ft. of the primary runway centerline. FAA Order 6560.20B, *Siting Criteria for Automated Weather Observing Systems*, assists in the site planning for AWOS/ASOS systems.

ABI is equipped with an ASOS that is owned and operated by the National Weather Service. The ASOS is in good condition and is not expected to need to be modified/improved during the forecast period.

Instrument Landing System (ILS)

Instrument Landing Systems (ILS) are a ground-based navigation system, composed of a localizer and glideslope that provide vertical and horizontal guidance to pilots when conducting an instrument approach to a runway during inclement weather. Today, ILS systems are still the primary instrument approach system utilized at commercial service airports across the United States. However, with the FAA's migration to GPS based approaches and enroute navigation, the need for ILS systems is expected to decrease in the future.

Currently, ABI has an instrument landing system for Runway 35R. The system is in good condition. Due to the FAA's migration to GPS based instrument approach procedures, it is not expected that an additional ILS system will be needed at ABI.

Localizer System (LOC)

Localizer systems (LOC) are similar to ILS systems but the glide slope, which provides vertical guidance to pilots when conducting an ILS approach, is not present. Consequently, when conducting a localizer approach a pilot is only provided with horizontal guidance that tells them whether they are properly aligned with the runway centerline. Currently, ABI has a localizer approach to Runway 17R and the system is in good condition.

As previously discussed in this chapter, Runway 17R should be evaluated for a GPS based precision instrument approach. The existing localizer system should remain in place to support instrument approaches for aircraft that are not equipped with the proper GPS equipment to be able to execute a GPS based approach.

Airspace

The term "airspace" is frequently used when discussing the areas surrounding an airport. There are a number of different categories/types of airspace that must be considered as part of the airport master planning process. These include:

- Airspace Classification for Aeronautical Operators (e.g. Class B, C, D, etc.)
- FAR Part 77 – Imaginary Surfaces

Airspace Classification for Aeronautical Operators

The current airspace surrounding ABI is classified as Class C airspace. As the aeronautical operations levels are not expected to change significantly during the forecast period it is not expected that the current airspace classification will need to be changed during the 20-year planning horizon.

FAR Part 77 – Imaginary Surfaces

The 14 CFR Part 77, *Safe, Efficient Use, and Preservation of the Navigable Airspace*, provides standards and procedures to protect the continued safe and efficient use of airspace. 14 CFR Part 77.19, *Civil Airport Imaginary Surfaces*, defines the five civil imaginary surfaces related to airports. To ensure the continued safe and efficient use of the airspace surrounding an airport, it is important that the five civil airport imaginary surfaces remain clear of any obstructions that could pose a hazard to air navigation. It should be noted that some objects may be located within an airport's imaginary surfaces as long as they have been properly marked/lighted and an airspace review has been completed and determined that the object will not adversely affect the safe and efficient use of the local airspace.

The five civil airport imaginary surfaces described in 14 CFR Part 77 are defined below:

- Primary Surface - A surface longitudinally centered on a runway. When the runway has a specially prepared hard surface, the primary surface extends 200 ft. beyond each end of that runway; but when the runway has no specially prepared hard surface, the primary surface ends at each end of that runway. The elevation of any point on the primary surface is the same as the elevation of the nearest point on the runway centerline.
- Approach Surface - A surface longitudinally centered on the extended runway centerline and extending outward and upward from each end of the primary surface. An approach surface is applied to each end of each runway based upon the type of approach available or planned for that runway end.
- Horizontal Surface - A horizontal plane 150 ft. above the established airport elevation, the perimeter of which is constructed by swinging arcs of specified radii from the center of each end of the primary surface of each runway of the airport and connecting the adjacent arcs by lines tangent to those arcs.
- Conical Surface - A surface extending outward and upward from the periphery of the horizontal surface at a slope of 20 to 1 for a horizontal distance of 4,000 ft.
- Transitional Surface - These surfaces extend outward and upward at right angles to the runway centerline and the runway centerline extended at a slope of 7 to 1 from the sides of the primary surface and from the sides of the approach surfaces. Transitional surfaces for those portions of the precision approach surface which project through and beyond the limits of the conical surface, extend a distance of 5,000 ft. measured horizontally from the edge of the approach surface and at right angles to the runway centerline.

Based on the criteria described in 14 CFR Part 77, the five civil imaginary surfaces for ABI are described below:

- Runway 17L/35R
    - Primary Surface – 1,000 ft. wide x 200 ft. past each runway end
    - Approach Surface Runway 35R – 50:1 slope for first 10,000 ft. and a 40:1 slop for an additional 40,000 ft. Inner width of the approach surface is 1,000 ft. wide and expands to 16,000 ft. wide.
    - Approach Surface Runway 17L – 34:1 slope for 10,000 ft. Inner width of the approach surface is 1,000 ft. wide and expands to 4,000 ft. wide.
- Runway 17R/35L
    - Primary Surface – 500 ft. wide x 200 ft. past each runway end
    - Approach Surface Runway 17R – 34:1 slope for 10,000 ft. Inner width of the approach surface is 500 ft. wide and expands to 4,000 ft. wide.
    - Approach Surface Runway 35L – 20:1 slope for both runway ends for 5,000 ft. Inner width of the approach surface is 500 ft. wide and expands to 1,500 ft.
- Runway 4/22
    - Primary Surface – 500 ft. wide x 200 ft. past each runway end
    - Approach Surface Runway 22 – 34:1 slope for 10,000 ft. Inner width of the approach surface is 500 ft. wide and expands to 4,000 ft. wide.
    - Approach Surface Runway 4 – 20:1 slope for both runway ends for 5,000 ft. Inner width of the approach surface is 500 ft. wide and expands to 1,500 ft.
- Non-Runway Specific Surfaces
    - Horizontal Surface – Flat surface established at an elevation 1,940.6 ft. (150 ft. above field elevation). Perimeter is based on 10,000 ft. arcs swung from the ends of Runway 17L, 17R, and 35R and a 5,000 ft. arc swung from the end of Runway 35L.
    - Conical Surface – Extends from the edges of the Horizontal surface for a horizontal distance of 4,000 ft. at a 20:1 slope.
    - Transitional Surface – Extends from the edges of the primary surface until it reaches the horizontal surface and from the edges of the approach surfaces until it reaches the horizontal surface or for a horizontal distance of 5,000 ft.

These surfaces are depicted in the Airspace Drawing that is included as part of the Airport Layout Plan. ABI has no existing FAR Part 77 surface penetrations that need to be considered in the alternatives chapter.

Airfield Capacity and Delay Analysis

The FAA's standard method for determining airport capacity and delay for long-range planning purposes can be found in Advisory Circular (AC) 150/5060-5 (current edition), *Airport Capacity and Delay*. For this portion of the analysis, generalized airfield capacity was calculated in terms of:

1) Hourly capacity of runways
2) Annual Service Volume (ASV)

This approach utilizes the projections of annual operations by the proposed fleet mix as projected in the Forecast Chapter, Chapter 3, while considering a variety of other factors that are described below.

Airport Characteristics

In addition to the aviation activity forecasts, a number of an airport's characteristics and operational considerations are required in order to properly conduct an FAA capacity and delay analysis.

These elements include:

- Runway Configuration
- Taxiway Configuration
- Aircraft Mix Index
- Operational Characteristics
- Meteorological Conditions

When analyzed collectively, the above elements provide the basis for establishing the generalized operational capacity of an airport as expressed by Annual Service Volume. The following sections evaluate each of these characteristics with respect to Abilene Regional Airport.

Runway Configuration

The runway configuration is one of the primary factors that determine airfield capacity. The capacity of a two or more-runway system is substantially higher than an airport with a single runway. If runways intersect, the capacity is generally not as great as in a parallel runway layout because operations on the second runway are not possible until the aircraft on the first runway has cleared the intersection point.

As previously mentioned, ABI has two offset parallel runways (Runway 17L/35R and 17R/35L) that are available for air carrier use and a shorter crosswind runway (Runway 4/22) that is primarily used by smaller aircraft when needed due to wind conditions. Since it is expected that Runway 4/22 will be closed at some point during the 20-year planning horizon and is not currently used on a daily basis, it has been excluded from this analysis to focus on the capacity and delay inherent with the utilization of the parallel runway system.

Taxiway Configuration

The distance an aircraft has to travel to an exit taxiway after landing also sets limits on the airfield capacity. Larger aircraft require more distance to slow to a safe speed before exiting the runway. Thus, they require greater runway occupancy times. If taxiways are placed at the approximate location where the aircraft would reach safe taxiing speed, the aircraft can exit and clear the runway for another user. However, if the taxiway is spaced either too close or too far from the touchdown zone, the aircraft will likely spend more time on the runway than if the taxiway had been in the optimal location. Based on ABI's current and forecasted fleet mix, the optimal location for exit taxiways is in a range from 3,000 ft. to 5,500 ft. from the landing threshold with each exit separated by at least 750 ft. Based on the FAA criteria, the exit factor within the formula is maximized when a runway has four exit taxiways within the optimal range.

ABI currently has one exit taxiway within this range for Runway 17L, 17R, and 35L. Runway 35R has two exits available within this range.

Aircraft Mix Index

The operational fleet at an airport influences an airfield's capacity based upon differing aircraft requirements. Various operational separations are set by the FAA for a number of safety reasons. An airfield's capacity is the time needed for the aircraft to clear the runway either on arrival or departure. As aircraft size and weight increases, so does the time needed for it to slow to a safe taxing speed or to achieve the needed speed for takeoff. Thus, a larger aircraft generally requires more runway occupancy time than a smaller aircraft. As additional larger aircraft enter an airport's operating fleet, the lower the capacity will likely be for that Airport.

There are four categories of aircraft used for capacity determinations under the FAA criteria. These classifications are based upon the maximum certificated takeoff weight, the number of engines, and wake turbulence classifications. The aircraft indexes and characteristics are shown in the following table, **Table 4-11,** *Aircraft Classifications*, and the following figure, **Figure 4-11**, *Cross Section of Aircraft Classifications*.

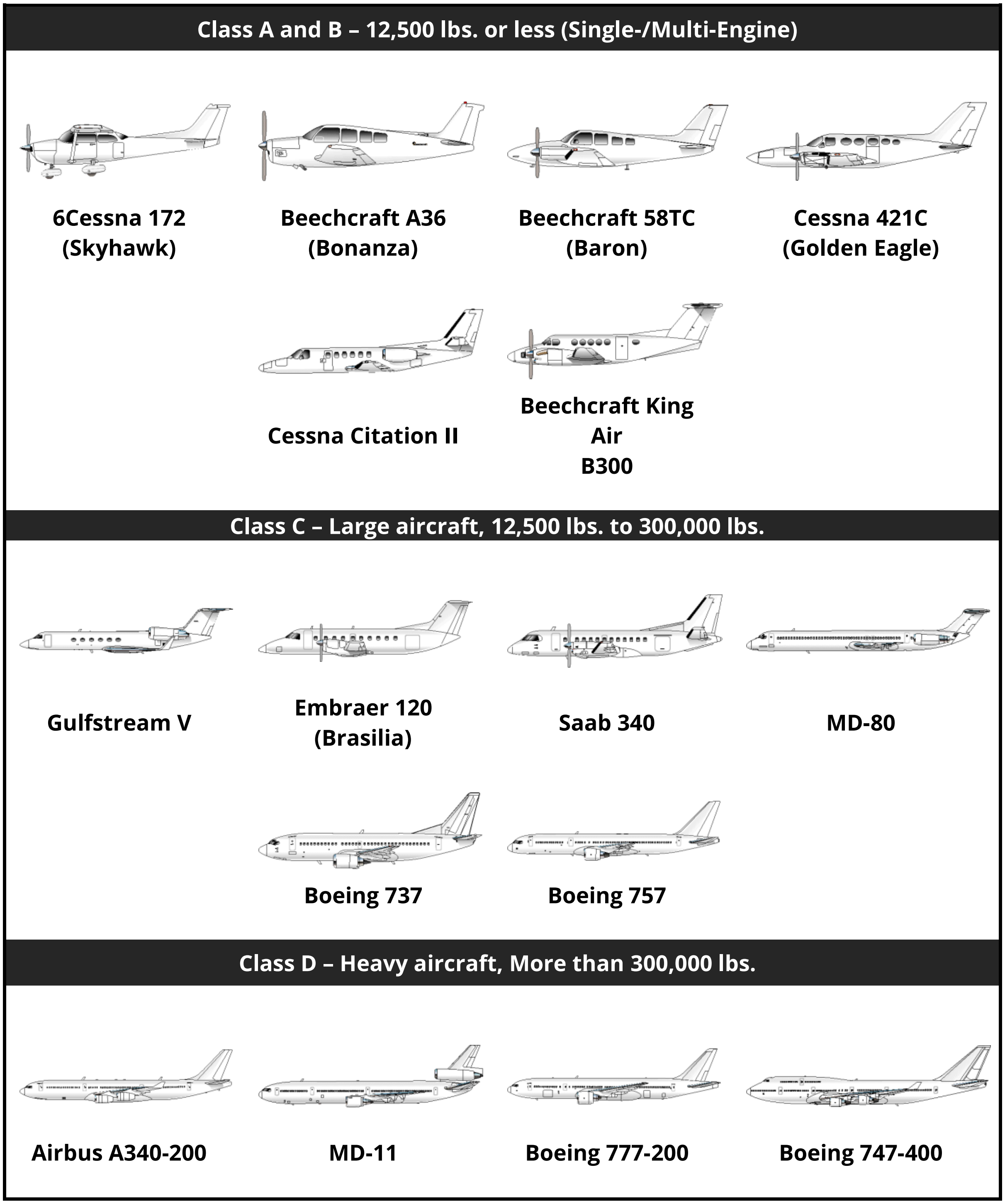
Table 4-11
Aircraft Classifications

Aircraft Class	Maximum Certificated Takeoff Weight (lbs)	Number of Engines	Wake Turbulence Classification [1]
A and B	Under 12,500	Single-/Multi-	Small
C	12,500 – 300,000	Multi-	Large
D	Over 300,000	Multi-	Heavy

Source: FAA Advisory Circular 150/5360-5, Change 2, *Airport Capacity and Delay*.
[1] Wake turbulence classifications as defined by the FAA, Small – Aircraft of 41,000 lbs. maximum certificated takeoff; Large – Aircraft more than 41,000 lbs certificated takeoff weight, up to 255,000 lbs: Heavy – Aircraft capable of takeoff weights of more than 255,000 lbs whether or not they are operating at this weight during a particular phase of flight.

These classifications are used to determine the mix index, which is required to calculate the theoretical capacity of an airfield. The mix index is defined as the percent of Class C aircraft plus three (3) times the percent of Class D aircraft, reflected as a percentage (C+3D). The percent of A and B class aircraft do not count towards the calculation of the mix index due to the quick dissipation of turbulence produced by this category. Using the FAA formula, the aircraft mix for ABI is expected to be approximately 35 during the planning horizon.

Figure 4-11
Cross Section of Aircraft Classifications



Source: Dr. Antonio Trani, Department of Civil Engineering, Virginia Tech University.

Airfield Operational Characteristics

Operational characteristics that can affect an airfield's overall capacity include the percent of aircraft arrivals and the percent of touch-and-go operations.

Percent of Aircraft Arrivals

The percent of aircraft arrivals is the ratio of landing operations to the total operations for the airport. This percent is considered due to the fact that aircraft approaching an airport for landing require more runway occupancy time than an aircraft departing the airfield. The FAA methodology used provides for computing airfield capacity with a 40%, 50%, or 60% of arrivals. For the purposes of capacity and delay calculations, the 50% arrivals factor was used.

Percent of Touch-and-Go Operations

The percent of touch-and-go operations plays a critical role in the determination of airport capacity. Touch-and-go operations are defined as an aircraft touching down on the runway and immediately taking off again without stopping. Touch-and-go operations are typically associated with flight training activity. It is estimated that the total number of touch-and-go operations at ABI is less than 10% of total operations.

Meteorological Conditions

Aircraft operating parameters are dependent upon the weather conditions, such as cloud ceiling height and visibility range. As weather conditions deteriorate, pilots must rely on instruments to define their position both vertically and horizontally. Capacity is lowered during such conditions because the FAA requires aircraft separation increases for safety reasons. Additionally, some airports may have limitations with regards to their instrument approach capability which also impacts capacity during inclement weather. The FAA defines three (3) general weather categories, based upon the ceiling height of clouds above ground level and visibility.

- Visual Flight Rules (VFR): Cloud ceiling is greater than 1,000 ft. above ground level (AGL) and the visibility is at least 3 statute miles
- Instrument Flight Rules (IFR): Cloud ceiling is at least 500 ft. AGL but less than 1,000 ft. AGL and/or the visibility is at least 1 statute mile but less than 3statute miles
- Poor Visibility and Ceiling (PVC): Cloud ceiling is less than 500 ft. AGL and/or the visibility is less than 1 statute mile

According to 2016 ASOS data, ADS observes VFR conditions approximately 91% of the time, IFR conditions approximately 6% of the time, and PVC conditions approximately 3% of the time.

Hourly Capacity of Runways

Hourly capacity of a runway system measures the maximum number of aircraft operations that can be accommodated by an airport's runway configuration in one hour. This capacity is calculated by analyzing the appropriate series of graphs and tables for VFR and IFR conditions within FAA (AC) 150/5060-5. From these figures, the hourly capacity is calculated by multiplying the hourly capacity base, the touch-and-go factor, and the exit factor together. The equation for this formula is:

Hourly Capacity = C* x T x E

where: C* = hourly capacity base
T = touch-and-go factor
E = exit factor

The airport's calculated hourly capacity can be seen in the following table, **Table 4-12**, *Hourly Capacity*.

Table 4-12
Hourly Capacity

Year	VFR Operations	IFR Operations	Weighted Hourly Capacity (Cw)
2017	135	75	113.95
2022	135	75	113.95
2027	135	75	113.95
2032	135	75	113.95
2037	135	75	113.95

Source: FAA Advisory Circular 150/5360-5, Change 2, Airport Capacity and Delay.

Annual Service Volume

Under the FAA methodology, the most important value that must be computed to evaluate the capacity at an airport is the annual service volume (ASV). ASV represents a measure of the approximate number of total operations that an airport can support annually. Using the FAA's methodology to estimate ASV, the ratio of annual operations to average daily operations, during the peak month, must first be calculated along with the ratio of average daily operations to average peak hour operations, during the peak month. These values are then multiplied together resulting in a product to be multiplied by the weighted hourly capacity.

The equation used to calculate ASV is:

Annual Service Volume = Cw x D x H

where: Cw = weighted hourly capacity
D = ratio of annual operations to average daily operations during the peak month
H = ratio of average daily operations to average peak hour operations during the peak month

The Airport's ASV, as calculated based on the method above, can be seen in the following table, **Table 4-13**, *Annual Service Volume (ASV).*

Table 4-13
Annual Service Volume (ASV)

Year	Forecasted Annual Operations	Forecasted Peak Hour Operations	Computed ASV	Forecasted Operations % of ASV (% Capacity)
2017	46,223	16	331,887	13.9%
2022	45,982	16	331,887	13.8%
2027	46,448	16	331,887	14%
2032	46,717	16	331,887	14.1%
2037	47,143	16	331,887	14.2%

Source: FAA Advisory Circular 150/5360-5, Change 2, Airport Capacity and Delay.

Aircraft Delay

ABI currently has excess capacity and is forecasted to continue to have excess capacity during the forecast period. Consequently, the average delay per aircraft is estimated to be less than 1 minute. The total annual delay is also estimated to be negligible. Based on this analysis it is estimated that most aircraft delays will be due to circumstances outside the design capacity of ABI's airfield.

Delay and Capacity Analysis Summary

Based on the results of this analysis it is not expected that airfield delay and capacity will be an alternative consideration during the forecast period.

Airfield/Airspace Facility Requirements Summary

Based on airfield/airspace facility requirements defined previously in this document, the following airfield/airspace development objectives have been created to guide the alternatives development process:

Runways:

- Evaluate the feasibility of extending Runway 17R/35L or 17L/35R to at least 8,500 ft. to accommodate future traffic.
- Evaluate the feasibility of adding a GPS based precision instrument approach to Runway 17R and a GPS based non-precision instrument approach to Runway 35L.
- Evaluate the feasibility of adding an approach lighting system to Runway 17R to complement the proposed precision instrument approach for that runway.
- Gain sufficient control over the land outside of airport property but within the RPZ for Runway 17L, 17R, and 35R.
- Address the deficiency of the runway hold position markings for Runway 4/22.
- Add a four-light PAPI system to Runway 35R.

Taxiways

- Update all taxiway fillets that were designed to the older ADG based taxiway design standards as part of upcoming pavement rehabilitation projects.
- Resolve the prohibited taxiway configuration issues. Currently, there are six taxiways that allow direct access from a ramp area to a runway without requiring an aircraft to make a turn.

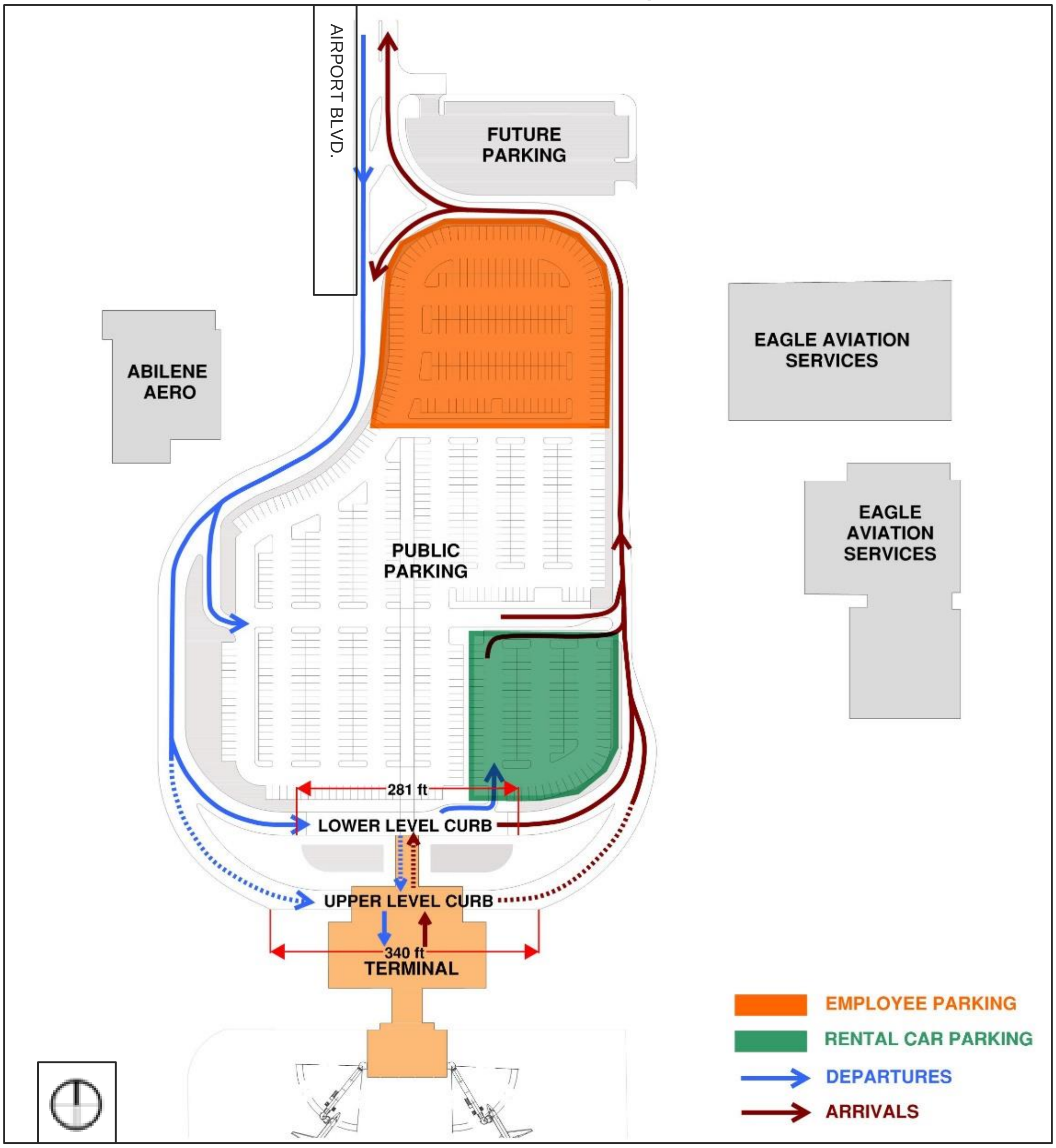
Landside/Roadway Facility Requirements

Landside facilities include the airport access roads, curbside areas, and parking facilities that accommodate passenger movement, vehicle parking, and ground transportation services such as car rental, shuttle, cab, and/or Transportation Network Companies (TNCs). Landside facilities at ABI are displayed in **Figure 4-12**, *Landside Facilities Map.*

TNCs are defined as companies that provide prearranged transportation services using an online-enabled application or platform to connect passengers with drivers using their personal, non-commercial, vehicles. Two of the biggest TNC companies in operation today are Uber and Lyft.

For this analysis, it was assumed that there will not be a significant change in the relative availability, convenience, or price of the various landside modes or facilities over the planning period.

Figure 4-12
Landside Facilities Map



Source: Corgan, 2018

Automobile Access/Circulation and Parking

Ground Transportation Trends

Emerging trends in ground transportation include the increase in popularity of TNCs and the development of autonomous vehicles.

TNCs are already commonplace today and their popularity is expected to continue to rise. Based on a Goldman Sachs study, it was estimated that 15 million TNC trips occurred world-wide on a daily basis in 2017. By 2030, that number is expected to increase to 97 million trips per day.

Autonomous vehicles, while still a new and emerging technology, are expected to become more commonplace during the forecast period. An autonomous vehicle is defined as a vehicle with features that allow it to accelerate, brake, and steer with limited or no driver interaction. A March 3, 2017 report published by *Forbes* magazine (https://www.forbes.com/sites/oliviergarret/2017/03/03/10-million-self-driving-cars-will-hit-the-road-by-2020-heres-how-to-profit/?sh=15f367a27e50) states that 25% of vehicles on the road will be autonomous by the year 2030.

These trends will have an impact on the utilization of landside facilities at airports as more people begin to use them. In general, it is expected that the proliferation of TNCs and autonomous vehicles will result in an increase in demand for curbside space and a decrease in demand for parking facilities.

Airport Roadways Signage

The access and circulation roads at ABI are asphalt roads in good condition and are devoid of potholes. However, the curvilinear geometry of the roads creates a limited sight distance for vehicles circulating within the landside area. Portions of the ABI roadway are shown in **Figure 4-13**, *Upper & Lower Level Access Roads*, and **Figure 4-14**, *Upper Level Curb*.

On-airport wayfinding signage is provided at several locations along airport roadways to guide vehicle traffic to a variety of destinations. Proceeding south towards the terminal on Airport Boulevard and further onto Airport Parking Circle, multiple signs with plain arrows (as shown in **Figure 4-15**, *Access Road Signage,* and **Figure 4-16**, *Exit Signage)* provide guidance to airport patrons on where to access and exit the terminal area, parking area, rental car return, and Abilene Aero. These signs are not consistent in terms of color, size, and overall visual style. Additionally, the location of each sign (driver's side or passenger's side of the roadway) varies. In an effort to improve an airport patron's ability to find their intended destination, it is recommended that the existing roadway signage be replaced with new signage that has a consistent color, size, style, and location.

Figure 4-13
Upper & Lower Level Access Roads

Source*:* Corgan, 2018

Figure 4-14
Upper Level Curb

Source: Corgan, 2018

Figure 4-15
Access Road Signage

Source: Corgan, 2018

Figure 4-16
Exit Signage

Source: Corgan, 2018

Off-Airport Roadways Signage

Approaching Airport Boulevard from TX-36, two signs indicate a turn for merging onto Airport Boulevard, one for vehicles coming from the north and one from the south. There is a marquee airport entrance sign located at the intersection of TX-36 and Airport Boulevard. However, the entrance sign is not easily visible when traveling northbound on TX-36 making the airport entrance easy to miss. Modifications to the actual sign or the location of the sign are recommended to improve visibility of the sign for traffic flowing in both directions on TX-36, but particularly for northbound vehicles.

Additionally, there is limited signage on Loop 322 for the airport. This issue should be reviewed and discussed with TxDOT to identify opportunities to improve directional signage to the airport along Loop 322.

Departure Curb Capacity

Facility requirements, capacity, and performance of an airport's roadways are evaluated based on Level of Service (LOS) standards discussed in Airport Cooperative Research Program (ACRP) Report #25, *Airport Passenger Terminal Planning and Design*.

A roadways LOS is determined based on the congestion and delay vehicles experience when utilizing the roadways. Based on the congestion and delay experienced a roadways LOS category (A-F) can be estimated. LOS Category A roads have little to no congestion/delay while LOS Category F roads common have severe congestion/delay.

Using these standards and terminal curbside field observations, curb and roadway requirements can be calculated. The factors that can affect a roadway's given Level of Service (LOS) include the number of lanes, the length of the curbs, and how the curb roadways are allocated and managed. Table **4-14.**

Table 4-14, *Departure Curbside Length Requirements Analysis,* summarizes the departure curb requirements for all scenarios as well as the existing curb conditions at ABI. The existing terminal has an upper level departures curb that measures 340 linear ft. and a lower level arrivals curb that measures 281 linear ft. Combined, the two curbs provide the existing terminal with a curbside total of 621 linear ft.

Passengers being dropped off at ABI throughout the planning horizon are likely to be dropped off by private vehicle, TNCs, or autonomous vehicles. As mentioned previously, autonomous vehicles are expected to be more common by 2030 but they will not completely replace driver operated vehicles. They are expected to be adopted in major metropolitan areas first and then permeate to smaller communities. To account for the potential pace that the new technology will be adopted in and around Abilene, it was assumed that approximately 30% of passengers departing ABI will be dropped off by one of these 3 transportation modes with the remaining 70% of departing passengers driving to the airport and parking their vehicles in public parking spaces or returning rental cars. This represents a Modal Split (the percentage of travelers using a particular type of transportation) of 30%. Through field observations at airports throughout the country, the typical dwell time for passengers being dropped off by the 3 transportation modes is 60-90 seconds depending on whether a vehicle was dropping off or picking-up passengers, ease of circulation, and congestion on the curb roadways.

For the purpose of this analysis, a dwell time of 60 seconds was used for vehicles dropping off departing passengers as this was consistent with curbside operations observed at ABI and other regional airports of similar size. Contributing factors to departure curbside dwell time include low congestion on the roadway meaning that vehicles do not often find themselves boxed in between other vehicles operating on the curbside preventing them from being able to move off the curb after dropping off a passenger.

In scenario 1, there are 71 Peak Hour Departing Passengers (PHDP). Based on the aforementioned modal split of 30%, during the peak hour, 21 passengers would be dropped off by TNCs, autonomous vehicles, or traditional vehicles (30%), and 50 passengers would park vehicles in the ABI parking lot or return a rental car (70%). A 30-minute peaking factor was assumed where 60% of the PHDP passengers would be dropped off in a 30-minute period. Assuming the same 30% modal split, 13 passengers would be dropped off at the airport by TNCs, autonomous vehicles, or traditional vehicles and 29 passengers would be parking in the ABI parking lot or return a rental car. This assumption is in line with expert expectations for the utilization of the modes of transportation previously mentioned. A 15-minute peaking factor was also established. The 15-minute peaking period assumes that 50% of the 30-minute peaking period passengers would arrive during the same 15-minute period. Consequently, the 15-minute peaking period establishes that 6 passengers would be dropped off by TNCs, autonomous vehicles, or traditional vehicles. Using a vehicle length of 25 ft. which is representative of a large SUV, it was determined that 53 linear ft. of curbside will be required to accommodate departing passengers dropped off during a 5-minute peak period.

For scenario 4 where the PHDP is 86, the 30-minute peaking period equals 15, meaning that approximately 15 passengers will arrive within a 30-minute period. This leads to 8 passengers arriving during a 15-minute peaking period which coupled with a 25-foot vehicle length leads to a required curbside length of 65 linear ft. to accommodate passengers dropped off during a 5-minute peaking period.

Based on this analysis, the existing departure curbside is sufficient to accommodate all four future scenarios as shown in **Table 4-14.**

Table 4-14
Departure Curbside Length Requirements Analysis

	PHDP	Mode Split	30 MIN Peaking at 60%	15 MIN Peaking at 50%	Vehicle Length (Feet)	Peak 5 MIN Curb Requirement (Feet)
Scenario 1	71	21	13	6	25	53
Scenario 2	77	23	14	7	25	58
Scenario 3	81	24	15	7	25	61
Scenario 4	86	26	15	8	25	65

Source: Corgan, 2018

Arrivals Curb Capacity

Vehicles operating on the arrivals curb that pick up arriving passengers were observed to have a longer dwell time through field observations. The longer dwell time is due to the time it takes for a passenger to approach the vehicle picking them up, greet the driver, organize and stow away their belongings and then get in the car to leave the curb. Due to these factors, the 90 second dwell time was used for vehicles operating on the arrivals curb. It was assumed that arriving passengers would use the same modal split as that used by departing passengers, meaning that 30% of passengers arriving at ABI will be picked up by TNC, autonomous vehicle, or private vehicle. The other 70% of arriving passengers will be going to their cars in the parking facility or renting a vehicle. The same methodology used to determine departure curb requirements was used to determine requirements for the arrival curb. **Table 4-15**, *Arrivals Curbside Length Requirements Analysis*, summarizes the arrivals curb requirements for all scenarios.

The scenario 1 forecast shows a demand for 71 Peak Hour Terminating Passengers (PHTP). A 30-minute peaking factor was assumed where 100% of passengers being picked up occupy the curb in a 30-minute period. This means that 21 passengers would be picked up by one of the three transportation modes, all of which would be picked up during the 30-minute peak period. A 15-minute peaking factor is also assumed, where 50% of the 21 passengers are picked up during a 15-minute period. The 15-minute peaking period equals 11 passengers. Using a vehicle length of 25 ft. that is representative of a large SUV, it was determined that 89 linear ft. of curbside will be required to accommodate departing passengers getting picked up during a 5-minute peak period.

For scenario 4 where the PHTP is 86, where the modal split equals 26 passengers being picked up at the airport curb, the 30-minute peaking for the arrivals curb was 26 passengers. This leads to a 15-minute peaking period during which 13 passengers are picked up. Factoring a 25-foot vehicle length leads to a required curbside length of 108 linear ft. to accommodate passengers getting picked up during a 5-minute peaking period.

Based on this analysis, the existing arrivals curbside of 281 linear ft. is sufficient to accommodate all four future scenarios.

Table 4-15
Arrivals Curbside Length Requirements Analysis

	PHTP	Mode Split	30 MIN Peaking at 100%	15 MIN Peaking at 50%	Vehicle Length (Feet)	Peak 5 MIN Curb Requirement (Feet)
Scenario 1	71	21	21	11	25	89
Scenario 2	77	23	23	12	25	96
Scenario 3	81	24	24	12	25	101
Scenario 4	86	26	26	13	25	108

Source: Corgan, 2018

Public Parking

The existing landside facility includes a covered parking area with 732 spaces. Out of these 732 spaces, 103 are dedicated for rental car services and approximately 200 are utilized by employees (e.g. EASI, terminal, etc.). This leaves approximately 429 parking spaces for public use. An expansion of public parking would be required should utilization of the parking facility reach a rate of 90% utilization during a peak period.

The methodology for this analysis was to determine vehicle parking space utilization during the highest 3-month (90 days) parking revenue period that was reported over a five-year period from 2012 through 2016. The highest 3-month parking revenue period was identified to be September – November of 2016, which had a total revenue of $198,899. The total revenue was divided by the 429 available public parking spaces to find a revenue of $463.63 per space over this 3-month period. The revenue per space was then divided by the parking rate of $9 per day to find a parking space occupancy of 51.51 days out of the 3-month period, which equals a utilization rate of 56%.

Taking the total revenue for the 3-month period and applying it to the approved forecast for annual passengers with a CAGR of 0.82%, the total revenue for the 3-month period during scenario 4 equals $234,189. Following the same method, this equals a $545.90 revenue per space which equals a space occupancy of 60.66 days out of the 3-month period which equals a utilization rate of 66%.

This would stand true assuming that modal splits that passengers use to get to and from ABI would remain the same as they are today. With the emergence of autonomous vehicles and the increase in the use of TNCs, it was considered that the same modal split of 70% private vehicles and 30% drop-off, TNC and autonomous vehicles, which was applied to the terminal curbside analysis would actually reduce the utilization rate for public parking to 53%.

The analysis means that an expansion of the airport's parking facilities is not required over the four scenarios of the planning horizon. **Table 4-16**, *Public Parking Busiest Quarter Analysis*, summarizes the results of the public parking utilization analysis.

Table 4-16
Public Parking Busiest Quarter Analysis

	Spaces	Rev. / Space	Days Occupied	Utilization %
Existing	429	$463.63	51.51	0.56
Scenario 4 Constant Mode Split	429	$545.90	60.66	0.66
Scenario 4 w/TNC & Autonomous	429	$436.72	48.52	0.53

Source: Corgan, 2018

Employee Parking

While there is dedicated parking for employees of Abilene Aero, the Air Traffic Control Tower (ATCT) and some for Eagle Aviation Services Inc. (EASI), approximately 200 out of the 629 spaces in the main parking area are utilized by airport, terminal, and EASI employees.

Based on the public parking analysis, the assumption is that the 200 employee parking spaces would not be needed for public parking over the four scenarios. The operations of major airport tenants, such as EASI, could potentially drive an increase in the need for additional employee parking should EASI or other tenants decide to hire more staff. If this growth occurs the need for additional parking spots could occur.

An increase in public parking spaces could drive the need to provide additional employee parking if a number of the current employee spaces are used for public parking. This scenario is not expected.

Rental Car Ready/Return

Rental car requirements were determined based on aggregate for all providers. There are currently 103 rental car parking positions located on-site at ABI.

Rental car revenue data was compiled for the 2014, 2015, and 2016 Fiscal Years as well as partial data for Fiscal Year 2017, which made for a small sample of data to analyze. The data from the 3 full years (FY2014, FY2015, and FY2016) shows that annual rental car revenue was reported in the low to mid $50,000s each year

The data shows that over the three-year period, revenue from rental car commissions remained relatively consistent so the assumption was made that the same will occur over the planning horizon. Applying the anticipated technology advancements in TNCs and autonomous vehicles, the existing rental car facilities have been deemed to be sufficient for all future scenarios. Rental car companies have expressed the need for a quick turn-around facility where they can clean and service vehicles to improve the efficiency of their operations. A separate area along the main airport roadway would be recommended to accommodate this facility.

Landside Facilities Requirements Summary

The Landside Facility Requirements Analysis shows that the existing roadways, terminal curb areas, public, employee, and rental car parking facilities are sufficient to accommodate future facility requirements. Modifications to the roadway layout are recommended to improve line of sight to the terminal building along the roadways. Additional facilities may be required such as a quick turn-around facility for the rental car companies.

It is recommended that existing roadway signage be modified to provide consistency in terms of sign color, size, overall visual style, and the location of these signs with regards to the road (i.e., on the left or right side of the road).

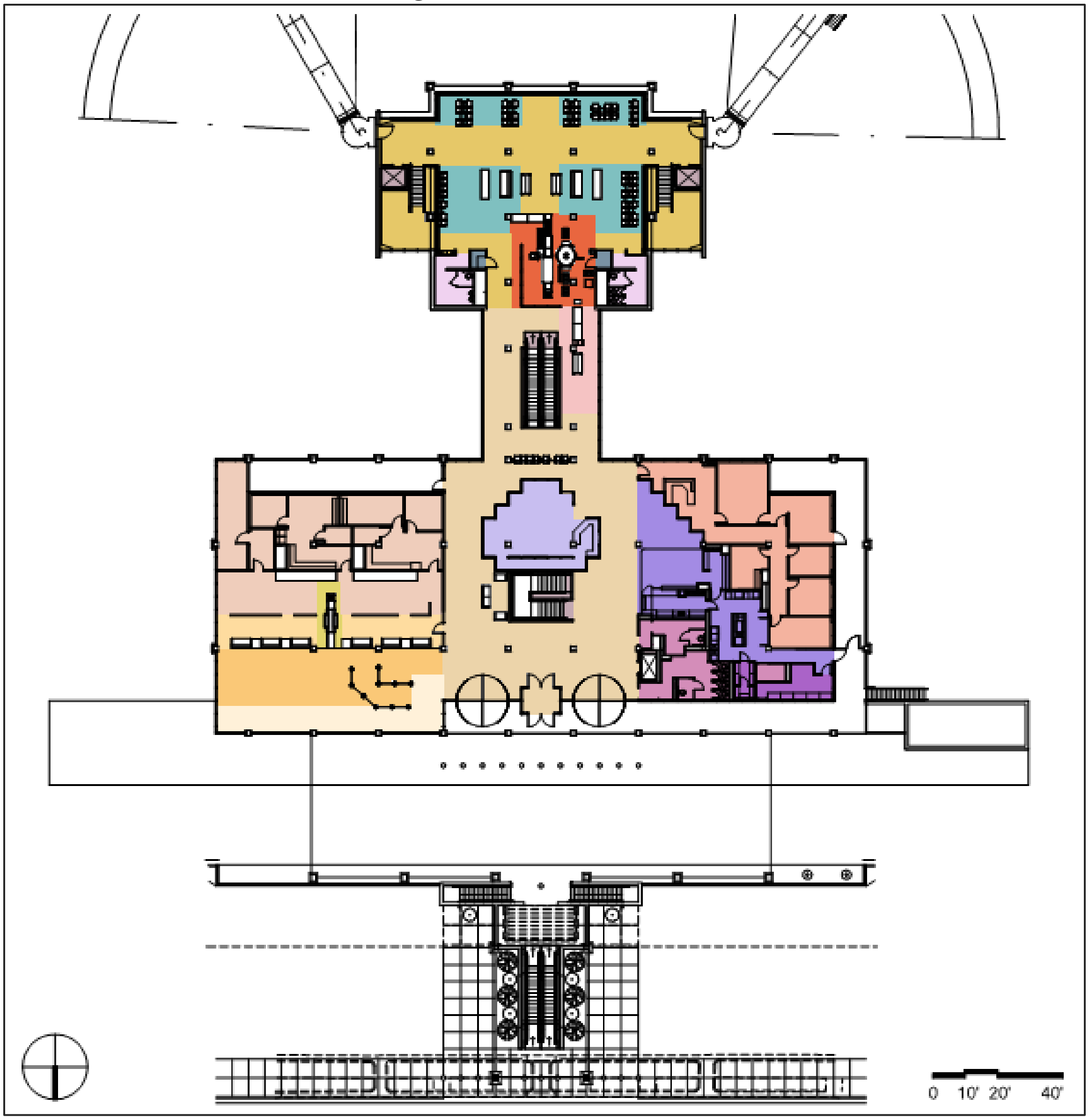
Existing off-property signage requires improvement to provide more signage indicating the airport's location on nearby roads such as TX-36 and TX-322. Improvements are recommended to the airport's entrance sign to improve visibility for vehicles traveling northbound on TX-36.

Terminal Facility Requirements

Passenger Terminal Facilities

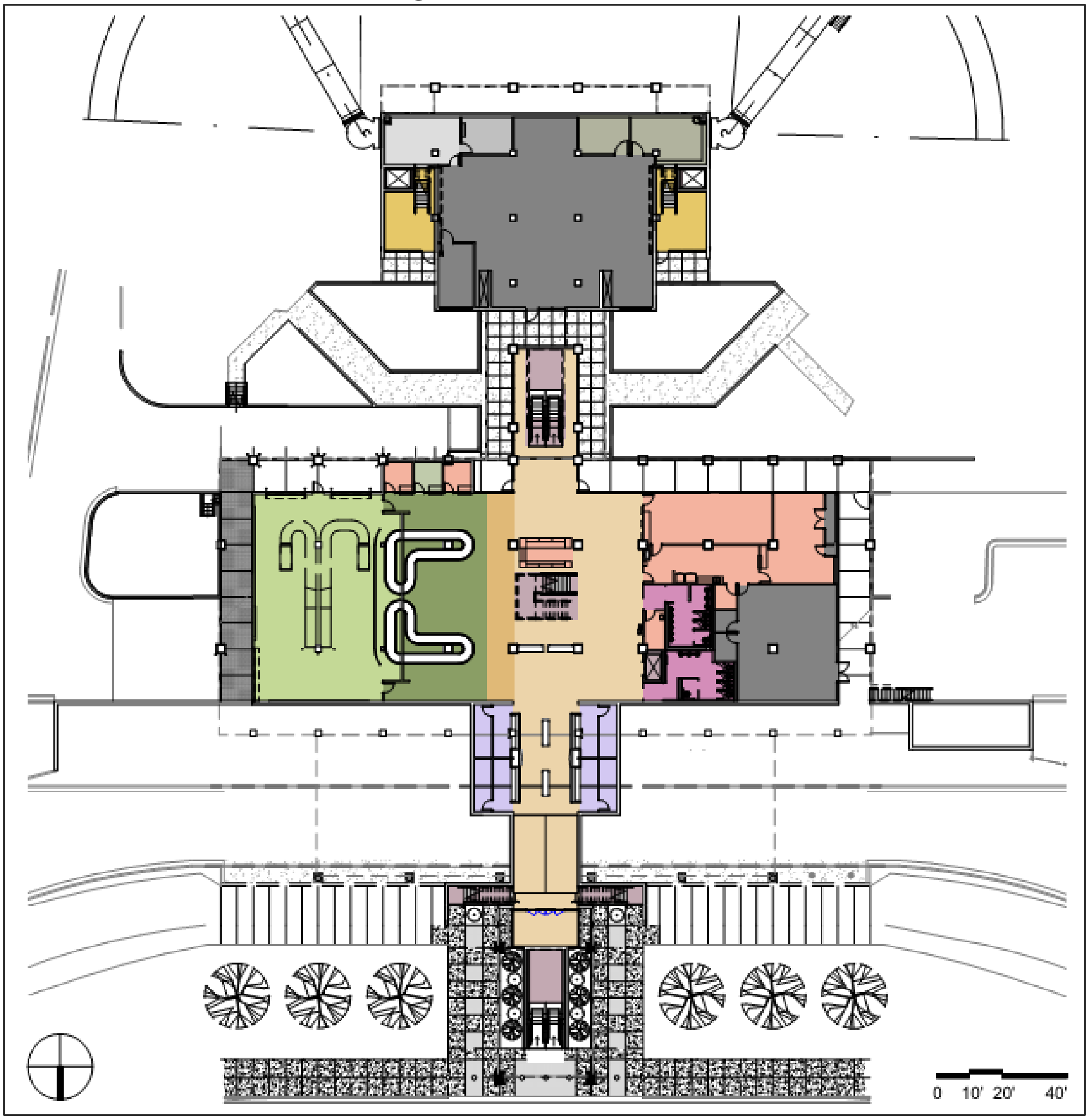
The existing terminal at ABI consists of a 2-level building with a large vertical core located in the center of the non-secure area. Inside the terminal, passengers experience exposed aggregate material and flare columns that frame a pan-formed ceiling. **Figure 4-17**, *Existing Terminal Floor Plan – Level 2*, and **Figure 4-18**, *Existing Terminal Floor Plan – Level 1*, show color block floor plans for level 2 and level 1 respectively.

Figure 4-17
Existing Terminal Floor Plan – Level 2



Source: Corgan, 2018

Figure 4-18
Existing Terminal Floor Plan – Level 1



Source: Corgan, 2018

Terminal space requirements for ABI were determined by applying planning factors to future passenger activity levels, based on Level of Service (LOS) Optimum standards set by the International Air Transportation Association (IATA) Airport Development Reference Manual (ADRM) 10th edition, the Transportation Security Administration (TSA), Corgan experience and various industry best practices for terminal planning. **Table 4-17**, *Forecast Commercial Passenger Enplanements*, displays peak hour passenger demand data from the Forecast Chapter, Chapter 3, which was used to size terminal facilities and determine facility requirements for Scenarios 1, 2, 3, and 4.

Table 4-17
Forecast Commercial Passenger Enplanements

Description	Base Year 2017	Scenario 1 2022	Scenario 2 2027	Scenario 3 2032	Scenario 4 2037
Annual (ANNEP)	90,399	90,045	98,885	103,108	110,367
Peak Month	8,814	8,464	9,295	9,692	10,374
Peak Month Average Day (PMAD)	294	282	310	323	346
Peak Hour Departing Passengers (PHDP)	59	71	77	81	86
Peak Hour Passengers	118	142	154	162	172

Source: Corgan, 2018

Passenger Processing

The terminal provides passenger processing functions such as ticketing, checked baggage screening, passenger security screening, and baggage claim.

Ticketing

The ticketing area includes check-in counters and a queue area in front of the counters. The offices behind the counters serve as airline office/operations areas. There are six check-in counters with a total of seven check-in positions totaling an area of 626 sq. ft. Facility requirements for the ticketing area were determined using IATA ADRM-10th edition. The ticket counter area is defined using a planning factor of 3.9 sq. ft. per PHDP as shown in **Table 4-18**, *Ticketing Area Facility Requirements*, below. The current check-in counter area exceeds current area requirements and requirements for all four future scenarios.

To determine facility requirements for the ticket counter queuing area a planning factor of 5.8 sq. ft. per PHDP is applied. In the existing terminal, the queueing area in front of the check-in measures 1,166 sq. ft. **Table 4-18** shows the existing area exceeds current requirements and requirements for all four future scenarios.

However, there is the occasional charter flight that operates out of ABI with a narrow-body aircraft. On the occasion, these charter flights operate simultaneously or at similar times to a scheduled air carrier flight, there are congestion issues in the ticketing area due to passengers for both flights checking in. Since charter flights are not a daily occurrence, expanding the ticketing area based on facility requirements for simultaneous charter and air carrier operations is not recommended. Implementing non-capital solutions such as reallocation of existing ticketing area, temporary stanchions or active line management should be considered to manage departing passenger demand during charter operations.

In the existing terminal, Airline Operations/Airline Ticket Offices area measure 2,476 sq. ft. Facility requirements for these offices are determined by applying a planning factor of 0.023 sq. ft. per Annual Enplanements (ANNEP). This is an industry best practice for regional airports that Corgan has utilized when programming and designing regional terminal buildings similar in size and scope to ABI. Applying this methodology, it was determined that the existing airline office space exceeds current requirements as well as scenarios 1, 2, and 3. For scenario 4, requirements show that the offices need to be expanded 62 sq. ft. to meet the scenario 4 requirement of 2,538 sq. ft. as shown in **Table 4-18**.

Table 4-18
Ticketing Area Facility Requirements

Description	Existing Terminal	Scenario 1 2022	Scenario 2 2027	Scenario 3 2032	Scenario 4 2037
Ticket Counter Area	626	277	300	316	335
Ticket Counter Length (7 Positions)	*52*	*28.4*	*30.8*	*32.4*	*34*
Ticket Counter Queuing	1,166	412	447	470	499
Curbside Baggage Check	-	60	65	68	72
Airline Operations / Airline Ticket Office	2,476	2,071	2,274	2,371	2,538

Source: Corgan, 2018

Baggage Screening

The baggage screening requirements are based on TSA's 2016 count of checked bags screened at ABI. This includes bags scanned through the Explosive Detection System (EDS) machines and hand searched bags (trace detection). The TSA currently uses one CT-80 EDS machine with a manufacturer's hourly throughput of 226 bags. The CT-80 EDS is located on the departures level between the two central check-in counters. **Table 4-19** shows EDS requirements for Scenario 4 based on passenger arrival distribution. The analysis assumes 1.5 bags per passenger. It identifies that one EDS machine is adequate to meet requirements for all future scenarios.

Table 4-19
EDS Requirements Analysis

Passenger Arrival Distribution %			
Time Before Departure (minutes)	**90 min Check-in Distribution**	**Total Bags**	**Required EDS in Scenario 4**
90 - 100			
80 - 90	20.00%	25.8	0.7
70 - 80	20.00%	25.8	0.7
60 - 70	25.00%	32.3	0.9
50 - 60	20.00%	25.8	0.7
40 - 50	12.50%	16.1	0.4
30 - 40	2.50%	3.2	0.1
Total	**100.00%**	**129.00**	

Source: Corgan, 2018

However, a second EDS machine is recommended to provide redundancy and prevent TSA staff from having to resort to hand inspection for checked baggage should the single machine malfunction.

Instead of being placed in between the check-in counters, an in-line baggage screening system is recommended. The area required for an in-line EDS system includes the space needed for the EDS machine itself, an input and output baggage belt, a side table to perform manual bag searches by hand, and space for personnel to circulate. Space requirements for a typical in-line layout is approximately 1,250 sq. ft. per machine. If two EDS machines were installed at ABI a total area of 2,500 sq. ft. would be needed as shown in **Table 4-20**, *Baggage Screening Facility Requirements*.

Table 4-20
Baggage Screening Facility Requirements

Description	Existing Terminal	Scenario 1 2022	Scenario 2 2027	Scenario 3 2032	Scenario 4 2037
Bag Screen Room	164	2,500	2,500	2,500	2,500

Source: Corgan, 2018

Outbound Baggage

The outbound baggage area is on the first floor of the terminal behind the baggage claim area. There are two parallel bag belts that carry bags down from behind the bag screening area. Once here, bags are manually lifted off the bag belts by airline employees and loaded onto baggage carts to be sent out to the aircraft. The existing terminal has 1,868 sq. ft. of outbound baggage area. Facility requirements for the outbound baggage area are determined by multiplying the PHDP by a planning factor of 25 sq. ft. per PHDP. **Table 4-21**, *Baggage Processing Facility Requirements*, shows that the existing outbound baggage area is sufficient to meet the demand for scenario 1. However, the area would need to be expanded to meet the total area demand for outbound baggage in scenarios 2, 3, and 4, which are 1,925 sq. ft., 2,025 sq. ft., and 2,150 sq. ft. respectively.

Baggage Claim

The baggage claim area consists of a non-secure public space used by passengers to collect their checked bags. This area includes the space around the claim carousels.

The existing terminal has two L-shaped flat-plate baggage claim devices, providing a total linear frontage of 116 ft. Facility requirements for the baggage claim linear frontage is determined by multiplying the Peak Hour Terminating Passenger (PHTP) by a planning factor of 1.4 linear ft. per PHTP. The existing frontage exceeds requirements for scenarios 1, 2, and 3 but falls just short of the scenario 4 demand of 120 ft. as shown in **Table 4-21**. Instead of expanding the linear frontage by 4 ft. to meet scenario 4 demand, it is recommended that the airport should monitor congestion levels in scenarios 3 and 4. There is currently 0 ft. of linear frontage for oversized baggage claim, which falls short of the demand of 8 ft. for all four scenarios.

Facility requirements for the baggage claim area are determined by multiplying the PHTP value by a planning factor of 20 sq. ft. per PHTP. The existing baggage claim area is 1,716 sq. ft. which is sufficient to meet current requirements and requirements of all four scenarios. **Table 4-21** shows baggage claim area requirement to be 1,420 sq. ft., 1,540 sq. ft., 1,620 sq. ft., and 1,720 sq. ft. for scenarios 1, 2, 3, and 4 respectively.

Inbound Baggage

The existing inbound baggage area is located behind the baggage claim carousel. Bags coming off an aircraft enter this area via a baggage cart and are then loaded onto the baggage claim carousel by airline employees. Facility requirements for the inbound baggage area are determined by multiplying the PHTP value by a planning factor of 11.8 sq. ft. per PHTP. The inbound baggage area in the existing terminal is 935 sq. ft. which exceeds demand for scenarios 1 and 2. The inbound baggage area would need to be expanded to meet the total area demand for inbound baggage in scenarios 3 and 4, which are 956 sq. ft. and 1,015 sq. ft. respectively as shown by **Table 4-21**.

Baggage Service Office

Baggage service offices, managed by the airlines, generally provide assistance for delayed, damaged, or lost baggage. In the existing terminal, there are three baggage service offices each measuring 79 sq. ft. However, two of these offices are utilized by the airport administration, meaning that the total area for baggage service offices in the existing terminal is 79 sq. ft. Facility requirements for the baggage service offices are determined by multiplying the PHTP value by a planning factor of 2.87 sq. ft. per PHTP. **Table 4-21** shows that the baggage service office would need to be increased to meet the total area demand for scenarios 1, 2, 3, and 4 which are 204 sq. ft., 221 sq. ft., 232 sq. ft. and 247 sq. ft. respectively.

Table 4-21
Baggage Processing Facility Requirements

Description	Existing Terminal	Scenario 1 2022	Scenario 2 2027	Scenario 3 2032	Scenario 4 2037
Baggage Claim Area / Oddsize Area	1,716	1,420	1,540	1,620	1,720
Baggage Claim Frontage	*116*	*99.4*	*107.8*	*113.4*	*120*
Oversized Bag Claim	*0*	*8*	*8*	*8*	*8*
Baggage Service Office	79	204	221	232	247
Outbound Baggage	1,868	1,775	1,925	2,025	2,150
Inbound Baggage	935	838	909	956	1,015

Source: Corgan, 2018

Concessions

Concessions requirements were projected in terms of four categories of use for the terminal. Currently, all concession areas are located landside and accessible to the public. Vending machines are the only concessions on the secure side of the terminal. The methodology to determine demand concession requirements is based on a Corgan best practice planning factor that considers an area requirement of 9 sq. ft. per 1,000 enplanements. Forecast enplanements are divided by 1,000 and then multiplied by 9 sq. ft. or determine total concessions requirements. The total concession requirement is then divided into subset concession categories for food & beverage and retail concessions. The percentage for each subset category is determined in accordance with IATA guidelines and is discussed in the following sections.

Food and Beverage

This area includes food and beverage restaurants, kiosks, and quick serve locations. The existing terminal has one restaurant on the non-secure side. On the secure side of the terminal, vending machines are provided. The existing terminal has a total of 1,244 sq. ft. of space allocated for food and beverage concessions. IATA recommends that 60% of the total food and beverage and retail concessions area be dedicated to food and beverage, which leads to the facility requirements shown below in **Table 4-22**, *Concessions Facility Requirements*. Existing food and beverage concessions space exceeds future requirements for all scenarios.

News, Gifts, and Sundry (Retail)

This area includes bookstores, newsstands, small gift shops, specialty shops, and other retail. In the existing terminal, a gift shop is located south of the terminal entrance and measures 768 sq. ft. IATA recommends that 40% of the total food and beverage and retail concessions area be dedicated to retail which means the existing area exceeds requirements for all scenarios as shown in **Table 4-22**.

Concession Storage

Concession storage constitutes the storage and support space separate from the individual concession locations. This can be dry storage, freezers, and coolers. The existing terminal has 253 sq. ft. of storage available for concessionaires. Based on experience, Corgan believes it is a best practice for concession storage space to be approximately 20% of the total food and beverage and retail concessions space. This leads to the conclusion that existing storage for concessions areas meets the requirements for all four scenarios as shown in **Table 4-22.**

Ground Transportation

The ground transportation area is comprised of the area used by ground transportation companies other than rental cars to book services for passengers. An example of a ground transportation company using this area would be a shuttle bus company. Since there are no ground transportation services at ABI, there is not a ground transportation area within the existing terminal. Should ground transportation services operate out of ABI in the future, facility requirements for the space required inside the terminal building using a planning factor of 0.004 sq. ft. multiplied by the total number of annual enplaned passengers. This method and planning factor is an industry best practice used for regional airports of similar size to ABI. Ground transportation requirements for all scenarios are shown in **Table 4-22** below.

Information

The existing terminal has a 144-sq. ft. informational booth where visitors can obtain information on the airport, flights, or the surrounding community. Information booths are not commonplace in regional terminals and are subject to the value that each individual airport and local community place on the information booth. As such, an industry standard planning factor does not exist for information booths. There is no expansion requirement for this area and the existing information booth could be retained or reduced in size.

Rental Car Counters

Three rental car companies at ABI currently operate out of a 755 sq. ft. area located on the lower level of the terminal near the baggage claim area along the circulation path to the Level 1 Entrance/Exit. The rental car area consists of four counters, circulation, and queuing space in front of the counters. Congestion occurs in this area as it is too narrow to accommodate multiple rental counter queues and the circulation of passengers exiting or entering the building through this area. Facility requirements for this area are determined with an industry best practice that is applied to regional airports of similar size to ABI. The industry best practice applies a planning factor of 0.015 sq. ft. is required per the annual enplanement volume, meaning that the annual enplanement volume value is multiplied by 0.015 to obtain requirements. **Table 4-22** shows that the rental car counter area would have to be increased to 1,351 sq. ft., 1,483 sq. ft., 1,547 sq. ft., and 1,656 sq. ft. for scenarios 1, 2, 3, and 4 respectively.

Table 4-22
Concessions Facility Requirements

Description	Existing Terminal	Scenario 1 2022	Scenario 2 2027	Scenario 3 2032	Scenario 4 2037
Concessions (Food / Beverage)	1,244	486	534	557	596
Concessions (News / Gifts / Sundry)	768	324	356	371	397
Concessions (Concession Storage)	253	162	178	186	199
Ground Transportation	-	360	396	412	441
Information	144	-	-	-	-
Rental Car Counters	755	1,351	1,483	1,547	1,656
Subtotal Concessions	**3,164**	**2,683**	**2,947**	**3,073**	**3,289**

Source: Corgan, 2018

Secure Public Area

The secure public area within the terminal building includes a security screening checkpoint, holdrooms, restrooms, and airline operations space.

Transportation Security Administration (TSA) Security Screening Checkpoints

The existing Security Screening Check Point (SSCP) consists of a single screening lane with an hourly passenger processing capacity of 150 passengers under TSA protocols and covers an area of 734 sq. ft. **Table 4-23** shows SSCP requirements analysis for Scenario 4 based on passenger arrival distribution and a processing rate of 150 passengers per hour.

The analysis was conducted on a 90-minute passenger distribution where the checkpoint is expected to open one and a half hours before scheduled departure and under a 60-minute passenger distribution where the checkpoint is expected to open an hour before scheduled departure. In both cases, it was found that the existing single lane is sufficient to meet demand for all future scenarios. However, a second lane is recommended for the purpose of redundancy should the existing equipment malfunction. Facility requirements for the SSCP and SSCP Queuing space are TSA standards that cover the area required for all equipment and space necessary for personnel and passengers. Adding a second SSCP lane would require an expansion of 1,666 sq. ft. to meet the required area of 2,400 sq. ft. for scenario 1. Further expansion would not be required after scenario 1.

Table 4-23
SSCP Requirements Analysis

Passenger Arrival Distribution %						
Time Before Departure (minutes)	**90 min Distribution**	**Total Passengers**	**Required SSCP in Scenario 4**	**60 min Distribution**	**Total Passengers**	**Required SSCP in Scenario 4**
90 - 100	5.00%	4.30	0.2			
80 - 90	10.00%	8.60	0.3			
70 - 80	10.00%	8.60	0.3			
60 - 70	15.00%	12.90	0.5			
50 - 60	25.00%	21.50	0.9	10.00%	8.60	0.3
40 - 50	25.00%	21.50	0.9	15.00%	12.90	0.5
30 - 40	10.00%	8.60	0.3	20.00%	17.20	0.7
20 - 30	5.00%	4.30	0.2	27.50%	23.65	0.9
20 -	10.00%	8.60	0.3	27.50%	23.65	0.9
Total	100.00%	**86.00**		**100.00%**	**86.00**	

Source: Corgan, 2018

The existing terminal has 392 sq. ft. of SSCP Queuing space. Since the second SSCP lane is recommended for redundancy purposes, facility requirements for the queuing area are equal to a single checkpoint lane. TSA standards state a requirement of 400 sq. ft. of queuing space per checkpoint. Facility requirements for the SSCP and the SSCP Queuing area are shown below in **Table 4-24.**

TSA Administration

In addition to the passenger screening area that TSA operates, TSA needs space for administrative functions, including breaks, restrooms, and training areas. Facility requirements for these areas are driven by industry best practices. A planning factor of 1.4 sq. ft. per PHDP is applied to determine size requirements for TSA offices. A planning factor of 2.94 sq. ft. per PHDP is applied to determine size requirements for TSA break areas. The TSA office and breakroom in the existing terminal are located on the lower level below the holdroom area. The office measures 175 sq. ft. and the breakroom measures 338 sq. ft., both of which exceed demand for all scenarios as shown in **Table 4-24.**

Table 4-24
TSA Area Facility Requirements

Description	Existing Terminal	Scenario 1 2022	Scenario 2 2027	Scenario 3 2032	Scenario 4 2037
SSCP	734	2,400	2,400	2,400	2,400
SSCP Queuing	392	400	400	400	400
TSA Offices / Training / Restrooms	175	99	108	113	120
TSA Break	338	209	226	238	253

Source: Corgan, 2018

Passenger Holdrooms

ABI has two airline gates in the terminal building for arriving and departing passengers. Holdroom seating is dependent on peak hour operations, design aircraft, assumed load factor, and the resulting peak hour departing passenger. For this analysis, a space allocation per passenger was used in accordance with IATA Level of Service (LOS) Optimum guidance. This guidance recommends allocating 18.2 sq. ft. per seated passenger and 12.9 sq. ft. per standing passenger. IATA LOS Optimum provides for 80% of Peak Hour Departing Passengers (PHDP) seated and 20% standing.

The forecast identified a requirement of 86 PHDP for scenario 4 based on scheduled air carrier service. Charter flights are occasionally operated out of ABI on a narrow body aircraft. For the purpose of the holdroom sizing analysis, the peak hour was assumed to consist of passengers to depart on a regularly scheduled air carrier flight on a regional jet and passengers to depart on a Charter flight to occupy the holdroom simultaneously.

The existing holdroom measures 1,530 sq. ft. The requirements analysis in **Table 4-26** shows that an expansion would be required to meet the demand of 4,192 sq. ft. for scenario 1. After scenario 1, no further expansion would be required.

Table 4-25 shows how the demand requirement of 4,192 sq. ft. was calculated in accordance with IATA Optimum Level of Service standards.

Table 4-25
IATA Optimum Level of Service Holdroom Calculations

Aircraft	Seats	Load Factor	% PAX Seated	% PAX Standing	SF/seated PAX	SF/Standing PAX	Ticket Lift Area	Total Holdroom Area
Regional Jet	76	90%	70%	20%	18.2	12.9	310	1,357
Narrow-body	170	90%	70%	20%	18.2	12.9	490	2,835
							Total	**4,192**

Source: Corgan, 2018

Restrooms

Restrooms on the secure side of the existing terminal measure 351 sq. ft. Facility requirements for secure side restrooms are driven by the number of Peak Hour Passengers (PHP) with an industry best practice planning factor of 3.5 sq. ft. applied per PHP. Requirements for secure side restrooms are larger than the non-secure side due to secure side restrooms being utilized more during peak times. Peak times for secure side restrooms would be right after a flight has arrived, due to a high percentage of arriving passengers coming off the flight deciding to use the restrooms in the secure side of the terminal instead of using the restrooms available on the aircraft. Projected requirements in **Table 4-26** show that the restrooms would need to be expanded to 497 sq. ft., 539 sq. ft., 567 sq. ft., and 602 sq. ft. to meet the demand for scenarios 1, 2, 3, and 4 respectively.

Circulation

Secure side circulation refers to areas of the terminal building, on level 2 after the SSCP, that does not serve a specific function such as SSCP, holdroom seating, restrooms, or airline functional areas. These areas allow passengers on the secure side of the terminal to walk freely and without obstruction between the secure side functional areas. The area for secure-side circulation in the existing terminal is 2,653 sq. ft. Facility requirements for secure side circulation are determined by applying an industry best practice used at airports of similar size to ABI. The planning factor used requires 750 sq. ft. of circulation space for each airline gate. Since there are two gates served out of the secure side, circulation space requirements equal 1,500 sq. ft. as seen in **Table 4-26**.

Table 4-26
Secure Public Area Facility Requirements

Description	Existing Terminal	Scenario 1 2022	Scenario 2 2027	Scenario 3 2032	Scenario 4 2037
Departure Lounges (Holdrooms)	1,530	4,192	4,192	4,192	4,192
Restrooms	351	497	539	567	602
Circulation	2,653	1,500	1,500	1,500	1,500

Source: Corgan, 2018

Non-Secure Public Area

Non-secure public area entails facilities and spaces available to passengers on the non-secure side of the terminal. These spaces include non-secure circulation and areas for non-secure restrooms and other support functions.

Non-Secure Restrooms

Non-secure restrooms in the existing terminal are located to the West of the airport entrance on both levels. Non-secure restrooms in the existing terminal measure a total of 1,133 sq. ft., which exceeds requirements for all scenarios. Facility requirements for non-secure restrooms are driven by the number of Peak Hour Passengers (PHP) and an industry best practice planning factor of 3 sq. ft. per PHP. The facility requirement calculation involves taking the 3 sq. ft. planning factor and multiplying it by the PHP. Non-secure restroom requirements are 426 sq. ft., 462 sq. ft., 486 sq. ft., and 516 sq. ft. respectively as shown in **Table 4-27**, *Non-Secure Public Area Facility Requirements*. The recommendation is to retain existing restrooms in order to maintain the same level of service that exists today.

Non-Secure Circulation

Non-secure circulation space is comprised of circulation for ticketing and baggage claim as well as general circulation. Non-secure circulation allows passengers on the non-secure side of the terminal, prior to going through SSCP, to walk freely and without obstruction between the secure side functional areas. Facility requirements for all non-secure circulation categories are implemented from industry best practices that have been applied at airports of similar size to ABI.

The existing terminal has 647 sq. ft. of circulation for ticketing which satisfies requirements for scenario 1. A planning factor of 8.7 sq. ft. per Peak Hour Departing Passenger (PHDP) is multiplied by the PHDP value to determine ticketing circulation area requirements. The ticketing circulation area would need to be expanded to meet facility requirements of 670 sq. ft., 705 sq. ft., and 748 sq. ft. for scenarios 2, 3, and 4 respectively as shown below in **Table 4-27**.

The existing terminal has 516 sq. ft. of circulation for baggage claim. A planning factor of 10 sq. ft. per Peak Hour Terminating Passenger (PHTP) is multiplied by the PHTP value to determine baggage claim circulation area requirements. The baggage claim circulation area would need to be expanded to meet area requirements for baggage claim circulation are 710 sq. ft., 770 sq. ft., 810 sq. ft., and 860 sq. ft. for scenarios 1, 2, 3, and 4 respectively as shown below in **Table 4-27**.

The existing terminal has 8,526 sq. ft. of general non-secure circulation space, which exceeds current and future demand. As seen in **Figure 4-17** showing the floor plan for level 2 of the existing terminal building, general circulation consists of the area in between the main entrance, the ticketing area to the left, restrooms and restaurant to the right and down towards the security checkpoint. The retail concessions and vertical circulation area to the south of the entrance are not included as general circulation space.

As seen in **Figure 4-18** showing the floor plan for level 1 of the existing terminal building, general circulation space consists of the area connecting the main entrance to the escalators going around the west side of the central staircase and information booth. A planning factor of 0.02 sq. ft. per Annual Enplanements is multiplied by the ANNEP value to determine general non-secure circulation area requirements. General non-secure circulation space requirements are 1,801 sq. ft., 1,978 sq. ft., 2,062 sq. ft., and 2,207 sq. ft. for scenarios 1, 2, 3, and 4 respectively.

Table 4-27
Non-Secure Public Area Facility Requirements

Description	Existing Terminal	Scenario 1 2022	Scenario 2 2027	Scenario 3 2032	Scenario 4 2037
Circulation–Ticketing	647	618	670	705	748
Circulation-Baggage Claim	516	710	770	810	860
Circulation-General	8,526	1,801	1,978	2,062	2,207
Restrooms	1,133	426	462	486	516
Other	-	126	138	144	155

Source: Corgan 2018

Non-Public Areas

Non-public areas were assessed as a whole for the terminal. These areas include mechanical, communications rooms and electrical spaces, loading docks, general storage for custodial and Airport, and restrooms not accessible to the public.

Airport Administration

The existing terminal has 3,781 sq. ft. of airport administration space located on both levels of the terminal's non-secure side. The airport administration space includes four offices, a conference room, reception area, kitchen, break room, press/meeting room, and communications room. The airport administration has expressed the desire to provide additional office space for staff to be hired in the future. With this in mind, the recommendation was made for three additional 150-sq. ft. offices to be added for a total expansion of 450 sq. ft. It is assumed that two offices, for a total of 300 sq. ft., would be added in scenario 1 and the final 150 sq. ft. of office space would be added in scenario 4. **Table 4-28** shows Airport Administration space requirements.

Table 4-28
Airport Administration Facility Requirements

Description	Existing Terminal	Scenario 1 2022	Scenario 2 2027	Scenario 3 2032	Scenario 4 2037
Airport Administration	3,781	4,081	4,081	4,081	4,231

Source: Corgan 2018

Loading Docks

The existing terminal has 0 sq. ft. of loading dock area; concessionaires currently bring supplies through the airport's main door. Adding a loading dock would eliminate the need for concessioner deliveries to be brought through the main terminal lobby. Loading dock area requirements are determined by an industry best practice applied at airports of similar size where loading dock area represents 0.3% of the building's total sq. footage. Loading dock area requirements are 88 sq. ft., 92 sq. ft., 94 sq. ft., and 98 sq. ft. for scenarios 1, 2, 3, and 4 respectively as shown in **Table 4-29**. The main goal of a loading dock at ABI would be to eliminate the need for concessionaires to bring goods into the airport through the main door. An alternative solution could be considered to avoid the need to build a loading dock.

Storage

Storage spaces are dedicated areas used by custodial or the airport administration to store supplies and other items. The existing terminal has 50 sq. ft. of storage space. An expansion of total storage space would be required to meet the demands for scenarios 1, 2, 3, and 4 which are 293 sq. ft., 306 sq. ft., 313 sq. ft., and 325 sq. ft. respectively as shown in **Table 4-29**. Space requirements for these areas are driven by the building's total sq. footage where these areas represent 1% of total square footage. Therefore, if the terminal building is expanded these areas may also need to be increased accordingly.

Maintenance

Maintenance areas include janitor closets and closets to store custodial supplies. The existing terminal has 486 sq. ft. of maintenance space which exceeds requirements for all scenarios. Total maintenance space requirements are 293 sq. ft., 306 sq. ft., 313 sq. ft., and 325 sq. ft. for scenarios 1, 2, 3, and 4 respectively as shown in **Table 4-29**. Space requirements for these areas are driven by the building's total square footage where these areas represent 1% of total square footage. Therefore, if the terminal building is expanded these areas may also need to be increased accordingly.

Mechanical/Electrical/Building Systems

Mechanical, Electrical, and Building Systems areas include the interior rooms in the Airport that house air handling units, electrical panels, and communications systems. Space requirement for these facilities is based on a percentage of the total building square footage. The existing terminal has 4,522 sq. ft. of mechanical, electrical, building systems areas which exceeds requirements for all scenarios as shown by **Table 4-29**. Space requirements for these areas are driven by the building's total square footage where these areas represent 12% of total square footage. Therefore, if the terminal building is expanded these areas may also need to be increased accordingly.

Table 4-29
Non-Public Area Facility Requirements

Description	Existing Terminal	Scenario 1 2022	Scenario 2 2027	Scenario 3 2032	Scenario 4 2037
Loading Dock	-	88	92	94	98
Storage	50	293	306	313	325
Maintenance	486	293	306	313	325
Mech. / Elec. / Bldg. Systems	4,522	3,516	3,671	3,760	3,906
Subtotal Non-Public Area	**5,058**	**4,190**	**4,375**	**4,480**	**4,655**

Source: Corgan, 2018

Wayfinding

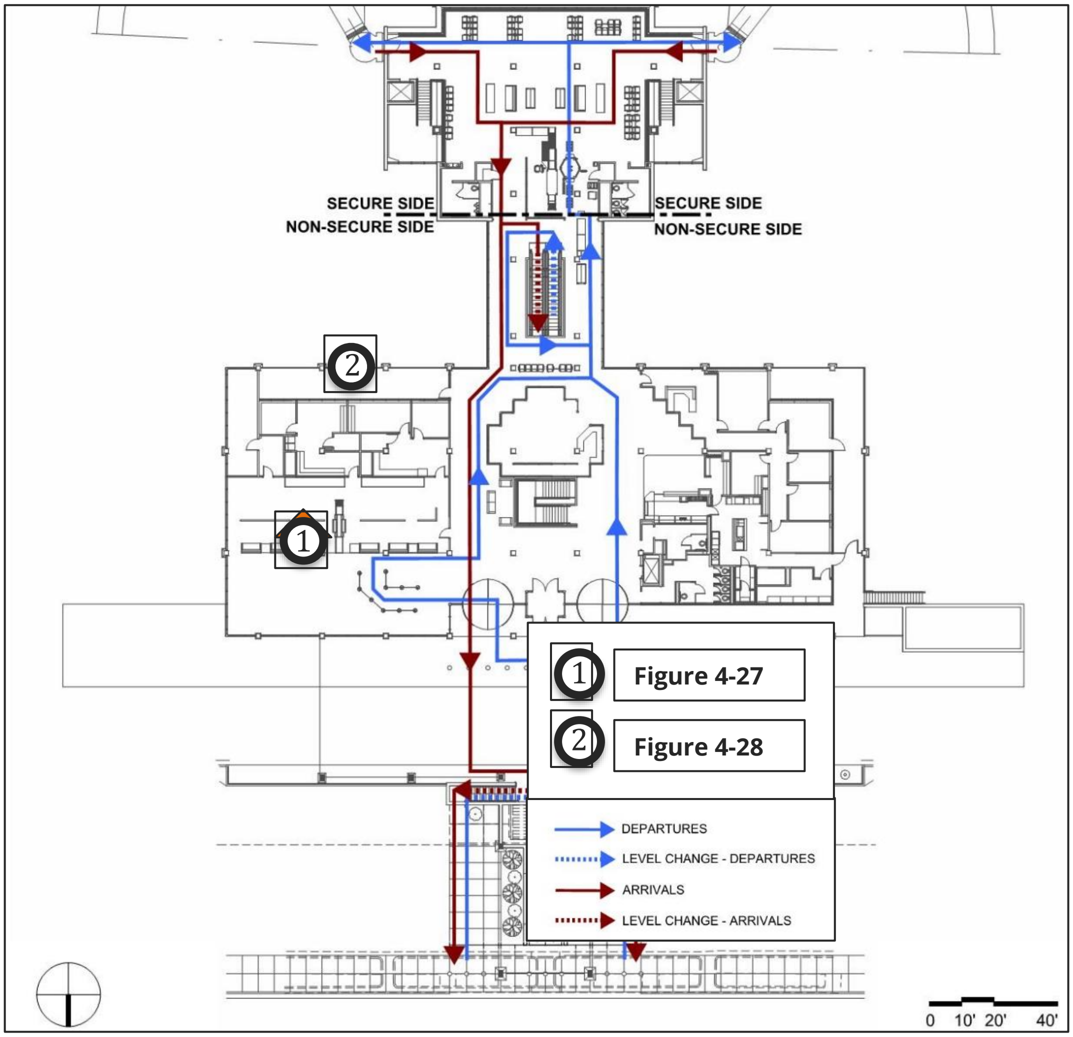
Wayfinding plays a very large role in the passengers' journey while navigating through the airport. When passengers perform wayfinding tasks needed to reach their destinations, they are not relying on signage alone as wayfinding is primarily spatial problem solving (Arthur and Passini, 1992). Consequently, architectural design is crucial to successful wayfinding strategies.

Environmental Level & Passenger Perspective

This section refers to elements in the space or environment around a person that define that space and in turn define a person's perception of these spaces. The first objective is to create a unique personality and identity for each destination along the path. Clear wayfinding between destinations should then be articulated through architectural design, landmarks, signage, and user-friendly technology. Placing a proper hierarchy of these elements with strategic use of colors, patterns and lighting can further ensure the success of the passenger's journey. For example, orienting ticket counters in such a way as to be part of the edge defining the path to the security screening checkpoint or inserting a bold piece of art in an area that can be associated with only that location would give passengers a memorable element for guidance. Art may also be used as an identifying branding element for the airport in general. ABI does a good job of using art to aid with wayfinding with the display of a vintage model airplane in the central lobby area of the departures level.

Clear and consistent naming of functions, areas, and levels of the building will take the guesswork out of how a passenger identifies their location. Applying individual colors or visual themes for different functions is a way for passengers to not only know where they are but also mentally connect with their location and understand when they move from one section of the terminal building to another. This can be achieved inside the terminal building by subtle changes in flooring colors and materials, ceiling patterns, and ceiling heights that help identify a specific functional area inside the building and separate it from other functional areas. **Figure 4-19** identifies locations on the upper level where environmental level wayfinding is observed. As shown in **Figure 4-20**, *Terminal Environmental Level Wayfinding – Entrance Lobby Ceiling*, and **Figure 4-21**, *Terminal Environmental Level Wayfinding – Ceiling Change at SSCP*, the ABI terminal achieves this objective with changes in ceiling color and "honeycomb size and depth" shape as the passenger moves from the non-secure side of the terminal building through the SSCP and into the holdrooms. Having a unique art piece like the vintage aircraft model ABI has in the central lobby of the upper level is also an effective manner to uniquely identify an area of the building. The vintage aircraft model provides a consistent wayfinding landmark, sense of place, and convenient meeting place for passengers.

Figure 4-19
Terminal Environmental Level Wayfinding – Upper Level



Source: Corgan, 2018

Figure 4-20
Landmark in Entrance Lobby

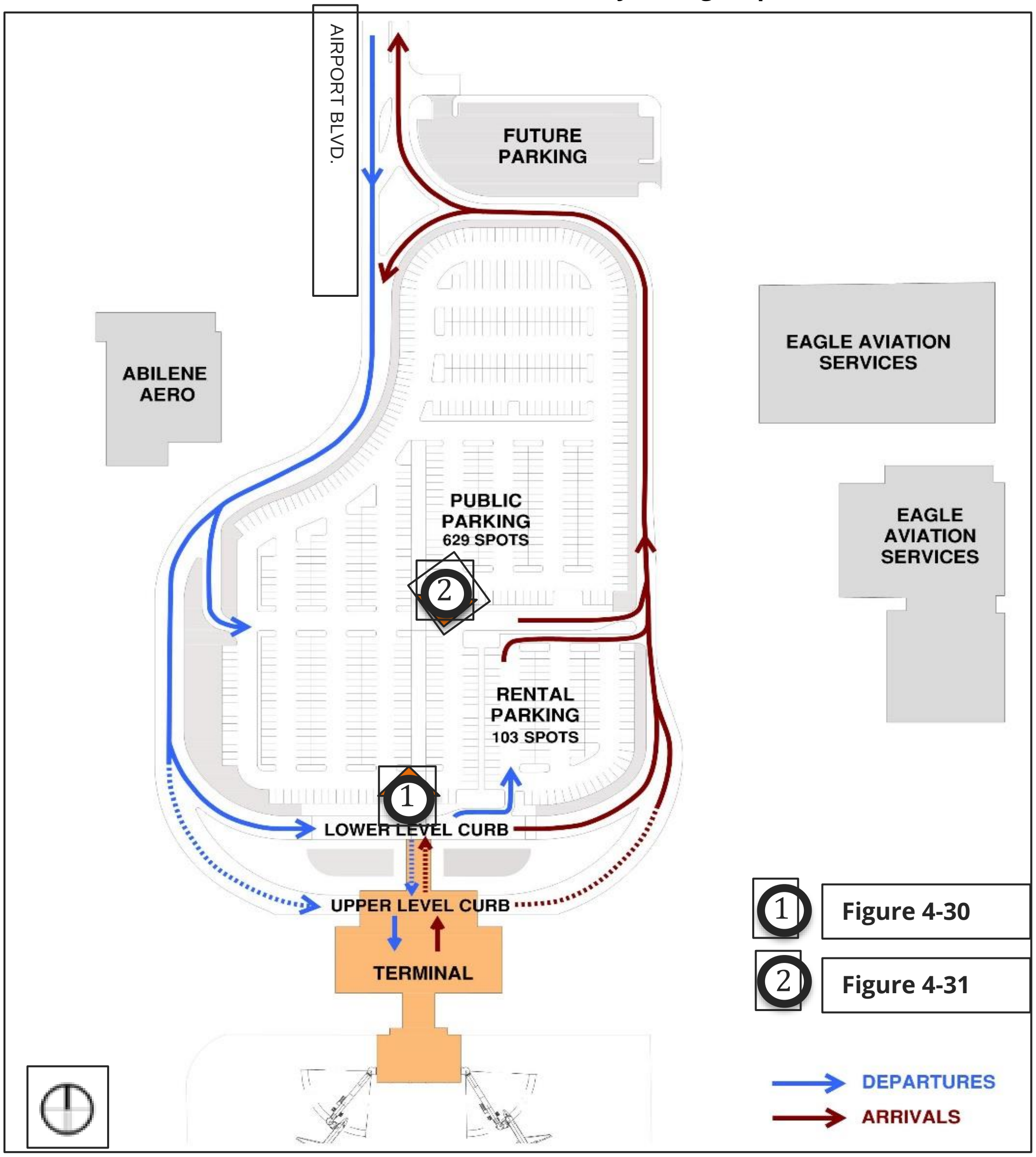
Source: Corgan, 2018

Figure 4-21
Ceiling Change at SSCP

Source: Corgan, 2018

These principles can be applied in the terminal building as well as the parking area. Providing unique colors or themes for specific zones of the parking facility can help passengers to remember where they are parked. Changes in pavement material types and colors in the parking area is also an effective wayfinding method for parking areas. **Figure 4-22**, *Landside Environmental Level Wayfinding Map*, shows locations where wayfinding examples were found within the landside facilities at ABI. An example of this would be the red concrete pavers ABI employs to delineate passenger walkways and corridors through the parking lot as shown in **Figure 4-23.** **Figure 4-24** depicts an example of existing signage that is insufficient because it is not prominent enough.

Figure 4-22
Landside Environmental Level Wayfinding Map

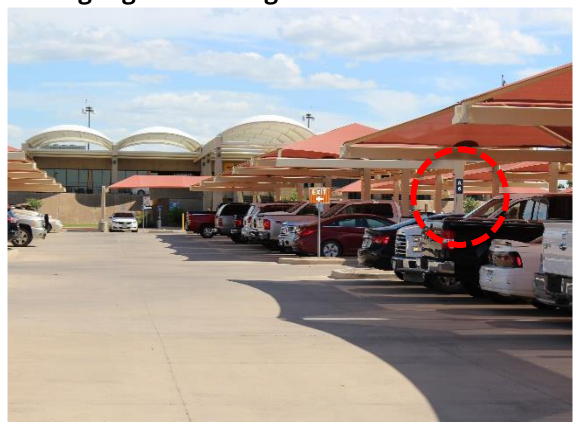


Source: Corgan, 2018

Figure 4-23
Red Concrete Pavers Marking Path Towards Parking

Source: Corgan, 2018

Figure 4-24
Signage In Parking Lot Not Prominent



Source: Corgan, 2018

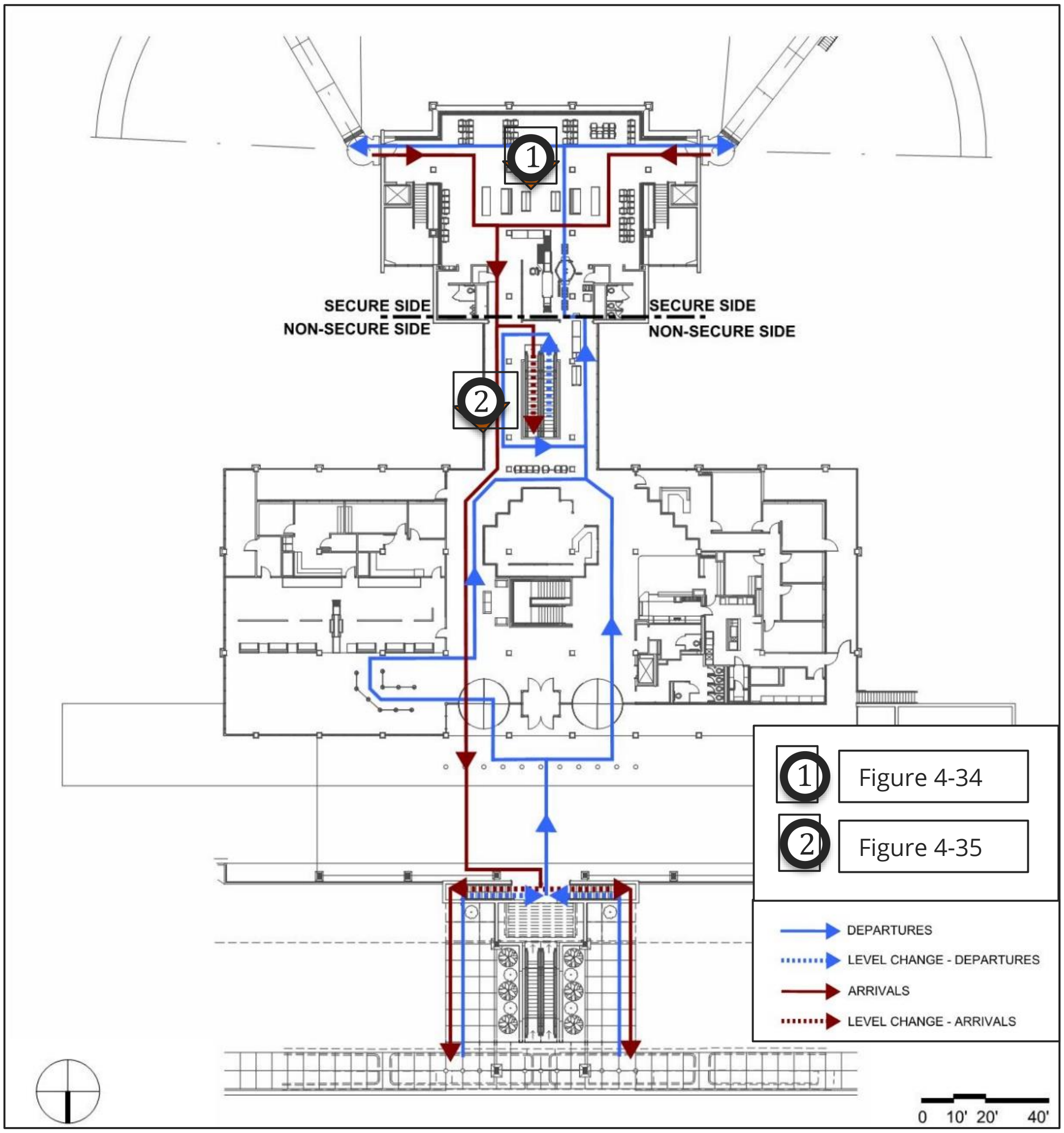
Location Level

On a very basic level, a person arriving at an airport terminal for a flight is coming from a vehicular curb and going to a gate. Being able to visually associate with those two points allows them to quickly orient themselves within the building. They know the ultimate beginning and end to their path and want to continually travel in a direction that leads them there. Being able to see the curb or parking area, as well as the airfield, subconsciously leads a passenger in the right direction.

Within a public parking area, passengers need to know where they are leaving their vehicle, where they need to go to continue their journey, and how they can get back to their vehicle later. Each section or zone of the parking area should have unique identifiers to provide a sense of place. ABI does provide signage that helps passengers identify what specific section or zone of the parking facility they are in by giving zones an alpha-numeric denomination. There are signs, consisting of white text on a blue background, on the canopy poles to uniquely identify parking sections. However, these signs are small in size and are not easily noticeable.

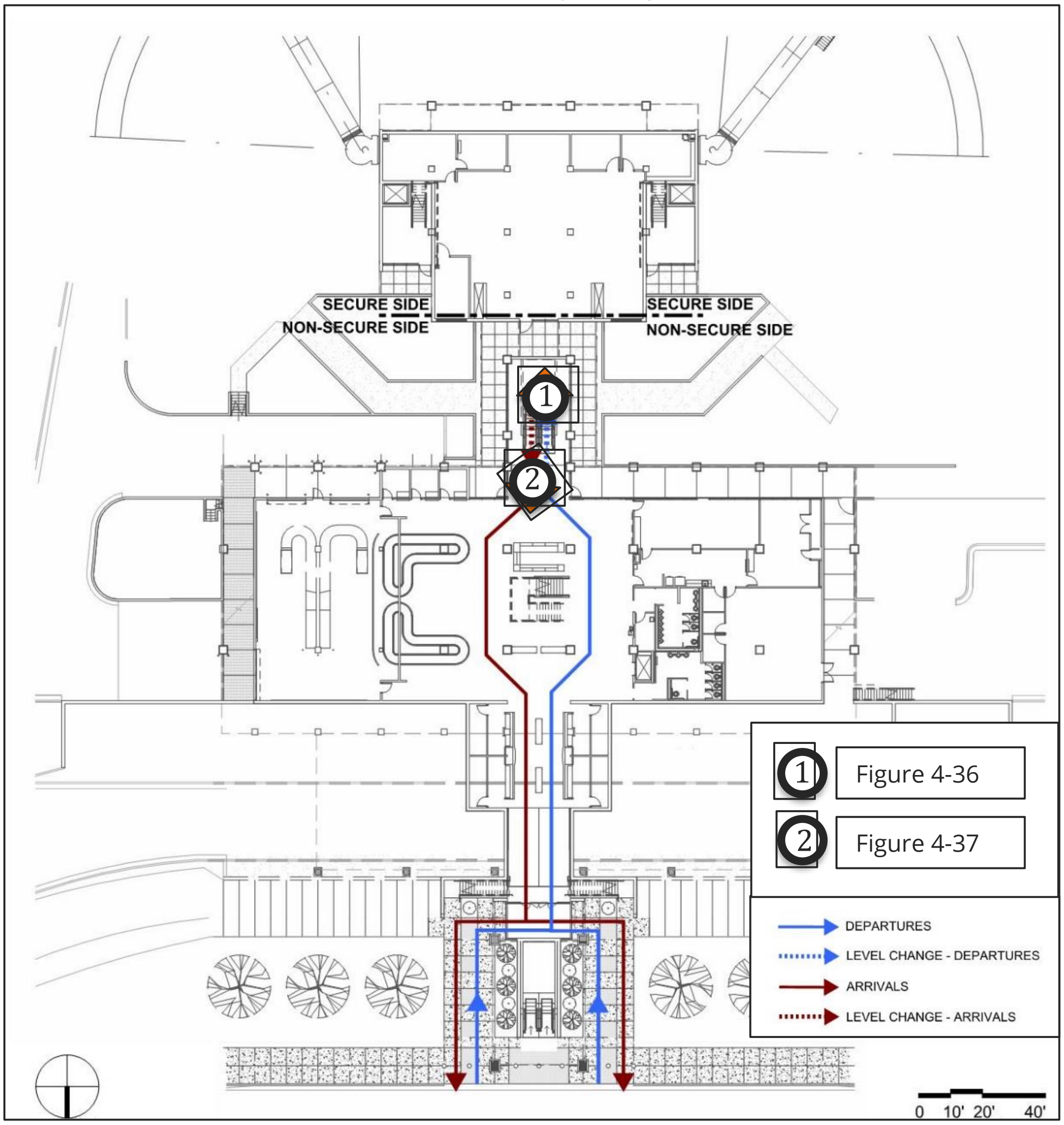
There should be clear lines of sight and safe pedestrian paths to terminal entrances that guide them to check-in locations. Visual cues within the terminal should also easily lead the passenger back to the correct section or zone of the parking area so that the frustration of finding their vehicle at the end of their trip is diminished. Signage within ABI's existing terminal should be updated to provide clear direction of where passengers are located within the terminal in relation to the passenger path and ultimate destinations such as check-in, ticketing, SSCP, departure gates, or bag claim. **Figure 4-25,** *Terminal Location Level Wayfinding – Upper Level* and **Figure 4-26**, *Terminal Location Level Wayfinding – Lower Level* depict areas of the terminal where wayfinding issues were found. Specific examples at ABI of where passenger paths are not intuitive and reliance on signage is critical include but are not limited to arrival passengers exiting the holdroom (**Figure 4-27**), outside the holdroom where arriving passengers will miss the start of the escalator(**Figure 4-28).** The top of the escalators where departing passengers are trying to get to the SSCP (**Figure 4-29**), and at the bottom of the escalators where there is a lack of signage on the lower level to direct passengers to baggage claim and landside functions (**Figure 4-30**).

Figure 4-25
Terminal Location Level Wayfinding – Upper Level



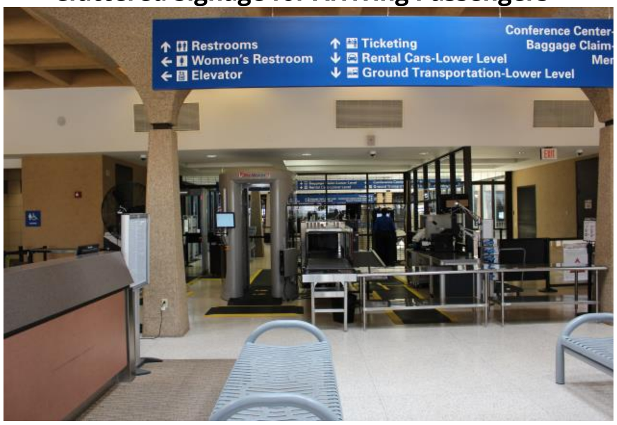
Source: Corgan, 2018

Figure 4-26
Terminal Location Level Wayfinding – Lower Level



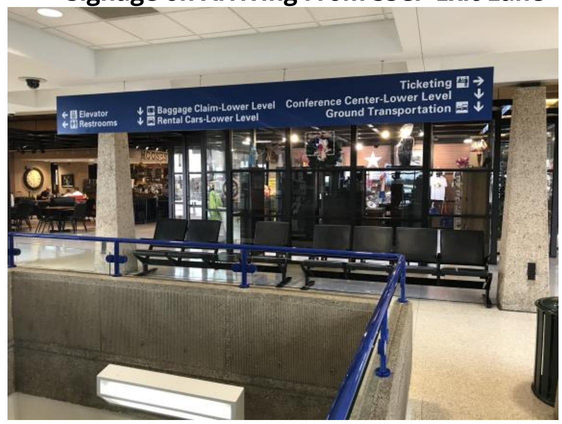
Source: Corgan, 2018

Figure 4-27
Cluttered Signage for Arriving Passengers



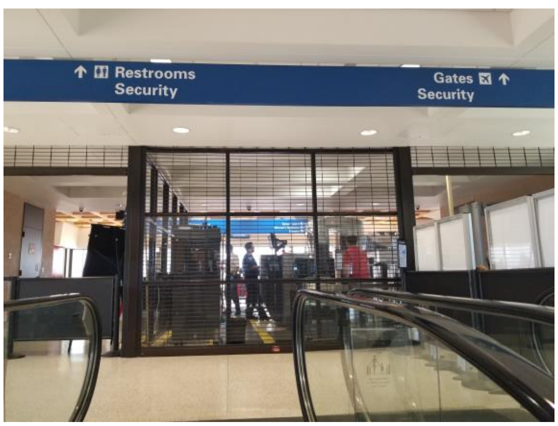
Source: Corgan, 2018

Figure 4-28
Signage on Arriving From SSCP Exit Lane



Source: Corgan, 2018

Figure 4-29
Top of Escalator



Source: Corgan, 2018

Figure 4-30
Bottom End of Escalator

Source: Corgan, 2018

Building Level

Once inside the building, having direct paths between typical destinations with few choices for deviation make navigation easier. Straight paths with fewer turns and corners are most intuitive. Using the building elements to control sightlines along the path allows for fewer distractions and easier decision making, which maintains lower anxiety levels for the passenger. Finish materials can also be used to indicate a path in a very literal way to remove any question about the direction one should take.

Passengers should always have a perception of where the ultimate destination is located. Not knowing how far away that point is causes unneeded anxiety. Primary circulation paths should focus lines of sight between points by using major building elements and/or landmark icons. Intermediate destinations should be visible from primary paths at decision point nodes. These nodes should be sized to allow time and space for those decisions to be made, allowing passengers to orient themselves before moving on. Paths should be kept as short as possible between decision points and destinations. Passengers need to know how far they are going and how long it will take them to get there.

At ABI there are some areas where there is limited visibility between a passenger's current location and destination. An example of this would be when passengers enter the building at the departures level. From the building entrance and from the ticketing area there is not a direct line of sight to the security checkpoint and passengers find themselves having to walk on an indirect path to go around the vertical circulation core and retail concessions area in the central lobby as shown in **Figure 4-31**, *Exiting Ticketing Lobby*. On the lower level, the central stairway blocks line of sight from the entrance rental car counters to the escalators as shown in **Figure 4-32**, *Central Stairs Block Line of Sight Towards Escalator.*

Figure 4-31
Exiting Ticketing Lobby

Source: Corgan, 2018

Figure 4-32
Central Stairs Block Line of Sight Towards Escalator

Source: Corgan, 2018

Figure 4-33
Directions Through Cell Phone Apps

Source: Corgan 2018

Beyond the visual perception of the length of a path, the use of technology to convey this information can be used in many ways. Electronic signage that indicates travel time between two functional areas can be displayed throughout the terminal building to allow passengers to estimate their allowable dwell time in these areas. In addition to supplementing visual perception, this technology is useful when a visual line of sight is not feasible to provide that visual perception.

The recent development of beacon technology has provided a convenient way to address peoples' needs to offer help and services based on their current location. Beacons are one-way transmitters that are used to mark important places and objects. Typically, a beacon is visible to a user's device from a range of a few meters, allowing for highly context-sensitive use cases.

This allows for temporal, context, and location-driven communication with passengers through their cell phones' Bluetooth feature. Smartphone apps can display path guidance as well as calculate travel time as shown in **Figure 4-33**, *Directions Through Cell Phone Apps*. Such solutions utilizing the smartphone platform could be implemented at ABI to assist passengers in wayfinding. The more personalized this information can be to the individual passenger, the more relaxed they will feel which will improve their airport experience.

Each key area within the facility should have a unique identity to aid in wayfinding. So that this does not become more overwhelming than it should, centralized areas that provide time and space for decision-making should tie these key destinations together. A place to gather, meet up with other travelers in their party, eat a meal, or visit the retail shops in the area help to relax passengers. Large volumes and broad vistas allow the passenger to get a sense of the entire space, taking in destination points, paths available, and vertical circulation methods to get there. The lobby area on the second level of ABI's existing terminal could be an ideal location for an open centralized area with concessions, circulation, and other functional areas located around it.

Intuitive Wayfinding

Intuitive wayfinding is defined as finding your way, based on quick perception and direct interpretation, without consciously thinking about it.

To understand how we can find our way without even thinking about it, we have to look at psychology. This field of science teaches us that there are two processes of reasoning, called System 1 and System 2. System 1 is characterized by unconscious reasoning. This way of reasoning is implicit. It is also fast and automatic and influenced by emotions. This way of reasoning is very difficult to change or manipulate. System 2 is characterized by conscious reasoning. This way of reasoning is explicit. It is also slow and volatile and influenced by conscious judgment. The advantage of this is that we can easily expand or change this way of reasoning when we encounter new or unexpected situations.

Intuitive wayfinding makes use of our System 1 way of reasoning. It is therefore mostly based on experience. People learn how to navigate when driving through a country, walking in a city, or moving through a building. Intuitive wayfinding in these cases is based on common sense knowledge, learned through experience. It is therefore important to stick to well established conventions when routing passengers through an airport. Using intuitive wayfinding it is possible to:

- Reinforce main routes/entrances within the terminal
- Improve the atmosphere of specific functional areas like SSCP (safe, warm, welcome)

- Attract passengers (in a direction, up the stairs, etc.)
- Influence speed of moving through the terminal
- Influence perceived waiting time
- Improve passenger experience (fun!)

Figure 4-34
Intuitive Wayfinding

Source: Corgan, 2018

Intuitive wayfinding is not useful for communicating complex routes or processes. It is also hard to implement when the building or environment is not intuitive. The role of intuitive wayfinding in an airport environment will therefore typically be limited to reinforcing paths and directions. While airports should provide sufficient signage to help passengers find the way, the goal of intuitive wayfinding would be to make the terminal facility easy enough to navigate that a passenger does not have to be constantly looking for signage to find their way through the terminal building.

Intuitive wayfinding can be implemented within ABI's terminal building with the use of distinctive finishes that trace a path for passengers to follow as seen in **Figure 4-34**, *Intuitive Wayfinding*. Specific areas within the building can be renovated or expanded in such a manner that passengers moving through the spaces can intuitively find their way towards the destination. For instance, on entering the ABI terminal at the lower level, the natural path for departing passengers to go up to the upper level for security or ticketing is obstructed as the corridor between the rental car counters is narrow and the location and orientation of the central staircase obstructs the view towards the escalator going up to the upper level. Similarly, the natural path for arriving passengers who wish to exit the terminal from the upper level is obstructed when arriving through the exit lane due to the central position of the gift shop in the middle of Level 2.

Landmarks and Visual Focus Points

Landmarks and visual focus points are memorable locations that help the passenger to orient himself. **Figure 4-35** shows an example landmark.

Figure 4-35
Example of a Prominent Landmark

Landmarks are features that stand out in the environment, and that are distinct enough to function as identification for an entire area. Additional landmarks could be added to identify specific zones of ABI's parking facility which would make it easier for passengers to identify where they are parked or where their pick-up is located.

The following represent important criteria for landmarks:

- Each landmark should be unique and not share any characteristics with other landmarks (no 'family' or 'series')
- A user must be able to easily describe a landmark
- A landmark should stand out from the architecture and regular signage
- A landmark should articulate a location, not a function

The existing terminal at ABI has a prominent landmark on the second floor in the form of the vintage aircraft model hanging from the ceiling. This is a good example of a location within the terminal where a person knows exactly where they are and that is easy to find as a meeting place.

Visual focus points are an identifiable structure or element that stands out from its background. Visual focus points are conspicuous and unique enough to identify routes of places ('I have been here before'), but not to identify entire areas or spaces.

Terminal Facility Requirements Summary

A summary of the terminal building facility requirements discussed above are shown in **Table 4-30**, *Terminal Facilities Requirements Summary*, below where areas that currently do not meet requirements are shown in red. From the table, the following significant areas of the terminal building do not meet Scenario 1 requirements.

- Departure Lounges - Expansion required to meet 4,192 sq. ft. of holdroom space required in future scenarios to accommodate peak hour departing passengers.
- Security Checkpoint Expansion required to meet 2,400 sq. ft. of SSCP space required in future scenarios in accordance with TSA standards. Expansion required due to the recommended addition of a second SSCP processing lane for redundancy purposes.
- Baggage Screening Expansion required to meet 2,500 sq. ft. requirement for baggage screening space. Expansion is driven by the recommendation to establish a standard in-line baggage screening layout and the addition of a second EDS machine for redundancy purposes.

Table 4-30
Terminal Facilities Requirements Summary

Description	Existing Terminal	Scenario 1 2022	Scenario 2 2027	Scenario 3 2032	Scenario 4 2037
Airline Functions					
Ticket Counter Area	626	277	300	316	335
Ticket Counter Length (7 Positions)	*52*	*28.4*	*30.8*	*32.4*	*34*
Ticket Counter Queuing	1,166	412	447	470	499
Curbside Baggage Check	-	60	65	68	72
Baggage Claim Area / Oddsize Area	1,716	1,420	1,540	1,620	1,720
Baggage Claim Frontage	*116*	*99.4*	*107.8*	*113.4*	*120*
Oversized Bag Claim	*0*	*8*	*8*	*8*	*8*
Baggage Service Office	79	*204*	221	232	247
Outbound Baggage	1,868	1,775	1,925	2,025	2,150
Inbound Baggage	935	838	909	956	1,015
Airline Operations / Airline Ticket Office	2,476	2,071	2,274	2,371	2,538
Departures Lounges (Holdrooms)	1,530	4,192	4,192	4,192	4,192
Jet Gates	*2*	*2*	*2*	*2*	*2*
Subtotal Airline Functions	**10,396**	**11,248**	**11,873**	**12,250**	**12,769**
Concessions					
Concessions (Food / Beverage)	1,244	486	534	557	596
Concessions (News / Gifts / Sundry)	768	324	356	371	397
Concessions (Concession Storage)	253	162	178	186	199
Ground Transportation	-	360	396	412	441
Information	144	-	-	-	-
Rental Car Counters	755	1,351	1,483	1,547	1,656
Subtotal Concessions	**3,164**	**2,683**	**2,947**	**3,073**	**3,289**
Secure Public Area					
SSCP	734	2,400	2,400	2,400	2,400

	SSCP Queuing	392	400	400	400	400
	Circulation	2,653	1,500	1,500	1,500	1,500
	Restrooms	351	497	539	567	602
	Bag Screen Room	164	2,500	2,500	2,500	2,500
	TSA Offices / Training / Restrooms	175	99	108	113	120
	TSA Break	338	209	226	238	253
	Airport Administration / Training	3,781	4,081	4,081	4,081	4,231
	Other	-	-	-	-	-
	Subtotal Secure Public Area	**8,588**	**11,686**	**11,754**	**11,800**	**12,006**
	Non-Secure Public Area					
	Circulation - Ticketing	647	618	670	705	748
	Circulation - Baggage Claim	516	710	770	810	860
	Circulation - General	8,526	1,801	1,978	2,062	2,207
	Restrooms	1,133	426	462	486	516
	Other	-	126	138	144	155
	Subtotal Non-Secure Public Area	**10,822**	**3,681**	**4,018**	**4,207**	**4,486**
						-
	Non-Public Area					-
	Loading Dock	-	88	92	94	98
	Storage	50	293	306	313	325
	Maintenance	486	293	306	313	325
	Mech. / Elec. / Bldg. Systems	4,522	3,516	3,671	3,760	3,906
	Subtotal Non-Public Area	**5,058**	**4,190**	**4,375**	**4,480**	**4,655**
	Grand Total	**38,028**	**33,488**	**34,966**	**35,810**	**37,204**

Source: Corgan 2018

General Aviation and Aircraft Maintenance Facilities

General Aviation facilities are an important component of an airport. Consequently, as part of the master planning process, it is important to analyze the existing general aviation facilities in light of the established forecast to identify where improvements are necessary.

For this analysis, the Abilene Aero Ramp and the Northwest GA ramp and their associated hangars are considered general aviation facilities. ABI has a large aircraft Maintenance, Repair, and Overhaul (MRO) operation on the airfield – Eagle Aviation Services, Inc. The development needs of this facility will also be discussed in this section.

General Aviation Terminal/FBO Facilities

General aviation terminal/Fixed Based Operator (FBO) facilities and vehicle parking facilities play an important role in an airport's efforts to serve the general aviation and air taxi community.

General Aviation Terminal/FBO Building

Sufficient general aviation terminal/FBO facilities are vital to support the propagation of general aviation activity at an airport. Currently, ABI has one FBO - Abilene Aero. Abilene Aero is a full-service FBO that offers a wide array of amenities and services including aircraft fueling, aircraft maintenance, aircraft sales, charters, meeting rooms, pilot lounges, flight planning facilities, crew cars, catering, etc.

In establishing future plans for the development of general aviation terminal/FBO facilities some key considerations are:

- Planned development should allow for incremental linear expansion of facilities and services in a modular fashion along an established flightline.
- Major design considerations involve minimizing earthwork/grading, avoiding flood-prone areas, and integrating existing paved areas to reduce pavement (taxilane) costs.
- Future terminal expansion should allow sufficient maneuverability and accessibility for appropriate types (mix) of general aviation aircraft within secured access areas.
- Future terminal area development should enhance safety, visibility, and be aesthetically pleasing.

The GA terminal at ABI is operated by Abilene Aero. The facility is approximately 8,000 sq. ft., was recently remodeled, and is in good condition. The facility currently provides a sufficient level of service to airport users and receives high ratings from general aviation centric websites such as Airnav.com.

The formula contained in the Airport Cooperative Research Program (ACRP) *Report 113: Guidebook on General Aviation Facility Planning*, was used to evaluate whether the existing terminal facility will be sufficient to meet forecasted demand. The formula states that the demand for general aviation terminal space is a function of an airport's forecasted peak hour air taxi, general aviation, and military operations multiplied by a per square footage allotment per person and the average number of pilots/passengers per aircraft. According to ACRP Report 113, the average number of pilots/passengers per aircraft is typically 2.5. However, because of the number of larger aircraft using ABI this number was increased to 3.5. For the square footage allotment per person, ACRP Report 113 recommends between 100 sq. ft. and 150 sq. ft. For these calculations 150 sq. ft. was used to provide maximum comfort/support space.

The results of these calculations are shown in **Table 4-31**, *GA/FBO Terminal Building Facility Requirements*.

Table 4-31
GA/FBO Terminal Building Facility Requirements

Facility	2017	2022	2027	2032	2037
Formula Factors					
- Peak Hour Operations (AT, GA, Military)	14	14	14	14	14
- Peak Hour Multiplier	3.5	3.5	3.5	3.5	3.5
- Sq. Ft. Per Person	150	150	150	150	150
Total Terminal Sq. Ft. Requirement	7,350	7,350	7,350	7,350	7,350
Current Terminal Sq. Ft.	8,000	8,000	8,000	8,000	8,000
Surplus/Deficiency (Sq. Ft.)	**650**	**650**	**650**	**650**	**650**

Source: Garver, 2017

Based on these calculations, it is estimated that the size of the existing GA/FBO Terminal Building will be sufficient to accommodate future general aviation, air taxi, and military demand.

General Aviation Terminal/FBO Vehicle Parking

Vehicle parking space requirements are based on the number of pilots/passengers using general aviation facilities and the number of employees working at those facilities.

Vehicle parking space requirements were completed utilizing the formula contained in ACRP Report 113 for calculating the number of parking spaces needed for the FBO terminal/hangar facility. The formula states that vehicle parking space requirements are a function of passenger/pilot activity and employee parking space requirements.

To calculate the vehicle parking space needs for passenger/pilots the number of peak hour general aviation, air taxi, and military operations were multiplied by the average number of pilots/passengers per aircraft. According to ACRP Report 113, the average number of pilots/passengers per aircraft is typically 2.5. However, because of the number of larger jet aircraft using ABI, this number was increased to 3.5.

The amount of vehicle space required for employees is primarily a function of office space at a particular location. ACRP Report 113 recommends that on average one vehicle parking space is needed per 200 sq. ft. of office space. Abilene Aero's employees park their vehicles inside the

Air Operations Area (AOA) behind Abilene Aero's terminal/hangar building and not in the public parking lot. Consequently, employee parking has been excluded from the analysis below. It is not expected that additional parking spaces beyond what is already available will be needed for employee parking during the forecast period.

Table 4-32, *GA/FBO Terminal Vehicle Parking Facility Requirements,* provides an estimate of the terminal space requirements during the forecast period based on these factors.

Table 4-32
GA/FBO Terminal Vehicle Parking Facility Requirements

Facility	2017	2022	2027	2032	2037
Passenger/Pilot Parking Needs					
- Peak Hour Operations (AT, GA, and Military)	14	14	14	14	14
- Peak Hour Multiplier	3.5	3.5	3.5	3.5	3.5
- Parking Space Need for Passenger/Pilot	49	49	49	49	49
Total # of Spaces Currently	66	66	66	66	66
Total Deficiency/Surplus	**17**	**17**	**17**	**17**	**17**

Source: Garver, 2017

Based on these calculations, it is estimated that the size of the existing GA/FBO parking lot will be sufficient to accommodate future general aviation, air taxi, and military demand.

General Aviation Hangar Facilities

Future hangar areas should achieve a balance between maintaining an unobstructed expansion area, minimizing pavement development, and allowing convenient airside and landside access. For planning purposes, hangars should accommodate at least 95 percent of all based general aviation aircraft. Typically, single-engine piston aircraft demand 1,200 sq. ft., twin-propeller aircraft require 1,200 to 3,000 sq. ft., business turboprop/jet aircraft require approximately 3,000 to 5,000 sq. ft., and helicopters typically require approximately 1,500 sq. ft. General hangar design considerations include the following:

- Construction of aircraft hangars should be beyond an established building restriction line (BRL) surrounding the runway and taxiway areas, the runway OFZ, runway, and taxiway OFAs, and remain clear of the FAR Part 77 Surfaces and Threshold Siting Surfaces.
- Maintaining the minimum recommended clearance between T-hangars of 79 ft. for one-way traffic, and 143 ft. for two-way traffic is required. Taxilanes supporting T-hangars should be no less than 25 ft. wide. Individual paved approaches to each hangar stall are typically less costly, but not preferred to paving the entire T-hangar access/ramp area.

- Construction of additional hangar space if required to accommodate 95% of the current based aircraft, hangar waiting list, and forecast need.
- Adequate drainage with minimal slope differential between the hangar door and taxilane. A hard-surfaced hangar floor is recommended, with less than 1% downward slope to the taxilane/ramp.
- Segregate hangar development based on the hangar type and function. From a planning standpoint, hangars should be centralized in terms of auto access, and located along the established flight line to minimize costs associated with access, drainage, utilities and auto parking expansion.

Currently, on the Abilene Aero and Northwest GA Ramp, ABI has 143,500 sq. ft. of T-hangar space and approximately 188,000 sq. ft. of corporate/executive/box hangar space. As of July 2017, multiple T-hangars were vacant and approximately 36,000 sq. ft. of box hangar space was still available.

As of publication date, there were 105 based aircraft (79 single engine, 17, multi-engine, 8 jets, 1 helicopter) at the airport. Based on the forecast for based aircraft and the based aircraft fleet mix changes, it is presumed that hangar space will need to change as described in **Table 4-33**, *Hangar Facility Requirements,* to accommodate future demand.

Table 4-33
Hangar Facility Requirements

Facility	2017	2022	2027	2032	2037
Based Aircraft - Single Engine Piston/Light Sport Aircraft	79	77	76	75	74
Estimated Hangar Space per Aircraft	1,250	1,250	1,250	1,250	1,250
T-Hangar Space Required (sq. ft.)	98,750	96,250	95,000	93,750	92,500
Based Aircraft - Multi-Engine/Turboprop	17	17	17	17	17
Estimated Hangar Space per Aircraft	3,000	3,000	3,000	3,000	3,000
Box Hangar Space Required (sq. ft.)	51,000	51,000	51,000	51,000	51,000
Based Aircraft - Helicopters	1	2	2	3	3
Estimated Hangar Space per Aircraft	1,500	1,500	1,500	1,500	1,500
Box Hangar Space Required (sq. ft.)	1,500	3,000	3,000	4,500	4,500
Based Aircraft - Jet	8	10	11	12	13
Estimated Hangar Space per Aircraft	5,000	5,100	5,200	5,300	5,400
Box Hangar Space Required (sq. ft.)	40,000	51,000	57,200	63,600	70,200
Annual Itinerant Aircraft Operations - Airline OPS	25,224	25,736	26,013	26,366	26,673
Maintenance/Transient Hangar Area Demand (ft^2)	12,612	12,868	13,007	13,183	13,337
Total T-Hangar Space Required (sq. ft.)	98,750	96,250	95,000	93,750	92,500
Current T-Hangar Space (sq. ft.)	143,500	143,500	143,500	143,500	143,500
Surplus/Deficiency (sq. ft.)	**44,750**	**47,250**	**48,500**	**49,750**	**51,000**
Total Box Hangar Space Required (sq. ft.)	105,112	117,868	124,207	132,283	139,037
Box Hangar Space Lost to Exclusive Use/Office Space (estimated at 30%) (sq. ft.)	31,534	35,360	37,262	39,685	41,711
Total Box Hangar Space Required + Space Lost to Exclusive Use/Office Space (sq. ft.)	136,646	153,228	161,468	171,968	180,747
Current Box Hangar Space (sq. ft.)	188,000	188,000	188,000	188,000	188,000
Surplus/Deficiency (sq. ft.)	**51,354**	**34,772**	**26,532**	**16,032**	**7,253**

Source: Garver, 2017

Table Notes:

1. An average of 1,250 sq. ft. per aircraft was utilized for single-engine/light sport aircraft as it is the average size of an individual T-hangar.
2. An average of 3,000 sq. ft. per aircraft was utilized for the size of turboprop/multi-engine aircraft (this is approximately the size of a King Air 350).
3. An average of 1,500 sq. ft. per helicopter was utilized for based helicopter hangar demand calculations.
4. An average of 5,000 sq. ft. per aircraft was utilized for the size of jet aircraft (this is approximately the size of a Citation X). An escalation factor of 100 additional sq. ft. per 5-year increment was added to the jet aircraft category to account for the general trend toward larger jet aircraft.

5. A factor of .5 per operation was utilized for the calculations related to itinerant/maintenance hangar area demand.
6. To account for lost box hangar space due to a tenant's exclusive use of a facility/building in office space, an exclusive use/office space factor of 30% has been added to hangar space demand.

Based on these calculations, it is estimated that ABI will have sufficient T-hangar and box hangar space to accommodate demand during the forecast period. Additionally, ABI should consider reducing the current number of T-hangars present on the field and explore the possibility of redeveloping some of those sites into other facilities. Even though the existing box hangar infrastructure should be theoretically sufficient to accommodate forecasted demand, the location of additional box hangar sites will be considered in the alternatives chapter in case a new hangar needs to be constructed.

General Aviation Ramp/Apron Facilities

Aircraft ramp/apron areas are provided for aircraft maneuvering and parking. Typically, aprons are utilized for aircraft parking have a blend of based aircraft utilizing the apron as a permanent parking location and itinerant aircraft that are using the apron as a temporary parking location. However, Abilene Aero only has three Cessna Caravans that use the ramp as a regular tie-down location. Consequently, the ramp is almost exclusively used by aircraft for temporary parking on the ramp. This assumption has been taken into consideration in the calculations contained in this section related to the required aircraft apron area. This assumption is not expected to change during the forecast period.

Additionally, only the Abilene Aero and Northwest GA ramps were utilized for these calculations as those are the ramps primarily used by GA aircraft. The terminal area ramp is primarily used by airline aircraft and consequently has been included in the evaluation of the terminal ramp. The need to expand the EASI ramp is expected to be driven by the growth of the EASI facility. The facility requirements of the EASI ramp will be considered in a different section.

To begin the analysis, a weighted average of the apron square footage needed to park an aircraft was calculated. This weighted average was calculated based on the forecasted aircraft operations fleet mix at ABI. The weighted average also accounts for all required wingtip/nose/tail clearances on all sides of the aircraft and equivalent taxilane in front of the aircraft to allow aircraft of a similar size to pass by.

Table 4-34, *Aircraft Apron Space – Weighted Average Requirement – 2017*, shows the weighted average apron space requirement per aircraft calculation for 2017. The fleet mix at ABI is expected to shift slightly during the forecast period. Consequently, the weighted averages 2017, 2022, 2027, 2032, and 2037 are shown in **Table 4-35**, *Aircraft Apron Space – Weighted Average Requirement*.

Table 4-34
Aircraft Apron Space – Weighted Average Requirements - 2017

ADG	Average Length (ft)	Average Wingspan (ft)	Additional Clearance (ft)	TOFA Clearance (ft)	Average Parking Area Required (ft^2)	Fleet Mix	Weighted Average Parking Area (ft^2)
I	26	35	7.50	79	6,000	60.40%	3,624
II	55	60	9.00	115	14,664	38.35%	5,624
III	100	100	11.00	162	34,648	0.68%	236
IV	155	140	13.5	225	67,969	0.22%	153
Helicopter	35	30	12.00	0	3,186	0.34%	11
					Weighted Average:		**9,648**

Source: Garver, 2017
Notes: These calculations take into account the TOFA required for another aircraft to pass by the parked aircraft. The average parking area required was calculated by multiplying the average aircraft length plus 2 times the additional clearance margin by the average aircraft wingspan plus 2 times the additional clearance margin and then adding that number to the TOFA plus the aircraft's average wingspan plus 2 times the additional clearance margin.

Table 4-35
Aircraft Apron Space – Weighted Average Requirement

Year	Weighted Average Parking Area (ft^2) Per Aircraft
2017	9,648
2022	9,815
2027	9,816
2032	9,836
2037	9,846

Source: Garver, 2017

Based on these calculations and the ABI peaking characteristics described in the Forecast Chapter, Chapter 3, **Table 4-36**, *Aircraft Apron Space – Facility Requirement Calculations*, shows the estimated amount of apron space that will be required at ABI during the forecast period.

Table 4-36
Aircraft Apron Space – Facility Requirement Calculations

Year	Peak Month Average Day (PMAD) (GA/AT/ MILITARY ONLY)	Forecasted % of Itinerant Operations	Estimated Percentage of Itinerant Ops on Apron at Same Time	Weighted Average Aircraft Parking Area (ft²)	Estimated Parking Apron Required	Aircraft Circulation Factor	Total Apron Area Required (ft²)	Current Apron Area (ft²)	Surplus/ Deficiency Based on Current Apron Size (ft²)
2017	141	66.00%	70.00%	9,648	628,490	314,245	942,735	1,432,098	**489,363**
2022	142	66.00%	70.00%	9,815	643,903	321,952	965,855	1,432,098	**466,243**
2027	144	66.00%	70.00%	9,816	653,039	326,519	979,558	1,432,098	**452,540**
2032	145	66.00%	70.00%	9,836	658,914	329,457	988,370	1,432,098	**443,728**
2037	147	66.00%	70.00%	9,846	668,681	334,341	1,003,022	1,432,098	**429,076**

Source: Garver, 2017
Notes: An assumption was made that no more than 70% of the total number of estimated itinerant operations during the PMAD would be on the ramp at the same time. The estimated parking apron required was calculated by multiplying the PMAD by the forecasted % of itinerant operations, then multiplying that result by the estimated percentage of itinerant OPS on the apron at the same time, and then multiplying that result by the weighted average aircraft parking area. A factor of .5 was added to the apron space calculation to account for general aircraft circulation and aircraft movement.

Based on these calculations, ABI should have sufficient ramp space to be able to accommodate the forecasted general aviation, air taxi, and military traffic throughout the forecast period. As part of the Alternatives Chapter, various alternatives will be considered for expanding the GA ramp areas in case the need arises during the forecast period.

EASI Ramp and Hangar Facilities

As discussed previously, Eagle Aviation Services, Inc. (EASI) is an aircraft maintenance base for Envoy Air that provides airline flights at ABI under the American Eagle brand. Currently, EASI handles the maintenance for the majority of the ERJ-145 and ERJ-140 fleet for the entire Envoy Air. Due to the growth of Envoy's fleet, increasing demands have been placed on EASI's facilities in the past 5 years. As a result of that demand, EASI has had to build new hangars to support the growing maintenance demands of the Envoy fleet.

Envoy continues to add new aircraft to its existing fleet. They have added new ERJ-175 aircraft and have started bringing older ERJ-140 aircraft out of storage for use. Consequently, it is expected that the need to expand the EASI facilities (hangars and aprons) could occur during the forecast period. As a result, options for the continued development of EASI's facilities will be considered in the Alternatives Chapter.

General Aviation Fuel Storage Facilities

Fuel storage requirements are based on the forecast of annual operations, aircraft utilization, average fuel consumption rates, and the forecast mix of aircraft anticipated at ABI. On average, the typical single-engine airplane consumes 12.0 gallons of fuel per hour and flies approximately 100 nautical miles (1.0 to 1.5 hours) per flight. Turbine aircraft generally will fly greater distances averaging 300 nautical miles and approximately 1.5 – 2.0 hours. Market conditions will determine the ultimate need for fuel tanks and their size. The following guidelines should be implemented when planning future airport fuel facilities:

- Aircraft fueling facilities should remain open continually (24-hour access), remain visible, and be within close proximity to the terminal building or FBO to enhance security and convenience.
- Fuel storage capacity should be sufficient for average peak-hour activity.
- Fueling systems should permit adequate wing-tip clearance to other structures, designated aircraft parking areas (tie-downs), maneuvering areas, and OFAs associated with taxilane and taxiway centerlines.
- Fuel facilities should be located beyond the RSA and BRL.
- Fuels storage tanks should be equipped with monitors to meet current state and federal environmental regulations and be sited in accordance with local fire codes.
- Have a dedicated fuel truck for Jet-A delivery to minimize the liability associated with towing and maneuvering expensive aircraft up to and in the vicinity of fueling facilities.
- Maintaining adequate truck transport access to the fuel storage tanks for fuel delivery.

As reported in the Inventory chapter, Chapter 2, ABI is equipped, through Abilene Aero, with four Jet-A tanks totaling 47,000 gallons of storage capacity and two 100LL tanks totaling 20,000 gallons of storage capacity. Additionally, Abilene Aero recently installed a 500-gallon 100LL self-service tank. Based on discussions with the FBO it is believed that these tanks will provide sufficient storage capacity for the duration of the forecast period unless aircraft operations and fleet mix change significantly. The development of a larger fuel farm facility will not be a development objective in the Alternatives Chapter.

Air Cargo/Unmanned Aircraft System (UAS) Facilities

FedEx currently has a facility on the Northwest GA ramp. The building includes a distribution facility that sorts shipments for delivery and truck transfer. FedEx currently operates a small number of Cessna Caravans out of ABI for air cargo purposes.

As discussed in the Forecast Chapter, Chapter 3, air cargo demand is forecasted to grow at a slow rate at ABI during the forecast period. This is expected to be primarily driven by the incremental growth of the Abilene region's economy and the continued growth of direct-to-consumer shipping that is a result of more online purchasing. As part of the master planning process, FedEx was contacted to gather their input/insight on how cargo operations at ABI could change in the future. However, no actionable information was obtained. Consequently, it is difficult to establish how this growth will translate into future facility requirements for ABI.

An additional factor that adds complexity to establishing cargo related facility requirements at ABI is the growth and continued evolution of UAS. The utilization of drones and drone technology has evolved at a rapid pace over the past 5 years and this trend is expected to continue. There are now companies developing UAS for cargo transport (both package delivery and mass transport). While the technology is evolving quickly, it is expected that the FAA will be cautious and diligent in studying the use of UAS and determining how, and if, UAS should be integrated into the regular use of airports and the National Air Space System. However, if UAS integration at airports does occur, it is expected that the commercial use of drones for cargo operations will probably occur before the utilization of UAS for passenger carriage.

Since it is unclear exactly how the use of UAS may be integrated into the daily use of an airport, it is important that flexibility is maintained when planning for potential on-airport drone facilities for UAS -based cargo operations and other commercial purposes.

In the Alternatives Chapter, various sites at ABI will be reviewed and considered for traditional air cargo, UAS -based cargo, and other commercial UAS operations. In general, it is believed that these facilities should be located on-airport but as far away as practical from the primary runways to ensure maximum flexibility if the FAA decides not to allow UAS to utilize the runways used by piloted aircraft.

Support Facilities

ABI has a number of support facilities that need to be considered in the facility requirements analysis. These facilities include the ARFF Station, utilities, the airport maintenance facility, and the rental car service center.

ARFF Station

The existing Aircraft Rescue and Fire Fighting (ARFF) facility is located south of the intersection of Taxiway M and P close to the terminal ramp. The facility is occupied 24 hours per day, 7 days a week, 365 days a year. The facility currently houses two 1,500-gallon ARFF trucks. ABI is currently an ARFF Index B airport and is expected to remain an ARFF Index B airport during the forecast period. The ERJ-175 which is forecasted to become the primary air carrier aircraft at ABI during the forecast period is 104 ft. in length which is within the Index B aircraft length parameters (90 ft. to 126 ft.).

An expansion is currently planned for the existing ARFF station. The expansion will extend the existing facility an additional 20+ ft. to the north to allow it to accommodate newer ARFF trucks which are typically longer than older ARFF trucks. Based on the forecast, no additional expansions should be required unless a new regulatory requirement is placed on ARFF facilities that require an expansion.

Utilities

As discussed in the Inventory Chapter, Chapter 2, ABI currently has sufficient utility infrastructure to meet its needs. Due to the slight growth expected during the forecast period, it is not expected that significant utility improvement will be needed during the forecast period. The exception is the stormwater drainage infrastructure. As discussed in the Inventory Chapter a drainage issue exists along Lance Drive close to the EASI facility. This issue needs to be addressed with stormwater infrastructure improvements.

Airport Maintenance Facility

The ABI maintenance facility is located on Bonanza Drive, close to the intersection of Bonanza Drive and Airport Blvd. The facility consists of a single small building (approximately 2,000 sq. ft.) and a laydown yard (approximately 28,000 sq. ft.). ABI would like to expand the facility to provide covered parking for vehicles/equipment and a larger enclosed storage/maintenance area. Development alternatives for the airport maintenance facility will be included in the Alternatives Chapter.

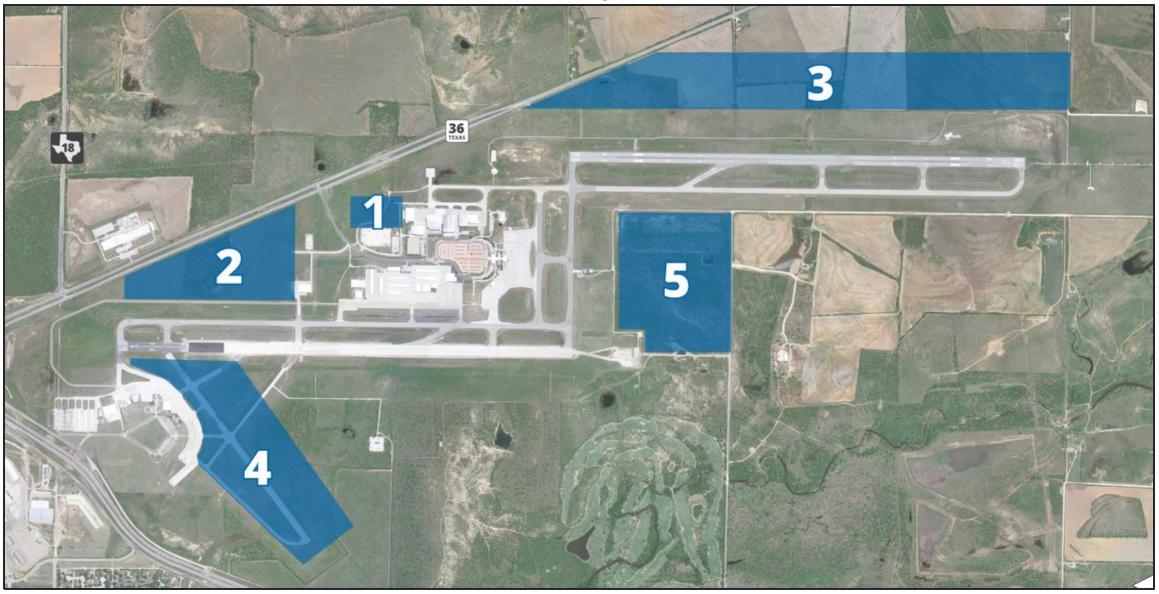
Rental Car Service Center

ABI is currently collecting a Customer Facility Charge (CFC) to fund the development of a consolidated rental car service facility. This facility will provide rental car storage and maintenance facilities. Additionally, this facility could also serve as a rental car return facility. Potential locations for this facility will be considered during the Alternatives Chapter.

Future Aeronautical/Non-Aeronautical Development

Future new aeronautical and non-aeronautical developments at ABI will play a major role in the growth and development of ABI during the forecast period. As discussed in the Inventory Chapter, ABI has a number of areas that are undeveloped or well-suited for redevelopment. These areas are shown below in **Figure 4-36**, *Potential Development Areas,* and **Table 4-37**, *Potential Development Areas*.

Figure 4-36
Potential Development Areas



Source: Garver, 2017

Table 4-37
Potential Development Areas

Development Area	Acreage	Potential Use	Owned by ABI (Y/N)	Location Description
#1	21	Aeronautical	Yes	North of existing EASI Facility and South of Airport Blvd.
#2	66	Aeronautical and Non-aeronautical	Yes	Area north of Airport Blvd and west of HWY 36
#3	100	Aeronautical	No	Area east of Runway 17L/35R
#4	87	Aeronautical	Yes	Runway 4/22 Area
#5	85	Non-aeronautical	No	Area south of ARFF Station

Source: Garver, 2017

The type(s) of development(s) that should be considered in each of these areas will be discussed in the Alternatives Chapter.

Facility Requirements Summary

Based on the analysis described in this chapter, the following development objectives have been developed for ABI to guide the alternatives development process:

Runways:

- Evaluate the feasibility of extending Runway 17R/35L or 17L/35R to at least 8,500 ft. to accommodate future traffic.

- Evaluate the feasibility of adding a GPS based precision instrument approach to Runway 17R and a GPS based non-precision instrument approach to Runway 35L.
- Evaluate the feasibility of adding an approach lighting system to Runway 17R to complement the proposed precision instrument approach for that runway.
- Gain sufficient control over the land outside of airport property but within the RPZ for Runway 17L, 17R, and 35R.
- Address the deficiency of the runway hold position markings for Runway 4/22.
- Add a four light PAPI system to Runway 35R.

Taxiways

- Update all taxiway fillets that were designed to the older ADG based taxiway design standards as part of upcoming pavement rehabilitation projects.
- Resolve the prohibited taxiway configuration issues. Currently, there are six taxiways that allow direct access from a ramp area to a runway without requiring an aircraft to make a turn.

Landside/Roadway:

- Improve roadway signage on airport.
- Improve roadway signage off airport and the visibility of the airport's marquee sign.

Terminal:

- Evaluate the need to reduce space allocated for areas that are larger than needed over the forecast period.
- Expand the areas where additional space is required (e.g. departure lounges, outbound baggage, rental car, SSCP, baggage screening, airport offices, etc.)

General Aviation and Aircraft Maintenance Facilities:

- Identify a site for potential box hangar development. Consider potentially re-developing some T-hangar sites for this.
- Identify a site for potential ramp expansion.
- Establish an expansion plan for the EASI facility.

Other Facilities and Future Development:

- Establish a land-use plan for potential aeronautical/non-aeronautical development sites.
- Evaluate potential locations for a rental car service center.
- Evaluate options for expanding the existing airport maintenance facility.
- Stormwater drainage improvements along Lance Drive by EASI facility.
- Evaluate potential air cargo and drone development/expansion sites.

Chapter 5 – Airport Alternatives Analysis

Introduction

This chapter describes the various runway, taxiway, terminal, landside, land-use development, and aeronautical development alternatives that were created based on the needs defined in the Facility Requirements Chapter. This chapter also discusses the evaluation process used to select the preferred development alternative for each area, reviews the results of the evaluation process, and provides an overview of the composite preferred development alternative.

Alternatives Development Process

The development of the various alternatives described in this chapter was created by reviewing the facility requirements defined in Chapter 4 and brainstorming numerous development options that could potentially satisfy the requirements. A portion of this brainstorming was accomplished through a number of design charrettes that were conducted with members of the ABI Master Plan Steering Committee (MPSC) and other Abilene Regional Airport stakeholders. The alternative ideas that were developed during the brainstorming process were then consolidated into seven runway/approach alternatives, ten taxiway development alternatives, eight terminal alternatives, one landside alternative, twelve land-use development alternatives, and four aeronautical development alternatives. Each of these alternatives then went through the formal evaluation process described in each section to select a preferred alternative for that area. The preferred alternative for each area was then combined into a composite preferred development alternative.

To help guide the development of the composite preferred alternative for ABI, each of the alternative categories discussed above was ranked in order of importance to the airport's long-term development. The ranking is shown below:

1. Runway/Approach
2. Taxiway
3. Terminal & Landside
4. Land-Use
5. Aeronautical Development

The operation of an airport centers on its airside facilities. Consequently, it is of the utmost importance for airports to ensure that their runway, approach, and taxiway needs are given the highest priority. Terminal and landside facilities are the next priority as these facilities are typically the largest non-airfield building/infrastructure facilities on the airport and are the most difficult to make significant modifications to without incurring a substantial cost. Land-Use alternatives were considered the fourth priority because non-aeronautical revenue development is a high priority for ABI. Aeronautical development alternatives were considered the fifth priority because the areas where these facilities are established are largely based on the preferred land-use alternative that is selected for the airport.

Runway/Approach Alternatives

This section discusses the runway/approach alternatives that were developed for ABI, the formal evaluation that was completed for the alternatives, and an overview of the preferred runway/approach alternative that was selected.

The existing Runway Design Code (RDC) for Runway 17L/35R is C-III-2,400, Runway 17R/35L is C-III-5,000, and Runway 4/22 is B-II-5,000.

Development Objectives

Based on the analysis completed in the Facility Requirement Chapter, various components of ABI's runway/approach facilities need to be improved or modified to meet the current and long-term needs of ABI's users. These improvement needs are discussed in the runway/approach development objectives shown below:

- Runway/Approach Objective #1: Evaluate the feasibility of extending Runway 17R/35L or 17L/35R to at least 8,500 feet to accommodate future traffic that could fly longer routes.
- Runway/Approach Objective #2: Evaluate the feasibility of adding a GPS based precision instrument approach (or ILS) to Runway 17R and a GPS based non-precision instrument approach to Runway 35L (1 mile or ¾ mile visibility minimums) to improve the usability of the airport during all weather conditions.
- Runway/Approach Objective #3: Evaluate the feasibility of adding a MALSR to Runway 17R to complement the proposed precision instrument approach for that runway.
- Runway/Approach Objective #4: Gain sufficient control over the land within the ultimate Runway Protection Zones (RPZs) associated with Runway 17L, 17R, 35L, and 35R.
- Runway/Approach Objective #5: Resolve the issue with the runway hold position markings associated with Runway 4/22 being located inside the Runway 4/22 Obstacle Free Zone (OFZ).
- Runway/Approach Objective #6: Physically de-couple Runway 4/22 from Runway 17L/35R.

Many of these development objectives are addressed in a different manner in each of the alternatives. However, several development objectives are addressed identically in each of the alternatives. Specifically, the following items are addressed identically in each alternative:

- Runway/Approach Objective #1: In each of the alternatives, Runway 17L/35R is the runway that is extended to 8,500 ft. in length as opposed to Runway 17R/35L. Runway 17L/35R was chosen as the runway that should be extended to 8,500 ft. because it is the runway with the lowest existing approach minimums, has fewer barriers (e.g. environmental, engineering, infrastructure, etc.) that would impact the extension, requires less land purchase, and allows for better future land-use for aeronautical and non-aeronautical development.
- Runway/Approach Objective #5: In all of the alternatives Runway 4/22 is shown as being decommissioned at some point in the future which will resolve the issue related to the runway hold position markings being located too close to the runway centerline which allows aircraft to penetrate the runway OFZ. Currently, Runway 4/22 is infrequently used and the infrastructure associated with the runway (e.g. pavement, lighting, markings, signage, etc.) is outdated and the runway edge lighting system is not operational. Additionally, Runway 4/22 is not necessary to meet the FAA wind coverage requirements for the parallel runways and is considered a tertiary runway which limits its eligibility for AIP grant funds. Based on this information, it is recommended that Runway 4/22 be closed in the future and the area redeveloped for aeronautical and non-aeronautical land use.
- Runway/Approach Objective #6: Each of the alternatives shows the physical de-coupling of Runway 4/22 and Runway 17R/35L. This will include the removal of the Runway 4/22 pavement that is inside the Runway Safety Area (RSA) for Runway 17R/35L.

Runway/Approach Objectives #2, 3, and 4 are all addressed in different manners in each of the runway/approach alternatives.

Runway/Approach Alternatives

Based on the development objectives discussed above, the following seven runway/approach alternatives were created. Each of these alternatives portrays various ways the runway/approach development objectives could be met.

- ***Alternative #1 – Close to Status Quo***

  Alternative #1 is considered "close to status quo" because the alternative includes a minimum number of infrastructure/approach changes. It is meant to be a low-cost alternative for future development. In this alternative, the RPZ dimensions for each runway remain unchanged from their existing dimensions.

  Specifically, this alternative includes the following improvements/changes compared to the existing runway/approach facilities:

  - Decommissioning of Runway 4/22.
  - Removal of Runway 4/22 pavement inside the Runway 17L/35R RSA.

- Extending Runway 17L/35R 1,302 ft. to the south to a total length of 8,500 ft. This includes the relocation of the existing MALSR system for Runway 35R to accommodate runway extension, the relocation of the Runway 35R PAPI, and the purchase of 26 acres of property to protect the Runway 35R RPZ.
- Approach visibility minimums stay the same for each runway end with exception of Runway 35L. An Instrument Approach Procedure (IAP) with visibility minimums of 1 mile added to Runway 35L.
- The portions of the RPZs associated with Runway 17R and 17L that extend beyond the existing airport property line are addressed with avigation easements or property purchases. Avigation easements are considered more likely. An avigation easement has already been established for non-airport property north of TX-36 that is inside the RPZ limits for Runway 17L. An avigation easement for Runway 17R will need to be established.

Runway/Approach Alternative #1 is shown in **Figure 5-1**.

✈ ***Alternative #2 – Improved Approaches for Runway 17R (PIR) and 35L***

Alternative #2 investigates the impacts of adding a precision instrument approach to Runway 17R and a non-precision IAP with ¾ mile visibility minimums to Runway 35L. The addition of these approaches greatly expands the RPZs for these runways. The new RPZ for Runway 17R would extend over the Loop 322 and TX-36 intersection. The new RPZ for Runway 35L would remain on airport property.

Specifically, this alternative includes the following improvements/changes compared to the existing runway/approach facilities:

- Decommissioning of Runway 4/22.
- Removal of Runway 4/22 pavement inside the Runway 17L/35R RSA.
- Extending Runway 17L/35R 1,302 ft. to the south to a total length of 8,500 ft. This includes the relocation of the existing MALSR system for Runway 35R to accommodate runway extension, the relocation of the Runway 35R PAPI, and the purchase of 26 acres of property to protect the Runway 35R RPZ.
- Approach visibility minimums stay the same for each runway end with exception of Runway 17R and 35L. An Instrument Approach Procedure (IAP) with visibility minimums of 3/4 mile is added to Runway 35L. An IAP with precision instrument minimums (1/2 mile) is added for Runway 17R and a MALSR is installed to support the newly establish precision instrument approach for the runway.
- The portions of the RPZs associated with Runway 17R and 17L that extend beyond the existing airport property line are addressed with avigation easements or property purchases. Avigation easements are considered more likely. An avigation easement has already been established for non-airport property north of TX-36 that is inside the RPZ limits for Runway 17L. An avigation

easement for Runway 17R will need to be established. However, a sizable portion of the RPZ associated with Runway 17R extends over Loop 322 and TX-36. Consequently, the feasibility of this alternative is predicated on FAA accepting the location of these roadways inside the RPZ.

Runway/Approach Alternative #2 is shown in **Figure 5-2**.

✈ ***Alternative #3 – Improved Approaches for Runway 17R (PIR) and 35L with RPZs on Airport Property***

Alternative #3 studies the impacts of establishing a PIR for Runway 17R and a non-precision IAP with ¾ mile visibility minimums to Runway 35L similar to Alternative #2. However, this alternative assumes that the RPZs for Runway 17L and Runway 17R will have to be pulled onto airport property which will require landing threshold displacements for these runways.

Specifically, this alternative includes the following improvements/changes compared to the existing runway/approach facilities:

- Decommissioning of Runway 4/22.
- Removal of Runway 4/22 pavement inside the Runway 17L/35R RSA.
- Extending Runway 17L/35R 1,302 ft. to the south to a total length of 8,500 ft. This includes the relocation of the existing MALSR system for Runway 35R to accommodate runway extension, the relocation of the Runway 35R PAPI, and the purchase of 26 acres of property to protect the Runway 35R RPZ.
- Approach visibility minimums stay the same for each runway end with exception of Runway 17R and 35L. An Instrument Approach Procedure (IAP) with visibility minimums of 3/4 mile is added to Runway 35L. An IAP with precision instrument minimums (1/2 mile) is added for Runway 17R and a MALSR is installed to support the newly establish precision instrument approach for the runway. The landing threshold for Runway 17R would be displaced by approximately 2,514 ft. which would require the MALSR system to be an in-pavement system.
- The portions of the RPZs associated with Runway 17R and 17L that currently extend beyond the existing airport property line would be pulled back onto airport property by displacing the landing threshold of each runway and establishing the use of declared distances. The landing threshold for Runway 17R would be displaced 2,514 ft. and the landing threshold for Runway 17L would be displaced 1,213 ft.

Runway/Approach Alternative #3 is shown in **Figure 5-3**.

✈ ***Alternative #4 – Improved Approaches for Runway 17R (PIR) and 35L with Runway Extensions Due to Displaced Thresholds***

Alternative #4 is a variation of Alternative #3. This alternative extends Runway 17R/35L and Runway 17L/35R to the south by the same distance the landing thresholds are displaced for Runway 17R and 17L to bring the RPZs for those runways completely on to airport property.

Specifically, this alternative includes the following improvements/changes compared to the existing runway/approach facilities:

- Decommissioning of Runway 4/22.
- Removal of Runway 4/22 pavement inside the Runway 17L/35R RSA.
- Extending Runway 17L/35R 1,302 ft. to the south to a total length of 8,500 ft. This includes the relocation of the existing MALSR system for Runway 35R to accommodate runway extension, the relocation of the Runway 35R PAPI, and the purchase of 26 acres of property to protect the Runway 35R RPZ.
- Runway 17L/35R would be extended 2,514 ft. to the south to maintain the existing Landing Distance Available (LDA) for Runway 17L of 7,203 ft.
- Approach visibility minimums stay the same for each runway end with exception of Runway 17R and 35L. An Instrument Approach Procedure (IAP) with visibility minimums of 3/4 mile is added to Runway 35L. An IAP with precision instrument minimums (1/2 mile) is added for Runway 17R and a MALSR is installed to support the newly establish Precision Instrument Approach for the runway. The landing threshold for Runway 17L would be displaced by approximately 2,514 ft. which would require the MALSR system to be an in-pavement system.
- The portions of the RPZs associated with Runway 17R and 17L that currently extend beyond the existing airport property line would be pulled back onto airport property by displacing the landing threshold of each runway and establishing the use of declared distances. The landing threshold for Runway 17R would be displaced 2,514 ft. and the landing threshold for Runway 17L would be displaced 1,213 ft.

Runway/Approach Alternative #4 is shown in **Figure 5-4**.

✈ ***Alternative #5 – Close to Status Quo With RPZs on Airport Property***

Alternative #5 is a variation of Alternative #1. This alternative maintains all the RPZs at their existing dimensions but studies the impacts of pulling the existing RPZs completely onto airport property.

Specifically, this alternative includes the following improvements/changes compared to the existing runway/approach facilities:

- Decommissioning of Runway 4/22.
- Removal of Runway 4/22 pavement inside the Runway 17L/35R RSA.
- Extending Runway 17L/35R 1,302 ft. to the south to a total length of 8,500 ft. This includes the relocation of the existing MALSR system for Runway 35R to accommodate runway extension, the relocation of the Runway 35R PAPI, and the purchase of 26 acres of property to protect the Runway 35R RPZ.
- Approach visibility minimums stay the same for each runway end with exception of Runway 35L. An Instrument Approach Procedure (IAP) with visibility minimums of 1 mile is added to Runway 35L.
- The portions of the RPZs associated with Runway 17R and 17L that currently extend beyond the existing airport property line would be pulled back onto airport property by displacing the landing threshold of each runway and establishing the use of declared distances. The landing threshold for Runway 17R would be displaced 802 ft. and the landing threshold for Runway 17L would be displaced 1,213 ft.

Runway/Approach Alternative #5 is shown in **Figure 5-5**.

✈ ***Alternative #6 – ¾ Mile IAPs for Runway 17R and 35L with RPZs on Airport Property***

Alternative #6 studies the impacts of establishing a non-precision IAP with ¾ mile visibility minimums for Runway 17R instead of establishing a precision instrument approach. Additionally, this alternative assumes the landing thresholds for Runway 17R and 17L will be displaced to pull the RPZs onto completely onto airport property.

Specifically, this alternative includes the following improvements/changes compared to the existing runway/approach facilities:

- Decommissioning of Runway 4/22.
- Removal of Runway 4/22 pavement inside the Runway 17L/35R RSA.
- Extending Runway 17L/35R 1,302 ft. to the south to a total length of 8,500 ft. This includes the relocation of the existing MALSR system for Runway 35R to accommodate runway extension, the relocation of the Runway 35R PAPI, and the purchase of 26 acres of property to protect the Runway 35R RPZ.
- Approach visibility minimums stay the same for each runway end with exception of Runway 17R and 35L. An Instrument Approach Procedure (IAP) with visibility minimums of ¾ mile is added to Runway 17R and Runway 35L.
- The portions of the RPZs associated with Runway 17R and 17L that currently extend beyond the existing airport property line would be pulled back onto airport property by displacing the landing threshold of each runway and establishing the use of declared distances. The landing threshold for Runway 17R

would be displaced 1,574 ft. and the landing threshold for Runway 17L would be displaced 1,213 ft.

Runway/Approach Alternative #6 is shown in **Figure 5-6**.

✈ ***Alternative #7 – ¾ Mile IAPs for Runway 35L***

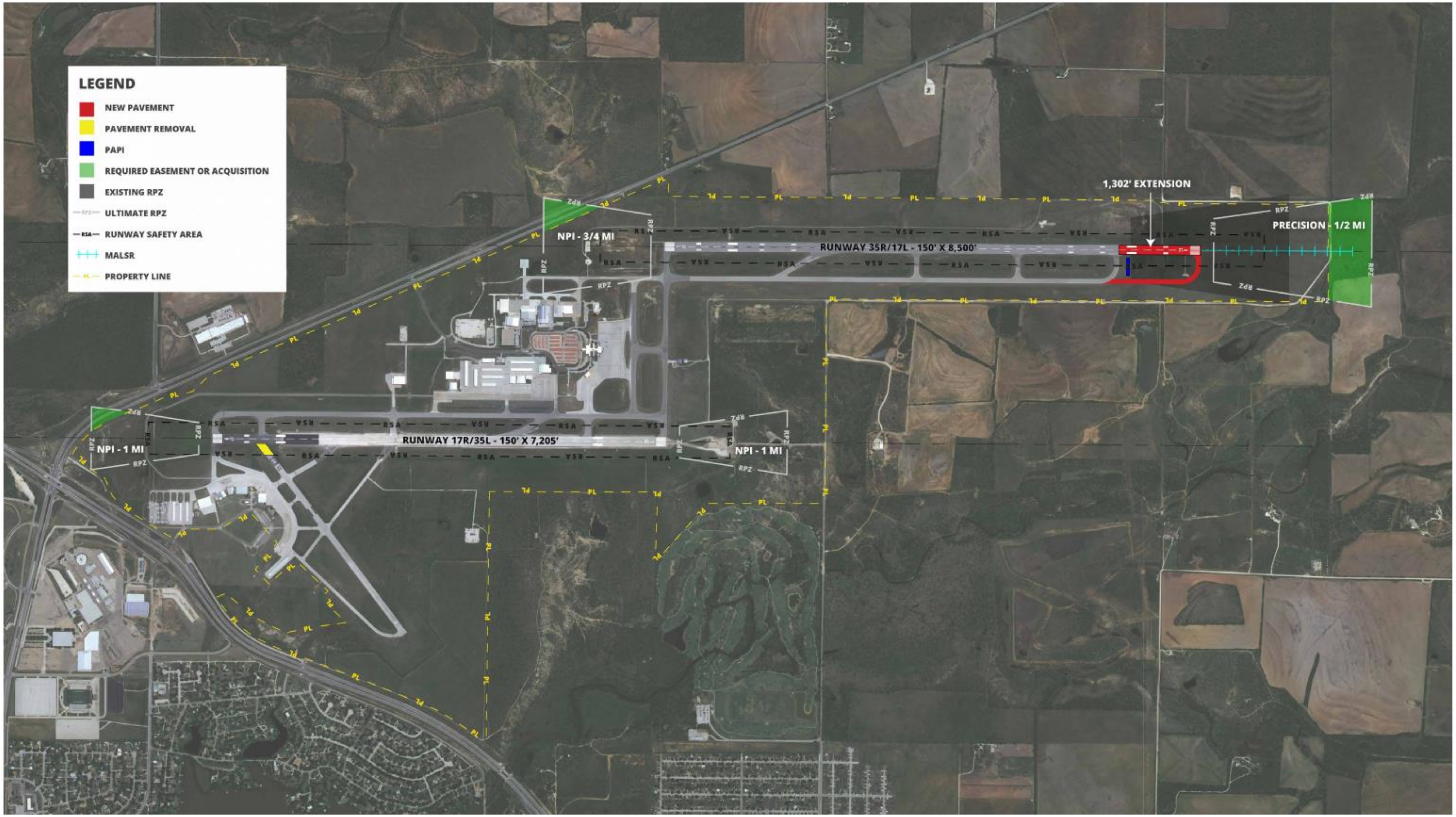
Alternative #7 combines aspects of the other alternatives to establish an alternative that uses the existing infrastructure and property to the fullest extent possible. This alternative does not change the approaches or RPZs for Runway 17L, 17R, and 35R but adds a non-precision IAP with ¾ mile visibility minimums for Runway 35L to improve accessibility to ABI if Runway 35R is not available.

Specifically, this alternative includes the following improvements/changes compared to the existing runway/approach facilities:

- Decommissioning of Runway 4/22.
- Removal of Runway 4/22 pavement inside the Runway 17L/35R RSA.
- Extending Runway 17L/35R 1,302 ft. to the south to a total length of 8,500 ft. This includes the relocation of the existing MALSR system for Runway 35R to accommodate runway extension, the relocation of the Runway 35R PAPI, and the purchase of 26 acres of property to protect the Runway 35R RPZ.
- Approach visibility minimums stay the same for each runway end with exception of Runway 35L. An Instrument Approach Procedure (IAP) with visibility minimums of ¾ mile is added to Runway 35L.
- The portions of the RPZs associated with Runway 17R and 17L that extend beyond the existing airport property line are addressed with avigation easements or property purchases. Avigation easements are considered more likely. An avigation easement has already been established for non-airport property north of TX-36 that is inside the RPZ limits for Runway 17L. An avigation easement for Runway 17R will need to be established.

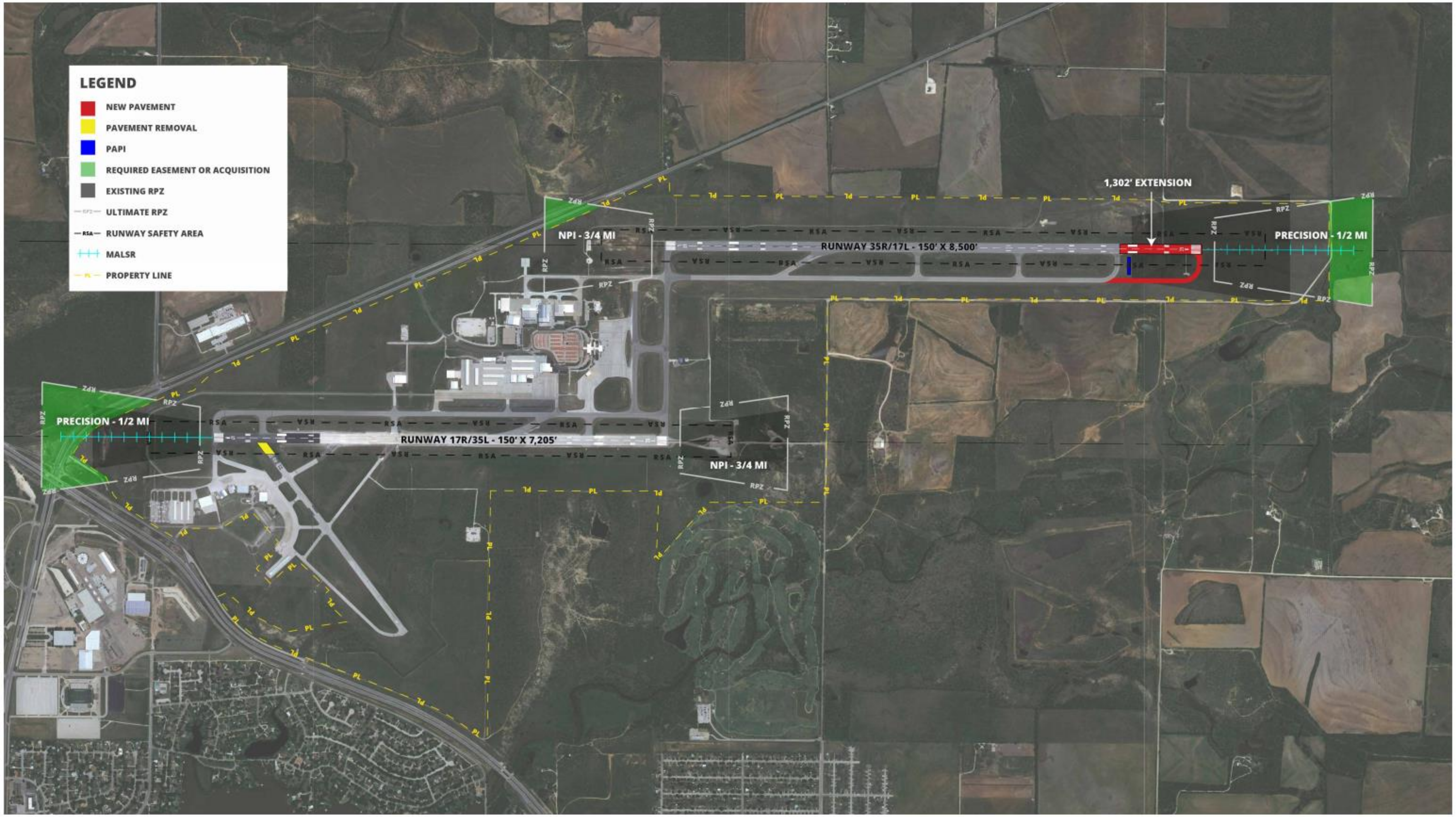
Runway/Approach Alternative #7 is shown in **Figure 5-7**.

Figure 5-1
Runway/Approach Alternative #1



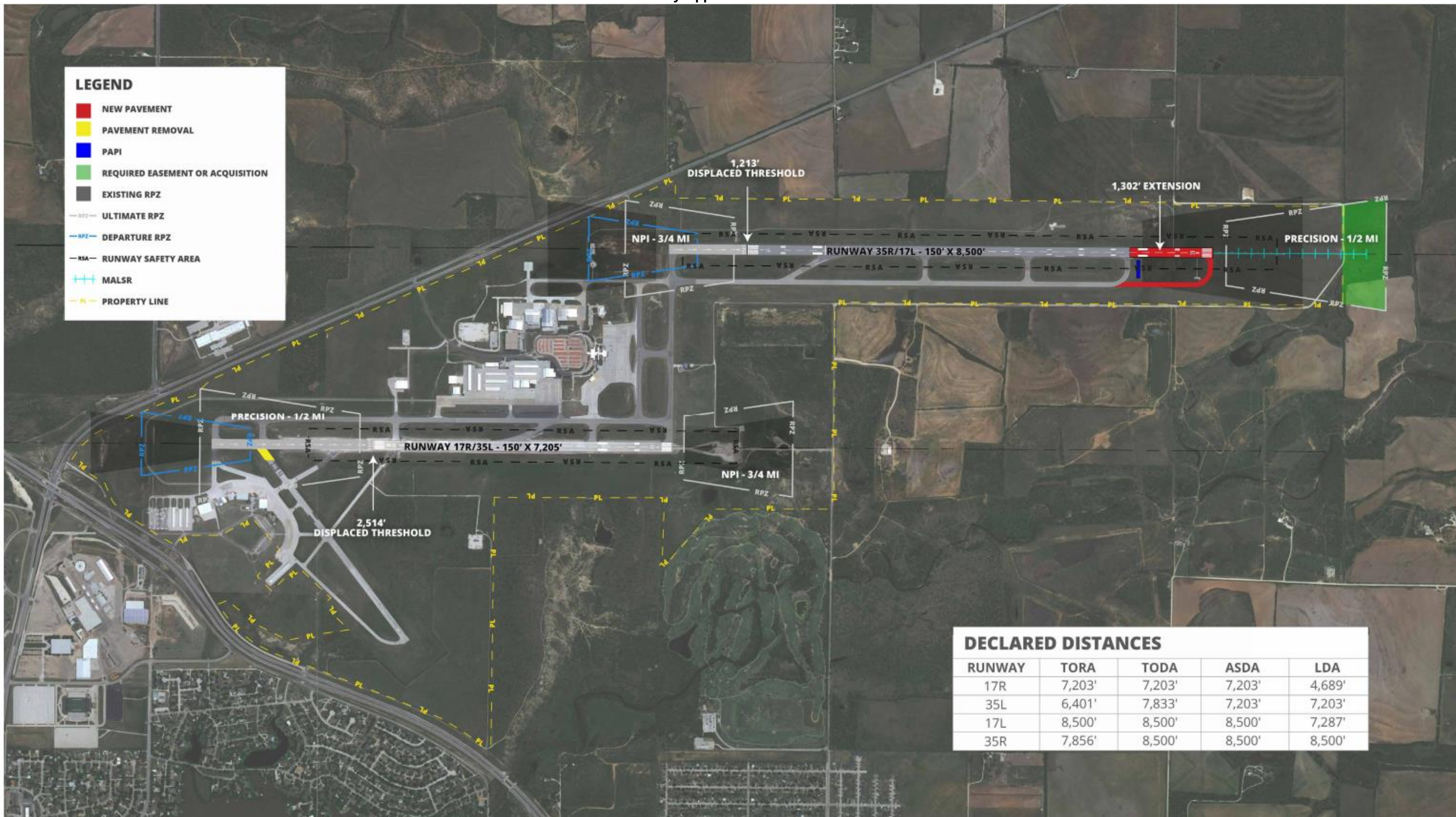
Source: Garver, 2018

Figure 5-2
Runway/Approach Alternative #2



Source: Garver, 2018

Figure 5-3
Runway/Approach Alternative #3

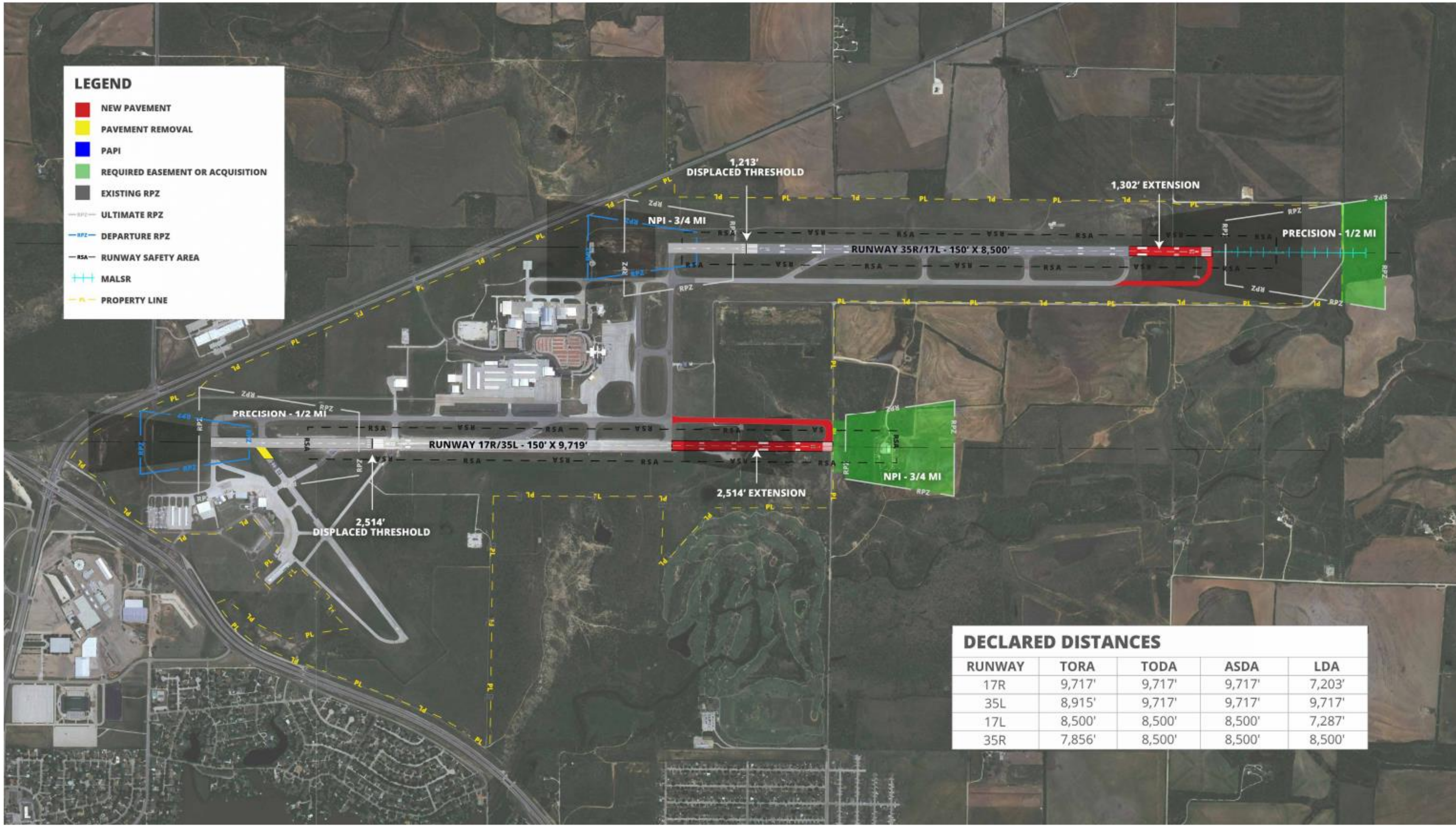


DECLARED DISTANCES

RUNWAY	TORA	TODA	ASDA	LDA
17R	7,203'	7,203'	7,203'	4,689'
35L	6,401'	7,833'	7,203'	7,203'
17L	8,500'	8,500'	8,500'	7,287'
35R	7,856'	8,500'	8,500'	8,500'

Source: Garver, 2018

Figure 5-4
Runway/Approach Alternative #4

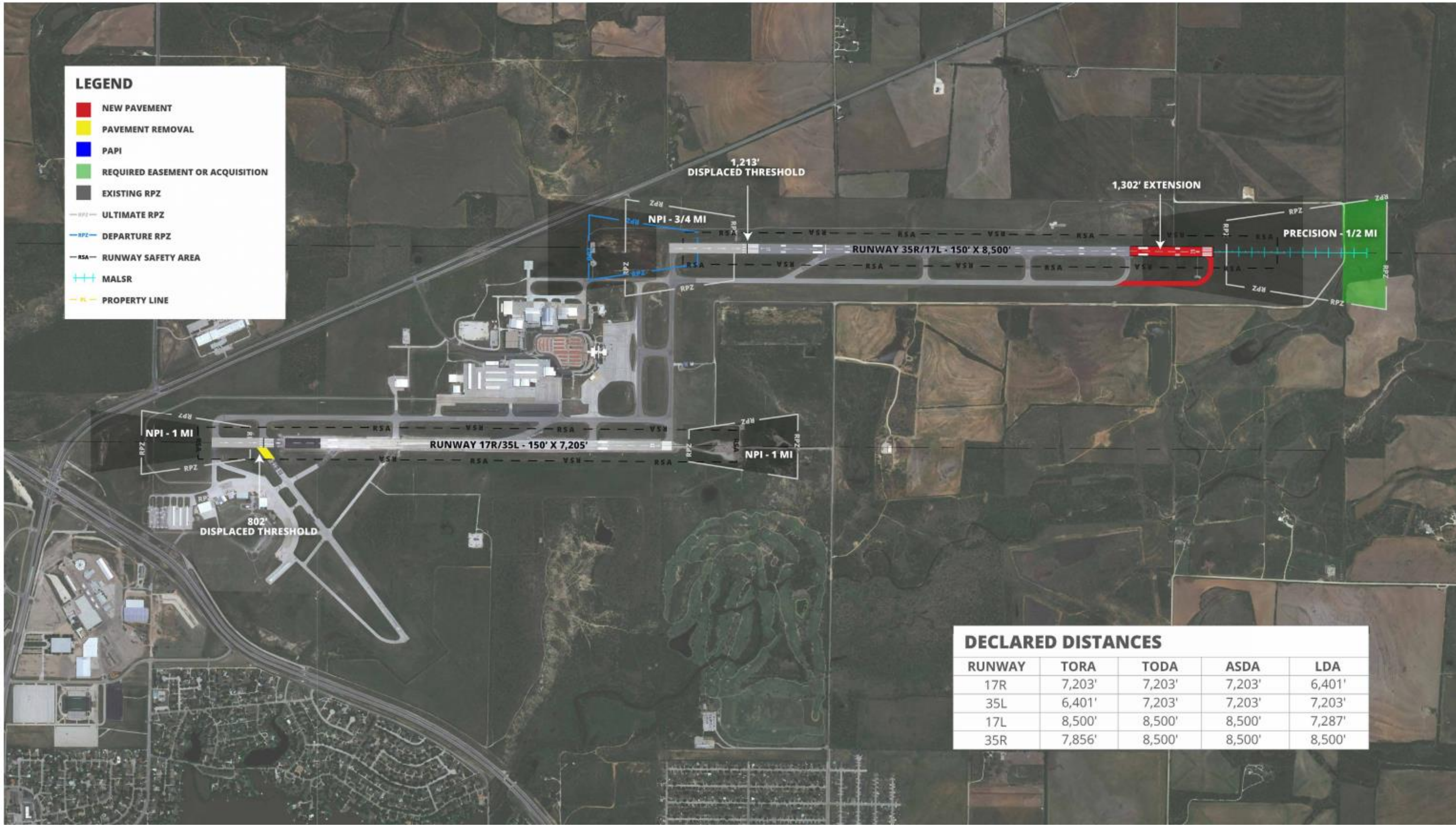


DECLARED DISTANCES

RUNWAY	TORA	TODA	ASDA	LDA
17R	9,717'	9,717'	9,717'	7,203'
35L	8,915'	9,717'	9,717'	9,717'
17L	8,500'	8,500'	8,500'	7,287'
35R	7,856'	8,500'	8,500'	8,500'

Source: Garver, 2018

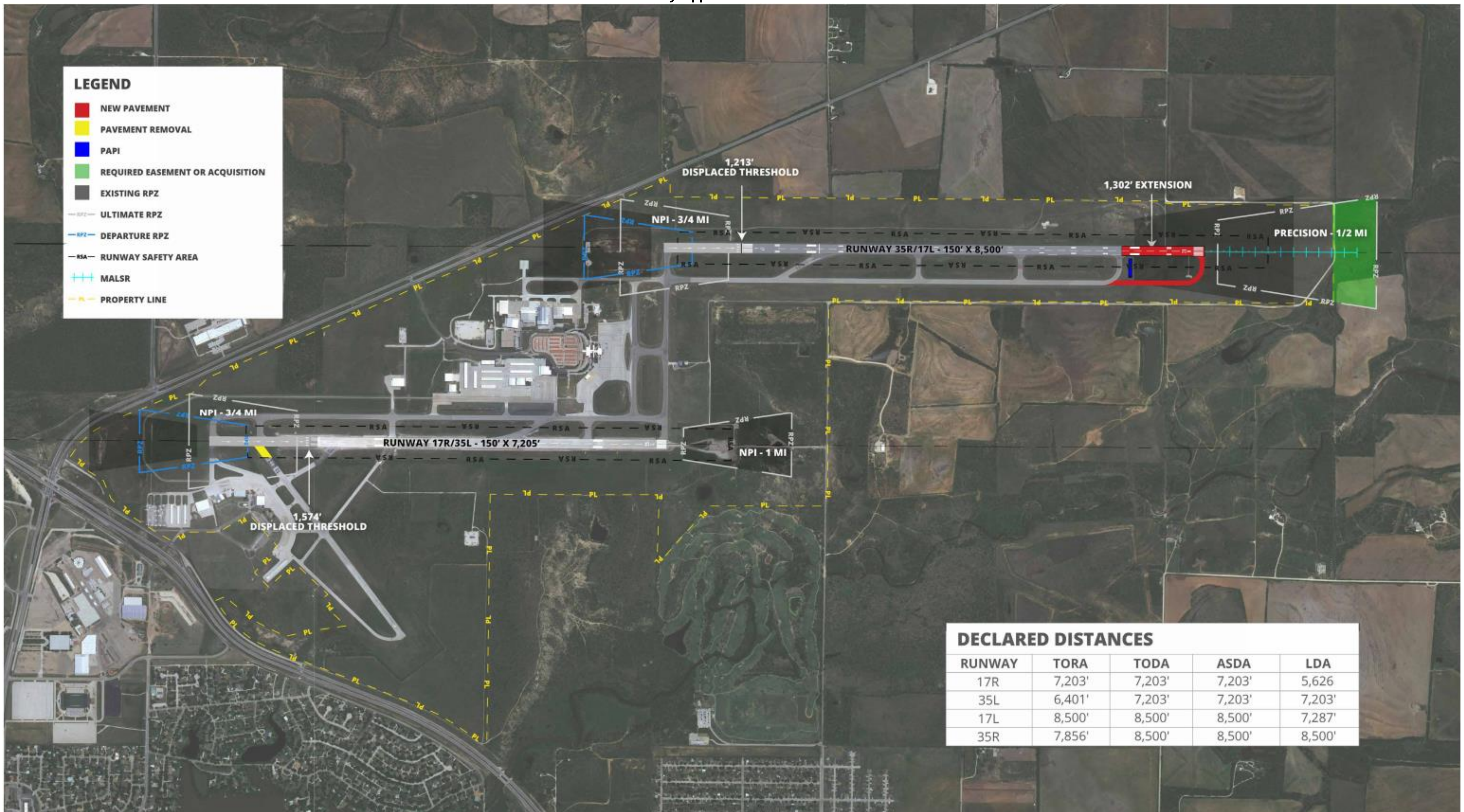
Figure 5-5
Runway/Approach Alternative #5



RUNWAY	TORA	TODA	ASDA	LDA
17R	7,203'	7,203'	7,203'	6,401'
35L	6,401'	7,203'	7,203'	7,203'
17L	8,500'	8,500'	8,500'	7,287'
35R	7,856'	8,500'	8,500'	8,500'

Source: Garver, 2018

Figure 5-6
Runway/Approach Alternative #6



RUNWAY	TORA	TODA	ASDA	LDA
17R	7,203'	7,203'	7,203'	5,626
35L	6,401'	7,203'	7,203'	7,203'
17L	8,500'	8,500'	8,500'	7,287'
35R	7,856'	8,500'	8,500'	8,500'

Source: Garver, 2018

Figure 5-7
Runway/Approach Alternative #7

Source: Garver, 2018

Runway/Approach Alternatives Evaluation

One of the tasks of a master plan is to analyze alternatives to determine which alternative provides a realistic and feasible plan that will allow the airport to meet future demand in a safe and efficient manner. To facilitate this analysis, evaluation criteria were established and an evaluation matrix was developed showing how each alternative compared based on the evaluation criteria.

Each of the evaluation criteria is discussed in detail below.

- Ability to Meet the Established Airside Development Objectives – Does the alternative meet the established development objectives? Safety related development objectives are typically considered more important that other non-safety related objectives.
- Conformance with FAA Design Standards – Does the alternative meet all the applicable FAA design standards? Unless absolutely necessary, each proposed alternative should meet all applicable FAA design standards without requiring a Modification to Standards (MOS).
- Environmental Impacts – What impacts will the proposed alternative have on the environment? This includes water, soil, wildlife, noise, and cultural environmental factors as well as any other applicable to the airport or region. The environmental process when using Federal funds is a component for major CIP projects. The environmental process will begin in the early stages of project development and the outcome will be a key factor in how the project develops. When increasing the size of an airport to accommodate larger aircraft, noise sensitive areas need to be evaluated. Soil conditions for construction will need to be suited for airport uses. Floodplains, wetlands, endangered species, and areas of cultural significance need to be avoided if possible.
- Engineering Factors/Considerations and Ease of Implementation – Are there any impediments/barriers that would prevent or make it difficult to construct this alternative (e.g. terrain, environmental, off-site land uses, etc.)? Constructability is a key factor when major expansion is expected. If there are roadblocks to development the costs usually increase and additional time is needed to complete the project. The terrain change on the site will be a factor to constructability. This category was evaluated by information gathered from site visits, review of existing available data, and aerial photographs.
- Residential and/or Business Impacts – How much of an impact will the proposed alternative have on off-airport land-use (e.g. residential, businesses, etc.)? Ideally, the off-airport impacts to existing land use should be minimal. In addition, do not limit future development if possible.
- Infrastructure Relocation Impacts – How much of an impact will the proposed alternative have on off-airport infrastructure (e.g. roads, utilities, etc.)? Ideally, the off-airport impacts to existing infrastructure should be minimal.

- Development Cost – What is the estimated cost to construct the proposed alternative? Costs estimates are order-of-magnitude costs and should be considered official engineering cost estimates. Generally, a lower cost for future development is best assuming the development can meet all the required development objectives without limiting the future growth of the airport.

A "stop light" style rating system was used for the evaluation criteria. Green indicates that the alternative has a low impact and/or meets the established requirement for that particular evaluation area. Yellow indicates that the alternative has a moderate impact and/or fails to meet some of the necessary requirements for the particular evaluation area. Red indicates that the alternative has a high impact and/or fails to meet most of the established requirements for that particular evaluation area.

In the following section, each of the seven runway/approach alternatives is analyzed based on these evaluation criteria.

Runway/Approach Alternative Evaluation Results

Based on the evaluation criteria discussed above, the following evaluation matrix (**Table 5-1**) was developed showing the proposed rating of each alternative.

Table 5-1
Runway/Approach Evaluation Matrix

	Runway/Approach Development Alternative #						
Evaluation Criteria	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Ability to Satisfy the Established Facility Requirements							
Conformance with FAA Design Standards							
Environmental Impacts							
Engineering Factors/Considerations and Ease of Implementation							
Residential and/or Business Impacts							
Infrastructure Relocation Impacts (e.g. Roads, Powerlines, Utilities, etc.)							
Development Cost	$9.5M	$10.8M	$13.5M	$29.8M	$11.9M	$12M	$9.6M

- Low Impact **or** Meets Requirements

- Moderate Impact **or** Fails to Meet Some Requirements

- High Impact **or** Fails to Meet Most Requirements

The ratings that each alternative received in each evaluation area are discussed in the evaluation commentary sections below.

Evaluation Commentary for Alternative #1

Alternative #1 includes a limited number of runway/approach changes. Runway 17L/35R is extended 1,302 ft. to a total length of 8,500 ft. but Runway 17R/35L remains at its existing length. Additionally, all the Instrument Approach Procedures (IAP) remain the same with the exception of Runway 35L. Runway 35L doesn't have an existing IAP. In this alternative, an IAP with 1 mile visibility minimums would be established for Runway 35L. Due to the limited number of changes, this alternative received a "green" rating in the areas of engineering factors/considerations and ease of implementation, residential and/or business impacts, and development cost. Additionally, the alternative meets all existing FAA design standards so it also received a "green" in conformance with FAA design standards area.

Alternative #1 received a "yellow" rating for its ability to satisfy the established facility requirements because it only includes an IAP with 1 mile visibility minimums to Runway 35L instead of an approach with ¾ mile visibility minimums. During periods of the year where IFR conditions are more common, the winds typically favor the use of Runway 35R and 35L. Runway 35R has a precision instrument approach with ½ mile visibility minimums but Runway 35L does not have an existing IAP. If Runway 35R is closed for unforeseen circumstances or major maintenance activities, an IAP with 1 mile visibility minimums for Runway 35L will not allow ABI to provide a comparable level of accessibility to the airport during IFR conditions due to the ½ mile difference in visibility minimums between the two approaches. Consequently, ABI would be better served by establishing an IAP to Runway 35L with ¾ mile visibility minimums as opposed to 1 mile visibility minimums to ensure it can adequately accommodate existing and forecasted traffic if Runway 35R is ever closed.

Alternative #1 received a "yellow" rating for its impact on infrastructure relocation impacts. This is due to the 1,302 ft. extension of Runway 17L/35R to the south. This extension will require the relocation of County Road 109 which runs along the edge of the existing airport property line at the approach end of Runway 35R and the relocation of the existing power lines that are in the same area.

Alternative #1 received a "yellow" rating related to environmental impacts. This is due to the 1,302 ft. extension of Runway 17L/35R to the south. As part of the alternatives evaluation process, an environmental specialist reviewed the proposed extension of Runway 17L/35R for potential environmental impacts. A number of likely impacts were identified:

- <u>Floodplain/Wetland</u>: As previously discussed, County Road 109 and the existing powerlines will need to be relocated further to the south if the runway is extended. Additionally, the MALSR system associated with Runway 35R will also be relocated 1,302 ft. further south. These changes will likely encroach upon the 100 year floodplain and wetland area that follow a small creek bed immediately south of County Road 109.

- Farmland: A portion of the area required for the runway and parallel taxiway extension is considered "prime farmland" and could potentially require mitigation if the runway and taxiway are built.
- Threatened and Endangered Species: The potential exists for the area impacted by the extension to potentially be inhabited by a protected species that may require mitigation.

In total, Alternative #1 was rated "green" in four areas and "yellow" in three areas. No areas were rated "red" for Alternative #1.

Evaluation Commentary for Alternative #2

Alternative #2 includes several runway/approach changes. Runway 17L/35R is extended 1,302 ft. to a total length of 8,500 ft. but Runway 17R/35L remains at its existing length. Additionally, a precision instrument approach is added to Runway 17R and an IAP with ¾ mile visibility minimums is added to Runway 35L. Since this alternative has very few major infrastructure changes, it received a "green" rating in the area of residential and/or business impacts. Additionally, since this alternative meets all existing FAA design standards, the alternative also received a "green" in conformance with FAA design standards area. Alternative #2 was also given a "green" rating for its ability to satisfy the established facility requirements because it provides an IAP with ¾ mile visibility minimums to Runway 35L.

Alternative #2 received a "yellow" rating for its impact on infrastructure relocation impacts. This is primarily due to the 1,302 ft. extension of Runway 17L/35R to the south and the establishment of a precision instrument approach for Runway 17R. This runway extension will require the relocation of County Road 109 which runs along the edge of the existing airport property line at the approach end of Runway 35R and the relocation of the existing power lines that are in the same area. A MALSR would need to be installed for Runway 17R. The MALSR would extend over TX-36 and could impact the layout and future development of the roadway. Additionally, based on the aeronautical survey conducted as part of this Airport Master Plan study there are two poles along TX-36 and one along Loop 322 that would penetrate the FAR Part 77 surfaces for Runway 17R if a PIR is established. However, none of the penetrations are in excess of 4 feet and consequently, it is expected that the light poles would not need to be removed for the approach to be established. Several trees close to the approach end of Runway 35L were noted as penetrations of the proposed FAR Part 77 surfaces for Runway 35L. None of these penetrations are more than 6 ft. However, due to their close proximity to the Runway 35L threshold, it is expected that some of these trees will need to be removed or trimmed.

Alternative #2 received a "yellow" rating for its cost for development. This alternative has a higher cost compared to Alternative #1 because of the addition of the precision instrument approach for Runway 17R which will require the addition of a MALSR system for that runway.

Alternative #2 received a "yellow" rating related to environmental impacts. This is due to the 1,302 ft. extension of Runway 17L/35R to the south. As part of the alternatives evaluation process, an environmental specialist reviewed the proposed extension of Runway 17L/35R for potential environmental impacts. A number of likely impacts were identified:

- Floodplain/Wetland: As previously discussed, County Road 109 and the existing powerlines will need to be relocated further to the south if the runway is extended. Additionally, the MALSR system associated with Runway 35R will also be relocated 1,302 ft. further south. These changes will likely encroach upon the 100 year floodplain and wetland area that follow a small creek bed immediately south of County Road 109.
- Farmland: A portion of the area required for the runway and parallel taxiway extension is considered “prime farmland” and could potentially require mitigation if the runway and taxiway are built.
- Threatened and Endangered Species: The potential exists for the area impacted by the extension to potentially be inhabited by a protected species that may require mitigation.

In total, Alternative #2 was rated “green” in three areas and “yellow” in four areas. No areas were rated “red” for Alternative #2. However, the feasibility of this alternative is predicated on the FAA allowing the establishment of a precision instrument approach for Runway 17R without requiring a displacement to the Runway 17R threshold or the relocation of TX-36 or Loop 322. The establishment of a precision instrument approach for Runway 17R would greatly expand the RPZ for Runway 17R to where it would extend over the intersection of TX-36 and Loop 322.

Evaluation Commentary for Alternative #3

Alternative #3 includes several runway/approach changes. Runway 17L/35R is extended 1,302 ft. to a total length of 8,500 ft. but Runway 17R/35L remains at its existing length. Additionally, a precision instrument approach is added to Runway 17L and an IAP with ¾ mile visibility minimums is added to Runway 35L. Since this alternative has very few major infrastructure changes that expand the footprint of the airport, it received a “green” rating in the area of residential and/or business impacts. Additionally, since this alternative meets all existing FAA design standards, the alternative also received a “green” in conformance with FAA design standards area.

Alternative #3 received a “yellow” rating for its impact on infrastructure relocation impacts. This is due to the 1,302 ft. extension of Runway 17L/35R to the south. This extension will require the relocation of County Road 109 which runs along the edge of the existing airport property line at the approach end of Runway 35R and the relocation of the existing power lines that are in the same area.

Alternative #3 received a “yellow” rating for its cost for development. This alternative has a higher cost compared to Alternative #2 because of the addition of the in-pavement MALSR for Runway 17R and marking, lighting, signage, and charting changes that would be required related to the displacement of the runway thresholds.

Alternative #3 received a "yellow" rating related to environmental impacts. This is due to the 1,302 ft. extension of Runway 17L/35R to the south. As part of the alternatives evaluation process, an environmental specialist reviewed the proposed extension of Runway 17L/35R for potential environmental impacts. A number of likely impacts were identified:

- Floodplain/Wetland: As previously discussed, County Road 109 and the existing powerlines will need to be relocated further to the south if the runway is extended. Additionally, the MALSR system associated with Runway 35R will also be relocated 1,302 ft. further south. These changes will likely encroach upon the 100 year floodplain and wetland area that follow a small creek bed immediately south of County Road 109.
- Farmland: A portion of the area required for the runway and parallel taxiway extension for Runway 17L/35R is considered "prime farmland" and could potentially require mitigation if the runway and taxiway are built.
- Threatened and Endangered Species: The potential exists for the area impacted by the extension to potentially be inhabited by a protected species that may require mitigation.

Alternative #3 received a "red" rating for its ability to satisfy the established facility requirements because the displacement of the threshold for Runway 17R would shorten the runways Landing Distance Available (LDA) to less than 5,000 feet which could potentially present a safety and usability issue for some of the larger jet aircraft that currently use the airport.

Alternative #3 also received a "red" in the engineering factors/considerations and ease of implementation category due to the in-pavement MALSR system that would be needed for the precision instrument approach for Runway 17R. While technically possible, installing an entire MALSR system in an in-pavement configuration would make the system very difficult to maintain and would require trenching through the existing runway pavement for installation.

In total, Alternative #3 was rated "green" in two areas, "yellow" in three areas, and "red" in 2 areas.

Evaluation Commentary for Alternative #4

Alternative #4 includes several runway/approach changes. Runway 17L/35R is extended 1,302 ft. to a total length of 8,500 ft. and Runway 17R/35L is extended 2,514 ft. to compensate for the displacement of the Runway 17R landing threshold. Additionally, a precision instrument approach is added to Runway 17R and an IAP with ¾ mile visibility minimums is added to Runway 35L. Since this alternative expands the footprint of the airport significantly it received a "yellow" rating for its residential and/or business impacts. This alternative was not given a "red" rating in this area because none of the areas required for this expansion are heavily populated or have large-scale commercial developments however, implementation of this alternative would limit future commercial development in the vicinity.

Alternative #4 received a “red” rating for its impact on infrastructure relocation. This is due to the 1,302 ft. extension of Runway 17L/35R to the south and the extension of Runway 17R/35L to the south. The extension of Runway 17L/35R will require the relocation of County Road 109 which runs along the edge of the existing airport property line at the approach end of Runway 35R and the relocation of the existing power lines that are in the same area. The extension of Runway 17L/35R will require the relocation of Industrial Blvd. and the existing power lines that run along Industrial Blvd.

Alternative #4 received a “red” rating for its cost for development. This alternative has a higher cost than any other alternative as it includes two runway extensions.

Alternative #4 received a “red” rating related to environmental impacts. This is due to the 1,302 ft. extension of Runway 17L/35R and the 2,514 extension of Runway 17R/35L. As part of the alternatives evaluation process, an environmental specialist reviewed the proposed extension of both runways for potential environmental impacts. A number of likely impacts were identified:

- Floodplain/Wetland: As previously discussed, County Road 109 and the existing powerlines will need to be relocated further to the south if Runway 17L/35R is extended. Additionally, the MALSR system associated with Runway 35R will also be relocated 1,302 ft. further south. These changes will likely encroach upon the 100 year floodplain and wetland area that follow a small creek bed immediately south of County Road 109. The extension of Runway 17R/35L will have similar impacts as there is an established wetland area and floodplain that would be impacted by the extension.
- Farmland: A portion of the area required for the runway and parallel taxiway extension for Runway 17L/35R and Runway 17R/35L are considered “prime farmland” and could potentially require mitigation if the runway and taxiway are built.
- Threatened and Endangered Species: The potential exists for the area impacted by the extension to potentially be inhabited by a protected species that may require mitigation.

Since this alternative meets all existing FAA design standards, the alternative received a “green” in conformance with FAA design standards area. Alternative #4 also received a “green” rating for its ability to meet the established facility requirements.

Alternative #4 received a “red” in the engineering factors/considerations and ease of implementation category due to the in-pavement MALSR system that would be needed for the PIR for Runway 17R. While technically possible, installing an entire MALSR system in an in-pavement configuration would make the system very difficult to maintain and would require trenching through the existing runway pavement for installation.

In total, Alternative #4 was rated “green” in two areas, “yellow” in one area, and “red” in four areas.

Evaluation Commentary for Alternative #5

Alternative #5 includes a limited number of runway/approach changes. Runway 17L/35R is extended 1,302 ft. to a total length of 8,500 ft. but Runway 17R/35L remains at its existing length. Additionally, all the Instrument Approach Procedures (IAP) remain the same with the exception of Runway 35L. Runway 35L doesn't have an existing IAP. n this alternative, an IAP with 1 mile visibility minimums would be established for Runway 35L. Due to the limited number of changes, this alternative received a "green" rating in the areas of engineering factors/considerations and ease of implementation, and residential and/or business impacts. Additionally, the alternative meets all existing FAA design standards so the alternative also received a "green" in conformance with FAA design standards area.

Alternative #5 received a "yellow" rating for its ability to satisfy the established facility requirements because it only includes an IAP with 1 mile visibility minimums to Runway 35L instead of an approach with ¾ mile visibility minimums and because of the displacements to the landing thresholds for Runway 17R and 17L. During periods of the year where IFR conditions are more common, the winds typically favor the use of Runway 35R and 35L. Runway 35R has a Precision Instrument Approach with ½ mile visibility minimums but Runway 35L does not have an existing IAP. If Runway 35R is closed for unforeseen circumstances or major maintenance activities, an IAP with 1 mile visibility minimums for Runway 35L will not allow ABI to provide a comparable level of accessibility to the airport during IFR conditions due to the ½ mile difference in visibility minimums between the two approaches. Consequently, ABI would be better served by establishing an IAP to Runway 35L with ¾ mile visibility minimums as opposed to 1 mile visibility minimums to ensure it can adequately accommodate existing and forecasted traffic if Runway 35R is ever closed. The landing threshold displacements needed to bring the RPZs fully onto airport property are not desirable either as it shortens the landing distance available to aircraft using Runway 17R and 17L.

Alternative #5 received a "yellow" rating for its impact on infrastructure relocation impacts. This is due to the 1,302 ft. extension of Runway 17L/35R to the south. This extension will require the relocation of County Road 109 which runs along the edge of the existing airport property line at the approach end of Runway 35R and the relocation of the existing power lines that are in the same area.

Alternative #5 received a "yellow" rating related to environmental impacts. This is due to the 1,302 ft. extension of Runway 17L/35R to the south. As part of the alternatives evaluation process, an environmental specialist reviewed the proposed extension of Runway 17L/35R for potential environmental impacts. A number of likely impacts were identified:

- Floodplain/Wetland: As previously discussed, County Road 109 and the existing powerlines will need to be relocated further to the south if the runway is extended. Additionally, the MALSR system associated with Runway 35R will also be relocated 1,302 ft. further south. These changes will likely encroach upon the 100 year floodplain and wetland area that follow a small creek bed immediately south of County Road 109.

- Farmland: A portion of the area required for the runway and parallel taxiway extension is considered "prime farmland" and could potentially require mitigation if the runway and taxiway are built.
- Threatened and Endangered Species: The potential exists for the area impacted by the extension to potentially be inhabited by a protected species that may require mitigation.

Alternative #5 received a "yellow" rating for its cost for development. This alternative has a higher cost compared to Alternative #1 because of the lighting, signage, and marking changes that would be required to displace the Runway 17R and Runway 17L landing thresholds.

In total, Alternative #5 was rated "green" in three areas and "yellow" in four areas. No areas were rated "red" for Alternative #5.

Evaluation Commentary for Alternative #6

Alternative #6 includes a limited number of runway/approach changes. Runway 17L/35R is extended 1,302 ft. to a total length of 8,500 ft. but Runway 17R/35L remains at its existing length. Additionally, all the Instrument Approach Procedures (IAP) remain the same with the exception of the approaches for Runway 17R and Runway 35L. Runway 35L doesn't have an existing IAP and Runway 17R has an IAP with 1 mile visibility minimums. In this alternative, an IAP with ¾ mile visibility minimums would be established for both Runway 17R and Runway 35L. Due to the limited number of changes, this alternative received a "green" rating in the areas of engineering factors/considerations and ease of implementation, and residential and/or business impacts. Additionally, the alternative meets all existing FAA design standards so the alternative also received a "green" in conformance with FAA design standards area.

Alternative #6 received a "yellow" rating for its ability to satisfy the established facility requirements because of the displacements to the landing thresholds for Runway 17R and 17L. The landing threshold for Runway 17L would be displaced 1,213 ft. and the landing threshold for Runway 17R would be displaced 1,574 ft. These displacements would shorten the Landing Distance Available (LDA) for both runways to less than 6,000 ft. (5,985 ft. for Runway 17L and 5,626 ft. for Runway 17R) which is not desirable.

Alternative #6 received a "yellow" rating for its impact on infrastructure relocation impacts. This is due to the 1,302 ft. extension of Runway 17L/35R to the south. This extension will require the relocation of County Road 109 which runs along the edge of the existing airport property line at the approach end of Runway 35R and the relocation of the existing power lines that are in the same area.

Alternative #6 received a "yellow" rating related to environmental impacts. This is due to the 1,302 ft. extension of Runway 17L/35R to the south. As part of the alternatives evaluation process, an environmental specialist reviewed the proposed extension of Runway 17L/35R for potential environmental impacts. A number of likely impacts were identified:

- Floodplain/Wetland: As previously discussed, County Road 109 and the existing powerlines will need to be relocated further to the south if the runway is extended. Additionally, the MALSR system associated with Runway 35R will also be relocated 1,302 ft. further south. These changes will likely encroach upon the 100 year floodplain and wetland area that follow a small creek bed immediately south of County Road 109.
- Farmland: A portion of the area required for the runway and parallel taxiway extension is considered “prime farmland” and could potentially require mitigation if the runway and taxiway are built.
- Threatened and Endangered Species: The potential exists for the area impacted by the extension to potentially be inhabited by a protected species that may require mitigation.

Alternative #6 received a “yellow” rating for its cost for development. This alternative has a higher cost compared to Alternative #6 because of the additional obstruction clearing/marking/lighting that may be required for the newly established ¾ mile IAPs for Runway 17R and Runway 35L.

In total, Alternative #6 was rated “green” in three areas and “yellow” in four areas. No areas were rated “red” for Alternative #6.

Evaluation Commentary for Alternative #7

Alternative #7 includes a limited number of runway/approach changes. Runway 17L/35R is extended 1,302 ft. to a total length of 8,500 ft. but Runway 17R/35L remains at its existing length. Additionally, all the Instrument Approach Procedures (IAP) remain the same with the exception of the approach for Runway 35L. Runway 35L doesn’t have an existing IAP. In this alternative, an IAP with ¾ mile visibility minimums would be established for Runway 35L. Due to the limited number of changes, this alternative received a “green” rating in the areas of engineering factors/considerations and ease of implementation, residential and/or business impacts, and its development cost. Additionally, the alternative meets all existing FAA design standards so the alternative also received a “green” in conformance with FAA design standards area.

Alternative #7 received a “green” rating for its ability to satisfy the established facility requirements because the alternative maintains the existing runway lengths during the short-term and provides a ¾ mile visibility approach to Runway 35L which will improve accessibility to ABI during times when Runway 35R is not available for use.

Alternative #7 received a “yellow” rating for its impact on infrastructure relocation impacts. This is due to the 1,302 ft. extension of Runway 17L/35R to the south. This extension will require the relocation of County Road 109 which runs along the edge of the existing airport property line at the approach end of Runway 35R and the relocation of the existing power lines that are in the same area.

Alternative #7 received a "yellow" rating related to environmental impacts. This is due to the 1,302 ft. extension of Runway 17L/35R to the south. As part of the alternatives evaluation process, an environmental specialist reviewed the proposed extension of Runway 17L/35R for potential environmental impacts. A number of likely impacts were identified:

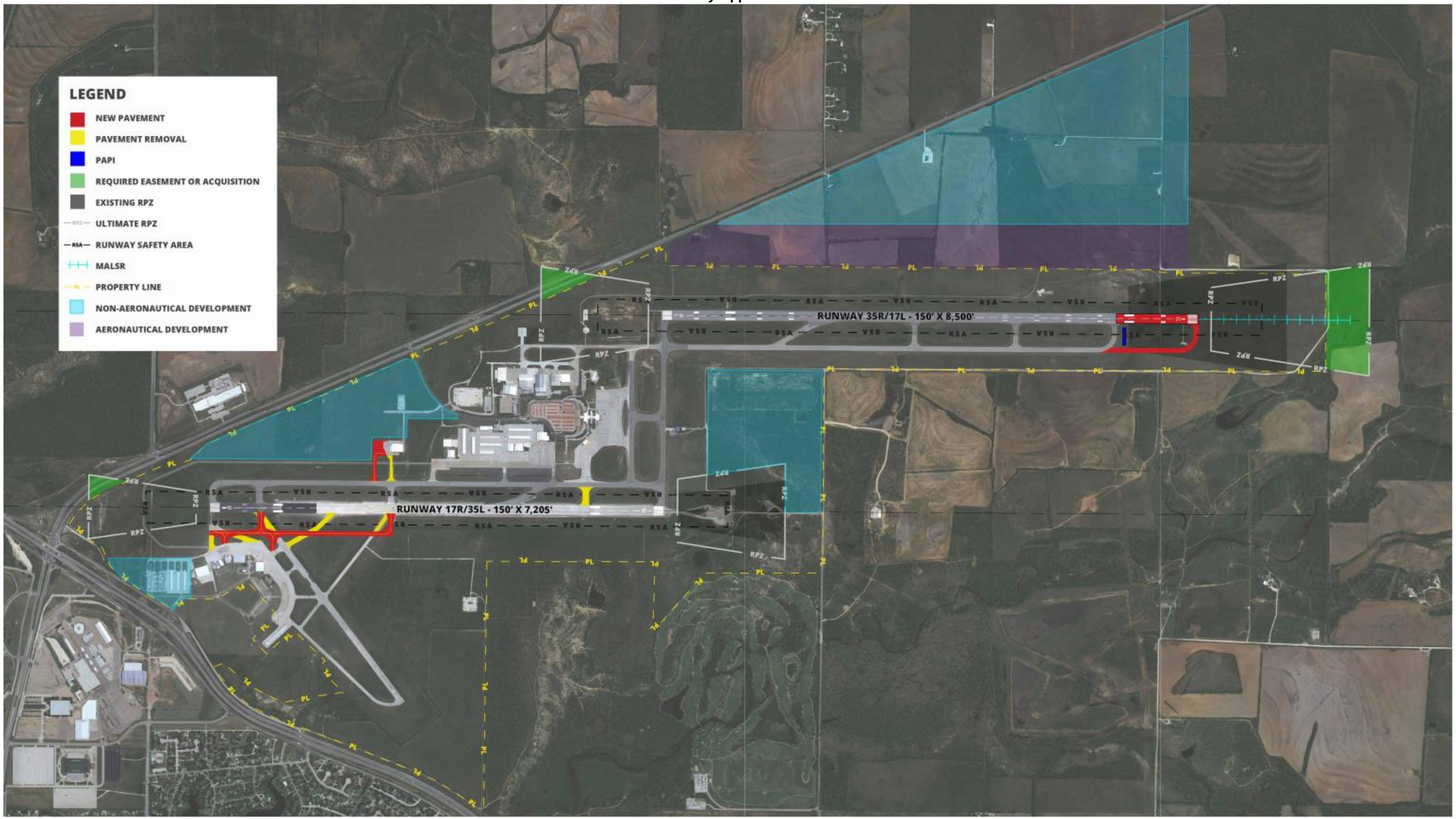
- Floodplain/Wetland: As previously discussed, County Road 109 and the existing powerlines will need to be relocated further to the south if the runway is extended. Additionally, the MALSR system associated with Runway 35R will also be relocated 1,302 ft. further south. These changes will likely encroach upon the 100 year floodplain and wetland area that follow a small creek bed immediately south of County Road 109.
- Farmland: A portion of the area required for the runway and parallel taxiway extension is considered "prime farmland" and could potentially require mitigation if the runway and taxiway are built.
- Threatened and Endangered Species: The potential exists for the area impacted by the extension to potentially be inhabited by a protected species that may require mitigation.

In total, Alternative #7 was rated "green" in five areas and "yellow" in two areas. No areas were rated "red" for Alternative #7.

Preferred Runway/Approach Alternative

Based on the runway/approach alternatives evaluation analysis described above and discussion with the Master Plan Steering Committee (MPSC) and ABI stakeholders, Alternative #7 was selected as the preferred development alternative. Alternative #7 provides a realistic future development plan that will meet the facility requirements established in the previous chapter. The preferred runway/approach alternative is shown as **Exhibit 5-8**.

Figure 5-8
Preferred Runway/Approach Alternative



Source: Garver, 2018

Taxiway Alternatives

Once an airport's preferred runway/approach alternative has been selected, the taxiway system can be analyzed to determine the modifications that should be made to best accommodate the projected aeronautical demand for the airport. ABI's existing taxiway system has been well planned out and sufficiently meets the needs of current users. As aeronautical traffic is not expected to increase significantly at ABI during the forecast period, it is not expected that additional taxiways will need to be added to improve airfield capacity or efficiency. Consequently, the taxiway development objectives that need to be addressed in this taxiway alternative analysis for ABI are:

- Taxiway Development Objective #1: Improve taxiway fillets designed to the outdated ADG based taxiway design standards to the current TDG based design standards as taxiways are rehabilitated. This issue primarily exists along Taxiway Delta and the taxiways associated with the Northwest GA Ramp.
- Taxiway Development Objective #2: Resolve the direct ramp to runway access issues that currently exist on Taxiways A1, A2, A3, C1, C3, and R.

Since Taxiway Development Objective #1 is a fillet design issue related to changes in design standards, an alternative analysis does not need to be completed to determine the best way to meet this objective. Instead, as taxiways are reconstructed at ABI as part of the airport's regular pavement maintenance program, an analysis should be completed to determine the fillet improvements that need to be made to bring the pavement in alignment with current FAA fillet design standards.

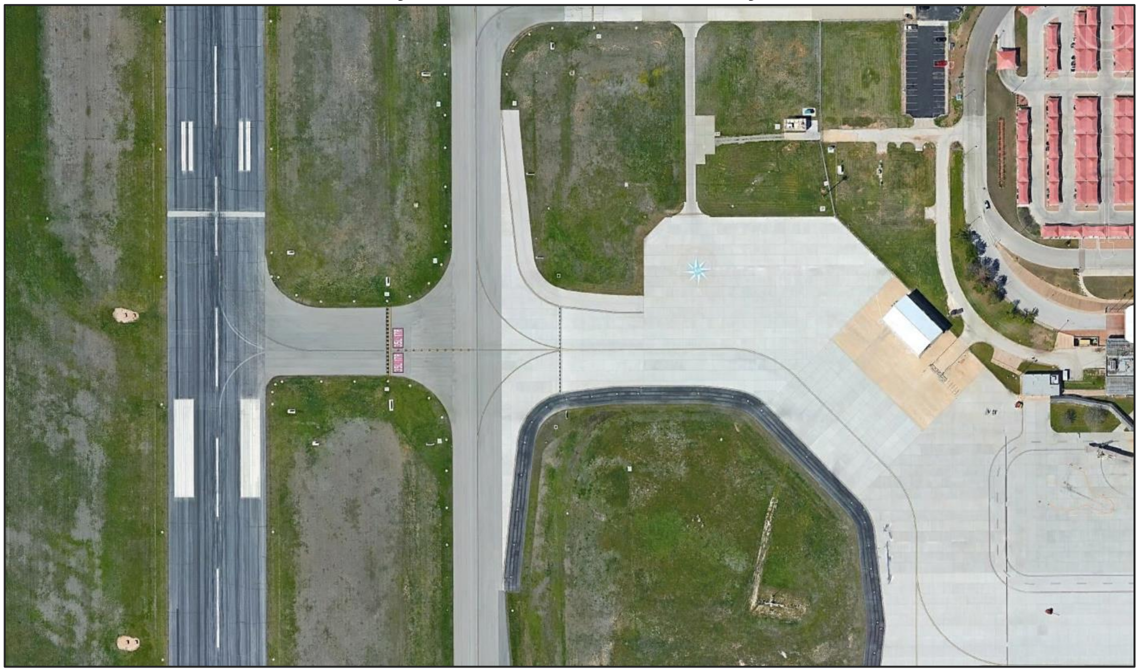
Consequently, the focus of this taxiway alternative analysis is Taxiway Development Objective #2 which relates to resolving the existing direct ramp to runway access issues occurring on the airfield. This issue exists on Taxiways A1, A2, and A3 as all of these taxiways allow direct access from the northwest GA ramp to Runway 4/22. However, since Runway 4/22 is expected to be permanently decommissioned at some point during the forecast period, it is anticipated that the direct ramp to runway access issue associated with Taxiways A1, A2, and A3 will all be resolved by the decommissioning of Runway 4/22.

The direct ramp to runway access issue also exists on Taxiway C1, C3, and R at their intersections with Runway 17R/35L, and resolving this issue will be the primary focus of the taxiway alternative analysis.

Taxiway C1 and Runway 17R/35L

Figure 5-9 depicts the direct ramp to runway access issue occurring at Taxiway C1 and Runway 17R/35L. Taxiway C1 allows direct ramp access from the air carrier ramp to Runway 17R/35L without requiring aircraft to make a turn. This taxiway is primarily used by aircraft exiting Runway 17R after landing to access the air carrier ramp.

Figure 5-9
Taxiway C1 Intersection with Runway 17R/35L



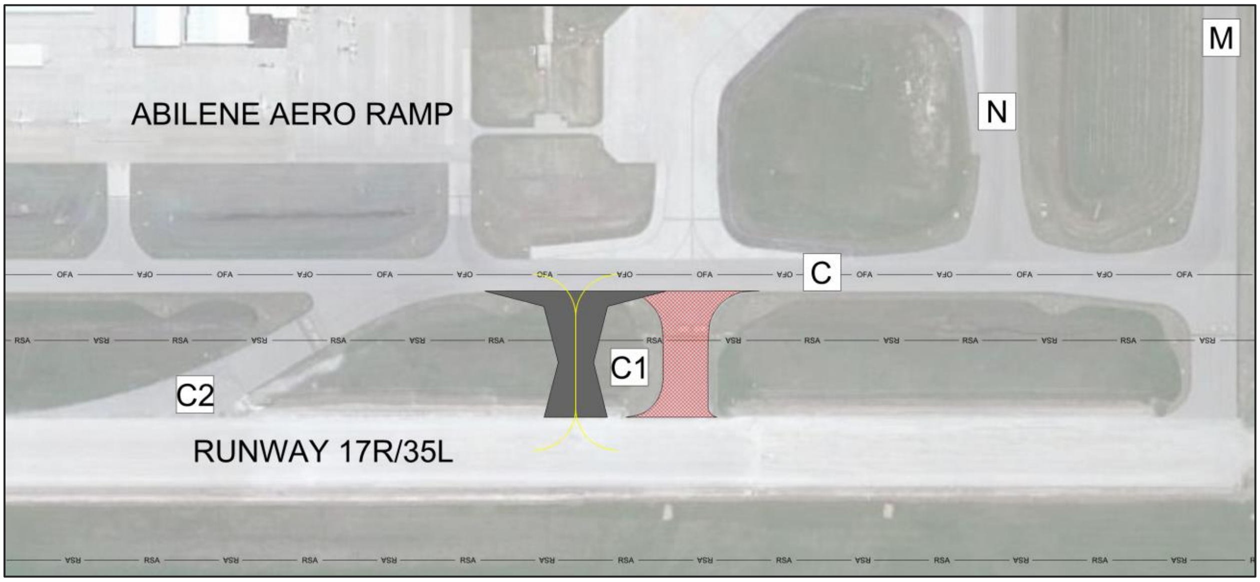
Source: Garver, 2018.

To resolve this issue, five potential alternatives were created and analyzed. Each of the five potential alternatives is described below.

Alternatives

Alternative #1 includes the removal of the existing Taxiway C1 and the relocation of that taxiway north of its existing location as shown in **Figure 5-10.** The relocation of Taxiway C1 between Taxiway C and Runway 17R/35L will resolve the direct ramp to runway access issue.

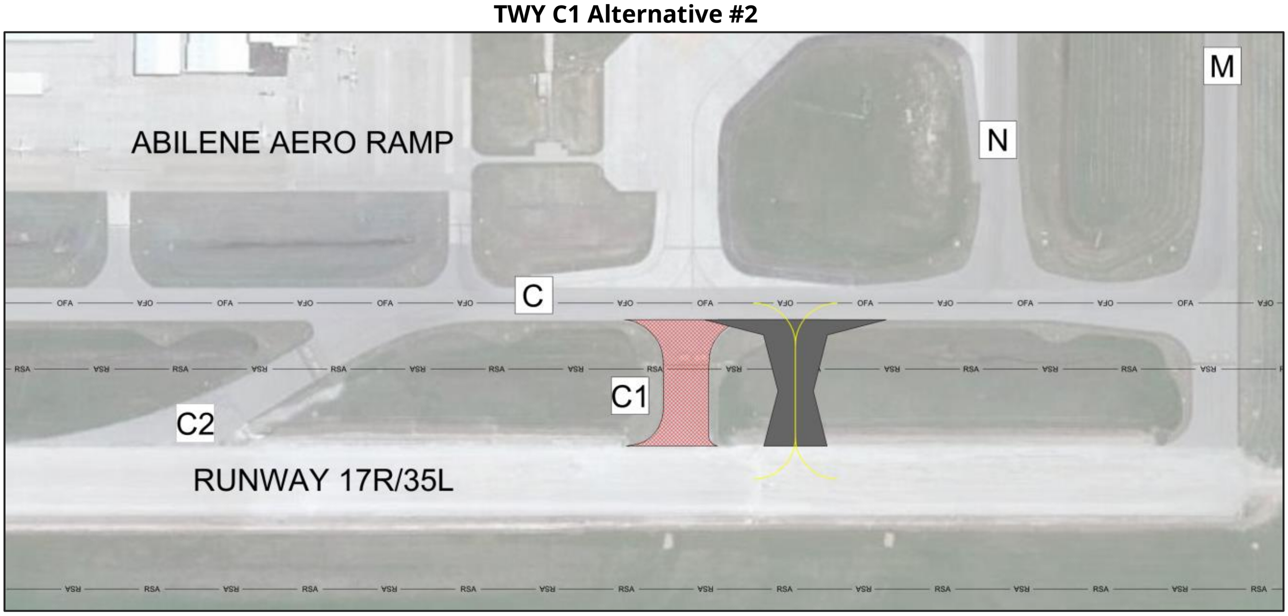
Figure 5-10
TWY C1 Alternative #1



Source: Garver, 2018.

Alternative #2 includes the removal of the existing Taxiway C1 and the relocation of that taxiway south of its existing location as shown in **Figure 5-11**. The relocation of Taxiway C1 between Taxiway C and Runway 17R/35L will resolve the direct ramp to runway access issue.

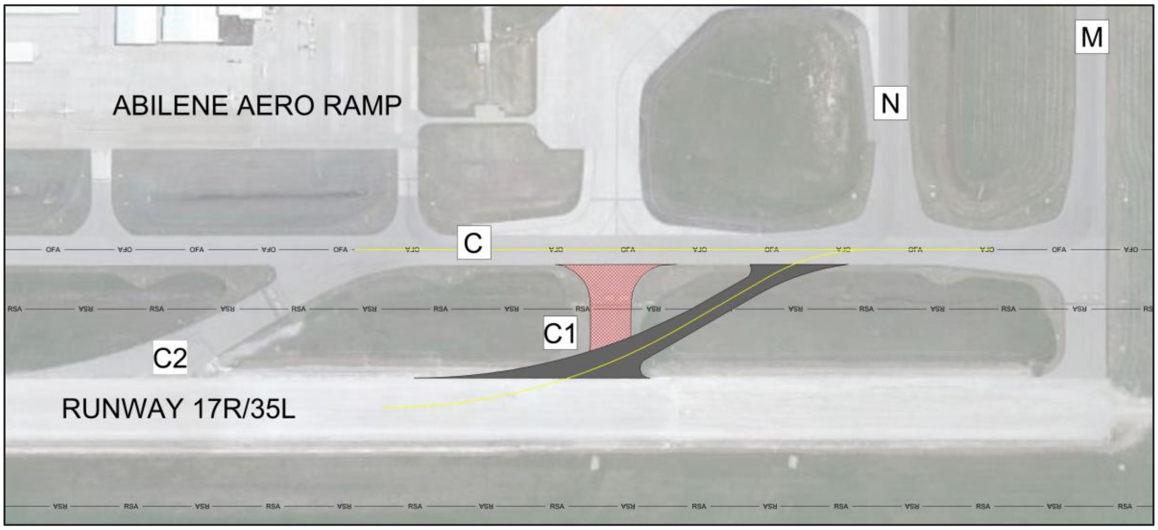
Figure 5-11
TWY C1 Alternative #2



Source: Garver, 2018.

Alternative #3 includes the removal of the existing Taxiway C1 and the construction of a new high-speed exit taxiway as shown in **Figure 5-12**. The relocation of Taxiway C1 between Taxiway C and Runway 17R/35L will resolve the direct ramp to runway access issue.

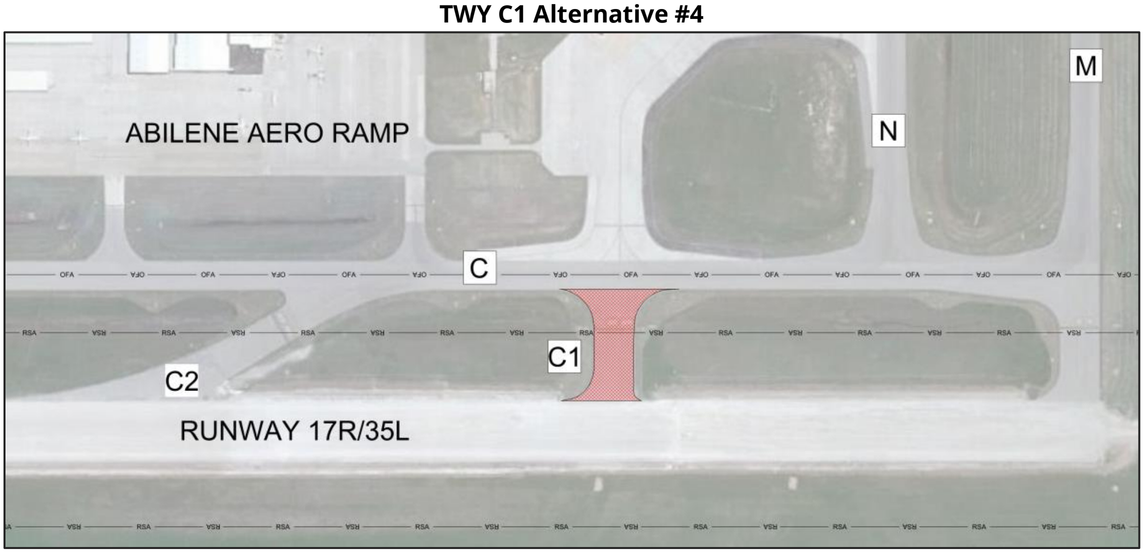
Figure 5-12
TWY C1 Alternative #3



Source: Garver, 2018.

Alternative #4 includes the removal of the existing Taxiway C1 as shown in **Figure 5-13**. No replacement taxiway would be constructed in this alternative. The removal of Taxiway C1 between Taxiway C and Runway 17R/35L will resolve the direct ramp to runway access issue.

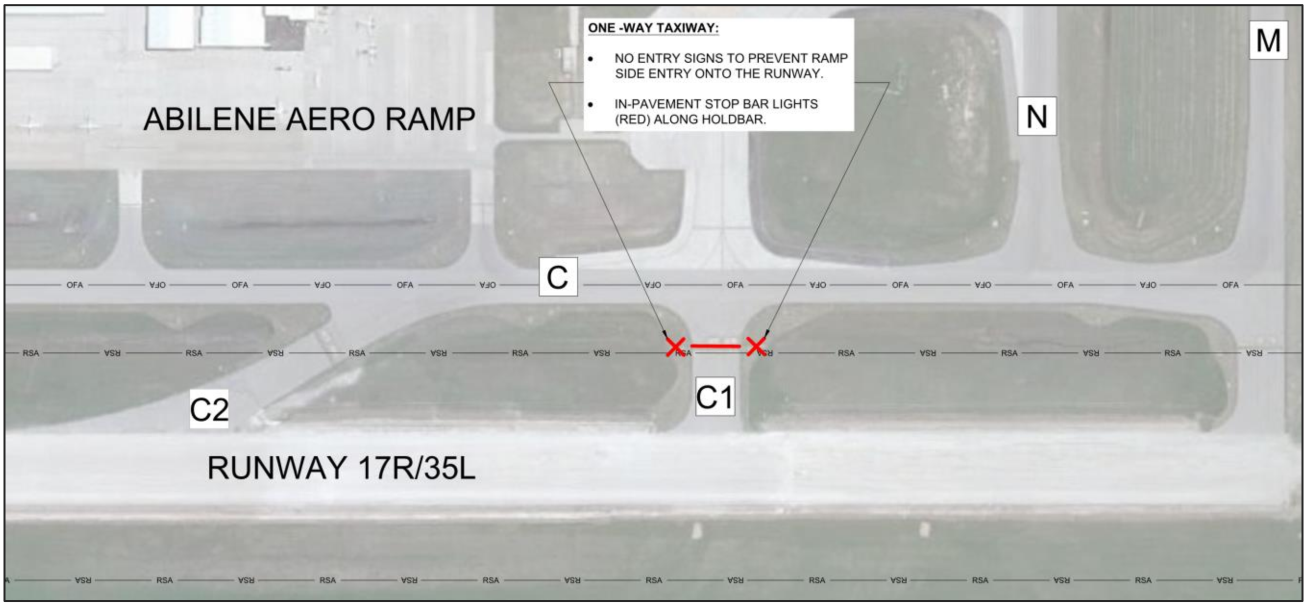
Figure 5-13
TWY C1 Alternative #4



Source: Garver, 2018.

Alternative #5, shown in **Figure 5-14**, keeps Taxiway C1 at its existing location but makes it a "one-way" taxiway so that it can only be used by aircraft exiting Runway 17R/35L. For this alternative "no-entry" signs and a stop bar light system would be installed along the runway hold position marking to indicate to pilots approaching from the ramp that the taxiway is not available for their use. This alternative would require an FAA Approved Modification to Standards (MOS) as this taxiway configuration is non-standard.

Figure 5-14
TWY C1 Alternative #5



Source: Garver, 2018.

Alternative Evaluation Criteria

To evaluate the alternatives, many of the same criteria used to evaluate the runway/approach alternatives were used including:

- Ability to Meet the Established Airside Development Objectives
- Conformance with FAA Design Standards
- Environmental Impacts
- Engineering Factors/Considerations and Ease of Implementation
- Development Cost

A general description of each of these evaluation criteria is contained in the runway/approach alternatives section. In addition to these evaluation criteria, impact on airfield efficiency/capacity was added as an evaluation area for the taxiway alternatives analysis. Ideally, alternatives should enhance or maintain airfield efficiency/capacity and not reduce it.

Similar to the runway/approach alternative evaluation, a "stop light" style rating system was used for the evaluation. Green indicates that the alternative has a low impact and/or meets the established requirement for that particular evaluation area. Yellow indicates that the alternative has a moderate impact and/or fails to meet some of the necessary requirements for the particular evaluation area. Red indicates that the alternative has a high impact and/or fails to meet most of the established requirements for that particular evaluation area.

Taxiway C1 Alternative Evaluation Results

Based on the evaluation criteria discussed above, the following evaluation matrix (**Table 5-2**) was developed showing the proposed rating of each alternative.

Table 5-2
Taxiway C1 Alternative Evaluation Matrix

	Taxiway C/C1				
Evaluation Criteria	**1**	**2**	**3**	**4**	**5**
Ability to Satisfy the Established Facility Requirements	Green	Green	Green	Green	Green
Conformance with FAA Design Standards	Green	Green	Green	Green	Red
Enviromental Impacts	Green	Green	Green	Green	Green
Engineering Factors/Considerations and Ease of Implementation	Yellow	Yellow	Yellow	Green	Yellow
Impact on Airfield Efficiency/Capacity	Green	Green	Green	Yellow	Green
Development Cost	$1.05M (Yellow)	$1.05M (Yellow)	$1.33M (Yellow)	$0.59M (Green)	$50,000 (Green)

Green - Low Impact **or** Meets Requirements

Yellow - Moderate Impact **or** Fails to Meet Some Requirements

Red - High Impact **or** Fails to Meet Most Requirements

The ratings that each alternative received in each evaluation area are discussed in the evaluation commentary sections below.

Evaluation Commentary for Alternative #1, #2, and #3

Alternatives 1, 2, and 3 all provide similar solutions to resolve the direct ramp to runway access issue that currently exists. Each of these alternatives was rated "green" for their ability to satisfy the established facility requirements, conformance with FAA design standards, and environmental impacts. Each of these alternatives also received a "green" rating for their impact on airfield efficiency/capacity because they will provide a similar or slightly elevated (Alternative #3) level of capacity. Each of these alternatives received a "yellow" rating in the evaluation areas of development cost and engineering factors/considerations and ease of implementation. The alternatives all received a lower rating in the latter category due to the closures of Runway 17R/35L that would be required to remove the existing taxiway and reconstruct the new taxiway.

Each of these alternatives was rated "green" in four areas and "yellow" in two areas. No areas were rated "red" for these alternatives.

Evaluation Commentary for Alternative #4

Alternative #4 includes the removal of Taxiway C1 and does not include the reconstruction of a replacement taxiway. This alternative was rated "green" for its ability to satisfy the established facility requirements, conformance with FAA design standards, and environmental impacts. The alternative also received a "green" rating related to engineering factors/considerations and ease of implementation as this alternative would require fewer closures of Runway 17R/35L to complete compared to Alternatives 1, 2, and 3. This alternative also received a "green" rating for its overall development cost as it is $0.5 million less expensive than Alternatives 1, 2, and 3.

It should also be noted that as an alternative to removing the existing pavement, this taxiway could be closed, the edge lighting removed, no-entry signs installed in-place of the runway hold position signs, and surface painted X's installed on each end of the taxiway. This would close the taxiway to aircraft traffic but still allow vehicles to use it as necessary. This option would further reduce the cost of this alternative.

This alternative received a "yellow" rating for its impact on airfield efficiency/capacity because the closure of Taxiway C1 is expected to increase Runway Occupancy Time (ROT) for large aircraft landing on Runway 17R. However, since aeronautical activity is not expected to grow significantly during the forecast period and airfield capacity is not expected to be an issue, the removal or closure of Taxiway C1 should not significantly affect ABI's airfield capacity.

In total, Alternative #4 received a "green" rating in five areas and a "yellow" rating in one area. No areas were rated "red" for this alternative.

Evaluation Commentary for Alternative #5

Alternative #5 includes the installation of a light stop bar along the runway hold position marking for Runway 17R/35L and the installation of no-entry signs on each side of the taxiway in place of the existing runway hold position signs. This alternative would essentially make Taxiway C1 a "one-way" taxiway where aircraft would only be allowed to exit Runway 17R/35L using the taxiway but would be prohibited from entering Runway 17R/35L using the taxiway.

This alternative was rated "green" for its ability to satisfy the established facility requirements and environmental impacts. This alternative also received a "green" rating in the areas of development cost and impact on airfield efficiency and capacity as this is the cheapest of the five alternatives and would maintain the airfield capacity at its existing level.

The alternative received a "yellow" rating related to engineering factors/considerations and ease of implementation as the existing taxiway pavement would need to be trenched through to install the stop bar light system and electrical control modifications might be required to ensure the stop bar light remained illuminated at all times.

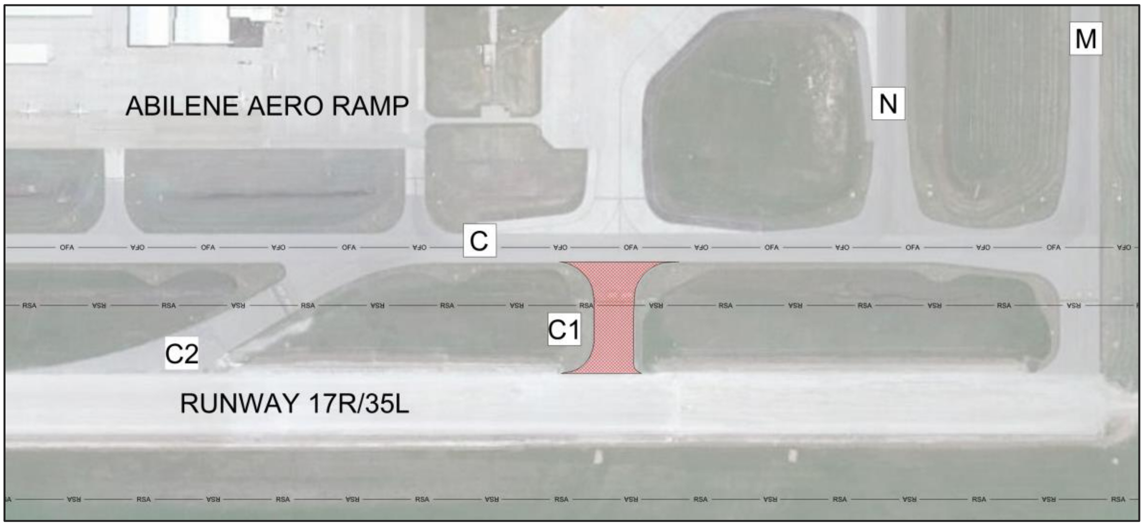
Alternative #5 received a "red" rating for its conformance with FAA design standards as this is not a standard taxiway configuration (e.g. a one-way taxiway) and use of a stop bar light system. Consequently, this alternative would require an FAA-approved Modification to Standards (MOS) to be implemented. It should be noted that the FAA has granted MOS's for similar taxiway configurations when a history of runway incursions with a particular taxiway exists.

In total, Alternative #5 received a "green" rating in four areas, a "yellow" rating in one area, and a "red" rating in one area.

Preferred C1 Alternative

Based on the results of the taxiway alternative analysis and feedback from the MPAC and ABI Stakeholders, Alternative #4 was selected as the preferred development alternative. The preferred alternative is shown as **Figure 5-15**.

Figure 5-15
TWY C1 Preferred Alternative



Source: Garver, 2018.

Taxiway C3 and Runway 17R/35L

Figure 5-16 depicts the direct ramp to runway access issue occurring at Taxiway C3 and Runway 17R/35L. Taxiway C3 allows direct ramp access from an Abilene Aero hangar to Runway 17R/35L without requiring aircraft to make a turn. This taxiway is primarily used by smaller aircraft exiting Runway 35L after landing to access Abilene Aero. The taxiway is infrequently used by aircraft crossing Runway 17R/35L to Taxiway S or vice-versa.

Figure 5-16
Taxiway C1 Intersection with Runway 17R/35L

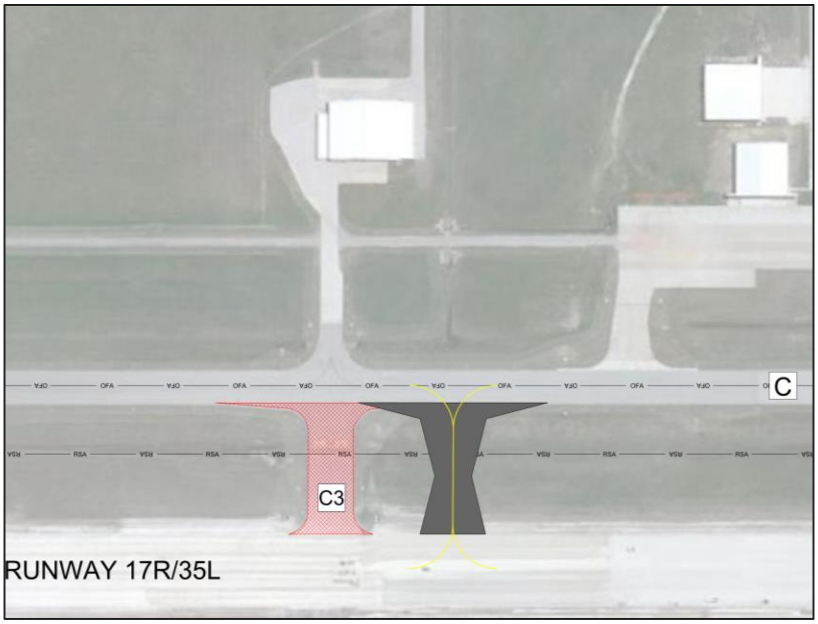
Source: Garver, 2018.

To resolve this issue, three potential alternatives were created and analyzed. Each of the three potential alternatives are described below.

Alternatives

Alternative #1 includes the removal of the existing Taxiway C3 and the relocation of that taxiway south of its existing location as shown in **Figure 5-17**. The relocation of Taxiway C3 between Taxiway C and Runway 17R/35L will resolve the direct ramp to runway access issue.

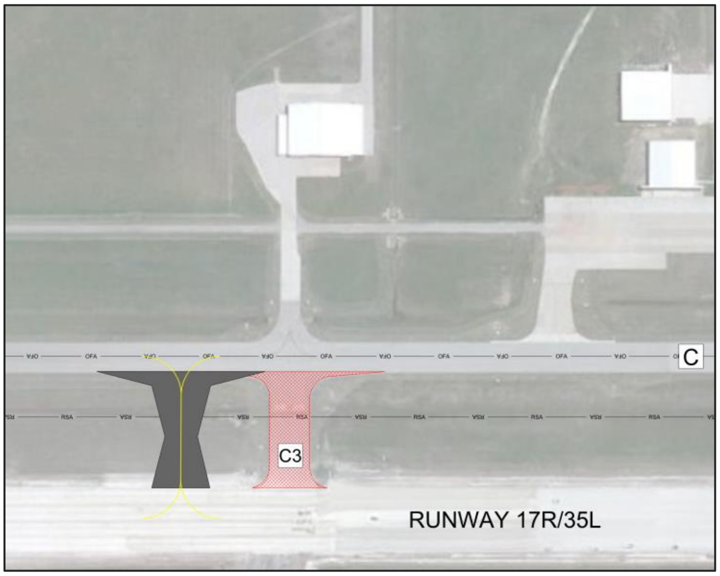
Figure 5-17
TWY C Alternative #1



Source: Garver, 2018.

Alternative #2 includes the removal of the existing Taxiway C3 and the relocation of that taxiway north of its existing location as shown in **Figure 5-18.** The relocation of Taxiway C3 between Taxiway C and Runway 17R/35L will resolve the direct ramp to runway access issue.

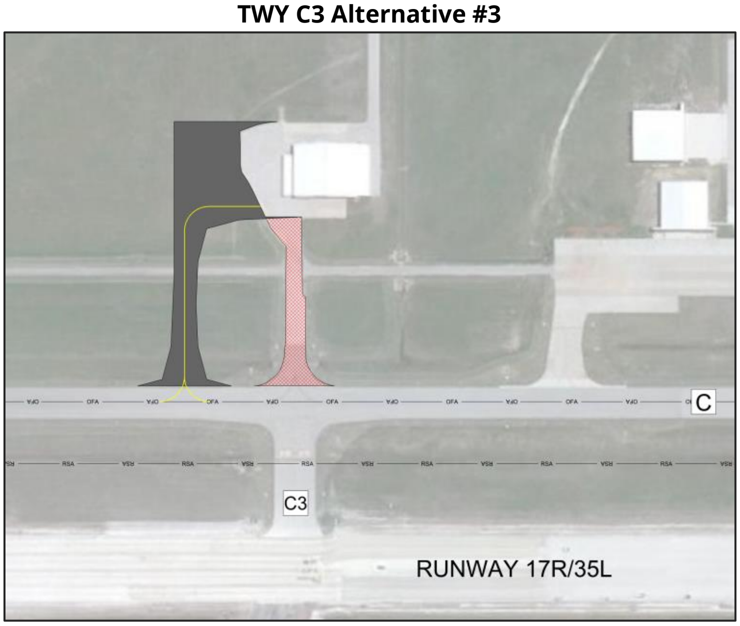
Figure 5-18
TWY C3 Alternative #2



Source: Garver, 2018.

Alternative #3 leaves Taxiway C3 at its current location and expands the ramp surrounding the hangar to the north to allow for the construction of a new taxilane to connect the ramp to Taxiway C. This alternative is shown in **Figure 5-19.** The relocation of the taxilane to a new location will resolve the direct ramp to runway access issue.

Figure 5-19
TWY C3 Alternative #3



Source: Garver, 2018.

Taxiway C3 Alternative Evaluation Results

The same evaluation criteria that were used to analyze the Taxiway C1 alternative were used to evaluate the Taxiway C3 alternatives. Based on evaluation criteria, the following evaluation matrix (**Table 5-3**) was developed showing the proposed rating of each alternative.

Table 5-3
Taxiway C3 Alternatives Evaluation Matrix

	Taxiway C/C3		
Evaluation Criteria	**1**	**2**	**3**
Ability to Satisfy the Established Facility Requirements	[green]	[green]	[green]
Conformance with FAA Design Standards	[green]	[green]	[green]
Enviromental Impacts	[green]	[green]	[green]
Engineering Factors/Considerations and Ease of Implementation	[yellow]	[yellow]	[green]
Impact on Airfield Efficiency/Capacity	[yellow]	[yellow]	[green]
Development Cost	$1.05M [green]	$1.05M [green]	$1.6M [yellow]

[green] - Low Impact **or** Meets Requirements

[yellow] - Moderate Impact **or** Fails to Meet Some Requiremer

[red] - High Impact **or** Fails to Meet Most Requirements

The ratings that each alternative received in each evaluation area are discussed in the evaluation commentary sections below.

Evaluation Commentary for Alternative #1 and #2

Alternatives 1 and 2 both provide similar solutions to resolve the direct ramp to runway access issue that currently exists. Each of these alternatives was rated "green" for their ability to satisfy the established facility requirements, conformance with FAA design standards, and environmental impacts. Both of these alternatives also received a "green" rating for development costs as they the cheapest of the alternative options.

Alternatives 1 and 2 received "yellow" ratings for their impact on airfield efficiency/capacity because relocating Taxiway C1 will eliminate the Taxiway C3/S crossing point for Runway 17R/35L. These alternatives also received a "yellow" rating in the engineering factors/considerations and ease of implementation area due to the runway closures that will be required to remove the existing pavement and construct the new taxiway.

These alternatives were rated "green" in four areas and "yellow" in two areas. No areas were rated "red" for these alternatives.

Evaluation Commentary for Alternative #4

Alternative #4 received "green" ratings for its ability to meet the established facility requirements, conformance with FAA design standards, and environmental impacts. The alternative also received a "green" rating for its impact on airfield efficiency/capacity as it maintains the existing Taxiway C3/S crossing point of Runway 17R/35L. Engineering factors/considerations and ease of implementation were also rated "green" as no runway closures would be required under this option.

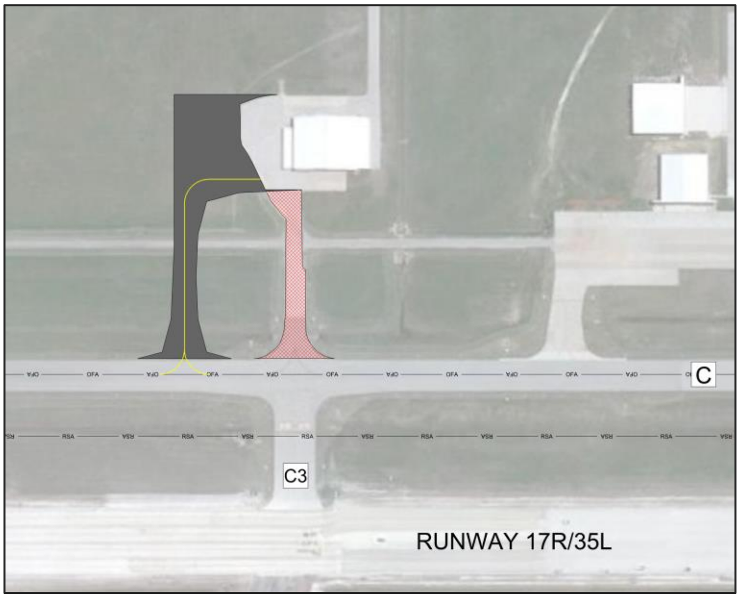
However, this alternative has the highest expected cost which resulted in a "yellow" rating in the development cost category.

In total, Alternative #4 received a "green" rating in five areas and a "yellow" rating in one area. No areas were rated "red" for this alternative.

Preferred C3 Alternatives

Based on the results of the taxiway alternative analysis and feedback from the MPSC and ABI Stakeholders, Alternative #4 was selected as the preferred development alternative. The preferred alternative is shown as **Exhibit 5-20**.

Figure 5-20
TWY C3 Preferred Alternative



Source: Garver, 2018.

Taxiway R and Runway 17R/35L

Figure 5-21 depicts the direct ramp to runway access issue occurring at Taxiway R and Runway 17R/35L. Taxiway R allows direct ramp access from the Northwest GA ramp to Runway 17R/35L without requiring aircraft to make a turn. This taxiway is used by aircraft both entering and existing Runway 17R/35L depending on the flow of operations.

Figure 5-21
Taxiway R Intersection with Runway 17R/35L

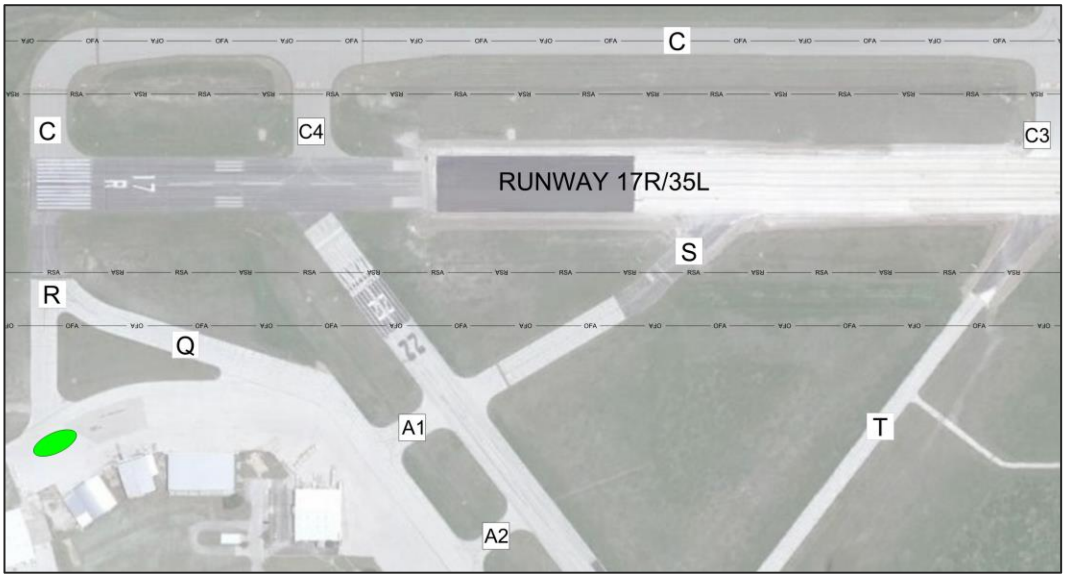
Source: Garver, 2018.

To resolve this issue, two alternatives were developed. However, rather than comparing these alternatives, the first alternative is meant to be a near-term solution while the second alternative is a long-term solution that would occur as part of the future re-development/expansion of the Northwest GA Ramp. Both alternatives are described in the section below.

Alternatives

Alternative #1A is the near-term solution that includes the installation of a surface painted "no-taxi" island on the ramp prior to where the Northwest GA Ramp and Taxiway R intersect. This alternative is shown as **Figure 5-22**. The installation of this "no-taxi" island is an excellent low cost solution that will resolve the direct ramp to runway access issue. The estimated cost for this alternative is expected to be approximately $10,000.

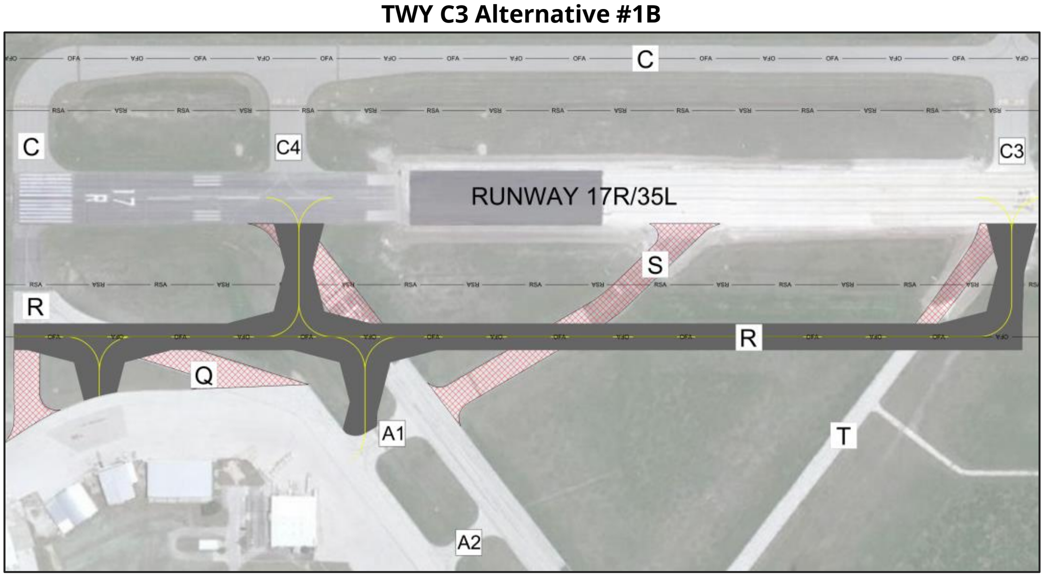
Figure 5-22
TWY R Alternative #1A



Source: Garver, 2018.

Alternative #1B includes the removal of many of the existing taxiways west of Runway 17R/35L and the redevelopment of a new parallel taxiway system that would mirror the parallel taxiway configuration used on the east side of Runway 17R/35L. The proposed parallel taxiway configuration could be extended further to the south to accommodate additional development in the future. This alternative is shown in **Figure 5-23**.

Figure 5-23
TWY C3 Alternative #1B



Source: Garver, 2018.

Land-Use and Development Alternatives

Land-use designations at an airport are an important factor that should be considered as part of an airport's long-term development strategy. In general, any land that could reasonably be needed for aeronautical purposes should be reserved for aeronautical development in the future even if it is outside the 20-year planning horizon. Any land that is not reasonably expected to be needed for aeronautical purposes in the future should be considered for a non-aeronautical land-use designation which, if granted, creates opportunities for potential non-aeronautical developments on airport property that can greatly increase an airport's potential revenue.

Non-aeronautical revenue generation is a significant priority for ABI to help support the financial health of the airport moving forward. Consequently, in the development of the proposed land-use alternatives, some aggressive non-aeronautical land use alternatives were proposed for consideration.

For ABI's land-use alternatives analysis, five different locations were identified to be studied to establish future aeronautical and non-aeronautical land use designations. These locations include the undeveloped areas:

- South of Airport Blvd. Along TX-36
- North of Airport Blvd. Along TX-36
- East of Runway 17L/35R
- Northwest GA Ramp Area
- Southern Area Between the Parallel Runways

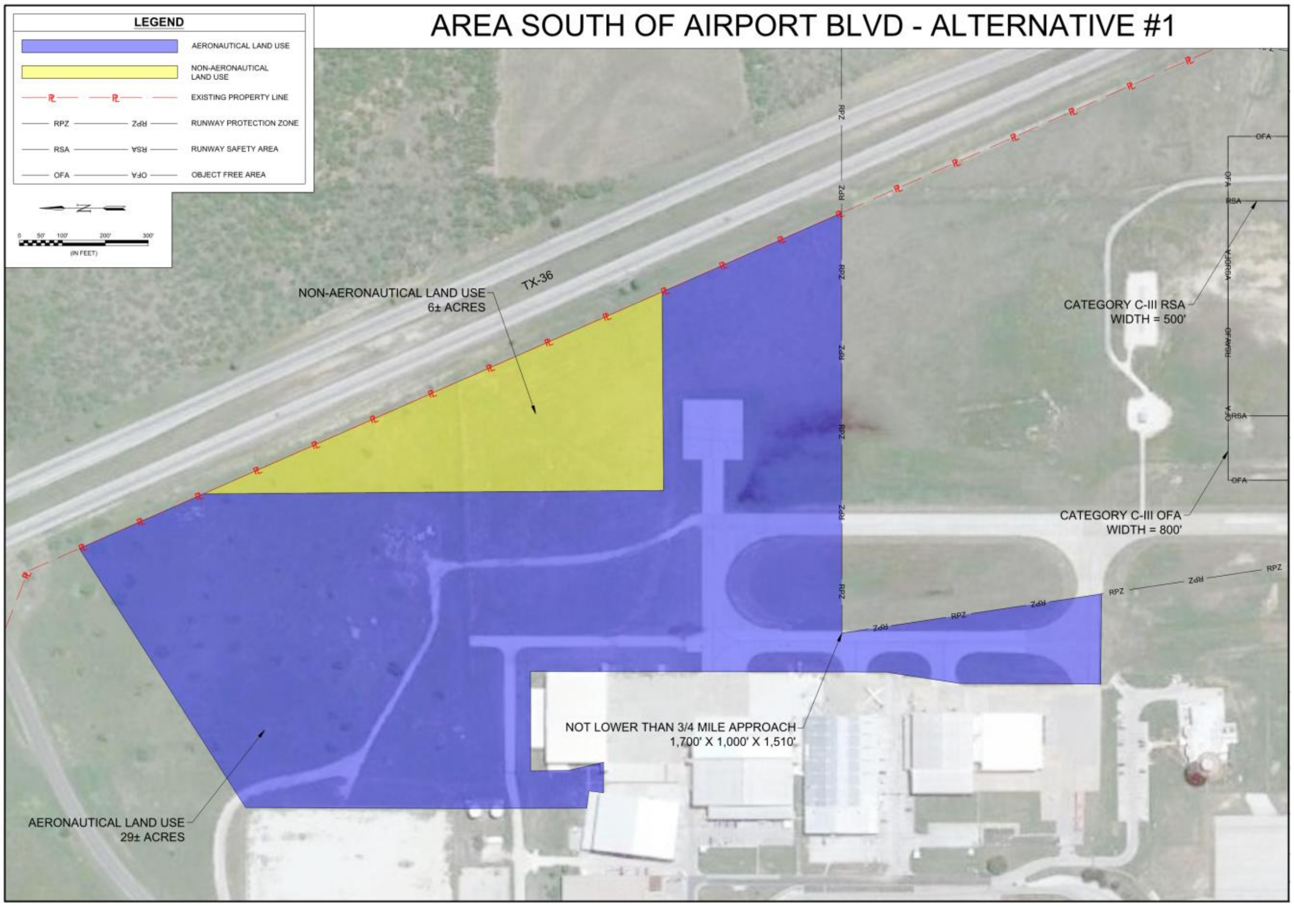
In each of these locations, various land use alternatives were developed and discussed with the Master Plan Steering Committee (MPSC) to determine the alternative for each area that presented the highest and best use of the available land in each area. Based on the forecast of aeronautical demand presented in Chapter 3, it is anticipated that all of the alternatives presented will provide sufficient space for future aeronautical development at ABI.

Land-Use Alternatives - South of Airport Blvd. Along TX-36

There are approximately 35 acres of developable land in the undeveloped area south of Airport Blvd. and west of TX-36. The extended centerline for Runway 17L/35R runs through this property which limits the potential for significant development in much of the area due to height restrictions associated with the use of the runway and potential noise sensitivity issues. Additionally, the area is immediately adjacent to the Eagle Aviation Services Inc. (EASI) area which is a major tenant on the airfield. Consequently, the non-aeronautical development potential for this area is limited.

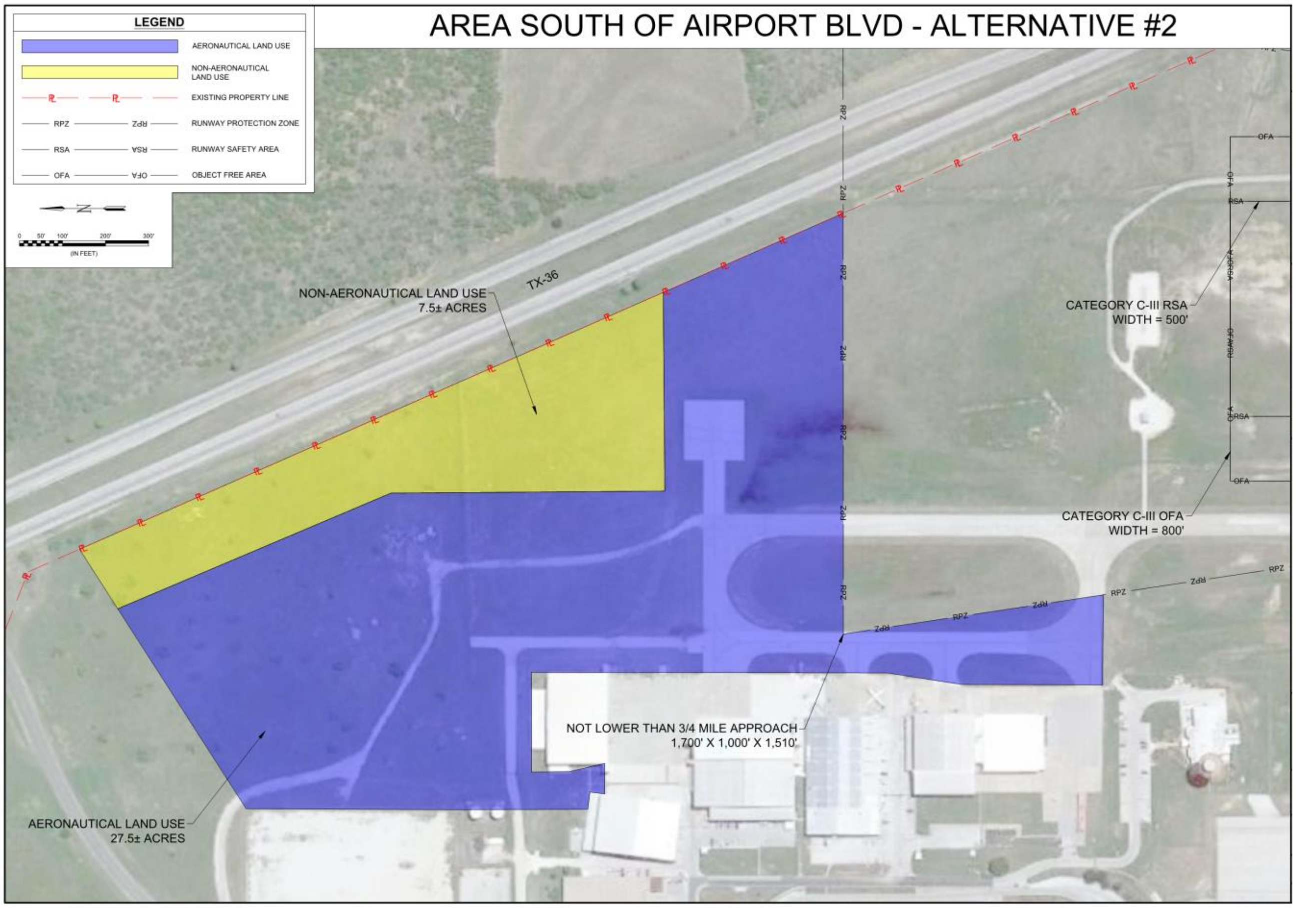
The three Land-Use Alternatives for this area are shown in **Figure 5-24, 5-25, and 5-26**.

Figure 5-24
Land-Use Alternative #1– South of Airport Blvd. Along TX-36



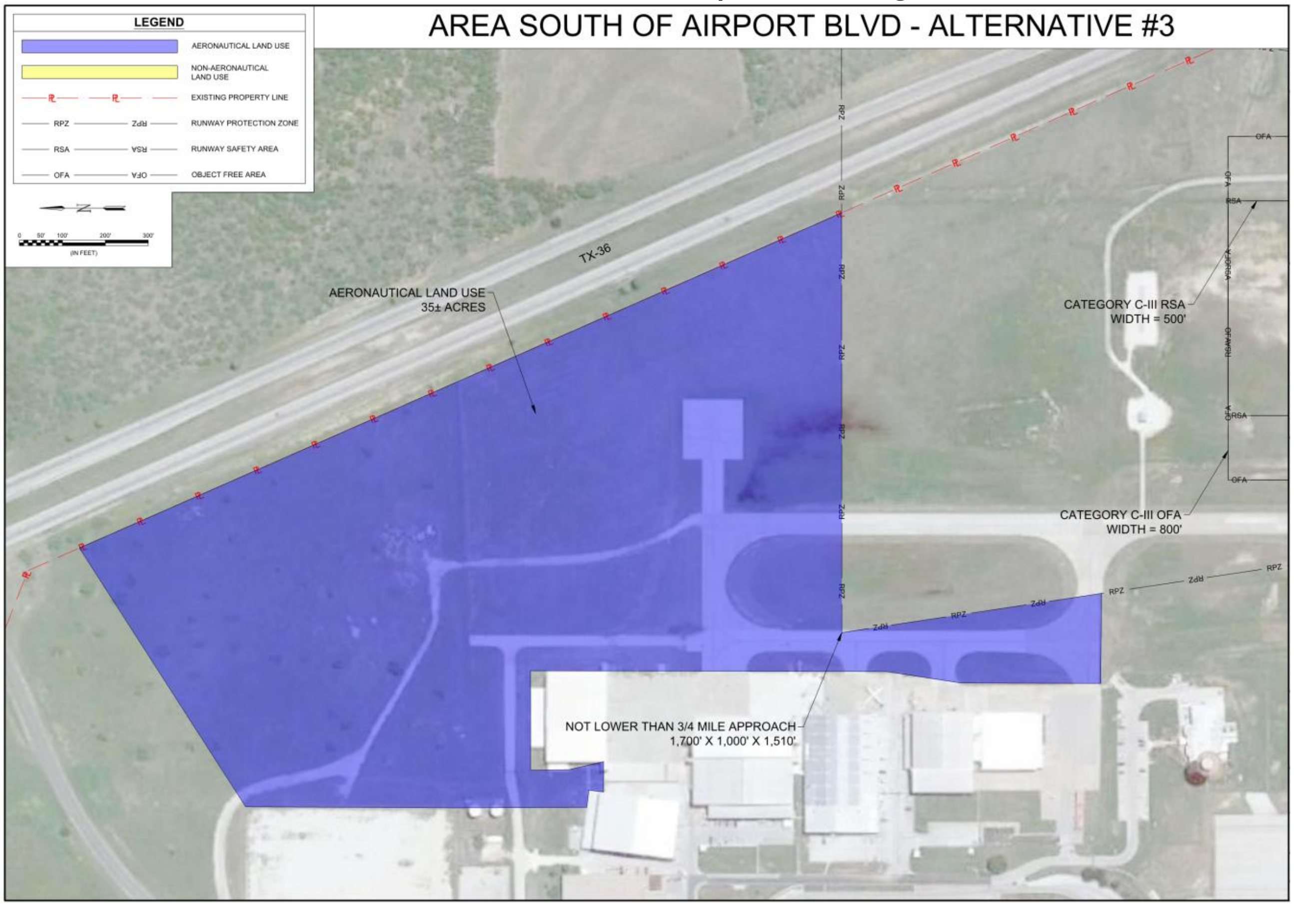
Source: Garver, 2018.

Figure 5-25
Land-Use Alternative #2– South of Airport Blvd. Along TX-36



Source: Garver, 2018.

Figure 5-26
Land-Use Alternative #3– South of Airport Blvd. Along TX-36



Source: Garver, 2018.

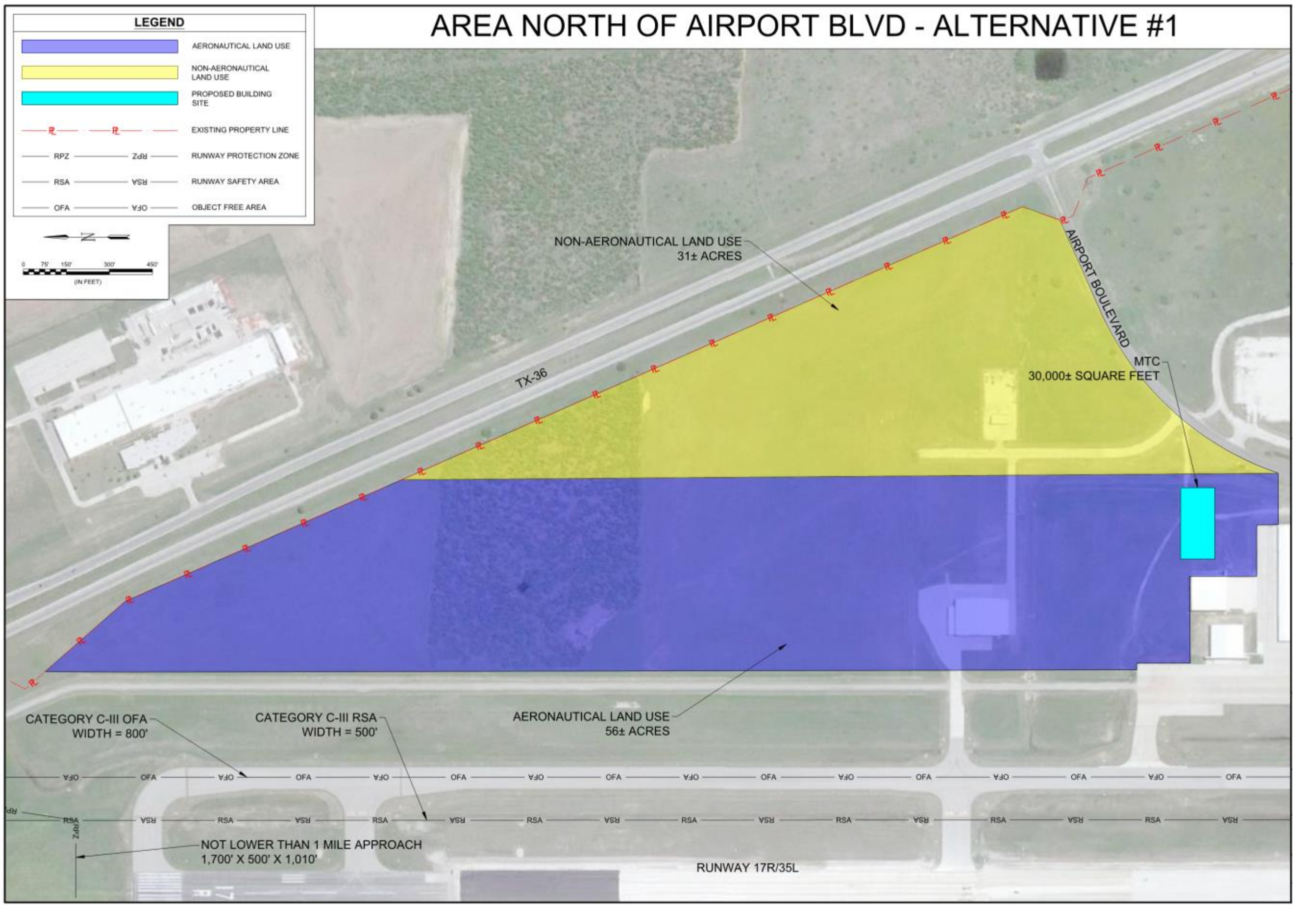
Based on discussions with the MPAC and ABI stakeholders, Land-Use Alternative #3 was selected as the preferred land-use alternative for this area.

Land-Use Alternatives - North of Airport Blvd. Along TX-36

There are approximately 87 acres of developable land in the undeveloped area north of Airport Blvd. and west of TX-36. This area is well positioned for future non-aeronautical development such as light retail, gas stations, and restaurants because of its location along TX-36 and proximity to Loop 322. Consequently, all the land-use alternatives for this area are aggressive non-aeronautical land-use options.

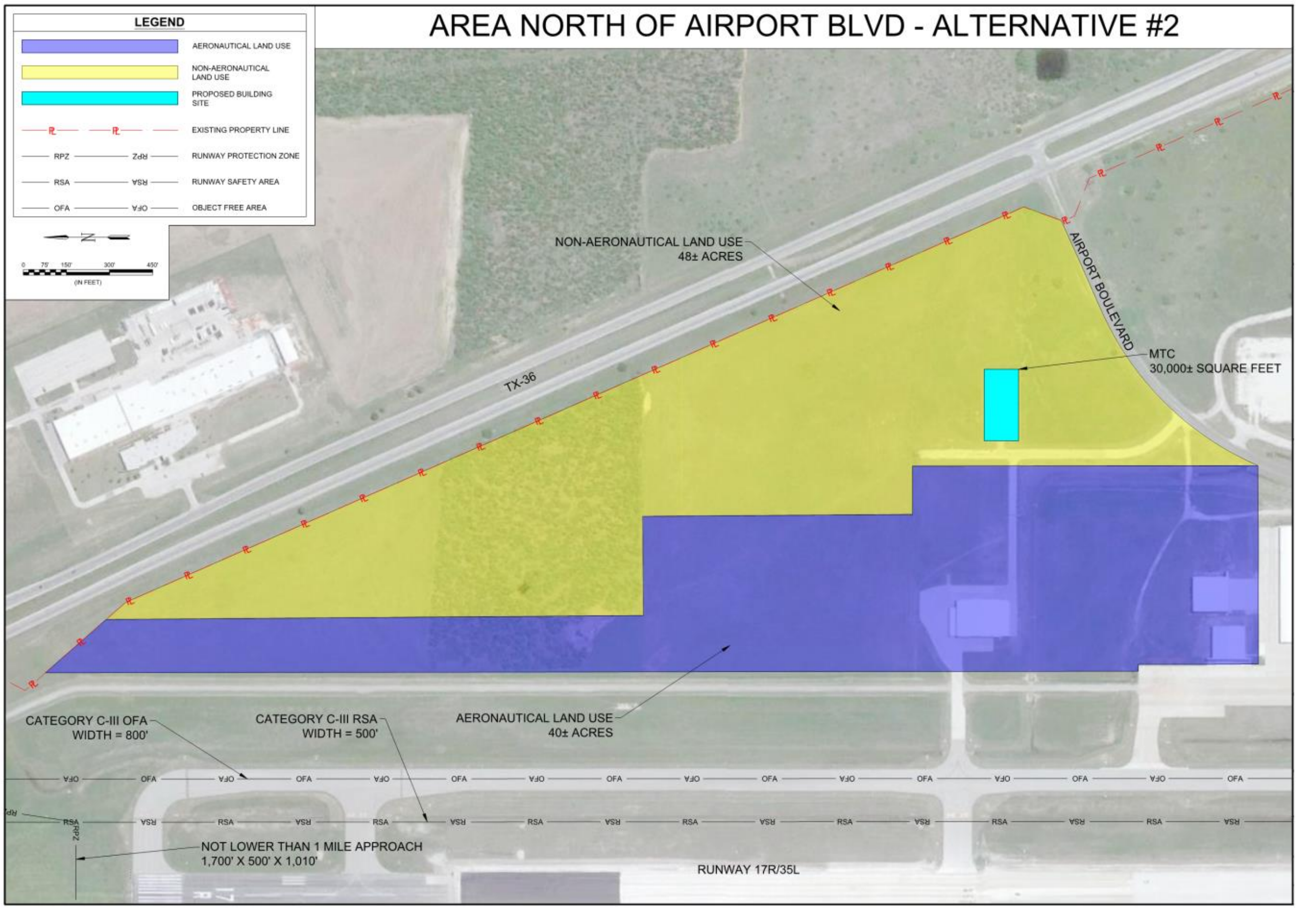
The three Land-Use Alternatives for this area are shown in **Figure 5-27, 5-28, and 5-29**.

Figure 5-27
Land-Use Alternative #1 – North of Airport Blvd. Along TX-36



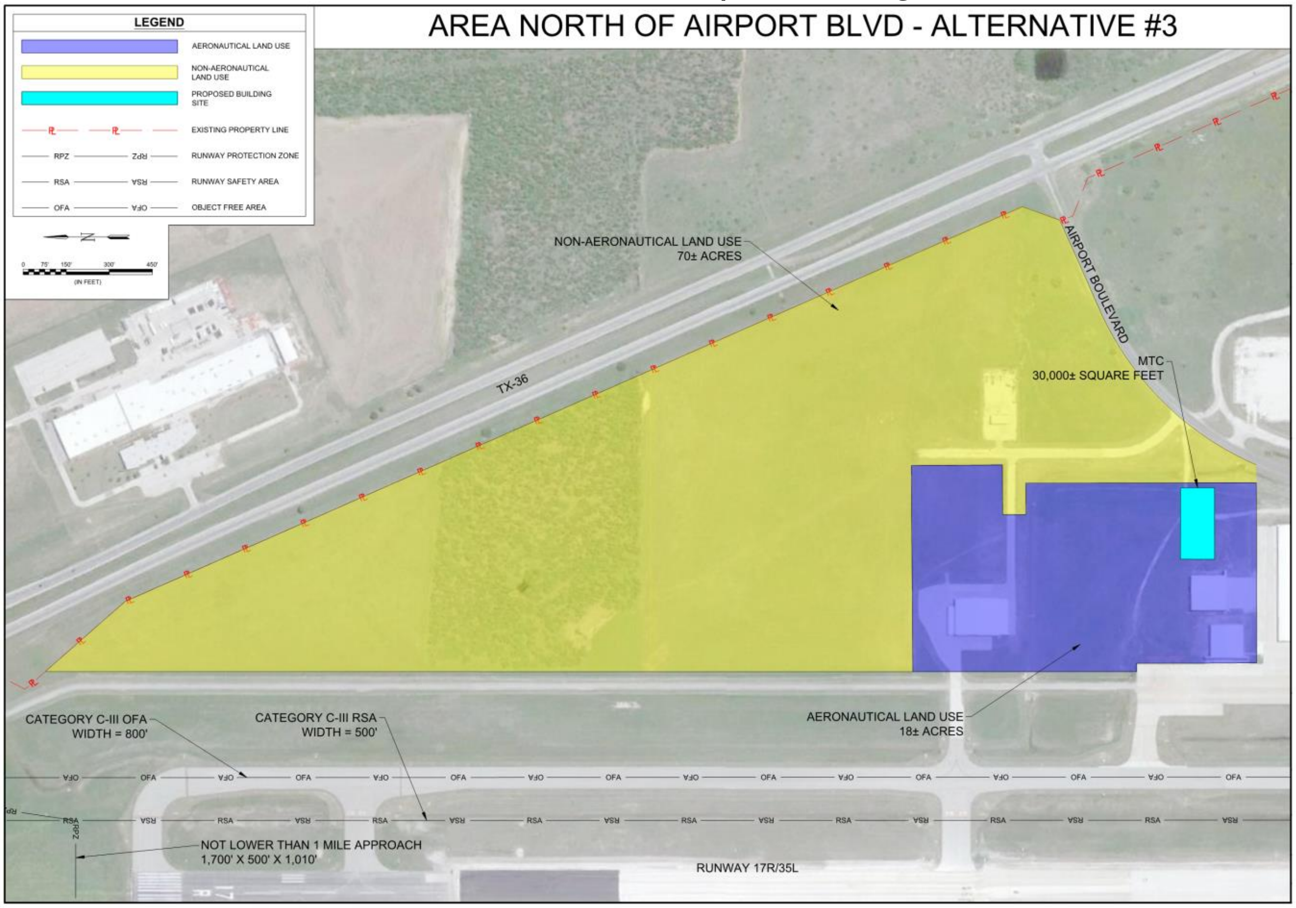
Source: Garver, 2018.

Figure 5-28
Land-Use Alternative #2– North of Airport Blvd. Along TX-36



Source: Garver, 2018.

Figure 5-29
Land-Use Alternative #3 – North of Airport Blvd. Along TX-36



Source: Garver, 2018.

Based on discussions with the MPAC, Land-Use Alternative #3 was selected as the preferred land-use alternative for this area.

Land-Use Alternatives - East of Runway 17L/35R

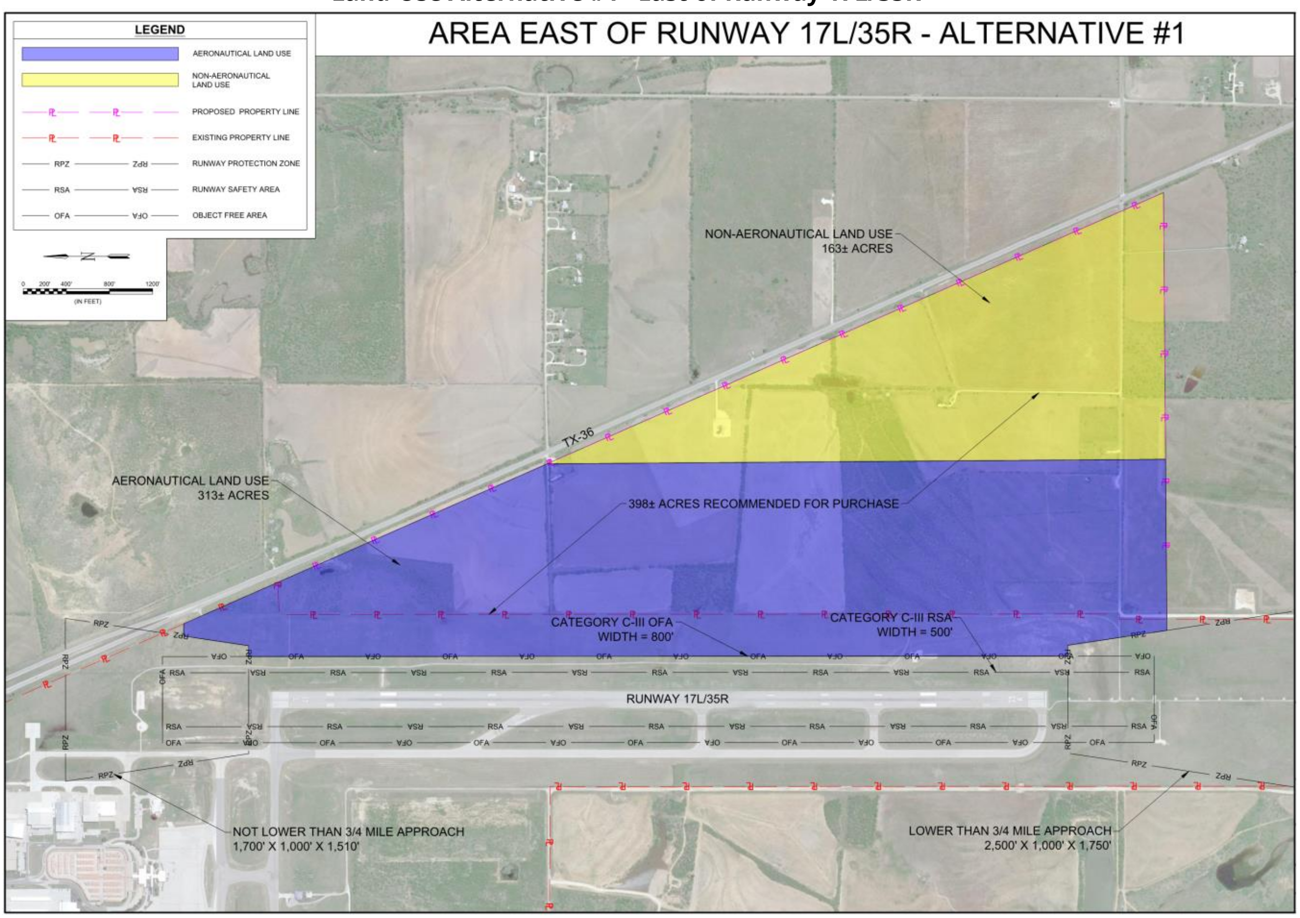
There are approximately 476 acres of developable land in the area between Runway 17L/35R and TX-36. Approximately 78 acres of this area is already owned by the airport and 398 acres of it are not owned by the airport. The 78 acres owned by the airport are immediately east of Runway 17L/35R inside the existing perimeter fence. A few residences currently exist on the 398 acres that are not owned by the airport. Other than the residences, the area is largely un-developed.

As much of this property is not owned by the airport and there are numerous other locations for development on property the airport currently owns, the development of this area is considered a lower priority. However, the portion of this area adjacent to Runway 17L/35R is well suited for a major aeronautical development such as a heavy Maintenance, Repair, and Overhaul (MRO) business or a large cargo operation. Additionally, depending on how drones are integrated into the National Airspace System (NAS), this area could provide a suitable site for drone operations for cargo and other non-passenger activities as it provides good access to Runway 17L/35R but would largely keep drones off of the taxiways and on-field facilities used by piloted aircraft. Drone activity involving passengers or Vertical Takeoff and Landing (VOTL) vehicles should be located in the vicinity of the terminal for roadway and parking access. Alternatives for those drone operations will be discussed in the landside alternatives section.

If this land is ever purchased and used for future development it is recommended that a portion of the property close to TX-36 be used for non-aeronautical development.

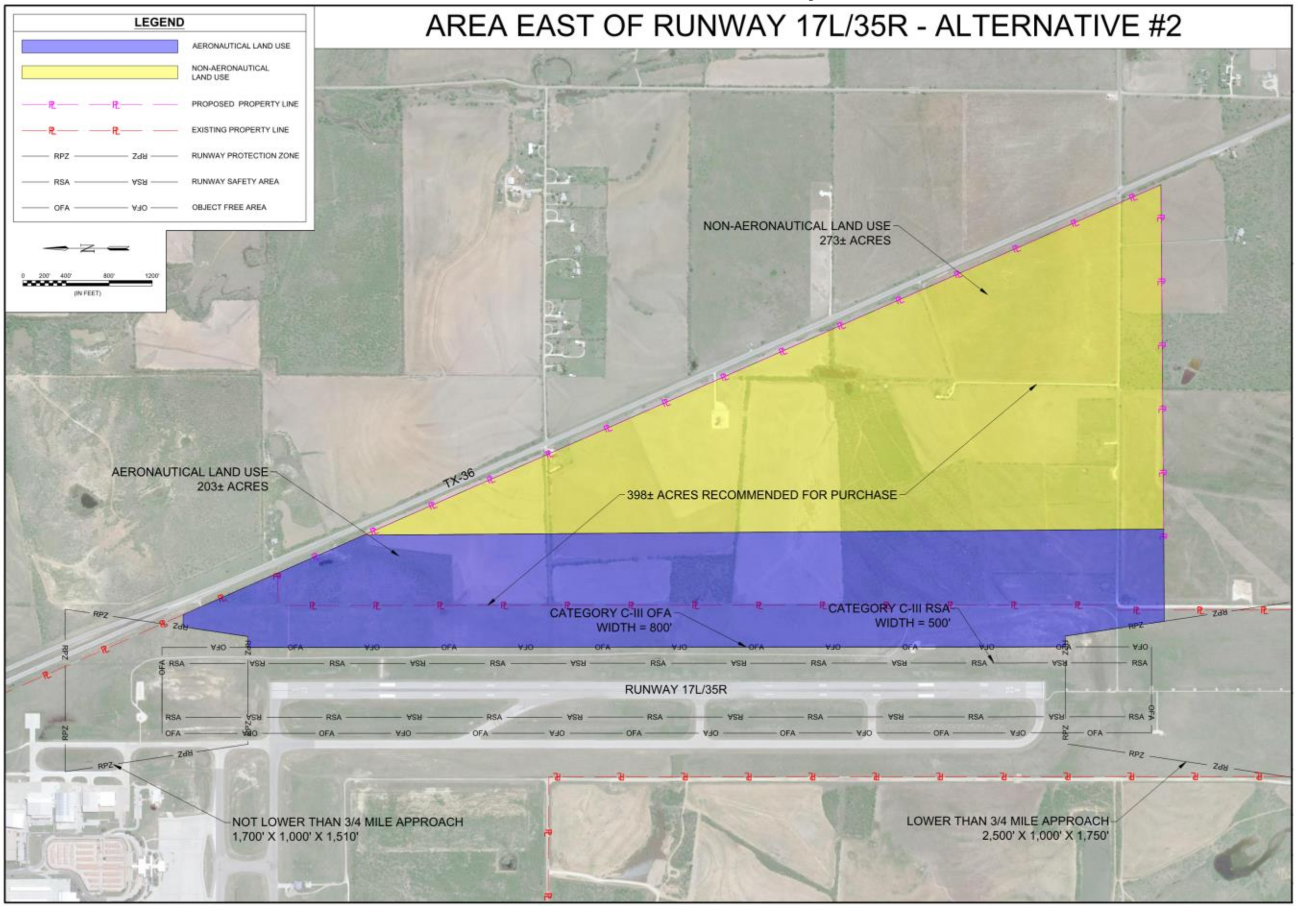
The two Land-Use Alternatives for this area are shown in **Figure 5-30 and 5-31**.

Figure 5-30
Land-Use Alternative #1– East of Runway 17L/35R



Source: Garver, 2018.

Figure 5-31
Land-Use Alternative #2 – East of Runway 17L/35R



Source: Garver, 2018.

Based on discussions with the MPAC, Land-Use Alternative #1 was selected as the preferred land-use alternative for this area.

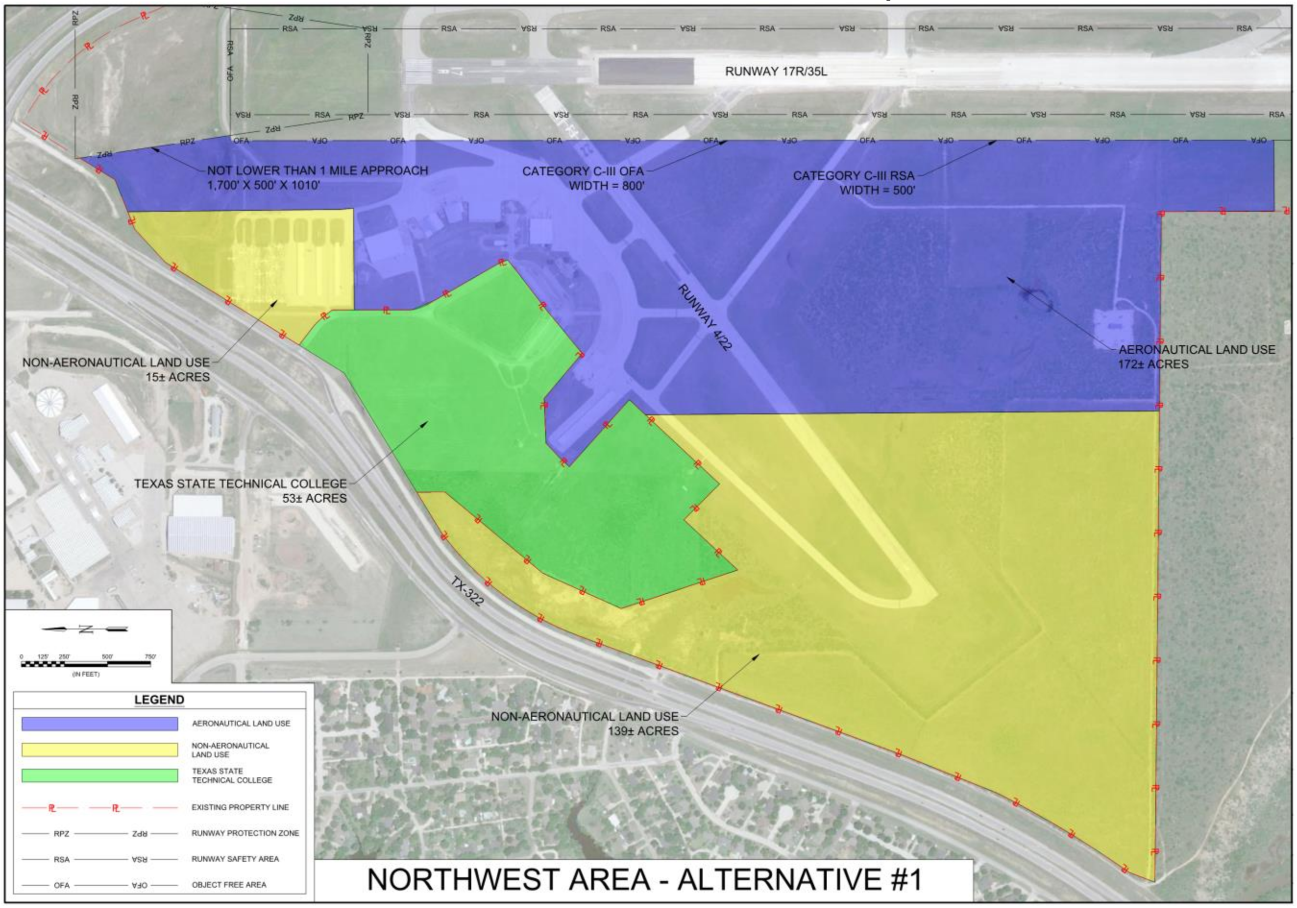
Land-Use Alternatives – Northwest GA Ramp

As previously discussed, it is expected that Runway 4/22 will be closed at some point during the forecast period. When this occurs, ABI plans to re-develop this area into a blend of aeronautical and non-aeronautical developments. There is approximately 326 acres of land in this area that could be developed or re-developed.

Due to this property's proximity to TX-36, Loop 322, and the TSTC development, a portion of this area is well suited for non-aeronautical development such as hotels, light retail, gas stations, and restaurants.

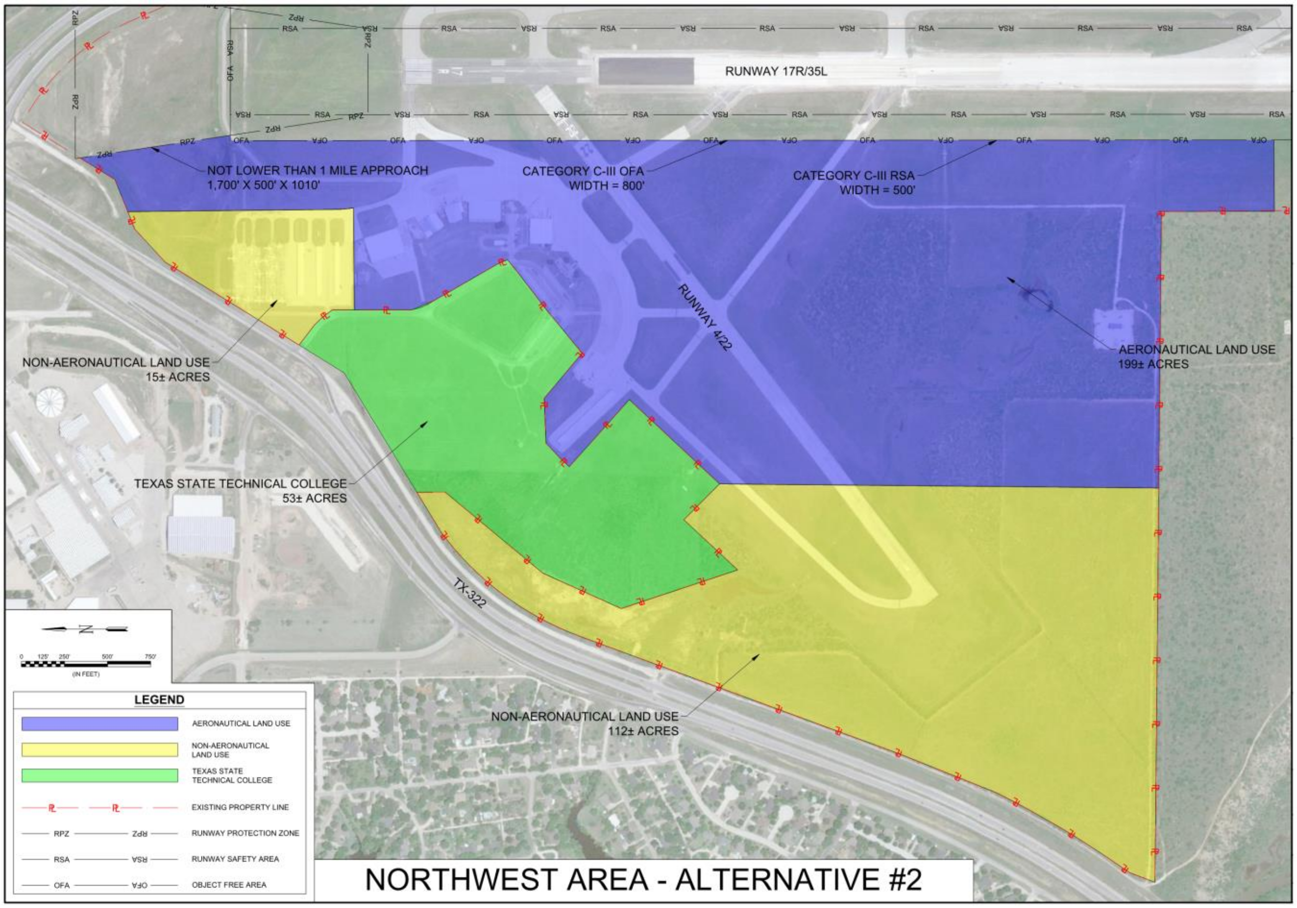
The four Land-Use Alternatives for this area are shown in **Figure 5-32, 5-33, 5-34, and 5-35**.

Figure 5-32
Land-Use Alternative #1– Northwest GA Ramp



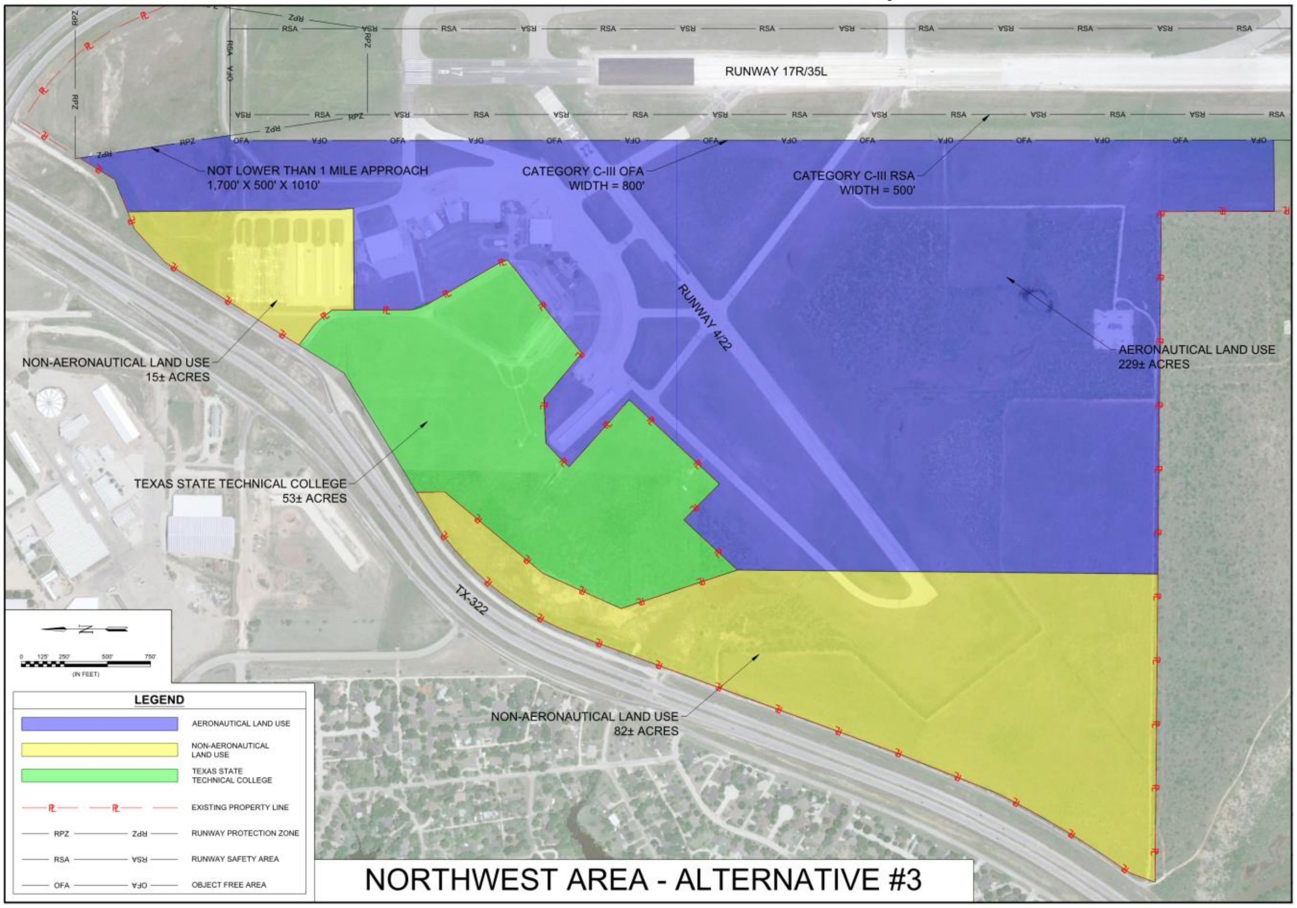
Source: Garver, 2018.

Figure 5-33
Land-Use Alternative #2 – Northwest GA Ramp



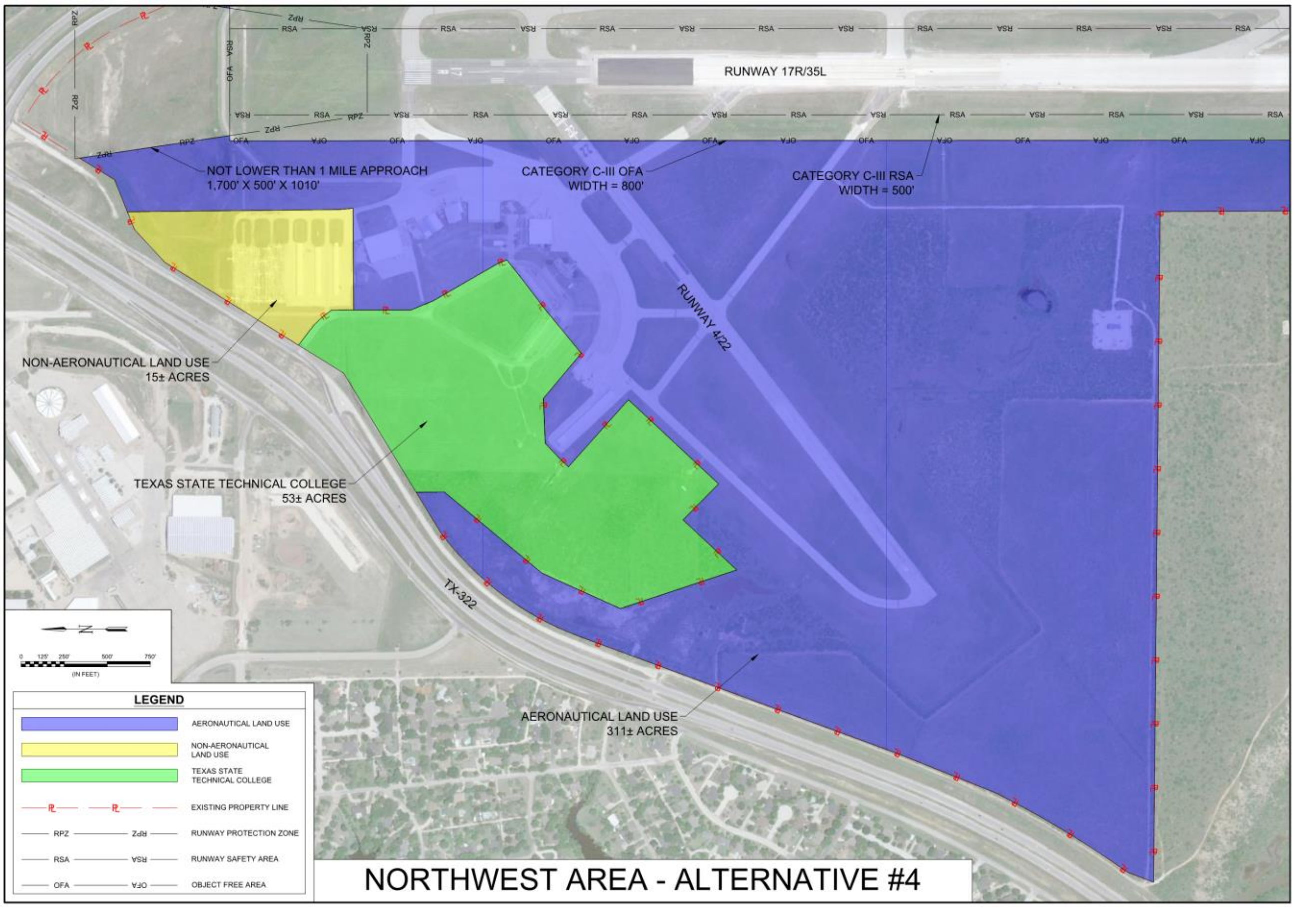
Source: Garver, 2018.

Figure 5-34
Land-Use Alternative #3 – Northwest GA Ramp



Source: Garver, 2018.

Figure 5-35
Land-Use Alternative #4 – Northwest GA Ramp



Source: Garver, 2018.

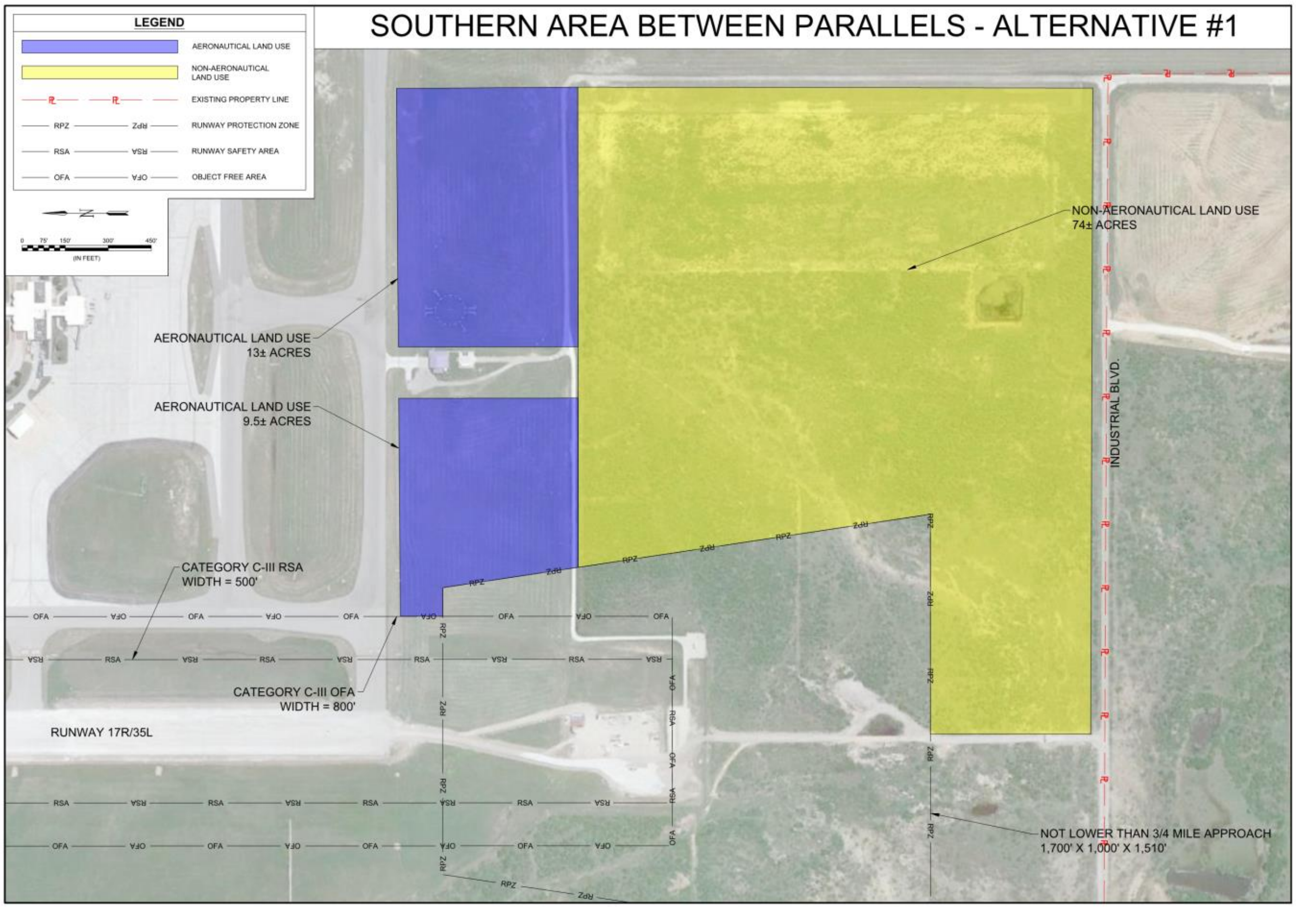
Based on discussions with the MPAC, Land-Use Alternative #4 was selected as the preferred land-use alternative for this area.

Land-Use Alternatives – Southern Area Between the Parallel Runways

There is approximately 96.5 acres of airport property located between the offset parallel runways that could be used for a blend of aeronautical and non-aeronautical development. This area can be accessed using Industrial Blvd. It is recommended that the properties to the east and west of the existing ARFF station and immediately south of Taxiway M be used for aeronautical development while the property south of the airport's perimeter road is used for non-aeronautical development. The non-aeronautical portion of the property in this area is well suited for some type of industrial development.

Only one land-use alternative is developed for this area. The alternative is shown in **Figure 5-36**.

Figure 5-36
Land-Use Alternative – Southern Area Between the Parallel Runways



Source: Garver, 2018.

Terminal and Landside Alternatives

This section explores alternative concepts for terminal area development to meet the facility requirements for terminal and landside facilities presented in the previous chapter. The development process began with high-level concepts showing potential expansion or renovation of functional areas within the terminal building as per facility requirements in Scenario 4. These concepts were reviewed by the Master Plan Steering Committee (MPSC) and then further refined to create a series of development alternatives for the terminal.

Facility Requirements Summary

The facility requirements analysis, summarized in **Table 5-4,** identified three major functional areas of the existing terminal building that need to be expanded significantly to meet future demand in Scenario 4 – departure holdroom area, Security Screening Checkpoint (SSCP), and baggage screening. The high-level concepts addressed the potential expansion of these areas.

Table 5-4
Terminal Facilities Requirements Summary

Description	Existing Terminal	Scenario 1 2022	Scenario 2 2027	Scenario 3 2032	Scenario 4 2037
Airline Functions					
Ticket Counter Area	626	277	300	316	335
Ticket Counter Length (7 Positions)	*52*	*28.4*	*30.8*	*32.4*	*34*
Ticket Counter Queuing	1,166	412	447	470	499
Curbside Baggage Check	-	60	65	68	72
Baggage Claim Area / Odd size Area	1,716	1,420	1,540	1,620	1,720
Baggage Claim Frontage	*116*	*99.4*	*107.8*	*113.4*	*120*
Oversized Bag Claim	*0*	*8*	*8*	*8*	*8*
Baggage Service Office	79	*204*	221	232	247
Outbound Baggage	1,868	1,775	1,925	2,025	2,150
Inbound Baggage	935	838	909	956	1,015
Airline Operations / Airline Ticket Office	2,476	2,071	2,274	2,371	2,538
Departures Lounges (Holdrooms)	1,530	4,192	4,192	4,192	4,192
Jet Gates	*2*	*2*	*2*	*2*	*2*
Subtotal Airline Functions	10,396	11,248	11,873	12,250	12,769

	Concessions					
	Concessions (Food / Beverage)	1,244	486	534	557	596
	Concessions (News / Gifts / Sundry)	768	324	356	371	397
	Concessions (Concession Storage)	253	162	178	186	199
	Ground Transportation	-	360	396	412	441
	Information	144	-	-	-	-
	Rental Car Counters	755	1,351	1,483	1,547	1,656
	Subtotal Concessions	3,164	2,683	2,947	3,073	3,289
	Secure Public Area					
	SSCP	734	2,400	2,400	2,400	2,400
	SSCP Queuing	392	400	400	400	400
	Circulation	2,653	1,500	1,500	1,500	1,500
	Restrooms	351	497	539	567	602
	Bag Screen Room	164	2,500	2,500	2,500	2,500
	TSA Offices / Training / Restrooms	175	99	108	113	120
	TSA Break	338	209	226	238	253
	Airport Administration / Training	3,781	4,081	4,081	4,081	4,231
	Other	-	-	-	-	-
	Subtotal Secure Public Area	8,588	11,686	11,754	11,800	12,006
	Non-Secure Public Area					
	Circulation - Ticketing	647	618	670	705	748
	Circulation - Baggage Claim	516	710	770	810	860
	Circulation - General	8,526	1,801	1,978	2,062	2,207
	Restrooms	1,133	426	462	486	516
	Other	-	126	138	144	155
	Subtotal Non-Secure Public Area	10,822	3,681	4,018	4,207	4,486
						-
	Non-Public Area					-
	Loading Dock	-	88	92	94	98

	Storage	50	293	306	313	325
	Maintenance	486	293	306	313	325
	Mech. / Elec. / Bldg. Systems	4,522	3,516	3,671	3,760	3,906
	Subtotal Non-Public Area	5,058	4,190	4,375	4,480	4,655
	Grand Total	38,028	33,488	34,966	35,810	37,204

Concept Development

High-level terminal development concepts were presented to the MPSC in the facility requirements meeting. A workshop was conducted during the meeting so that the committee members could comment on the concepts and provide their own ideas and inputs. The following paragraphs describe these concepts which served as a precursor to the detailed alternatives presented later in this chapter.

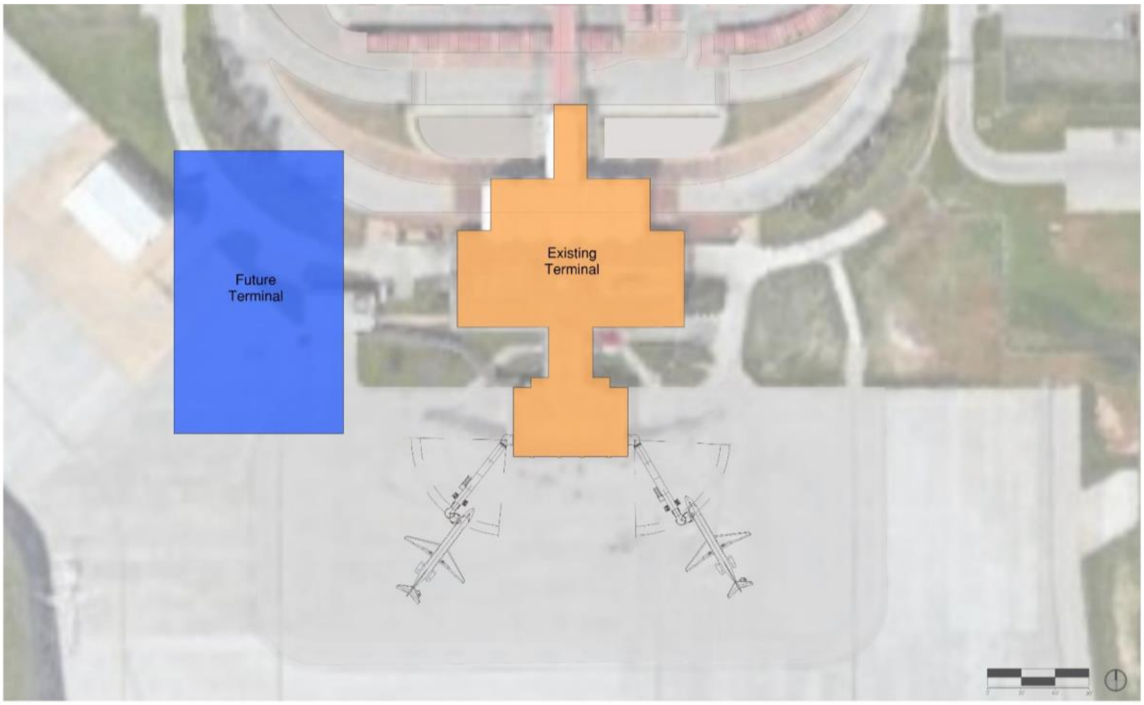
New Terminal

The new terminal concept considered a brand-new terminal on a greenfield site that is independent of the existing terminal building. The new terminal would have the capacity to accommodate all future traffic across the entire 20-year planning horizon and can be constructed independently of existing airport operations. The existing terminal building would be demolished after the new terminal is fully operational.

A feasible site for a new terminal building was identified west of the existing terminal as shown in **Figure 5-37** on the next page. A new terminal building in this location would require a realignment of existing airport roads such as ‘Airport Boulevard’ or construction of a new access road to reach the new terminal building curbside. The new terminal building would also require the expansion of existing utilities, in addition to a renovation of landside facilities to better serve the new terminal building. Modifications and expansion of airside infrastructure such as taxiways and the apron would also be required to accommodate aircraft operations at the new terminal location.

Since the existing building was designed to be incrementally expanded and facility requirements for future Scenario 4 could be met by maximizing the site of the existing terminal building, the MPSC expressed concern that a new terminal option overlooked the expansion possibilities of the existing building. In addition, the cost and time needed to build a new terminal would be too high compared to an incremental expansion/renovation of the existing terminal. As a result, the MPSC discarded the option of a new terminal and decided to retain the existing terminal building.

Figure 5-37
New Terminal



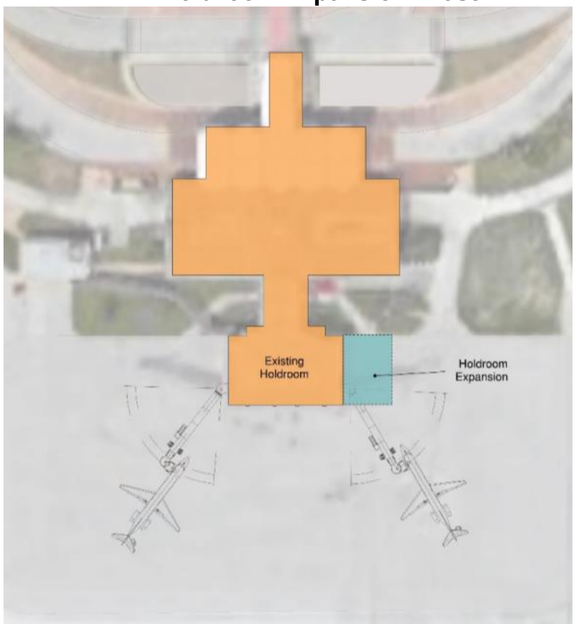
Source: Corgan 2018

Holdroom Expansion

These concepts show the potential expansion concepts of the existing holdroom. **Figure 5-38** shows expansion to the east and **Figure 5-39** shows expansion to the west. **Figure 5-40** shows a concept of expanding the holdroom to both the east and west and **Figure 5-41** shows the potential expansion of the existing holdroom to the south.

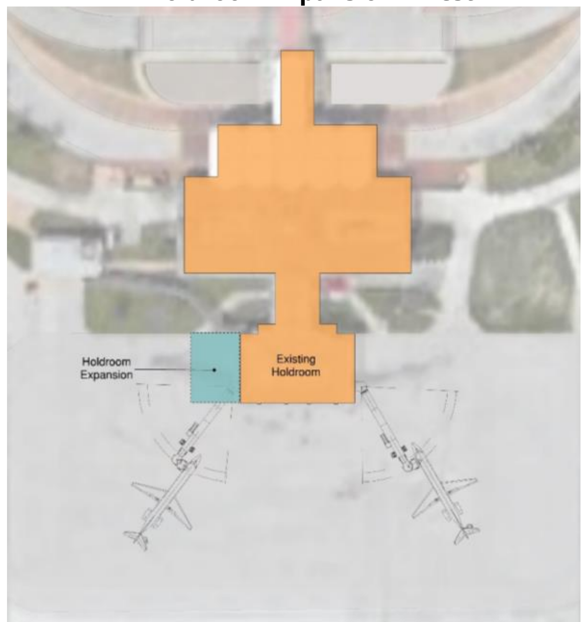
The committee noted that there may be challenges to relocate the east aircraft parking position if expansion occurs to the east. A holdroom expansion to the east would shift the position further east and impact a non-contact aircraft parking position used for weather diversions. A holdroom expansion to the south is a feasible option that would limit impacts to other facilities on the ramp and in the terminal.

Figure 5-38
Holdroom Expansion - East



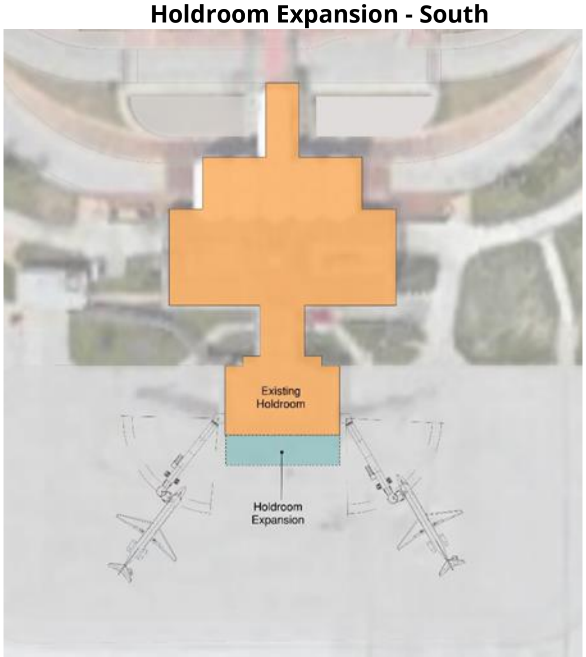
Source: Corgan 2018

Figure 5-39
Holdroom Expansion - West



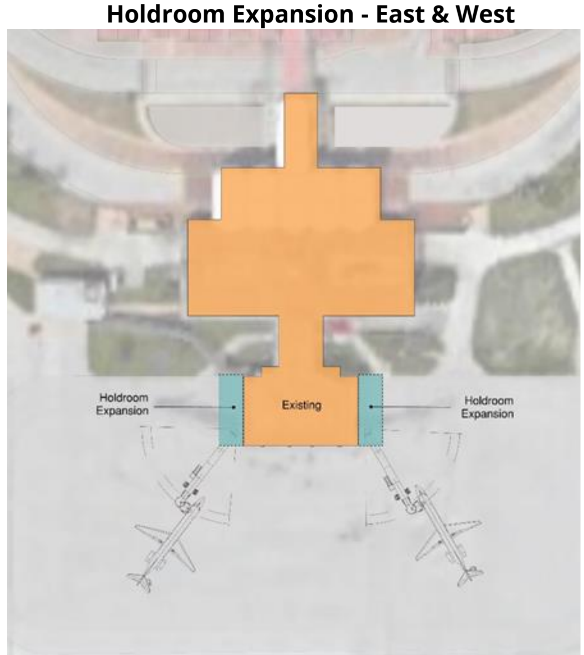
Source: Corgan 2018

Figure 5-40
Holdroom Expansion - South



Source: Corgan 2018

Figure 5-41
Holdroom Expansion - East & West

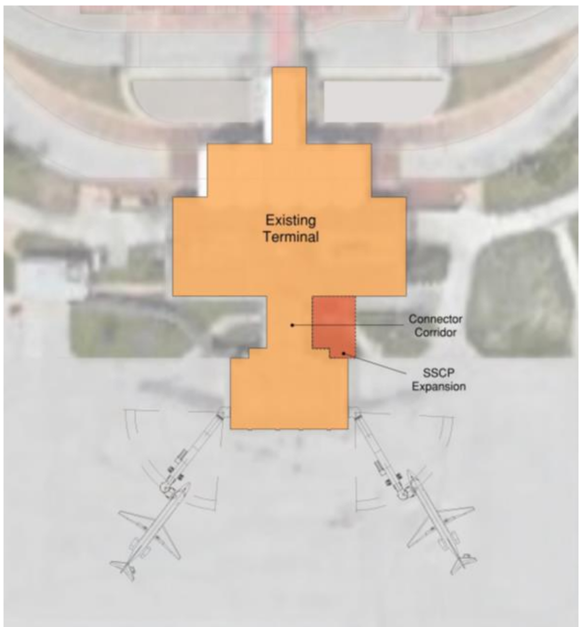


Source: Corgan 2018

Infill Expansion

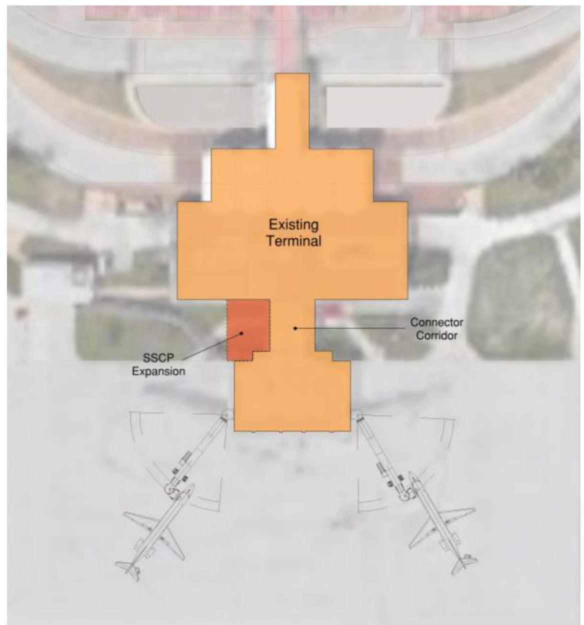
Infill expansion concepts show the expansion of other functional areas such as Security Screening Checkpoint (SSCP) and Baggage Handling Systems (BHS). **Figure 5-42** shows expansion to the east of the connector corridor and **Fig 5-43** shows expansion to the west of the connector corridor. **Figure 5-44** shows a relocation and expansion of the existing SSCP south into the existing holdroom. This concept would be paired with a holdroom expansion to the south. **Figure 5-45** shows a BHS expansion to the east of the existing BHS and **Fig 5-46** shows a BHS expansion to the south of the existing BHS.

Figure 5-42
Infill SSCP - East



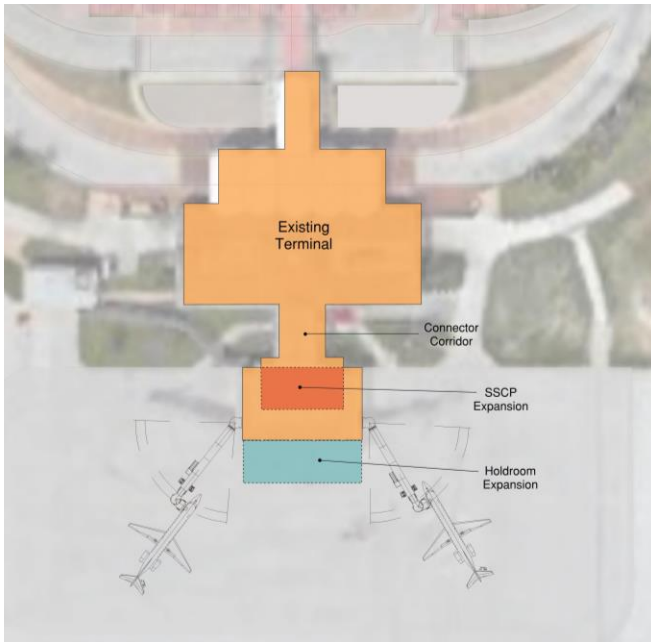
Source: Corgan 2018

Figure 5-43
Infill SSCP - West



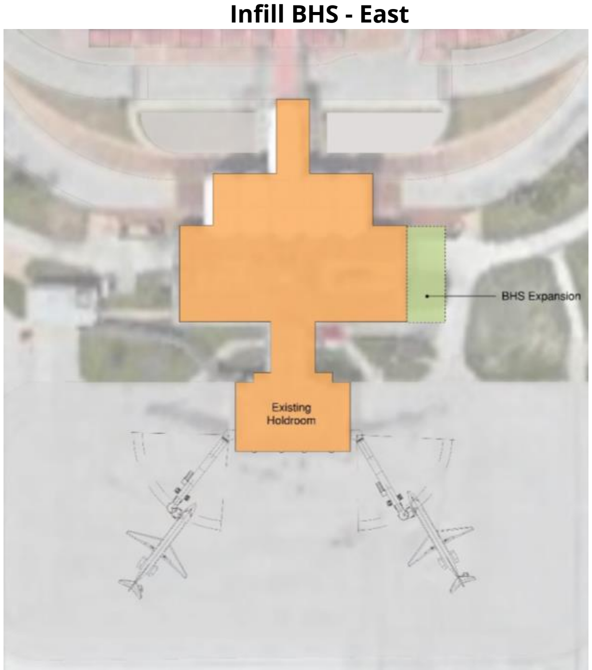
Source: Corgan 2018

Figure 5-44
Infill SSCP - South



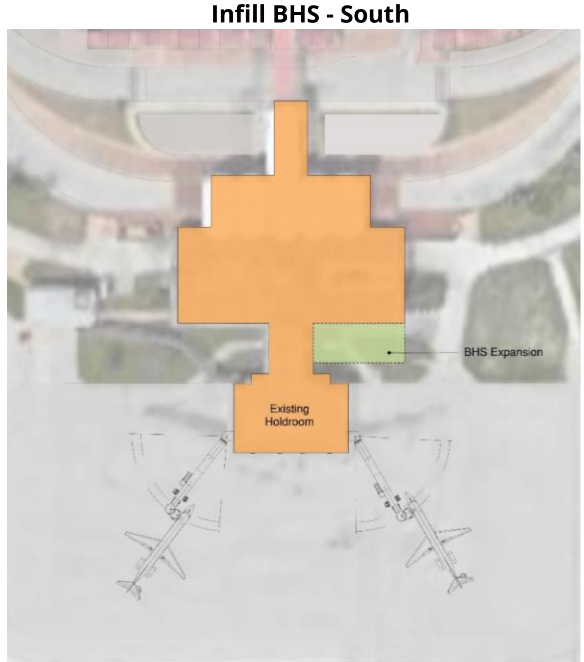
Source: Corgan 2018

Figure 5-45
Infill BHS - East



Source: Corgan 2018

Figure 5-46
Infill BHS - South



Source: Corgan 2018

Concept Development Conclusion

The discussion generated by the concepts defined above was used to provide guidance for the detailed alternatives development process discussed in the remainder of this section.

Passenger Terminal Alternatives Descriptions

The high-level concepts for terminal development were further refined to create detailed terminal alternatives. A workshop was conducted with the MPSC to assess the alternatives on April 25, 2018. The goal of the workshop was to obtain the committee's input and suggestions on various alternative schemes for terminal development. Evaluation of these alternatives included consideration of ownership costs, capital costs, and operational efficiency.

The alternatives discussed in the workshop can be classified into four "families" of alternatives:

1. No Expansion
2. Limited Build
3. Infill Expansion
4. Full Expansion

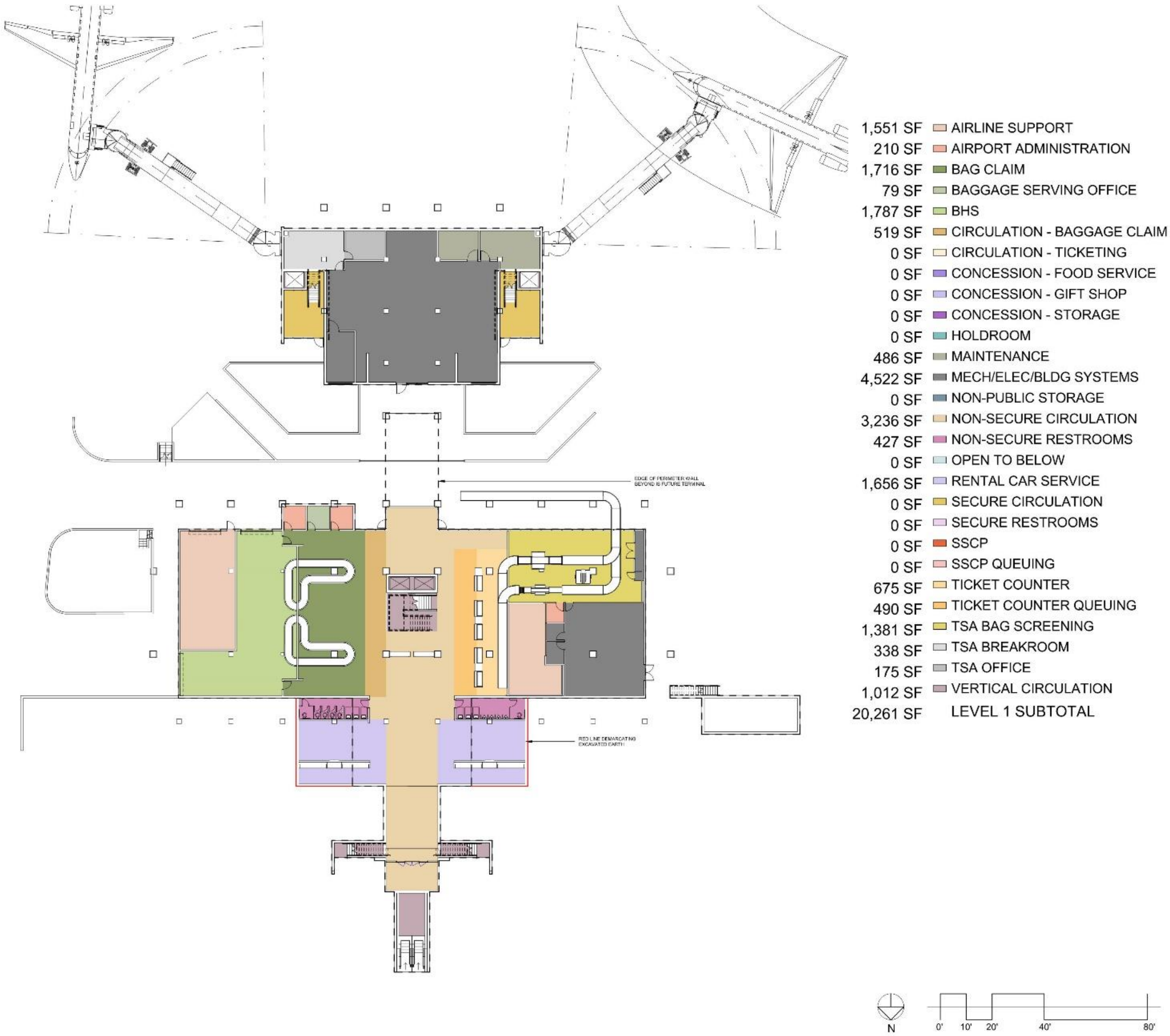
Description: Alternative 1 - No Expansion

Based on square footage requirements for future demand required in Scenario 4, the existing building currently has sufficient floor area to meet the total area requirement. However, as explained in the earlier sections of this chapter, specific functional areas have insufficient square footage to meet future area requirements. The no expansion alternative attempts to meet square footage requirements for these specific functional areas by reallocating space within the existing terminal building without expanding the building footprint.

Figure 5-47 and **Figure 5-48** show floor plans for level 1 and level 2 respectively for the no-expansion alternative. With the objective of reallocating space, the secure side holdroom is expanded into the connector corridor and the SSCP is relocated to the northern section of the terminal building. Relocating the SSCP also requires relocating ticketing and bag screening to the west side of the lower level. This option presents challenges with secure side circulation and does not provide enough square footage for the SSCP and queuing area.

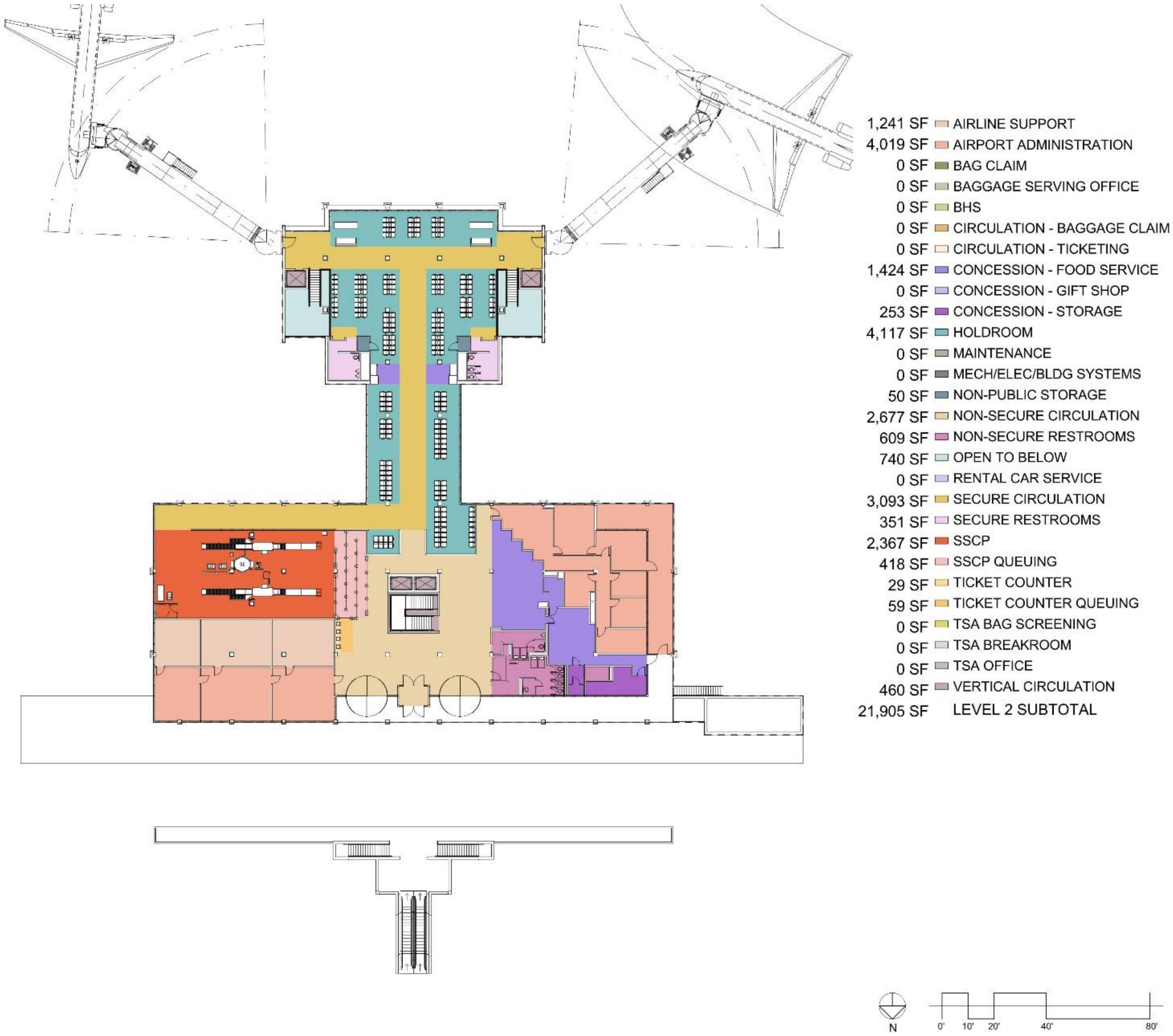
Another concern with the no expansion option is allocating sufficient space within the existing terminal building to accommodate the required space for rental car counters. The design team identified the possibility of widening the rental car space on the first floor underneath the upper level roadway. However, this approach would require a major excavation project under the existing upper level roadway to accommodate the rental car counters, which would demand a significant financial investment.

Figure 5-47
Alternative 1-1 – Level 1



Source: Corgan 2018

Figure 5-48
Alternative 1-1 – Level 2



Source: Corgan 2018

Description: Alternative 2 - Limited Build

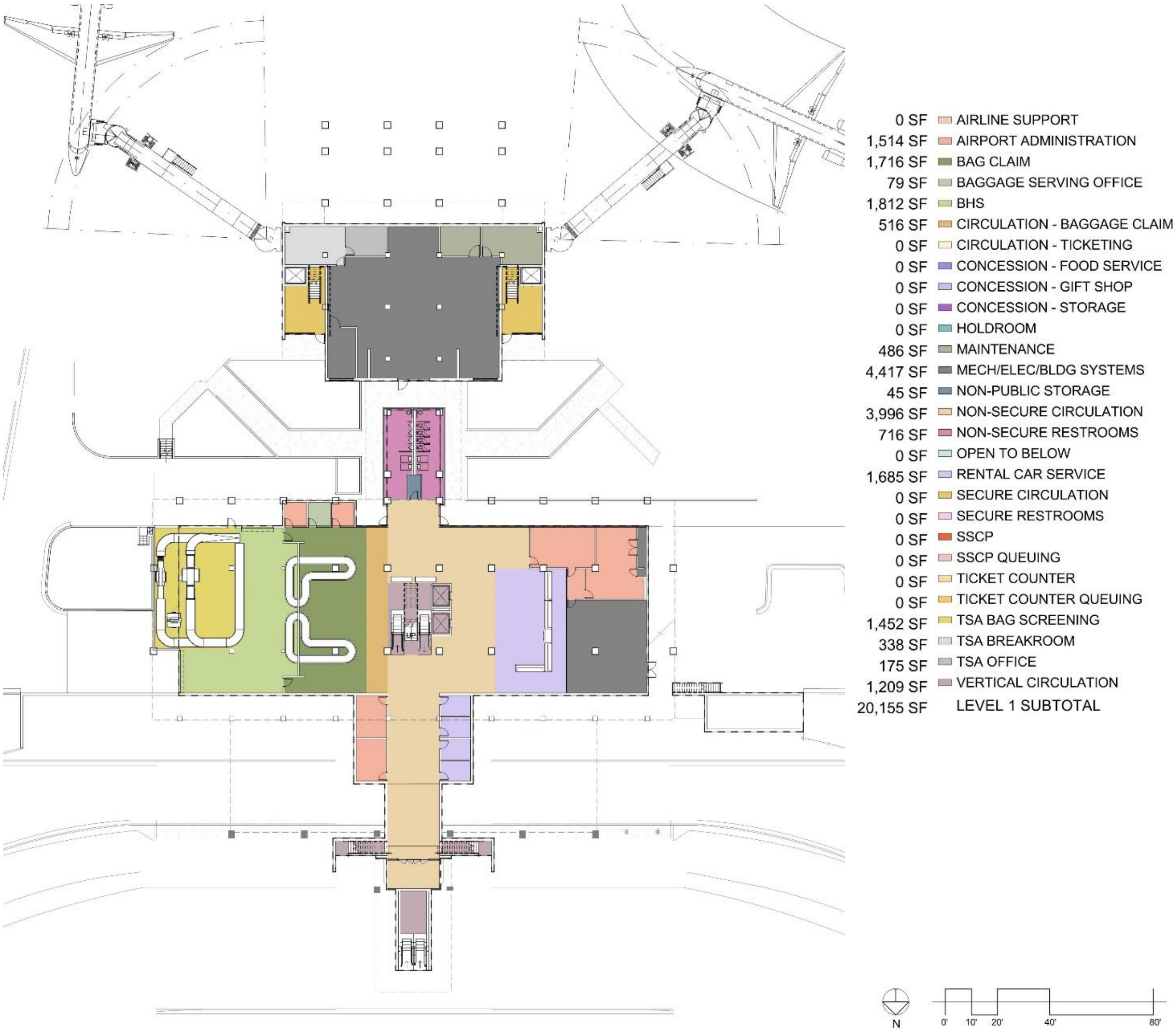
Limited build alternatives consider the reallocation of functional spaces inside the existing terminal building with minimal building expansion. These options stemmed from findings in the facility requirements chapter which concluded that even though the total square footage within the existing terminal building is sufficient to meet requirements throughout the planning horizon, specific functional areas lack the necessary square footage. Therefore, while retaining the existing building configuration, the building needs to be expanded to add space to the functions deficient in square footage. A common theme with all the limited build alternatives is the removal of the retail area located on level 2 south of the central staircase. Elimination of the retail area provides a clear line of sight through the terminal and improves intuitive wayfinding.

In all the limited build alternatives, vertical circulation deficiencies were addressed by relocating the existing escalators into space currently occupied by the large central staircase. A new single staircase was added in between the 2 escalators and 2 new large elevators were added adjacent to the escalators forming a central vertical core in the middle of the terminal building.

Alternative 2-1

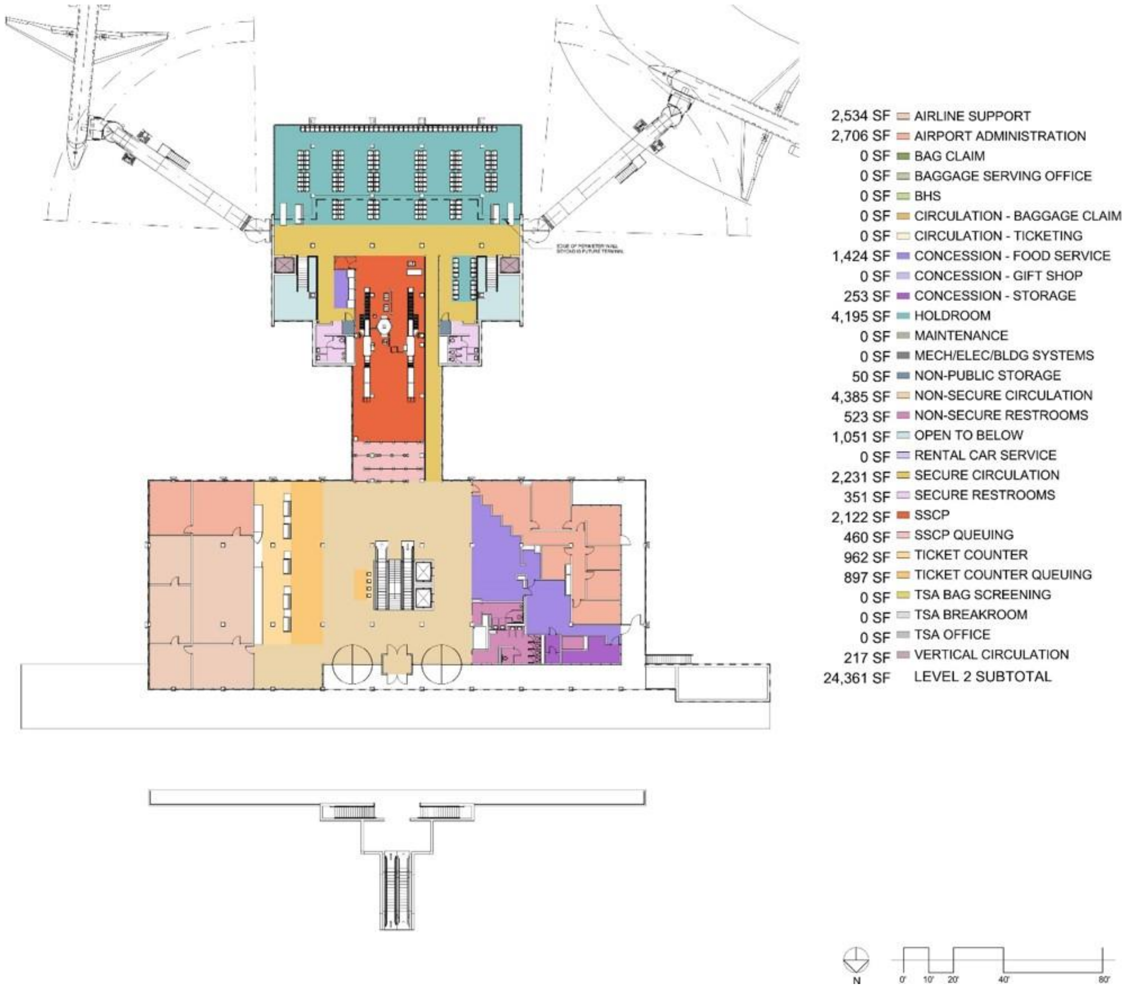
Figure 5-49 depicts the floor plan of level 1 for Alternative 2-1 and **Figure 5-50** depicts level 2. Alternative 2-1 rotates the ticketing area 90 degrees so that it faces towards the middle of the terminal and adds check-in kiosks to reduce the required footprint for the ticketing area. The holdroom is expanded south to increase capacity and the baggage room is expanded east to accommodate an in-line baggage screening explosives detection system (EDS).

Figure 5-49
Alternative 2-1 – Level 1



Source: Corgan 2018

Figure 5-50
Alternative 2-1 – Level 2

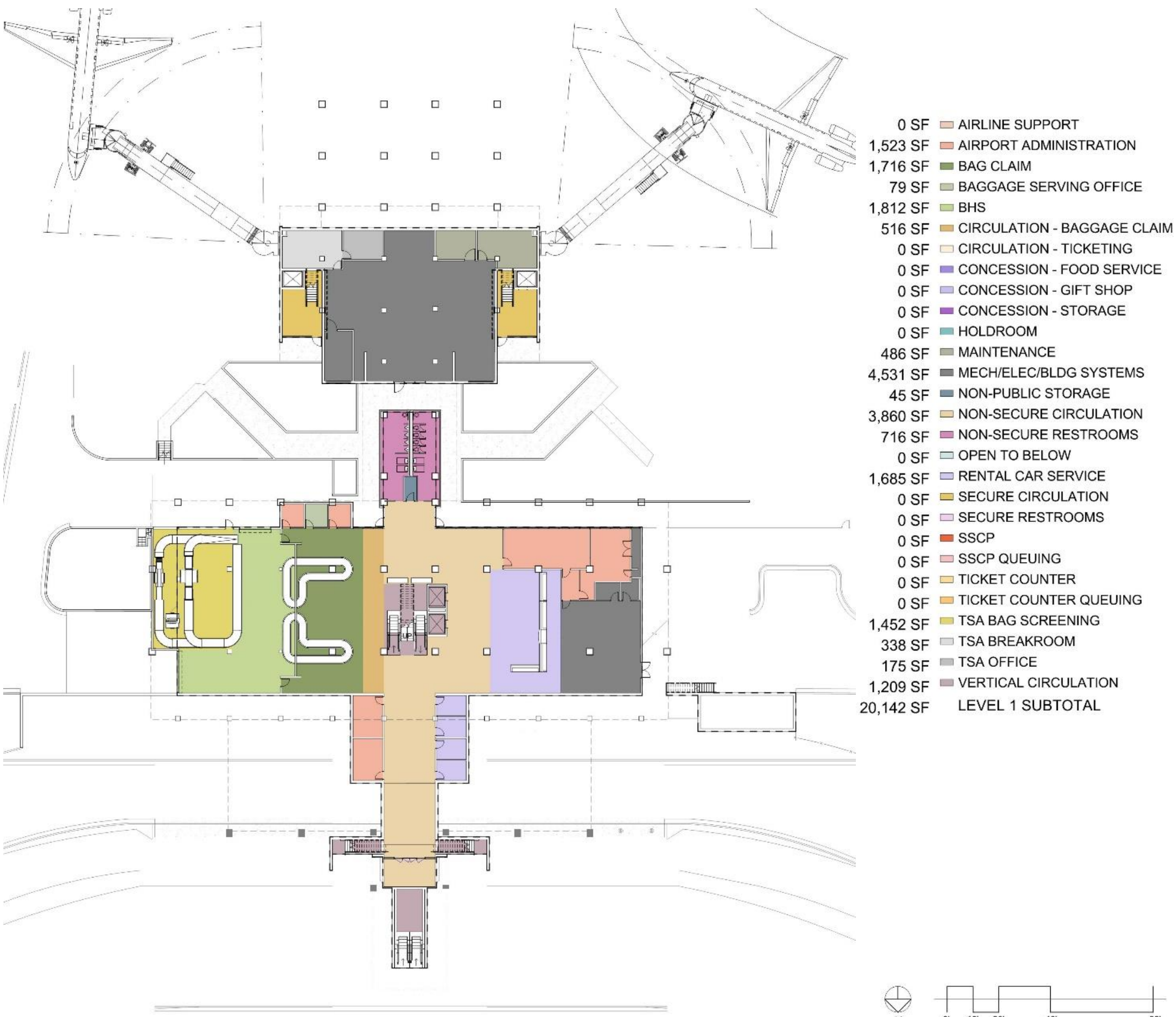


Source: Corgan 2018

Alternative 2-2

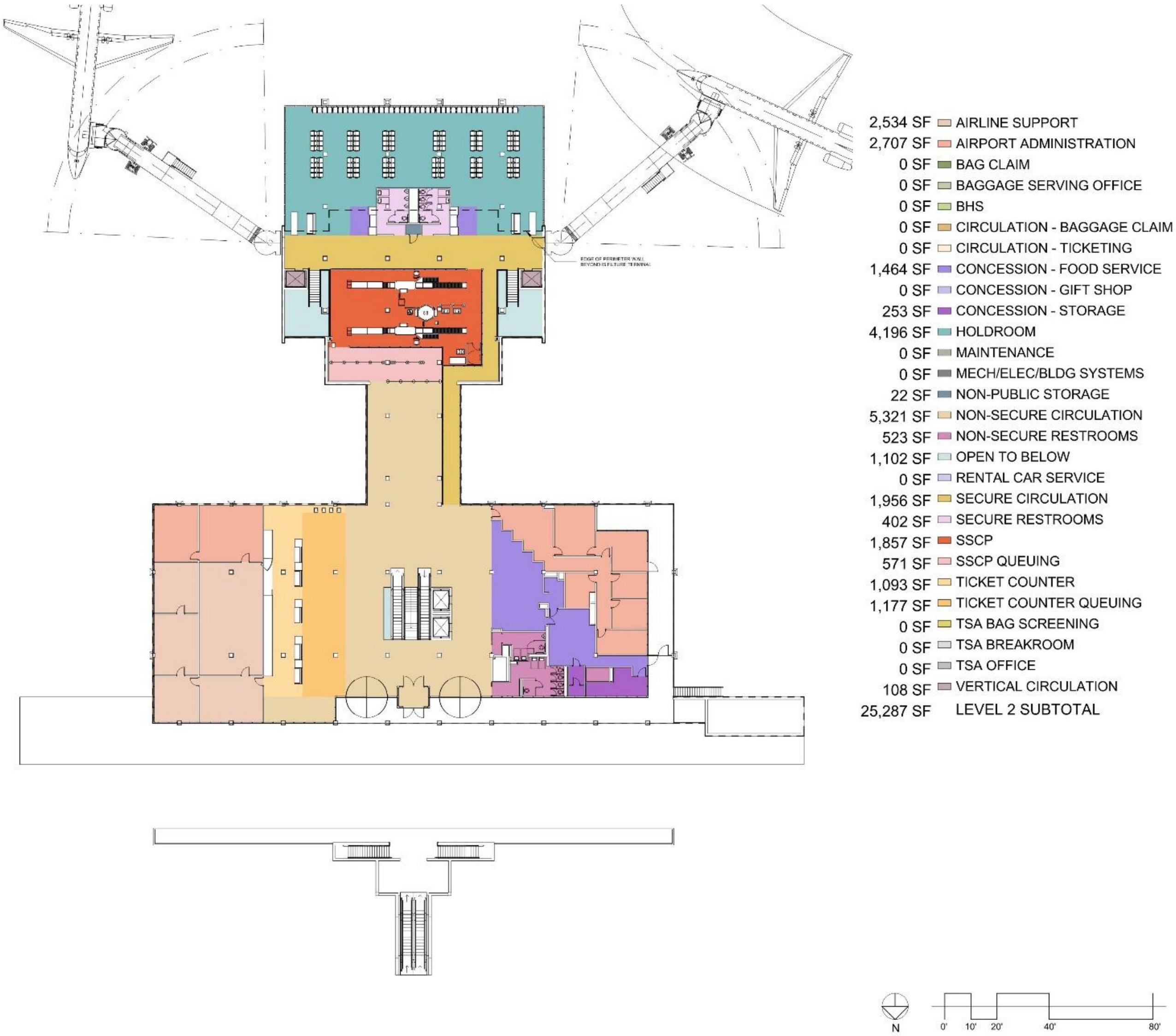
Alternative 2-2 incorporates the same design as Alternative 2-1 with the exception of the layout and location of the SSCP. In Alternative 2-2, the SSCP is pushed south into the holdroom and rotated 90 degrees. This location for the SSCP requires the relocation of the secure side restrooms and a larger expansion of the holdroom to meet requirements. **Figure 5-51** depicts the floor plan for level 1 and **Figure 5-52** depicts the floor plan for level 2.

Figure 5-51
Alternative 2-2 – Level 1



Source: Corgan 2018

Figure 5-52
Alternative 2-2 – Level 2

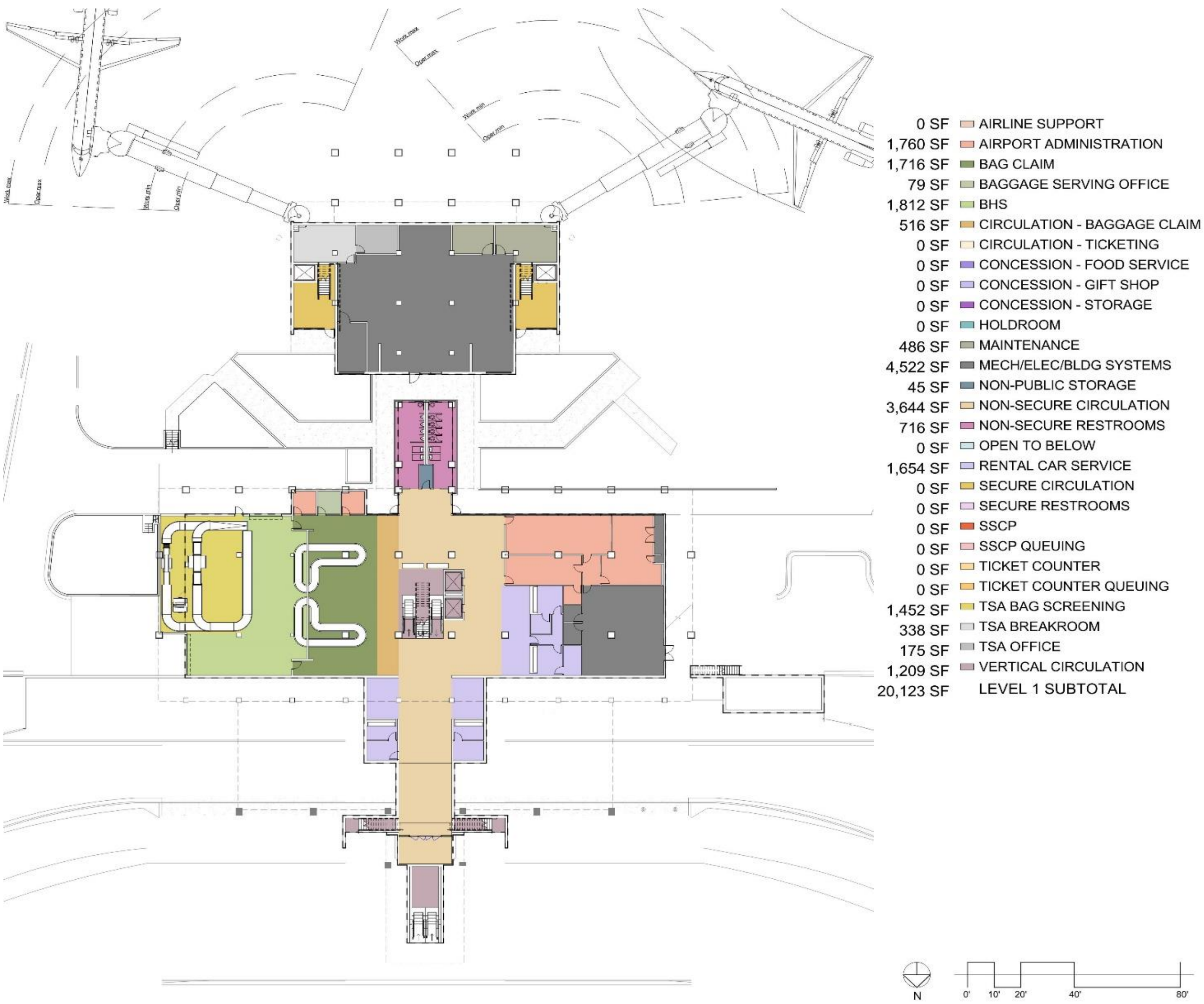


Source: Corgan 2018

Alternative 2-3

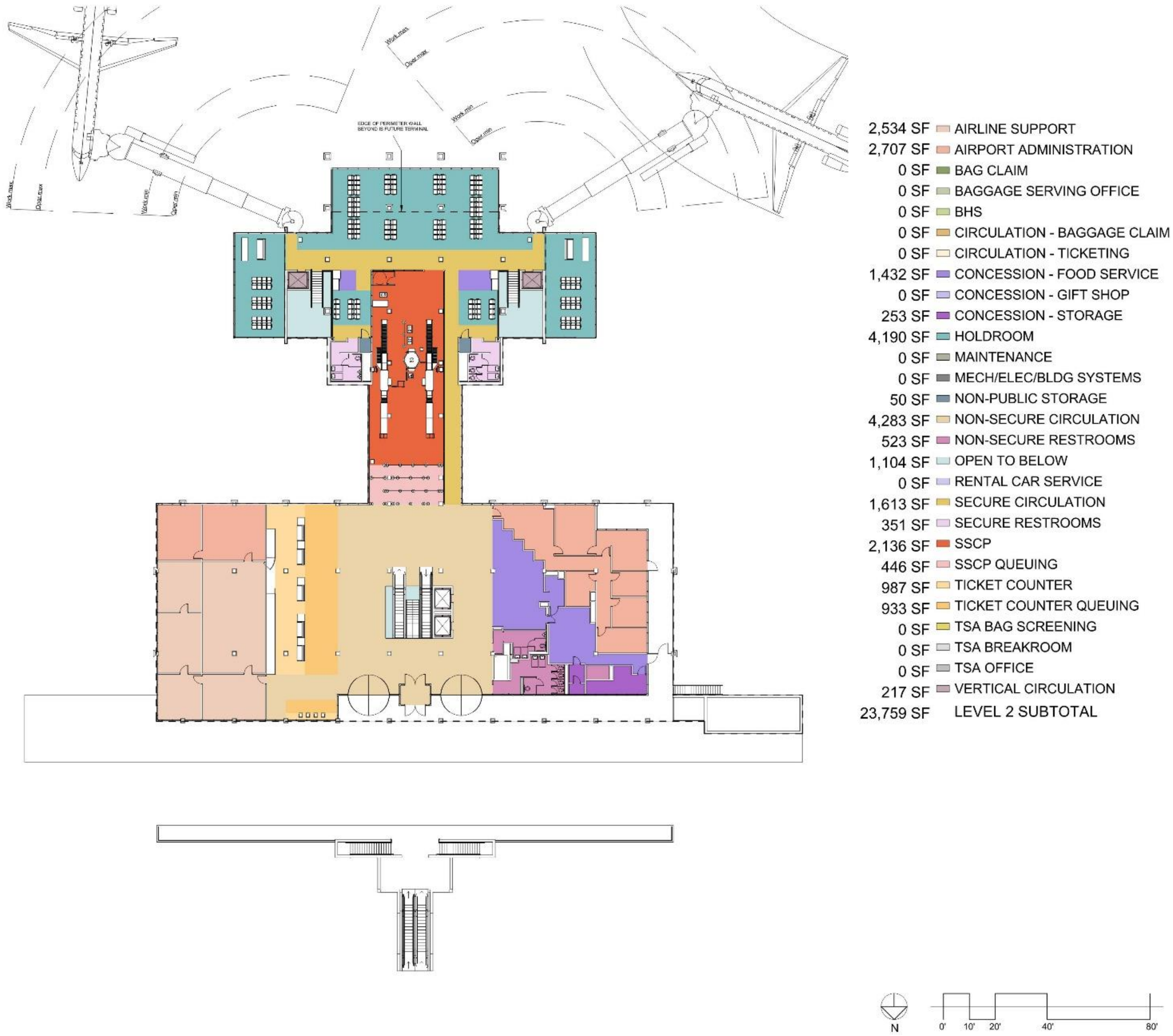
Alternative 2-3 is the same design as Alternative 2-1 with the exception of how the holdroom is expanded and the location of the rental car counters on level 1. In Alternative 2-3, small expansions are made to the holdroom in multiple directions – east, south, and west – instead of a large expansion in a single direction. This approach requires a shift in the rotunda location for the passenger boarding bridges (PBB) at both gates. **Figure 5-53** depicts the floor plan for level 1 and **Figure 5-54** depicts the floor plan for level 2.

Figure 5-53
Alternative 2-3 – Level 1



Source: Corgan 2018

Figure 5-54
Alternative 2-3 – Level 2

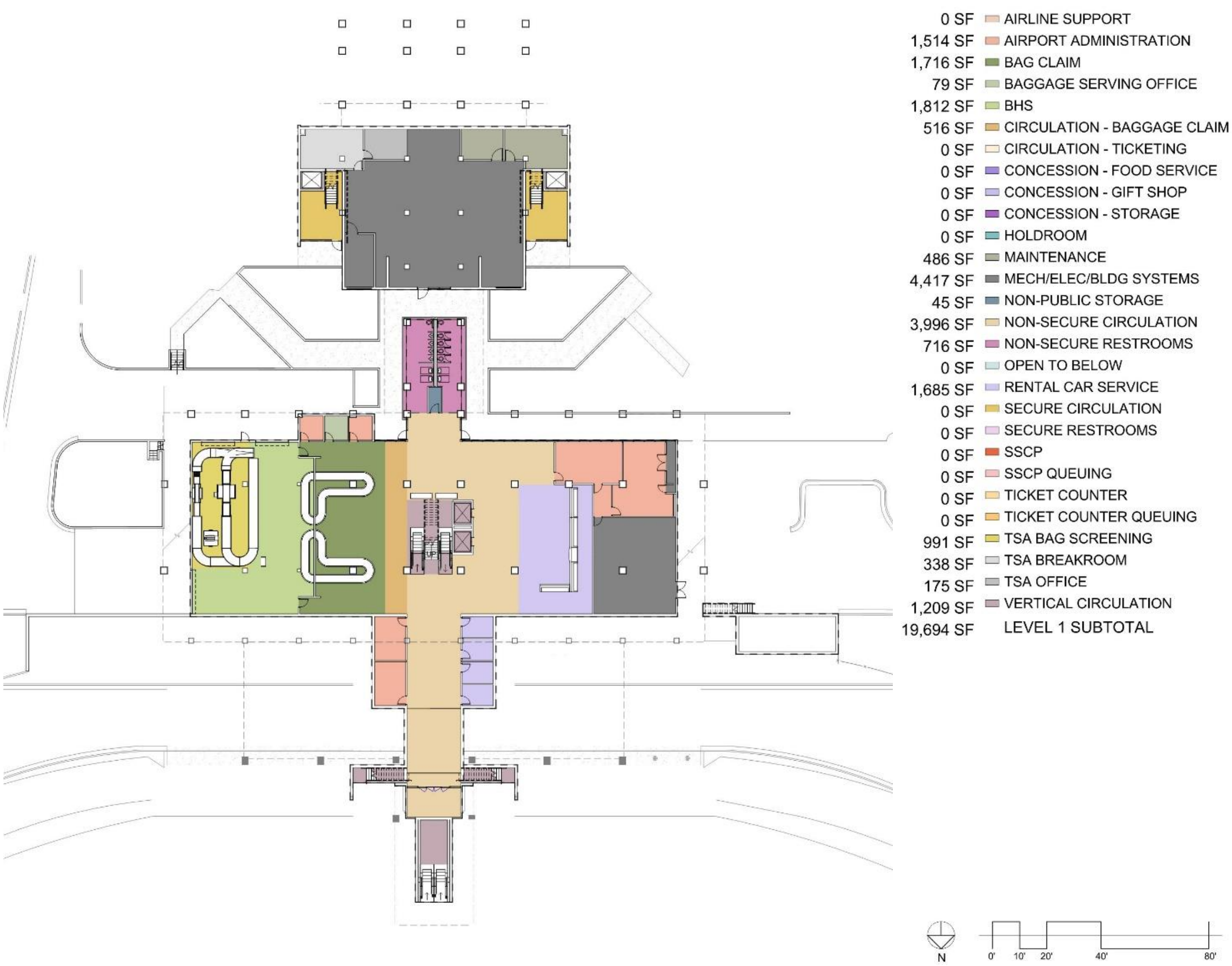


Source: Corgan 2018

Alternative 2-4

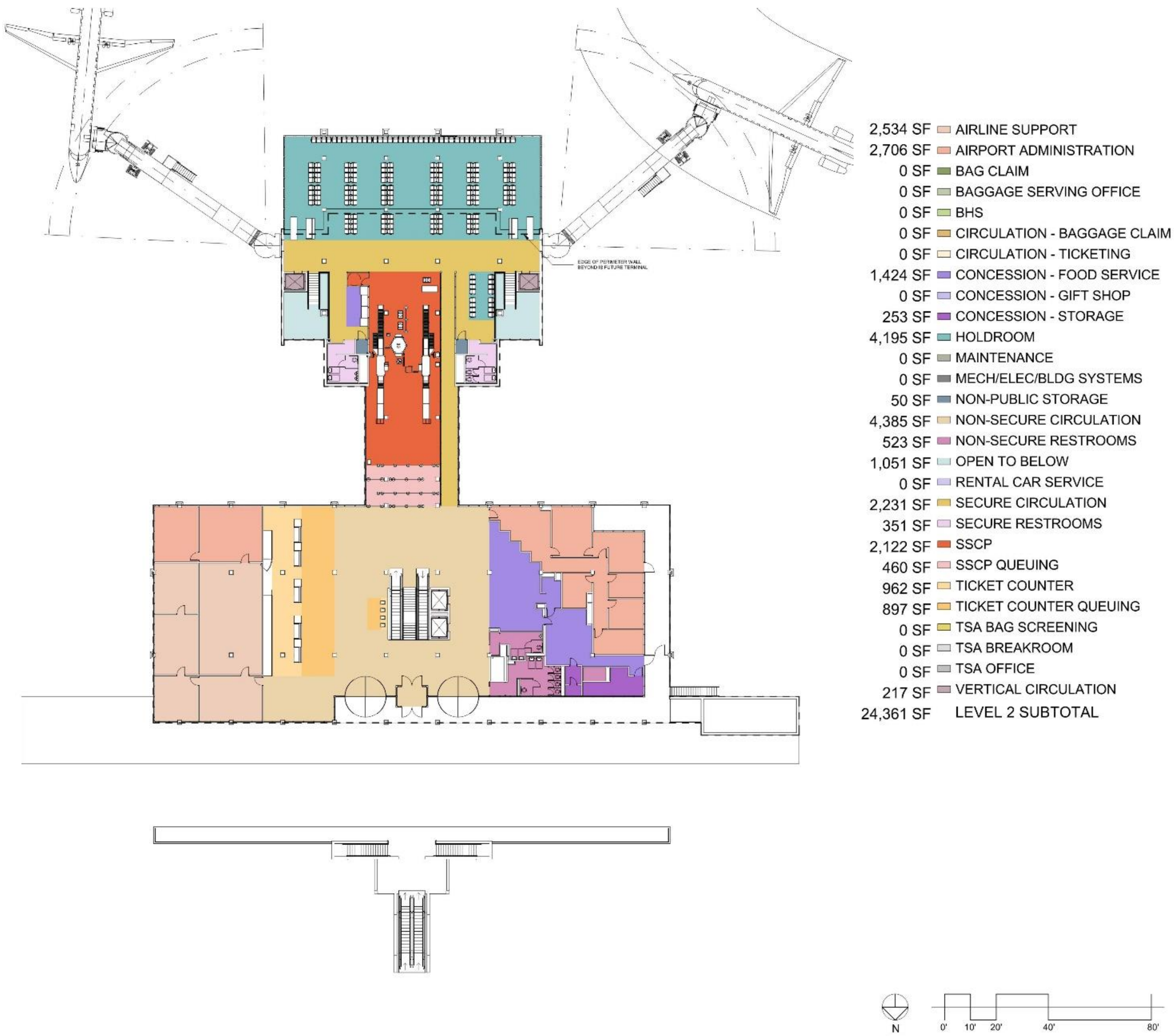
Alternative 2-4 is a similar design to Alternative 2-1 with the exception of how the 2 in-line baggage screening systems are installed. In this alternative, the BHS is designed within a smaller space, without expansion of the existing building. **Figure 5-55** depicts the floor plan for level 1 of and **Figure 5-56** depicts the floor plan for level 2.

Figure 5-55
Alternative 2-4 – Level 1



Source: Corgan 2018

Figure 5-56
Alternative 2-4 – Level 2

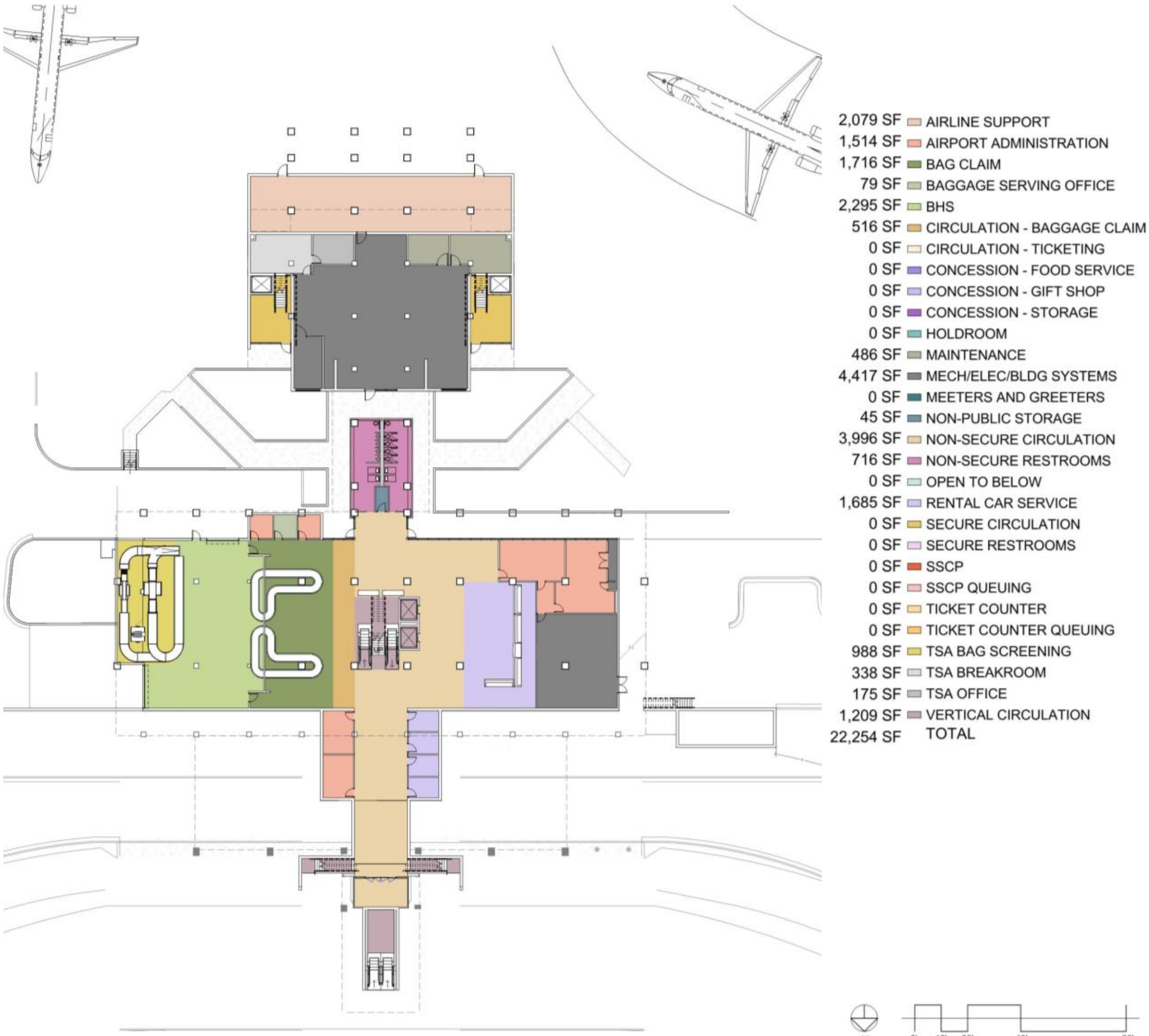


Source: Corgan 2018

Alternative 2-5

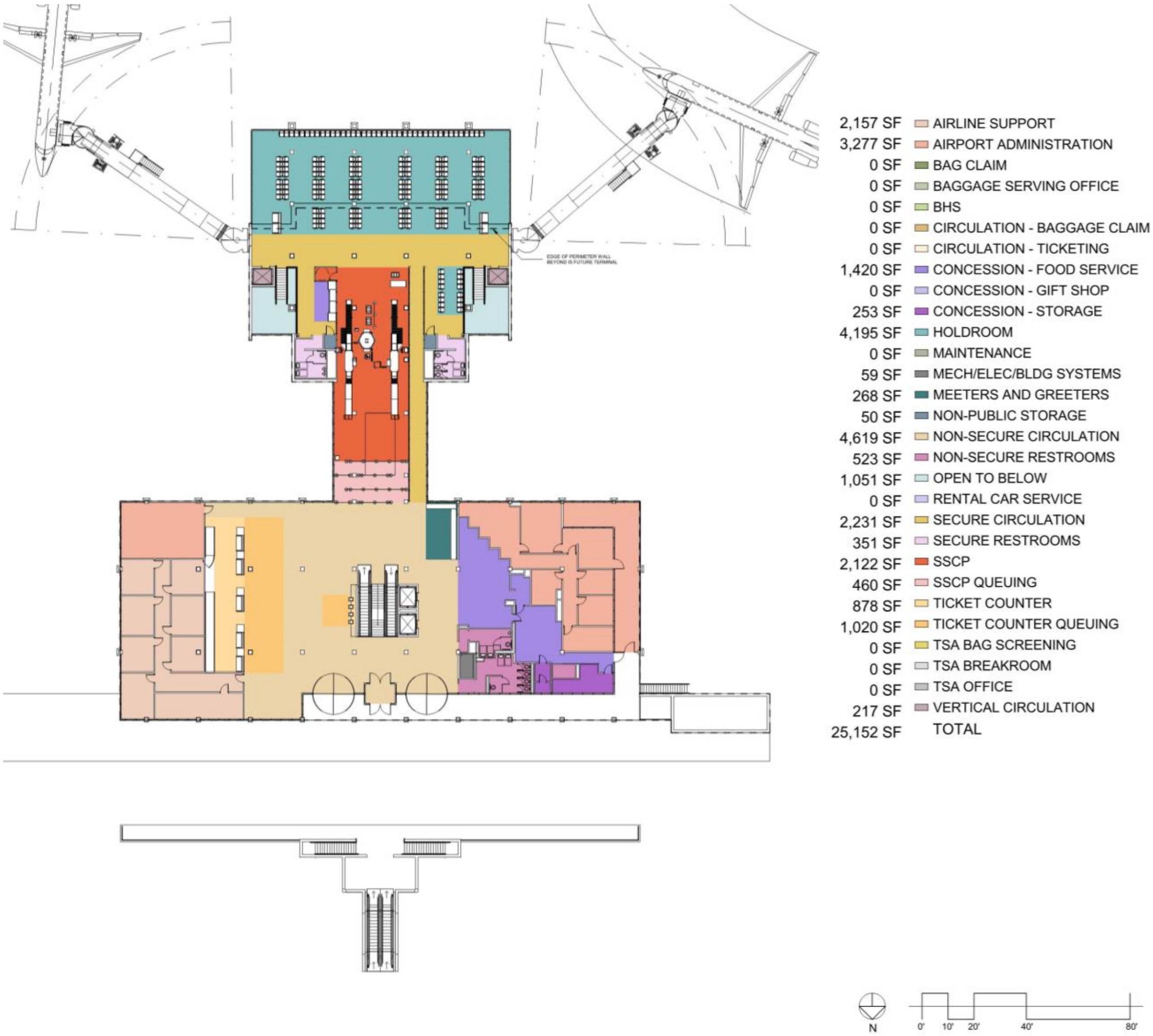
Alternative 2-5 is a similar design to Alternative 2-4. On level 1, the same layout shown in Alternative 2-4 is used with the exception of the new in-line baggage screening system occupying larger space compared to Alternative 2-4, by expanding the existing building to the east. This alternative also adds airline support space on the apron underneath the holdroom expansion. On level 2, the same layout as Alternative 2-4 is used with the exception of the ticketing area. In Alternative 2-5, the office space is reduced behind ticketing which allows for the counters to shift eastward and out of the central lobby, providing a more open space as a result of this. **Figure 5-57** depicts the floor plan for level 1 of alternative 2-5 and **Figure 5-58** depicts the floor plan for level 2.

Figure 5-57
Alternative 2-5 – Level 1



Source: Corgan 2018

Figure 5-58
Alternative 2-5 – Level 2



Source: Corgan 2018

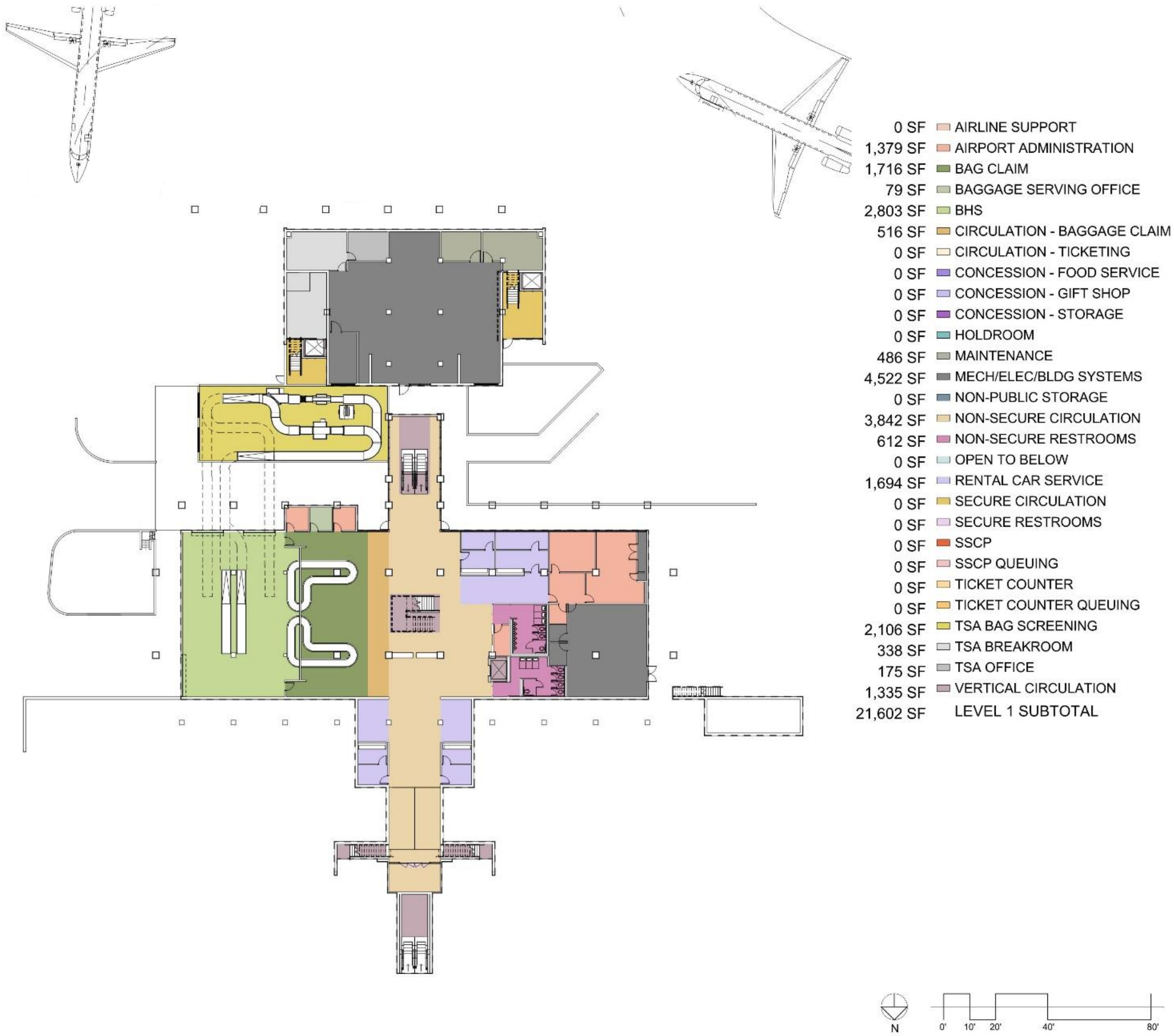
Description: Alternative 3 - Infill Expansion

The objective of the infill expansion alternatives was to resolve existing issues by providing larger expansions to the holdroom area, the connector corridor, and renovating less area compared to limited-build alternatives. As in limited build alternatives, a common theme for all infill alternatives is the removal of the central retail concessions area on level 2. All 3 infill expansion alternatives require the relocation of 1 PBB rotunda, increasing the complexity of constructability and implementation of the proposed layout.

Alternative 3-1

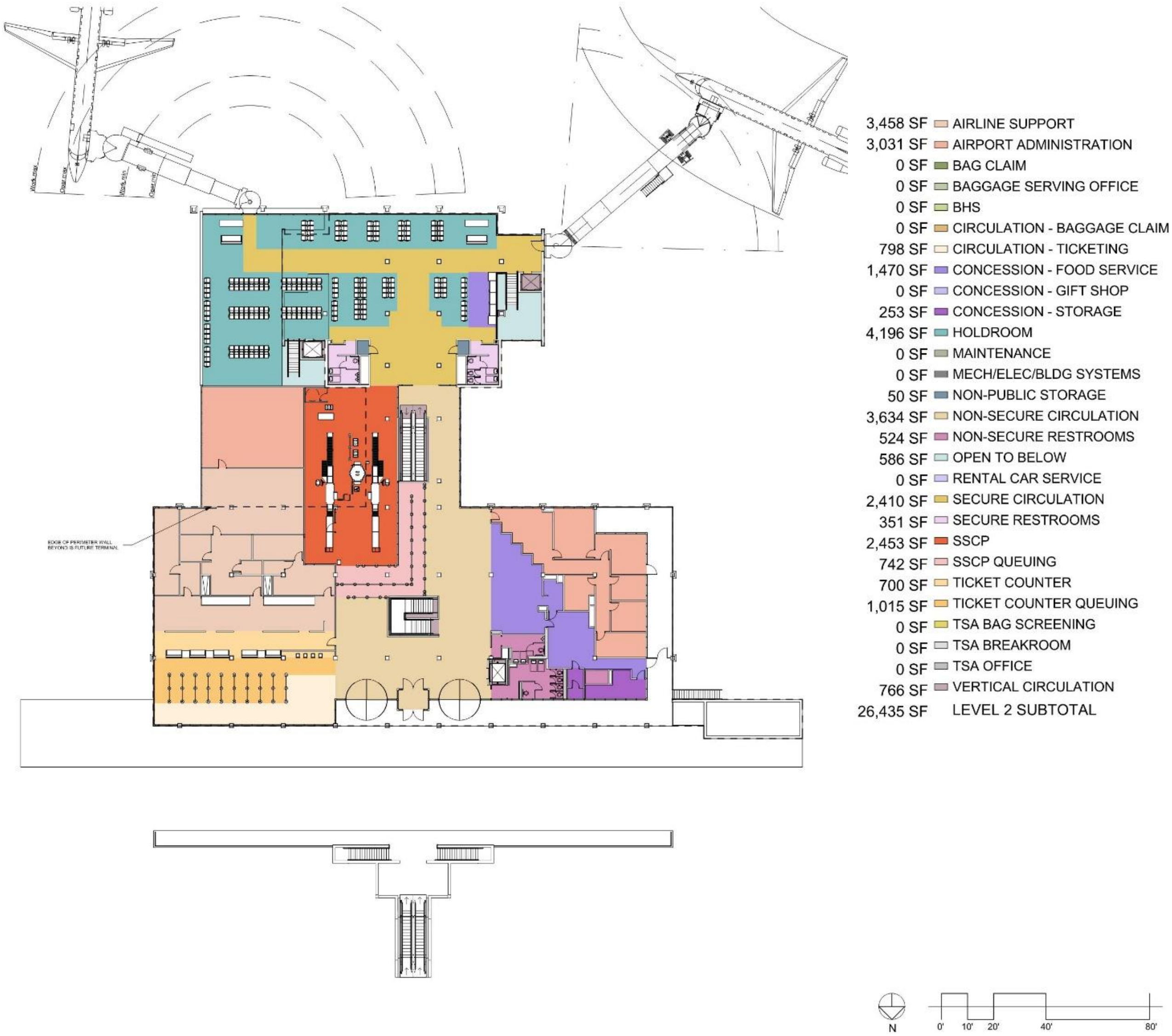
The main factor of infill Alternative 3-1 is the expansion of the bag room area to the south, joining it with the holdroom area. Level 1 of the expansion area is to accommodate a dual in-line bag screening system whereas level 2 of the expansion is utilized by airline offices, airport administration, and the expanded SSCP. The holdroom is expanded east to accommodate area requirements and requires relocation of the PBB rotunda. **Figure 5-59** depicts a floor plan of level 1 for Alternative 3-1 and **Figure 5-60** depicts level 2.

Figure 5-59
Alternative 3-1 – Level 1



Source: Corgan 2018

Figure 5-60
Alternative 3-1 – Level 2

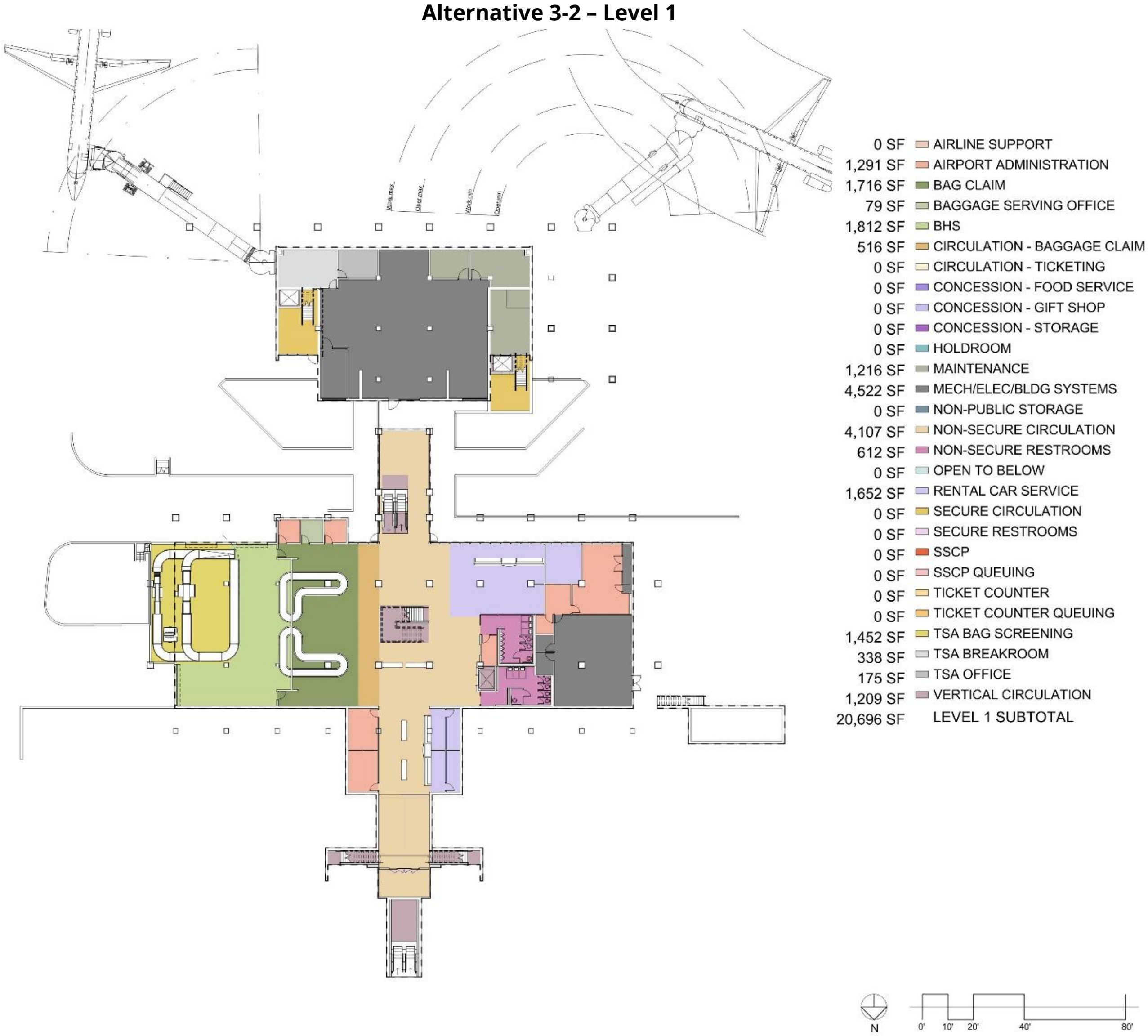


Source: Corgan 2018

Alternative 3-2

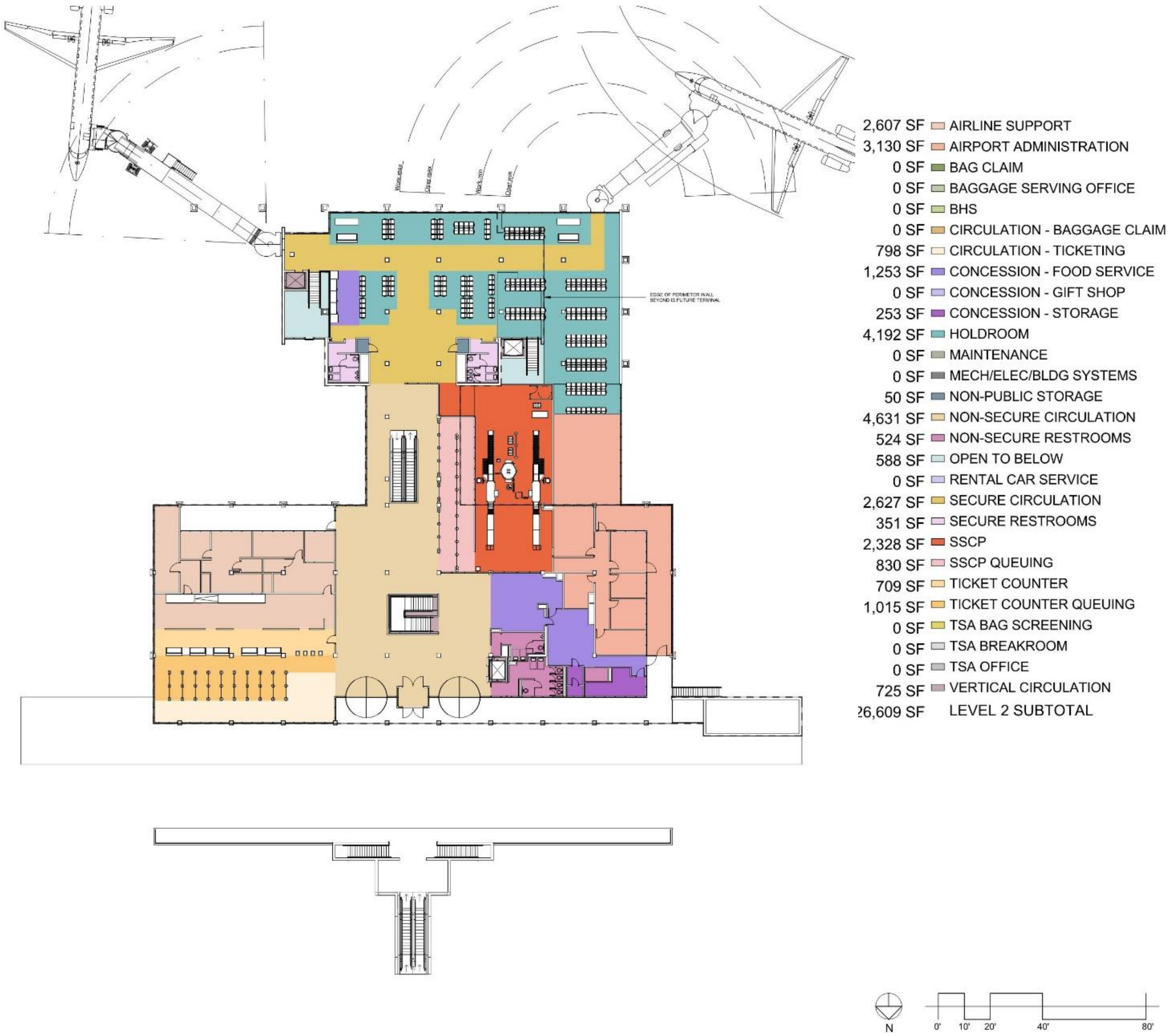
Infill Alternative 3-2 includes a minor expansion on the east side of the bag room to accommodate a dual in-line bag screening system and a significant expansion on level 2. The level 2 expansion is to the west of the connector corridor where airport administration space and room for an expanded SSCP is added. The holdroom is expanded to the west and PBB rotunda is shifted. **Figure 5-61** depicts a floor plan of level 1 for alternative 3-2 and **Figure 5-62** depicts level 2.

Figure 5-61
Alternative 3-2 – Level 1



Source: Corgan 2018

Figure 5-62
Alternative 3-2 – Level 2

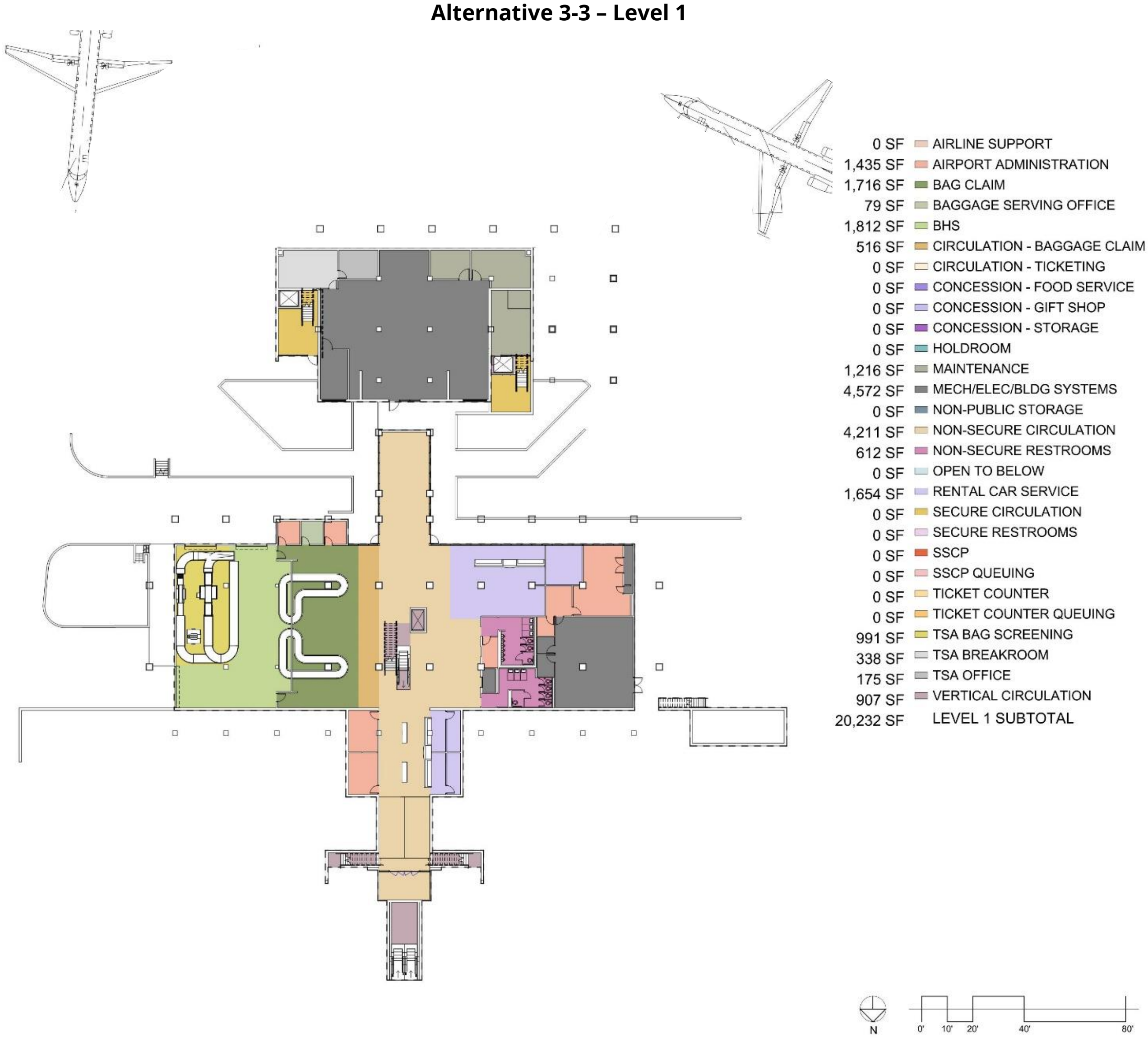


Source: Corgan 2018

Alternative 3-3

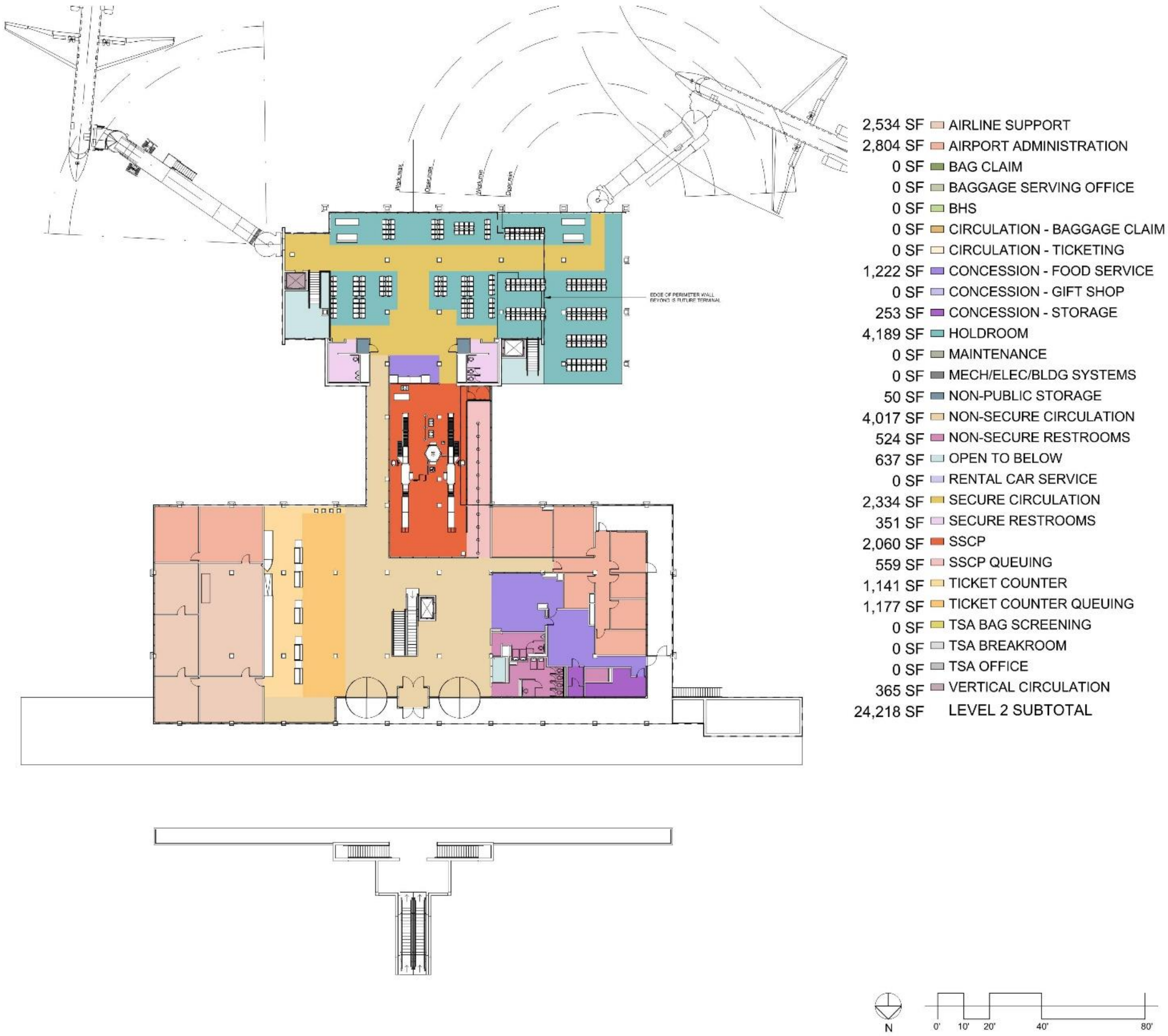
Infill Alternative 3-3 consists of a west expansion of the connector corridor on level 2, forming the same layout as in alternative 3-2. Different from Alternative 3-2 is the ticketing area which is rotated 90 degrees and faces west into the main terminal area. On level 1, the dual in-line bag screening system is compact and located in the southeast corner of the bag room alleviating the need for expansion. **Figure 5-63** depicts a floor plan of level 1 for Alternative 3-3 and **Figure 5-64** depicts level 2.

Figure 5-63
Alternative 3-3 – Level 1



Source: Corgan 2018

Figure 5-64
Alternative 3-3 – Level 2



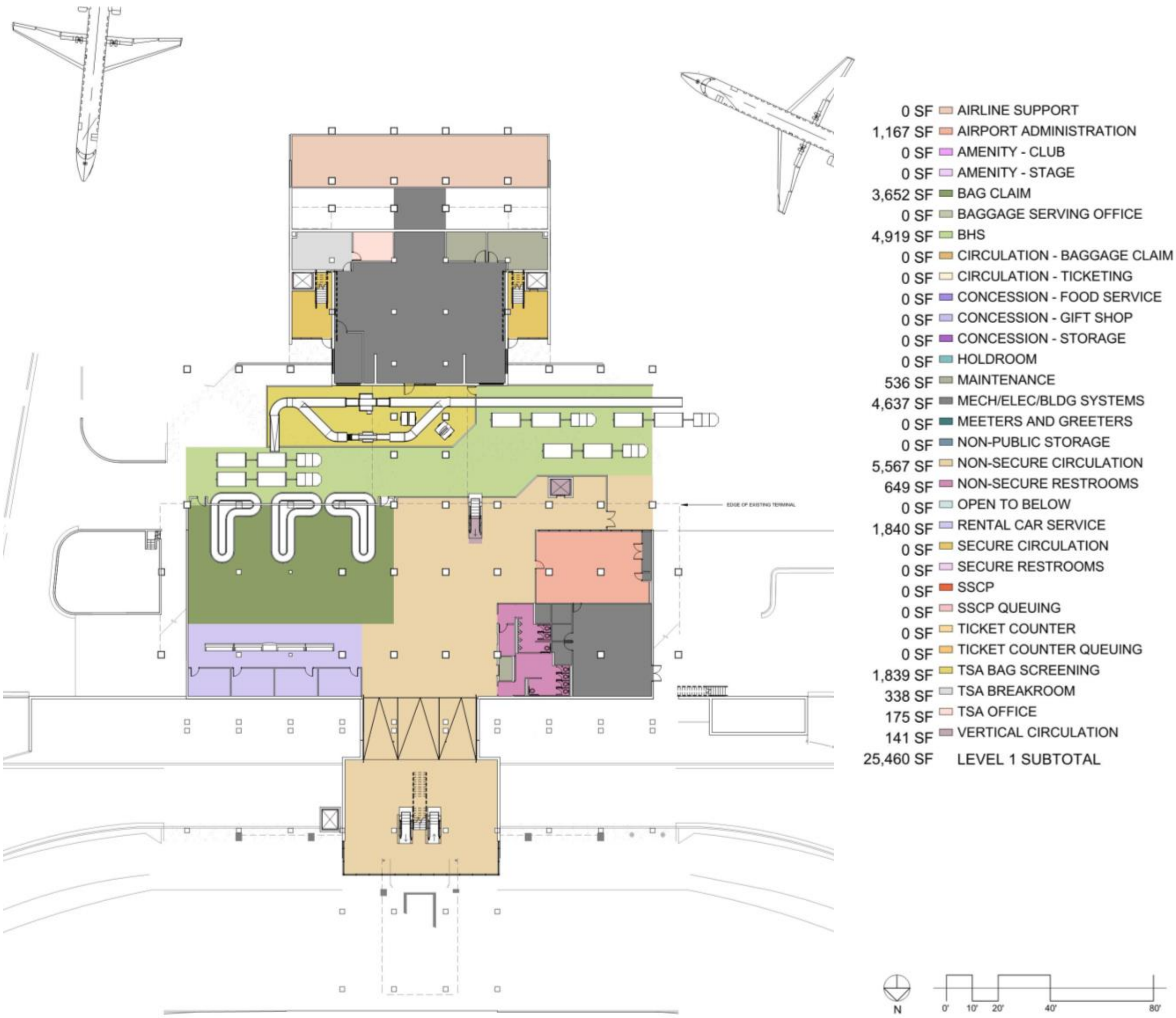
Source: Corgan 2018

Description: Alternative 4 - Full Expansion

Alternative 4-1

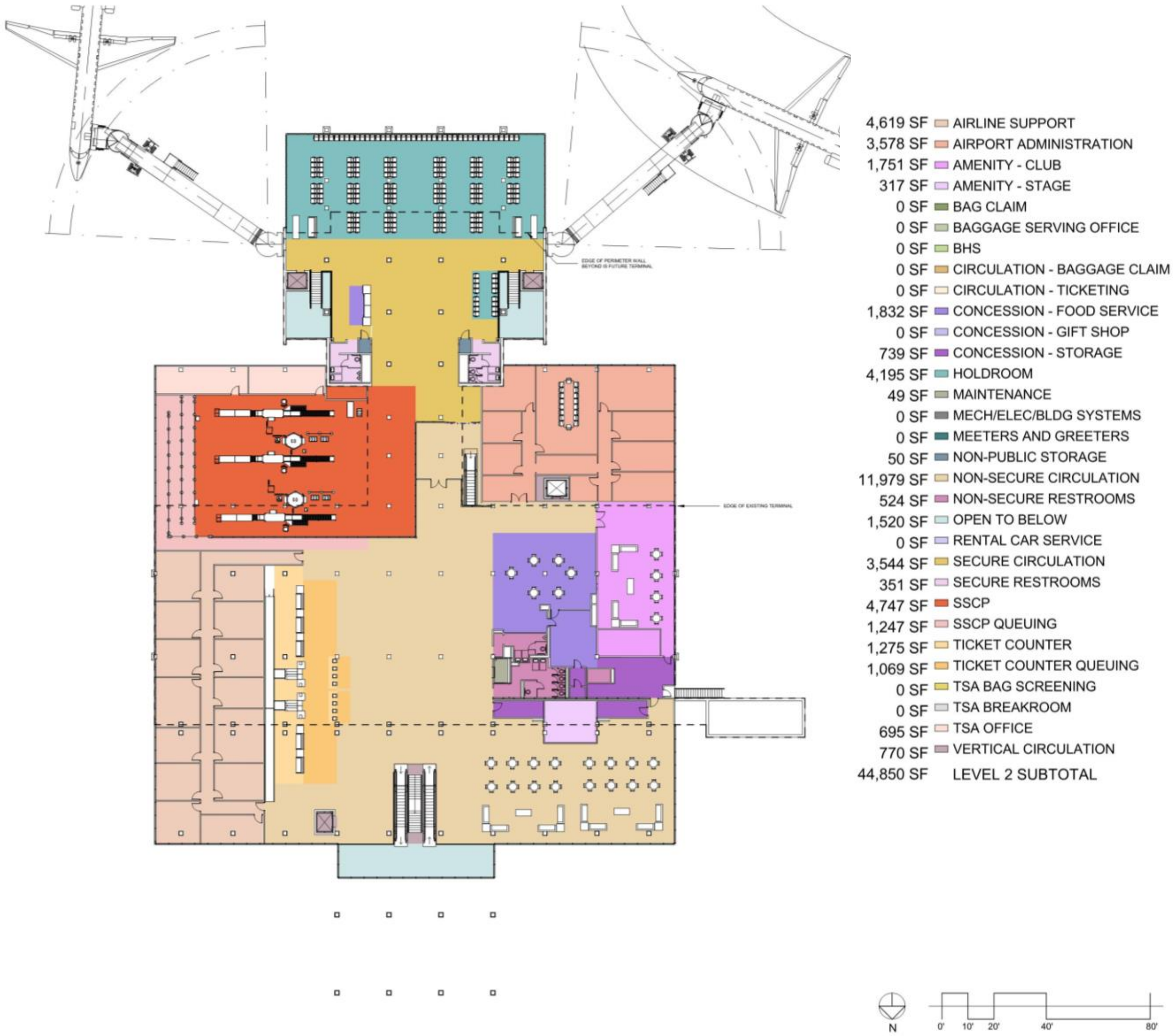
Developed as a result of input received from airport staff, Alternative 4-1 features a significant reallocation of existing terminal building space and a major expansion adding new space. A major component of this alternative is the elimination of the upper level departures curb, converting the lower level curb into both a departures and arrivals curb. Inside the terminal building, the alternative features an enlarged SSCP, enlarged baggage claim, ticketing and airport administration areas, and the inclusion of new community spaces and VIP lounge. **Figure 5-65** shows level 1 of Alternative 4-1 and **Figure 5-66** shows level 2.

Figure 5-65
Alternative 4-1 – Level 1



Source: Corgan 2018

Figure 5-66
Alternative 4-1 – Level 2



Source: Corgan 2018

Terminal Alternatives Evaluation Matrix

The matrix shown in **Figure 5-67** was developed to compare and evaluate all terminal alternatives against each other using defined criteria based upon ABI's priorities and each alternative's ability to meet facility requirements. The matrix allows all alternatives to be evaluated in a comprehensive manner, identifying pros and cons of each alternative. The matrix includes alternatives from each family:

1. No Expansion
2. Limited Build
3. Infill Expansion
4. Full Expansion

Alternatives are compared using 4 main categories of evaluation criteria which include:

- Functional Areas – Evaluates how alternatives meet facility requirements identified in the facility requirements chapter.
- Wayfinding/Passenger Experience – Evaluates alternatives with regards to passenger experience including walk distances, conflicting passenger flows, and intuitive wayfinding.
- Constructability – Evaluates alternatives on the ease of construction including phase-ability and impacts on operations.
- Cost – Compares rough order of magnitude cost estimates for all alternatives based on general square footage rates for new construction or renovations including approximately 20% contingency.

Evaluation: Alternative 1 - No Expansion

The no expansion alternative meets all functional area facility requirements by renovating 20,753 sq. ft. of existing the terminal building and a small expansion of 4,138 sq. ft. The area to be renovated is significantly larger in this alternative compared to other alternatives, but the expansion is significantly smaller. Vertical circulation is facilitated by removing all existing escalators, retaining the existing central staircase, and adding 2 new elevators adjacent to the existing staircase, where the retail concessions area is located today.

Alternative 1-1 provides arriving passengers with a short, direct and intuitive path of 343 ft. from either boarding gate on the upper level to the exit via revolving doors on the northern end of the upper level The relocation of ticketing to level 1 creates a longer walking distance of 687 ft. for departing passengers, from the terminal building entrance on the northern end of the lower level to any of the boarding gates on the upper level. This path requires changing levels when passengers are departing.

This alternative provides a solution to conflicting passenger flows at check-in areas, bag screening, SSCP queuing, general circulation, and rental car queuing areas where existing passenger flows within these areas cross one another.

Since this alternative relies on renovating most of the existing terminal building, constructability challenges can be expected since all modifications are dependent on each other, therefore making it difficult to phase construction. The implementation of this alternative may cause significant disruptions to operations as the terminal expands through future scenarios.

The rough order of magnitude cost estimated for Alternative 1-1 is $12 million, lower than any other alternatives.

Evaluation: Alternative 2 - Limited Build

Alternative 2-1

Alternative 2-1 meets most functional area facility requirements with the exception of the area required for an expanded SSCP. The design in Alternative 2-1 provides a 2-lane SSCP in an area of 2,122 sq. ft. Alternative 2-1 includes 6,488 sq. ft. of new building footprint and 18,877 sq. ft. of renovated space inside the existing terminal building.

Alternative 2-1 will enhance the passenger experience as they pass through ABI's renovated terminal. This alternative provides walking distances under 500 ft. for both arriving and departing passengers and minimal level changes (maximum of 1), passengers have a direct and intuitive path to make their way through ABI's facility. Alternative 2-1 also resolves conflicting passenger flows at check-in areas, bag screening, SSCP queuing, general circulation, and rental car queuing areas.

Alternative 2-1 presents minor constructability issues, specifically with incremental development due to an expansion being required before the new in-line BHS system can be implemented. This alternative is estimated to have minimal impact on operations, although a temporary exit from the holdroom will be required for arriving passengers to accommodate SSCP modifications.

The rough order of magnitude cost estimate for Alternative 2-1 is $12.7 million.

Alternative 2-2

Alternative 2-2 meets most functional area facility requirements but falls short on the square footage requirements for the SSCP. The design in Alternative 2-2 includes a 2-lane SSCP in an area of 1,857 sq. ft., creating a compact working space for screeners. This alternative comprises 7,401 sq. ft. of new building expansion and 19,779 sq. ft. of renovated space inside the existing terminal building making this alternative a larger project compared to Alternative 2-1.

Alternative 2-2 will enhance the passenger experience with walking distances close to 500 ft. for both arriving and departing passengers, minimal level changes (maximum of 1) passengers have a direct and intuitive path to make their way through the terminal. This alternative also resolves conflicting passenger flows at check-in areas, bag screening, SSCP queuing, general circulation, and rental car queuing areas.

Characteristics of Alternative 2-2 include constructability and spatial dependency challenges, specifically related to phasing. Before the SSCP can be modified and expanded, the secure-side restrooms have to be relocated, which cannot occur until the holdroom expansion is complete. When the interior renovations take place to achieve complete reorientation and expansion of the existing SSCP, passenger screening processes for scheduled flights may be moderately impacted.

The rough order of magnitude cost for Alternative 2-2 is $13.7 million.

Alternative 2-3

Similar to other limited build alternatives, Alternative 2-3 meets most functional area facility requirements. However, similar to Alternative 2-1, the area provided for the SSCP is slightly under the area required for an expanded SSCP. The design provides a 2 lane SSCP in an area of 2,136 sq. ft. This alternative comprises 5,854 sq. ft. of new building expansion and 18,469 sq. ft. of renovated space inside the existing terminal building making this alternative a smaller project compared to Alternatives 2-1 and 2-2.

This alternative will enhance the passenger experience. This alternative provides walking distances close to 500 ft. for both arriving and departing passengers, minimal level changes (maximum of 1), passengers have a direct and intuitive path to make their way through the facility. A possible concern is that passengers on level 1 may have trouble finding their respective rental car counter since the rental car companies are separated. This alternative also resolves issues with conflicting passenger flows at check-in areas, bag screening, SSCP queuing, general circulation, and rental car queuing areas.

Alternative 2-3 is expected to have moderate constructability issues, specifically with the proposed holdroom expansion, which will require a relocation of the passenger boarding bridges (PBBs) rotundas at both gates. The relocation of the PBB rotundas can be expected to cause an impact on operations as airlines will have to temporarily ground-load aircraft as PBBs are shut down and relocated during construction. However, the proposed holdroom expansion does have the advantage that the 3 different sections can be independently added under a phased construction.

The rough order of magnitude cost estimate for Alternative 2-3 is $15.5 million which includes relocating 2 PBB rotundas.

Alternative 2-4

Alternative 2-4 meets most functional area facility requirements with the exception of the area requirements for an expanded SSCP and BHS. The proposed 2-lane SSCP occupies a 2,122 sq. ft. area. For BHS, requirements state a need for 2,500 sq. ft. The proposed area for BHS accommodating 2 in-line baggage screening systems is only 991 sq. ft. which provides a very small space for screeners to perform inspections on bags. Alternative 2-4 includes 6,027 sq. ft. of new building footprint and 18,877 sq. ft. of renovated space inside the existing terminal building, very similar to Alternative 2-1.

This alternative will improve the passenger experience. This alternative provides walking distances under 500 ft. for both arriving and departing passengers, minimal level changes (maximum of 1), passengers will have a direct and intuitive path to make their way through ABI's facility. Alternative 2-4 also resolves conflicting passenger flows at check-in areas, bag screening, SSCP queuing, general circulation, and rental car queuing areas.

Alternative 2-4 is expected to have very few constructability issues, as all modifications can be implemented independently. This alternative is estimated to have minimal impact on operations, although a temporary exit from the holdroom will be required for arriving passengers to accommodate for SSCP modifications.

The rough order of magnitude cost estimate for Alternative 2-4 is $12.4 million.

Alternative 2-5

Alternative 2-5 meets most functional area facility requirements with the exception of the area requirements for the expanded SSCP and BHS. The 2-lane SSCP is approximately 2,122 sq. ft. For the BHS, requirements state a need for 2,500 sq. ft.; however, the 2 in-line systems are located in a 988 sq. ft. area which creates a compact working space for screeners. Alternative 2-5 includes 9,378 sq. ft. of new expansion which is significantly larger than other limited build alternatives and 14,812 sq. ft. of renovated space inside the existing terminal building, which is significantly less than other limited build alternatives. This is due to the addition of airline support space on the lower level with direct apron access underneath the expansion covering the apron which reduces the office space behind ticketing counters and shifts the ticketing layout away from the center of the building.

This alternative will improve the passenger experience. This alternative provides walking distances under 500 feet for both arriving and departing passengers, minimal level changes (maximum of 1), passengers are given a direct and intuitive path to make their way through ABI's facility. Conflicting passenger flow issues are solved at check-in areas, bag screening, SSCP queuing, general circulation and rental car queuing areas where existing passenger flows with these areas are in conflict with one another.

Alternative 5 is expected to have very few constructability issues, as all modifications can be implemented separately. This alternative is estimated to have minimal impact on operations, although a temporary exit from the holdroom will be required for arriving passengers to accommodate for SSCP modifications.

The rough order of magnitude cost estimate for Alternative 2-5 is $12.6 million.

Evaluation: Alternative 3 - Infill Expansion

Alternative 3-1

Alternative 3-1 meets most functional area facility requirements with the exception of the 2 in-line BHS layout. The design team provided a BHS system in a layout where bag screening occupies 2,106 sq. ft., which is relatively large compared to other alternatives. Infill expansion Alternative 3-1 includes 10,009 sq. ft. of new building space and renovation of 14,200 sq. ft.

Existing vertical circulation is retained except the existing elevator is replaced with a larger elevator in the same location.

This alternative provides arriving passengers with a short of 367 ft., however, the path is not intuitive as many existing issues such as the location of the down escalator close to the holdroom exit are still present. The departure path remains the same as today although it is easier for passengers to find their way, in large part due to the removal of the retail concessions. Infill expansion Alternative 3-1 solves most issues with conflicting passenger flows at bag screening, SSCP queuing, general circulation, and rental car queuing. Existing conflicts with passenger circulation in check-in areas are still present in the proposed layout.

The relocation of 1 PBB rotunda creates moderate issues in the implementation and would impact operations as disruptions are expected at the gate where the PBB will be relocated. Airlines will have to temporarily ground load aircraft while the holdroom expansion is completed and the PBB activated at its new location.

Rough order of magnitude cost estimate for Alternative 3-1 equals $13.9 million which includes relocating 1 PBB rotunda.

Alternative 3-2

Alternative 3-2 meets all functional area facility requirements with 9,277 sq. ft. of new building space and 14,465 sq. ft. of renovated space. Existing vertical circulation is retained with the exception of the existing elevator, which is replaced with a larger elevator in the same location.

Alternative 3-2 provides arriving passengers with a short walking distance of 370 ft. However, the path is not intuitive as many existing issues such as the location of the down escalator close to the holdroom exit are still present. The departure path of 615 ft. is longer than today although it is easier for passengers to find their way, in large part due to the removal of the retail concessions. This alternative also resolves most conflicting passenger flows at bag screening, SSCP queuing, general circulation, and rental car queuing areas. Existing conflicts with passenger circulation in check-in areas are still present in the proposed layout.

The relocation of 1 PBB rotunda creates challenges in project implementation and would impact operations as disruptions are expected at the gate where the PBB will be relocated. Airlines will have to temporarily ground load aircraft while the holdroom expansion is completed and the PBB activated in its new location.

Rough order of magnitude cost estimate for Alternative 3-2 equals $13.5 million which includes relocating 1 PBB rotunda.

Alternative 3-3

Infill expansion Alternative 3-3 meets most of the functional area facility requirements with the exception of the 2-lane SSCP layout and the 2 in-line bag screening systems layout. The proposed SSCP expansion covers an area of 2,060 sq. ft. The design team provided a BHS system in a layout where bag screening occupies 991 sq. ft., which leaves little room for a working environment and is smaller compared to other alternatives. Infill expansion Alternative 3-3 includes 6,422 sq. ft. of new building space and renovation of 19,061 sq. ft.

Existing vertical circulation is removed and replaced with a single vertical circulation core in place of the existing central staircase. The proposed vertical circulation core includes a single down escalator, a single staircase adjacent to the escalator, and 1 new elevator adjacent to the escalator.

Arriving and departing passenger paths are moderately long at 524 ft. and 516 ft. respectively. However, circulation paths are direct and intuitive except for the path for arriving passengers on the lower level where rental car counters are divided into separate locations. Infill expansion Alternative 3-1 solves issues with conflicting passenger flows in check-in, bag screening, SSCP queuing, and rental car queuing areas. Existing conflicts with passenger circulation in general circulation areas are still present in the proposed layout where passenger flows cross each other.

The relocation of 1 PBB rotunda presents moderate challenges in project implementation and would impact operations as disruptions are expected at the gate where the PBB will be relocated. Airlines will have to temporarily ground load aircraft while the holdroom expansion is completed and the PBB activated in its new location.

Rough order of magnitude cost estimate for Alternative 3-3 equals $13.8 million which includes relocating 1 PBB rotunda.

Evaluation: Alternative 4 - Full Expansion

Alternative 4-1

The full expansion meets all functional area facility requirements and exceeds requirements for areas such as the SSCP where a 3-lane SSCP is provided covering an area of 4,747 sq. ft. The full expansion includes 32,282 sq. ft. of new building space and 27,641 sq. ft. of renovated space.

Existing vertical circulation is removed and replaced with a vertical core located near the building entrance. The vertical core includes dual escalators and a staircase located between the dual escalators. One new elevator is installed adjacent to the ticketing area and one new elevator is installed adjacent to the airport administration entrance. A single downward escalator is installed at the holdroom exit to be used by arriving passengers to descend to the bag claim area on level 1.

This option provides arriving passengers with a short and intuitive path of 393 ft. The path for departing passengers is moderately long compared to other alternatives at 559 ft. but remains within industry standards of 1,000 linear ft. for maximum unassisted walk distance. The departure path requires passengers to make one level change to reach check-in and SSCP. The alternative solves all conflicting passenger flow issues in check-in, bag screening, SSCP queuing, general circulation, and rental car queuing areas.

The major expansion in different sections of the building facilitates ease of constructability and implementation for this alternative. The development of this alternative is expected to have limited impacts on operations with a temporary holdroom exit required to accommodate the expansion and relocation of the SSCP.

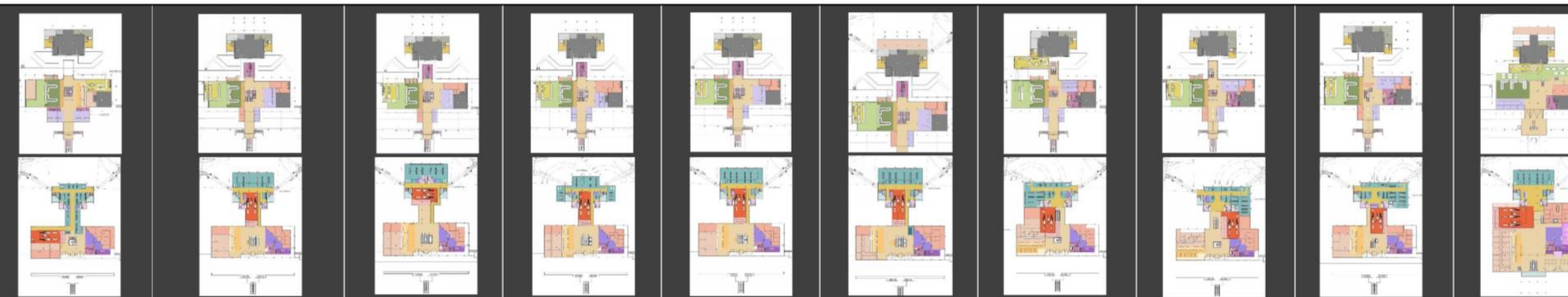
The rough order of magnitude cost estimate for this major renovation and expansion project is expected to be $32.9 million not including the cost of roadway modifications required to the terminal approach roadway and curb.

Alternative Evaluation Conclusion

The selected preferred terminal development alternative is identified and discussed in the Recommended Terminal Area Development section.

Figure 5-67
Terminal Alternatives Evaluation Matrix

Abilene Regional Airport
Comparison Matrix
CORGAN
June 21, 2018



	FACILITY REQ.	1-1	2-1	2-2	2-3	2-4	2-5	3-1	3-2	3-3	4-1
1 FUNCTIONAL AREAS											
A Holdroom	4,192 SF	4,117 SF	4,195 SF	4,196 SF	4,190 SF	4,195 SF	4,195 SF	4,196 SF	4,192 SF	4,189 SF	4,195 SF
Gates	2	2	2	2	2	2	2	2	2	2	2
Relocated PBB Rotunda	0	0	0	0	2	0	0	1	1	1	0
B Security Screening Checkpoint (SSCP)	2,400 SF	2,367 SF	2,122 SF	1,857 SF	2,136 SF	2,122 SF	2,122 SF	2,453 SF	2,328 SF	2,060 SF	4,747 SF
SSCP Lanes	2	2	2	2	2	2	2	2	2	2	3
C Baggage Screening	2,500 SF	1,381 SF	1,452 SF	1,452 SF	1,452 SF	991 SF	988 SF	2,106 SF	1,452 SF	991 SF	1,839 SF
In-line Explosives Detection System	2	2	2	2	2	2	2	2	2	2	2
D Additional Square Footage	0	4,138	6,488	7,401	5,854	6,027	9,378	10,009	9,277	6,422	32,282
E Renovated Square Footage	0	20,753	18,877	19,779	18,469	18,877	14,812	14,200	14,465	19,061	27,641
F Vertical Cores	-										
Escalators	-	Removed existing	Relocated to replace central staircase	Relocated to replace central staircase	Relocated to replace central staircase	Relocated to replace central staircase	Relocated to replace central staircase	Retained	Relocated	Removed existing 1 new down escalator to replace central staircase	1 down at holdroom exit Dual escalators located at building entrance
Staircase	-	Retained	Removed existing New single stair between escalators	Removed existing New single stair between escalators	Removed existing New single stair between escalators	Removed existing New single stair between escalators	Removed existing New single stair between escalators	Retained	Retained	Removed existing Single stair added adjacent to escalator	Remove existing. Staircase located in between dual escalators
Elevator	-	Removed existing 2 new adjacent to staircase	Removed existing 2 new adjacent to escalators	Removed existing 2 new adjacent to escalators	Removed existing 2 new adjacent to escalators	Removed existing 2 new adjacent to escalators	Removed existing 2 new adjacent to escalators	Replace with larger elevator in same location	Replace with larger elevator in same location	Remove existing 1 new adjacent to escalator	Remove existing. 1 new by ticketing and 1 new by airport administration
2 WAYFINDING/PASSENGER EXPERIENCE											
A Passenger Walk Distance (feet)	-										
Departing Passengers	-	687	412	424	415	412	456	550	615	524	559
Arriving Passengers	-	343	498	529	500	498	389	367	370	516	393
B Conflicting Passenger Flows	-										
Check-in	-	Resolved	Resolved	Resolved	Resolved	Resolved	Resolved	Not Resolved	Not Resolved	Resolved	Resolved
Bag Screening	-	Resolved	Resolved	Resolved	Resolved	Resolved	Resolved	Resolved	Resolved	Resolved	Resolved
SSCP Queuing	-	Resolved	Resolved	Resolved	Resolved	Resolved	Resolved	Resolved	Resolved	Resolved	Resolved
General Circulation	-	Resolved	Resolved	Resolved	Resolved	Resolved	Resolved	Resolved	Resolved	Not Resolved	Resolved
Rental Car Queue	-	Resolved	Resolved	Resolved	Resolved	Resolved	Resolved	Resolved	Resolved	Resolved	Resolved
C Direct and Intuitive Path	-										
Departing Passengers	-										
Level 1	-	NO	YES	YES	YES	YES	YES	NO	NO	YES	YES
Level 2	-	YES	YES	YES	YES	YES	YES	NO	NO	YES	YES
Arriving Passengers	-										
Level 1	-	YES	YES	YES	NO	YES	YES	NO	NO	NO	YES
Level 2	-	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
3 CONSTRUCTABILITY											
Incremental Development	-	DIFFICULT	MODERATE	MODERATE	MODERATE	EASY	EASY	MODERATE	MODERATE	MODERATE	EASY
Summary	-	All modifications are dependent on each other and dividing renovations into separate phases is not feasible.	Expansion required to accommodate baggage screening room.	Holdroom has to expand before secure-side restrooms can move and SSCP modified.	Requires relocation of both PBB rotundas to accommodate holdroom expansion.	All modifications can be made separately increasing ease of implementation.	All modifications can be made separately increasing ease of implementation.	Holdroom expansion requires relocation of 1 PBB rotunda.	Holdroom expansion requires relocation of 1 PBB rotunda.	Holdroom expansion requires relocation of 1 PBB rotunda.	All modifications can be made separately increasing ease of implementation.
Construction Impact on Operations	-	SIGNIFICANT	LIMITED	MODERATE	SIGNIFICANT	LIMITED	LIMITED	MODERATE	MODERATE	MODERATE	LIMITED
Summary	-	Check-in, bag screening and SSCP operations to be significantly impacted.	Temporary exit from holdroom for arriving passengers to accommodate SSCP modifications.	Temporary exit from holdroom for arriving passengers to accommodate SSCP modifications. SSCP operations also impacted.	Passenger boarding will have to be ground loading for all gates while PBBs are shut down and relocated with holdroom expansion.	Temporary exit from holdroom for arriving passengers to accommodate SSCP modifications.	Temporary exit from holdroom for arriving passengers to accommodate SSCP modifications.	Passenger boarding will have to be ground loading for 1 gate while PBBs are shut down and relocated with holdroom expansion.	Passenger boarding will have to be ground loading for 1 gate while PBBs are shut down and relocated with holdroom expansion.	Passenger boarding will have to be ground loading for 1 gate while PBBs are shut down and relocated with holdroom expansion.	Temporary exit from holdroom for arriving passengers to accommodate SSCP modifications.
4 COST											
A New Construction	-	$2,600,000	$4,100,000	$4,700,000	$3,700,000	$3,800,000	$5,900,000	$6,300,000	$5,800,000	$4,000,000	$20,300,000
B Renovation	-	$9,400,000	$8,600,000	$9,000,000	$8,400,000	$8,600,000	$6,700,000	$6,500,000	$6,600,000	$8,700,000	$12,600,000
C Total	-	$12,000,000	$12,700,000	$13,700,000	$15,500,000	$12,400,000	$12,600,000	$13,900,000	$13,500,000	$13,800,000	$32,900,000

Source: Corgan 2018

Landside Alternatives

Landside alternatives addressed requirements for landside facilities identified in the facility requirements chapter. Alternatives revolved mainly around identifying possible on-airport locations for a rental car maintenance facility as well as efforts to address line of sight issues within the geometry of Airport Boulevard and Airport Parking Circle.

Rental Car Service/Maintenance Facility

Rental car companies identified the need for an on-site facility where they could perform preventative and light maintenance on their vehicles as well as get vehicles ready for customers. The new rental car service/maintenance facility would house 4 maintenance bays (1 for every rental car company) and a 5^{th} bay that would serve as a car wash. Six locations were identified for the location of this facility as shown in **Figure 5-68**.

Location 1
This location is located south of Airport Boulevard to the east of Bonanza Drive. Access to this location would be from Airport Boulevard.

Location 2
This location is located on the south side of a large abandoned lot to the east of Airport Boulevard. Access to this location would be through a frontage road branching off Airport Boulevard.

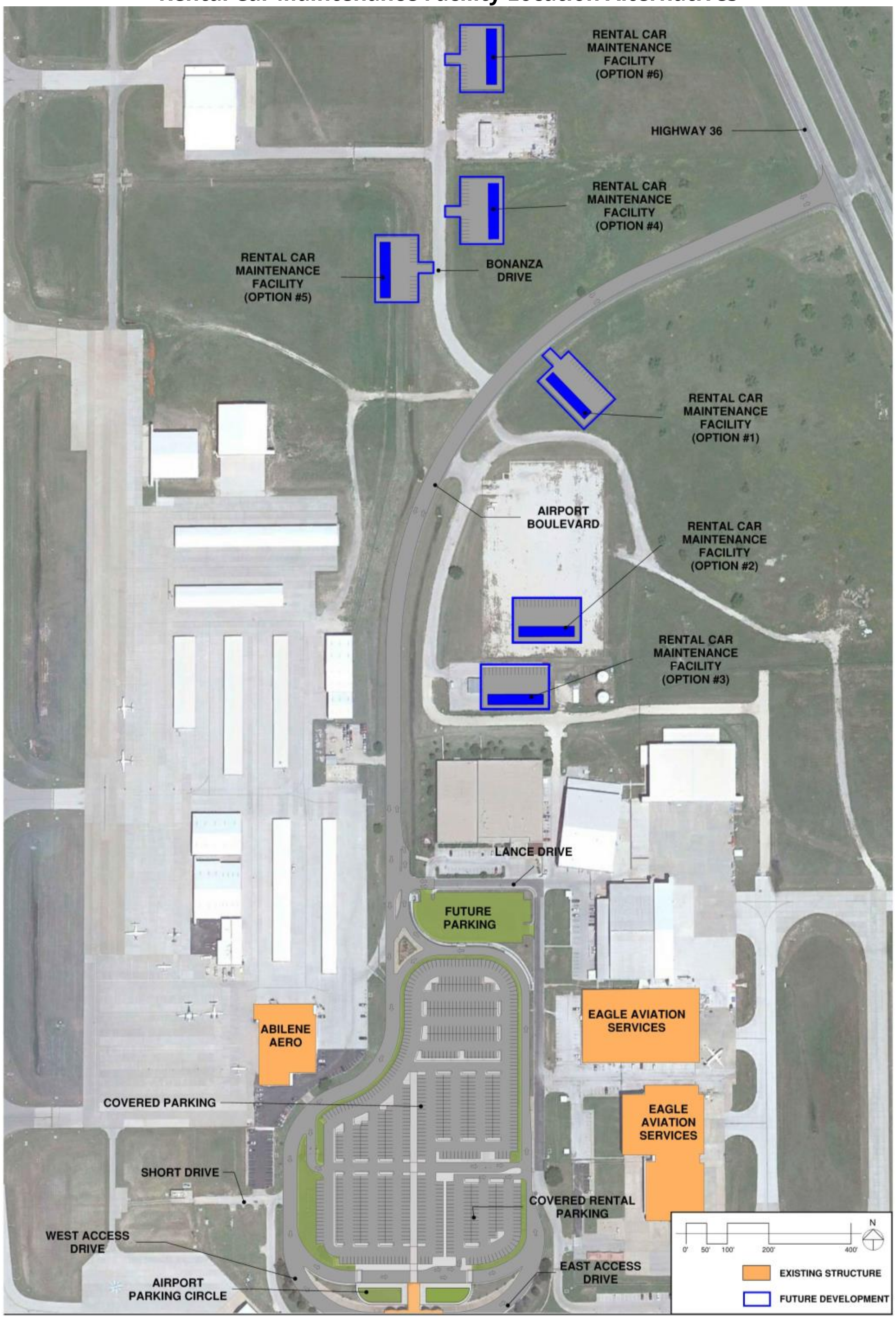
Location 3
This location is located on the east end of the Rental Car overflow parking lot located to the east of Airport Boulevard. Access to this location would be through a frontage road branching off Airport Boulevard.

Location 4
This location is located east of Bonanza Drive to the south of an existing airport maintenance facility. Access to this location would be from Bonanza Drive.

Location 5
This location is located west of Bonanza Drive opposite location 4. Access to this location would be from Bonanza Drive.

Location 6
This location is located east of Bonanza Drive to the north of an existing airport maintenance facility. Access to this location would be from Bonanza Drive.

Figure 5-68
Rental Car Maintenance Facility Location Alternatives



Source: Corgan 2018

Recommended Terminal Area Development

In order to develop a comprehensive terminal area plan, the next step was to select one of the terminal development alternatives and pair it with an appropriate landside alternative. After conducting a comparative analysis of the alternatives and input from the Master Plan Steering Committee, Alternative 4-1 was selected as the preferred alternative for terminal development. This alternative requires modifications to the geometry of roadways approaching the terminal and terminal curbsides.

Terminal

The recommended terminal alternative selected is Alternative 4-1, shown in **Figure 5-69** and **Figure 5-70**, which requires significant expansion and renovation of the existing terminal building. It provides a central main entrance into the terminal on the lower level, eliminating the need for the upper level roadway. As the building gains significant square footage, it offers enlarged SSCP and enlarged baggage claim, ticketing, and airport administration areas. It also provides additional space for community events and offers a designated area for a VIP lounge.

Ticketing Area

The ticketing area is located on the upper level oriented north-south and facing west. It consists of 5 check-in counters and 8 self-check-in kiosks. Two self-bag-drop machines are provided in the center. The counters including the movement area behind them cover 1,275 sq ft.

The queueing area in front of the counters covers 1,069 sq ft. Departing passengers can access the ticketing area by taking escalators at the main entrance on the lower level, located on the northern end of the building. They enter a large open space inviting them into the terminal and can choose to go to check-in counters or walk straight towards the SSCP.

TSA Security Screening Checkpoint

The SSCP is located on the east side of the terminal oriented east-west. It follows the standard TSA checkpoint layout and consists of three lanes. It covers an area of 4,747 sq ft. exceeding the facility requirements. The queuing area begins just south of ticketing counters. It measures 1,247 sq ft., which is sufficient for three lanes. 695 sq ft. of office space is provided for TSA. The SSCP entrance is clearly visible to departing passengers coming up to level 2 because of the open space in the center. After passing through the checkpoint, passengers are directed intuitively into the holdroom area.

Arriving passengers can exit the holdroom via a corridor located west of the SSCP. The corridor is equipped with double doors for added security. Its proximity to the checkpoint makes it visible for the TSA personnel allowing them to monitor the corridor from the SSCP.

Holdrooms

Holdrooms are expanded towards the south increasing the existing building footprint and would cover the existing apron area between the two aircraft parking positions. The holdroom area measures 4,195 sq ft. which meets facility requirements. The existing boarding doors for the two gates are retained in their current position, eliminating the need to relocate passenger boarding bridges. 3,554 sq ft. of secure circulation space is gained making the holdroom area more spacious and appealing.

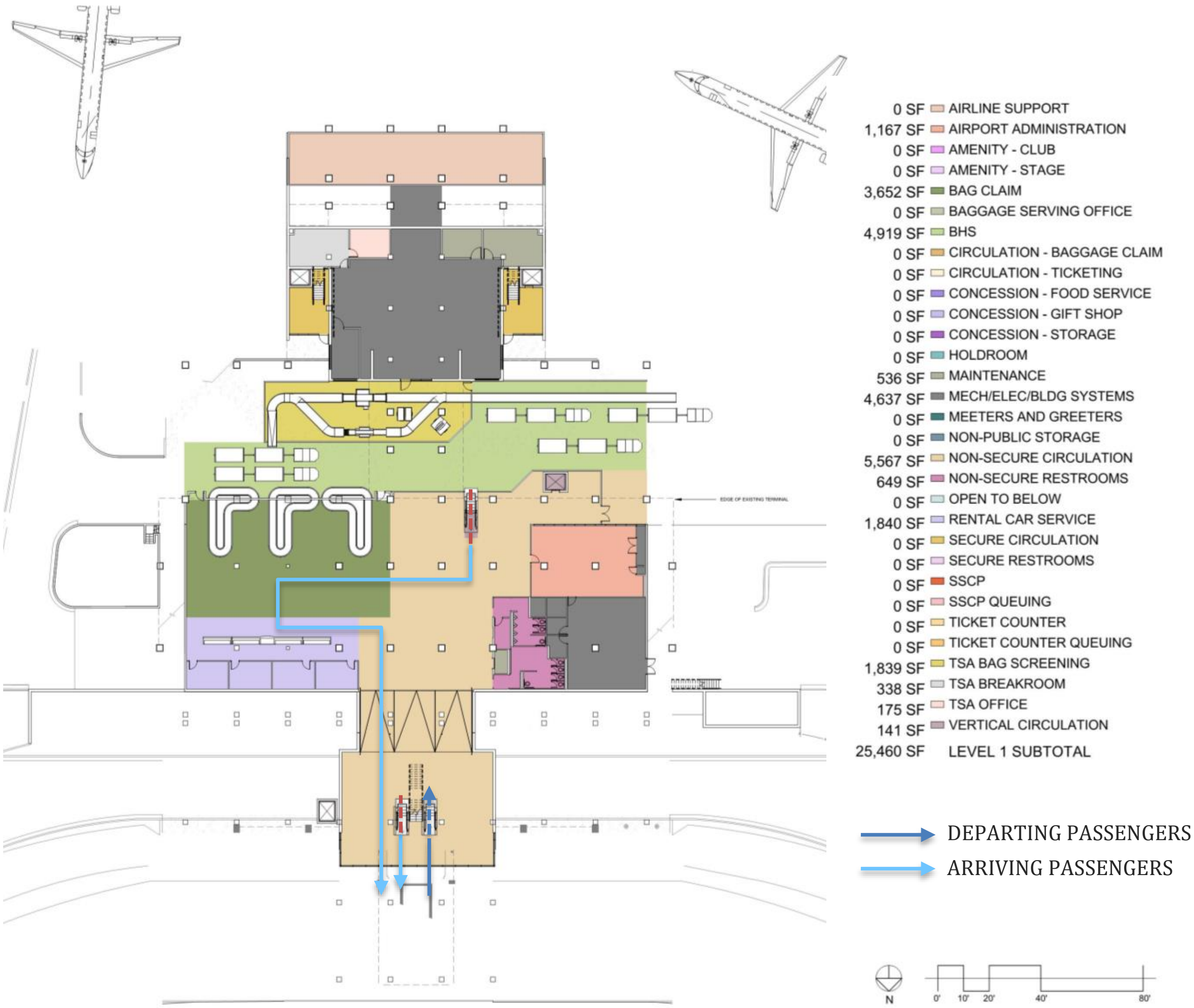
Concessions and Other Amenities

Non-secure concession space is located on the west side of the upper level. The existing retail space in the center is eliminated. The general location of the restaurant is retained with a slight reconfiguration of the seating area. Existing kitchen and storage rooms for the restaurant are retained. The large open space between concessions and ticketing counters can act as a waiting area for meeters and greeters. On the secure side, a concession space is provided that can house a pop-up concession or compact coffee shop, or a sandwich shop. Total area combining secure and non-secure concessions measures 1,832 sq ft.

The existing office space behind the restaurant is redesigned to accommodate a VIP lounge. Passengers in the lounge can enjoy natural light and distant views outside the terminal. Entrance to the lounge is provided just south of concessions. The lounge space measures 1,751 sq ft.

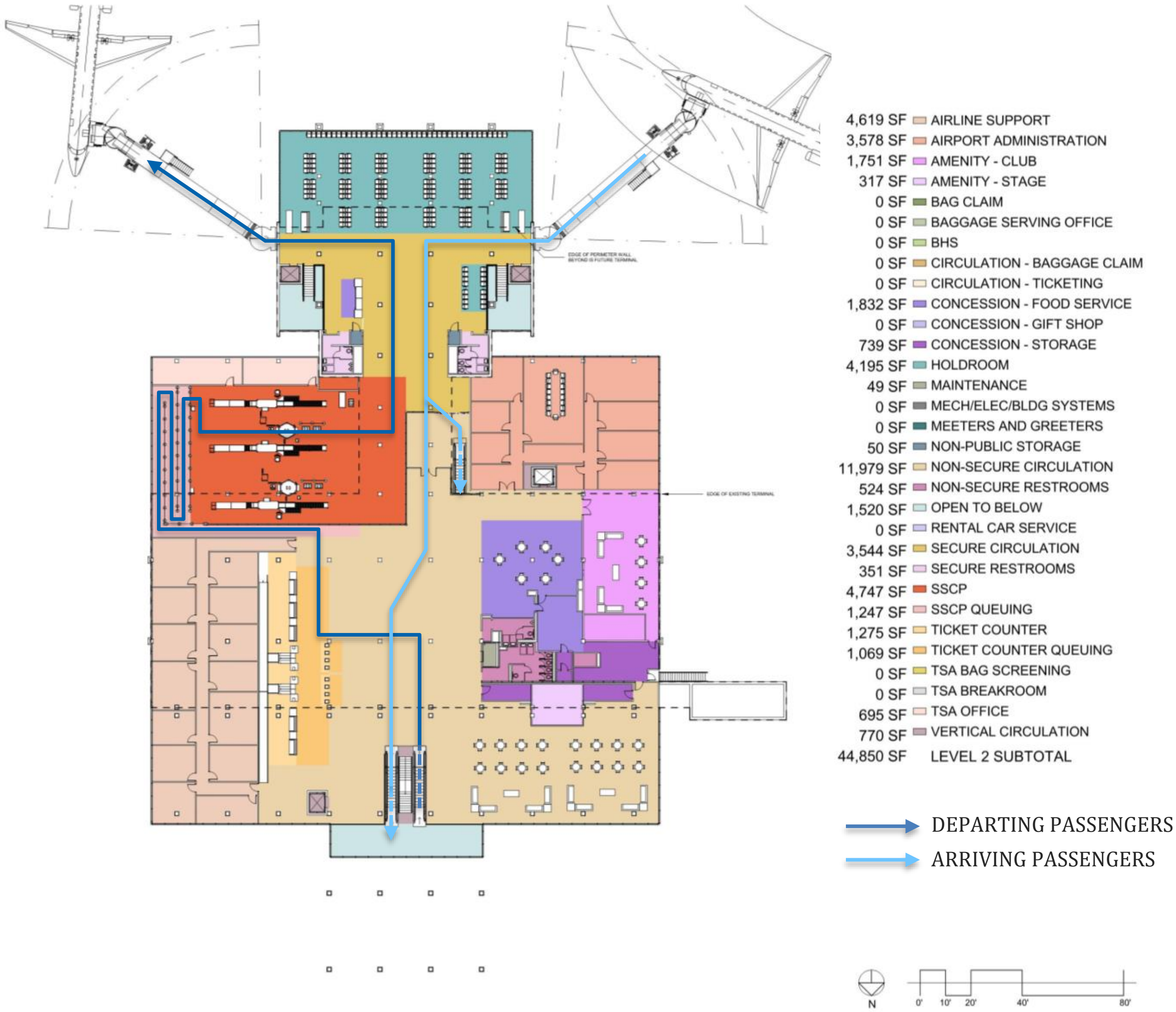
In addition to these amenities, a designated gathering hall is provided in the north-west section of the terminal. It consists of a stage facing north with the restaurant kitchen to the south. Various community activities and entertainment performances can be organized in this space. It can also be used by the airport administration for conducting public meetings.

Figure 5-69
Alternative 4-1 – Level 1



Source: Corgan 2018

Figure 5-70
Alternative 4-1 – Level 2



Source: Corgan 2018

Baggage Handling System (BHS)

The BHS, located on the lower level, comprises bag screening, the circulation area for bag carts, and the baggage claim area. The inbound and outbound baggage make-up areas are oriented east-west passing underneath the existing connector corridor. The bag screening room is located just north of the mechanical room in the northern section of the terminal building. It consists of 2 in-line EDS machines that are fed by conveyor belts coming from the ticketing area on the upper level. After going through the EDS machines, outbound baggage would be picked on the west side of the terminal. Sufficient circulation space and make-up area is provided for two carts to stage behind each other to pick up outbound baggage. The inbound baggage area is located on the east side of the terminal building. 3 flat-plate devices can be accommodated in the provided area.

Baggage Claim and Rental Car Services

The baggage claim area located in the eastern section of the terminal measures 3,652 sq ft. The area exceeds the facility requirements. Arriving passengers coming down from the southern escalator can access the bag claim directly to their right as they arrive on the lower level. Four rental car counters are provided on the north of bag claim with dedicated office space. The counters are clearly visible to arriving passengers once they are on the lower level.

Airport Administration Office Areas

The office spaces are primarily located on the upper level. Offices for airport administration are located in the south-west section of the upper level. The space can accommodate eight offices, a conference room, a breakroom, and a reception area. Total area allocated to airport administration measures 3,578 sq ft. Offices for airline employees take up the eastern section of the upper level configured in a linear layout and located conveniently behind ticketing counters. Total area occupied by airline office space measures 4,619 sq ft. Both the airline as well as airport administration office spaces would receive plenty of natural light offering views outside the terminal building. The existing offices for TSA and breakroom on the lower level are retained. As the upper level is expanded south, the area underneath the upper level expansion can be used as support space or office space for airline employees working on the ramp.

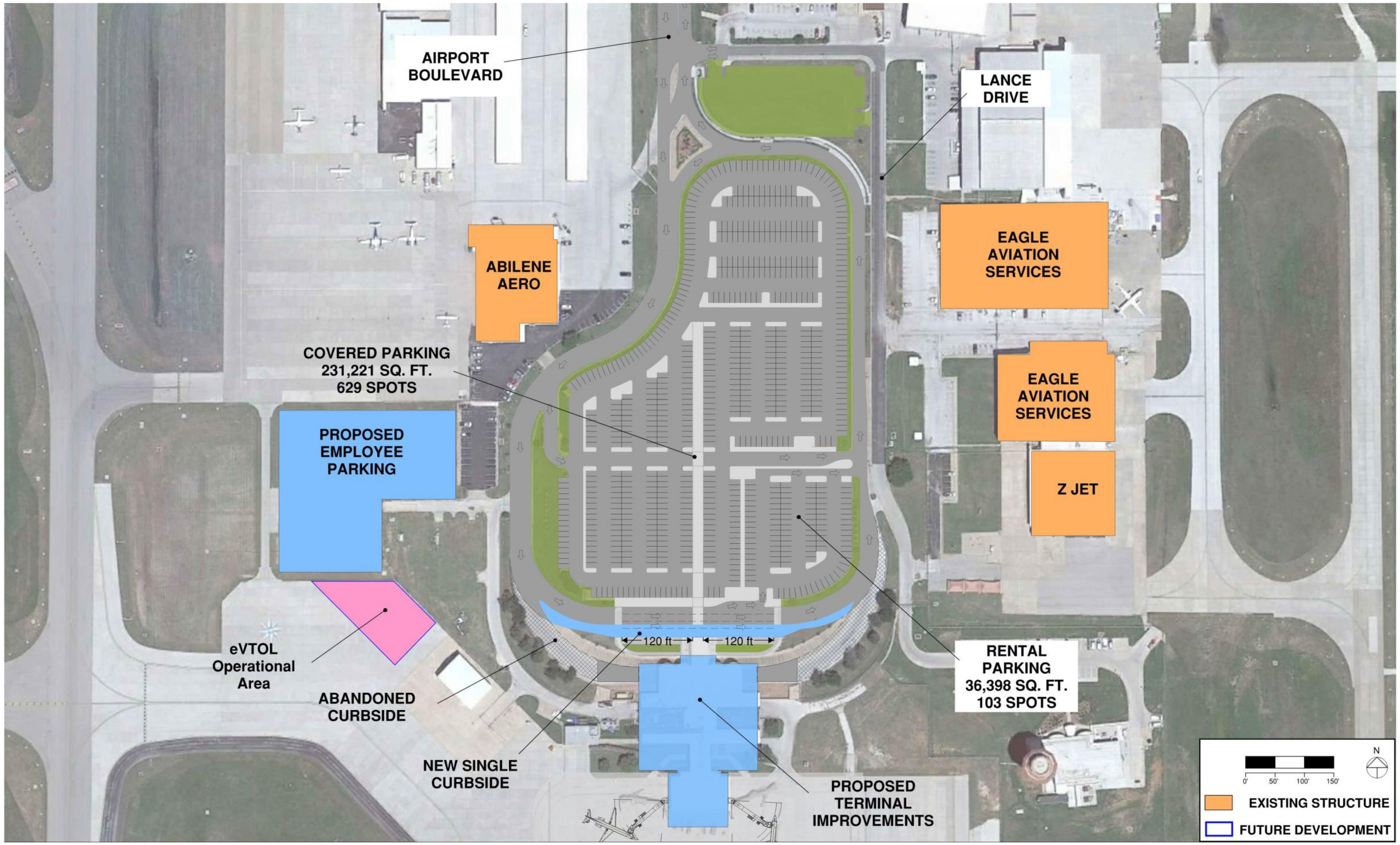
Landside

The preferred terminal alternative includes a redevelopment of the airport roadway geometry and curbside as shown in **Figure 5-71**. Existing airport curbside consists of a 2 level curbside with arrivals on the lower level and departures on the upper level. The proposed development changes curbside to a single curbside with all traffic directed to the lower level where there are 2 curbs laid out side by side with a pedestrian crosswalk to divide them. Each curb has a linear length of 120 ft. which is sufficient to meet facility requirements for departures and arrivals curb identified as 65 ft. and 108 ft. respectively. The existing lower level roadway is widened towards the terminal providing a total width of 51 ft. that includes 3 12-ft. wide lanes and a 15-ft. wide curb for vehicles to park and unload/load.

The geometry of the airport parking circle is adjusted to provide a wider and smoother turn into the curbside which serves to improve the existing line of sight issues when driving along the airport parking circle.

In anticipation of developing UAS technology and future demand for TNC type operations of Vertical Takeoff and Landing (VTOL) vehicles, space will be reserved in the terminal area to accommodate such developing technologies. Between Abilene Aero's FBO area and the main passenger terminal, there is space available for accommodating VTOL or UAS passenger operations that provides convenient roadway access and parking for those operations as well as separation from commercial service activities and sterile passenger areas of the terminal.

Figure 5-71
Proposed Landside Roadway Geometry

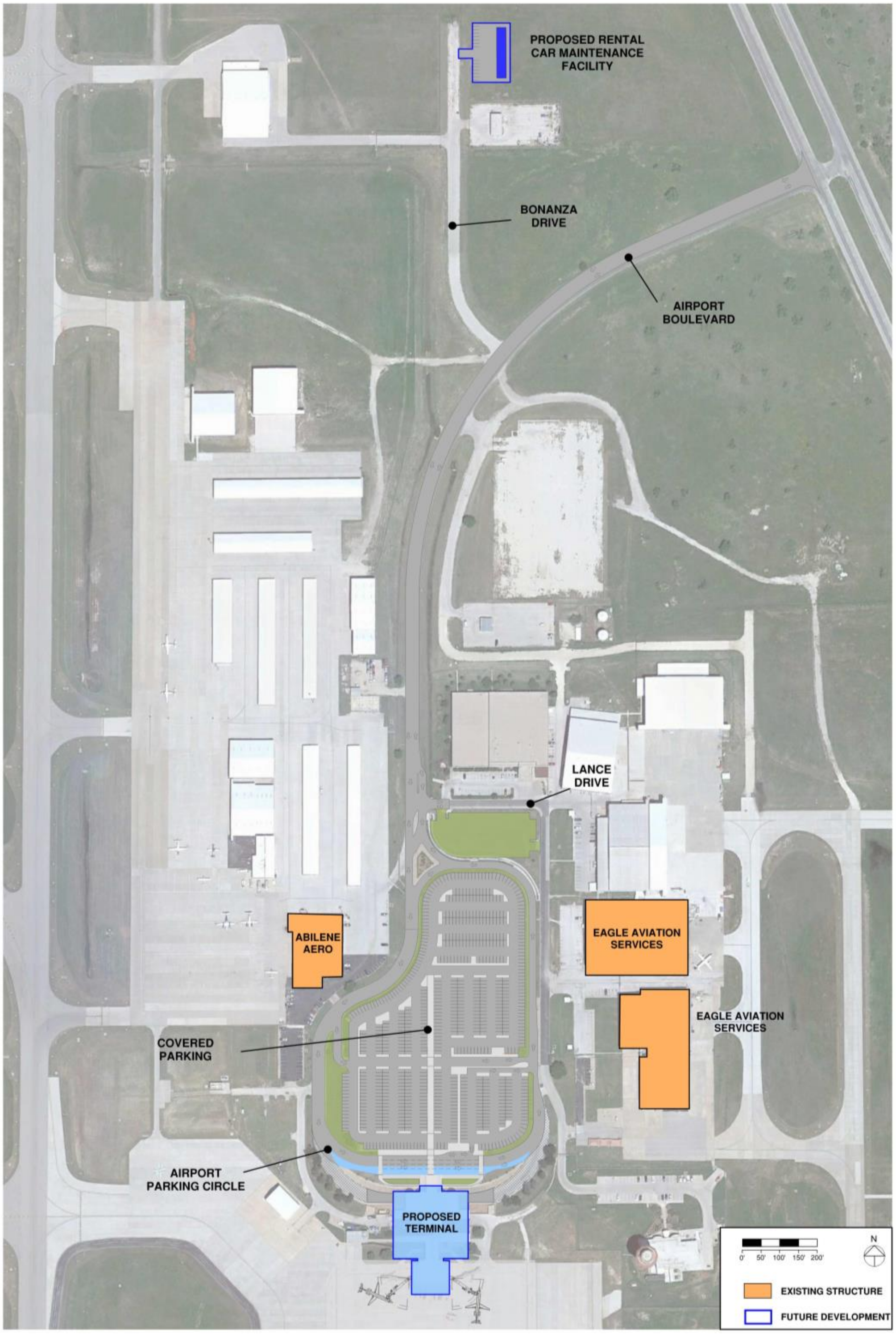


Source: Corgan 2018

Site Plan

Figure 5-72 on the next page displays a terminal area site plan showing the proposed terminal development, proposed roadway geometry, and other landside developments. For landside facilities, Location 6 was selected as the preferred location for the rental car maintenance facility. This location's close proximity to an existing airport maintenance facility provides a feasible connection to existing utilities. The location also allows the land on both sides of Airport Boulevard just south of Highway 36 to be allocated for non-aeronautical development.

Figure 5-72
Proposed Terminal Area Site Plan



Source: Corgan 2018

Aeronautical Facility Development Alternatives

An airport's aeronautical facilities include its FBOs, corporate hangars, T-hangars, aircraft Maintenance, Repair, and Overhaul (MRO) facilities, and any Specialized Aviation Service Operations (SASO) which include flight training, aerial photography, and other specialized commercial aeronautical operations. At ABI, these facilities include the Abilene Aero facilities, the Eagle Aviation Services, Inc. facilities, and other general aviation or maintenance operations located at ABI.

Development Objectives

As discussed in the forecast chapter, the growth of general aviation activity and based aircraft at ABI is expected to be relatively flat during the forecast period. Consequently, it is possible that the existing general aviation facilities at ABI may be able to accommodate the majority of anticipated demand with minimal expansion. However, it is important that ABI is prepared from a planning perspective to accommodate potential growth in case demand increases. With this considered, the following development objectives were established in the Facility Requirements Chapter to guide the aeronautical facility alternative development process.

- Identify sites and configurations for potential box hangar development.
- Identify sites for limited t-hangar development. The need for T-hangars is expected to be limited as there are currently several empty t-hangar units and the number of single engine piston aircraft on the field are expected to decline in alignment with the nation-wide decline in single engine piston aircraft.
- Identify a site for potential ramp expansion.
- Establish an expansion plan for the EASI facility.

Each of these development objectives will be addressed in the various alternatives that are described throughout the remainder of this section.

Aeronautical Facility Development Alternatives

Based on the development objectives discussed above, the following four alternatives were created. Each of these alternatives portrays various ways the aeronautical development objectives could be met.

- ***Alternative #1***
    - Area South of Airport Blvd. and North of the Existing EASI Facility
        - Taxilane E expansion to the north
        - New ramp area.
        - Four (4) new box hangars (200 ft. x 150 ft.)
        - Parking for employees
    - Abilene Aero Area

    - Six (6) new box hangars (150 ft. x 150 ft.)
    - Existing ramp expansion to the north.
  - South Airfield Development Area Between Parallels
    - Four (4) new box hangars (200 ft. x 200 ft.)
    - New roadway to hangars extending from Industrial Blvd.
  - Runway 4/22 Redevelopment Area
    - Hangar and ramp development along existing Runway 4/22 (12 box hangars – 200 ft. x 200 ft.)
    - T-Hangar development south of new box hangar development.
    - Removal of existing T-hangar facility located close to new TSTC development.
    - Roadway connecting Navajo Trail to Industrial Blvd.

Aeronautical Facility Development Alternative #1 is shown in **Figure 5-72**.

- ***Alternative #2***
  - Area South of Airport Blvd. and North of the Existing EASI Facility
    - Taxilane E expansion to the north
    - New ramp area.
    - Four (4) new box hangars (200 ft. x 150 ft.)
    - Parking for employees
  - Abilene Aero Area
    - Six (6) new box hangars (150 ft. x 150 ft.)
    - Existing ramp expansion to the north.
  - South Airfield Development Area Between Parallels
    - Four (4) new box hangars (200 ft. x 200 ft.)
    - New roadway to hangars extending from Industrial Blvd.
  - Runway 4/22 Redevelopment Area
    - Hangar and ramp development along existing Runway 4/22 (10 box hangars – 200 ft. x 200 ft.) with two expansion pods (6 hangars in one pod and 5 hangars in the second pod)
    - T-Hangar development south of new box hangar development.
    - Removal of existing T-hangar facility located close to new TSTC development.
    - Roadway connecting Navajo Trail to Industrial Blvd.

Aeronautical Facility Development Alternative #2 is shown in **Figure 5-73**.

- ***Alternative #3***
  - Area South of Airport Blvd. and North of the Existing EASI Facility
    - Taxilane E expansion to the north
    - New ramp area.
    - Four (4) new box hangars (200 ft. x 150 ft.)
    - Parking for employees

- Abilene Aero Area
  - T-Hangar Development
- South Airfield Development Area Between Parallels
  - Four (4) new box hangars (200 ft. x 200 ft.)
  - New roadway to hangars extending from Industrial Blvd.
- Runway 4/22 Redevelopment Area
  - Hangar and ramp development in three 8 hangar pods along proposed western parallel taxiway for Runway 17R/35L.
  - T-Hangar development west of new box hangar development.
  - Removal of existing T-hangar facility located close to new TSTC development.
  - Roadway connecting Navajo Trail to Industrial Blvd.

Aeronautical Facility Development Alternative #3 is shown in **Figure 5-74**.

✈ ***Alternative #4***

- Area South of Airport Blvd. and North of the Existing EASI Facility
  - Taxilane E expansion to the north
  - New ramp area.
  - Four (4) new box hangars (200 ft. x 150 ft.)
  - Parking for employees
- Abilene Aero Area
  - Six (6) new box hangars (150 ft. x 150 ft.)
  - Existing ramp expansion to the north.
- South Airfield Development Area Between Parallels
  - Four (4) new box hangars (200 ft. x 200 ft.)
  - New roadway to hangars extending from Industrial Blvd.
- Runway 4/22 Redevelopment Area
  - Hangar and ramp development along existing Runway 4/22 (24 box hangars – 200 ft. x 200 ft.) with proposed taxilane.
  - Removal of existing T-hangar facility located close to new TSTC development.
  - Roadway connecting Navajo Trail to Industrial Blvd.

Aeronautical Facility Development Alternative #4 is shown in **Figure 5-75**.

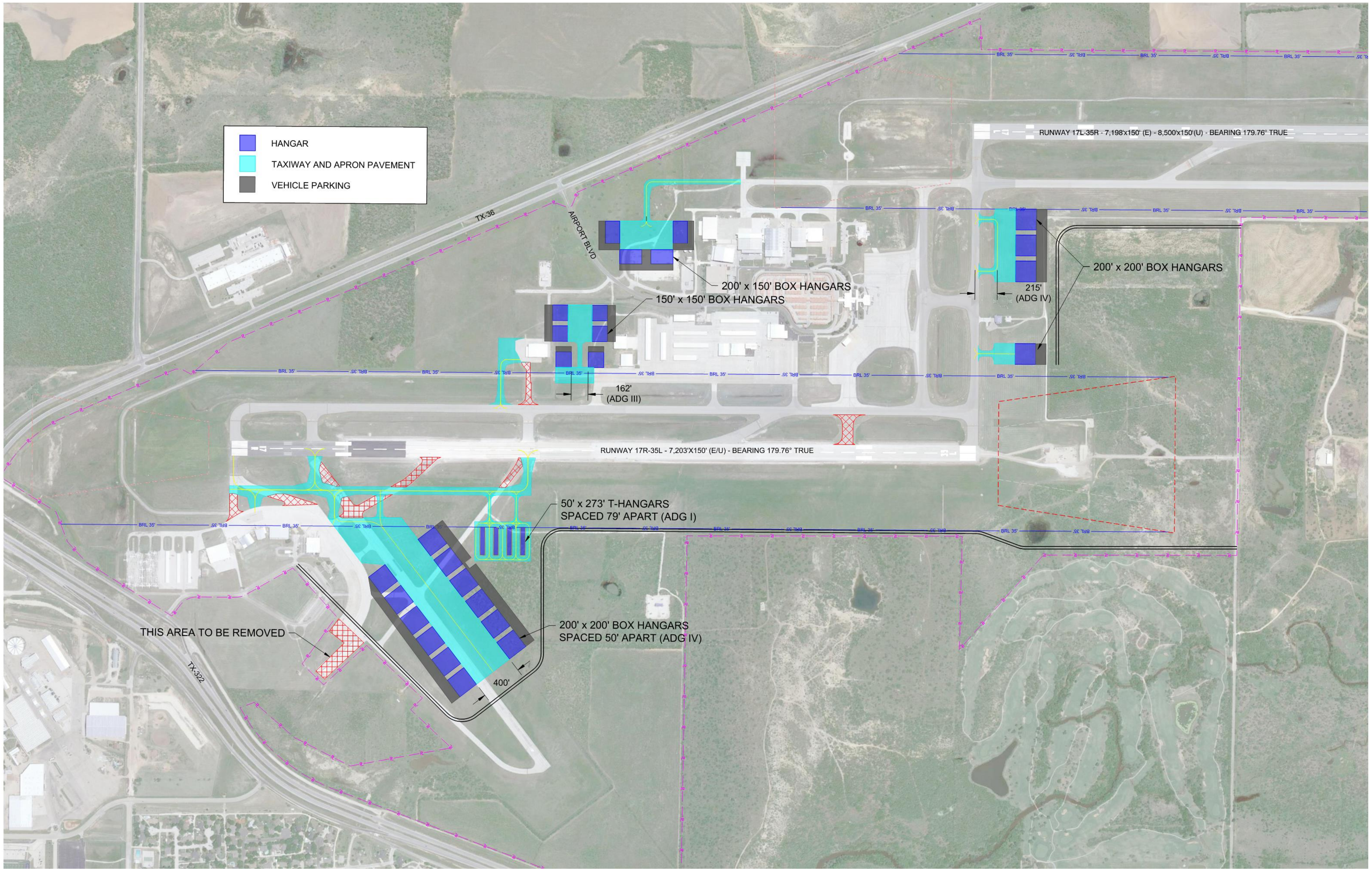
✈ ***Alternative #5***

- Area South of Airport Blvd. and North of the Existing EASI Facility
  - Taxilane E expansion to the north
  - New ramp area.
  - Four (4) new box hangars (200 ft. x 150 ft.)
  - Parking for employees
- Abilene Aero Area
  - Six (6) new box hangars (150 ft. x 150 ft.)

    - Existing ramp expansion to the north.
- South Airfield Development Area Between Parallels
    - Four (4) new box hangars (200 ft. x 200 ft.)
    - New roadway to hangars extending from Industrial Blvd.
- Runway 4/22 Redevelopment Area
    - Hangar and ramp development parallel Taxiway R.
    - Removal of existing T-hangar facility located close to new TSTC development.
    - Roadway connecting Navajo Trail to Industrial Blvd.
    - Former 4/22 Runway and taxiway area available for redevelopment to industrial and/or commercial use.

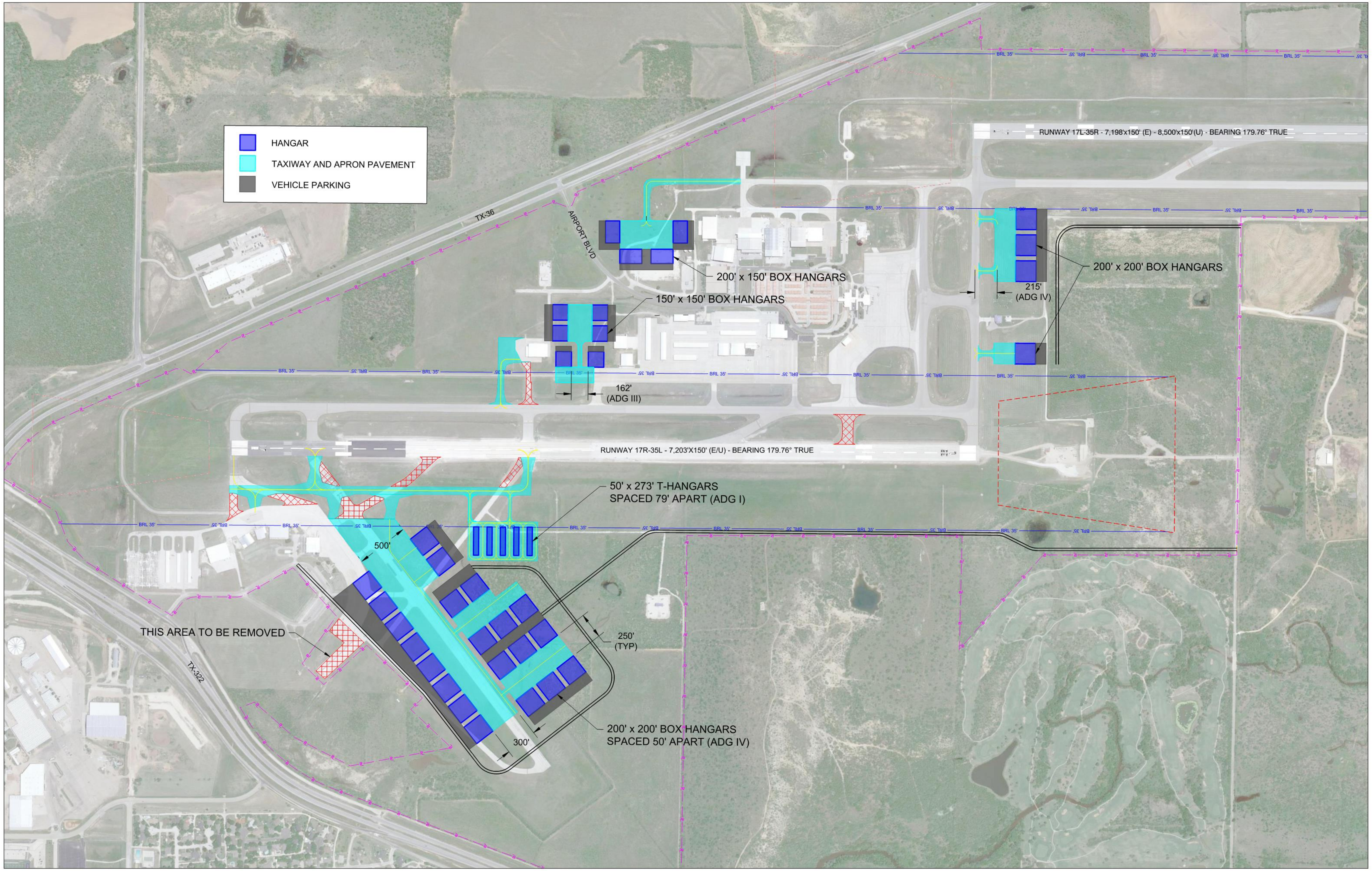
Aeronautical Facility Development Alternative #5 is shown in **Figure 5-76**.

Figure 5-72
Aeronautical Facility Development Alternative #1



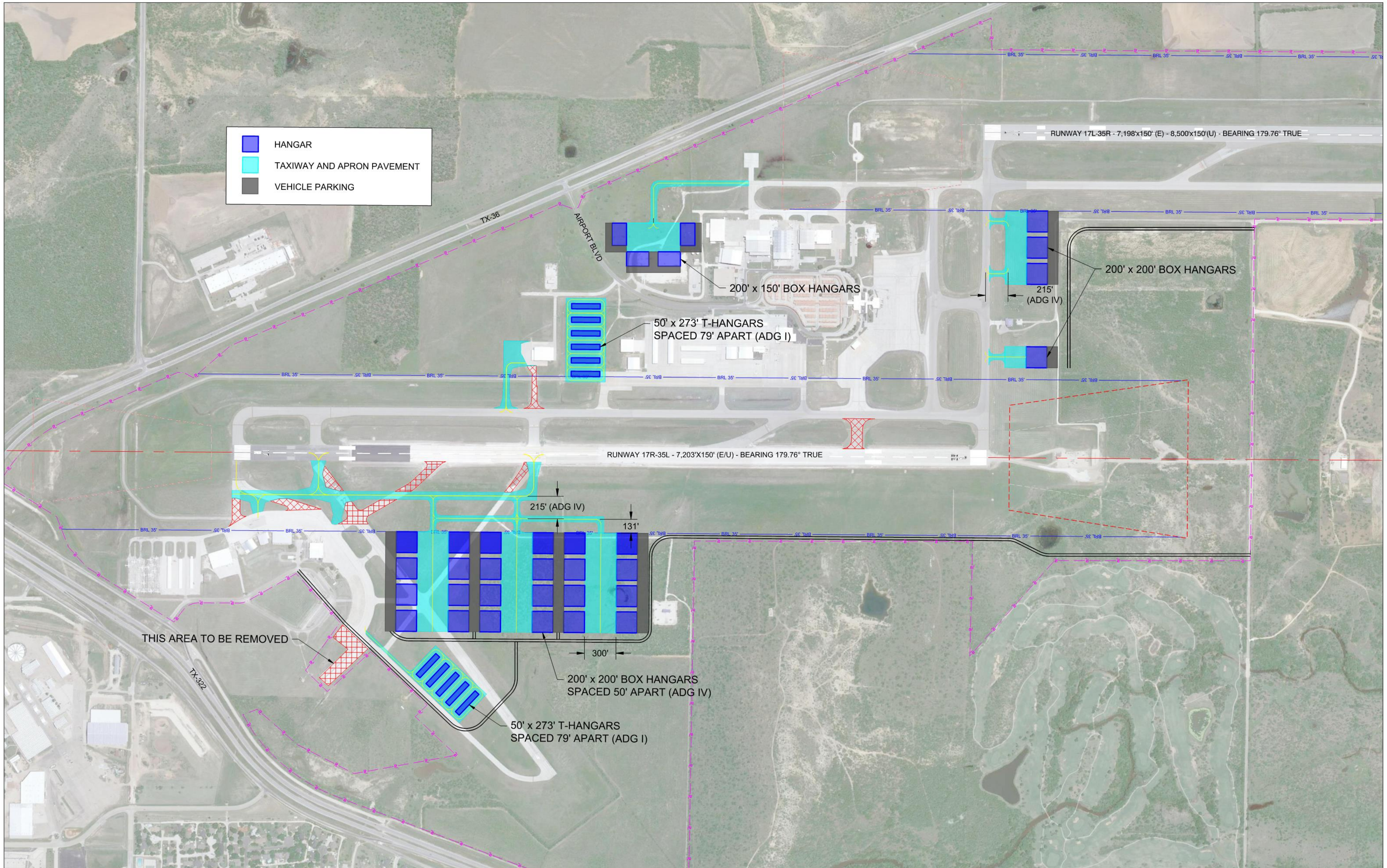
Source: Garver, 2018

Figure 5-73
Aeronautical Facility Development Facility Alternative #2



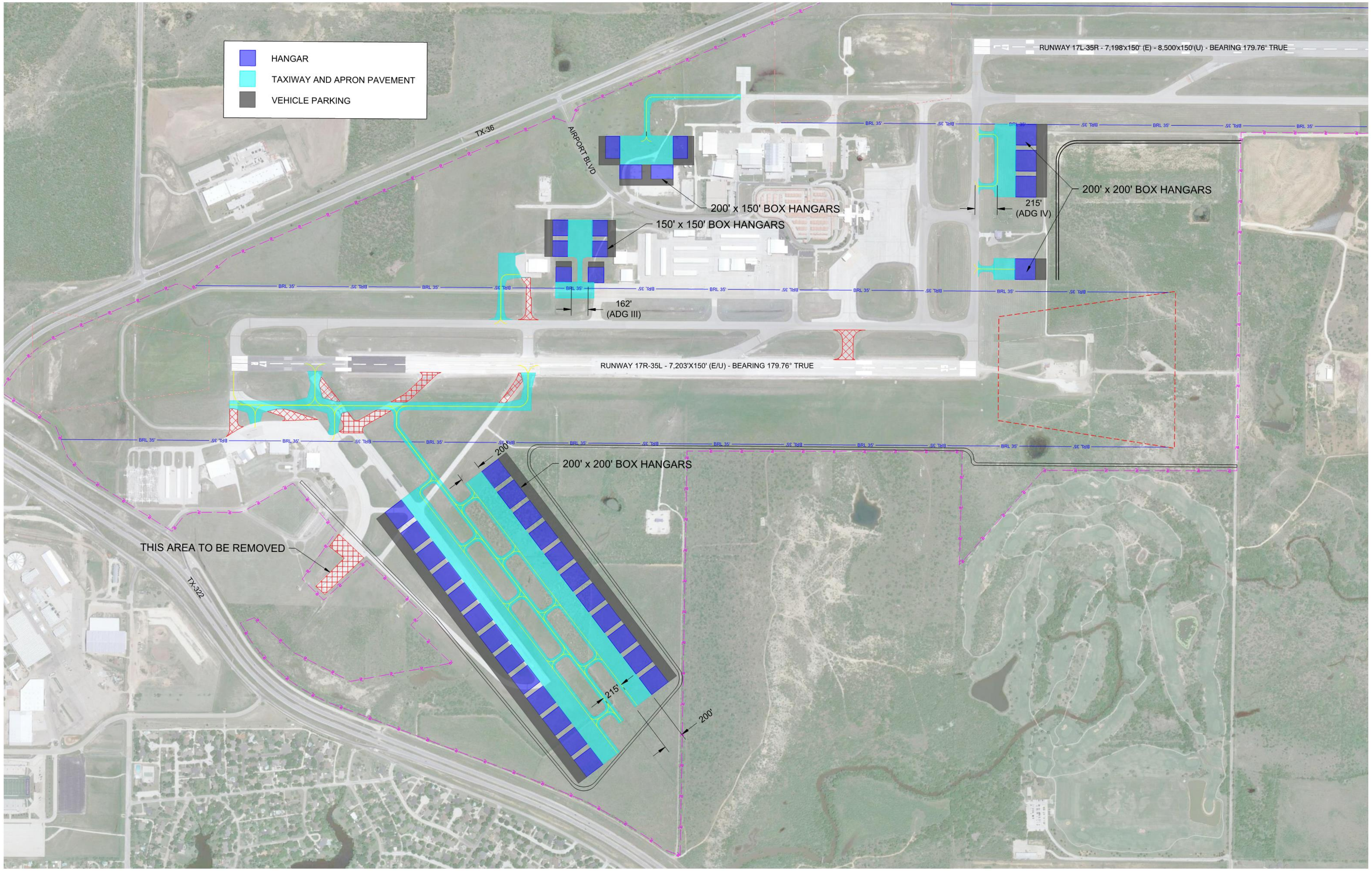
Source: Garver, 2018

Figure 5-74
Aeronautical Facility Development Facility Alternative #3



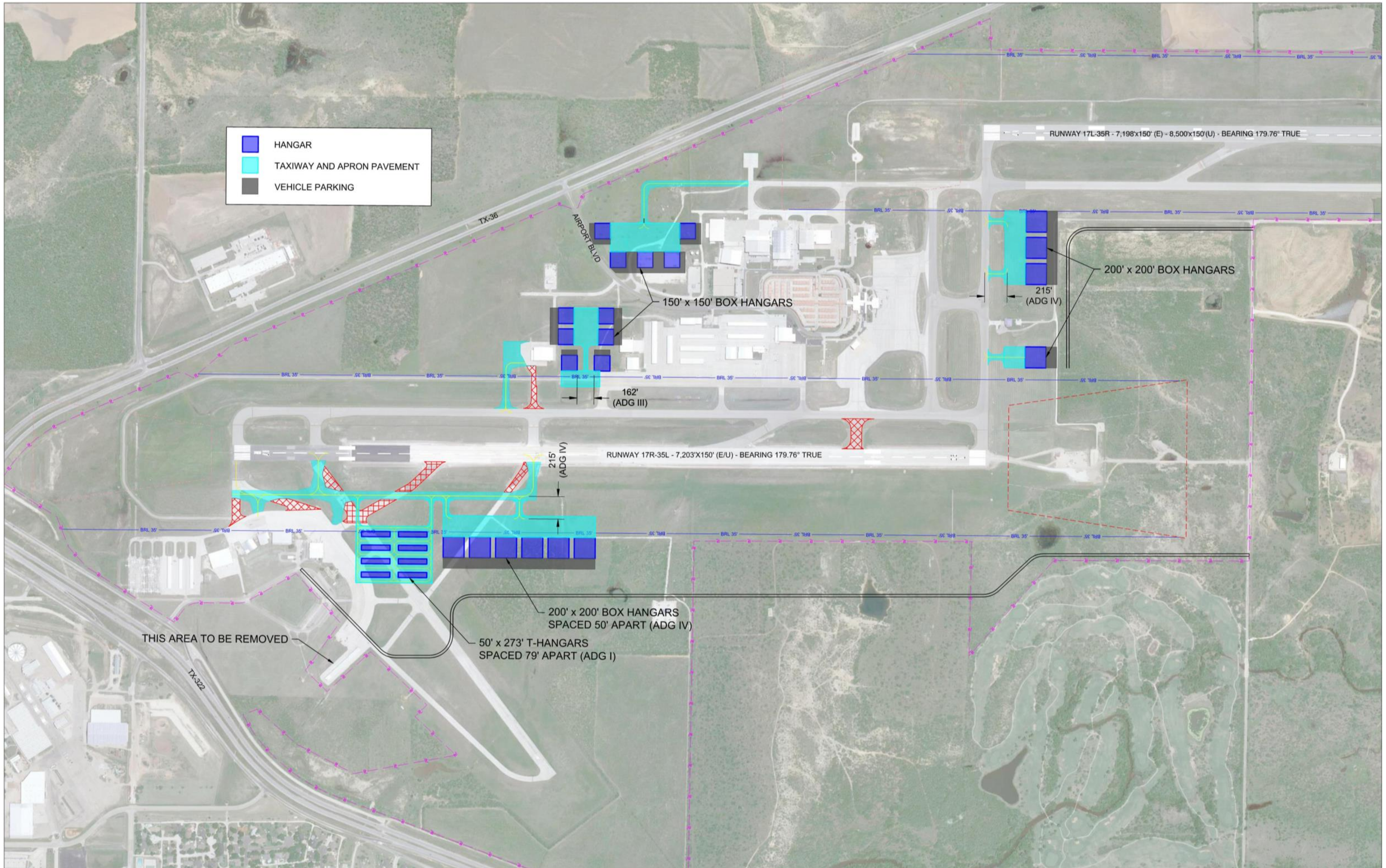
Source: Garver, 2018

Figure 5-75
Aeronautical Facility Development Facility Alternative #4



Source: Garver, 2018

Figure 5-76
Aeronautical Facility Development Facility Alternative #5



Source: Garver, 2018

Aeronautical Facility Development Alternatives Evaluation

One of the tasks of a master plan is to analyze alternatives to determine which alternative provides a realistic and feasible plan that will allow the airport to meet future demand in a safe and efficient manner. To facilitate this analysis, evaluation criteria were established and an evaluation matrix was developed showing how each aeronautical facility development alternative compared based on the evaluation criteria. The evaluation criteria are discussed below.

The following criteria are rated on a Good, Fair, and Poor scale:

- Scalability – Does the alternative allow for the incremental expansion of aeronautical facilities to meet demand? Ideally, development plans should allow for aeronautical facilities to grow at the rate demand dictates without requirement substantial non-revenue producing developments (e.g. large ramp area, long taxilanes, substantial roadway developments, etc.).
- Maximize Utilization of Existing Airport Infrastructure – How much of an impact will the proposed aeronautical facility development alternative have on existing airport infrastructure (e.g. existing ramps, taxiways, runways, etc.)? Ideally, alternatives should make good use of the existing airport infrastructure.
- Limit Non-Revenue Producing Development – How much non-revenue producing development (e.g. taxilanes, ramps, roadways, etc.) are required compared to how much revenue producing development (e.g. hangars, leasable ramp, etc.) is provided? Ideally, alternatives should limit the amount of non-revenue producing space needed for the amount of revenue producing space it provides.
- Ability to Accommodate Additional Expansion – Does the alternative allow the opportunity for additional expansion beyond what is shown in the development alternative? Ideally, alternatives should be able to accommodate additional growth beyond what is shown in the future.
- Environmental Considerations – What impacts will the development alternative have on the environment? This includes water, soil, wildlife, noise, and cultural environmental factors as well as any other applicable to the airport. The environmental process when using Federal funds is a component for major CIP projects. The environmental process will begin in the early stages of project development and the outcome will be a key factor in how the project develops. Soil conditions for construction will need to be suited for airport uses. Floodplains, wetlands, endangered species, and culturally significant areas need to be avoided if possible.
- Ability to Meet the Established Aeronautical Facility Development Objectives – Does the alternative meet the aeronautical facility development objectives?
- Maximization of Ultimate Development Capacity – Does the alternative maximize the ultimate development capacity of the airport? Alternatives should be in a configuration that allows for the ultimate development of all developable areas of the airport.

In the following section, each of the four aeronautical facility development alternatives is analyzed based on these evaluation criteria. The majority of the analysis focuses on evaluating the alternative layouts for the Runway 4/22 re-development area as there is little variation between the alternatives for the other development areas.

Aeronautical Facility Development Alternatives Evaluation Results:

Based on the evaluation criteria discussed above, the following matrix (**Table 5-5**) was developed showing the proposed rating of each alternative.

Table 5-5
General Aviation and Aircraft Maintenance Facility Alternatives Evaluation Results

Alternative #	Scalability	Maximize Utilization of Existing Infrastructure	Limit Non-Revenue Producing Development	Ability to Accommodate Additional Expansion	Environmental Considerations	Ability to Meet Facility Requirements	Maximization of Ultimate Development Capacity
1	Green	Yellow	Yellow	Yellow	Green	Green	Yellow
2	Green	Green	Yellow	Yellow	Green	Green	Green
3	Green	Yellow	Green	Yellow	Green	Green	Yellow
4	Green	Green	Yellow	Yellow	Green	Green	Green
5	Green	Yellow	Yellow	Green	Green	Green	Green

Green - Low Impact or Meets Requirements

Yellow - Moderate Impact or Fails to Meet Some Requirements

Red - High Impact or Fails to Meet Most Requirements

Commentary regarding the results of the evaluation process is provided below.

Evaluation Commentary for Alternative #1

Alternative #1 includes a linear hangar development along Runway 4/22 and a roadway connecting Navajo Trail to Industrial Blvd. This alternative received “green” ratings for scalability, environmental considerations, and the ability to meet facility requirements. However, this alternative received a “yellow” rating related to its ability to maximize the ultimate development capacity of the area and its ability to accommodate additional expansion. These ratings were given because the proposed alternative fails to utilize the vast majority of the Runway 4/22 area for development. Additionally, the establishment of the new roadway prohibits the linear expansion of the proposed development further to the west. This alternative also received a “yellow” rating related to its ability to maximize the utilization of existing infrastructure. This rating was given became much of the western portion of the existing Runway 4/22 pavement is abandoned and not used under this alternative. This alternative also received a “yellow” rating related to the amount of non-revenue producing space it creates. This rating was given because of the large common use ramp area that is shown between the opposing hangars in the Runway 4/22 area.

Evaluation Commentary for Alternative #2

Alternative #2 includes a linear hangar development along Runway 4/22 and the development of two additional hangar pods to the south of the linear development. This alternative received “green” ratings for its scalability, utilization of existing infrastructure, environmental considerations, ability to meet facility requirements, and for its maximization of ultimate development capacity. The “green” ratings were given in these areas because this alternative blends a substantial use of the existing Runway 4/22 pavement with a modular development concept to maximize the development of hangars in the area. This alternative received a “yellow” rating related to its ability to accommodate additional expansion. This rating was given because the new roadway connecting Navajo Trail and Industrial Blvd. would limit further expansion to the west and leave some of the land in the Runway 4/22 area unused. This alternative also received a “yellow” rating related to the amount of non-revenue producing development required. This rating was given because of the common use ramp area that would need to be developed to connect the linear hangar development with the pod hangar developments.

Evaluation Commentary for Alternative #3

Alternative #3 includes the development of three pods of 8 hangars along the proposed realignment of Taxiway Romeo. Utilizing a pod development configuration minimizes the amount of non-revenue producing development required to enable hangar development. Consequently, this alternative received “green” ratings for its scalability, small amount of non-revenue producing development required, environmental considerations, and its ability to meet facility requirements. This alternative received a “yellow” rating for its utilization of existing infrastructure as the alternative abandons the majority of the existing Runway 4/22 pavement. For the same reason, this alternative also received a “yellow” rating related to maximization of the area’s ultimate development capacity. Finally, this alternative received a “yellow” rating related to its ability to accommodate additional expansion as the roadway system needed to connect the hangar pods will greatly limit the potential for future expansion. This alternative also showed the potential development of additional T-hangars in the Abilene Aero area as opposed to the development of additional box hangars. Since the demand for T-hangars at ABI is expected to be limited in the future, the T-hangar development option for the Abilene Aero area was eliminated.

Evaluation Commentary for Alternative #4

Alternative #4 includes a long linear hangar development along the existing Runway 4/22 pavement with a common taxilane in between the two rows of hangars. This alternative received “green” ratings for its scalability, maximization of existing infrastructure, environmental considerations, ability to meet facility requirements, and maximization of the area's ultimate development capacity. This alternative received a "yellow" rating related to the amount of non-revenue producing development required and its ability to accommodate additional expansion in the future.

Evaluation Commentary for Alternative #5

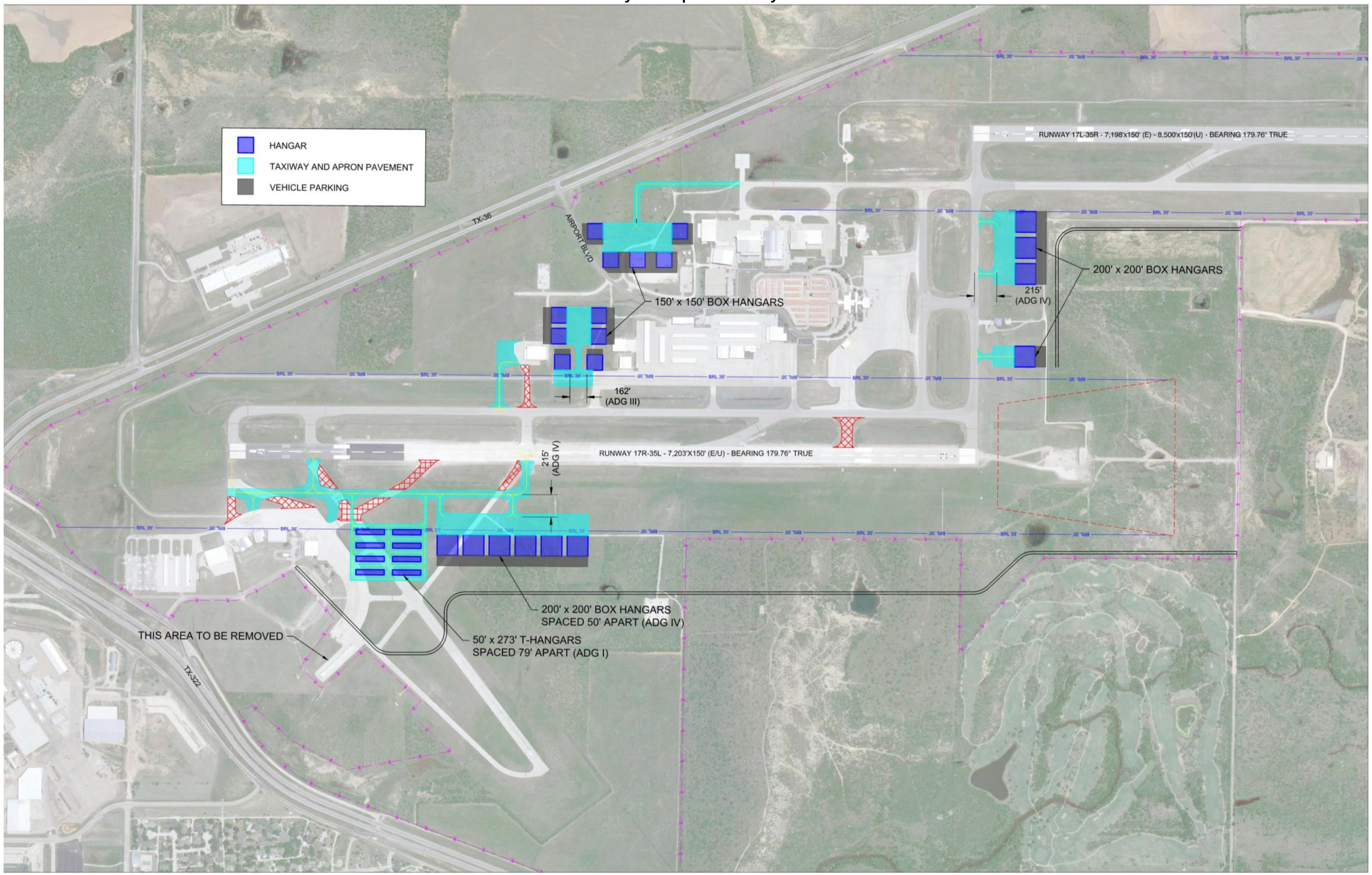
Alternative #5 includes development along the 17R-35L flightline and parallel Taxiway Romeo. It includes an apron for corporate hangar development and a separate t-hangar development area. Both hangar areas have access to Taxiway Romeo which will be developed when Runway 4/22 is decommissioned. An auto access road is included in Alternative #5 that connects Navajo Trail to Industrial Boulevard and allows for redevelopment of areas outside the access road for commercial or industrial use. This alternative received "green" ratings for its scalability, ability to accommodate additional expansion, environmental considerations, ability to meet facility requirements, and maximization of the area's ultimate development capacity. This alternative received a "yellow" rating related to the amount of non-revenue producing development required and its maximization of use of the existing Runway 4/22 infrastructure.

Preferred Aeronautical Facility Development Alternative

Based on the aeronautical facility development alternatives evaluation analysis described above and discussion with the Master Plan Steering Committee (MPSC) and airport stakeholders, Alternative #5 was selected as the preferred development alternative.

The preferred aeronautical facility development alternative is shown in **Figure 5-77**.

Figure 5-77
Aeronautical Facility Development Facility Alternative #5

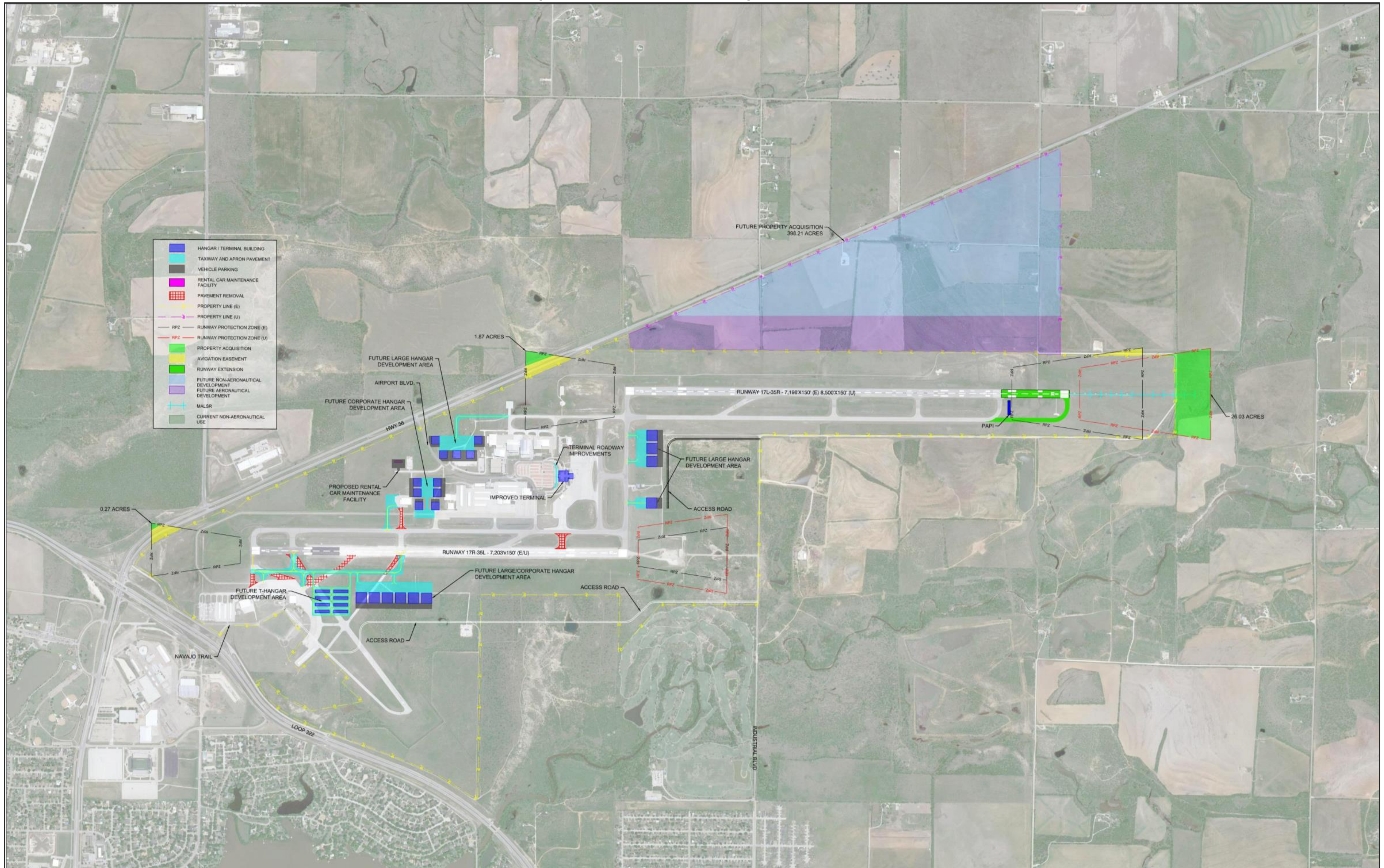


Source: Garver, 2018

Composite Recommended Development Alternative

The composite recommended development Alternative shown in **Figure 5-78** shows a composite development plan that combines each of the preferred development alternatives. This development plan will serve as the basis for the ultimate development shown in the Airport Layout Plan.

Figure 5-78
Composite Recommended Development Alternative



Source: Garver, 2018

Chapter 6 – Airport Layout Plan Narrative Report

Introduction

A set of Airport Layout Plan (ALP) drawings has been prepared for Abilene Regional Airport (ABI) that graphically depict the existing and proposed facilities through the 20-year planning program as recommended and approved by the City of Abilene. The set includes: Title Sheet, Airport Layout Drawing (ALD), Airport Airspace Drawing, Inner Portion of the Approach Surface Drawings, Departure Surface Drawings, Terminal Area Drawing, Land Use Drawing, and Exhibit A Airport Property Map.

Airport Layout Drawing

The Airport Layout Drawing (ALD) is a scaled single-page drawing depicting existing and ultimate airport development based on proposed land, facilities, and features recommended for the short and long-term operation and development of the Airport. In addition, the ALD displays separation and clearance distances for future unrestricted development of the Airport and navigational aid (NAVAID) facilities. The layout is the result of a series of analyses and discussions with the Planning Advisory Committee to determine the optimum plan to yield a safe and cost-effective facility. The proposed improvements include projects needed to meet the projected aviation demands of the airport service area throughout the next 20-years.

Airport Airspace Drawing

The airport airspace drawing is a graphical depiction showing the land use area covered by Federal Aviation Regulations (FAR) Part 77 imaginary airspace surface criteria, which is used as a federal guideline to determine whether existing or proposed structures represent obstructions to air navigation (penetrate any of the FAR Part 77 imaginary airspace surfaces). Once approved by the FAA, the FAR Part 77 airspace is reserved for aeronautical purposes. Therefore, it is recommended that the City of Abilene review and update their Height and Hazard zoning as necessary to reflect the updated Airspace Drawing, and to the extent reasonable, restrict and enforce the height of structures and objects of natural growth, as appropriate, within the FAR Part 77 airspace structure. The new airspace map associated with this project should be adopted and put in place as soon as possible to protect the airport.

Inner Portion of the Runway Approach Surface Drawings

This is a large-scale drawing showing the plan and profile views of the inner portions of the approach surfaces. The plans are designed to identify current and potential structures (roadways, powerlines, trees, etc.) in relation to the existing and ultimate runway threshold. This drawing aids in determining the clearance or violation of close-in objects based on top elevations as they are encountered along the extended runway centerline and within the approach surfaces. Each violation and/or obstruction is identified, with appropriate future mitigation recommendations.

Departure Surface Drawings

The departure surface drawing is a large-scale drawing showing the plan and profile views of the departure surfaces. The plans are designed to identify current and potential structures (roadways, powerlines, trees, etc.) in relation to the existing and ultimate runway threshold. This drawing aids in determining the clearance or violation of close-in objects based on top elevations as they are encountered along the extended runway centerline and within the departure surfaces. Each violation and/or obstruction is identified, with appropriate future mitigation recommendations.

Terminal Area Drawing

This is a large-scale drawing of the terminal area showing the ultimate construction of facilities to meet future terminal area requirements. The primary features of this plan include improvements to and new development of facilities and equipment. The ultimate design for the terminal area provides an adequate and functional layout for aircraft parking and maneuvering, hangar and terminal development, airport access and parking, maintenance facility development, and other types of airport-related development planned for the Airport. Additionally, the plan will provide adequate separation and clearances for future unrestricted development of all terminal facilities and equipment.

Land Use Drawing

The land use drawing is a single-page drawing, at the same scale as the ALD, showing all on-airport land uses to include: aeronautical purposes (runways/taxiways/safety areas), non-aeronautical use (revenue generation areas), terminal use, agricultural use, and light/heavy industrial use. Also depicted beyond the airport boundary are the land uses in the airport vicinity generally based on established zoning patterns.

Airport Exhibit A Property Map Drawing

This is a three-page drawing, Exhibit A - Property Map, showing an overlay of all relevant tracts of existing airport fee-simple property and aviation/avigation easement interests including the size (acres), date (grant agreement), and proposed airport property acquisition. Properties recommended for the ultimate build-out based on the recommendations of the master plan will be included along with existing ownership, type of ultimate ownership by the Airport, total acreage in the parcel, and ultimate acreage needed for airport development and safety, as available.

Chapter 7 – Financial Analysis

All data and projections are current as of the date the data was gathered and studied. Data and time periods may have changed by the time of publication.

Capital Improvement Plan (CIP)

The Capital Improvement Plan (CIP) and phased implementation plan establish an orderly series of improvements intended to support the growth and development of Abilene Regional Airport (ABI) in alignment with the preferred development concept outlined in the Alternatives chapter.

Many of the recommended improvements address safety and standardization of airfield facilities. Other projects will be focused on maintenance and rehabilitation and will be driven by the condition of the affected facility. For facility development or expansion projects, it is important to note that market demand, instead of timing will be the driver for initiating the expansion of facilities. Changes in types of activity or increases in activity levels or demand should be reviewed annually by the City of Abilene, FAA, and the Airport Management Team to determine if any of the changes should trigger the next steps of development. This exercise will aid the City of Abilene and FAA in building and updating the rolling 3-year Airport Improvement Program for ABI based on aviation demand.

In developing ABI's CIP and phased implementation plan, the following guidelines have been followed:

- The scheduling of projects is prioritized to permit improvements in a coordinated approach. The phasing and priority of each project have been determined with respect to airport safety, demand, compatibility with other airport projects, and FAA programming schedules.
- Overall, the CIP has been structured to provide the flexibility to meet short and long-range goals. Therefore, individual projects should not be considered as a single improvement, but as part of a project series that arrives at the ultimate concept
- The implementation plan does not represent an obligation of local funds, nor does it require funding without justification of demand levels by the City of Abilene, TxDOT, or Federal Aviation Administration (FAA).
- The expressed desire, intent, and ability of the City to achieve airport land use compatibility, coupled with favorable aesthetics transition, remains important planning and funding considerations.

Phased Implementation Plan

The Phased Implementation Plan is divided into the following terms:

- Phase I (0-5 years) – Short-term implementation projects
- Phase II (6-10 years) – Mid-term implementation projects
- Phase III (11-20 years) – Long-term implementation projects

Each phase consists of projects and improvements categorized by the following areas: 1) airside improvements and 2) terminal/landside improvements. The airside and terminal/landside implementation projects within each phase and their associated costs are shown in **Table 6-1 through Table 6-3**.

Table 6-1
Short-Term Projects
Abilene Regional Airport

SHORT TERM DEVELOPMENT		
NO.	**CAPITAL PROJECTS 2020**	**COST**
1	NEW ARFF STATION CONSTRUCTION - PHASE 2	$4,679,716
	TOTAL CAPITAL PROJECTS 2020	**$4,679,716**
CAPITAL PROJECTS 2021		
2	TERMINAL IMPROVEMENTS	$490,000
	TOTAL CAPITAL PROJECTS 2021	**$490,000**
CAPITAL PROJECTS 2022		
3	TERMINAL IMPROVEMENTS	$1,210,000
	TOTAL CAPITAL PROJECTS 2022	**$1,210,000**
CAPITAL PROJECTS 2023		
4	TERMINAL IMPROVEMENTS	$1,210,000
	TOTAL CAPITAL PROJECTS 2023	**$1,210,000**
CAPITAL PROJECTS 2024		
5	TERMINAL IMPROVEMENTS	$4,000,000
	TOTAL CAPITAL PROJECTS 2024	**$4,000,000**
TOTAL SHORT TERM PROJECT COSTS		**$11,589,716**

Table 6-2
Mid-Term Projects
Abilene Regional Airport

MID TERM DEVELOPMENT		
NO.	**CAPITAL PROJECTS 2024-2028**	**COST**
1	REPLACEMENT OF 2 EXISTING PBB BRIDGES	$1,740,000
2	DE-COUPLE RUNWAY 4/22 AND RUNWAY 17R/35L AND NORTHWEST GA RAMP REHABILITATION	$6,222,222
3	RECONSTRUCT T1 AND T2	$900,000
4	TAXIWAY R REALIGNMENT	$4,549,600
5	TAXIWAY CHARLIE 1 - PARTIAL CLOSURE-PROPERTY ACQUISITION	$321,750
6	EASTERN TAXIWAY SYSTEM (TAXIWAY D AND ASSOCIATED STUBS) REHABILITATION	$17,352,500
7	RUNWAY 17L/35R PAVEMENT REHABILITATION	$699,600
8	RUNWAY 17R/35L PAVEMENT REHABILITATION	$701,800
9	CENTRAL TAXIWAY SYSTEM (TAXIWAY M, N, P) REHABILITATION	$440,000
10	WESTERN TAXIWAY SYSTEM (TAXIWAY C AND ASSOCIATED STUBS) REHABILITATION	$418,000
11	RENTAL CAR MAINTENANCE FACILITY	$1,120,000
12	TERMINAL RENOVATION ADMINISTRATION AREA AND GENERAL CIRCULATION. APPROXIMATELY 6,251 SQ FT	$1,280,000
13	TERMINAL RENOVATION. TICKETING AND CHECK IN AREA. APPROXIMATELY 6,065 SQ FT	$4,020,000
14	TAXILANE DELTA EXTENSION TO NORTH	$2,349,600
15	HANGAR P TAXILANE REALIGNMENT	$1,936,000
TOTAL MID TERM PROJECT COSTS		**$44,051,072**

Table 6-3
Long-Term Projects
Abilene Regional Airport

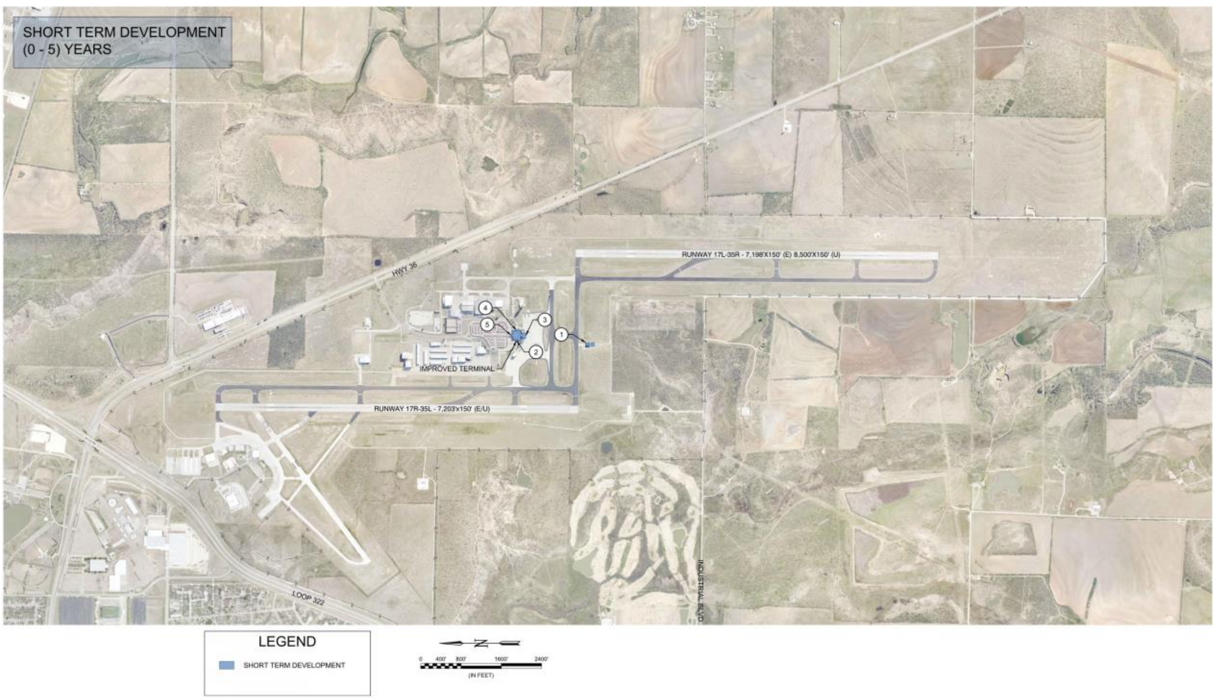
LONG TERM DEVELOPMENT		
NO.	**CAPITAL PROJECTS 2029-2038**	**COST**
1	TERMINAL EXPANSION - SSCP AREA APPROXIMATELY 10,450 SQ FT	$9,310,000
2	TERMINAL RENOVATION - BAGGAGE CLAIM AND CONCESSIONS AREAS APPROXIMATELY 14,326 SQ FT	$9,030,000
3	TERMINAL EXPANSION - HOLD ROOM AREA. APPROXIMATELY 5,640 SQ FT	$3,690,000
4	TERMINAL RENOVATION - HOLD ROOM AREA. APPROXIMATELY 5,735 SQ FT	$2,840,000
5	ACQUIRE ARFF TRUCK	$700,000
6	TERMINAL RENOVATION - SSCP AREA AND VERTICAL CORE. APPROXIMATELY 6,560 SQ FT	$3,580,000
7	ROADWAY AND CURBSIDE MODIFICATIONS, APPROXIMATELY 9,500 SQ FT	$140,000
8	TERMINAL EXPANSION - TICKET AND ENTRANCE AREA. APPROXIMATELY 11,845 SQ FT	$7,740,000
9	TAXIWAY ROMEO EXTENSION.	$5,084,200
10	NAVAJO CIRCLE ACCESS ROAD TO RUNWAY 4/22 REDEVELOPMENT AREA	$3,312,100
11	INDUSTRIAL BLVD. CONNECTION TO NEW NAVAJO CIRCLE ACCESS ROAD	$4,354,900
12	CORPORATE HANGAR RAMP AND ACCESS	$2,849,000
13	T-HANGAR RAMP AND ACCESS	$1,424,500
14	MID-FIELD ACCESS ROAD	$1,688,500
15	RUNWAY 17L/35R EXTENSION TO 8,500 FT, INCLUDES LIGHTING SYSTEM IMPROVEMENTS, RELOCATION OF MALSR, PAPI RELOCATION, LAND PURCHASE AND EXTENSION OF TWY D TO THE RUNWAY END	$9,600,000
16	RUNWAY 17L/35R OVERLAY	$5,291,000
17	LAND ACQUISITION OF 398 ACRES OF PROPERTY EAST OF RUNWAY 17L/35R	$1,393,000
TOTAL LONG TERM PROJECT COSTS		**$72,027,200**

Short-term Implementation Program

The short-term implementation period is the only planning horizon separated into single years. This is to allow the CIP to be coordinated with the planning cycle of the FAA. Specific timing of the projects will be reviewed against and ordered according to available funding in the financial analysis portion of this chapter.

Projects called out during this timeframe are very specific in terms of actual design and construction. As such, some projects are initially put through an environmental and/or design phase and then followed up with actual construction.

Exhibit 6-1
Short Term Projects



Source: Garver, 2018

The short-term implementation program considers 5 projects for the planning period as shown in **Exhibit 6-1**. The following provides a detailed breakdown of each project within FY 2020-2024.

FY 2020 Projects

Project #1: ARFF Station Replacement

Description: Project includes the replacement of the ARFF station.
Cost Estimate: $4,679,716
Funding Eligibility: AIP Entitlement Funding, Proposition 9 Local Match Funding.

FY 2021 Projects

Project #1: Acquire ARFF Truck

Description: Project includes the acquisition of the ARFF truck.
Cost Estimate: $600,000
Funding Eligibility: AIP Entitlement Funding, Proposition 9 Local Match Funding.

Project #2: Terminal Interior Rehabilitation – Phase 1

Description: Interior project that includes updates to restrooms, interior finishes, and passenger boarding bridge rehabilitation.
Cost Estimate: $490,000
Funding Eligibility: AIP Entitlement Funding, Proposition 9 Local Match Funding, Cash Reserves/Net Revenues.

FY 2022 Projects

Project #1: Terminal Interior Rehabilitation – Phase 2

Description: Interior project that includes updates to restrooms, interior finishes, and passenger boarding bridge rehabilitation.
Cost Estimate: $1,210,000
Funding Eligibility: AIP Entitlement Funding, Proposition 9 Local Match Funding, Cash Reserves/Net Revenues.

FY 2023 Projects

Project #1: Terminal Interior Rehabilitation – Phase 3

Description: Interior project that includes updates to restrooms, interior finishes, and passenger boarding bridge rehabilitation.
Cost Estimate: $1,210,000
Funding Eligibility: AIP Entitlement Funding, Proposition 9 Local Match Funding, Cash Reserves/Net Revenues.

FY 2024 Projects

Project #1: Terminal Interior Rehabilitation – Phase 4
Description: Interior project that includes updates to restrooms, interior finishes, and passenger boarding bridge rehabilitation.
Cost Estimate: $4,000,000
Funding Eligibility: AIP Entitlement Funding, Proposition 9 Local Match Funding, Cash Reserves/Net Revenues.

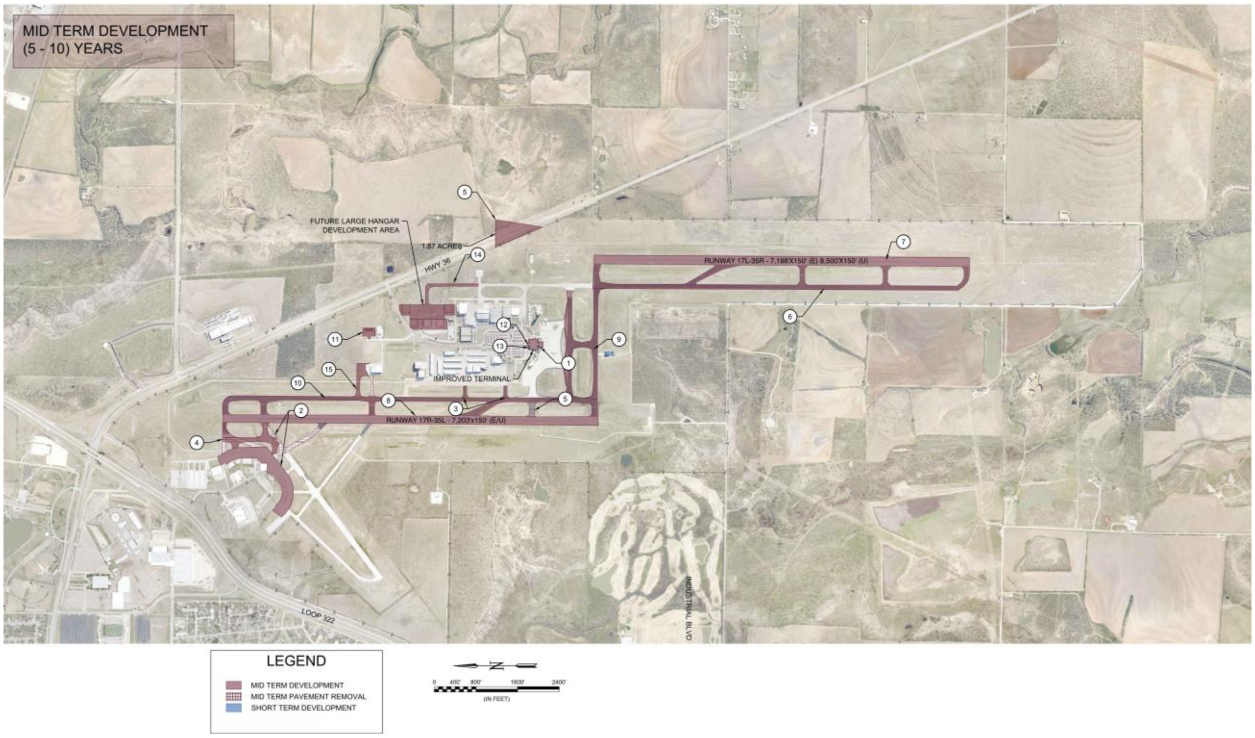
Summary

The short-term CIP includes projects that focus on the interior of the terminal building and construction of an ARFF facility. The total investment necessary for the short-term CIP is approximately $11 million.

Mid-Term Implementation Program

The mid-term covers the period 6-10 years and includes 14 projects. These projects are shown in **Exhibit 6-2**. Planning projects beyond the short-term timeframe can be challenging. Due to the fluid nature of funding availability and the possibility of changing priorities, these projects have been grouped together into a single project list and not prioritized by year. Further evaluation of these projects should occur during this planning horizon to determine their order of importance based upon airport safety, demand, and efficiency.

Exhibit 6-2
Mid-Term Projects



Source: Garver, 2018

The following section includes a description of each project.

Project #1: Passenger Boarding Bridges – Design and Construction

Description: Project to replace the existing two passenger boarding bridges.
Cost Estimate: $1,740,000
Funding Eligibility: Other Unidentified Funding.

Project #2: Northwest GA Ramp Rehabilitation – Design and Construction

Description: Pavement rehabilitation project in the GA area west of Runway 17R/35L.
Cost Estimate: $6,222,222
Funding Eligibility: Other Unidentified Funding.

Project #3: Reconstruct T1 and T2 – Design and Construction

Description: Project to reconstruct the T1 and T2 access taxiways to the corporate aviation ramp area to Taxiway Design Group and current Advisory Circular dimensional standards.
Cost Estimate: $900,000
Funding Eligibility: AIP Entitlement Funding, Passenger Facility Charges (PAYG).

Project #4: Deactivate Runway 4/22 - Realign Taxiway R – Design and Construction

Description: Project to deactivate and decouple Runway 4/22 from Runway 17R/35L and to realign Taxiway R to parallel taxiway configuration. Project also removes pavement west of Runway 17R/35L to meet new Design Standards Advisory Circular.
Cost Estimate: $4,549,600
Funding Eligibility: AIP Discretionary Funding, Other Unidentified Funding.

Project #5: Taxiway Charlie 1 – Design and Construction

Description: Project includes closure and removal of Taxiway Charlie 1 between Taxiway C and Runway 17R/35L to meet new Design Standard Advisory Circular.
Cost Estimate: $321,750
Funding Eligibility: AIP Discretionary Funding, Other Unidentified Funding.

Project #6: Eastern Taxiway System Rehabilitation – Design and Construction

Description: Pavement rehabilitation project on Taxiway D and associated stub/connector taxiways.
Cost Estimate: $17,352,500
Funding Eligibility: AIP Entitlement Funding, AIP Discretionary Funding, Passenger Facility Charges (PAYG), Other Unidentified Funding.

Project #7: Runway 17L/35R Pavement Rehabilitation – Design and Construction

Description: Pavement rehabilitation of Runway 17L/35R consisting of a crack seal, seal coat, and remarking of the runway pavement.
Cost Estimate: $699,600
Funding Eligibility: AIP Entitlement Funding, Passenger Facility Charges (PAYG).

Project #8: Runway 17R/35L Pavement Rehabilitation – Design and Construction

Description: Pavement rehabilitation of Runway 17R/35L consisting of a crack seal, seal coat, and remarking of the runway pavement.
Cost Estimate: $701,800
Funding Eligibility: AIP Entitlement Funding, Passenger Facility Charges (PAYG).

Project #9: Central Taxiway System Rehabilitation – Design and Construction

Description: Pavement rehabilitation of Taxiways M, N, and P consisting of a crack seal, seal coat, and remarking of the taxiway pavement.
Cost Estimate: $440,000
Funding Eligibility: AIP Entitlement Funding, Passenger Facility Charges (PAYG).

Project #10: Western Taxiway System Rehabilitation – Design and Construction

Description: Pavement rehabilitation of Taxiway C and associated stub/connector taxiways consisting of crack seal, seal coat, and pavement remarking.
Cost Estimate: $418,000
Funding Eligibility: AIP Entitlement Funding, Passenger Facility Charges (PAYG).

Project #11: Rental Car Maintenance Facility, Design, and Construction

Description: Design and construction of an approximately 17,100 square foot facility that includes a 4-maintenance bay +1 car wash bay to be constructed in preferred location.
Cost Estimate: $1,120,000
Funding Eligibility: Cash Reserves/Net Revenues.

Project #12: Terminal Renovation – Design and Construction

Description: Project includes removal of the retail concession area, renovation of existing Airport administration area, and improvements for upper and lower level general circulation improvements.
Cost Estimate: $1,280,000
Funding Eligibility: AIP Entitlement Funding, Passenger Facility Charges (PAYG), New City GO Debt Proceeds.

Project #13: Terminal Renovation – Design and Construction

Description: Project to move and rotate ticketing counters into new location, converting 6 existing counters into 3 conventional counters plus 4 check-in kiosks and two bag drop locations. Also includes relocation of airline support offices into space behind the new ticketing counters.
Cost Estimate: $4,020,000
Funding Eligibility: AIP Entitlement Funding, Passenger Facility Charges (PAYG), New City GO Debt Proceeds.

Project #14: Taxilane Delta Extension– Design and Construction

Description: Project to extend Taxilane Delta to the North for expansion of maintenance hangar area.
Cost Estimate: $2,349,600
Funding Eligibility: Public/Private Funding.

Project #14: Hangar P Taxilane Realignment– Design and Construction

Description: Project to realign Taxilane P adjacent to C3 to meet the new Design Standards Advisory Circular.
Cost Estimate: $1,936,000
Funding Eligibility: AIP Discretionary Funding, Other Unidentified Funding.

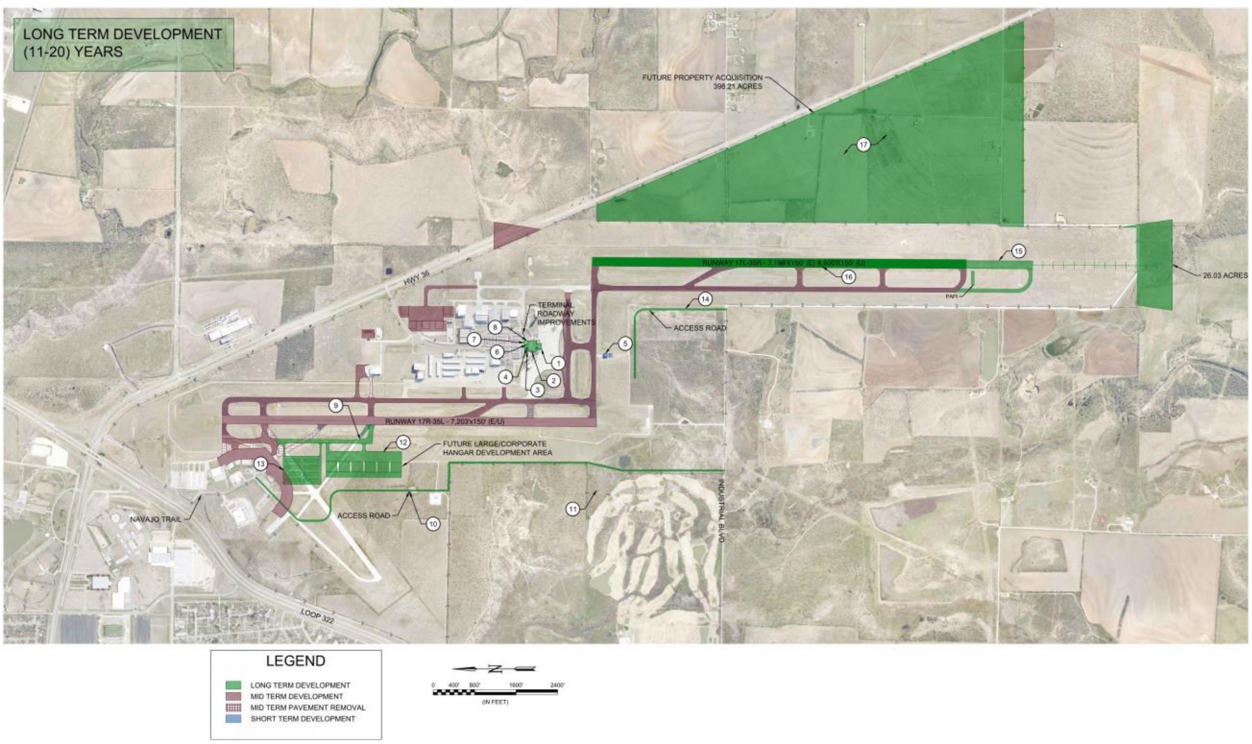
Summary

Projects in the mid-term begin to pursue more comprehensive updates to the terminal building but have an emphasis on maintaining and rehabilitating the airfield pavement assets. Approximately $44 million dollars' worth of improvements are planned for the mid-term planning horizon.

Long-Term Implementation Program

The long-term planning period covers the period 11-20 years and includes 17 projects. These projects are shown in **Exhibit 6-3**. Due to the fluid nature of funding availability and the possibility of changing priorities, these projects have been grouped together into a single project list and not prioritized by year. Further evaluation of these projects should occur during this planning horizon to determine their order of importance based upon airport safety, demand, and efficiency. Additional long-term horizon projects will include a privately funded hangar and business developments that are included on the airport layout plan and in the master plan development concepts. Costs for privately funded projects are not included as part of this analysis.

Exhibit 6-3
Long Term Projects



Source: Garver, 2018

The following section includes a description of each project.

Project #1: Terminal Expansion – Design and Construction

Description: Project includes expansion of the main building core to include a new baggage handling system on the east side of the building and a new airport administrative space on the west side. The passenger screening area is relocated into the east expansion on level 2.
Cost Estimate: $9,310,000
Funding Eligibility: AIP Entitlement Funding, Passenger Facility Charges (PAYG), and Other Unidentified funding.

Project #2: Terminal Renovation – Design and Construction

Description: Project includes renovation of the bag claim and rental car counter areas on Level 1, renovation of food and beverage concessions space on level 2, and construction of a VIP lounge in the area previously occupied by airport administration.
Cost Estimate: $9,030,000
Funding Eligibility: Other Unidentified funding, Cash Reserves/Net Revenues.

Project #3: Terminal Expansion – Design and Construction

Description: Project includes expansion of the existing holdroom, construction of airline support space below the holdroom expansion.
Cost Estimate: $3,690,000
Funding Eligibility: AIP Entitlement Funding, Passenger Facility Charges (PAYG), and Other Unidentified funding.

Project #4: Terminal Renovation – Design and Construction

Description: Project includes renovation of the existing holdroom and removal of airline support space adjacent to SSCP.
Cost Estimate: $2,840,000
Funding Eligibility: Other Unidentified funding.

Project #5: Acquire ARFF Truck

Description: Project includes the acquisition of the ARFF truck.
Cost Estimate: $700,000
Funding Eligibility: AIP Entitlement Funding, Passenger Facility Charges (PAYG).

Project #6: Terminal Renovation – Design and Construction

Description: Project includes expansion of SSCP from 2-lane to 3-lane checkpoint, removal of existing central staircase, and construction of new vertical core in the North end of the building.
Cost Estimate: $3,580,000
Funding Eligibility: AIP Entitlement Funding, Passenger Facility Charges (PAYG), and Other Unidentified funding.

Project #7: Roadway & Curbside – Design and Construction

Description: This project includes approximately 9,500 square feet of roadway and curbside modifications.
Cost Estimate: $140,000
Funding Eligibility: Cash Reserves/Net Revenues.

Project #8: Terminal Expansion – Design and Construction

Description: North expansion to Level 2 of the main terminal building reaching over the existing upper level roadway, to include additional ticketing and airline support space, and expansion to the building entrance on Level 1.
Cost Estimate: $7,740,000
Funding Eligibility: Other Unidentified funding.

Project #9: Taxiway Romeo Extension to Taxiway Charlie 3 Crossing – Design and Construction

Description: Project includes an extension from Taxiway Romeo to Taxiway Charlie 3 Crossing.
Cost Estimate: $5,084,200
Funding Eligibility: AIP Entitlement, AIP Discretionary, Other Unidentified funding.

Project #10: Navajo Circle Access Road to Runway 4/22 – Design and Construction

Description: Project includes the design and construction of Navajo Circle Access road to Runway 4/22 redevelopment area.
Cost Estimate: $3,312,100
Funding Eligibility: Public/Private Funding.

Project #11: Industrial Blvd. Connection to new Navajo Circle Access Road – Design and Construction

Description: Project includes a connection from Industrial Blvd to the new Navajo Circle Access Road.
Cost Estimate: $4,354,900
Funding Eligibility: Other Unidentified funding.

Project #12: Corporate Hangar Ramp and Access

Description: Project includes design and construction of a corporate hangar ramp and associated taxiways off the extended Taxiway Romeo in the Runway 4/22 redevelopment area.
Cost Estimate: $2,849,000
Funding Eligibility: Other Unidentified funding.

Project #13: T-Hangar Ramp and Access

Description: Project includes design and construction of a T-Hangar ramp and associated taxiways off the extended Taxiway Romeo in the Runway 4/22 redevelopment area.
Cost Estimate: $1,424,500
Funding Eligibility: Other Unidentified funding.

Project #14: Mid-Field Access Road – Design and Construction

Description: Project includes the design and construction of a mid-field access road.
Cost Estimate: $1,688,500
Funding Eligibility: Public/Private Funding.

Project #15: Runway 17L/35R Extension to 8,500 feet – Design and Construction

Description: Project includes improvements to the lighting system, relocation of MALSR, PAPI relocation, land purchase, and extension of Taxiway D to the runway end.
Cost Estimate: $9,600,000
Funding Eligibility: AIP Entitlement, Other Unidentified funding.

Project #16: Runway 17L/35R Overlay – Design and Construction

Description: Project includes the overlay of Runway 17L/35R.
Cost Estimate: $5,291,000
Funding Eligibility: AIP Entitlement, AIP Discretionary Funding, Other Unidentified Funding.

Project #17: Land Acquisition of 398 Acres of Property East of Runway 17L/35R – Design and Construction

Description: Project includes the acquisition of 398 acres of land East of Runway 17L/35R.
Cost Estimate: $1,393,000
Funding Eligibility: Public/Private Funding.

Summary

Projects in the long-term include major terminal renovations and expansions that will be triggered by increased passenger activity. Airfield projects include the redevelopment of the Runway 4/22 area to accommodate GA and Corporate hangar demand and business demand. All long-term development projects will be demand driven and incorporated into the ACIP as needed and when appropriate. Approximately $72 million dollars' worth of improvements are planned for the long-term planning horizon.

Capital improvement Summary

The CIP is intended as a road map of airport improvements to help guide the City of Abilene, Airport Executive Staff, and the FAA. The plan, as presented, will help accommodate the forecast increases in passenger, business, and aviation activity demand at ABI over the next 20 years and beyond.

Financial Implementation Analysis

Financial Analysis Objectives

The primary objective of the Financial Implementation Analysis for the Abilene Regional Airport (ABI) Master Plan is to evaluate the Airport's capability to fund the Capital Improvement Program and to finance Airport operations. The program is planned for implementation through three phases of development including a five-year Short-Term period (2019-2023), a five-year Mid Term period (2024-2028), and a ten-year Long-Term period (2029-2038). The analysis includes the development of a detailed Financial Implementation Plan. Objectives for developing the Financial Implementation Plan include presenting the results of the implementation evaluation and providing practical guidelines for matching an appropriate amount and timing of financial sources with the planned use of funds.

Overall Approach

The overall approach for conducting the Financial Implementation Analysis included the following steps:

- Gathering and reviewing key Airport documents related to historical financial results, capital improvement plans, operating budgets, regulatory requirements, City policies, airline agreements, and other operating agreements with Airport users
- Interviewing key Airport officials to gain an understanding of the existing operating and financial environment, relationships with the airlines, and overall management philosophy
- Reviewing the Aviation Activity Forecast previously developed in the Master Plan
- Reviewing the Capital Improvement Program project cost estimates and development schedules anticipated for the planning period and projecting the overall financial requirements for the program
- Determining and analyzing the sources and timing of capital funds available to meet the financial requirements for operating the Airport and financing the Capital Improvement Program
- Analyzing historical operations and maintenance expenses, developing operations and maintenance expense growth assumptions, reviewing assumptions with Airport management, and projecting future operations and maintenance expenses for the planning period
- Analyzing historical revenue sources, developing revenue growth assumptions, reviewing assumptions with Airport management, and projecting future airline and non-airline revenues for the planning period
- Completing the results of the review in a Financial Analysis Summary that evaluates the financial reasonableness of the Capital Improvement Program

Capital Funding Sources

In the past, the Airport has used a combination of FAA Airport Improvement Program (AIP) entitlement and discretionary grants, Passenger Facility Charges, City Capital Contributions, and cash reserves/net operating revenues to fund capital improvements. These funding sources, as well as additional sources of capital funding, will continue to be important to finance the Airport's Master Plan Capital Improvement Program (CIP) during the future twenty-year planning period.

Airport Improvement Grants

The Airport receives grants from the Federal Aviation Administration (FAA) to finance the eligible costs of certain capital improvements. These federal grants are allocated to commercial passenger service airports through the Airport Improvement Program (AIP). AIP grants include passenger entitlement grants, which are allocated among airports by a formula that is based on passenger enplanements and discretionary grants which are awarded in accordance with FAA guidelines. On October 5, 2018, after several years of continuing budget resolutions and other short-term legislative measures implemented by Congress, the FAA Reauthorization Act of 2018 was enacted and authorized funding for the AIP through September 30, 2023.

Under current AIP authorization legislation, eligible projects are funded on a 90% AIP grant/10% local match basis for small and non-hub airports. Under this authorization, the Airport is projected to receive current entitlements of about $1.1 million in 2019 and future annual grants which are projected to grow to $1.3 million by 2038 - the end of the planning period. Non-Hub airports (those with annual enplanements between 10,000 passengers and approximately 449,000 passengers) can accumulate and carryover up to three years of unspent entitlements plus the current year before the awards are revoked. In 2019, the Airport had $1.1 million in entitlements to carryover for use in 2019. The implementation analysis assumes the application of annual AIP passenger entitlement funds will be about $6.7 million during the Short-Term planning period, $6.4 million during the Mid Term and $13.2 million during the Long Term.

The approval of AIP discretionary funding is based on a project eligibility ranking method the FAA uses to award grants, at their discretion, based on a project's priority and importance to the national air transportation system. In past years, Abilene received discretionary funding to support apron and taxiway reconstruction and extension projects, and most recently, Runway 17L/35R and Runway 17R/35L rehabilitation projects. It is reasonable to assume that the Airport will receive additional discretionary funding during the planning period for higher priority, eligible projects, such as airfield safety projects, Eastern Taxiway System (Taxiway D) rehabilitation, taxiway extension, a runway extension, and future runway rehabilitation projects. The implementation analysis assumes that $6.7 million of AIP discretionary funds will be required during the Short Term for projects to meet the new airfield design standards including the closure and removal of Taxiway C1, Hangar P Taxiway realignment, Taxiway R

Realignment, and the decoupling of Runway 4/22 and Runway 17R/35L. The implementation analysis also assumes that AIP discretionary grants of about $16.4 million will be available for the rehabilitation of the Eastern Taxiway System, including Taxiway D and associated stubs during the five-year Mid Term period. An additional $23.0 million of AIP discretionary funds are assumed for the Long Term for the extension of Taxiway R to Taxiway C3 crossing, the extension of Runway 17L/35R, and an overlay of Runway 17L/35R. Since the future availability of AIP discretionary grants is not certain until an actual grant is awarded, it should be noted that any CIP projects which have discretionary funds indicated as a funding source in the implementation plan may need to be delayed until such funds actually become available.

The Airport works with the FAA to identify projects included in its CIP that may be candidates for funding from these additional supplemental appropriations. As the award of such funds remains undetermined, this implementation analysis does not assume the receipt of additional "supplemental" funds. However, should the Airport be awarded funding for projects through supplemental appropriations, it is likely that AIP entitlement funds assumed to fund those projects would be replaced with supplemental funds and made available to fund other eligible projects in the CIP.

The implementation analysis further assumes that the current AIP program will continue to be extended through 2038 and that future program authorizations will provide substantially similar funding levels as it currently does and as it has historically provided since the program was established in 1982.

Passenger Facility Charges

The Aviation Safety and Capacity Expansion Act of 1990 established the authority for commercial service airports to apply to the FAA for imposing and using a Passenger Facility Charge (PFC) of up to $3.00 per eligible enplaned passenger. With the passage of AIR-21 in June 2000, airports could apply for an increase in the PFC collection amount from $3.00 per eligible enplaned passenger to $4.50. The proceeds from PFCs are eligible to be used for AIP eligible projects and for certain additional projects that preserve or enhance capacity, safety, or security; mitigate the effects of aircraft noise; or enhance airline competition. PFCs may also be used to pay debt service on bonds (including principal, interest, and issue costs) and other indebtedness incurred to carry out eligible projects. In addition to funding future planned projects, the legislation permits airports to collect PFCs to reimburse the eligible costs of projects that began on or after November 5, 1990.

ABI currently collects PFC revenues through an approved application at the $4.50 collection level. Current collections at the $4.50 collection level are approximately $350 thousand per year. This open application is expected to be fully collected in 2022. PFC collections from 2019 through 2022 are committed to repayment of costs expended on those projects included in the existing open application.

The implementation analysis assumes that the Airport will submit new PFC applications to fund future projects included in the CIP. The analysis assumes that PFC collections available for use on the projects included in the CIP will be about $504 thousand during the Short-Term planning period, $1.9 million during the Mid Term and $4.2 million during the Long Term.

The implementation analysis assumes that the Airport will use approximately $101 thousand in PFC funds to provide the local match to AIP grants to fund taxiway reconstruction projects at the end of the Short Term. During the Mid Term, the analysis assumes that the Airport will use approximately $1.4 million on a pay-as-you-go basis to find the local match to AIP grants for runway and taxiway rehabilitation projects. The implementation analysis assumes that PFCs will be used on a pay-as-you-go basis to fund terminal improvement projects of approximately $1.6 million in the Long Term.

In addition to using PFCs on a pay-as-you-go basis, the implementation analysis assumes that at the beginning of the Mid Term, the City will issue approximately $5 million in general obligation bonds to undertake a significant terminal rehabilitation project. Of the $5 million issued, it is estimated that approximately $2.8 million in principal costs will be retired using the City's general fund revenues. The remaining $2.2 million in principal is anticipated to be funded with PFC funds. Additionally, the analysis assumes that PFC funds in the amount of approximately $1.3 million will be used to fund the PFC eligible financing and interest cost on those bonds.

The implementation analysis assumes that the Airport will submit PFC applications and amendments, as required, to ensure that the collection of PFC revenues continues uninterrupted beyond the authorized expiration date through the end of the twenty-year planning period in 2038. As shown in **Schedule 6-3**, the analysis assumes 20-year debt at an interest rate of 5%. Annual debt service funded with PFC revenues would be approximately $174 thousand.

Proposition 9 Local Match Funding

In 2015, the City of Abilene began issuing general obligation bonds for voter approved capital improvement projects estimated to cost approximately $81 million. The bond program dedicated $4.2 million to Proposition 9, a local match that enables Abilene Regional Airport to receive $38 million in federal airport improvement grants. Of the $4.2 million, $2.0 million has been spent or committed on projects already completed or underway such as the reconstruction of Runway 17R/35L. The implementation analysis assumes that the remaining $2.2 million of Proposition 9 funds available will be used to fund, along with AIP funds, the following projects in the Short Term: the Aircraft Rescue and Firefighting (ARFF) Station Replacement, the acquisition of an ARFF truck, land acquisition in a runway protection zone, and rehabilitation of the terminal interior such as restrooms, interior finishes, and passenger boarding bridge rehabilitation.

Public/Private Funding

ABI is a municipally owned facility. The Airport is part of the General Fund of the City of Abilene, Texas. The City may periodically provide funding to the Airport for capital projects from its local capital budget. In 1989, the Development Corporation of Abilene (DCOA) was formed as a Type A municipal economic development corporation. The DCOA utilizes a portion of the local sales tax to provide incentives to existing and new employers in the creation and retention of jobs in the Abilene community. The DCOA may also provide funding toward Airport capital development as may qualify as economic development. Additionally, certain on-airport development projects may be funded through private third-party funding. This is frequently the case for general aviation development. The implementation analysis assumes public/private funding in the Mid Term of the planning period of approximately $2.8 million for a proposed extension of Taxiway D to the North. Additionally, in the Long Term of the planning period, approximately $9.7 million is assumed for land acquisition as well as the construction of the Navajo Circle Access Road and Mid-Field Access Road. These access roads would provide access to new or expanded general aviation and other aeronautical facilities. If public/private funding does not materialize in the time frame needed, the associated projects may have to be modified, delayed, or canceled until such funding is committed.

City General Obligation Debt

In addition to traditional sources such as AIP and PFC funding, capital development at ABI has also historically been funded through City funded debt, such as general obligation bonds or certificates of obligation. Repayments of such debts have been funded through property taxes, such as the recent Proposition 9 funding, or funded through other general fund revenues, including Airport revenues.

As described in Section 6.3.2 above, the implementation analysis assumes that at the beginning of the Mid Term, the City will issue approximately $5 million in general obligation bonds to undertake a significant terminal rehabilitation project. Of the $5 million issued, it is estimated that approximately $2.8 million in principal costs will be retired using the City's general fund revenues. As shown in **Schedule 6-3**, the analysis assumes 20-year debt at an interest rate of 5%. Annual debt service funded with general funds would be approximately $223,000.

Other Unidentified Funding

The traditional airport capital funding sources described in the preceding paragraphs are insufficient in amount and timing to finance a number of capital projects planned for implementation during the planning period. These projects include the local match of safety projects, including taxiway and taxilane realignment and runway de-coupling projects, programmed in the Short-Term planning period in anticipation of AIP discretionary funds. In the Mid Term, projects with unidentified funding include replacement of passenger loading bridges, northwest general aviation ramp rehabilitation, and a portion of rehabilitation of the Eastern Taxiway System (Taxiway D and Associated Stubs). In the Long Term, significant terminal expansion and rehabilitation projects as well as general aviation taxilane, ramp and access expansion projects, a runway extension project, and a runway rehabilitation project rely on the availability of currently unidentified funding. Consequently, non-traditional funding sources will be needed to finance the cost of projects totaling about $744 thousand during the Short Term of the planning period, $10.6 million during the Mid-Term planning period, and $59.5 million during the Long-Term planning period. The source of this non-traditional "other" funding has not yet been determined and represents a shortfall for the capital project implementation plan. This "other" funding may potentially include sources such as future private third-party funding, federal economic stimulus grants, City and local economic development funding, and other possible sources that are not certain at this time. If other funding sources cannot be identified and obtained in the time frame needed, the associated projects will have to be modified, delayed, or canceled until such funding can be identified. Consequently, this source of capital funding has been referenced in the Financial Implementation Analysis as "Other Unidentified Funding".

Cash Reserves/Airport Net Operating Revenue

At the beginning of 2019, the Airport had accumulated about $1.6 million in unrestricted cash reserves available for operations and capital project funding.

Revenue and expense projections included in the Financial Implementation Analysis indicate that the Airport is currently operating at a deficit and requires a subsidy from the General Fund to cover operations as well as an existing debt issuance which is scheduled to be paid in full in 2022. The Airport and the City are working to reverse this trend by generating additional revenue from existing operating revenue sources and by identifying new sources of operating revenue for the Airport. Based on operating revenue and expense projections, the Airport should be self-sustainingly by the end of the Short-Term planning period. Once this point is reached, it is anticipated that the Airport and City will adopt financial practices to accumulate net operating revenues to build an unrestricted cash balance in the Airport fund to establish a prudent minimum balance. For conservative planning purposes, the Financial Implementation Analysis assumes very limited net operating revenue available for capital development.

The implementation analysis assumes that Airport cash reserves/net operating cash flow will be used throughout the planning period to fund about $4.2 million in project costs. This will include some rental car facility improvements, terminal improvements, and roadway improvements. The implementation analysis assumes $2.2 million during the Short Term, and $2.0 million in the Long Term.

Financial Analysis and Implementation Plan for the Master Plan Capital Improvement Program

This analysis, along with the Schedules presented at the end of Chapter 6, provides the results of evaluating the financial reasonableness of implementing the Master Plan Capital Improvement Program during the planning period from 2019 through 2038.

Estimated Project Costs and Development Schedule

The Capital Improvement Program (CIP) Estimated Project Costs and Development Schedule is derived from previous results of the Master Plan analysis. The CIP for capital expansion and improvement projects is projected on an annual basis for the Short-Term planning period from 2019 through 2023, in total for the Mid-Term planning period from 2024 through 2028, and in total for the Long-Term planning period from 2029 through 2038. For each of these planning periods, **Schedule 6-1** (provided at the end of Chapter 6) presents the Capital Improvement Program including estimated costs and anticipated development schedule for the identified projects.

As shown in **Schedule 6-1**, the total estimated cost of projects is $125,939,005 in 2019 dollars. The estimated costs for projects scheduled during the period 2019 through 2038 are adjusted by an assumed 3% rate of annual inflation. The resulting total project costs escalated for inflation are $171,630,832. **Table 6-4** presents a summary of the Schedule and provides a comparison of 2019 base year costs with escalated costs adjusted for inflation for each of the planning periods.

Table 6-4
Summary of 2019 Base Year and Total Escalated Costs
Abilene Regional Airport

Planning Periods	2019 Base Year Costs	Total Escalated Costs
Short Term Projects (2019-2023)	$18,999,972	$20,305,293
Mid Term Projects (2024-2028)	34,058,410	41,941,748
Long Term Projects (2029-2038)	72,830,623	109,751,026
Total Project Costs	$125,939,005	$171,630,832

Source: Leibowitz & Horton AMC Analysis
Note: Addition errors are due to rounding of calculated amounts
Includes financing costs

6.4.2 Sources and Uses of Capital Funding

Funding sources for the CIP depend on many factors, including AIP and PFC project eligibility, the ultimate type and use of facilities to be developed, management's current and desired levels of the Airport's airline cost per enplaned passenger, the availability of other financing sources and the priorities for scheduling project completion. For master planning purposes, assumptions were made related to the funding source of each capital improvement.

Schedule 6-2 (provided at the end of Chapter 6) lists each of the CIP projects, their estimated costs (escalated annually for inflation), and the assumed funding sources and amounts. During the twenty-year planning period, it was assumed that AIP entitlement grants would partially fund ARFF facilities and equipment, terminal building rehabilitation and expansion, runway/taxiway rehabilitation, land acquisition, and general aviation facilities improvements. It was assumed that AIP discretionary grants would partially fund runway/taxiway rehabilitation and general aviation facilities improvements. PFC pay-as-you-go revenues were assumed to fund a portion of AIP eligible projects, including runway and taxiway improvements, terminal building rehabilitation and expansion, and ARFF facilities and equipment. New City issued general obligation debt is assumed to fund the Mid-Term terminal building rehabilitation improvements, a portion of which would be funded through PFC funds. Proposition 9 Funds were assumed to provide partial funding in addition to AIP grants during the Short-Term for ARFF station improvements and equipment, land acquisition, and terminal interior rehabilitation. Public/Private funding has been identified for the development of certain taxiway improvements as well as general aviation development. Projects for which funding has not been identified, reflected as "Other Unidentified Funding" include continued terminal building rehabilitation and expansion work, general aviation development, and some runway/taxiway improvements. Available cash reserves were assumed to fund rental car improvements, terminal roadway improvements, and terminal building improvements.

A summary of the sources of capital funding by type and uses of capital funding by planning period for the CIP is presented in **Table 6-5**.

Table 6-5
Summary of Sources and Uses of Capital Funding
Abilene Regional Airport

Sources of Capital Funding	Short Term (2019-2023)	Mid Term (2024-2028)	Long Term (2029-2038)	Totals
AIP Entitlement Grants	$6,694,179	$6,437,023	$13,199,373	$26,330,574
AIP Discretionary Grants	8,312,702	15,172,623	22,995,191	46,113,281
Passenger Facility Charge Debt	0	2,674,341	803,423	3,477,765
Passenger Facility Charges	101,296	1,447,889	1,589,889	3,139,074
Proposition 9 Local Match Funding	2,200,000	0	0	2,200,000
Public/Private Funding	0	2,847,317	9,670,894	12,518,211
New City GO Debt Proceeds	0	2,784,949	0	2,784,949
Other Unidentified Funding	743,858	10,577,606	59,507,849	70,829,313
Cash Reserves/Net Ops Cash Flow	2,253,258	0	1,984,407	4,237,665
Total Sources of Capital Funding	$20,305,293	$41,941,748	$109,751,026	$171,630,832
Uses of Capital Funding				

Runway/Taxiway Improvements	$3,901,933	$31,585,092	$22,523,974	$57,589,127
Terminal Roadway and Parking Improvements	0	0	211,763	211,763
Terminal Building Improvements	4,370,908	9,038,598	55,544,045	68,953,551
General Aviation Facility Improvements	6,222,222	1,318,058	28,305,394	35,845,674
Land Acquisition	0	0	2,107,037	2,161,674
ARFF Building and Equipment	4,656,630	0	1,058,813	5,715,443
Other Improvements	**1,153,600**	**0**	**0**	**1,153,600**
Total Uses of Capital Funding	$20,305,293	$41,941,748	$109,751,026	$171,630,832

Source: Leibowitz & Horton AMC Analysis
Note: Addition errors are due to rounding of calculated amounts.

Projected Operations and Maintenance Expenses

Operations and maintenance expense projections for the Short Term (2019 to 2023), the Mid Term (2024 to 2028), and the Long Term (2029 to 2038) planning periods are based on the Airport's 2019 budget, the anticipated impacts of inflation, aviation traffic increases, facility improvements and the recent experience of other airports with similar levels of aviation activity.

Operations and Maintenance Expense Projection Assumptions

Operations and maintenance expense growth assumptions, as reflected in **Schedule 6-4**, were developed to project the Airport's operating expenses during the planning period. Actual amounts for 2016 through 2018 and budgeted amounts for 2019 provide a comparison with expenses that are projected for the period 2020 through 2038.

For each of the following expense categories listed below, projections are based on 2019 budgeted amounts with an assumed 3% annual rate of inflation beginning in 2020.

- Personal Services – Salaries/Wages
- Personal Services – Benefits
- Supplies
- Maintenance
- Utilities
- Professional Services
- Advertising & Promotion
- Fleet Fuel and Maintenance
- Equipment Replacement
- Technology Fund Transfer
- Other Services and Charges

Projection of Operations and Maintenance Expenses and Operating Expenses Per Enplaned Passenger

The projection of operations and maintenance expenses is provided in **Schedule 6-4** (provided at the end of Chapter 6). As shown in the Schedule, total expenses are expected to grow from $2,152,760 budgeted in 2019 to $2,422,950 projected in 2023 reflecting an overall growth rate of 3% per year and total $11,429,295 during the Short-Term planning period. Mid Term expenses are projected to total $13,249,686 reflecting a 3% annual growth rate for the five-year period 2024-2028 and Long-Term expenses are projected to total $33,166,487 reflecting a 3% annual growth rate for the ten-year period 2029-2038.

Schedule 6-4 also provides a comparison of Abilene's total operating expenses per enplaned passenger versus non-hub airports with similar levels of aviation activity. Abilene's operating expenses per enplaned passenger are projected to increase from $24.73 budgeted for 2019 to an average of $31.21 during the Long-Term planning period. Over the same period of time, the overall non-hub industry average grows from $47.07 in 2019 to $60.44 during the Long Term (Source: Non-Hub Airports, FAA Operating and Financial Summary Report #127 and FAA Air Carrier Activity Information System enplanement database). These comparisons show that budgeted and projected operating expenses at Abilene are substantially lower than other non-hub airports of similar size during all three phases of the twenty-year planning period. This implies that the Airport currently manages operations and controls expenses in a manner that is more cost efficient than other comparable non-hub airports.

Projected Operating Revenues

Operating revenue projections for the Short Term (2019 to 2023), the Mid Term (2024 to 2028) and the Long Term (2029 to 2038) planning periods are based on the Airport's 2019 budget, current rates and charges methodology, current leasing practices, the anticipated impacts of inflation, aviation traffic increases, facility expansions and the recent experience of other airports with similar levels of aviation activity.

Operating Revenue Projection Assumptions

Operating revenue growth assumptions, as reflected in **Schedule 6-5** (provided at the end of Chapter 6), were developed to project the Airport's operating revenues during the planning period. Actual amounts for 2016 through 2018 and budgeted amounts for 2019 provide a comparison with revenues that are projected for the period 2020 through 2038. This analysis organizes revenues into categories for airline revenues, non-airline revenues and non-operating revenues. Annual revenue growth assumptions for the period 2020 through 2038 are provided in the following sections.

- Airline Revenues

  Landing fees – The Airport has established new landing fees for air carriers, estimated to commence in 2020. The new landing fee of $0.60 per 1,000 pounds of maximum gross landing weight is scheduled to escalate $0.10 each year through 2024. Airline landing fee projections beginning in 2020 are based on the new rate and recent years' average total gross landed weights. Beginning in 2021, revenue is based on the new rate plus increases in aircraft landed weight assuming one half the annual growth rate of the Master Plan forecast of passenger enplanements. This reflects the airlines' practice of managing increased load factors before additional flights are provided. Beginning in 2025, the analysis assumes continued landing fee rate increases based on 3% annual rate of inflation plus increases in aircraft landed weight assuming one half the annual growth rate of the Master Plan forecast of passenger enplanements.

  Terminal Space - Airlines – The Airport has also established new terminal rental rates for exclusive and joint use spaces in the terminal building, estimated to commence in 2020. The new terminal rental rate for 2020 is $21.50 per square foot and is scheduled to increase to $24.20 by 2023. Airline terminal space rents beginning in 2020 are based on these new rates and the approximate square footage of space leased by air carriers. Beginning in 2025, the analysis assumes continued terminal rental rate increases based on 3% annual rate of inflation.

- Non-Airline Revenues

  Non-Airline revenue projections beginning in 2020 for the following categories are based on the Airport's 2019 budget with growth at a 3% annual inflation rate thereafter:

  - Terminal Office Space – Non-Airline
  - Terminal Use
  - Building/Space Rental

- Hangar Rental
- Land Leases
- Fuel Flowage Fees
- Terminal Advertising
- Security Badge Charge
- Miscellaneous State Grants
- Indirect Cost Recovery
- Interfund Recoveries
- Personnel Recoveries
- Miscellaneous Revenues

Rental Car Commission projections beginning in 2020 are based on the Airport's 2019 budget with growth at a 3% annual inflation rate plus the annual rate of forecast enplanement growth. Projections for revenue from Terminal Parking are based on the Airport's 2019 budget with a growth based on the annual rate of forecast enplanement growth only. A one-time adjustment for a 10% price increase is assumed during the Mid Term planning period.

- Non-Operating Revenues - Non-Operating revenues at ABI include non-routine revenues such as damage claims and recoveries, transfers from other funds and the sale of land. None of those revenues are typically budgeted. The budget in 2019 assumes no revenue from these sources and, therefore, the analysis assumes no future revenues from these sources.

Projection of Operating Revenues, Airline Cost Per Enplaned Passenger and Operating Revenues Per Enplaned Passenger

The projection of operating revenues is provided in **Schedule 6-5** at the end of Chapter 6. As shown in the Schedule, airline revenues are expected to grow from $94,805 budgeted in 2019 to $180,737 projected for 2023 and total $728,498 during the Short-Term planning period. During the five-year Mid Term period, airline revenues are projected to total $1,054,402 and during the ten-year Long-Term period, revenues are projected to total $2,719,726. The overall annual growth rate for airline revenues is 6.2% during the twenty-year planning period. Non-Airline revenues are expected to grow from $2,023,665 budgeted in 2019 to $2,257,256 projected for 2023 and total $10,680,158 during the Short-Term planning period. During the Mid Term period, non-airline revenues are projected to total $12,453,607 and during the Long-Term period, non-airline revenues are projected to total $31,385,961. The overall annual growth rate for non-airline revenues is 2.8%. Total Airport revenues (including non-operating revenues) are expected to grow from $2,118,470 budgeted in 2019 to $2,437,992 projected for 2023 and total $11,408,655 during the Short-Term planning period. During the Mid Term period, revenues are projected to total $13,508,010 and during the Long-Term period, revenues are projected to total $34,105,687. The overall annual growth rate for total Airport revenues is 3.0%.

Schedule 6-5 also provides a comparison of the Airport's airline cost per enplaned passenger (CPEP) versus non-hub airports with similar levels of aviation activity. The airline CPEP (all airline fees and rentals divided by enplaned passengers) is a measure airlines use to compare their cost of operations among the airports they serve. Abilene's airline CPEP is projected to grow from $1.09 budgeted in 2019 to an average of $2.56 during the Long-Term planning period. Over the same period, the overall non-hub industry average grows from $9.34 in 2019 to $11.99 during the Long Term (Source: Non-Hub Airports, FAA Operating and Financial Summary Report #127 and FAA Air Carrier Activity Information System enplanement database).

This comparison indicates that airline rates and charges at Abilene are much lower than the industry average and are projected to remain below the industry average through the Long-Term planning period. This indicates that the Airport has room to grow airline rates and charges in the future if it is determined that there is a need or justification to do so. While the Airport has adopted increased airline rates incrementally from 2020 to 2024, the Airport should continue to monitor its rates in comparison with the non-hub industry average and other comparable peer airports.

Schedule 6-5 also provides a comparison of Abilene's total operating revenue per enplaned passenger versus an average for other non-hub airports. The Airport's total operating revenue per enplaned passenger is projected to grow from $24.34 budgeted for 2019 to an average of $32.10 during the Long-Term planning period. Over the same period, the overall non-hub industry average grows from $47.33 in 2019 to $60.77 during the Long Term (Source: Non-Hub airports, FAA Operating and Financial Summary Report #127 and FAA Air Carrier Activity Information System enplanement database). These comparisons show that both airline and non-airline revenues are much lower than the non-hub industry averages throughout the planning period.

Abilene does have a diverse source of non-airline revenues including aeronautical and non-aeronautical land/ground rents and building rents and terminal related revenues such as concessions, advertising, parking, and rental car concessions. The Airport and the City are actively working to generate additional revenue from existing operating revenue sources and by identifying new sources of operating revenue for the Airport. For example, the Airport is working with the FAA on land releases to allow for non-aeronautical development on certain areas of the Airport. Additionally, as existing agreements such as concession agreements expire, the Airport should continue to review those agreements in light of the increased air carrier terminal rental rate and current industry best practices.

The Airport's overall policies for setting/negotiating airline and non-airline user fees and rental rates should continue to be reviewed and adjusted over time in order to establish rates that are more comparable with other airports having similar levels of aviation activity.

Financial Plan Summary for the Master Plan Capital Improvement Program

The Financial Plan Summary presented in **Schedule 6-6** at the end of Chapter 6 includes a Capital Cash Flow section that presents a summary of projected capital funding (from **Schedule 6-2**) and scheduled capital expenditures (from **Schedule 6-1**) with the cash flow that results from implementing the Master Plan Capital Improvement Program. **Schedule 6-6** also includes an Operating Cash Flow section that summarizes totals for operating revenues (from **Schedule 6-5**) and operating expenses (from **Schedule 6-4**) with the addition of beginning cash reserve balances to provide the cash flow that results from these activities.

In **Schedule 6-1** of the Financial Implementation Analysis, practical approaches were provided for scheduling capital expenditures to match the availability of capital funding. **Schedule 6-2** provided practical approaches for matching specific capital funding sources with each of the identified projects. As shown in **Schedule 6-6**, positive year end cash reserves are projected throughout the twenty-year planning period 2019 to 2038.

Based on the assumptions underlying the Financial Implementation Analysis summarized in the Capital Cash Flow section of **Schedule 6-6**, implementation of projects in the Master Plan CIP that are scheduled throughout the twenty-year planning period is projected to be financially reasonable if the City can identify approximately $76.4 million in funding for projects with Other Unidentified Funding. If funding sources are not available for these projects and other alternative sources cannot be identified, then development of these projects will not be feasible during the implementation period that is currently planned.

Implementation of other capital projects during the 2019-2038 planning period that have AIP discretionary grants indicated as a funding source is subject to the availability of those grants which are provided at the sole discretion of the FAA. If the identified portion of discretionary funding is not awarded by the FAA, then these projects will need to be delayed until funding is available.

Additionally, the Financial Implementation Analysis relies on achievement of the aviation activity and passenger enplanement forecast. Actual aviation traffic may temporarily vary from the projected levels of activity without a significant adverse impact on the capital program. If decreased traffic levels occur and persist, implementation of all the proposed projects may not be financially feasible. It should also be noted, however, that if the forecast activity levels are not met, then a number of the planned capital improvements may not be necessary.

Financial Analysis Schedules

Financial Analysis Schedules 6-1 through 6-6 are presented on pages 30-36.

Chapter 8 – Preferred Development Alternative – Environmental Overview

Introduction

Analysis of the potential environmental impacts of recommended airport development projects is a key component of the Master Plan. This Environmental Overview will identify significance thresholds for the various resource categories contained in FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*, Exhibit 4-1 and FAA Order 5050.4B, *National Environmental Policy Act* (NEPA) *Implementation Instructions for Airport Actions*, Table 7.1 and then evaluate the development concept to determine whether the proposed actions could individually or collectively significantly affect the quality of the environment.

The construction of any improvements depicted on the recommended development concept plan would require compliance with NEPA to receive federal financial assistance or to obtain federal approval (i.e., a federal action). For projects not "categorically excluded" under FAA Order 1050.1F, compliance with NEPA is generally satisfied through the preparation of an Environmental Assessment (EA). An EA is prepared when the initial review of the proposed action indicates that it is not categorically excluded, involves at least one extraordinary circumstance, or the action is not one known normally to require an Environmental Impact Statement (EIS). If none of the potential impacts are likely to be significant, then the responsible FAA official prepares a Finding of No Significant Impact (FONSI), which briefly presents, in writing, the reasons why an action, not otherwise categorically excluded, would not have a significant impact on the environment and the approving official may approve it. Issuance of a FONSI signifies that FAA would not prepare an EIS and has completed the NEPA process for the proposed action.

In instances where significant environmental impacts are expected, an EIS may be required. An EIS is a clear, concise, and appropriately detailed document that provides agency decision-makers and the public with a full and fair discussion of significant environmental impacts of the proposed action and reasonable alternatives and implements the requirement in NEPA §102(2)(C) for a detailed written statement.

This cursory environmental review was performed to document the potential environmental impacts associated with the Airport Master Plan update for 2019. Environmental constraints are listed below and shown in **Figures 8-2 and 8-3**. The environmental resources evaluated include the following:

- Hazardous materials, solid waste, and pollution prevention
- Demographics
- Prime and unique farmlands
- Cultural Resources (historic and archaeological)

- Federally listed threatened and endangered species
- State listed species threatened species and species of concern
- Wetlands and other waters of the US
- Noise impacts (RCM)

Our environmental review also included contacting state and federal agencies overseeing their associated resources. Agencies contacted include the following:

- Texas Parks and Wildlife Department (TPWD)
- Texas State Historic Preservation Officer (SHPO)
- US Fish and Wildlife Service (USFWS)
- US Army Corps of Engineers (USACE)
- US Department of Agriculture (Rural Development) (USDA)

A response was received from TPWD and SHPO. The other agencies were contacted; however, no other firm responses were received. Information was collected from the USFWS's Information Planning and Conservation (IPaC) system in lieu of direct contact with USFWS.

The environmental and community impacts for the proposed improvements are briefly summarized in this document in accordance with the environmental study requirements set forth in FAA Order 1050.1F, Environmental Impacts: Policies and Procedures and Order 5050.4B National Environmental Policy Act. All summarizations are cursory in nature, and further study will be required through the National Environmental Policy Act (NEPA) process. Each resource category is discussed below with respect to the desktop review conducted for the planning area and data evaluated for determining potential impacts.

Air Quality

Threshold of Significance Definition: The action would cause pollutant concentrations to exceed one or more of the National Ambient Air Quality Standards (NAAQS), as established by the United States (U.S.) Environmental Protection Agency (EPA) under the Clean Air Act, for any of the time periods analyzed, or to increase the frequency or severity of any such existing violations.

Preferred Development Alternative Evaluation: There are currently no air quality concerns, publicly owned parks, recreational areas, wildlife and waterfowl refuges, national or state forests, wilderness areas, wild and scenic rivers resources, or coastal areas, located within the ground disturbance of the Area of Potential Effects (EPA). There are no Section 4(f) or Section 6(f) properties located in the ground disturbance APE. If an unknown historic site is located within the project area, it could qualify for protection under Section 4(f), which would be determined after a thorough NRHP status evaluation.

Hazardous Materials, Solid Waste, and Pollution Prevention

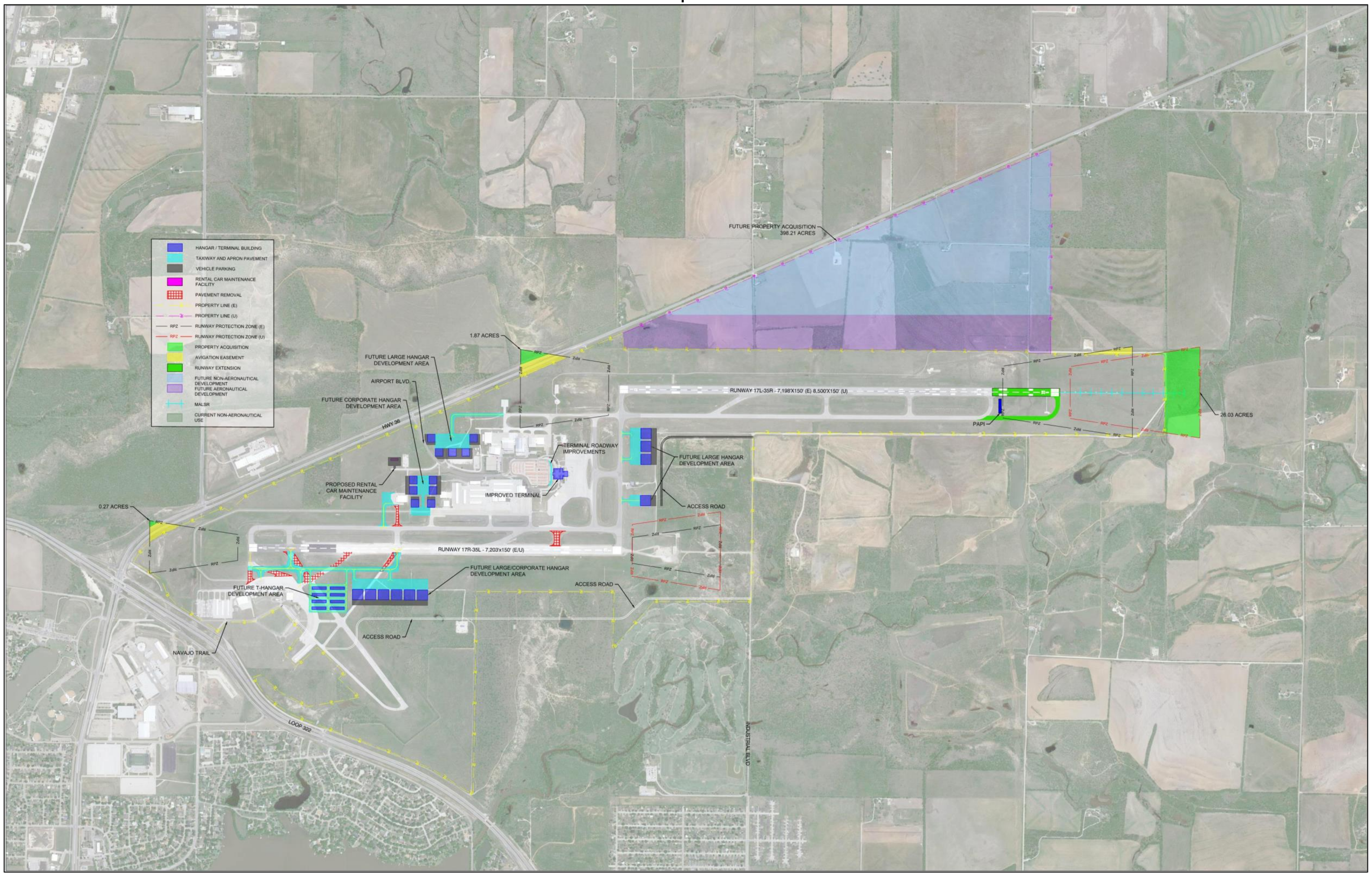
Threshold of Significance Definition: The FAA has not established a significance threshold for Hazardous Materials, Solid Waste, and Pollution Prevention. However, factors to consider are if an action would have the potential to**:**

- Violate applicable Federal, state, tribal, or local laws or regulations regarding hazardous materials and/or solid waste management;
- Involve a contaminated site (including but not limited to a site listed on the National Priorities List). Contaminated sites may encompass relatively large areas. However, not all of the grounds within the boundaries of a contaminated site are contaminated, which leaves space for siting a facility on non-contaminated land within the boundaries of a contaminated site. An EIS is not necessarily required. Paragraph 6-2.3.a of this Order allows for mitigating impacts below significant levels (e.g., modifying an action to site it on non-contaminated grounds within a contaminated site). Therefore, if appropriately mitigated, actions within the boundaries of a contaminated site would not have significant impacts;
- Produce an appreciably different quantity or type of hazardous waste;
- Generate an appreciably different quantity or type of solid waste or use a different method of collection or disposal and/or would exceed local capacity; or
- Adversely affect human health and the environment.

Preferred Development Alternative Evaluation: Pavement removal or rehabilitation, building renovations or construction will produce solid waste. If existing buildings and hangars are planned for renovation, screening for potentially hazardous materials, including asbestos, should be conducted. The proposed land acquisition of approximately 400 acres east of Runway 17L/35R would acquire at least three oil wells (identified by the presence of derricks), and at least one aboveground storage tank (AST) site containing three ASTs. The three oil wells and the AST site are located 0.07-0.27 miles northeast of the intersection of Elmdale Road and Abilene Municipal Airport road. No other hazardous waste or hazardous materials sites are present within the project area based on the EnviroMapper platform maintained by the U.S. Environmental Protection Agency (EPA). Additionally, the proposed land acquisition would include the purchase of three residences and farm-related buildings, which would need to be evaluated prior to acquisition. An Environmental Due Diligence Audit (EDDA) should be performed on all proposed land acquisition areas.

No other solid waste or other pollution sources were identified within or adjacent to the project area. Potential impacts regarding three known oil wells (active and/or inactive) will need to be assessed prior to land acquisition.

Figure 8-1
Preferred Development Alternative



Demographic Information

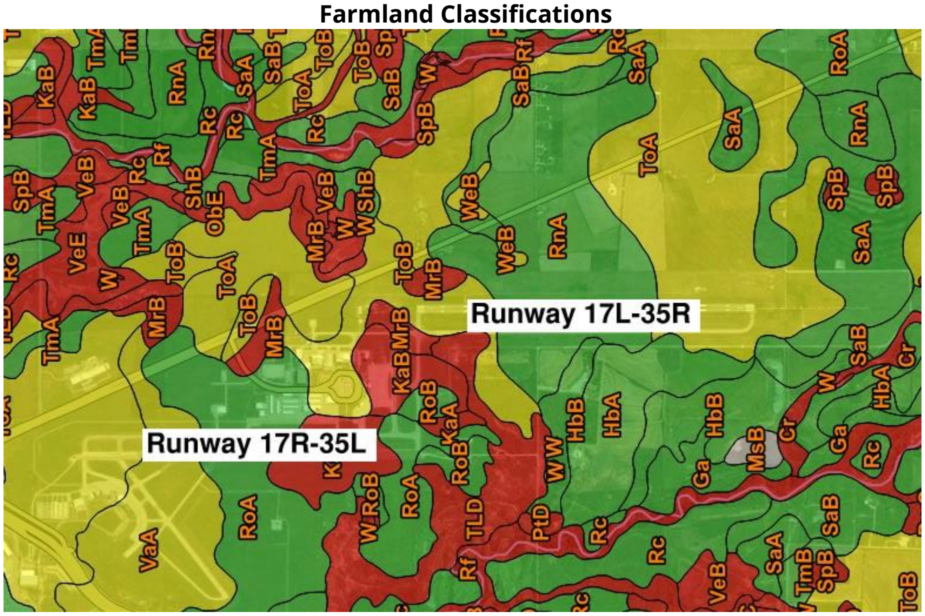
There are three residential homes located within the land acquisition area east of 17L-35R. All three homes are located in the large property acquisition area east of Runway 17L-35R. The population in this area is estimated by the U.S. Census Bureau to consist of predominantly white (100%) residents whose median household income is greater than the state or county average (U.S. Census Bureau 2010 Census Data & 2013-2017 American Community Survey Data). There are no environmental justice populations of concern associated with the proposed action.

Farmlands

Threshold of Significance Definition: The total combined score on Form AD-1006, “Farmland Conversion Impact Rating,” ranges between 200 and 260 points. The action would have the potential to convert important farmlands to non-agricultural uses. Important farmlands include pastureland, cropland, and forest considered to be prime, unique, or statewide or locally important land.

Preferred Development Alternative Evaluation: According to the USDA Natural Resources Conservation Service (NRCS) Web Soil Survey areas of prime farmland and prime farmland if irrigated occur within the current ABI land and proposed land acquisition areas. Impacts to these prime farmland areas will need to be evaluated through the completion of Form AD-1006 prior to acquisition and disturbance. Refer to **Figure 8-2**.

Figure 8-2
Farmland Classifications



Note: The classifications within and surrounding the Project Area Soils shown in green and yellow account for prime farmlands.

Historic, Architectural, Archeological, and Cultural Resources

Threshold of Significance Definition: The FAA has not established a significance threshold for Historical. Architectural, Archeological, and Cultural Resources. However, the factor to consider is that the action would result in the finding of Adverse Effect through the Section 106 process. However, an adverse effect finding does not automatically trigger the preparation of an EIS (i.e., a significant impact).

Preferred Development Alternative Evaluation: Garver contacted the State Historic Preservation Offices (SHPO) regarding the presence of cultural historic and/or archaeological sites located within or near the proposed action. SHPO responded with no indication of sites within or adjacent to the proposed action (**Appendix A**).

The National Historic Preservation Act of 1966 requires that an initial review be made in order to determine if any properties are on, or eligible for inclusion in, the National Register of Historic Places (NRHP) within the area of a proposed action's potential environmental impact. No sites listed in the NRHP are within the project area based on the EPA's EnviroMapper platform. The closest site listed in the NRHP is located in downtown Abilene approximately 3 miles away.

Biological Resources

Threshold of Significance Definition: The U.S. Fish and Wildlife Service or the National Marine Fisheries Service determines that the action would be likely to jeopardize the continued existence of a federally listed threatened or endangered species or would result in the destruction or adverse modification of federally designated critical habitat. The FAA has not established a significance threshold for the non-listed species. However, factors to consider are:

- A long-term or permanent loss of unlisted plant or wildlife species, i.e., extirpation of the species from a large project area (e.g., a new commercial service airport);
- Adverse impacts to special status species (e.g., state species of concern, species proposed for listing, migratory birds, bald and golden eagles) or their habitats;
- Substantial loss, reduction, degradation, disturbance, or fragmentation of native species' habitats or their populations; or
- Adverse impacts on a species' reproductive success rates, natural mortality rates, non-natural mortality (e.g., road kills and hunting), or ability to sustain the minimum population levels required for population maintenance.

Preferred Development Alternative Evaluation: The United States Department of the Interior, Fish and Wildlife Service (USFWS) listed threatened or endangered species as potentially occurring within the project area, which include: Least Tern (*Sterna antillarum*), Piping Plover (*Charadrius melodus*), Red Knot (*Calidris canutus rufa*), Sharpnose Shiner (*Notropis oxyrhynchus*), Smalleye Shiner (*Notropis buccula*), and Texas Fawnsfoot (*Truncilla macrodon*). No potential habitat occurs within or adjacent to the project area for any of the federally listed species. There is no critical habitat located within the project area. Potential habitat for the Texas Fawnsfoot could be located offsite within Lytle Creek southwest of the airport. The official IPaC (Information for Planning and Consultation) list provided by the USFWS is located in **Appendix B**.

The Texas Parks and Wildlife Department (TPWD) was also contacted. Their recommendations can be found in **Appendix C**. Their review included Federal Laws, State Laws, and Species of Concern/Special Features. Their recommendations for these sections, which include contacting the USFWS, are summarized below.

- Federal Laws – Migratory Bird Treaty Act (MBTA)
    - Recommendations: Exclude vegetation clearing from March through August. If clearing during this nesting season is unavoidable, they recommend a survey for active nests.
- State Laws – Parks and Wildlife Codes
    - Chapter 64
      Recommendations: The MBTA also applies to Chapter 64.
    - Section 68.015 – State listed Species
      Recommendations: TPWD has identified the Texas horned lizard (*Phrynosoma cornutum*) as state listed threatened. Potential habitat occurs within the project area for this species. TPWD recommends completing a presence/absence pre-construction survey for the project area and adjacent to construction areas during warmer months. Additional recommendations are included in their correspondence in Appendix A.
- Species of Concern/Special Features – Texas Natural Diversity Database (TXNDD)
    - Recommendations: The Western hog-nosed skunk (*Conepatus leuconotus*) has been documented as occurring within 1.5 miles of the project area. Precautions should be taken to avoid impacts if encountered. TPWD also recommends a review of the Taylor County list of rare species. This list was obtained and is also provided in Appendix A. If such species are encountered during construction, TPWD recommends avoidance. Habitat for the Black-capped Vireo (*Vireo atricapilla*), which is a state listed species present on the Taylor County list of rare species (Appendix A), may be present in the project area. Additional TPWD recommendations include contacting the USFWS regarding federally listed species.

Waters and Wetlands

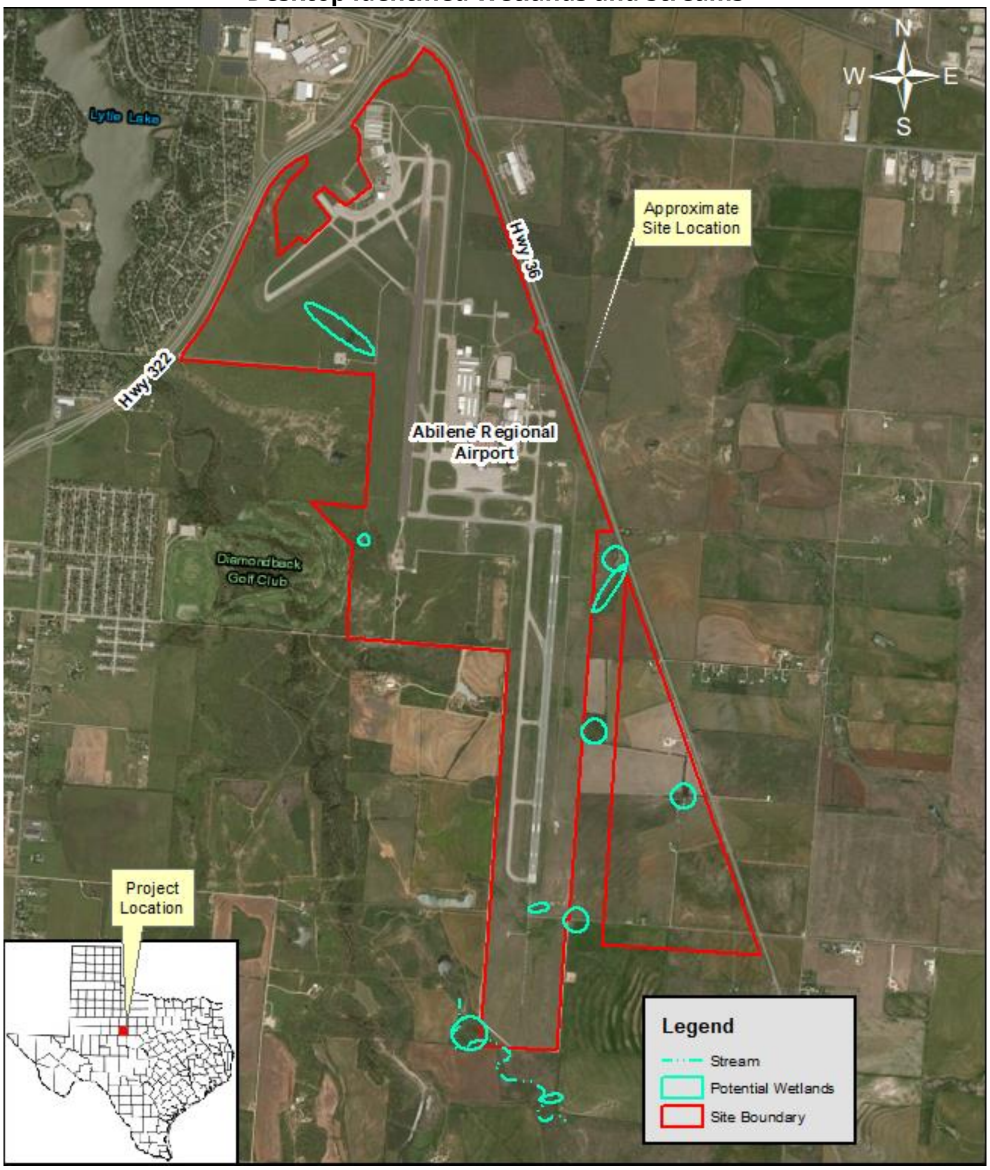
Threshold of Significance Definition: The action would:

- Adversely affect a wetland's function to protect the quality or quantity of municipal water supplies, including surface waters and sole source and other aquifers;
- Substantially alter the hydrology needed to sustain the affected wetland system's values and functions or those of a wetland to which it is connected;
- Substantially reduce the affected wetland's ability to retain floodwaters or storm runoff, thereby threatening public health, safety, or welfare (the term welfare includes cultural, recreational, and scientific resources or property important to the public);
- Adversely affect the maintenance of natural systems supporting wildlife and fish habitat or economically important timber, food, or fiber resources of the affected or surrounding wetlands;
- Promote development of secondary activities or services that would cause the circumstances listed above to occur; or
- Be inconsistent with applicable state wetland strategies.

Preferred Development Alternative Evaluation: The US Army Corps of Engineers (USACE) was contacted to determine if there are jurisdictional waters within the project area. A response has not been received to date and will be forwarded to the Airport when received.

The USACE regulates discharges to waters of the United States under its authority to administer Section 404 of the CWA. A Section 404 permit is required for actions placing dredge or fill material into the waters of the United States, including wetlands. A desktop review of the project area revealed that there may be wetlands and streams within the project area (**Figure 8-3**), which occurs within two different HUC12 watersheds. A full wetland and stream delineation should be conducted prior to any site impacts. The desktop review included a review of NRCS soil information, the National Wetlands Inventory (NWI), aerial photography, and topographic maps.

Figure 8-3
Desktop Identified Wetlands and Streams



Air Quality

Threshold of Significance Definition: The action would cause pollutant concentrations to exceed one or more of the National Ambient Air Quality Standards (NAAQS), as established by the Environmental Protection Agency under the Clean Air Act, for any of the time periods analyzed, or to increase the frequency or severity of any such existing violations.

Preferred Development Alternative Evaluation: The proposed annual operations at the Airport are not expected to approach or exceed 180,000 operations. The Airport is not located within a non-attainment area; therefore, general conformity regulations would not apply.

Noise and Noise-Compatible Land Use

Threshold of Significance Definition: The action would increase noise by DNL71.5 dB or more for a noise sensitive area that is exposed to noise at or above the DNL 65 dB noise exposure level, or that will be exposed at or above the DNL 65 dB level due to a DNL 1.5 dB or greater increase when compared to the no-action alternative for the same timeframe. For example, an increase from DNL 65.5 dB to 67 dB is considered a significant impact, as is an increase from DNL 63.5 dB to 65 dB. Some factors to consider are: The action would increase noise by DNL71.5 dB or more for a noise sensitive area that is exposed to noise at or above the DNL 65 dB noise exposure level, or that will be exposed at or above the DNL 65 dB level due to a DNL 1.5 dB or greater increase, when compared to the no action alternative for the same timeframe. For example, an increase from DNL 65.5 dB to 67 dB is considered a significant impact, as is an increase from DNL 63.5 dB to 65 dB.

Preferred Development Alternative Evaluation: Noise contours were generated using the FAA-approved Aviation Environmental Design Tool (AEDT) 2d Model program for determining potential noise-related impacts to the surrounding land uses. These contours were developed based on the yearly day/night sound levels (DNL) for which FAA measures noise impacts. Four levels of contours ranging from 70 DNL to 50 DNL were developed for the existing condition, 10-year future and 20-year future conditions regarding expected aviation activity and airport development. **Figures 8-4** through **8-6** show the noise exposure areas for each of the activity levels. The FAA considers a 65 DNL noise level as acceptable for residential developments per FAR Part 150. The 65 DNL contour will remain entirely on airport property through each of the future activity scenarios. The airport property and the properties immediately adjacent to the airport are largely undeveloped. There are no residential, educational, health, religious, parks, recreational areas, and wildlife refuges located with the 65 DNL for future airport development. No aviation related noise impacts are expected to occur.

Figure 8-4
Existing Noise Exposure

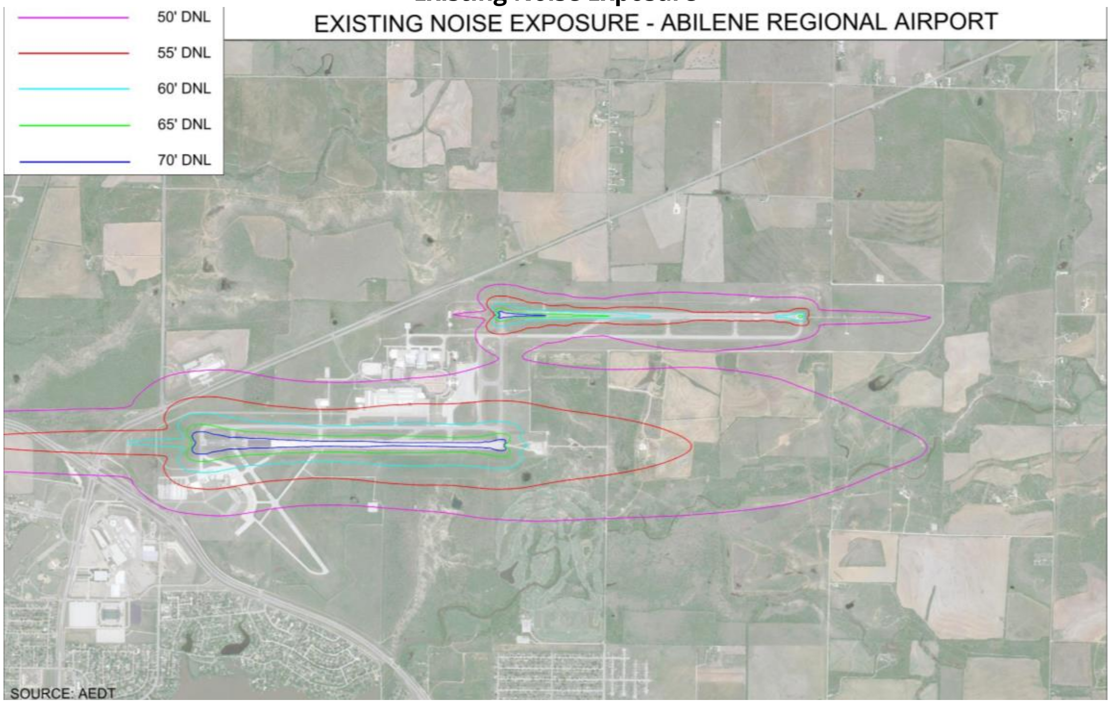


Figure 8-5
Forecasted 2029 Noise Exposure

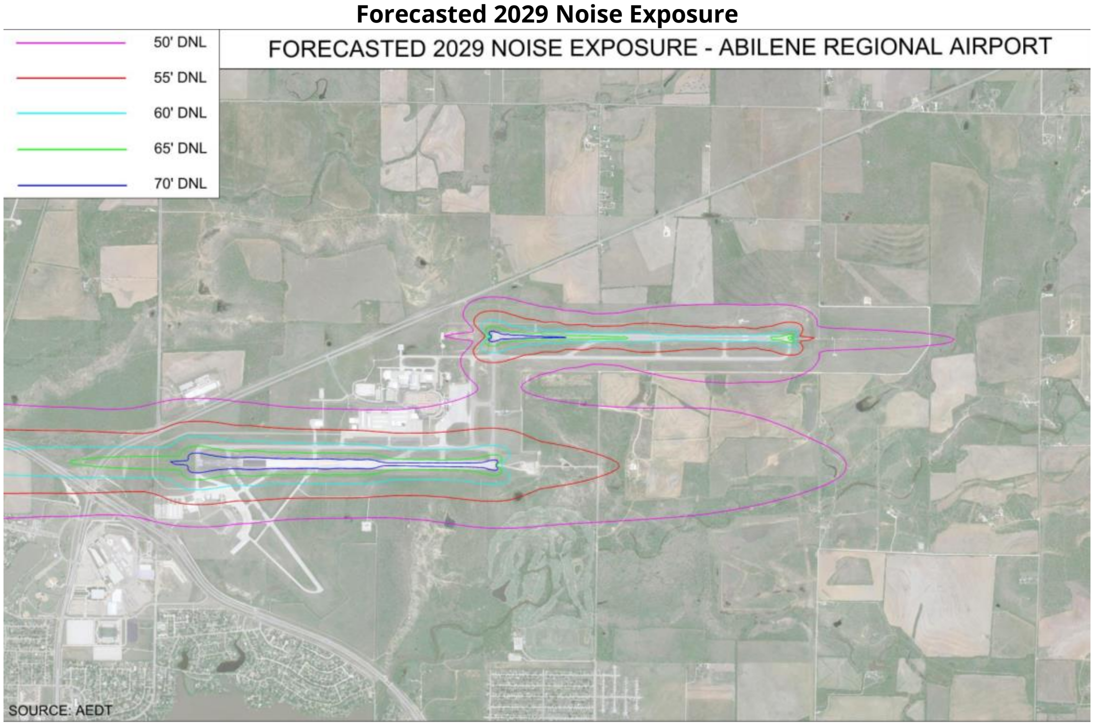
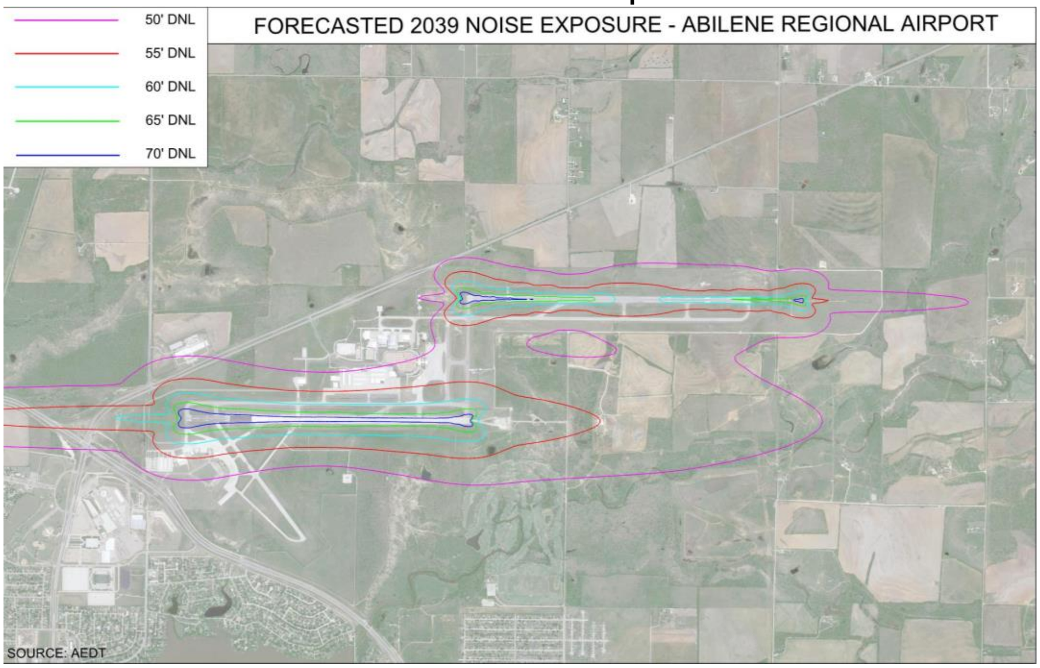


Figure 8-6
Forecasted 2039 Noise Exposure



Preferred Development Alternative – Environmental Appendices