AIRPORT MASTER PLAN

FRONT RANGE AIRPORT

FINAL REPORT

Prepared for:

Adams County

Colorado

Prepared by:

Jviation, Inc.

2019

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1.0 STUDY INTRODUCTION AND GOALS

This Airport Master Plan (AMP) for Front Range Airport ("FTG" or the "Airport") has been conducted to provide Adams County (the "Airport Sponsor" or "Sponsor") with a long-range plan for reasonable and orderly airport development designed to produce a safe, efficient, economical, and environmentally acceptable air transportation facility that meets existing and projected aviation demand levels in a thoughtful manner. This Master Plan along with the accompanying Airport Layout Plan (ALP) have been prepared in compliance with the Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5070-6B, *Airport Master Plans*. The previous Front Range Airport Master Plan was completed in 2004. This study was funded by the FAA, the Colorado Department of Transportation (CDOT) Division of Aeronautics, and Adams County. Technical work was conducted by a study team led by Jviation and supported by Woolpert, Inc.

The FAA requires that an airport undertake a master plan effort every five to ten years. Funding is provided by a combination of federal, state and local sources.

The ultimate goal of the AMP is to provide a carefully considered, systematic approach to the Airport's overall maintenance, development, and operation over a 20-year planning period. At its core, this planning effort is designed to identify and then plan for current and future airport facility needs well in advance of the actual demand for those facilities. The AMP is also designed to review and assess the Airport's current conformance with federal and state airport design and operational standards to help ensure that the Airport continues to operate as safely as possible. It will also ensure that FTG can appropriately coordinate project approvals, design, financing, and construction, while avoiding the potentially detrimental effects caused by inadequate or noncompliant airport facilities.

An Airport Master Plan documents an airport sponsor's short-, mid-, and long-term strategies for operation and development over a 20-year period.

1.1 Master Plan Purpose and Objectives

The overall purpose of the FTG AMP is to define the Airport Sponsor's strategy for the long-term development of the Airport. This AMP provides the framework to guide future airport development that will cost-effectively satisfy current and future aviation demand in a logical and financially-feasible manner, while also considering relevant environmental and community factors. Consistent with this purpose, the project team coordinated with the Airport to establish general objectives for the AMP, listed below.

An effective Airport Master Plan will reflect the goals and purposes of the airport sponsor and its associated stakeholders.

- Become an economic engine for Adams County and surrounding areas, providing jobs, revenue, and viable aviation services for a growing market.

- Serve as a model airport for aircraft operations, efficiency, and safety.
- Provide its tenants, users, business community, and travelers with a professional experience.
- Guide the development of the Airport with the goal of providing a safe, efficient, and effective facility as aviation demand, market conditions, and technologies evolve.
- Continue to comply with all appropriate federal regulations, obligations, and design standards.
- Present a recommended course of action for helping the Airport achieve and maintain short- and long-term financial self-sustainability.
- Be consistent with Adams County's goals for its public-use facilities.
- Consider and potentially integrate other County-related development initiatives, including Spaceport Colorado.
- Analyze the condition of existing facilities and their effectiveness serving current and future aviation needs, as well as conformance with federal airport design and operational standards.
- Provide a planning document for the next 20 years that is technically accurate, realistically executable, and financially feasible.
- Focus on environmental sustainability.
- Consider the current and projected security requirements for general aviation airports.
- Incorporate public involvement throughout the AMP process to ensure that the Airport's future aligns with the values and vision of the community.

It should be acknowledged that these specific airport goals are also consistent with the descriptions provided by the 2011 Colorado Aviation System Plan of an efficient and well-functioning airport system. In essence, that plan notes that for an airport system to operate effectively, its individual airports must exhibit similar characteristics. Specifically, an ideal airport system (and by extension the airports that comprise that system) should be characterized by the following traits:

- Provides sufficient capacity to meet current and future needs;
- Possesses the ability to respond to unforeseen changes in the aviation industry or in the local market area;
- Supports the local and state economy;
- Leverages historic investment and makes the most out of future investment and
- Operates in such a way as to address security and safety considerations, relative to perceived risks.

In addition to addressing these objectives, the AMP must also fulfill the broad master planning goals established by the FAA in AC 150/5070-6B, *Airport Master Plans*. These goals include the following:

- Document issues that the proposed development will address.
- Justify the proposed development through the technical, economic, and environmental investigation of concepts and alternatives.

- Provide an effective graphic presentation of the development of the Airport and anticipated land uses in the vicinity.
- Establish a realistic schedule for implementing the development proposed in the AMP, particularly the short-term capital improvement program.
- Propose an achievable financial plan to support the implementation schedule.
- Provide sufficient project definition and detail for subsequent environmental evaluations that may be required before the project is approved.
- Present a plan that satisfies local, state, and federal regulations.
- Document policies and future aeronautical demand to support municipal or local deliberations on spending, debt, land use controls, and other policies necessary to preserve the integrity of the Airport and its surroundings.
- Set the stage and establish the framework for a continuing planning process.

1.2 Overview of Airport Issue and Concerns

FTG's previous AMP was completed in 2004 by Washington Group International. Since that time, many of the Airport issues and focal points identified in that master planning effort have been addressed through the completion of specific projects and/or the updating of specific airport documents. Some issues may not have been addressed due to changing industry circumstances and/or master plan assumptions, or have still yet to be resolved.

The following issues and concerns have been identified for the 2016 AMP:

- **New Landside Development Areas:** The Airport must identify future potential development areas to meet demand for aviation-related businesses, hangars and other facilities such as airfield support storage and maintenance buildings. Similarly, FTG should identify areas on its property that could be made available for potential non-aviation related development to diversify the Airport's revenue streams and increase its economic benefit for the local area.
- **Regional Economic Development Initiatives:** Adams County is anticipated to realize significant population and economic growth as a result of several factors, including the Denver Aerotropolis/Airport City development initiative, the completion of the Regional Transportation District (RTD) University of Colorado "A" Line providing mass transit connections between downtown Denver and Denver International Airport, as well as Denver metro area development that continues to progress east. The potential impact of these factors on the Airport must be projected.
- **Pavement Strength:** FTG was explicitly designed as a General Aviation Reliever airport. The actual pavement design of the Airport's airfield infrastructure has strength ratings consistent with smaller general aviation aircraft. As corporate aircraft continue to increase in size and in frequency of operation at FTG, the pavement strength of this infrastructure must be reassessed.
- **Pavement Maintenance:** The Airport must establish a pavement maintenance program that considers the age and condition of existing

When starting an Airport Master Plan, it is important to acknowledge the key issues to be addressed within the planning effort.

airport pavements, options for maintenance or repair, and approximate costs for these improvements.

- **Colorado Spaceport Initiative:** FTG is the site of an exciting development initiative to establish the Airport as Colorado's first and only spaceport facility. While the specific details of that initiative are revisited within the AMP, consideration for its potential development requirements on the Airport must be anticipated.
- **Airport Security:** The Airport needs to evaluate its current security systems and policies, including airport fencing, cameras, security plans, etc.

All of these issues, as well as others that are uncovered during the planning process, are discussed in subsequent chapters.

1.3 Master Plan Communication & Coordination

Critical to the success of any Airport Master Plan is an effective communication and coordination effort with the airport's key stakeholders.

Public involvement is an integral part of any significant airport planning study since it encourages information sharing and collaboration among the community and the airport stakeholders that have a collective interest in the outcome of the study. Stakeholders typically include airport management, the airport sponsor, tenants, users, local businesses and residents, resource agencies, elected and appointed public officials, and the general public. With such a diverse stakeholder group, a variety of forums are often employed to enhance the effectiveness of the project coordination effort.

- A Planning Advisory Committee (PAC) was established to serve as a resource to ensure the Master Plan addressed the key issues facing the Airport and its surrounding community today and into the future. The PAC members represent:
  - Adams County Economic Development Council
  - Adams County Planning Department
  - Adjacent property owners
  - Airport businesses and tenants,
  - City of Aurora Planning Development Services Department
  - Denver International Airport
  - FTG Airport Advisory Board
  - Metro Denver Aviation Coalition
  - Regional Economic Advancement Partnership
  - Town of Bennett
  - CDOT Aeronautics
  - FAA

  Their roles were to review and comment on draft study products, and to provide links to agencies and other constituencies represented by the PAC membership. Three PAC meetings were held throughout the project.
- An online survey of key airport stakeholders (including users, tenants, based aircraft owners/pilots, transient pilots, and airport users at large) was conducted to solicit feedback regarding a variety of topics, including their

existing and projected activities at the Airport; FTG strengths, weaknesses, opportunities, and threats; and the future vision for FTG. The survey results were utilized to help guide planning actions documented in **Chapter 4, Airfield Capacity & Facility Requirements**.

- Various public outreach materials were created and methods employed to generate public awareness of the AMP. The materials and outreach program served as important sources of information for interested parties to keep them informed of the planning process, to solicit input, and to facilitate decision making during the process. The outreach materials included a project website, press releases for local media, meeting advertisements, and social media publications.
- Finally, in addition to the PAC, other forms of public involvement included regular public briefings to the Adams County Board of County Commissioners, as well as a public information meeting/workshop. The workshop provided an opportunity to engage the public in meaningful conversation about the Airport and the AMP. Other additional briefings and technical meetings were organized with key agencies, stakeholders, and public officials as required. Notes from meetings are included in **Appendix D**.

1.4 Master Plan Study Elements

The FTG AMP has been prepared consistent with the guidance provided in FAA AC 150/5070-6B, *Airport Master Plans*, and other industry-accepted principles and practices. Specifically, this Master Plan's chapters are designed to identify future facility requirements and provide the supporting rationale for their implementation.

Chapter 1, Study Introduction provides an overview of the AMP, including its purpose, objectives, and work products, and the overall structure of the project.

Chapter 2, Inventory establishes a sound basis for plan and program development. The inventory compiles essential data regarding the physical, operational, and functional characteristics of FTG, its sub-components, and its environs. Environmental data is included and considered throughout the master planning process and potential follow-on environmental efforts.

While an Airport Master Plan must follow the federally-defined airport planning process, the FAA only approves the aviation activity forecasts and the Airport Layout Plan.

Chapter 3, Aviation Activity Forecast serves as the hub of the AMP by utilizing local socioeconomic information and national air transportation trends to project the levels of aviation activity that can reasonably be expected at FTG over the 20-year planning period. Assessing future airport utilization and operational activity levels trends is especially important. Because many of the proposals and recommendations in the AMP are principally based on aviation activity demand forecasts, it is critical that the forecasts are reasonable and defensible. *The aviation forecasts must be officially reviewed and approved by the FAA.*

Chapter 4, Airfield Capacity & Facility Requirements utilizes the results of the Forecasts to assess the ability of existing airside and landside facilities to meet the projected level of demand for the five-, ten-, and twenty-year planning horizons. This analysis defines requirements for additional facilities, expansion to existing facilities, and determines whether the facilities will meet the forecast of demand over the 20-year planning period. Beyond this, airport facilities are examined with respect to

improvements needed to safely serve the type of aircraft expected to operate at the Airport in the future, including compliance with FAA design standards, as well as navigational aids to increase the safety and efficiency of operations.

Chapter 5, Development Alternatives & Recommended Plan considers a variety of solutions to accommodate the anticipated facility needs identified within the Facility Requirements analysis. Through this process, various facility and site plan alternatives are proposed and weighed with respect to their ability to meet the projected facility needs. This analysis ultimately results in the preferred alternative that is deemed to best meet the facility requirements in the most efficient and appropriate manner available to achieve the Airport's long-term goals. As a tool for the alternatives review and evaluation, matrices are employed to help identify the strengths and weaknesses of each proposed development alternative in order to determine a single direction for development. This evaluation method focuses on several key criteria, including cost, efficiency, feasibility, operational effectiveness, and other measures. An environmental screening of the preferred development plan is also included in this chapter.

Chapter 6, Airport Layout Plan provides both a graphic and narrative description of the recommended plan for the use, development, and operation of the Airport. *Note that the Airport Layout Plan set must be officially reviewed, approved and signed by the FAA.*

Chapter 7, Financial Plan focuses on the capital improvement program which defines the schedules, costs, and funding sources for the recommended development plan. It is important that the development program is practical, reasonable, and capable of enhancing the economic viability for the Airport.

2.0 INVENTORY

The first step in the airport master planning process, as outlined in Federal Aviation Administration (FAA) Advisory Circular 150/5070-6B, *Airport Master Plans*, involves gathering information about the airport and its environs. An inventory of current conditions is essential to the success of a master plan since the information also provides a foundation, or starting point, for subsequent evaluations.

This Airport Master Plan is intended to provide a comprehensive evaluation of FTG and result in a long-term facilities and operational plan for the Airport.

2.1 Airport Overview

Front Range Regional Airport (FTG or the Airport) is a public-use, general aviation airport owned and operated by Adams County. Located in northeastern Colorado, Adams County is the fifth most populous county in Colorado, with a current population of approximately 460,000. As FTG's owner, the County is responsible for operating and maintaining the Airport in a safe condition, and leasing properties within the Airport boundary. FTG is located along the Interstate 70 corridor near the town of Watkins, Colorado (**Figure 2-1**), 26 miles east of downtown Denver and seven miles southeast of Denver International Airport (DEN).

One of the largest general aviation airports in the country, FTG encompasses 3,349 acres of relatively flat agricultural land covered with prairie grass and a sparse collection of trees, of which 85 acres have been developed. The current Airport Reference Point (ARP)—defined as the approximate center of an airport's runways—is located at Latitude 39°47'03.1200"N and Longitude 104˚32'15.4400"W. The Airport elevation—identified as the highest point along an airport's runways—is 5,512 feet above mean sea level (MSL), and is located at the approach end of Runway 35.

Established by the Adams County Board of Commissioners (BoCC), the Front Range Airport Advisory Board encourages community involvement and asks individuals with relevant expertise to make recommendations to the BoCC regarding the attraction, recruitment, retention, and infrastructure needs of FTG. The ten-member board is appointed by the BoCC and consists of the County Manager or designee and members of the community from the following areas: current owners/tenants of the Airport, economic development, marketing, UAV sector, space sector, aviation sector, non-aviation business sector, Adams County citizen representation, and intergovernmental representation.

The Airport provides Adams County with aviation facilities designed to accommodate a full range of aviation services and operators, ranging from small general aviation aircraft to large corporate business jets. In addition to its many aviation-related benefits, FTG is an economic generator for the region, directly supporting industry, promoting tourism, and encouraging business development and expansion.

FIGURE 2-1 - FTG PROXIMITY MAP

2.2 Airport History

In 1974, the Denver Regional Council of Governments (DRCOG) adopted the Denver Regional Airport System Plan (RASP) that projected those aviation facilities required to meet existing and future aviation demand within the region through the year 2000. When incorporating the diminishing role of Denver Stapleton Airport for general aviation usage, the RASP's forecasted growth in aviation activity for the region exceeded those existing airport facilities that were available at the time (both public and private). The RASP concluded that even if the region's existing public airports were expanded to their maximum development potential, four new general aviation airports would be required by the year 2000. The 1980 National Airport System Plan recommended construction of two new general aviation reliever airports in the Denver Metropolitan Region; one of these airports was Adams County Airport, which later became Front Range Airport.

FTG's first Master Plan was completed in 1982, and included a phased development plan through the year 2003. An Environmental Assessment (EA) of the impacts of the proposed airport development was prepared in conjunction with the Master Plan. The EA was presented at a public hearing in April of 1982, and subsequently submitted to the Federal Aviation Administration (FAA). The FAA accepted the Master Plan and approved the EA. Construction of the Airport began in 1983 and Runway 8/26 was opened for service in August 1984.

FTG's 2004 Master Plan focused on the long-term development of the Airport with a focus on promoting and enhancing general aviation activities, providing opportunities to develop air cargo operations to satisfy regional demands, providing continued growth prospects for aviation-related industries, and promoting continued local economic growth and development. While the 2004 Master Plan reflected an aggressive development plan, most of those projects have yet to be executed. In particular, the focus on air cargo operational development at FTG has been tabled indefinitely.

The FAA has invested over $48 million in FTG since its construction in 1983.

Additional information related to the development of the Airport since 1982 can be seen by examining the history of FAA Airport Improvement Program (AIP) grants, as shown in **Table 2-1**.

TABLE 2-1 - HISTORY OF AIP GRANTS

AIP Number	Fiscal Year	AIP Federal Funds	Work Description
3-08-0016-01	1982	$2,750,000	Grade & drain Runway 8/26 parallel and connecting taxiways, building area & airport access road. Relocate portion of County Rd. 26N. Install perimeter fence
3-08-0016-02	1982	$3,300,000	Pave & mark Runway 8/26, aircraft parking apron and access Rd. Install segmented circle and lighted wind cone
3-08-0016-03	1983	$1,948,588	Pave & mark parallel taxiway system for Runway 8/26. Install MIRL and signage system, VASI-2, Beacon & airport security lights
3-08-0016-04	1985	$1,320,321	Grade, drain, pave & overlay Runway 17/35 and connecting Taxiway. Install MIRL for Runway 17/35. Expand Terminal Apron. Install drainage in Special base operator Area. Install Airport access road lighting
3-08-0016-05	1986	$440,492	Land acquisition for approach protection
3-08-0016-06	1986	$105,140	Construct 2-bay maintenance equipment building
3-08-0016-07	1986	$130,974	Land acquisition
3-08-0016-08	1987	$500,000	Pave airport owned hangar. Master Plan Update; including EA & land acquisition. FAA: Construct aprons & connecting taxiways
3-08-0016-09	1987	$19,998	Airport Layout Plan (ALP) Update
3-08-0016-10	1987	$1,311,697	Install ILS/MALSR system; replace MIRL/HIRL, apply markings to Runway 8/26, land reimbursement (Parcel 1B); upgrade AWOS-II to AWOS III
3-08-0016-11	1988	$1,300,000	$800,000 land reimbursement (Parcels IC, ID & 5A) $500,000 expansion of Terminal apron, apron flood lighting
3-08-0016-12	1989	$2,552,588	Acquire parcels 2, 4B, 5, 6, 7, 7B, 9, 9B, 11 and parcel 1 improvements; provide relocation assistance
3-08-0016-13	1990	$3,033,392	Site preparation and drainage for Runway 17R/35L including parallel taxiway D and connecting Taxiway C
3-08-0016-14	1991	$3,976,768	Pave and light Runway 17R/35L, pave parallel taxiways
3-08-0016-15	1991	$460,698	Reimbursement for acquisition of parcels 4, 4D, and 9C; 156 acres
3-08-0016-16	1991	$1,721,579	Construct a General Aviation apron area and dual connector taxiway
3-08-0016-17	1992	$417,923	Reimbursement for acquisition of parcels 3, 9D & 9E
3-08-0016-18	1993	$1,956,203	$400,000 for NAVAIDs; acquire SRE, grade Runway critical areas
3-08-0016-19	1993	$2,588,605	Construct access road, SRE building, and east taxiway system
3-08-0016-20	1996	$1,630,120	Rehabilitate Runway 8/26 & connector taxiways; improve Runway edge, lights and Runway precision markings

AIP Number	Fiscal Year	AIP Federal Funds	Work Description
3-08-0016-21	1998	$434,500	Rehabilitate guidance signs for Taxiways A, B, C, D, E and connecting taxiways. Install signage & supplemental wind cones for Runways 8/26 & 17/35
3-08-0016-22	1999	$580,000	Rehabilitate Terminal Apron. Construct Portland cement concrete parking slab.
3-08-0016-23	1999	$185,000	Land Acquisition
3-08-0016-24	1999	$306,000	Land Acquisition
3-08-0016-25	2000	$200,000	Land Acquisition for approach protection of 8/26. Relocation assistance and demolition of buildings
3-08-0016-26	2001	$200,033	Update Airport Master Plan
3-08-0016-27	2002	$150,000	Acquire SRE, acquire land for approach protection
3-08-0016-28	2003	$2,003,587	Runway 17/35 Overlay
3-08-0016-29	2005	$300,000	Rehabilitate Taxilanes, Taxiway A7, install AWOS
3-08-0016-30	2006	$163,977	Rehabilitate west half of Taxilane 7B
3-08-0016-31	2008	$150,000	Rehabilitate east half of Taxilane 7A
3-08-0016-32	2009	$2,100,000	Rehabilitate Terminal Apron
3-08-0016-33	2009	$129,072	Rehabilitate west half of Taxilane 7A
3-08-0016-34	2010	$150,000	Rehabilitate east half of Taxilane 7B
3-08-0016-35	2010	$1,000,000	Construct electrical vault, replace airfield lighting control system
3-08-0016-36	2011	$130,000	Replace Runway 17/35 edge lights
3-08-0016-37	2011	$1,205,000	Rehabilitate Taxiway D
3-08-0016-38	2012	$3,859,000	Rehabilitate Runway 8/26
3-08-0016-39	2014	$3,049,000	Rehabilitate Taxiway A

Source: FAA

2.3 Airport Role

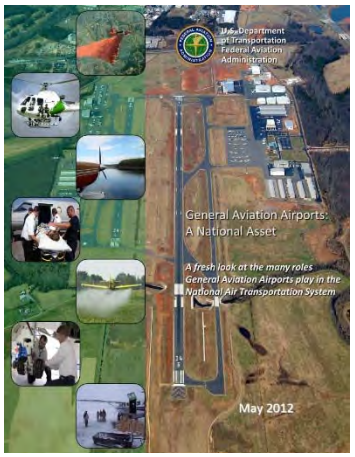
Airports can play different functional roles and can contribute at many levels in meeting the transportation and economic needs on national, regional, state, and local levels. Identifying and understanding the various roles that an airport plays is essential for that airport to be developed with facilities and services appropriate to fulfilling its respective roles. Following are FTG's various role classifications.

2.3.1 National Plan of Integrated Airport Systems (NPIAS)

The NPIAS is an FAA-sponsored national airport system plan whose purpose is to identify the airports that are important to national air transportation. Being identified within NPIAS makes an airport eligible to receive grants under the FAA's Airport Improvement Program (AIP) for the planning and implementation of airport capital improvements and infrastructure development. Specifically, NPIAS defines an airport by its service level, which reflects the type of service that a given airport provides for its host community. This service level also defines the funding categories established by Congress to assist in the distribution of funding resources for airport development.

The 2015-2019 NPIAS classified FTG as a public-use *Reliever* service level airport. Reliever airports are airports designated by the FAA to relieve congestion at Commercial Service Airports and to provide improved general aviation access to the overall community.

2.3.2 General Aviation Airports: A National Asset



In 2012, the FAA prepared *General Aviation Airports: A National Asset* (ASSET 1) which further classifies the nation's nearly 3,000 general aviation (GA) airports, heliports, and seaplane bases identified in the FAA's NPIAS. This in-depth analysis highlights the pivotal role GA airports play in our society, economy, and the aviation system. The study also aligns the general aviation airports into four categories—national, regional, local, and basic—based on their existing activity levels. These categories better capture their diverse functions and the economic contributions GA airports make to their communities and the nation.

The FAA's Asset study classifies FTG as a *Regional* airport, defined as an airport that supports general aviation activities such as emergency service, charter or critical passenger service, cargo operations, flight training, and personal flying. This grouping is characterized as having "high levels of activity with some jets and multi-engine propeller aircraft, averaging about 90 total based aircraft, including 3 jets."

In 2014, ASSET 2 was released to further review those NPIAS airports that were unclassified in ASSET 1. ASSET 2 did not impact FTG's classification as a Regional airport.

2.3.3 Colorado Statewide Airport System Plan

Colorado Department of Transportation (CDOT) Aeronautics conducted a study in 2011 to provide an analysis of the statewide airport system of public use airports. CDOT produced an extensive assessment of the current system's condition, as well as a guide for meeting its current and future needs. This plan provided tools to help facilitate the continued successful development of its aviation system, and to show the relationship between system performance measures, benchmarks, and facility and service objectives that were established in 2000.

Front Range Airport is classified in the CDOT Airport System Plan's Technical Report as a *Major General Aviation* airport. Airports must meet the following objectives to be classified in this category:

- Runway length adequate for all small aircraft
- Primary runway width of at least 75 feet
- Full or partial parallel taxiway for the primary runway

FTG Economic Impact in 2013

2.4 Economic Impact

In 2013, CDOT conducted an Economic Impact Study for Colorado airports that measured the economic contributions that stem from on-airport activities and off-airport spending by visitors that arrive via an airport. The economic contributions of these activities are measured through jobs, associated payroll, and economic output. On-airport activities include tenants and airport-related activities such as administration, operation, and maintenance. Visitor spending includes food, lodging, transportation, entertainment, and retail purchases that result in support of local jobs and payroll. Capital improvement projects at the airports also support jobs and payroll over the duration of the project. The capital improvement, airport, tenant, and visitor impacts, in conjunction with multiplier effects, represent total economic contribution for a given airport.

Through this planning effort, FTG's annual economic impact in 2013 was estimated to be $75.5 million in total economic output, generating 489 jobs with a total annual payroll of $31.6 million. Additionally, according to this study, FTG generates 19,000 visitors to Colorado.

2.5 Primary Airport Data

Table 2-2 provides a summary of some of the important primary data elements for FTG. The most recent (2014) Airport Layout Plan was utilized as the source for much of the data.

TABLE 2-2 - PRIMARY AIRPORT DATA

Data Element	FTG Data
Airport Name	Front Range Airport
FAA Designation	FTG
Airport Sponsor	Adams County
Associated Town	Watkins, CO
Date Established	1983
Airport Management	– Full-time staff – Front Range Airport Advisory Board
Airport Roles	– FAA NPIAS: Reliever – FAA ASSET: Regional – CDOT: Major General Aviation
Radio Frequencies	– Unicom: 122.95 MHz – CTAF: 120.2 MHz – ATIS: 119.025 (303-261-9104)
Airspace Classification	Class G up to 699 AGL, Class D surface-8,000 AGL (when ATCT operating)
Airport Reference Point	N 39° 47' 03.1200" W 104° 32' 15.4400"
Elevation	5,512' Mean Sea Level
Acreage	3,349 acres

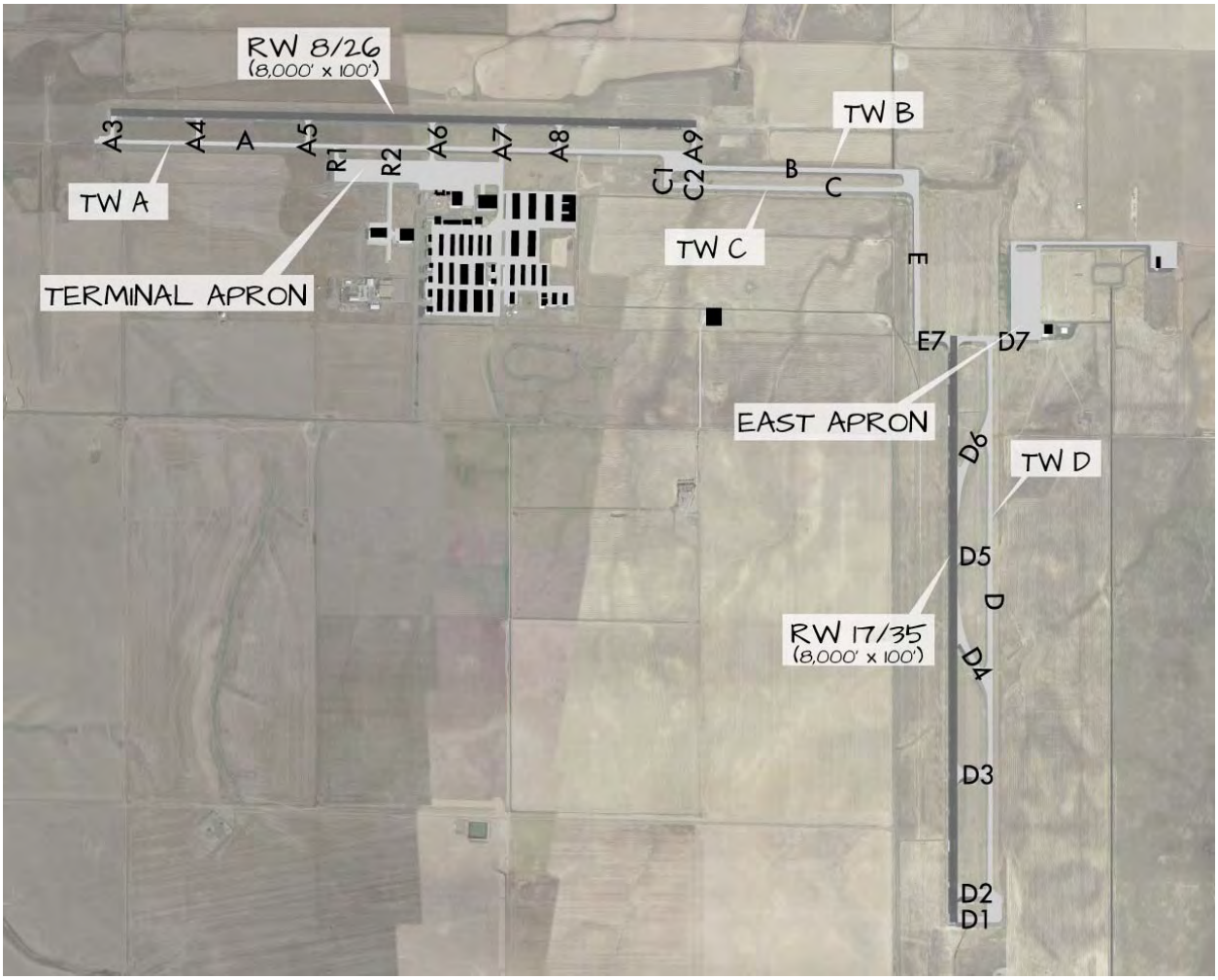
Data Element	FTG Data
Sectional Chart	Denver
Mean Maximum Temperature	88.1°F (July)
Precipitation	– Mean Maximum Rain: 2.43" (May) – Total Average Annual Rainfall: 15.48" – Mean Maximum Snow: 12.6" (March) – Total Average Annual Snow: 59.6"

Source: FTG ALP 2014; FAA 5010 Airport Master Record, Western Region Climate Center
Notes: AGL- Above Ground Level

2.6 Airside Facilities

Airside facilities consist of the parts of the Airport that accommodate the movement of aircraft, and encompass runways, taxiways, airfield lighting, and other facilities necessary to support flight activity. **Figure 2-2**Error! Reference source not found. depicts FTG's existing airside facilities.

FIGURE 2-2 - FTG AIRSIDE FACILITIES



Source: Jviation

2.6.1 Runways

As shown in **Figure 2-2**, FTG has two runways (Runway 8/26 and Runway 17/35) that are perpendicular to each other, although they do not intersect. Both runways have full parallel and connecting taxiways that provide aircraft access to the terminal and other facilities on the Airport. **Table 2-3** provides additional detail about each runway: size, markings, pavement type/strength, elevation, gradient, runway design code (RDC), and critical aircraft intended to use the runway most frequently.

Runway 8 at FTG

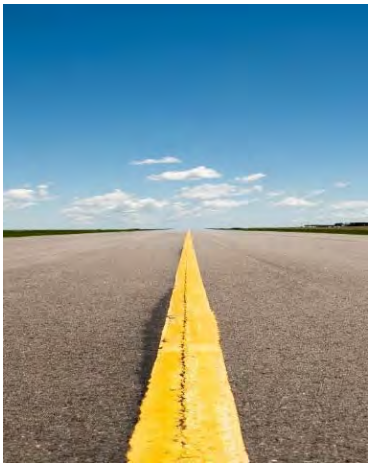
TABLE 2-3 - FTG RUNWAY INFORMATION

Element	Runway Data
Runway 8/26	
Dimensions	8,000' x 100'
Runway Markings	Precision-Instrument
Runway Surface Type	Asphalt
Runway End Elevations	5449.8' / 5485.4'
Visual Slope Indicator	PAPI-2L
Effective Gradient	.4%
Pavement Strength	28,000 pounds Single Wheel (SW) 40,000 Dual Wheel Gear (DW)
Pavement Condition	Excellent (PCI = 86-100)
RDC	C-II
Critical Aircraft	Bombardier Challenger CL604
Runway 17/35	
Dimensions	8,000' x 100'
Runway Markings	Precision-Instrument
Runway Surface Type	Asphalt
Runway End Elevations	5472.5' / 5511.5'
Visual Slope Indicator	PAPI-4L
Effective Gradient	.5%
Pavement Strength	34,000 pounds Single Wheel (SW) 75,000 pounds Dual Wheel Gear (DW)
Pavement Condition	Fair (PCI = 56-70)
RDC	C-II
Critical Aircraft	Bombardier Challenger CL604

Source: FTG ALP 2014; CDOT; FAA 5010 Airport Master Record

2.6.2 Taxiways

Taxiways are paved areas over which airplanes move from one part of the airfield to another. One of their more important uses is to provide access between the terminal/hangar facilities and the runways. There are three types of taxiways: parallel, entrance/exit, and access. Taxiways that are parallel to runways generally provide a route for aircraft to reach the runway end. Entrance/exit taxiways, which usually connect runways to parallel taxiways, provide paths for aircraft to enter the runway for departure or leave the runway after they have landed. Access taxiways provide a means for aircraft to move among the various airside components of an airport: hangar areas, aprons, fueling areas, etc.



Taxiway at FTG

FTG has two full-length parallel taxiways (one for each runway), each with seven connecting taxiways. **Table 2-4** details information about each taxiway including type, associated runway, width, and condition (based on pavement condition index standards).

TABLE 2-4 - FTG TAXIWAY INFORMATION

Taxiway ID	Type	Associated Runway	Width (feet)	Condition
A	Parallel	8/26	50	Excellent (PCI = 86-100)
A3	Entrance/Exit	8/26	50	Excellent (PCI = 86-100)
A4	Entrance/Exit	8/26	50	Excellent (PCI = 86-100)
A5	Entrance/Exit	8/26	50	Excellent (PCI = 86-100)
A6	Entrance/Exit	8/26	50	Excellent (PCI = 86-100)
A7	Entrance/Exit	8/26	50	Excellent (PCI = 86-100)
A8	Entrance/Exit	8/26	50	Excellent (PCI = 86-100)
A9	Entrance/Exit	8/26	50	Excellent (PCI = 86-100)
R1	Access	8/26	50	Poor (PCI = 41-55)
R2	Access	8/26	50	Fair (PCI = 56-70)
B	Access	8/26 & 17/35	50	Good (PCI = 71-85)
C	Access	8/26 & 17/35	50	Poor (PCI = 41-55)
C1	Access	8/26 & 17/35	90	Poor (PCI = 41-55)
C2	Access	8/26 & 17/35	90	Poor (PCI = 41-55)
E	Access	17/35	50	Good (PCI = 71-85)
E7	Entrance/Exit	17/35	70	Fair (PCI = 56-70)
D	Parallel	17/35	50	Fair/Good Poor (PCI = 41-70)
D1	Entrance/Exit	17/35	70	Fair/Good Poor (PCI = 41-70)
D2	Entrance/Exit	17/35	90	Fair/Good Poor (PCI = 41-70)
D3	Entrance/Exit	17/35	90	Fair/Good Poor (PCI = 41-70)
D5	Entrance/Exit	17/35	90	Fair/Good Poor (PCI = 41-70)
D6	Entrance/Exit	17/35	70	Fair/Good Poor (PCI = 41-70)
D7	Entrance/Exit	17/35	70	Fair/Good Poor (PCI = 41-70)

Source: Jviation, CDOT

2.6.3 Aprons

Terminal Apron at FTG

An aircraft apron area is used for aircraft movement and positioning, vehicle movement and parking, and aircraft tie-down. FTG has two aircraft aprons: the Terminal Apron, and the East Apron. Located south of Runway 08/26 and Taxiway A, the asphalt Terminal Apron measures approximately 2,400 feet by 300 feet and serves the needs of both based and transient aircraft. It has 144 marked tie-downs for all aircraft, and has a concrete hardstand that measures approximately 210 feet by 90 feet. Pavement conditions of the Terminal Apron currently range from fair on the western half of the apron to poor and very poor on the eastern half. The asphalt East Apron measures approximately 1,200 feet by 400 feet and is located on the east side of the Airport, adjacent to the airport maintenance buildings. The pavement condition of the East Apron is currently considered to be poor.

2.6.4 Airfield Lighting

Identification Lighting

A rotating beacon with the universally accepted optical system for lighting airports identifies the location of the Airport. This beacon projects alternating green and white beams from dusk to dawn. When activated during daylight hours, the beacon signals Instrument Flight Rule (IFR) conditions. The FTG beacon is located in the terminal area.

Runway Lighting

Lighting aids are necessary to provide pilots with critical takeoff and landing information concerning runway alignment, lateral displacement, rollout operations, and distance. **Table 2-5** identifies the lighting aids available for each runway.

Runway edge lights are used to outline edges of runways during periods of darkness or restricted visibility conditions. Runway 8/26 is outfitted with High Intensity Runway Lights (HIRL) while Runway 17/35 has Medium Intensity Runway Lights (MIRL).

A Precision Approach Path Indicator (PAPI) is a series of lights that provides visual guidance during a runway approach. At FTG, each runway approach end is equipped with PAPIs that are owned and maintained by the Airport. Additionally, both Runway 8 and Runway 17 have Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR) that provide visual information to pilots on runway alignment, height perception, roll guidance, and horizontal references. On the other ends, Runway 26 and Runway 35 are equipped with Runway End Identifier Lights (REIL).

TABLE 2-5 - FTG RUNWAY LIGHTING

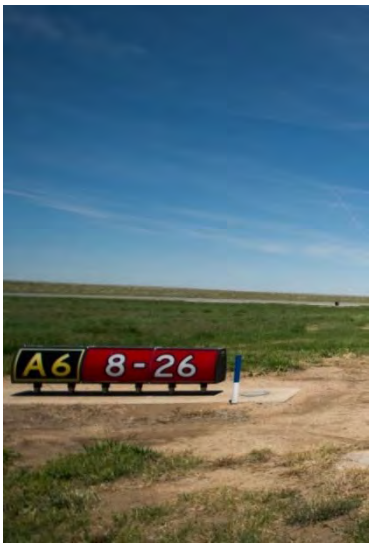
Lighting	Runways			
	8	26	17	35
Approach Lighting	REIL	MALSR	REIL	MALSR
Runway Edge Lighting	HIRL	HIRL	MIRL	MIRL

Lighting	Runways			
	8	26	17	35
Centerline Lighting	None	None	None	None
Visual Glide Slope Indicator (VGSI)	PAPI	PAPI	PAPI	PAPI

Source: FAA 5010 Airport Master Record

Taxiway Lighting

At FTG, only Taxiway D and its associated connectors are equipped with a Medium Intensity Taxiway Light (MITL) system to identify pavement edges. No other taxiways on the airport (e.g., Taxiways A, C, B, E and their associated connectors) are equipped with a taxiway lighting system, although their taxiway edges are marked with blue and white reflectors.



Taxiway Sign and Reflectors at FTG

Visual Aids

Additional visual aids and instrumentation at FTG assist pilots in arriving or departing. The Airport's segmented circle and integrated wind cone provide pilots with traffic pattern and wind direction/velocity information. This equipment is centrally located near the terminal area. The segmented circle/wind cone is lighted and located north of the mid-point of Runway 8/26.

Signage provides essential guidance to identify items and locations on an airport. Airfield signage gives pilots visual guidance information for all phases of movement on the airfield. FTG is equipped with FAA-compliant signs that include instruction, location, direction, destination, and information signs.

2.6.5 Automated Weather Observation System

FTG has an Automated Weather Observation System-III (AWOS) that provides continuous weather reports transmitted via VHF radio frequency. An AWOS is an automated sensor suite that is voice synthesized to provide a weather report that can be transmitted via VHF radio, non-directional beacon (NDB), or VHF omni-directional radio range (VOR), ensuring that pilots on approach have up-to-date airport weather for safe and efficient aviation operations. Most AWOS observe and record temperature and dew point in degrees Celsius, wind speed and direction in knots, visibility, cloud coverage and ceiling up to 12,000 feet, freezing rain, thunderstorm (lightning), and altimeter setting. This information can be heard on frequency 119.025. The AWOS at FTG was installed through a grants provided by CDOT.

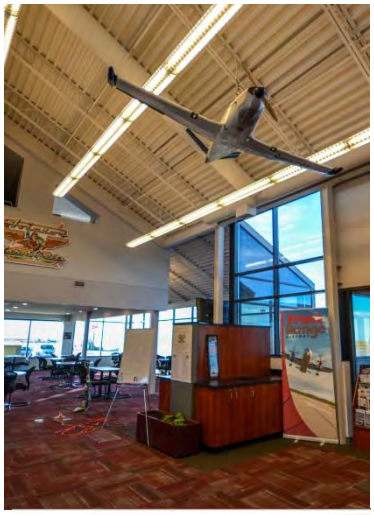
Terminal Building at FTG (Outside)

2.7 Landside Facilities

Landside development at the Airport includes a terminal building, fixed base operator facilities, and aircraft hangar facilities.

2.7.1 Terminal Building

The terminal building is located 1,000 feet south of centerline for Runway 8/26 between connector Taxiways A6 and A7. Construction of the terminal building was completed in 1987 and it was renovated in 2011. The building has two floors totaling



Terminal Building at FTG (Inside)

9,500 square feet, with the first floor consisting of a 900-square-foot pilot's lounge, restroom facilities, public telephones, vending machines, office space, customer service counter, employee locker room, and dining area. The second floor is home to the Airport administrative offices, a large conference room, and storage area. It is in excellent condition.

Fixed Base Operator (FBO)

Airports must provide a wide range of services to meet the varied demands of its individual market area. These demands are frequently accommodated by a fixed base operator (FBO) located on the airport that provides a variety of aeronautical services for pilots, aircraft, and passengers. FBO Services at Front Range is a full-service FBO that is owned and managed by Adams County. Located adjacent to the terminal apron and integrated with the terminal building, the FBO is open seven days a week from 7 am to 9 pm; Avgas self-fueling is available 24 hours a day. The FBO also provides the following non-inclusive list of services.

- FlyBuys Rewards Program
- Hertz Rent-A-Car on-site
- Catering
- Deicing/anti-icing
- Corporate/crew lounge with shower
- Corporate and general aviation services
- Courteous, professional line service
- Meeting and conference facilities
- Airport cars
- Shuttles to DEN and local hotels
- Flight planning and weather room
- The Aviator Bar and Grill
- Ground power units/lavatory services
- Heated hangars
- Hotel reservations

Note that while the FBO does not directly offer aircraft maintenance, such services are available through private companies on the Airport.

Hangar Area at FTG

2.7.2 Hangars

Hangars are enclosed structures for the parking, servicing, and maintenance of aircraft, designed to protect aircraft from adverse weather conditions such as wind, snow, hail, ice, sun, and rain. FTG currently has over 790,000 square feet of on-airport hangar space consisting of box hangars and T-hangars. In order to manage the large number of hangar buildings and units, FTG has broken down and identified specific areas on the airport by “modules,” with the Terminal Area accommodating Module 1, Module 2, and Module 3. **Figure 2-3** depicts the hangar locations and their respective modules.

Box hangars, also known as conventional hangars, have a square or rectangular footprint that can be sized to accommodate a wide range of aircraft storage needs, ranging from one single-engine aircraft up to multiple corporate jets. FTG currently has 21 box hangar structures that accommodate 156 individual units. There are also nine large executive hangars on the property. In total, these hangars provide approximately 466,000 square feet of hangar space.

Box Hangars at FTG

T-hangars are a series of interconnected aircraft hangars with footprints in the shape of a "T" that can store one single- or multi-engine aircraft in each unit. FTG currently has 148 nested T-hangar units in 12 separate structures. In total, these provide over 324,000 square feet of hangar space.

FTG's existing hangar and building units are listed in **Table 2-6**.

FIGURE 2-3 - FTG HANGAR LAYOUT

Source: Jviation

TABLE 2-6 - FTG HANGARS

Module	Address	Units	Area (square feet)	Year Constructed
1	37350 Astra Way	1	3,500	2002
1	37400 Astra Way	13	13,000	1997
1	37450 Astra Way		13,440	1998
1	37500 Astra Way	6	13,824	1997
1	37550 Astra Way	10	37,440	2000
1	37355 Astra Way	1	3,000	2000

Module	Address	Units	Area (square feet)	Year Constructed
1	37600 Astra Way	6	13,940 36,642	1997
1	37625 Astra Way	1	5,400	2000
1	37650 Astra Way	1	4,900	1997
1	37400 Beechcraft Way	1	8,000	1987
1	37400 Beechcraft Way	1	7,200	1987
1	37501 Beechcraft Way	1	4,320 4,708	1987
1	37503 Beechcraft Way	1	4,320 4,708	1987
1	37505 Beechcraft Way	1	9,000 9,205	2000
1	37600 Cessna Way	1	34,400	2003
1	5126 Front Range Parkway (FRA)	1	5,000	
1	5150 Front Range Parkway (FRA)	1	5,000	
1	5174 Front Range Parkway (FRA)	1	8,800	1990
1	5200 Front Range Parkway (FRA)	3	38,600	
1	37350 E 50th Avenue	1	5,625	2006
1	37355 E 50th Avenue	1	5,000	2000
1	37400 E 50th Avenue	1	13,440	1997
1	37450 E 50th Avenue	1	23,814	1997
1	37500 E 50th Avenue	1	28,130	1997
1	37550 E 50th Avenue	1	28,130	1999
1	37600 E 50th Avenue	1	23,814	2000
1	37401 51st Avenue (FRA)	1	18,000 8,578	1985
1	37451 51st Avenue (FRA)	1	18,000 15,512	1985
1	37501 51st Avenue (FRA)	1	15,500 4,708	1985
1	37551 51st Avenue (FRA)	1	15,500	1985
1	37601 51st Avenue (FRA)	1	15,500	1985
1	37651 51st Avenue (FRA)	1	15,500	1985
2	5195 Front Range Parkway	1	28,800	2007
2	5190 Violet Hill	1	27,000	2006
3	37700 Cessna Way	11	38,400	2001
3	37800 Cessna Way	12	38,400	2001
3	37850 Cessna Way	1	38,400	2001
3	37900 Cessna Way	A	5,690	2006
3	37900 Cessna Way	b	10,000	2006
3	37900 Cessna Way	c	10,000	2006
3	37701 51st Avenue	12	34,500	2004
3	37801 51st Avenue	12	34,500	2004
3	37700 Astra Way	1	15,400	2001
3	37750 Astra Way	1	14,896	2001

Module	Address	Units	Area (square feet)	Year Constructed
3	37800 Astra Way	11	18,000	2002
3	37835 Astra Way	1	15,210	2002
3	37700 50th Avenue	1	8,250	2001
3	37825 North Avenue	1	4,200	2002
3	37835 50th Avenue	1	3,300	2002
3	37870 50th Avenue	2	9,000	2008
3	37900 50th Avenue	2	9,000	2008

Source: Airport Records 2016

2.8 Airport Support Facilities and Equipment

2.8.1 Aircraft Fuel Storage

Self-Fueling Site at FTG

Front Range Airport offers both Jet-A and Avgas fuels for sale and use by aircraft. Avgas (or aviation gasoline) is used by aircraft having reciprocating piston engines. The most common grade of Avgas is 100 low lead (or 100LL). Jet-A is a kerosene-based fuel that contains no lead and is used for powering turbine-engine (jet or turboprop) aircraft. As previously mentioned, Adams County has retained the right to have FTG personnel serve as the Airport's lone FBO, resulting in the Airport realizing all profits associated with fuel sales.

Aviation fuel at FTG is stored in two locations. The first site abuts the terminal apron and provides 100LL self-fueling capabilities through a single, 10,000-gallon, double-walled above-ground storage tank. The second site is a dedicated fuel farm located on Cessna Way, southeast of the terminal area. This site houses three underground fuel storage tanks: one 20,000-gallon 100LL tank, and two 15,000-gallon Jet-A storage tanks. A leak detection system has been installed for each underground tank, and all tanks are in good condition. This site also offers self-serve fueling capabilities through a dispenser located immediately adjacent to the fuel farm. **Table 2-7** depicts the total fuel flowage at FTG for the period of 2004-2014.

Fuel Farm at FTG

TABLE 2-7 FUEL FLOWAGE

Year	100LL (Gallons)	Jet A (Gallons)
2004	219,261	150,862
2005	207,772	160,803
2006	203,886	157,779
2007	186,393	194,123
2008	156,950	162,667
2009	172,972	167,932
2010	152,935	175,600
2011	137,372	167,199
2012	120,351	168,607
2013	132,617	155,109
2014	131,881	188,362

Source: Airport Records, 2015

Fuel Truck at FTG

The Airport also utilizes fuel trucks to deliver and dispense aircraft fuel. These mobile fuel trucks include 5,000-gallon International Jet-A truck, a 2,000-gallon F-800 Jet-A truck, a 1,500-gallon 100LL truck, and a 750-gallon 100LL fuel bowser. The conditions of these fuel trucks range from fair to good. All storage tanks and fuel trucks are owned by Adams County.

2.8.2 Airport Equipment

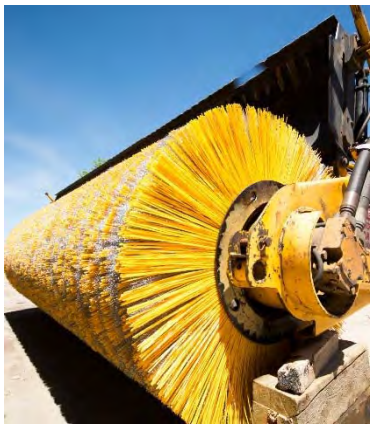
FTG owns and operates an inventory of vehicles and equipment to perform airfield maintenance, snow removal, and aircraft rescue and firefighting operations. Snow removal and firefighting equipment are eligible for FAA funding, while other maintenance equipment may be eligible for funding through CDOT Aeronautics.

Aircraft Rescue and Firefighting Equipment

ARFF Truck at FTG

Aircraft Rescue and Firefighting (ARFF) is a special category of firefighting on airports for response, evacuation, and possible rescue of passengers and crew in an aircraft. Since FTG is not a Federal Aviation Regulations (FAR) Part 139 airport (commercial certificated airport), it is not required to provide ARFF services. However, FTG does offer ARFF services with an FAA-defined Index B truck with a 1,500-gallon water/foam capacity, an Index E truck containing 500 pounds of dry chemical powder, and a Rapid Intervention Vehicle with 250 gallons of water-foam capacity as well as 300 pounds of dry powder. CDOT donated these vehicles to FTG, and are all in fair condition. They are stored in the maintenance bay with most of the other maintenance vehicles. Additionally, a mutual governmental agreement to provide emergency response exists between FTG and the Bennett Fire Department.

Snow Removal Equipment



Snow Broom at FTG

Snow Removal Equipment (SRE) is used to clear runway, taxiways, and aprons during snow events. FTG currently owns and operates the SRE inventoried in **Table 2-8**.

TABLE 2-8 - SRE INVENTORY

Year	Brand and Type	Condition
1993	International Plow Truck	Fair
1993	International Plow Truck	Fair
1993	Oshkosh P-Series Truck	Fair
1993	Oshkosh P-Series Truck	Fair
1996	Stewart Stevenson broom	Fair
1996	Stewart Stevenson broom	Fair
1993	International Paystar 5000 truck	Fair
1994	International Paystar 5000 truck	Fair
1982	Oshkosh Blower	Poor
1987	Oshkosh Blower	Poor
2003	Oshkosh Broom	Good

Source: Airport Records

Other Airport Maintenance Equipment

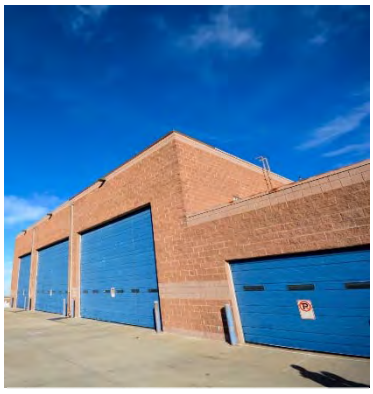
FTG has a variety of other maintenance equipment in its inventory for mowing, aircraft fueling and operations, and general maintenance. **Table 2-9** shows a list of existing equipment and current condition.

TABLE 2-9 - AIRPORT EQUIPMENT & VEHICLES

Year	Make/Model	Use	Condition
2002	Chevy Blazer	Operations/Maintenance	Fair
2004	Chevy 2500 Silverado Pick Up	Operations/Maintenance	Good
2004	Chevy 2500 Silverado Pick Up	Operations/Maintenance	Good
1997	Chevy 2500 Cheyenne Pick Up	Operations/Maintenance	Fair
1996	GMC 3500 1 Ton Pick Up	Operations/Maintenance	Fair
2002	GMC 3500 Van	Operations/Maintenance	Fair
2001	Case 821 Loader	Maintenance	Fair
1986	Case Backhoe 580 E	Maintenance	Fair
1985	Yanmar Tractor YM 336 D	Maintenance	Poor
2009	Schulte Mower Deck	Maintenance	Poor
1991	Rhino Mower Deck	Maintenance	Poor
1992	Bush Hog Mower Deck	Maintenance	Poor
2014	John Deere 5085E	Maintenance	New
2009	New Holland TV 6070 tractor	Maintenance	New
2008	Bobcat S220	Maintenance	Good
1998	Bobcat 873	Maintenance	Poor
1984	Ford F-800 Dump Truck	Maintenance	Poor
1994	International H Flatbed Truck	Maintenance	Fair
1958	Ford F-800 Boomtruck	Maintenance	Poor
1993	Air Compressor Trailer	Maintenance	Fair
Unknown	Light Trailer	Maintenance	Fair
2012	Magma 230 Cracksealer	Maintenance	Good
1996	Berry Crack Sealer	Maintenance	Fair
2002	Tymco air sweeper	Maintenance	Fair
1986	Tennant 95AA sweeper	Maintenance	Poor
1965	Towmotor forklift	Maintenance	Poor
Unknown	Miller welder	Maintenance	Good
2012	Lighted X's trailer #one	Maintenance	Good
2012	Lighted X's trailer #two	Maintenance	Good
1985	Ford F-800 Sludge Truck	Maintenance	Poor
1999	Ford F-40 Tow Truck	Maintenance	Good
1999	GMC 3500 Crane Truck	Maintenance	Good
Unknown	PSI Tug	FBO Equipment	Fair
1986	United Tug	FBO Equipment	Poor

Year	Make/Model	Use	Condition
1981	White Tug	FBO Equipment	Fair
2006	Eagle Tug	FBO Equipment	Fair
1998	Hobart Ground Power Unit	FBO Equipment	Fair
Unknown	Blue Hobart GPU	FBO Equipment	Poor
2006	International 100LL fuel truck	FBO Equipment	Good
2005	100LL Bowser fuel truck	FBO Equipment	Fair
2007	International Jet fuel truck	FBO Equipment	Good
1985	Ford F- 800 Jet fuel truck	FBO Equipment	Poor
1990	Ford F-150 PU	FBO Equipment	Poor
1998	Chevy C1500 PU	FBO Equipment	Fair
1998	Jeep Cherokee SE	FBO Equipment	Poor
2008	Chevy Impala Silver	FBO Equipment	Good
2008	Chevy Impala Red	FBO Equipment	Good
2008	Chevy Impala White	FBO Equipment	Good
2000	Buick Le Sabre	FBO Equipment	Fair
2002	GMC Envoy Red	FBO Equipment	Fair
2004	GMC Envoy Silver	FBO Equipment	Fair
1992	E-One ARFF	ARFF	Good
1984	GMC ARFF	ARFF	Poor
2009	WWTP	Generator	Good
2008	Terminal Cummings	Generator	Good
2011	Electrical Vault Cummings	Generator	Good
2005	Tower Cummings	Generator	Good

Source: Airport Records 2016



ARFF/SRE/Airfield Maintenance Building at FTG

ARFF/SRE/Airfield Maintenance Buildings

The ARFF/SRE/Airfield maintenance building is located 2,400 feet east of Runway 17/35 centerline and 500 feet north of the approach end to Runway 17. The building is only one level, but when it was constructed, it was designed to support the addition of a second floor when activity and demand at the Airport warrant such an expansion. The existing building is approximately 11,000 square feet with seven bays for equipment storage. Four of the bays have overhead doors that are 25 feet wide by 18 feet high, two bays have doors that are 16 feet wide by 18 feet high, and the last bay has an overhead door that is 12 feet wide by 18 feet high.

Located 165 feet to the east, a second maintenance storage building was constructed in 2012. This metal-sided, 6,400-square-foot building was constructed to provide covered storage for additional equipment in order to extend their operational lifespans. It should be noted that even with these two buildings, the Airport must store some vehicles and equipment outside.

2.8.3 Airport Access Roadways and Parking

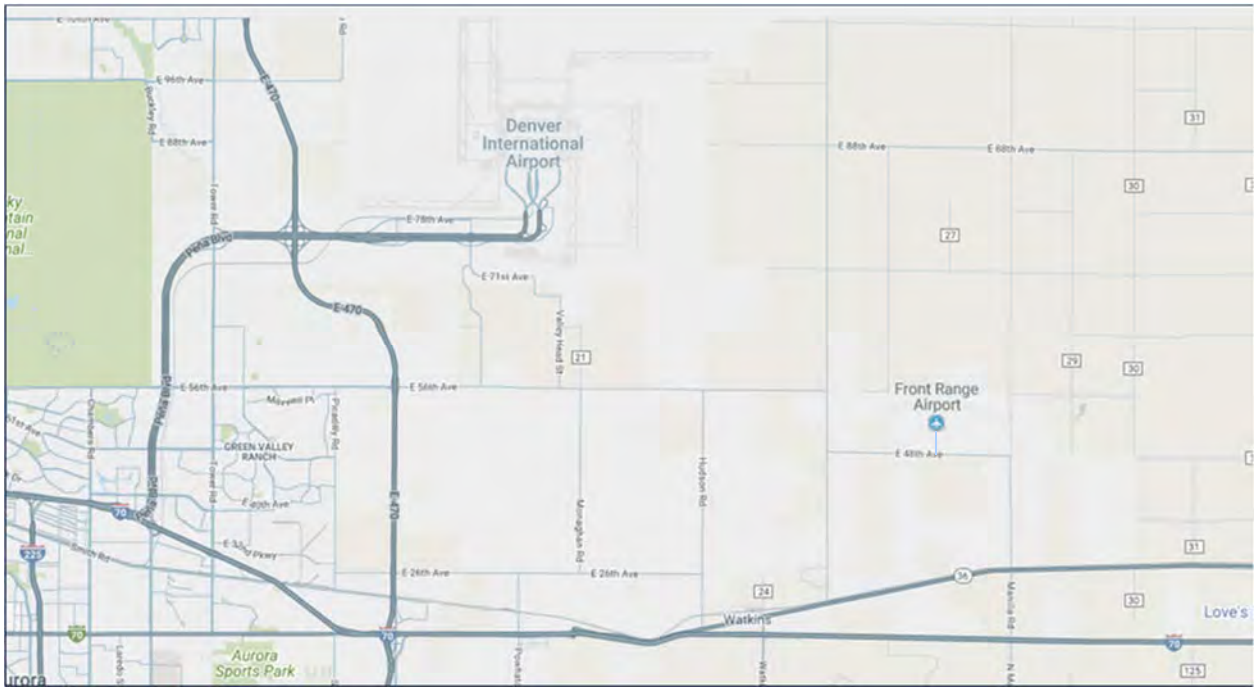
Front Range Parkway

Adequately accommodating automobile traffic and storage are important considerations during a master plan as they facilitate ease of access to airport users and can enhance the customer service experience. The following section summarizes existing road and parking conditions at the Airport.

Airport Access Road & Circulation Network

The main access road to FTG is Front Range Parkway, which is paved and in good condition. FTG is north of I-70 and east of the E-470 toll road. Downtown Denver and major highways I-225, I-25, and I-270 are accessible via I-70. Average drive time from FTG to the downtown area is approximately 40 minutes. The distance from FTG to DEN can be driven in under 20 minutes (**Figure 2-4**).

FIGURE 2-4 - AIRPORT TRANSPORTATION ACCESS



Source: Google Maps 2016

Auto Parking

Auto parking is available in five paved parking lots, totaling approximately 280 spaces, including overflow parking that is accommodated in a variety of grassed and other paved areas. The primary public parking lot at FTG is located immediately southwest of the terminal building. The lot's 55 marked parking spots (in addition to the estimated 40 turf parking spots) are available free of charge to all airport visitors and restaurant patrons, and are also used by employee vehicles, rental cars, and airport courtesy cars. Another 66 marked spaces are available in two paved parking lots located along Cessna Way, as well as another paved, unmarked lot east of the terminal. FTG tenants including CDOT Aeronautics, Colorado National Guard Armory,

and Colorado State Patrol, among others, have adequate, dedicated paved parking spaces.

2.8.4 Airport Security

Security measures on and around FTG are currently limited to the protection of critical navigational aids and infrastructure. This generally takes the form of locked security fencing, including a secured fence and badge access control system that serves as the access control measures for FTG's Air Traffic Control Tower (ATCT). No other airfield perimeter fence**,** wildlife, or security fence is present at FTG for security or access control.

2.8.5 Airport Utilities

FTG has a variety of public utilities, including natural gas, electrical service, water supply, fiber optics, and communications. All utility lines serving the Airport are underground and provide service to buildings and airfield facilities.

- Natural gas is supplied by Excel; propane is only on the east side of the airfield.
- Electricity is provided by Xcel Energy, located on Imboden Road.
- Water supply is distributed through a master meter at FTG. Potable water is purchased from the City of Aurora. The water supply originates through a series of deep-wells which is treated, pressurized, and then pumped to FTG.
- A wastewater treatment facility was built on airport property southwest of the airfield in 2008. The treatment facility is for on- and off-airport customers, and currently treats about 9,000 gallons of wastewater per day, with peaks of up to 12,000 gallons per day[1].
- Century Link provides phone service, internet, and data services to FTG.

2.9 Airspace System / Navigation and Communications

FTG operates within the larger National Aviation System (NAS), which includes a wide array of services, systems, and requirements for airports and pilots that function within it. The following sections provide an overview of some of FTG's key considerations with respect to navigating and operating within the NAS.

2.9.1 Air Traffic Service Areas and Aviation Communications

Within the continental United States, there are 22 geographic areas that are under Air Traffic Control (ATC) jurisdiction. Air traffic services within each area are provided by air traffic controllers in Air Route Traffic Control Centers (ARTCC). The ARTCCs provide air traffic service to aircraft operating on Instrument Flight Rule (IFR) flight plans within controlled airspace, and primarily during the enroute phase of flight. Those aircraft operating under Visual Flight Rules (VFR) that depend primarily on the "see and avoid" principle for separation may also contact the ARTCC or other ATC services to request traffic advisory services. Traffic advisory service is used to alert pilots of other air traffic known in the vicinity of, or within the flight path of, the

[1] Airport Data records 2011

aircraft. The airspace overlying FTG is contained within the Denver ARTCC jurisdiction, which includes the airspace of all Colorado and portions of Kansas, Nebraska, Wyoming, Utah, Arizona, and New Mexico. The Denver ARTCC can be reached at frequency 118.575 MHz.

Aircraft approaching or departing an airport are subject to airspace and air traffic control that is designed to serve one primary purpose: safe separation between aircraft. The primary means of controlling aircraft employed by air traffic controllers is computerized radar systems that are supplemented with two-way radio communications. Altitude assignments, speed adjustments, and radar vectors are examples of techniques used by controllers to ensure that aircraft maintain proper separation. Controllers use the following lateral and vertical separation criteria for aircraft:

- Lateral Aircraft Separation: three miles (radar environment)
- Lateral Aircraft Separation: five miles (non-radar environment)
- Vertical Aircraft Separation: 1,000 feet (below 29,000 feet) and 2,000 feet (29,000 feet and above)

FTG's ATCT was dedicated in June 2005 and is the tallest general aviation tower in the United States, with a height of 190.6 feet Above Ground Level (AGL). The ATCT is operated by a private company through FAA's Contract Tower Program. This program is used by airports that benefit from Air Traffic Control yet may not meet criteria that supports full time FAA staffing. The ATCT provides service to aircraft within a four-mile radius of FTG during its hours of operation (0700-2100 local time). The FTG ATCT is also equipped with a radar repeater scope, yet does not provide radar vectors or traffic advisories. Since FTG is located seven miles southeast of DEN, there is constant and close coordination occurring between the FTG and DEN ATC in order protect against potential traffic conflicts for aircraft arriving and departing the area. During the hours of operation, the FTG ATCT also operates the ground control frequency of 124.7 MHz. Denver approach and departure control operate on frequency 128.25 MHz. Clearance delivery is available during the hours of 2100-0700 local time on frequency 123.7 MHz.

ATCT at FTG

A Common Traffic Advisory Frequency (CTAF) is used at FTG during the hours that the ATCT is closed. The CTAF frequency (120.2MHz) is used by pilots to communicate within the proximity of the airport and activate the approach lighting system, PAPIs, REILs, MITLs and runway lighting systems. The UNICOM frequency serves a similar function on 122.95MHz, yet is used primarily by the fixed base operator (FBO). An AWOS-3 is located on the Airport as is an Automatic Terminal Information Service (ATIS), both of which can be accessed on 119.025 MHz. The FTG ATIS can also be reached via telephone at 303.261.9104.

2.9.2 Airspace

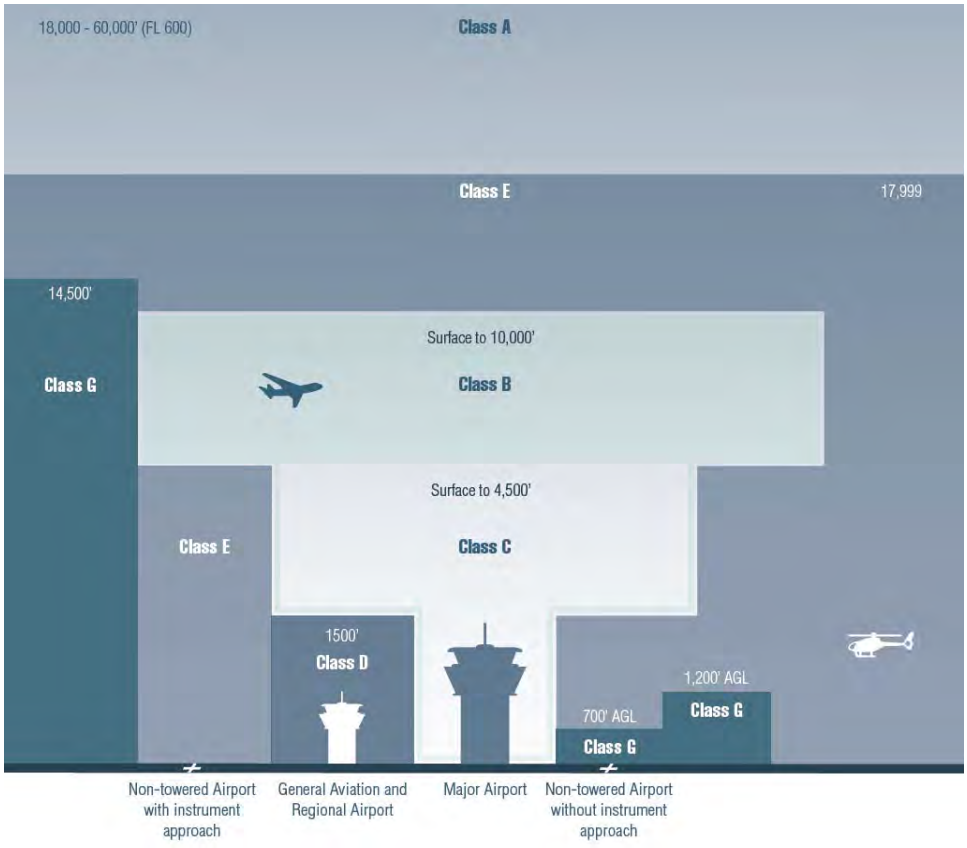
To ensure a safe and efficient airspace environment for all aspects of aviation, the FAA has established an airspace structure through the Federal Aviation Regulations (FAR) that regulates and establishes procedures for aircraft that use the NAS. This airspace structure essential provides for two basic categories of airspace: controlled

(classified as Class A, B, C, D, and E) and uncontrolled (classified as Class G). **Figure 2-5** illustrates each airspace type.

FTG is Class D airspace during ATCT hours of operation (0700-2100 local time) and Class G airspace at all other times. Aircraft must establish and maintain two-way radio contact with the control tower before entering or operating in Class D airspace. Denver International Airport's Class B airspace overlies and surrounds the FTG Class D airspace, which starts at the surface and extends up to 8,000 feet AGL (FTG is on the Denver VFR sectional chart, see **Figure 2-6**). Controllers at both airports coordinate to ensure an airspace transition free of traffic conflicts with minimal delays.

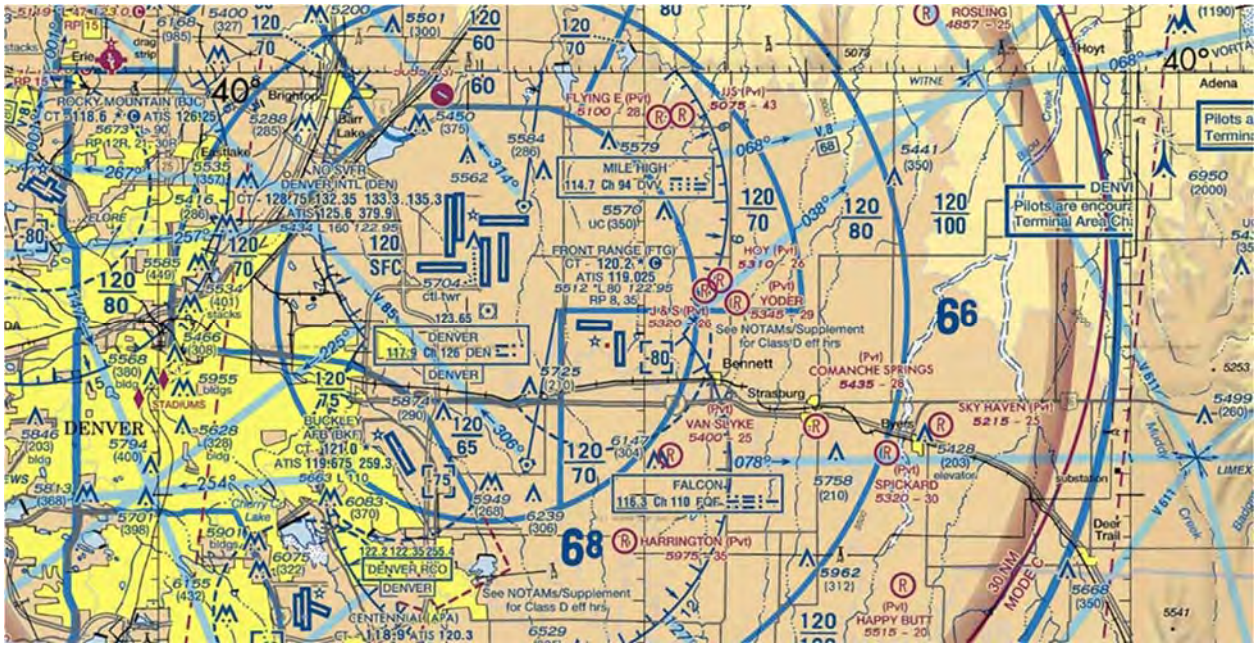
Front Range Airport is also inside the 30-mile Mode C veil which requires all aircraft to have operable transponders unless otherwise authorized by ATC.

FIGURE 2-5 - FAA AIRSPACE CLASSIFICATIONS



Source: FAA

FIGURE 2-6 - DENVER SECTIONAL CHART WITH FTG



Source: Denver Sectional Chart, US Department of Commerce, National Oceanic and Atmospheric Administration

2.9.3 Navigational Aids (NAVAIDs)

A variety of NAVAIDs are available to pilots around FTG, whether located near the field or at other locations within the region. Many of these NAVAIDs are available to enroute air traffic. They are used by pilots in the vicinity of the Airport and include those facilities listed in **Table 2-10**.

TABLE 2-10 - NAVAIDS NEAR FTG

Type	ID	Name	Frequency	Radial	Range
VORTAC	DVV	Mile High	114.7	141°	7.7 nm
VORTAC	FQF	Falcon	116.3	023°	6.8 nm
VOR-DME	DEN	Denver	117.9	099°	5.9 nm
VOR-DME	BJC	Jeffco	115.4	095°	28.8 nm

Source: http://www.airnav.com/airport/KFTG

Localizer at FTG

A VORTAC NAVAID consists of a co-located VHF omnidirectional range (VOR) beacon and a tactical air navigation system (TACAN) beacon. Both types of beacons provide pilots azimuth information, but the VOR system is generally used by civil aircraft and the TACAN system by military aircraft. However, the TACAN distance measuring equipment is also used for civil purposes. There are two VORTACs in range of FTG.

A VOR/DME system is a VOR Station with distance measuring equipment (DME) transmitting very high frequency signals, 360 degrees in azimuth oriented from magnetic north. The DME is used to measure, in nautical miles, the slant range distance of an aircraft from the NAVAID. There are two VOR/DMEs in range of FTG.

Glideslope at FTG

FTG currently has seven published instrument approaches, summarized in **Table 2-11**. The Airport has three Instrument Landing System (ILS) approaches, two of which provide the lowest ceiling (200 feet) and visibility minima (½ mile). **Figure 2-7**, **Figure 2-8**, **Figure 2-9**, **Figure 2-10**, **Figure 2-11**, and **Figure 2-12** show the current approach plates for these published instrument approaches.

TABLE 2-11 - LOWEST INSTRUMENT APPROACH MINIMUMS

Instrument Approach	Lowest Straight-in Approach		Lowest Circling Approach	
	Ceiling	Visibility	Ceiling	Visibility
ILS or LOC RWY 17	200 feet	¾ mile	600 feet	1 mile
ILS or LOC RWY 26	200 feet	½ mile	600 feet	1 mile
ILS or LOC RWY 35	200 feet	½ mile	600 feet	1 mile
RNAV (GPS) RWY 17	200 feet	¾ mile	600 feet	1 mile
RNAV (GPS) RWY 26	200 feet	½ mile	600 feet	1 mile
RNAV (GPS) RWY 35	200 feet	½ mile	600 feet	1 mile
NDB RWY 26	600 feet	¾ mile	600 feet	1 mile

Source: FAA

FIGURE 2-7 - ILS OR LOC RWY 17

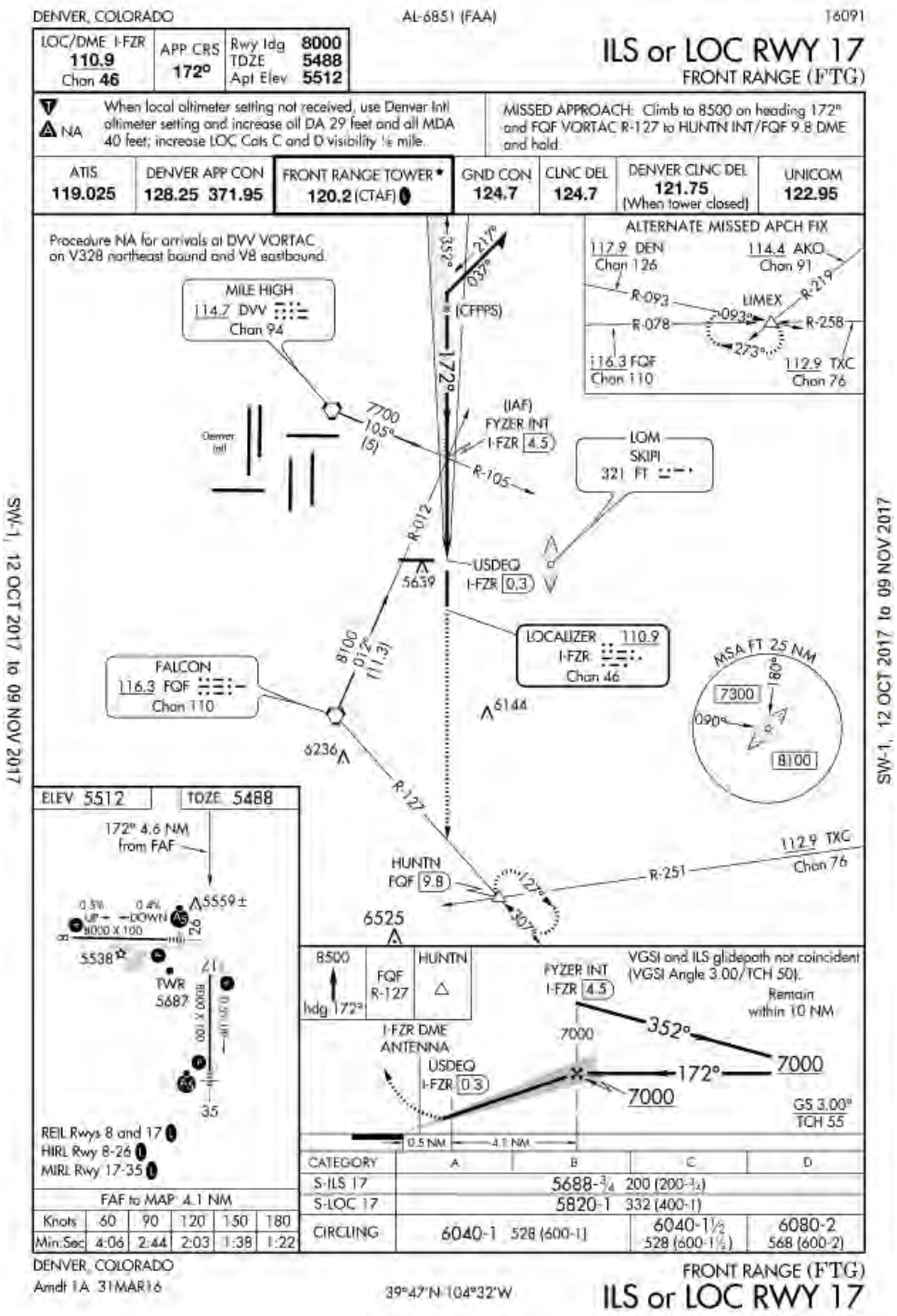


FIGURE 2-8 - ILS OR LOC RWY 26

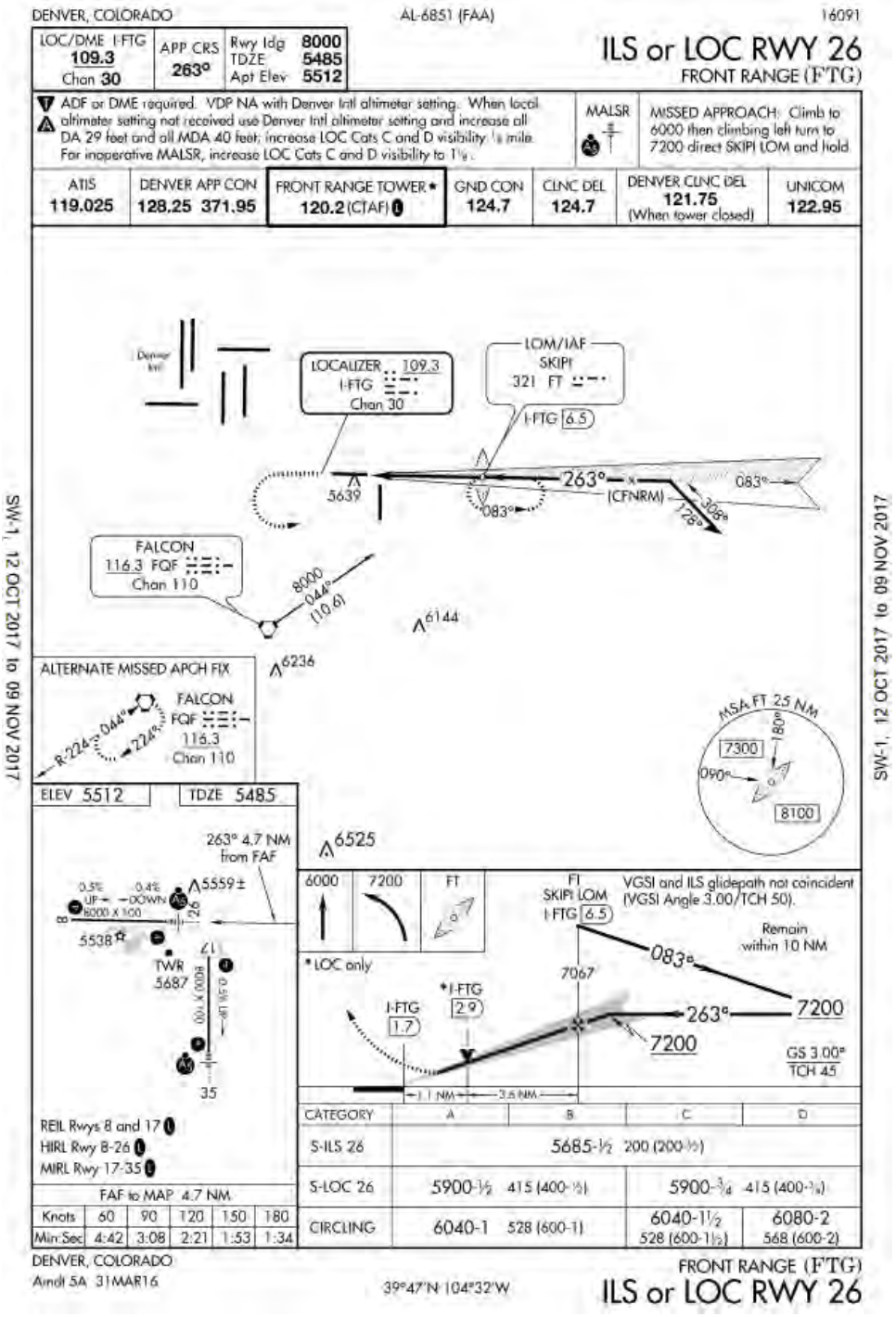


FIGURE 2-9 - ILS OR LOC RWY 35

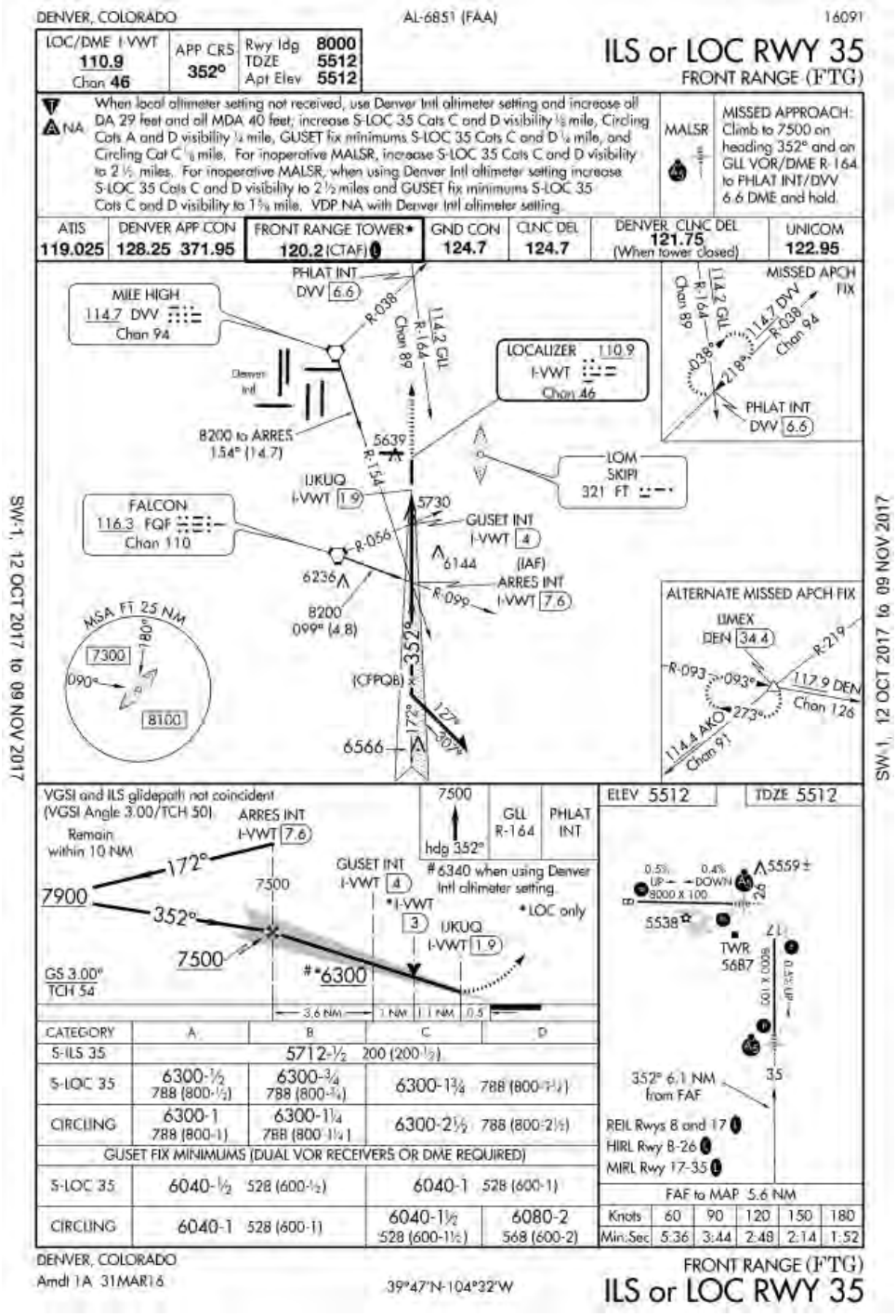


FIGURE 2-10 - RNAV (GPS) RWY 17

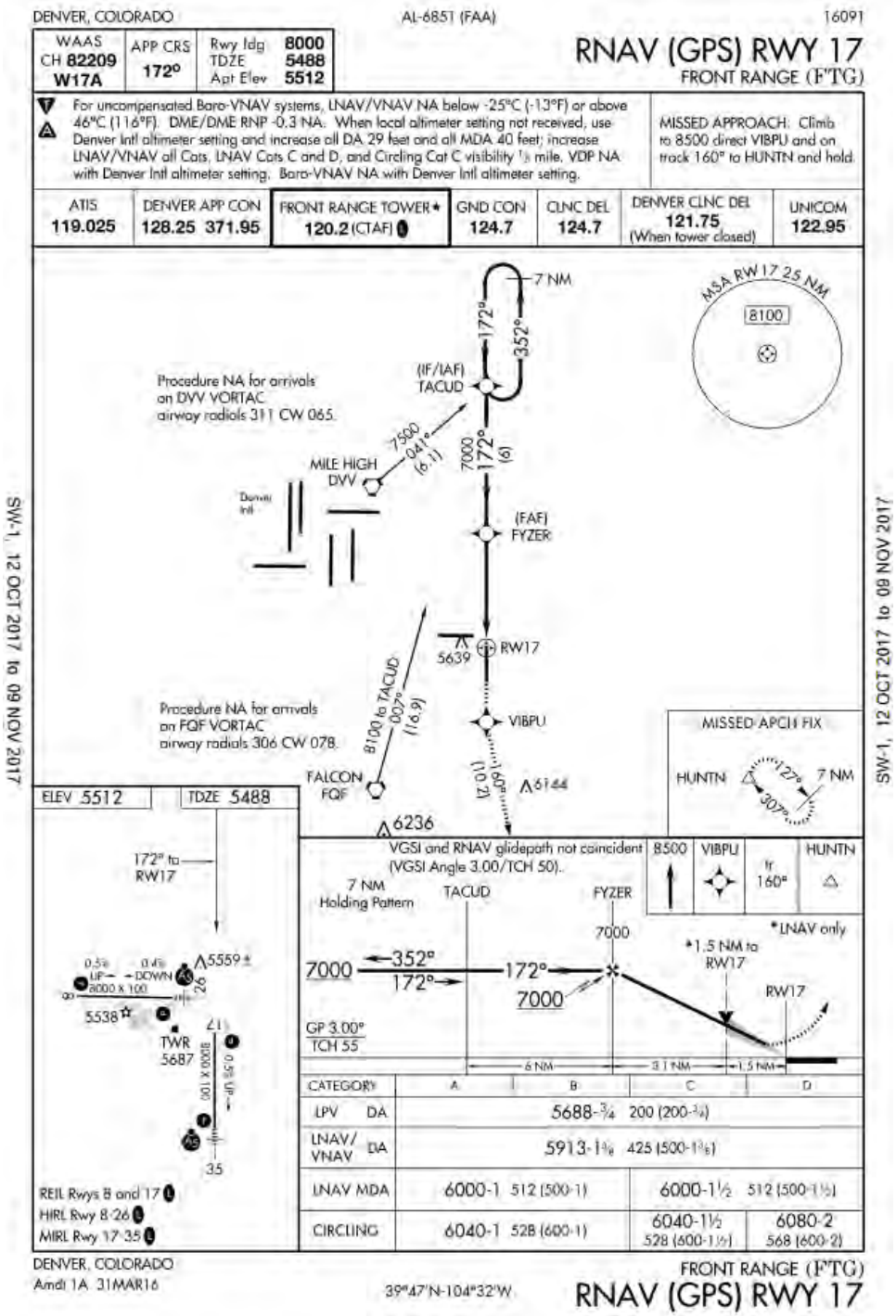


FIGURE 2-11 - RNAV (GPS) RWY 26

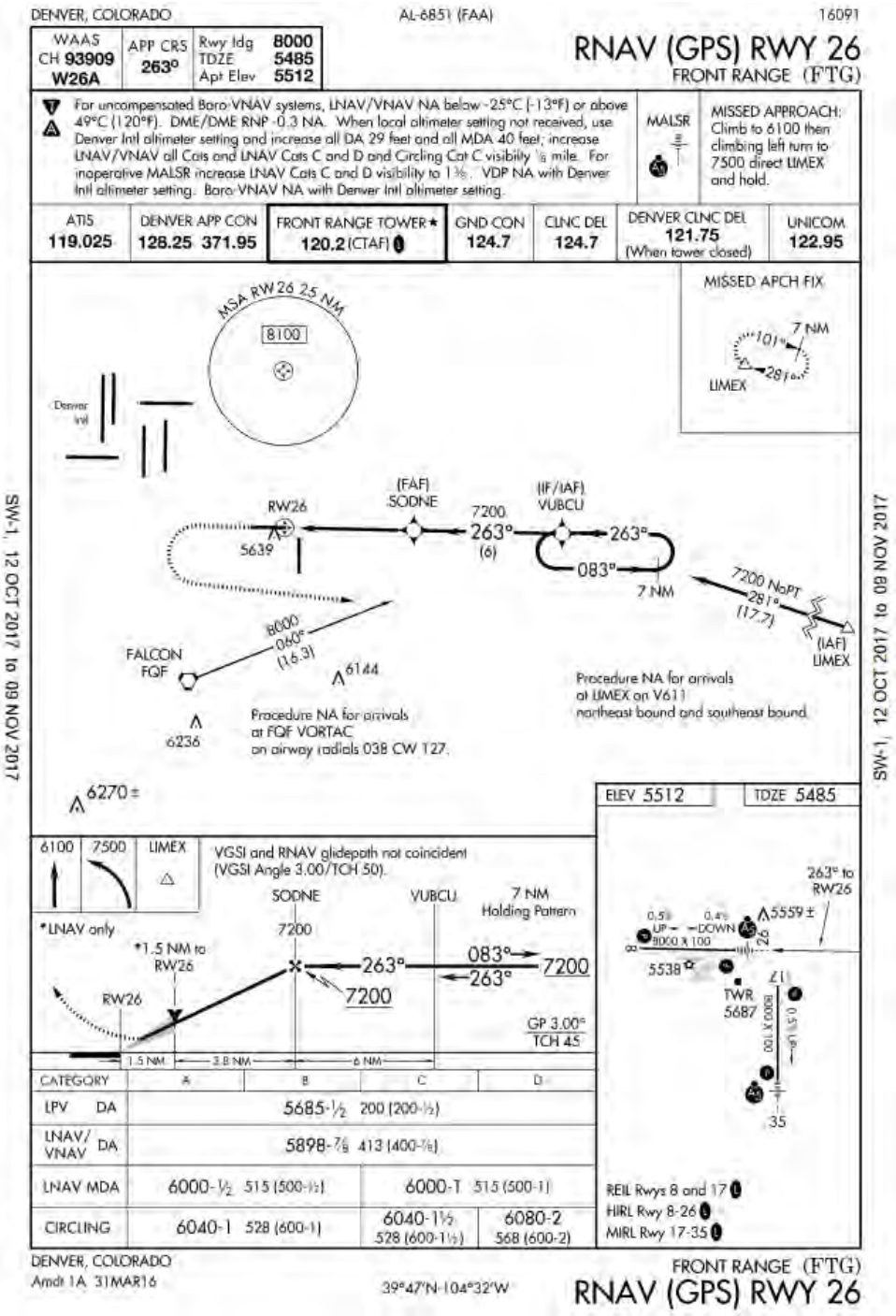
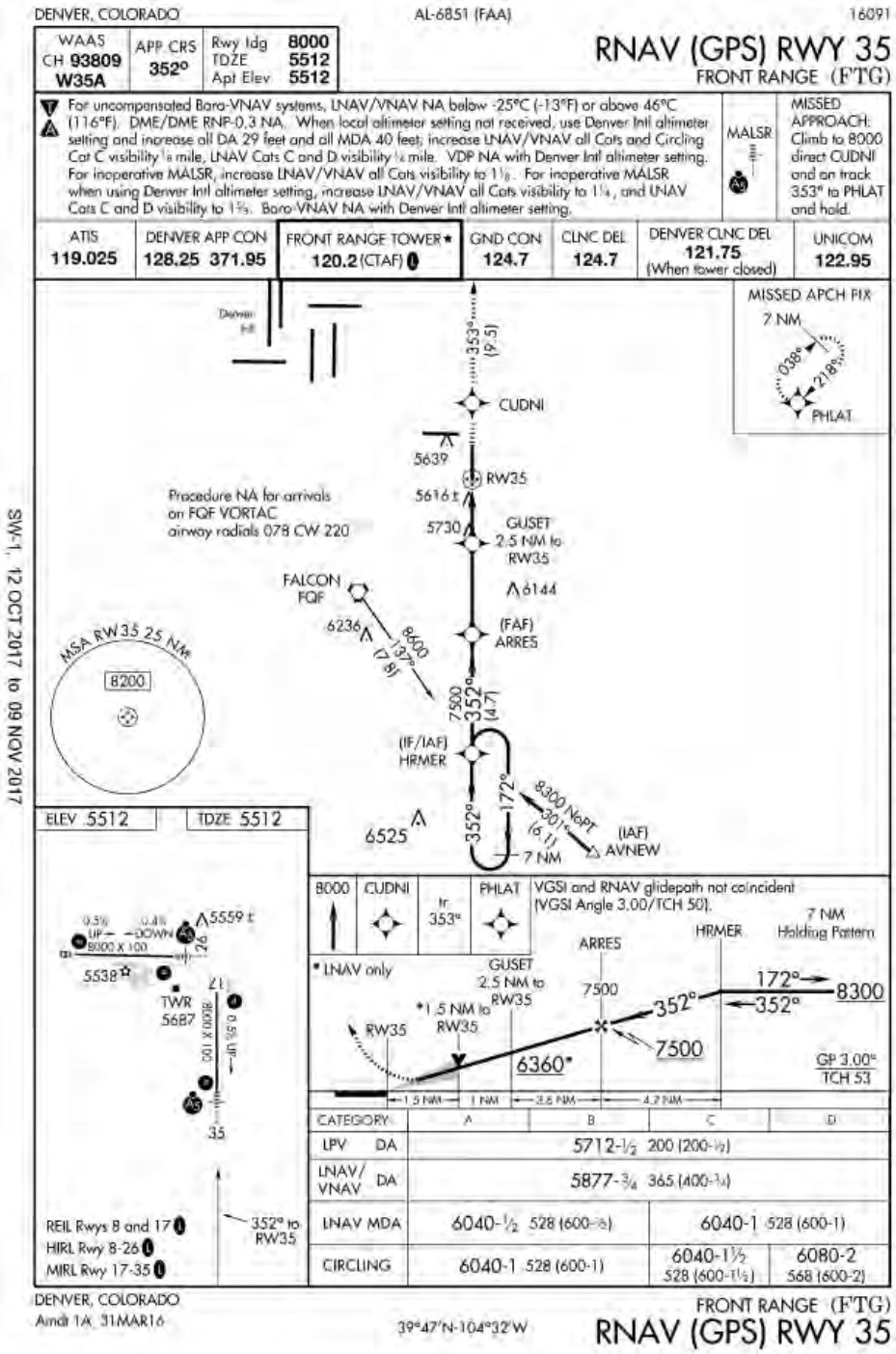


FIGURE 2-12 - RNAV (GPS) RWY 35

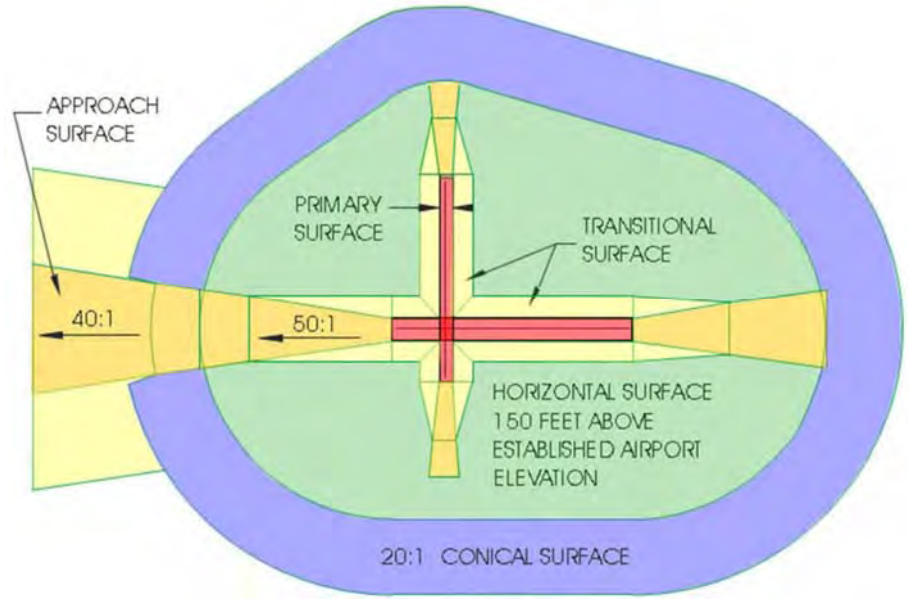


2.9.4 Part 77 Airspace Surfaces

FAR Part 77, Objects Affecting Navigable Airspace, is a tool used to protect the airspace over/around a given airport and each of its runway approaches from potential obstructions to air navigation. It is a federal regulation that all airports in the national airspace system are subject to the requirements of Part 77. To determine whether an object is an obstruction to air navigation, Part 77 establishes several imaginary airspace surfaces in relation to an airport and to each runway end. The dimensions and slopes of these surfaces depend on the configuration and approach categories of each airport's runway system. The size of the imaginary surfaces depends largely upon the type of approach to the runway in question. The principal imaginary surfaces are described below and illustrated in **Figure 2-13**.

- Primary Surface: Longitudinally centered on the runway at the same elevation as the nearest point on the runway centerline.
- Horizontal Surface: Located 150 feet above the established airport elevation, the perimeter of which is established by swinging arcs of specified radii from the center of each the primary surface end, connected via tangent lines.
- Conical Surface: Extends outward and upward from the periphery of the horizontal surface at a slope of 20:1 for a horizontal distance of 4,000 feet.
- Approach Surface: Longitudinally centered on the extended centerline, and extending outward and upward from each runway end at a designated slope (e.g. 20:1, 34:1, 40:1, and 50:1) based on the runway approach.
- Transitional Surface: Extends outward and upward at a right angle to the runway centerline at a slope of 7:1 up to the horizontal surface.

FIGURE 2-13 - PART 77 PLAN VIEW



Source: FAA

A full representation and analysis of all current and future Part 77 surfaces as they relate to FTG are depicted on the ALP set completed as part of this study. The

appropriate sheets of the ALP include the degree to which obstructions penetrate the surfaces and how best to resolve them. As part of this planning effort, an aerial survey of the Airport was undertaken that included an obstructions survey.

2.10 Other Airports

FTG lies within the eastern side of the Denver metropolitan area. Competition for based aircraft, tenants, and services at FTG can be compared with airports in the area that accommodate general aviation activities. **Table 2-12** represents some of the general aviation airports near FTG.

TABLE 2-12 - GENERAL AVIATION AIRPORTS NEAR FTG

Airport Name (ID)	Distance from FTG	Runway(s) & Dimensions (ft.)	Operations per Year	Based Aircraft	Services Offered
Centennial (APA)	19 nm SW	10/28: 4,800 x 75 17L/35R: 10,000 x 100 17R/35L: 7,001 x 75	321,569	984	100LL, Jet A, tie-downs, hangars, major airframe and power plant service, high/low oxygen, avionics, charter, rental, sales, instruction
Platte Valley Airpark (18V)	21 nm NW	15/33: 4,100 x 40 9/27: 2,500 x 90 (turf)	4,800	76	100LL, tie-downs, hangars, minor airframe and power plant service, instruction
Erie Municipal (EIK)	27 nm NW	15/33: 4,700 x 60	52,000	170	100LL, Jet A, tie-downs, hangars, high/low oxygen, major airframe and power plant service, rental, instruction, sales
Rocky Mountain Metropolitan (BJC)	28 nm W	3/21: 3,600 x 75 12L/30R: 9,000 x 100 12R/30L: 7,002 x 75	142,663	365	100LL, Jet A, tie-downs, hangars, major airframe and power plant service, high/low oxygen, avionics, cargo, charter, rental, sales, instruction

Source: FAA 5010 Airport Master Record

2.11 Airport Environs

The purpose of the following sections is to establish context for FTG within its community and regional setting. This includes demographic and economic considerations in Adams County and a brief discussion of other factors such as land use and environmental considerations

2.11.1 Community Overview

ADAMS COUNTY COLORADO

Formed in 1902 out of what had been part of Arapahoe County, Adams County is now the fifth-most populous of Colorado's 64 counties. Located predominantly north and east of the Denver Metropolitan Area, Adams County contains a total of 1,185 square miles (759,000 acres). The County stretches approximately 17 miles in latitude (north to south), and is approximately 72 miles wide (east to west). Land uses range from intensive urban activities in the west, to crop and grazing land in the central and east. Eight incorporated cities and two towns are wholly or partially located in Adams County, including the cities of Arvada, Aurora, Brighton, Commerce City, Federal Heights, Northglenn, Thornton, and Westminster and the towns of Bennett and Lochbuie. Together, they comprise 15% of the County's total land area. Agricultural activities are the single largest land use throughout the County, accounting for more than three quarters of the land area. An extensive network of canals in the northwest part of the County supports most of the irrigated farmland. The central portion of the County primarily produces wheat, while the eastern area is primarily pasture.

Adams County's economy is heavily tied to the rapidly growing Denver metropolitan area; its relatively central location makes it a natural location as a distribution hub for the American West, while also supporting a number of growing industries in technology and telecommunications. The metro area's location just east of the mineral-rich Rocky Mountain range encouraged mining and energy companies to spring up in the area, making the energy industry another staple of regional economy. Adams County has experienced significant growth in related industries and in support of rapidly growing residential communities. The County currently has over 481,000 residents, a large share of which (about 90,000 or 20 percent) live within the unincorporated areas of the county.

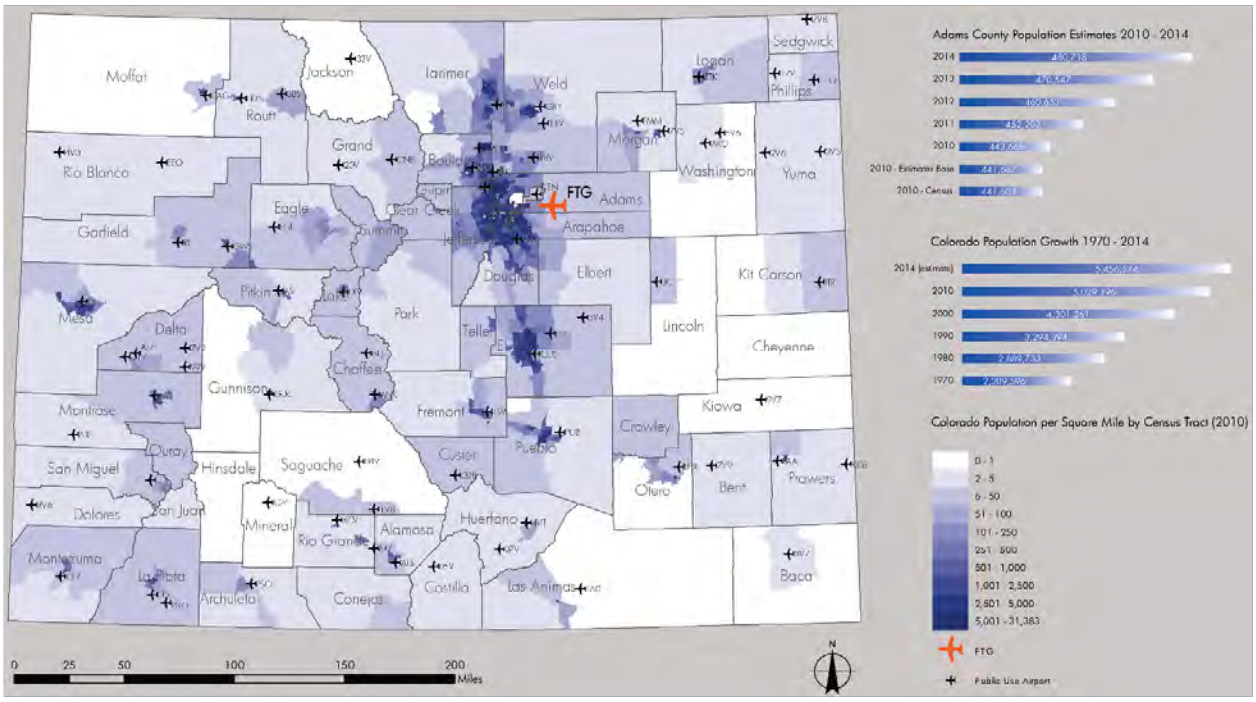
Adams County Government Center

2.11.2 Area Demographics

Between the years of 2010 and 2014, Colorado's population increased by 8.5 percent, while the population of Adams County increased by 8.4 percent.[2] **Figure 2-14** provides further detail about population changes over that time period for Colorado and Adams County.

The per capita income for residents of Adams County during 2015 was $25,039 with median household income of $58,946, while for the State of Colorado it was $32,217 and $60,629 respectively.

FIGURE 2-14 - POPULATION GROWTH RATE BY COUNTY



Source: Jviation, U.S. Census Bureau, Colorado Information Market Place (https://data.colorado.gov/)

[2] U.S. Census Bureau 2010-2014 Data

2.11.3 Area Economy

In 2015, the unemployment rate in Adams County averaged between 3.6 and 5.4 percent[3]. For the same year, the national unemployment rate averaged between 5.0 and 5.7 percent. The top ten industries for employment in Adams County in 2015 are shown in **Table 2-13**.

TABLE 2-13 - TOP INDUSTRIES IN ADAMS COUNTY - 2015

Industry	Employment
Construction	20,199
Retail trade	19,998
Health care and social assistance	17,864
Local government (including education)	17,296
Wholesale trade	16,188
Accommodation and food services	14,916
Transportation and warehousing	14,427
Manufacturing	13,756
Administrative and waste services	12,416
Professional and technical services	6,073

Source: US Bureau of Labor Statistics

2.11.4 Local Development Initiatives

In order to support and encourage economic growth throughout the County, Adams County considers economic development a strategic priority. Adams County is experiencing significant growth as a key part of the Denver metro area, having an abundance of land development opportunities that are unparalleled within the region. With a population that is projected to double by 2040, the County is ideally located at the crossroads of the metro area's transportation network, providing provides businesses and residents convenient access to I-25, I-70, I-270, and I-76. Adams County also surrounds DEN, connecting it to the global transportation network. Several of the most prominent development initiatives within the County include the following:

- The RTD FasTracks program is under construction within Adams County, and when the new transit lines open in 2017 and 2018, this project will bring 11 new mass transit stations to the county's residents and businesses.
- A wide variety of companies continue to locate facilities within Adams County. According to Adams County Economic Development's 2016 annual report, $300 million in capital improvements were invested in Adams County in 2016, up 14.5 percent from $262 million in 2015; 566 new jobs were added in the Adams County Enterprise Zones, a 52.7 percent jump from 2015; and there was a 31.5 percent increase in employer prospects from 2015 to 2016.
- The Colorado Aerotropolis is a 21,000-acre development corridor is an urban form surrounding DEN that is projected to connect workers, suppliers, executives, and goods to the global marketplace. A CDOT vision study

[3] http://data.bls.gov/map/MapToolServlet

projected 18 to 32 million square feet of new commercial development to occur in areas west and south of DEN in coming years, bringing with it up to $630 million in tax revenue. By 2040, that study also projects that the aerotropolis could attract 210,000 new residents and create up to 9,000 direct and 3,200 indirect construction jobs over 25 years.

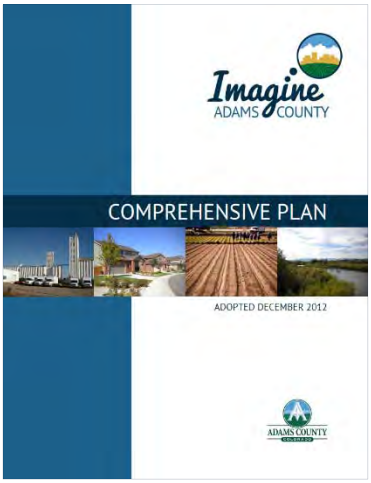
- Spaceport Colorado is an initiative to establish FTG as a future hub for commercial space transportation, research and development. Leveraging Colorado's aerospace workforce, the second largest in America, Spaceport Colorado will be a premier horizontal launch spaceport, ultimately becoming the foundation for America's global suborbital transportation network.

- The Gaylord Rockies Resort and Convention Center is an $800-million development located minutes from DEN in Aurora; it will feature over 1,500 guest rooms and over 485,000 square feet of meeting and convention space.

2.11.5 Local Comprehensive Planning

A local comprehensive plan is a strategic long-range document that addresses land use and zoning as it relates to growth and development of a county or municipality. With respect to an airport that lies within a community, it is critical that local comprehensive planning efforts acknowledge and address the issue of land use compatibility near an airport.

Adams County's latest Comprehensive Plan was completed in 2012 and includes multiple references to FTG, including the following:



- Inclusion of FTG as a major regional economic generator.
- Inclusion of FTG as a resource for the job creation strategy to supply suitable land for commercial and industrial development.
- Inclusion of FTG for the job creation strategy of determining how the County can best leverage its existing assets, as well as the potential development of a spaceport.
- Establishment of Policy 11.4 to alert future residents of residential development of any potential airport-related impacts, including notices and avigation easements.
- Establishment of an overall area-specific policy (Policy 18.0) to harvest the significant future growth potential exists along the I-70 Corridor east of Imboden Road in the FTG environs and adjacent to the Town of Bennett and the unincorporated community of Strasburg.
- Establishment of Policy 18.1 to continue to support and develop the Front Range Airport to accommodate large aircraft, as a general aviation and intermodal cargo hub for the state and region.
- Establishment of Policy 18.2 to support compatible commercial and industrial development around FTG.
- Establishment of Policy 18.3 to ensure that land uses outside the Airport Influence Zone surrounding FTG are compatible with airport operations and impacts.
- Inclusion of FTG in all relevant Comprehensive Plan maps.

2.11.6 Existing Land Use and Zoning

Of critical interest to any airport is the degree to which it is compatible with surrounding land uses. Airport compatible land uses can be defined as "those uses that can co-exist with an airport without constraining the safe and efficient operation of the airport or exposing people living or working nearby to unacceptable levels of noise or hazards."[4] This definition is intentionally broad since there are many variables that must be factored when considering whether a given land use is compatible with in an airport operational environment.

Appropriate land-use compatibility promotes the safety, health, and welfare of airport users and surrounding neighbors by protecting airspace and ensuring appropriate uses of lands both within and surrounding airport property boundaries. Typically, development actions that may affect surrounding land uses are changes in airport fleet mix and/or the number of aircraft operations, air traffic changes, and new approaches.

Per the Adams County Development Standards and Regulations, Chapter 3, Zone District Regulations, FTG is zoned by Adams County as AV, and the land immediately surrounding the Airport is zoned as A-1, A-3, and PUD, as depicted in **Figure 2-15**. These zoning designations are defined as follows:

- AV – Aviation. Land intended to provide for non-residential land uses associated with aviation operations, while minimizing risks to public safety and hazards to aviation users, including those employed at public aviation facilities.
- A-1 – Agricultural District. The purpose of the Agricultural-1 District is to provide a rural, single-family dwelling district where the minimum lot area for a home site is intended to provide for a rural living experience. Limited farming uses are permitted, including the keeping of a limited number of animals for individual homeowner's use. This district is primarily designed for the utilization and enjoyment of the County's rural environment.
- A-3 – Agricultural District. The purpose of the Agricultural-3 District is to provide land primarily in holdings of at least thirty-five (35) acres for dry land or irrigated farming, pasturage, or other related food production uses.
- PUD – Planned Unit Development. In accordance with the Planned Unit Development Act of 1972, the objective of a Planned Unit Development is to establish an area of land, controlled by one or more landowners, to be developed under unified control or unified plan of development for a number of dwelling units, commercial, educational, recreational, or industrial uses, or any combination of the foregoing, the plan for which does not correspond in lot size, bulk, type of use, density, lot coverage, open space, or other restrictions to the existing land use regulations.

  A PUD allows greater flexibility in the design of a development, more variety and diversification in the relationships between buildings, open spaces and uses, and conservation and retention of historical and natural topographic features, while meeting the goals, policies, and objectives of the

[4] Airport Cooperative Research Program, *Enhancing Airport Land Use Compatibility, Volume 1: Land Use Fundamentals and Implementation Resources*. (National Academies Press, 2010), 1-25.

comprehensive plan. This results in a PUD is to encourage the development of land as a single unit.

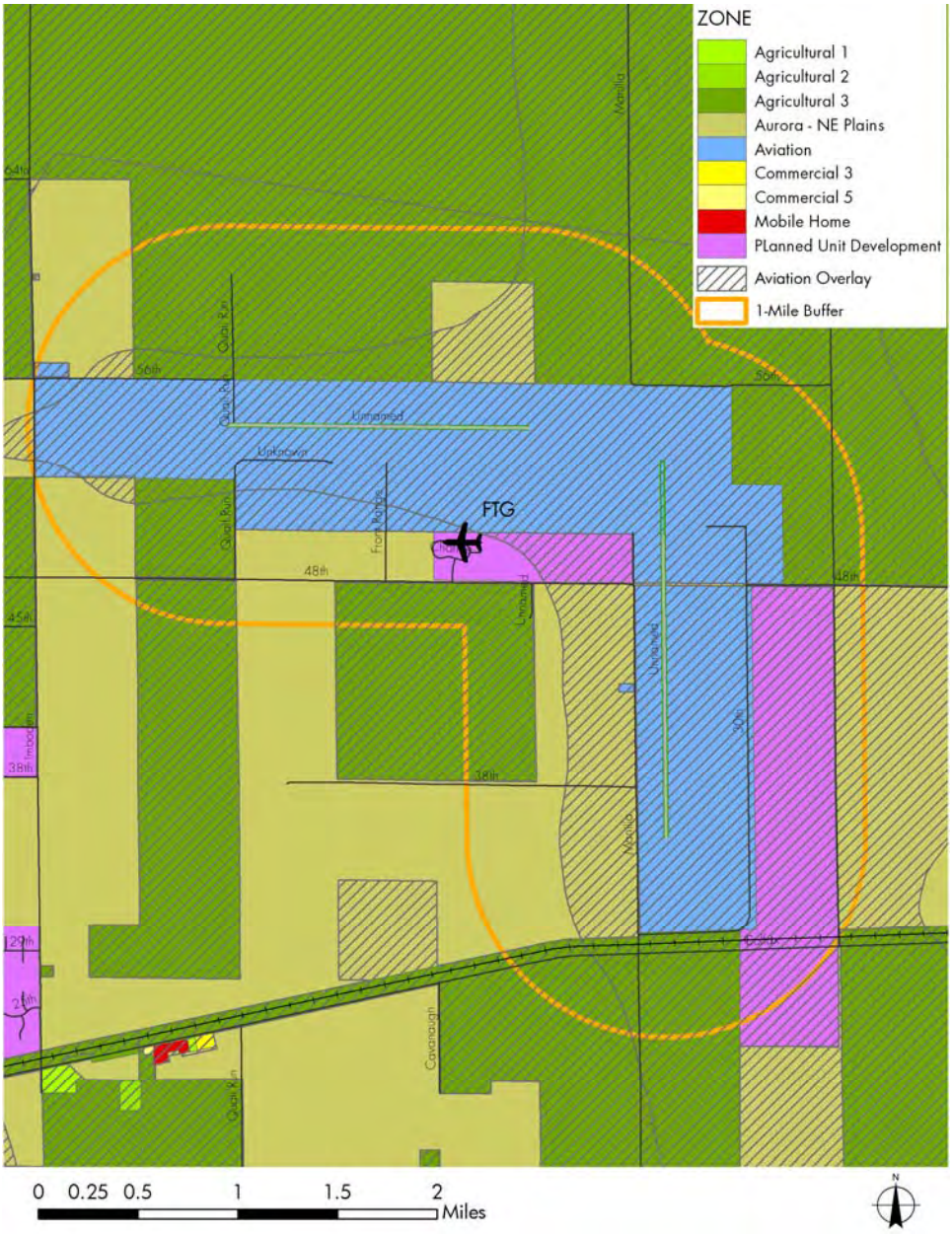
All uses that are in general conformity with the Adams County Comprehensive Plan, including, but not limited to, the contemplated density or intensity of land use, and are compatible with the site's physical and environmental characteristics, may be allowed within the PUD. The proposed land uses shall be compatible or designed to mitigate externalities with the existing, allowed, or conditional land uses adjacent to the proposed development. The PUD document for specific development shall establish permitted uses. The uses shall be specifically defined and approved as part of the PUD.

In addition to the above-mentioned zones, Adams County has implemented an Airport Influence Zone (AIZ) that encompasses the extents of the Airport property. The purpose of the AIZ is "to provide areas within the County suitable for the economic development and safe operation of air carrier and/or general aviation airports for public use without adversely affecting the activities upon surrounding properties. The AIZ is also intended to provide notice and disclosure of the airport location to owners of residential and non-residential properties in areas which may be subjected to aircraft activities, such duration and frequency which may constitute a nuisance to residential and other uses."[5]

Lands surrounding FTG are zoned for uses that are compatible with activities that occur both at and near the Airport.

[5] Adams County, *Adams County Development Standards and Regulations, Chapter 3*, *Zone District Regulations,* 2007

FIGURE 2-15 - FTG ZONING



Source: Jviation, Adams County Business Solutions Group Open Data Catalog

2.11.7 Environmental Overview

This section addresses environmental factors that specifically apply to FTG according to FAA Advisory Circular 150/5070-6B, *Airport Master Plans*. FTG has completed multiple environmental studies since 2010, which have been reviewed and are utilized in this section. Current information from federal, state and local agencies concerning environmental conditions on and near FTG have also been reviewed.

FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*, and FAA Order 5050.4B, *National Environmental Policy Act: Implementation Instruction for Airport*

Actions, address specific environmental categories that are evaluated in environmental documents in accordance with the National Environmental Policy Act (NEPA). The sections below provide an inventory of the applicable environmental categories as related to FTG. The following environmental categories have not been included in this overview since they are not relevant to FTG or any potential projects:

- Coastal Resources
- Climate
- Socioeconomic, Environmental Justice, and Children's Environmental Health and Safety Risks

Air Quality

An air quality analysis for federally-funded projects must be prepared in accordance with applicable air quality statutes and regulations that include the Clean Air Act (CAA) of 1970[6], the 1977 Clean Air Act Amendments[7], the 1990 Clean Air Act Amendments[8], and the National Ambient Air Quality Standards[9] (NAAQS). The air pollutants of concern in the assessment of impacts from airport-related sources include six "criteria pollutants": carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3), particulate matter (PM-10 and PM-2.5), and sulfur dioxide (SO_2).

All areas within the State of Colorado are designated with respect to the NAAQS as being in attainment, nonattainment, maintenance, or unclassifiable. An area with air quality better than the NAAQS is designated attainment, while an area with air quality worse than the NAAQS is designated nonattainment. An area may also be designated unclassifiable when there is a lack of data to form a basis of attainment status.

FTG is located in Adams County, which is a nonattainment area for 8-hour O_3 and maintenance for the CO and annual PM10.[10] As such, an air quality analyses should be completed for future construction projects that may impact air quality.

Biological Resources

Requirements are set forth by The Endangered Species Act[11], The Sikes Act[12], The Fish and Wildlife Coordination Act[13], The Fish and Wildlife Conservation Act[14], and the Migratory Bird Treaty Act[15], for the protection of fish, wildlife, and plants of local and

[6] U.S. Code. The Clean Air Act of 1970. U.S. Congress, Public Law 91-604, 42 U.S.C. §7401
[7] U.S. Code. The 1977 Clean Air Act Amendments, U.S. Congress, Public Law 95-95, 42 U.S.C. §7401
[8] U.S. Code. The 1990 Clean Air Act Amendments, U.S. Congress, Public Law 101-549, 42 U.S.C. §7401
[9] 40 CFR Part 50, Section 121, National Ambient Air Quality Standard
[10] U.S. Environmental Protection Agency, Green Book – Nonattainment Status for Each County by Year, http://www3.epa.gov/airquality/greenbook/anayo_co.html, accessed January 2016
[11] Endangered Species Act of 1973, U.S. Congress, Public Law 93-205, 16 U.S.C §1531-1544
[12] Sikes Act, Amendments of 1974, U.S. Congress, Public Law 93-452
[13] Fish and Wildlife Coordination Act of 1958, U.S. Congress, Public Law 85-624, 16 U.S.C §661-666c
[14] Fish and Wildlife Conservation Act of 1980, U.S. Congress, Public Law 96-366, 16 U.S.C §2901-2912
[15] Migratory Bird Treaty Act of 1981, 16 U.S.C §703-712

national significance. The U.S. Fish and Wildlife Service's (USFWS) Information, Planning, and Conservation (IPaC) System is used to identify species of concern. It has been recognized that various species listed by the USFWS as being threatened, endangered, or candidates may be found in Adams County. Identified species are depicted in **Table 2-14**.

TABLE 2-14 - THREATENED AND ENDANGERED SPECIES IN ADAMS COUNTY

Group	Species	Scientific Name	Status
Birds			
	Least Tern	*Sterna antillarum*	Endangered
	Mexican Spotted Owl	*Strix occidentalis lucida*	Threatened
	Piping Plover	*Charadrius melodus*	Threatened
	Whooping Crane	*Grus Americana*	Endangered
Fish			
	Pallid Sturgeon	*Scaphirhynchus albus*	Endangered
Flowering Plants			
	Colorado Butterfly Plan	*Gaura neomexicana var. coloradensis*	Threatened
	Ute ladies' tresses	*Spiranthes diluvialis*	Threatened
	Western Prairie Fringed Orchid	*Platanthera praeclara*	Threatened
Mammals			
	Preble's Meadow Jumping Mouse	*Zapus hudsonius preblei*	Threatened

Source: USFWS, Information, Planning, and Conservation System, Species Report, https://ecos.fws.gov, accessed January 2016

In addition to the information provided by the USFWS's IPaC System, FTG completed a Wildlife Hazard Assessment in 2013 and a Wildlife Hazard Management Plan in 2015.

Prior to development at FTG, a survey should be conducted to determine if any listed species are present within airport property.

Department of Transportation Act, Section 4(f)

The Department of Transportation (DOT) Act, Section 4(f) provides that the:

> Secretary of Transportation will not approve any program or project that requires the use of any publicly owned land from a public park, recreation area, or wildlife and waterfowl refuge of national, state, or local significance or land from an historic site of national, state, or local significance unless there is no feasible or prudent alternative

> and the use of such land includes all possible planning to minimize harm resulting from the use.[16]

The FAA has adopted the regulations the Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA) issued in March 2008 (23 CFR Part 774)[17] to address project-related effects on Section 4(f) resources.

For Section 4(f) purposes, a proposed action would eliminate a resource's use in one of two ways, physical use or constructive use.

> Physical Use: Action physically occupies and directly uses the Section 4(f) resource. An action's occupancy or direct control (via purchase) causes a change in the use of the Section 4(f) resources. For example, building a runway safety area across a fairway of a publicly-owned golf course is a physical taking because the transportation facility physically used the course by eliminating the fairway.
>
> Constructive Use: Action indirectly uses a Section 4(f) resource by substantially impairing the resource's intended use, features, or attributes. For example, a constructive use of an overnight camping area would occur when project-related aircraft noise eliminates the camping area's solitude. Although not physically occupying the area, the project indirectly uses the area by substantially impairing the features and attributes (i.e., solitude) that are necessary for the area to be used as an overnight camping area.[18]

FTG is located in a rural area, primarily surrounded by open agriculture and ranch land. The nearest Section 4(f) properties are in the Town of Bennett, CO; approximately five miles southeast of FTG (see **Table 2-15**). None of the properties are located adjacent to, or near, the Airport.

TABLE 2-15 - SECTION 4(F) PROPERTIES

Section 4(f) Property Name	Type	Location
Bennett High School	School	610 7th St, Bennett, CO
Corridor Community Academy	School	420 7th St, Bennett, CO
Bennett Middle School	School	455 8th St, Bennett, CO
Bennett Park and Recreation District	Park	455 S 1st St, Bennett, CO

Source: Google Earth 2010, and Town of Bennett website (http://www.townofbennett.org), Accessed January 2016

[16] U.S. Department of Transportation Act, section 4(f), recodified and renumbered as § 303(c) of 49 U.S.C.

[17] Vol. 73 Federal Register, page 13395, Mar. 2008.

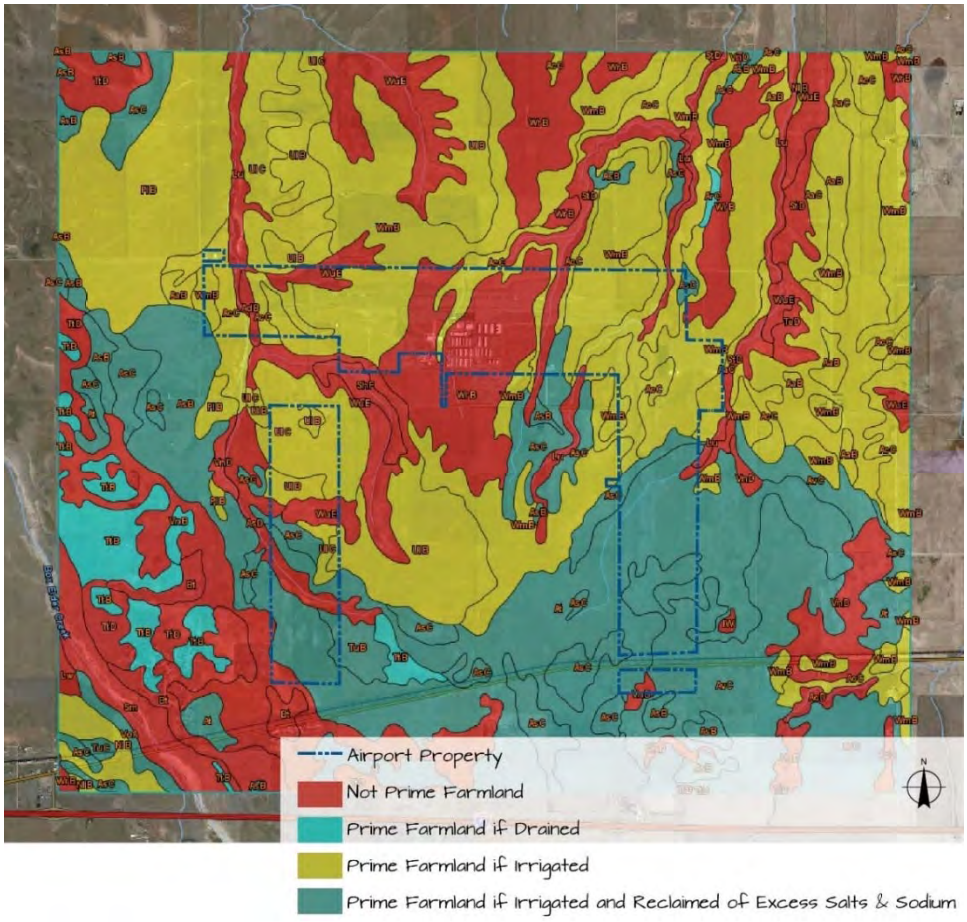
[18] A de minimis use cannot occur if a project constructively uses a Section 4(f) property. This is because the substantial impairment associated with a constructive use is more severe than the minor effects to which de minimis provisions apply.

Farmlands

The Farmland Protection Policy Act (FPPA) requires coordination with the local office of the U.S. Department of Agriculture, Natural Resources Conservation Service if a proposed project includes irreversible conversion of prime farmland to nonagricultural uses. The FPPA defines farmland as "prime or unique land as determined by the participating state or unit of local government and considered to be of statewide or local importance". Farmland subject to this requirement does not have to be currently used for cropland; it may be forested or pasture, but not urban or built-up land.

The Natural Resources Conservation Service (NRCS) Web Soil Survey was used to review soils on and around FTG. **Figure 2-16** details the soil types on Airport property. FTG resides on land classified as "Prime Farmland if Irrigated" and "Not Prime Farmland."

FIGURE 2-16 - FTG FARMLAND CLASSIFICATIONS



Source: Natural Resource Conservation Service, Web Soil Survey, https://websoilsurvey.nrcs.usda.gov/, Accessed January 2016

Hazardous Materials, Solid Waste, and Pollution Prevention

The Resource Conservation and Recovery Act (RCRA)[19], Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)[20], Superfund Amendments and Reauthorization Act (Superfund)[21], and the Community Environmental Response Facilitation Act (CERFA)[22] are the four primary laws regulating actions related to the use, storage, transportation, or disposal of hazardous materials, chemicals, substances, and wastes. For airports, hazardous materials used for operation and maintenance of aircraft, runways, and taxiways include fuels, degreasers, and aviation lubricants and oils.

Federal actions that pertain to the funding or approval of airport projects require the analysis of the potential for environmental impacts per the regulating laws, including a review of the National Priority List (NPL) in relation to an airport's location. Following a review and evaluation of the NPL, it was determined that there are currently no relevant sites located on or near FTG.

Historical, Architectural, Archeological, and Cultural Resources

The National Historic Preservation Act[23], and the Archaeological and Historical Preservation Act[24] regulate the preservation of historical, architectural, archaeological and cultural resources. Through these acts, it is required that the potential impacts by all Federal actions and undertakings on these resources be evaluated. Specifically, Section 106 of the National Historic Preservation Act (36 CFR 800 [Section 106]) requires federal agencies to account for the effects of their undertakings on historic properties and afford the Advisory Council on Historic Preservation (Council) reasonable opportunity to comment on such undertakings. Projects subject to Section 106 must consult with the State Historic Preservation Officer, Tribal Historic Preservation Officer(s), and Council to determine if the project has the potential to affect historic properties listed on or eligible for listing on the National Register of Historic Places (NRHP) and what, if any, alternatives exist to avoid, minimize or mitigate the adverse effect(s) to National Register and National Register-eligible properties.

For this Master Plan, historic, archaeological and cultural resources are defined as districts, sites, buildings, structures, objects, landscapes, and Native American Traditional Cultural Properties (TCPs) that are on or eligible for listing on the NRHP. Currently, the NRHP includes 17 properties located in Adams County, listed in **Table 2-16**. Nevertheless, a survey is required prior to development to determine if any historic, archaeological, and cultural resources occur on airport property.

[19] U.S. Code, 1976, Resource Conservation and Recovery Act, 42 USC, §6901
[20] U.S. Code 1980, Comprehensive Environmental Response, Compensation and Liability Act, 42 USC, §9601-9628
[21] U.S. Code 1986, Superfund Amendments and Reauthorization Act, 42 USC
[22] U.S. Code 1992, Community Environmental Response Facilitation Act, Public Law 102-426
[23] U.S. Code, 1966, National Historic Preservation Act of 1966, Public Law 89-665
[24] U.S. Code, 1974, Archaeological and Historical Preservation Act of 1974, 16 USC 469

TABLE 2-16 - NATIONAL REGISTER OF HISTORIC PLACES - ADAMS COUNTY

Property Name	Location	Date Added to Registry	Distance to Airport
Engelbrecht Farm	2024 Strasburg Rd., Strasburg	2014	14 miles
Fuller, Granville, House	2027 Galena St., Aurora	2012	16 miles
Robidoux, M.J. Lavina, House	1615 Galena St., Aurora	2011	16 miles
Bromley Farm--Koizuma Hishinuma Farm	15820 E. 152nd Ave., Brighton	2007	17 miles
Wilson, Blanche A., House	1671 Galena St., Aurora	1996	17 miles
Brighton High School	830 E. Bridge St., Brighton	1998	19 miles
Adams County Courthouse	22 S 4th Ave., Brighton	2006	20 miles
Riverside Cemetery	5201 Brighton Blvd., Denver	1994	20 miles
Thede Farmhouse	3190 W. 112th Ave., Northglenn	1998	22 miles
Eastlake Farmers Co-Operative Elevator Company	126th Ave and Claude Ct, Thornton	2010	23 miles
Union High School	3455 W. 72nd Ave., Westminster	2000	24 miles
Bowles House	3924 W. 72nd Ave., Westminster	1988	25 miles
Brannan Sand and Gravel Pit #8--Lake Sangraco Boathouse Complex	Address Restricted	2011	25 miles
Gregory, William J., House	8140 Lowell Blvd., Westminster	1996	25 miles
Harris Park School	7200 Lowell Blvd., Westminster	1990	25 miles
Metzger Farm	12080 Lowell Blvd., Westminster	2013	25 miles
Westminster University	3455 W. 83rd Ave., Westminster	1979	25 miles

Source: National Register of Historic Places, www.nationalregisterofhistoricplaces.com, Accessed January 2016

Noise and Noise Compatible Land Use

Aircraft noise and other airport-related noise, in particular aircraft noise, is often an area of primary concern as related to the airport environment. Within the context of an Airport Master Plan, actions and development that may be considered that change runway configurations, airport operational patterns, aircraft fleet mix, flight patterns, among others that have the potential to alter noise impacts on communities located in the vicinity of an airport. Laws governing airport noise include the following:

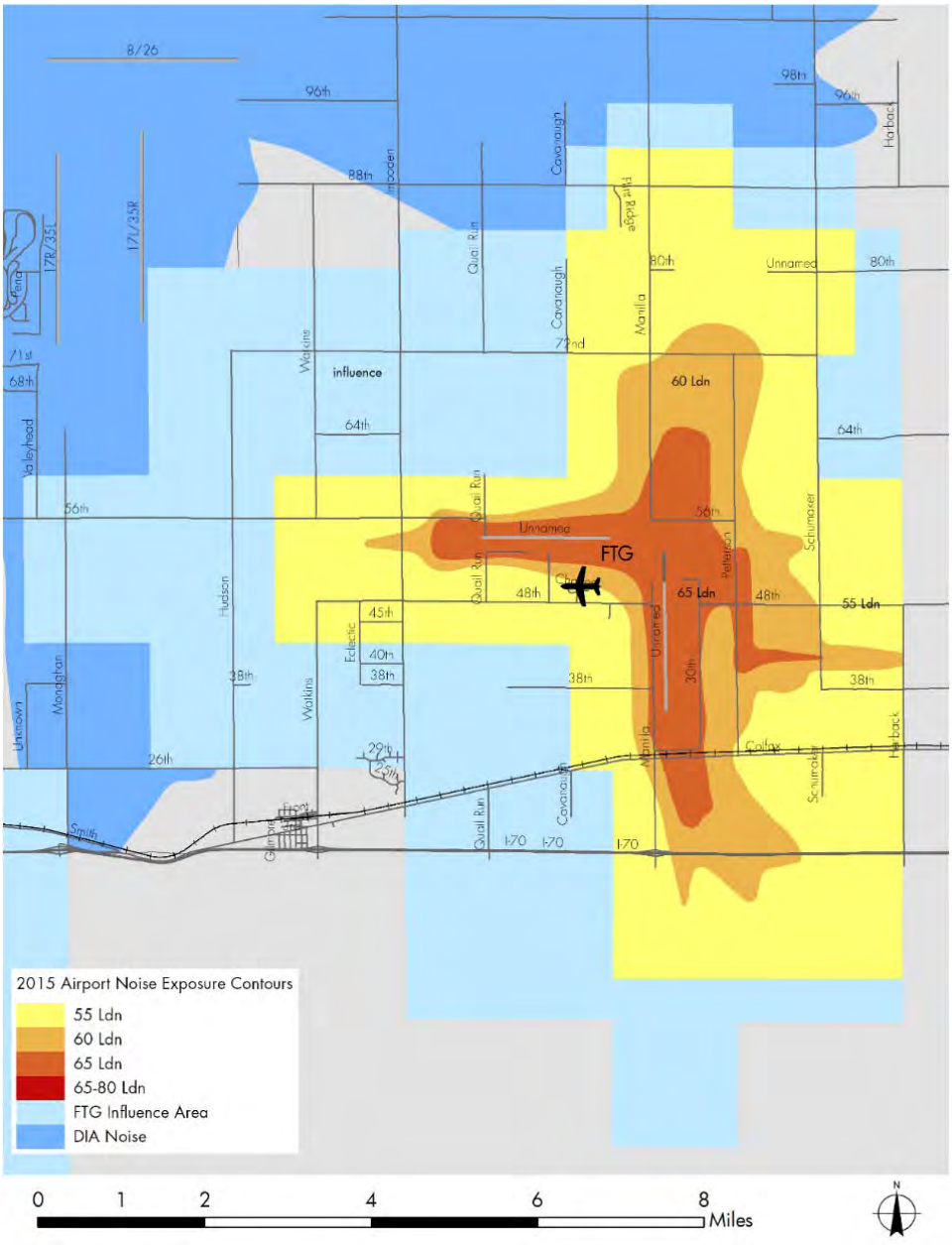
- 49 U.S.C. 47501-47507 (Aviation Safety and Noise Abatement Act of 1979, as amended); 14 CFR part 150, Noise Control and Compatibility Planning for Airports Advisory Circular, 150/5020.
- 49 U.S.C. 40101 et seq., as amended by PL 103-305 (Aug. 23, 1994) (The Federal Aviation Act of 1958).
- The Control and Abatement of Aircraft Noise and Sonic Boom Act of 1968; 14 CFR part 161 Notice and Approval of Airport Noise and Access Restrictions.

- 49 U.S.C. 47101 et seq., as amended by PL 103-305 (Aug. 23. 1994) (The Airport and Airway Improvement Act).
- 49 U.S.C. 2101 et seq. (Airport Noise and Capacity Act of 1990).
- 49 U.S.C. 44715 (The Noise Control Act of 1972).

Adams County Development Standards and Regulations include an Airport Noise Overlay (ANO) that includes the entire FTG property as well as adjacent lands. The ANO provides protection for residential and non-residential land uses near the Airport that may be subjected to noise levels of duration and frequency that could be considered a nuisance for residential and other like uses.

Existing noise conditions near the Airport are typical of areas containing the surrounding land uses. Aircraft operating on FTG must meet requirements of 14 CFR, section 36.103, which outlines aircraft noise limits. **Figure 2-17** shows areas on and near FTG that may be exposed to increased airport-related noise. These contours were generated in association with the 2004 Airport Master Plan and reflect potential future operations that have yet to occur at FTG (i.e., large aircraft air cargo operations).

FIGURE 2-17 - FTG NOISE CONTOURS



Source: Jviation, 2004 FTG Master Plan Update

Water Resources

Water resources include wetlands, floodplains, surface waters, ground waters, and Wild and Scenic Rivers. Vital to society, water resources provide drinking water and support recreation, transportation and commerce, industry, agriculture, and aquatic ecosystems. These resources act together as one integrated natural system. Impacts to one resource can disrupt the entire system. Water resources near FTG are summarized in the following sections.

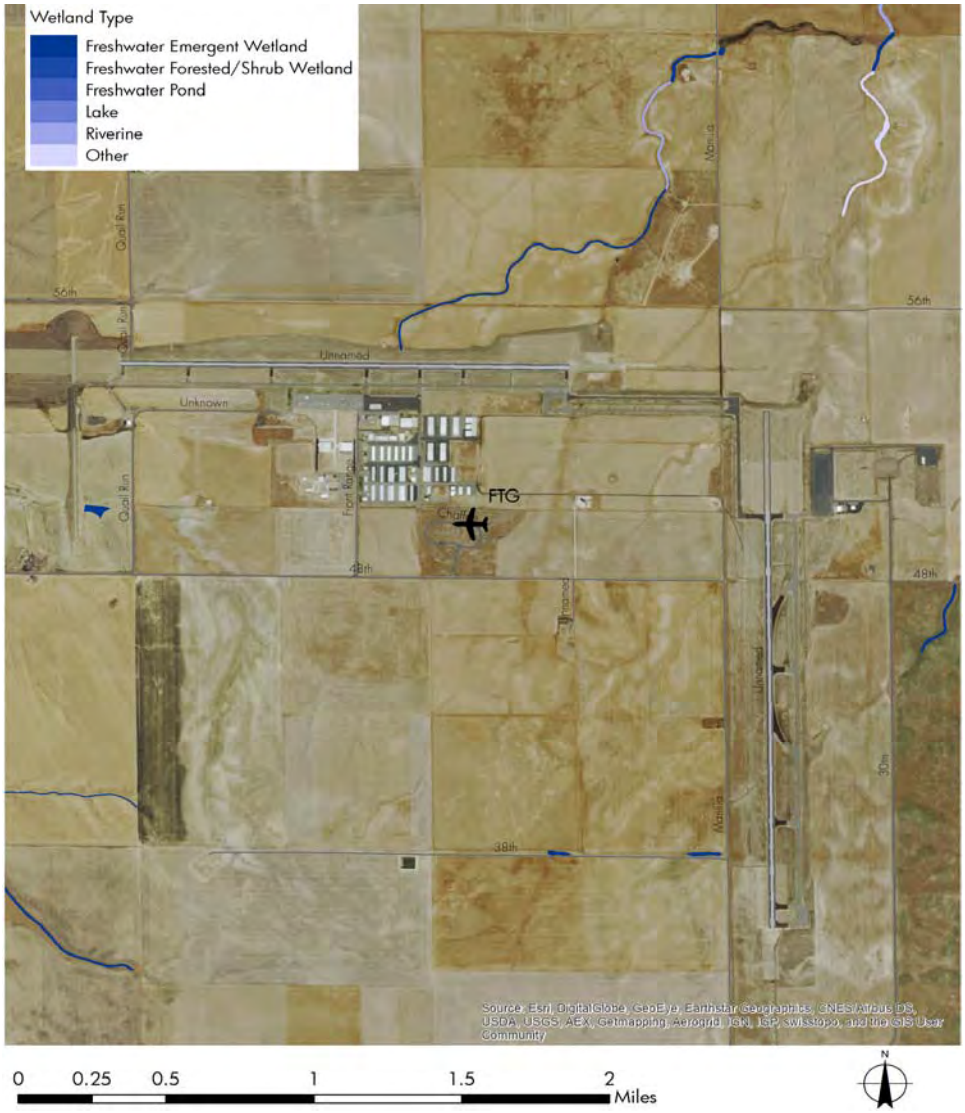
Wetlands

Federal agencies are required to minimize the destruction, loss, or degradation of wetlands. Principle federal laws governing Wetlands include the following:

- Clean Water Act, section 401 and 404 [33 U.S.C. 1344] [PL 92-500, as amended by PL 95-217 and PL 100-4]; 33 CFR parts 320-330.
- Rivers and Harbors Act of 1899, section 10; Order DOT 5660.1A, Preservation of the Nation's Wetlands.
- Executive Order 11990, Protection of Wetlands (May 24, 1977) (42 FR 26961).

According to the National Wetlands Inventory (NWI) wetlands have not been identified or delineated on FTG property (**Figure 2-18**).

FIGURE 2-18 - FTG WETLANDS



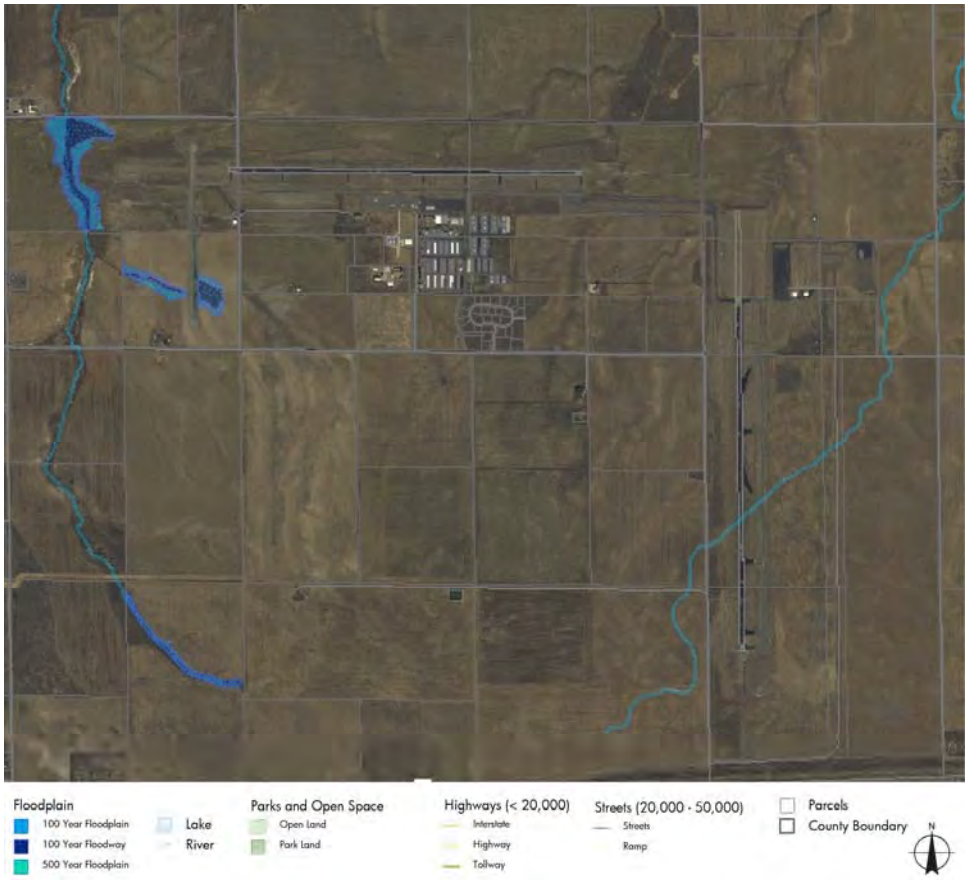
Source: Jviation, U.S. Fish and Wildlife Service

Floodplains

Construction in floodplains is regulated to reduce the risk of flood loss, minimize the impact of floods on human safety, health and welfare, and restore and preserve the natural and beneficial values provided by floodplains. Executive Order 11988, Floodplain Management,[25] directs federal agencies to avoid adverse impacts associated with the occupancy and modification of floodplains.

According to flood maps provided by Adams County GIS, shown in **Figure 2-19**, no floodplains exist within existing FTG property bounds. The figure does reflect a "river" located on the southeast corner of the Airport that runs under Runway 17/35; however, this river does not contribute to any 100- or 200-year floodplains.

FIGURE 2-19 - FTG FLOODPLAINS



Source: Jviation, FEMA

[25] Executive Order 11988, Floodplain Management, 1977

Surface and Ground Waters

The Federal Water Pollution Control Act, as amended by the Clean Water Act (CWA)[26] and the Safe Drinking Water Act, as amended, protect and regulate Federal actions that have the potential to impact surface and ground waters[27].

According to Colorado Division of Water Resources, FTG is located in the Denver Basin Aquifer system, which itself includes four aquifers: the Dawson aquifer, the Denver aquifer, the Arapahoe aquifer, and the Laramie-Fox Hills aquifer.[28] There are no surface waters within the vicinity of the Airport.

Hazardous materials used for operation and maintenance of aircraft, runways, and taxiways include fuels, degreasers, and aviation lubricants and oils. The Airport has a current Spill Prevention Control and Countermeasures (SPCC) Plan that establishes procedures for handling these substances. This plan is designed to provide preventative measures to ensure that any oil spills are contained and avoid oil spills reaching navigable waters. With its last plan completed in 2003 and required to be updated every five years, FTG is in the process of updating its SPCC Plan. Note that the 2003 FTG SPCC Plan included information such as:

- Basic overview of the airport storage facilities and their location
- Transfer and storage operations of oil
- Spill history - none reported
- Potential failure and oil migration identification and concerns
- Identification of spill control measures
- Implementation of SPCC Plan
- Conformance to guidelines
- Security of fuel storage and handling facilities
- Training recommendations and requirements
- Recommendations for oil storage
- Other general forms/logs and supporting documentation

Additionally, under the CWA, National Pollutant Discharge Elimination System (NPDES) permits are required for any discharge of storm water from municipalities and industrial sites. The Colorado Department of Health permit administers the Colorado Discharge Permit System. Through this, the FTG is required to submit a permit and develop a site-specific Storm Water Management Plan (SWMP). Last completed in 2002, the SWMP provides information such as:

- Basic overview of types of industrial waste
- List of FBO and tenant services as well as contact information
- Description of the site (FTG)
- Potential pollution sources and materials

[26] 33 U.S.C. Chapter 26.
[27] 42 U.S.C. 300.f.
[28] Colorado Division of Water Resources, http://water.state.co.us/groundwater/, Accessed January 2016

- Risk identification and assessment
- Preventative maintenance techniques
- Spill prevention and countermeasures and best management practices
- Erosion control
- Employee training
- Comprehensive inspections
- Record keeping and internal reporting procedures

Wild and Scenic Rivers

The Wild and Scenic Rivers Act, as amended, designates rivers and those eligible to be designated in the Wild and Scenic Rivers System. Wild and Scenic Rivers are designated as "rivers having remarkable scenic, recreational, geological, fish, wildlife, historic, or cultural values." The Department of the Interior (National Park Service, U.S. Fish and Wildlife Service, and Bureau of Land Management) and the Department of Agriculture (U.S. Forest Service) are the oversight agencies for the Wild and Scenic Rivers System. Federal agencies with jurisdiction over lands the border upon, or are adjacent to any designated rivers, are required to take the necessary actions to protect the rivers, as stated in Section 12 of the Wild and Scenic Rivers Act.

Colorado only has one river listed in the National Wild and Scenic Rivers System, the Cache la Poudre River. The nearest designated portion of this river is located approximately 40 miles northwest of FTG.[29]

[29] U.S. Forest Service, Cache la Poudre River, 2010

3.0 AVIATION ACTIVITY FORECAST

Forecasts must be both reasonable and defensible, since they can serve as the basis of future facility development requirements.

Forecasting aviation activity is a critical element in the Airport Master Plan (AMP) process since many development projects ultimately proposed within a master plan are based on aviation activity demand forecasts. For Front Range Airport (the Airport or FTG), the forecasts presented below are utilized in subsequent chapters to analyze Front Range Airport's ability to accommodate future activity and to determine the type, size, and timing of future airside and landside developments. In many cases, the decision to incorporate projects into an airport's long-term development plan is based on the anticipated levels of demand, including numbers as well as types of aircraft activity.

This chapter discusses the findings and methodologies used to project aviation demand at FTG for the 20-year planning window of 2017 through 2036. Per FAA Advisory Circular (AC) 150/5070-6B, *Airport Master Plans*, aviation forecasts should be realistic, based upon the latest available data, reflect current airport conditions, and provide adequate justification for airport planning and development. The forecasts developed in this master plan are designed to provide a sound, defensible, and defined rationale to guide the analysis of future airport development needs and alternatives. However, while sound forecasting is essential for a successful master plan, it should be noted that it can only serve as an approximation of future activity based on historical data and present circumstances. There are many unforeseen factors can and do influence forecasts, both positively and negatively. For this reason, the operational forecasts included in this chapter, and the projects that they justify, should be periodically revisited to ensure that they remain appropriate.

2017 serves as the base year of the FTG AMP since it was the last completed calendar year prior to this effort. Forecasts are generated for the near-term (2022), mid-term (2027), and long-term (2037) time frames.

The amount and type of aviation activity occurring at an airport is dependent upon many factors, and usually reflect the services available to aircraft operators, the businesses located on the airport or within the host community, and the prevailing economic conditions within the surrounding area. The FTG forecast analysis includes methodologies that consider historical aviation trends at the Airport, the surrounding region, and throughout the nation. Projections of aviation activity for FTG were prepared for the short- (0-5 year), medium- (6-10 year), and long-term (11-20 year) periods, and to specify the existing and future Critical Design Aircraft. Aviation demand forecasts developed for FTG in this chapter are documented in the following sections:

- Data Sources

- Demographic and Economic Factors
- National and Regional Aviation Outlooks and Trends
- Forecasting Methodologies
- Forecasting Aviation Activity Measures and Metrics
- Review of Historical and Existing Forecasts
- Aircraft Operations Forecast
- Based Aircraft Forecast
- Critical Design Aircraft
- Summary of Preferred Forecasts

3.1 Data Sources

The following sources of data and guidance were used in the development of the aviation activity forecasts.

- **FTG Data Sources and Interviews:** Data was collected directly from Front Range Airport administration, as well as through interviews with key stakeholders including Air Traffic Control Tower (ATCT) staff, airport personnel, tenants and others. This information provided documented data not only with respect to actual operational numbers, but also regarding how and why those totals accrue at FTG. As part of this data collection effort, the Airport conducted an independent hangar inspection during the Summer of 2016 to establish an accurate total of based aircraft.
- **FAA Terminal Area Forecast (TAF)[1]:** Updated annually by the FAA, the TAF is used to determine federal budget and staffing needs, as well as a resource for airport operators, the general public, and other interested parties. Due to staff resource limitations, the FAA is not able to forecast in as great of detail at smaller airports as they typically do at larger airports. Nevertheless, the TAF does provide a guideline for developing forecasts, and is utilized as a basis for comparison with other scenario-driven forecasts. Generally, for the FAA to approve of an airport's master plan forecasts, those forecasts must be supported by an acceptable forecast analysis that is consistent with the FAA TAF.[2]
- **FAA AC 150/5070-6B, *Airport Master Plans*:** This AC contains key guidance that explains the steps required for the development of a master plan, including the preparation of aviation activity forecasts, the forecast methodologies to be employed, and what elements should be forecasted. This chapter conforms to the requirements of FAA AC 150/5070-6B.
- **FAA Form 5010-1, Airport Master Record:** The Airport Master Record contains aeronautical data describing the physical and operational characteristics of civil public-use airports, joint-use military airports, and private-use military airports that are active and included in the NAS. It contains airport data derived from both physical inspections of the airport,

[1] FAA Terminal Area Forecast, http://aspm.faa.gov/main/taf.asp
[2] FAA AC 150/5070-6B, Airport Master Plans, http://www.faa.gov/documentLibrary/media/advisory_circular/150-5070-6B/150_5070_6b_chg1.pdf

and the National Airspace System Resources (NASR) database. The most recent FAA airport inspection at FTG occurred on April 24, 2014.

- **ACRP Report: Airport Aviation Activity Forecasting[3]:** This 2007 report was also prepared by the ACRP and discusses methods and various potential forecast models, and practices for aviation activity forecasting. This report identifies ways to evaluate forecasts, uncertainties and accuracy in forecasts. The ACRP report also identifies common aviation metrics, issues in data collection and preparation, and data sources.
- **Forecasting Aviation Activity by Airport[4]:** Written by GRA, Inc. under contract to the FAA, this 2001 document provides guidance to individuals, and the FAA, when preparing airport activity forecasts. The FAA utilizes this guidance when developing the TAF.
- **FAA Aerospace Forecasts, Fiscal Years 2017-2037[5]:** The FAA annually prepares this document to explain the current economic and aviation outlook, as well as macro level forecasts of aviation activity and the U.S. aircraft fleet.
- **Colorado Department of Local Affairs[6]:** The Colorado Department of Local Affairs (DOLA) is the principal department of the Colorado state government responsible for: local government assistance, property taxation, property assessment appeals, affordable housing, and housing construction regulation. DOLA maintains a significant number of socioeconomic databases on a county level, including demographic forecasts through the year 2040.
- **Federal and State Data Sources:** Information was obtained from the State of Colorado and the U.S. Department of Commerce, Bureau of Economic Analysis, the U.S. Census Bureau, and the Bureau of Labor Statistics to support data needs as necessary, and described, throughout this section.

3.2 Demographic and Economic Factors

Demand for aviation is largely a function of demographic and economic activity, provided there is a causal relationship. When preparing forecasts, planners should consider socioeconomic data, demographics, disposable income, and geographic attributes. As mentioned in the previous section, socioeconomic data was collected from a variety of sources.

Potential correlation between local socioeconomic data with an airport's forecast for future aviation demand is considered through this forecasting effort. FTG socioeconomic data focused on Adams County, as collected and maintained by the Colorado Department of Local Affairs, the Bureau of Economic Analysis, the U.S. Census Bureau and the Bureau of Labor Statistics.

[3] Airport Cooperative Research Program Synthesis 2, Airport Aviation Activity Forecasting, http://onlinepubs.trb.org/onlinepubs/acrp/acrp_syn_002.pdf
[4] FAA Aviation Data & Statistics, http://www.faa.gov/data_research/aviation_data_statistics/index.cfm?print=go
[5] FAA Aerospace Forecasts FY 2017-2037, www.faa.gov/data_research/aviation/aerospace_forecasts/
[6] Colorado Department of Local Affairs, January 2016, www.colorado.gov/pacific/dola

3.2.1 Population

The Colorado Department of Local Affairs reports that Adams County population grew from 395,384 people in 2005 to 480,317 in 2014, a 2.2 percent compound annual growth rate (CAGR), over that ten-year period. Over that same time frame, the State of Colorado's population grew from 4,662,534 (2005) to 5,343,471 (2014), a 1.4 percent CAGR, while the overall population of the U.S. grew at a 0.8 percent CAGR from 2005-2014.

3.2.2 Income

Adams County estimated per capita income increased from $33,607 in 2012 to $35,385 in 2014, a 2.6 percent average annual increase, with an average of $34,242 per the Bureau of Economic Analysis. Over that same period, the State of Colorado had an estimated per capita income increase from $44,266 in 2012 to $46,049 in 2014, a 2.0 percent average annual increase, with an average income of $44,918.

3.2.3 Employment

The ten-year (2005-2014) estimate for number of civilians employed in Adams County, as reported by the Colorado Department of Local Affairs, grew from 180,713 in 2005 to 225,545 in 2014, a 2.7 percent CAGR. This total represents approximately 47.0 percent of the 2014 county population, with the top industries including the following.

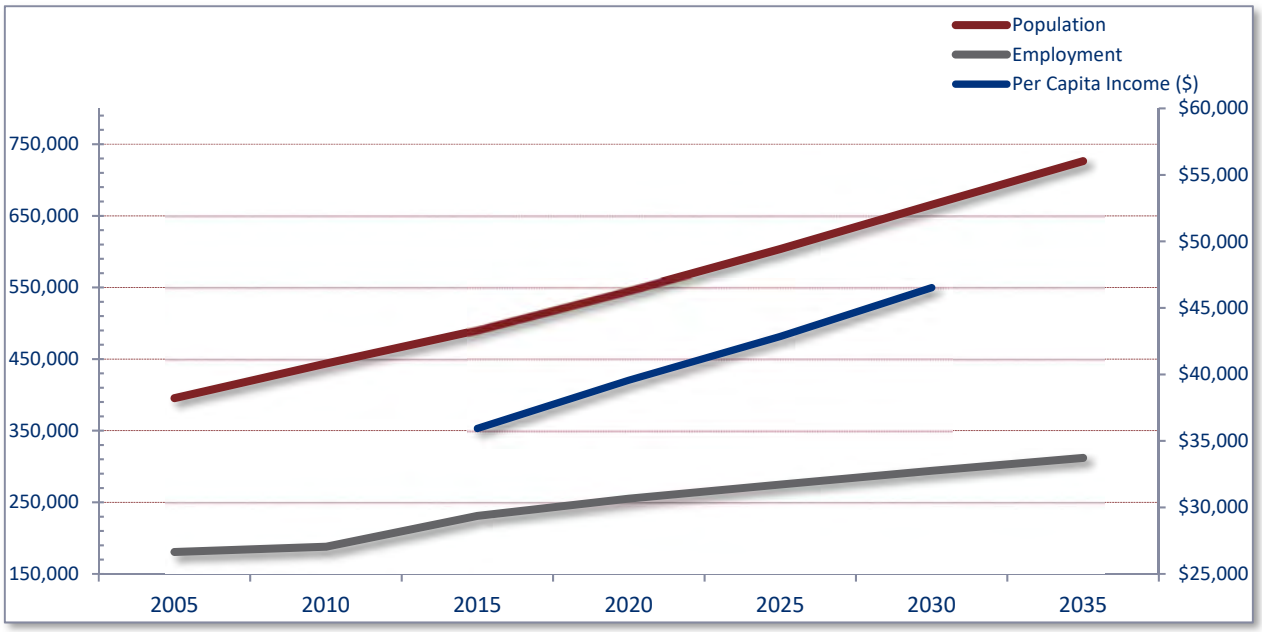
- Government (17.8 percent)
- Construction (11.0 percent)
- Retail Trade Construction (9.7 percent)
- Health Services (8.4 percent)
- Transportation and Warehousing (7.3 percent)

Within Colorado, over that same period, employment grew from 2,767,785 (2005) to 3,068,539 (2014), a 1.3 percent CAGR. Additionally, the Bureau of Labor Statistics reports that Adams County's 2014 unemployment rate of 5.7 percent exceeded Colorado's unemployment rate of 5.0 percent.

3.2.4 Adams County Socioeconomic Data Summary

Figure 3-1 provides a summary of the socioeconomic trends forecasted within Adams County through 2035.

FIGURE 3-1 - ADAMS COUNTY SOCIOECONOMIC TRENDS



Source: Colorado Department of Local Affairs; the Bureau of Economic Analysis

3.2.5 Regional Socioeconomic Conditions

Per Woods & Poole, the western region (consisting of the southwest, the Rocky Mountains, and the broad west regions) will experience the most growth of any region in the nation for the next 30 years. The population in the western region is forecast to increase by 43.9 million people between 2011 and 2040. By the year 2040, 36 percent of all Americans are expected to reside in the west; this is up from 24 percent in 1970 and 33 percent in 2011. Population growth also expected to generate 32.5 million jobs from 2010 to 2040, with a projected total U.S. job gain of 39 percent.

3.3 National and Regional Aviation Outlooks

3.3.1 FAA Aerospace Forecasts[7] FY 2017-2037

FAA prepares a national aerospace forecast every year to project commercial and general aviation (GA) activity levels so that the FAA can establish funding needs for various sections within the FAA, such as the Airport Traffic Organization (ATO). The forecast utilized in this chapter encompasses Fiscal Years 2017-2037, and looks at future economic conditions and assumptions, GA activity, commercial aviation activity, and air traffic control (ATC) workload. Some relevant highlights from the FAA's 2017-2037 forecast are presented in the excerpts from the report below.

- The long-term outlook for general aviation is stable to optimistic, as growth at the high-end offsets continuing retirements at the traditional low end of

[7] FAA Aerospace Forecast Fiscal Years 2017-2037. https://www.faa.gov/data_research/aviation/aerospace_forecasts/media/FY2017-37_FAA_Aerospace_Forecast.pdf

Pilatus PC12 Turboprop

Remos GX Light Sport Aircraft

Cessna Citation Jet

the segment. While steady growth in both national gross domestic product (GDP) and corporate profits results in continued growth of the turbine and rotorcraft fleets, the largest segment of the fleet (fixed wing piston aircraft) continues to shrink over the forecast.

- The active general aviation fleet is forecast to increase 0.1 percent a year between 2016 and 2037, resulting in an increase in the fleet of about 3,500 units as increases in the turbine, experimental, and light sport fleets offset declines in the fixed wing piston fleet. The total active general aviation fleet increases from an estimated 209,905 in 2016 to 213,420 aircraft by 2037
- The largest segment of the fleet, fixed wing piston aircraft is predicted to shrink over the forecast period by 22,500 aircraft (at an average annual rate of -0.8 percent). Unfavorable pilot demographics, overall increasing cost of aircraft ownership, coupled with new aircraft deliveries not keeping pace with retirements of the aging fleet are the drivers of the decline.
- The smallest segment of the fleet, light-sport-aircraft (created in 2005), is forecast to grow by 4.1 percent annually, adding about 3,355 new aircraft by 2037, more than doubling its 2015 fleet size.
- The more expensive and sophisticated turbine-powered fleet (including rotorcraft) is projected to grow by 14,700 aircraft - an average rate of 1.9 percent a year over the forecast period, with the turbojet fleet increasing 2.3 percent a year. The growth in U.S. GDP and corporate profits are catalysts for the growth in the turbine fleet.
- Although fleet growth is minimal, the number of general aviation hours flown is projected to increase an average of 0.9 percent per year through 2037, as growth in turbine, rotorcraft, and experimental hours more than offset a decline in fixed wing piston hours.
- Fixed wing piston hours are forecast to decrease by 0.8 percent, the same rate as the fleet declines. Conversely, hours flown by turbine aircraft (including rotorcraft) are forecast to increase 2.4 percent yearly over the forecast period. Jet aircraft are expected to account for most of the increase, with hours flown increasing at an average annual rate of 3.0 percent over the forecast period. The large increases in jet hours result mainly from the increasing size of the business jet fleet, along with estimated in-creases in utilization rates.

3.3.2 National Trends Impacting Future GA Activity

Aviation is a dynamic industry that is constantly adjusting to a variety of internal and external pressures. GA has experienced many significant challenges over the last twenty years that have dramatically impacted its future growth – and industry analysts anticipate more even more challenges to come. Several of those factors that could have the greatest impact on FTG are presented in the following sections.

National Economic Trends

There is a clear connection between GA activity on national and local levels and the general state of the national economy. The 2007 economic recession that significantly depressed corporate aviation activity, throughout the U.S. and global environment, also dramatically impacted piston-engine activity. The decline in

corporate aviation over that period clearly illustrates the close correlation between corporate aircraft activity and the performance of the stock market and corporate profits. With respect to the overall economy, the Congressional Budget Office (CBO) estimates that, in real terms, "GDP will expand at an average annual pace of 2.1 percent from the fourth quarter of 2016 to the fourth quarter of 2018, after having risen at an annual rate of 1.8 percent last year." In the longer term, the CBO projects actual and potential GDP alike will "expand at an average annual rate of 1.9 percent during the second half of the 10-year period. CBO estimates that the growth of potential output over that period will be faster than it has been since the 2007–2009 recession, mainly because the productivity of the labor force is projected to rise, returning closer to its average of the preceding two decades."[8] The FAA, and private companies, are optimistic about the long-term growth potential for corporate aviation. The Honeywell Business Aviation Forecast recently noted that it "sees 4.0 to 5.0 percent average annual industry growth over next decade with up to 9,250 deliveries of new business jets valued at over $250 billion expected through 2023. Although corporate activity has generally rebounded from the 2007 recession, corporate activity has not returned to the levels experienced prior to the economic downturn. Continued growth of the stock market and corporate profits are key factors to the long-term growth of corporate aviation activity.

Rising Cost of GA Aircraft Ownership

The cost of GA aircraft ownership has been rising faster than the overall rate of inflation for many years. A new Cessna 172, a mainline four seat single-engine piston aircraft, currently retails for almost $400,000, while other high performance single-engine piston airplanes retail from $700,000 to $1 million. Because of the high price point for entering the new aircraft market, many airplane owners have elected to continue to fly older, more affordable aircraft. With the average age of a GA aircraft in the U.S. now over 40 years old, costs for maintenance and replacement parts for those aircraft are increasing. Since much of GA activity is based on recreational and personal uses, the continued rising aircraft ownership costs are expected to have a dampening impact on overall activity levels.

Avgas Availability and Price

The amount of fuel used by most piston engine aircraft (100LL) sold in the U.S. has declined by more than 60 percent over the past 30 years. Market and environmental pressures have combined to make 100LL's availability occasionally limited and, at times, unavailable. It is projected that these pressures will ultimately result in the removal of 100LL from the marketplace. At present, there is no "drop-in" replacement for 100LL avgas that will work in all piston engines, although a coalition of industry groups, including the FAA, have recently tested four replacement fuels. Analysts are optimistic that more rigorous testing of two of those potential fuels will be completed by the end of 2018, at which point one or both fuels are expected to receive fleetwide authorization from the FAA to use in all piston-powered GA aircraft. Of course, if the replacement fuel is priced significantly higher than the current retail price for avgas, then overall GA activity will likely experience some decline even if replacement fuel is readily available.

[8] The Budget and Economic Outlook: 2017 to 2027. Congressional Budget Office. January 2017.

Security Regulations

The Department of Homeland Security's Transportation Security Administration (TSA) is charged with establishing protocols and maintaining security at airports within the U.S. While most new airport security regulations applied to airports with airline service (i.e. 14 CFR Part 139 airports), TSA has baseline airport and airspace security recommendations for all airports. Since one of GA's primary benefits for its users is the avoidance of security "hassles" at commercial service airports, the potential future imposition of new security requirements on GA airports would likely have a detrimental impact on operations.

Temporary Flight Restrictions (TFR) Impacts

TFRs are a combination of no-fly areas and designated areas for transient flights with strict conditions established to protect the transportation of the President of the United States. The imposition of TFRs reduces GA activity within a 50+ mile radius, adversely impacting many FBOs and other GA businesses. Airport managers and state aeronautic agencies have no discretion or input about when TFRs are imposed or how long they remain in effect. The National Business Aircraft Association (NBAA) noted: "TFRs do have a significant restrictive impact on general and business aviation."

Aging Pilot Population

According to FAA records, the number of total active licensed pilots in the US declined by 1.0 percent from 2007 to 2016, with licensed private pilots declining by 23.1 percent and commercial pilots decreasing by 16.5 percent over that same period[9]. This is the result of various factors including the pilot population aging faster than the general population, new, rigorous, FAA experience requirements for airline new hires, and an overall reduction of military flight training.

3.3.3 Regional Trends Impacting Future GA Activity

The Colorado Department of Transportation (CDOT) published the Colorado Aviation System Plan Update in 2011 to help assess, monitor, and plan for a system of airports that meet the State's long-term air transportation needs and support its overall economic goals. The System Plan notes that FTG is the ninth busiest GA airport in the state of Colorado in terms of aircraft operations (2010) (see **Table 3-1**)and ranked third in terms of the number of based aircraft with a total of 347 airplanes, as shown in **Table 3-2**. CDOT also classifies FTG as a Major General Aviation airport, the highest level in the system classification. Other airports in the Denver metropolitan area in the Major General Aviation airport category include Centennial Airport (APA) and Rocky Mountain Metropolitan Airport (BJC). Combined, FTG, APA, and BJC account for approximately 28.1 percent of all GA operations in the state of Colorado, and accommodate approximately 29.6 percent of all aircraft based in the state.

[9] 2016 Active Civil Airmen Statistics;
https://www.faa.gov/data_research/aviation_data_statistics/civil_airmen_statistics/

TABLE 3-1 - TOP 20 COLORADO AIRPORTS BY GA OPERATIONS

Rank	City	Airport	2010 GA Operations	% Share
1	Englewood	Centennial Airport (APA)	275,030	17.1%
2	Pueblo	Pueblo Memorial Airport (PUB)	175,180	10.9%
3	Broomfield/Denver	Rocky Mountain Metropolitan Airport (BJC)	118,640	7.4%
4	Loveland	Ft. Collins/Loveland Municipal Airport (FNL)	106,570	6.6%
5	Greeley	Greeley/Weld County Airport (GXY)	106,250	6.6%
6	Erie	Erie Municipal Airport (EIK)	67,500	4.2%
7	Longmont	Vance Brand Municipal Airport (LMO)	61,210	3.8%
8	Colorado Springs	Colorado Springs Municipal Airport (COS)	59,120	3.7%
9	Watkins	Front Range Airport (FTG)	58,220	3.6%
10	Boulder	Boulder Municipal Airport (BDU)	50,280	3.1%
11	Colorado Springs	Meadow Lake Airport (FLY)	41,100	2.6%
12	Grand Junction	Grand Junction Regional Airport (GJT)	38,110	2.4%
13	Alamosa	San Luis Valley Regional Airport (ALS)	27,850	1.7%
14	Aspen	Aspen-Pitkin County Airport (ASE)	27,350	1.7%
15	Eagle	Eagle County Regional Airport (EGE)	24,560	1.5%
16	Durango	Durango La Plata County Airport (DRO)	20,110	1.2%
17	Montrose	Montrose Regional Airport (MTJ)	17,600	1.1%
18	Akron	Colorado Plains Regional Airport (AKO)	16,700	1.0%
19	Pagosa Springs	Stevens Field (PSO)	16,100	1.0%
20	Glenwood Springs	Glenwood Springs Municipal Airport (GWS)	14,930	0.9%
Subtotal			1,322,410	82.1%
Other Airports			288,710	17.9%
All Colorado Airports			1,611,120	100.0%

Source: 2011 CDOT Aviation System Plan, Technical Report, Table 2-10

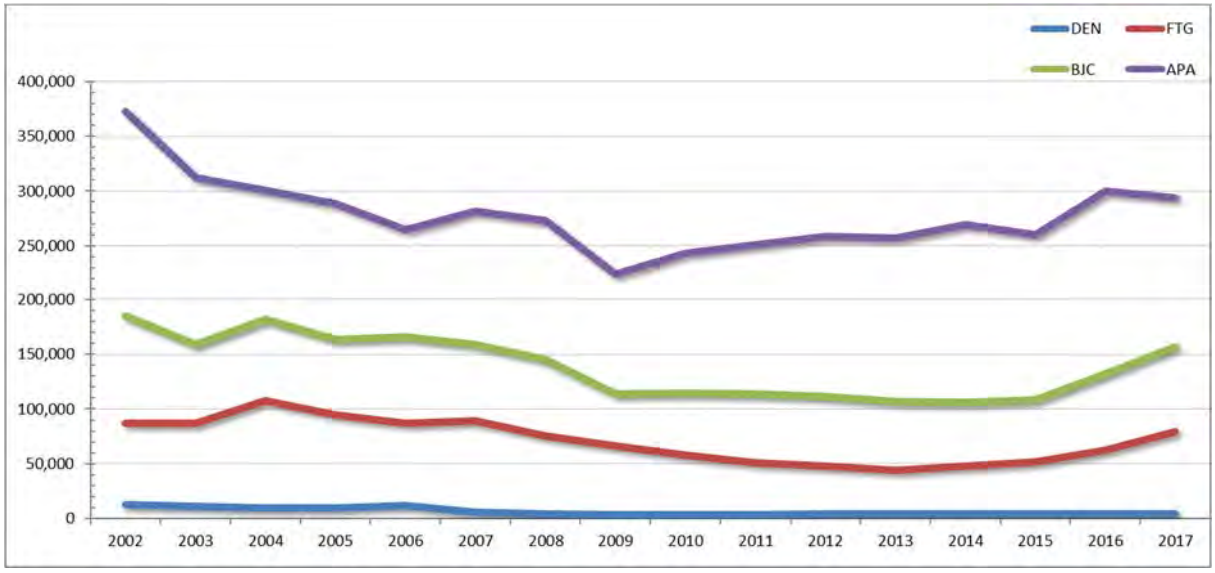
TABLE 3-2 - TOP 20 COLORADO AIRPORTS BY BASED AIRCRAFT

Rank	City	Airport	Based Aircraft	% Share
1	Englewood	Centennial Airport (APA)	822	15.7%
2	Broomfield/Denver	Rocky Mountain Metropolitan Airport (BJC)	384	7.3%
3	Watkins	Front Range Airport (FTG)	347	6.6%
4	Longmont	Vance Brand Municipal Airport (LMO)	340	6.5%
5	Colorado Springs	Meadow Lake Airport (FLY)	325	6.2%
6	Colorado Springs	Colorado Springs Municipal Airport (COS)	292	5.6%
7	Greeley	Greeley/Weld County Airport (GXY)	223	4.3%
8	Loveland	Ft. Collins/Loveland Municipal Airport (FNL)	216	4.1%
9	Erie	Erie Municipal Airport (EIK)	179	3.4%
10	Boulder	Boulder Municipal Airport (BDU)	159	3.0%
11	Pueblo	Pueblo Memorial Airport (PUB)	120	2.3%
12	Grand Junction	Grand Junction Regional Airport (GJT)	105	2.0%
13	Eagle	Eagle County Regional Airport (EGE)	100	1.9%
4	Canon City	Fremont County Airport (1V6)	88	1.7%
15	Montrose	Montrose Regional Airport (MTJ)	86	1.6%
16	Aspen	Aspen-Pitkin County Airport (ASE)	84	1.6%
147	Steamboat Springs	Steamboat Springs/Bob Adams Field	83	1.6%
18	Glenwood Springs	Glenwood Springs Municipal Airport (GWS)	73	1.4%
19	Hudson	Platte Valley Airpark (18V)	72	1.4%
20	Durango	Durango La Plata County Airport	70	1.3%
Subtotal			4,168	79.5%
Other Airports			1,077	20.5%
All Colorado Airports			5,245	100.0%

Source: 2011 CDOT Aviation System Plan, Technical report, Table 2-11

Based on that, it is reasonable to examine historical general aviation operational trends that have been experienced at these other airports (like BJC and APA) in comparison to FTG (see **Figure 3-2**). (Note the figure also includes Denver International Airport [DEN], a large hub commercial service airport that also accommodates a portion of the area's general aircraft operations.) All four have experienced net declines in overall GA activity over the past 15 years (2002-2017) with some recovery being experienced over the past three years. Overall since 2002, APA has lost 21.3 percent of its GA operations over that period, with BJC losing 15.4 percent, FTG losing 9.2 percent, and DEN losing 66.6 percent of their totals.

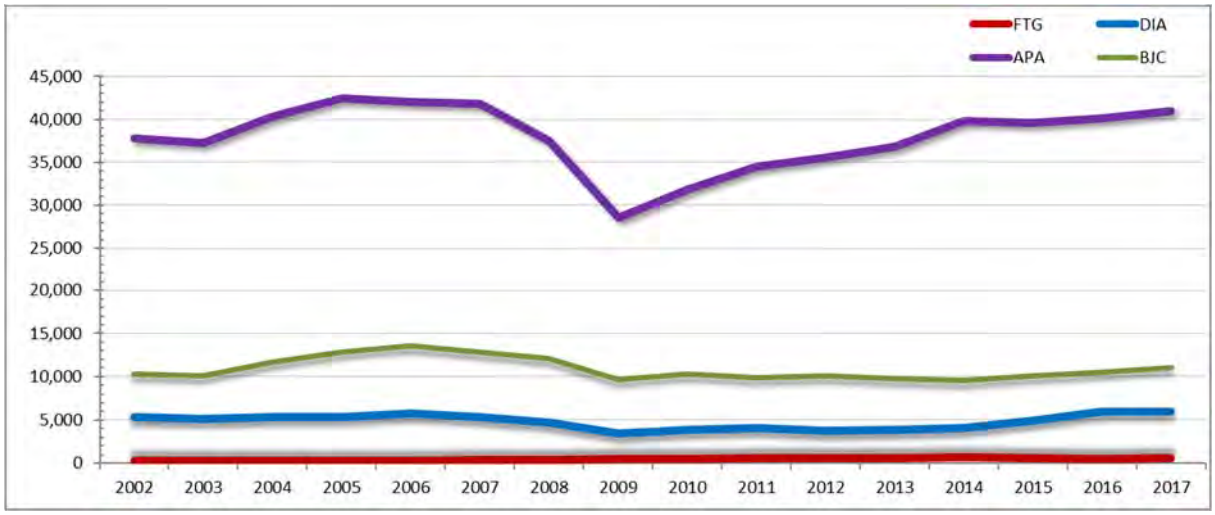
FIGURE 3-2 - GA AIRCRAFT OPERATIONS WITHIN THE REGION



Source: FAA Traffic Flow Management System Counts (TFMSC)

With respect to the business jet component of the GA market, these airports experienced operational levels consistent with the overall GA operational decline and the volatility experienced within the economy since 2002. **Figure 3-3** shows business jet activities experienced within the region between 2002 and 2017. FTG increased its business jet operations by 6.1 percent over that period, APA increased by 8.4 percent, BJC increased by 7.2 percent, and DEN increased by 11.1 percent.

FIGURE 3-3 - BUSINESS JET OPERATIONS WITHIN THE REGION



Source: FAA Traffic Flow Management System Counts (TFMSC)

Individual airports have little control over most factors that influence GA operational totals - they typically represent a mixture of national, and regional trends, some of which affect local GA activity. Local positive trends may counterbalance some of the impact from national challenges.

3.4 Forecasting Methodologies

There are several types of methodologies that can be used when developing aviation forecasts. Each forecast methodology must show short- (5 years), medium- (10 years), and long-term (beyond 10 years) periods, while keeping in mind that a forecast prepared using mathematical relationships must ultimately withstand the test of rational judgment. Each of these methodologies are used to develop forecasts for FTG GA aircraft operations and based aircraft. The different methodologies are briefly described below.

3.4.1 Time Series Analysis

A Time Series Analysis, also known as a trend or linear analysis, uses historic patterns of activity and projects the resultant trend into the future. The time series analysis is a regression analysis with time as the independent variable. The linear extrapolation uses the least squares method to fit a straight line between the historical points and continues to project that line into the future. This type of forecasting is widely used and highly valuable because it is relatively simple to apply. Its limitation is that it simply uses past historical data and variables that are not present in past data (such as change in fuel prices and any economic downturns) are not considered in the result.

3.4.2 Regression Analysis

Regression Analysis is a statistical technique that ties aviation demand (dependent variable), such as operations, to economic measures (independent variables), such as population, employment and per capita income. The independent variable is considered the explanatory variable because it "explains" the projected estimated value. The explanatory power of this approach is measured by the "R^2" statistic (called the correlation coefficient or the coefficient of determination). An R^2 helps determine if there is a correlation between the dependent and the independent variables. An R^2 of 0.0 represents that there is no statistical relationship between changes of the variable, an R^2 of 1.0 means that there is a perfect positive correlation, and an R^2 of -1.0 meaning that there is a perfect negative correlation. Regression analyses should be restricted to comparatively simple models with independent variables for which reliable forecasts are available. Most regression models for aviation use gross economic measures like income, population, and employment to forecast activity levels.

The Regression analysis models used in this forecast study include population, employment, and per capita income in Adams County. The compound annual growth rate (CAGR) in Adams County, between the years 2015 to 2040 is 1.9 percent for population and 1.5 percent for employment; per capita income is projected to climb at a rate of 1.7 percent through 2030.

3.4.3 Market Share Analysis

Market Share Analysis assumes a top-down model, and uses a relationship between national, regional, and local forecasts to predict trends at the Airport. This approach uses the forecast of large aggregates, such as the entire nation, to derive forecasts for a smaller area (i.e. airport). One example is to determine an airport's percentage

(market share) of the national enplanements and then forecast the airport's growth rate based on the national forecast growth rate. The market share analysis approach to forecasting is not without weaknesses. The national forecasts are composed of airports that are growing fast, growing slowly, those with no growth, and those that are declining. Since this analysis is based on the regional or larger aggregate, the planner must account for historical trends, as well as an understanding of the local airport market to better estimate the forecast.

The market share analysis used FTG's market share within both the FAA Northwest Mountain Region (ANM) (Colorado, Utah, Wyoming, Idaho, Montana, Washington, and Oregon), and the Airport's market share within the entire state of Colorado as reported by the TAF. FTG's historical market share of aircraft operations within Colorado and the ANM are utilized as a means of forecasting future growth.

3.5 Forecasting Aviation Activity Measures and Metrics

The forecasting parameters are determined by the level and type of aviation activity expected at FTG. As a commercial service airport, the forecast for FTG focuses on commercial passenger enplanements, as well as GA aircraft operations and based aircraft activity levels. The forecasts must also consider demographic and economic activity, because these are a primary forecast for aviation demand. As fully identified in **Section 3.4**, data sources for these metrics are from the FAA, Woods & Poole socioeconomic data, local socioeconomic data, and airport records.

3.5.1 Commercial Aviation

Commercial aviation consists of operating aircraft for hire to transport passengers or cargo on a scheduled and unscheduled basis. This can consist of scheduled air carrier service and unscheduled air service flights, such as air taxi/charter that operate on an on-demand basis. FTG is not currently served by a commercial air carrier nor is it projected to do so within the 20-year planning period. Therefore, the only commercial aviation operations projected for FTG will consist of air taxi/charter services.

3.5.2 General Aviation (GA)

GA is comprised of all civil aviation operations other than scheduled air services and non-scheduled air transport operations for remuneration or hire. Forecasting metrics of GA activity normally consist of aircraft operations and the number of based aircraft.

Aircraft Operations

Generally, the most important activity forecast for airfield planning is the level and type of aviation demand generated at the airport, which is measured by aircraft operations. An aircraft operation is either a take-off or a landing of an aircraft. This activity identifies the critical aircraft and how adequate the airfield serves this, and similar, aircraft. It is by this demand that runway and taxiway requirements are defined.

Since FTG is serviced by an ATCT, operational data for the Airport is generally considered to be reliable. For 2017, the FTG ATCT reported a total of 82,315 operations. However, as described below in **Section 3.7**, this baseline operational figure required adjustment due to a unique operational condition at FTG.

Based Aircraft

Based aircraft forecasts identify the number of aircraft that are projected to be stored at FTG. This data is used to calculate the need for specific types of hangars and aircraft parking aprons. An Airport hangar inspection conducted in July 2016 serves as the baseline for this forecasting element. Based on the inspection, FTG documented 323 single-engine aircraft, 36 multi-engine aircraft, five business jets, and five helicopters, for a total of 369 aircraft (2016) based at FTG.

3.6 Review of Historical and Existing Forecasts

3.6.1 2004 FTG Master Plan Forecast

The purpose of presenting the 2004 Airport Master Plan forecast is to provide an overview of the projections and underlying assumptions that were applied in the previous master planning effort. This is done to review, assess, and adjust any of those assumptions based upon was FTG has experienced since those forecasts were established. **Table 3-3** below identifies passenger enplanements, air cargo operations, air cargo tonnage, GA operations, and based aircraft, as reflected in the 2004 Airport Master Plan.

TABLE 3-3 - 2004 FTG AIRPORT MASTER PLAN FORECAST

	2002	2011	2016	2021	CAGR (2002-2021)
PAX Enplanements	0	0	0	0	0%
Air Cargo Operations	0	5,762	7,311	21,057	13.84%
Air Cargo Tonnage (million lbs.)	0	40.3	51.2	147.4	13.85%
GA Operations	91,806	155,082	193,384	252,932	5.48%
Based Aircraft	273	481		558	3.64%

Source: 2004 FTG AMP, Jviation

As shown in the previous table, the 2004 Airport Master Plan anticipated air cargo playing a prominent role in the future of FTG. This was based on an assumption that Front Range and neighboring DEN would enter into a Joint Operating Agreement (JOA) to create a non-competitive and synergistic air cargo environment that would enable the two airports to open new markets and maximize operational efficiencies. This JOA did not ultimately materialize and no air cargo operators are currently based at FTG, with all primary cargo operators electing to operate at DEN.

Additionally, GA operations were forecasted to increase at a robust 5.5 percent CAGR based on continued strong growth in population, employment and personal income, as well as national and local trends. The projected view of GA has shifted significantly with several economic downturns, increased security considerations, increased insurance and maintenance requirements, declining pilot starts, an aging GA fleet,

alternative communication means, and other considerations impacting operational patterns since 2004. Upon review of these historical GA forecasts, the 2004 Airport Master Plan forecasted significantly more general aviation operations (231,849) and based aircraft (351) in 2015 than are currently being realized at FTG.

3.6.2 CDOT Aviation Forecast

In 2011, the CDOT Aeronautics Division completed the CDOT Aviation System Plan. This study was conducted to provide CDOT Aeronautics with a performance-based airport system plan forecasts for the 76 public-use airports in Colorado. **Table 3-4** shows the forecasts for FTG as part of this study.

TABLE 3-4 - CDOT STATEWIDE AVIATION FORECAST UPDATE FOR FTG

Type	2015	2020	2030	CAGR (2015-2030)
Enplanements	0	0	0	0.0%
Commercial Operations	0	0	0	0.0%
GA Operations	59,040	60,014	62,516	0.38%
Military Operations	684	684	684	0.0%
Total Operations	59,724	60,698	63,200	0.38%
Based Aircraft	352	358	373	0.38%

Source: Colorado 2011 Aviation System Plan

3.6.3 FAA Terminal Area Forecast

The FAA annually prepares a TAF for each airport in the NPIAS. It identifies all airports in the U.S. that are considered significant to the national aviation infrastructure network. The latest TAF for FTG was published in January 2018, and is presented in **Table 3-5**. The TAF currently forecasts that airports the size of FTG will have little or no growth. The TAF for FTG shows a marginal decline in operations over the 20-year planning period, in addition to limited growth in based aircraft. These forecasts are not always site specific, and traditionally the FAA uses a conservative approach when site specific data cannot be obtained.

TABLE 3-5 - FAA TAF FORECAST FOR FTG

	2017	2022	2027	2032	2037	CAGR
Total Enplanements	0	0	0	0	0	0.0%
Itinerant Operations						
Air Carrier	0	0	0	0	0	0.0%
Air Taxi and Commuter	467	467	467	467	500	0.34%
GA	30,810	31.818	31.818	31.818	31.818	0.16%
Military	611	611	611	611	611	0.0%
Total Itinerant	31,888	32,896	32,896	32,896	32,929	0.16%
Local Operations						
GA	48,945	48,984	49,724	50,474	51,238	0.23%
Military	1,729	1,729	1,729	1,729	1,729	0.0%

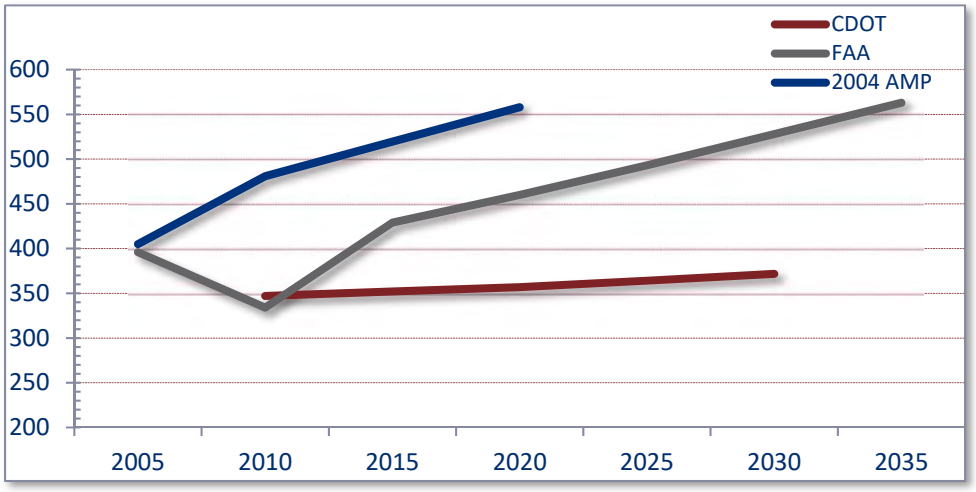
	2017	2022	2027	2032	2037	CAGR
Total Local	50,674	50,713	51,453	52,203	52,967	0.22%
Total Operations	82,562	83,609	83,349	85,099	85,896	0.20%
Based Aircraft	429	460	493	528	563	1.37%

Source: FAA TAF, Issued January 2018.

3.6.4 Previous and Existing Forecasts Comparison

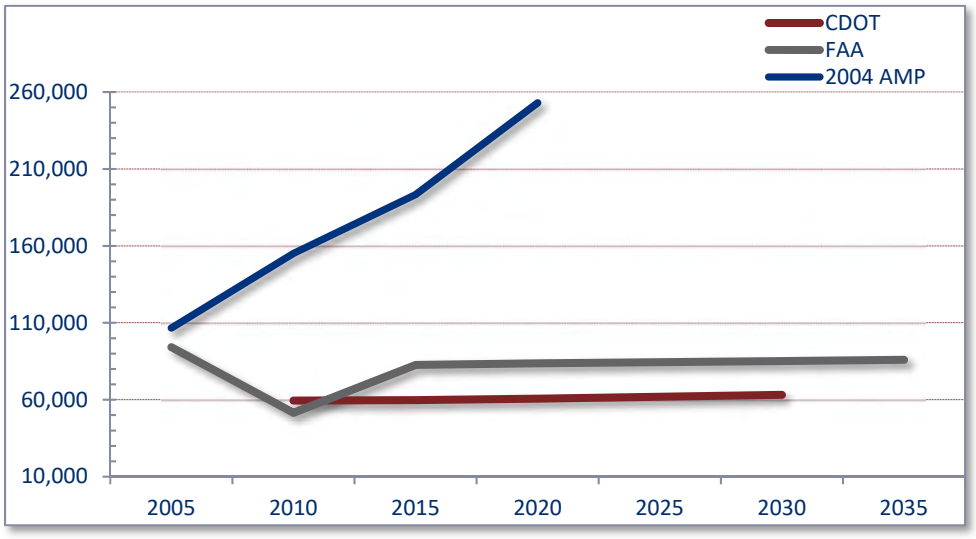
The following figures illustrate the differences among the FAA 2017 TAF, the CDOT System Plan forecasts, and the 2004 Airport Master Plan projections.

FIGURE 3-4 - PREVIOUS AND EXISTING FORECASTS OF BASED AIRCRAFT- FTG



Source: FAA 2017 TAF, 2004 FTG AMP, CDOT

FIGURE 3-5 - PREVIOUS AND EXISTING FORECASTS OF AIRCRAFT OPERATIONS



Source: FAA 2017 TAF, CDOT, 2004 FTG AMP

3.7 Aircraft Operations Forecast

As reported through the FAA's Air Traffic Activity System (ATADS), FTG had a total of 81,905 aircraft operations in 2017, which includes 439 conducted by air taxi/commuter aircraft, 2,198 by military aircraft, and the remaining 79,268 conducted by civil GA aircraft. While ATADS data (produced directly by the ATCT) is typically the most accurate traffic counts available on any airport, in the case of FTG, they do not reflect all of the operations currently being experienced at the Airport. Two primary factors contribute to this: the FTG ATCT is only open daily (and recording data) from 7 AM to 9 PM, and FTG currently has an air ambulance training company (Air Methods) that conducts the majority of its operations after dark, often when the ATCT is closed. In order to refine the ATADS data to properly reflect this operational condition, both the FTG ATCT and Air Methods were interviewed to identify where potential deficiencies in operational recording lay, as well as how to account for those deficiencies in a manner that was reasonable and minimized the potential for overestimating totals. Through that coordination, a methodology was developed to adjust the ATADS data to more accurately reflect current operations at FTG. Key assumptions made in that methodology include the following:

- Operational totals reported by airport administration (that include reporting by individual operators of their totals that occur both during and outside of ATCT hours) were averaged based on the totals reported the previous five years. This was done to ensure that the operational totals utilized were not an anomaly, but reflected a reasonable and normalized approximation.
- Based on the interviews, 30 percent of Air Methods' total reported operations were excluded from consideration since they were assumed to have occurred in non-movement areas, and therefore ineligible to be included in official airport operational totals.
- Since operational totals being missed by ATADS would be limited to only those that occur when both the ATCT is closed and it is dark, a comparative analysis of Denver area sunset and sunrise hours was conducted on a monthly basis with that of ATCT hours. Note that additional consideration was provided for dusk and dawn factors, as well as for daylight savings time.
- Additional corrective factors based on the interviews were also assumed to minimize the possibility for an overestimation of airport operational totals.
- Since this has the potential to impact FAA TAF operational baseline totals, the FAA was consulted about the approach and assumptions of this analysis - the FAA subsequently approved this methodology.

This methodology was discussed and approved by the FAA early in the master planning process to help account for those helicopter operations not being included in the ATADS data. The result of this methodology was to establish an adjusted baseline operational total for the forecast. (As an example, this methodology would result in the FTG operational total for 2017 being adjusted upward from 81,905 annual aircraft operations to 98,144 aircraft operations.) However, the Airport has also recently acknowledged that Air Methods operations are in the process of changing, with increased usage of flight simulators and fewer helicopters that will result in fewer of these uncaptured nighttime operations. Based on this, the Airport sponsor has elected to have the "official" annual operational total be consistent with

the ATADS data. However, it would also like to reserve the ability to re-establish the above methodology to adjust its official baseline annual aircraft operational totals as nighttime operations again become more prevalent.

The following sections describe the aircraft operational forecasts established for the various segments of aircraft activities at FTG.

3.7.1 Commercial Aviation Operations

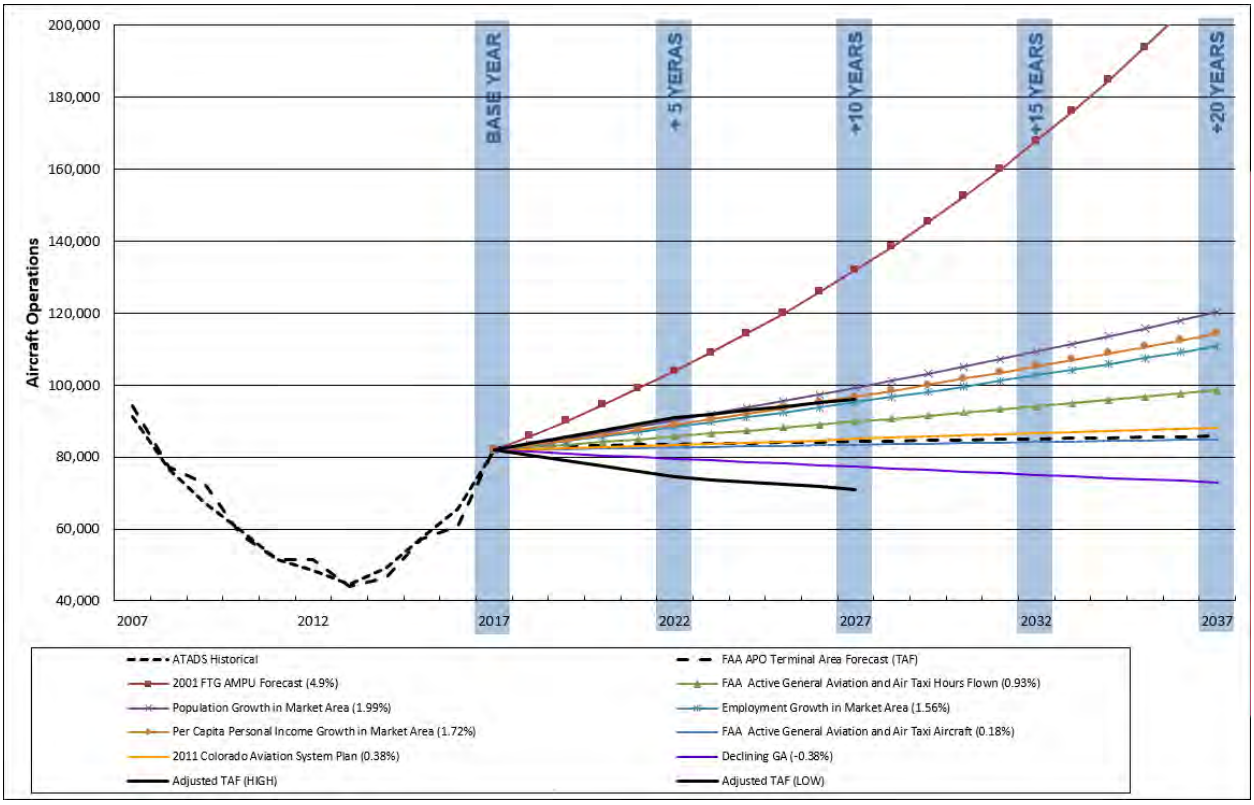
FTG does not currently have scheduled commercial air service, nor is it reasonably expected to accommodate such service within the planning period; a limited amount of air taxi/charter service is accommodated. Since these services largely mirror forecasting factors reflected in typical GA operations, the same methodologies are used for forecasting air taxi/charter operations.

3.7.2 General Aviation Operations

GA operations at FTG include all operations not classified as air carrier or military, and generally include those operations conducted by privately-owned aircraft used for business, recreation, flight training, and personal use. The methodologies used for forecasting GA aircraft operations included socioeconomic regression analyses, time series analyses, and market share analyses. Specifically, regression analyses were used for population, employment, and per capita income, while market share methodologies were based upon FTG's historical market share of aircraft operations within the ANM region (0.4 percent) and in Colorado (1.9 percent). Additionally, forecasts associated with the 2004 Master Plan, the 2011 Colorado Aviation System Plan, and the FAA Aerospace Forecast 2017-2037 were considered. Note that the times series analysis was not used for the operations forecast because continuing historical trends result in a projected continual decline in operations through the 20-year forecast period. The results produced through the application of these various methodologies and resources, as well as the historical FAA ATADS data and forecasted FAA TAF, are reflected in **Figure 3-6**.

As part of this effort, the FAA requires that study-related forecasts be consistent with the TAF or include sufficient documentation to explain the difference. Consistency with the FAA TAF is accepted if a forecast differs by less than 10 percent in the five-year forecast and 15 percent in the 10-year forecast. As a reference, this criterion is also included in **Figure 3-6**.

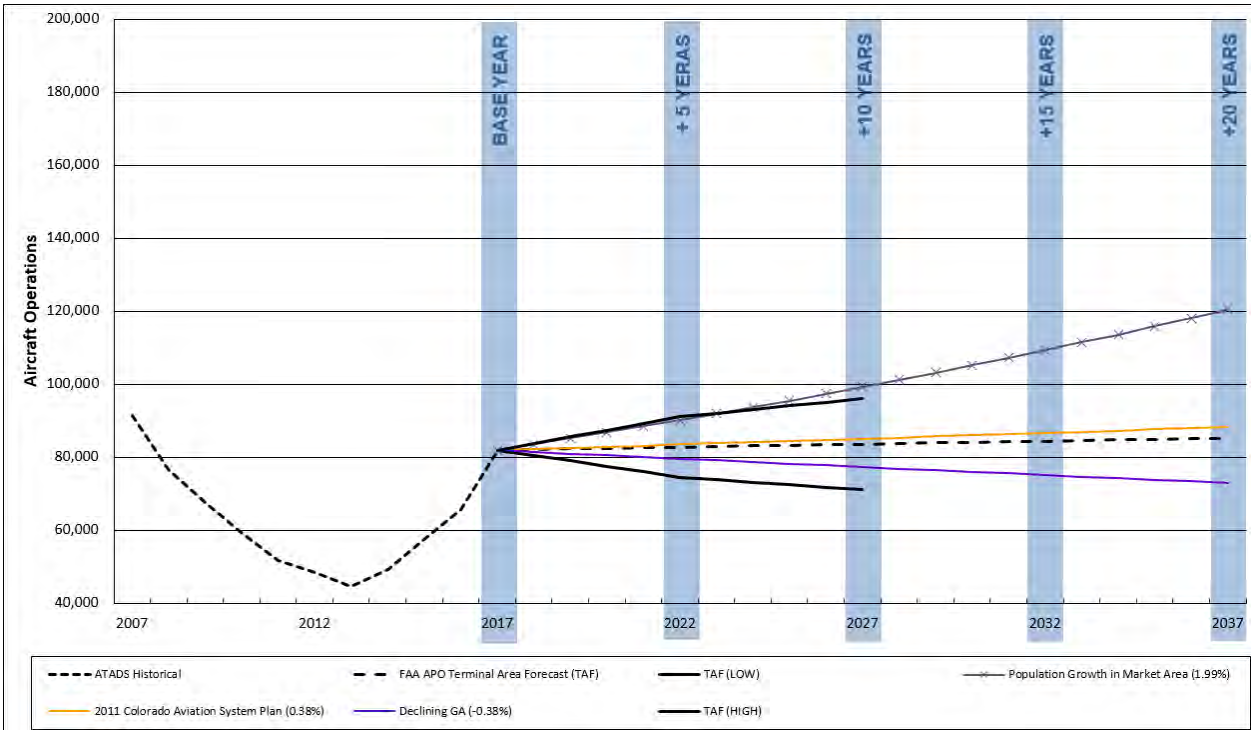
FIGURE 3-6 - FTG GENERAL AVIATION AIRCRAFT OPERATIONS FORECASTS



Source: Jviation

Three growth scenarios were used to forecast GA operations at FTG. The high growth scenario incorporates the Adams County population growth rate of 1.9 percent; the 2011 Colorado Aviation System Plan forecast for FTG (0.38 percent) reflects moderate growth, and a declining GA activity forecast (-0.38 percent) is the low growth scenario. These are reflected in **Figure 3-7** and **Table 3-6**. Note that these forecast scenarios provide a range of 120,333 (high) to 72,918 (low) GA operations by 2037, while the FAA TAF adjusted to the current operational level, projects 85,211 operations by the end of the 20-year planning period. With respect to the FAA TAF consistency criteria of forecasts differing by less than 10 percent in the five-year forecast and 15 percent in the 10-year forecast, only the high growth forecast does not comply, exceeding the criteria between years seven and ten.

FIGURE 3-7 - FTG AIRCRAFT OPERATIONS FORECAST SCENARIOS



Source: Jviation

TABLE 3-6 - FTG AIRCRAFT OPERATIONS RANGE OF FORECASTS

Year	High (1.99%) Adams County Population	Medium (0.38%) CO Aviation System Plan	Low (-0.38%) Declining GA	FAA TAF (2017I)	FAA TAF High / Low Range[2]
2017[1]	81,905	81,905	81,905	81,905	81,905
2022	90,144	83,442	79,553	82,718	90,990 – 74,446
2027	99,235	85,006	77,275	83,541	96,072 – 71,010
2032	109,265	86,602	75,064	84,372	-
2037	120,333	88,228	72,918	85,211	-

Source: Jviation

[1] Current (actual) data

[2] FAA requires recommended forecast scenario to differ by less than 10 percent from the existing TAF in the five-year forecast and 15 percent in the 10-year forecast, unless appropriate justification is provided. It does not apply beyond the ten-year forecast.

Additional Local Considerations

Adams County Economic Development

Beyond the primary socioeconomic trends for Adams County discussed previously, there are other economic initiatives that are important to recognize. The intergovernmental agreement between Adams County and City of Denver & Denver International Airport passed by voters in November 2015 (Denver Intergovernmental Agreements and Revenue Sharing with Adams County, Measure 1A) allows for the development of 1,500 acres of DEN property in exchange for tax revenues to be shared by the County and the City. This initiative is positioned as a pilot program for the potential long-term development of an "Airport City" or “aerotropolis” of businesses that would benefit from immediate proximity to DEN and have positive ancillary development impacts in surrounding communities. Because of the agreement, commercial non-aeronautical development will rapidly expand east, from the Denver metro area, into Adams County and towards FTG. The RTD rail line from Union Station to DEN and the new light rail line along the east side of Aurora , will also spur commercial and residential development. It is reasonable assume that the confluence of the various anticipated economic development initiatives and infrastructure investments will ultimately result in a significant boost to the socioeconomic underpinnings of Adams County – which in turn will positively impact FTG aircraft operational totals over the planning period.

Flight Training

FTG is experiencing an increasing amount of flight training activities, now currently having two flight schools based at the Airport after several years without any. These flight schools have opened at FTG within the past two years and have generated increased flight operational traffic at the Airport including touch-and-go operations, instrument approach training operations, etc. Note that having an active air traffic control tower in addition to multiple types of instrument approaches (including precision approaches) on both runways makes FTG a very attractive site for flight training. It should also be recognized that the presence and success of flight schools is largely driven by local area socio economics (i.e. population, employment, per capita income). With Adams County displaying significant growth in all socioeconomic areas today and projected to continue to do so into the future, the continued presence and growth of flight training operations is likely to continue.

Corporate Flight Departments

Like flight training, the presence of corporate flight departments based at an airport are largely a function of area socioeconomics. Corporate flight departments are typically based at airports that provide them with the facilities they need, the financial flexibility to assist in maintaining their operations, and the immediate accessibility required by their users (with respect to where they work and where they live). FTG meets the expectations of the first two requirements, yet the distance between FTG and the current metropolitan area population locus remains significant, albeit declining. As the Denver metro area development continues to progress east to Adams County, it is reasonable to anticipate an increase in the number of

corporate flight departments based at FTG, therefore positively impacting aircraft operational totals.

DEN and FTG Operational Dynamics

According to the FAA, DEN accommodates approximately ten times the number of corporate flight operations than FTG. This is attributed to a variety of factors, including the requirement of some corporate passengers to connect with commercial airline flights, corporate aircraft fueling and service agreements with established FBOs (i.e. Signature Flight Support), a closer physical proximity to the City of Denver, and the supporting highway network to facilitate efficient surface transportation to and around the City. As economic growth and transportation infrastructure improvements progress in and around Adams County, surface transportation efficiencies should improve dramatically, encouraging utilization of FTG over DEN. It is highly unlikely that corporate aircraft utilization of the two airports will balance within the planning period, however, thy may conform which would positively impact FTG's aircraft operational totals.

Spaceport Colorado

Building upon Colorado's extensive technology cluster of aerospace expertise, FTG and Adams County have embarked on an ambitious program to develop the first commercial spaceport in the State. Colorado has the nation's third-largest aerospace economy, and eight of the nation's top aerospace contractors maintain significant operations in Colorado. More than 400 space-related companies call Colorado home, developing products ranging from launch vehicles and satellites to command and control software, to sensors and navigation equipment. Specifically, the State has 160 businesses classified as being an "aerospace company," with more than 400 additional companies and suppliers providing space-related products and services. Direct employment in the Colorado aerospace market totals 25,110 private sector workers and approximately 27,890 military personnel. In turn these jobs support an additional 109,680 workers in other industries throughout Colorado through both direct and indirect impacts. In total, aerospace activities support an estimated 162,680 employees throughout Colorado.

Spaceport Colorado at FTG is envisioned as a horizontal launch facility, utilizing FAA-licensed Reusable Launch Vehicles or "space planes" that take-off and land from existing airport runways. These space planes would provide access to space for scientific research, education, and space tourism in the short-term; and point-to-point, high-speed, sub-orbital transportation to other international spaceports over the long term. FTG is in the process of filing an application to the FAA's Office of Commercial Space Transportation to be licensed as a commercial spaceport.

It is anticipated that the license and development of commercial space launch activities will also attract research and development (R&D) aerospace companies based at or near the Front Range to support commercial space ventures. Based on previous analyses, FTG appears to have adequate space and infrastructure available to accommodate a significant amount of aerospace-related development on airport property. If based at FTG, it is reasonable to assume that R&D aerospace firms and companies that fly the "space planes" will spur conventional corporate aircraft operations at FTG. It is anticipated that space-related development at FTG may occur

by 2021, and increase thereafter. While it is difficult to speculate how much additional aircraft activity will be generated by aerospace companies based at FTG, currently licensed commercial spaceports (i.e. Cecil Spaceport Field, FL; Mojave Air & Space Port, CA; Space Florida, FL; and Ellington Field, TX) anticipate conventional aviation activity growth in support of their spaceport activities.

FIGURE 3-8 - SPACEPORT COLORADO - DESIGN CONCEPT

Source: Spaceport Colorado

3.7.3 Local/Itinerant Operations

Local operations are those performed by aircraft that are based at FTG and operate in the local traffic pattern and/or within sight of the Airport. These operations also include simulated instrument approaches, and departures to or arrivals from practice areas within a prescribed distance from the Airport. Itinerant or transient operations are operations by aircraft that leave the local airspace.

The current FAA TAF indicates that total itinerant operations (air taxi/commuter, military and GA) were 39.9 percent and local GA operations were approximately 60.1 percent. For the purposes of this study, the majority of operations at FTG are expected to remain local; however, it is anticipated that FTG will experience a modestly increased rate of itinerant traffic over time to reflect increased regional economic development and associated business aircraft activities. Thus, the average itinerant/local split for total forecast operations from 2017-2037 is projected to be 45.0 percent itinerant and 55.0 percent local. Note that these percentages may be impacted by factors like the establishment of a flight school, the further development of corporate business hangars, and enhanced FBO services.

3.7.4 Design Hour Operations

Another measure of airport activity is design hour operations. The design hour is an estimate of an airports peak hour of the average day in the busiest month. Based on data obtained from the FTG ATCT, design hour calculations include the following.

- Peak Month Operations is the month that has the most operations. The Peak Month for FTG is typically June, July, or August at approximately 11.0 percent of the annual operations. FTG's peak month in 2017 was June, with approximately 9,993 peak month operations or 12.2 percent of the annual total.
- Design Day is the Peak Month Operations divided by 30 days. The Design Day for FTG in 2017 was 333.1 operations.
- Design Hour is an average of the highest number of operations within the most active hour of the day. Typically, these operations will range between 12.0 percent and 17.0 percent of the design day operations; for planning purposes, 15.0 percent was used to determine the Design Hour. The Design Hour Operations at FTG in 2017 is 50.0.

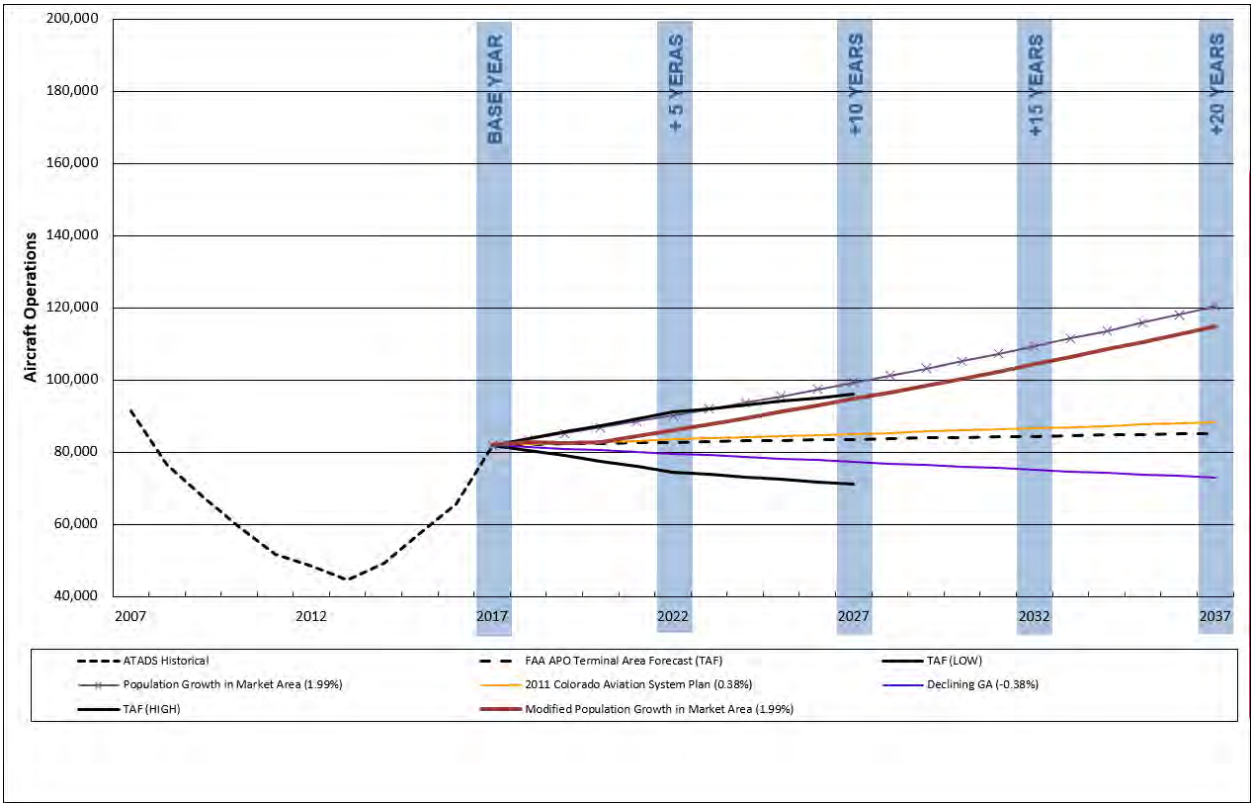
3.7.5 Military Operations

Military operations, historically, have not significantly contributed to the number of operations at FTG. Military operations are not dependent on the same stimuli as GA or commercial activity. Airport management records report that military operations at FTG are unpredictable and have fluctuated from year to year. The TAF indicates that military operations remain constant with 2,198 annual operations occurring throughout the 20-year planning period. This accounts for approximately 2.5 percent of FTG's total operations as projected in the TAF. Due to the fluctuation and unpredictability of military operations, this study projects, it is projected that military operations will remain constant throughout the forecast period.

3.7.6 Aircraft Operations Forecast Summary

The previous forecast scenarios were presented to the FAA and the FTG AMP Project Advisory Committee (PAC) in February 2016. Following comments received from the PAC and through additional interviews with stakeholders that included several PAC members, an additional forecast was developed that combined the high growth scenario (Adams County population growth) with the medium growth scenario (Colorado Aviation System Plan). This scenario assumes that FTG operational growth will lag slightly behind Adams County population growth, but that this growth will start to be realized by 2021. Specifically, this modified high growth scenario projects continued moderate (0.38 percent) growth through 2020 at which time growth would reasonably be expected to progressively increase to 1.9 percent. The modified high growth forecast scenario is shown below in **Figure 3-9** and **Table 3-7**. (Note that this forecast also lies within the FAA 10 percent and 15 percent range of the updated TAF.)

FIGURE 3-9 - FINAL FTG AIRCRAFT OPERATIONS FORECAST SCENARIOS



Source: Jviation

TABLE 3-7 - FINAL FTG AIRCRAFT OPERATIONS RANGE OF FORECASTS

Year	High (1.99%) Adams County Population	Modified High (0.38% / 1.99%) Adams County Population	Medium (0.38%) CO Aviation System Plan	Low (-0.38%) Declining GA	FAA TAF (2017)	FAA TAF High / Low Range[2]
2017[1]	81,905	81,905	81,905	81,905	81,905	81,905
2022	90,144	86,045	83,442	79,553	82,718	90,990 – 74,446
2027	99,235	94,712	85,006	77,275	83,541	96,072 – 71,010
2032	109,265	104,273	86,602	75,064	84,372	-
2037	120,333	114,823	88,228	72,918	85,211	-

Source: Jviation

[1] Current (actual) data

[2] FAA requires recommended forecast scenario to differ by less than 10 percent from the existing TAF in the five-year forecast and 15 percent in the 10-year forecast, unless appropriate justification is provided. It does not apply beyond the ten-year forecast.

Of the four forecast scenarios presented in the previous table, the modified high forecast was identified as being the preferred projection of aircraft operations for this master plan. That forecast generally reflects the extensive growth currently being realized and projected to continue to occur within the region. However, to project a realistic timing of when such regional development will ultimately impact FTG operations, it conservatively projects typically modest operational growth until 2020.

By that time, it is reasonable to assume that development associated with "Airport City," Spaceport Colorado, as well as general eastward development of the Denver metropolitan area should begin to more significantly impact FTG operations. **Table 3-8** presents a detailed description of the preferred forecast that includes the projected split of itinerant and local operations for the planning period.

TABLE 3-8 - FTG AIRCRAFT OPERATIONS PREFERRED FORECAST

Year	Itinerant Operations	Local Operations	Total Operations
2017[1]	32,672	49,233	81,905
2022	35,278	50,767	86,045
2027	40,726	53,986	94,712
2032	44,837	59,436	104,273
2037	51,670	63,153	114,823
Percent Split (2037)	45%	55%	100%

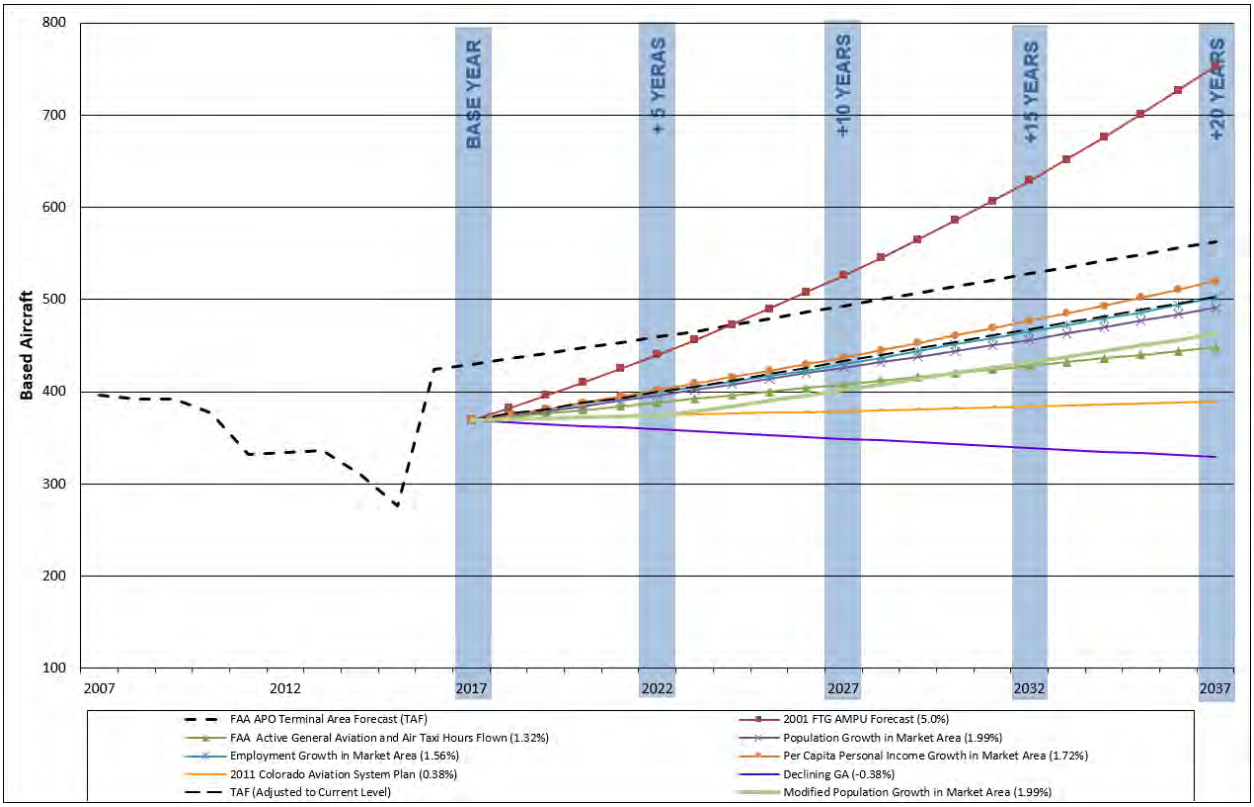
Source: Jviation
[1] Current (actual) data

The preferred aircraft operations projection for FTG represents an unconstrained projection based on existing market conditions and presumes that airport development needed to accommodate growth will be undertaken in a timely manner. This is especially relevant for infrastructure needed to support large scale hangar development for accommodating additional aircraft service companies at the Airport. Facilities needed for this type of growth are speculation and would require further study as to the exact time frame, tenants and uses of the proposed expansion. Impacts from this possible development would result in a growth of operations, which could set a new benchmark level of operations at FTG in the later years. Direct potential impacts to facilities will be discussed in following chapters.

3.8 Based Aircraft Forecast

The based aircraft forecast helps determine the future activity levels and the potential requirement for expanded or improved airport facilities. Following an airport-wide hangar inspection completed during July 2016, airport management provided documentation that indicated a lower number of current based aircraft (369) than the FAA 2017 TAF (429) and higher than FTG's last 5010 inspection (dated 12/31/2013) which reported 285. For this forecast, the 2016 hangar inspection totals have been used as the basis of the forecast. (Note that FTG has updated the FAA online aircraft database to reflect its surveyed totals.) The same methodologies used for operations forecasting have been utilized for forecasting based aircraft: socioeconomic analyses (including population, employment, and per capita income), time series analysis, and market share analysis. Additionally, forecasts associated with the 2004 Master Plan, the 2011 Colorado Aviation System Plan, and the FAA Aerospace Forecast 2017-2037 were considered. The results produced through the application of these various methodologies and resources are reflected below in **Figure 3-10.** Note that the FAA TAF forecast in this figure has been adjusted to reflect current based aircraft totals as reported by FTG.

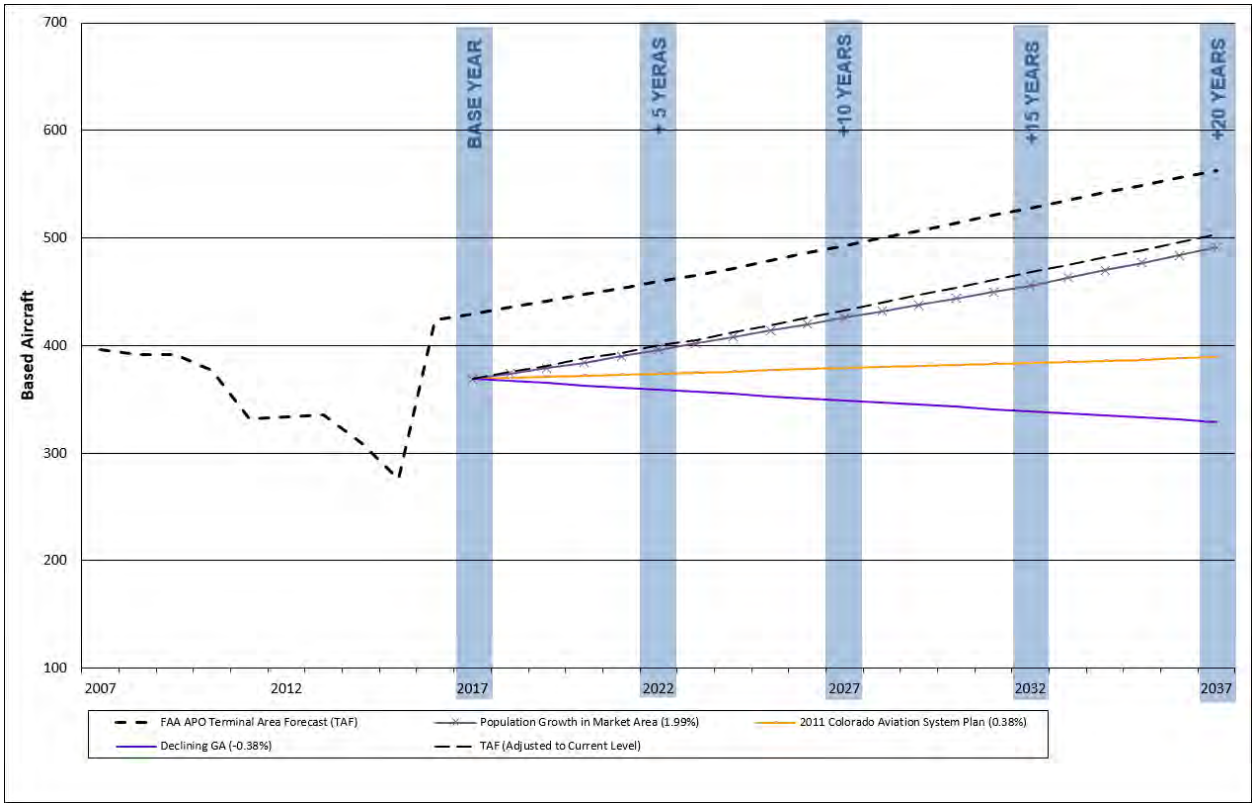
FIGURE 3-10 - FTG BASED AIRCRAFT RANGE OF FORECASTS



Source: Jviation

Three growth scenarios were used to forecast based aircraft at FTG, as well as consideration provided to the current TAF. The high growth scenario incorporates the Adams County population growth rate of 1.9 percent, the 2011 Colorado Aviation System Plan forecast for FTG (0.38 percent) reflects moderate growth, and a declining GA activity forecast (-0.38 percent) is the low growth scenario. These are reflected in **Figure 3-11** and **Table 3-9**. These forecast scenarios provide a range of 491 (high) to 329 (low) based aircraft by 2037, while the current TAF projects 563 based aircraft by the end of the 20-year planning period. Note that if the TAF were adjusted to reflect the actual number of aircraft currently based at FTG, that projection changes to 503 based aircraft by 2037, as shown in the following figure.

FIGURE 3-11 - FTG BASED AIRCRAFT FORECAST SCENARIOS



Source: Jviation

TABLE 3-9 - FTG BASED AIRCRAFT RANGE OF FORECASTS

Year	High (1.99%) Adams County Population	Medium (0.38%) CO Aviation System Plan	Low (-0.38%) Declining GA	FAA TAF (2017)	FAA TAF (adjusted to actual level)
2017[1]	369	369	369	429	369
2022	396	374	359	460	400
2027	426	379	349	493	433
2032	456	384	339	528	468
2037	491	389	329	563	503

Source: Jviation
[1] Current (actual) data

Preferred General Aviation Operations Forecast

Like the aircraft operations forecasts, the based aircraft forecast scenarios were presented to the FAA and the FTG AMP PAC in February 2016. Comments were received from the PAC and additional interviews with stakeholders were conducted. The Airport also provided updated based aircraft demand data that indicated a continued robust demand for basing aircraft in FTG hangars, as well as the potential establishment of a new flight school. Based on this data and coordination, the high growth forecast was identified as the recommended forecast scenario for FTG based aircraft.

3.9 Critical Design Aircraft

The Critical Aircraft is used to identify the design criteria for an airport. It is determined by the most demanding airplane, or family of airplanes, that accounts for at least 500 annual operations within the planning period. Formerly designated as the Airport Reference Code (ARC), the Runway Design Code (RDC) is a classification given to aircraft based on its maximum approach speed and wingspan. The FAA then uses this classification to apply specific airport design criteria appropriate to operational and physical characteristics of the aircraft types operating at that Airport. The RDC is applied to each separate airfield facility, and may be different if different Critical Aircraft are identified for each runway or airfield element.

The 2004 FTG Master Plan established the ARC (now defined as RDC) as a D-IV based on the need to accommodate the most demanding traits of a combination of the Airbus 300F (ARC/RDC C-IV) and the Grumman Gulfstream IV (ARC/RDC D-II). This classification was also based on the 2004 Master Plan's projection that FTG would realize significant air cargo operations (starting in 2005) that operate the A300F. When those air cargo operations did not materialize, the ARC/RDC was updated to a C-II based on the Bombardier CL 604 Challenger, a corporate business jet.

Specifically, FTG's current Airport Layout Plan indicates this RDC for both runways, with an existing Airport Approach Category (AAC) of C, and an Airplane Design Group (ADG) of II. This design category accommodates business jets up to the Gulfstream G-280, G-350, G-450; Falcon 2000 and 900; Bombardier Challenger 300/604/600; Cessna Citation X; and the Embraer Legacy 500/600, among others. An RDC of C-II also allows operations by smaller aircraft such as the Cessna Citation 1, 2, and CJ-series; Learjet 31, 35, 36, 45; Beech King Air 90, 200, and 350; Pilatus PC-12; TBM-850; as well as almost all piston engine aircraft. While FTG will occasionally accommodate operations by larger corporate jets such as the Gulfstream G-550 and Bombardier 700/Global 6000/Global Express (RDC C-III), these have not historically approached the FAA's 500 annual operation threshold for critical design aircraft status.

In 2017, the FAA's Traffic Flow Management System Counts (TFMSC) database indicated that the most demanding single aircraft that operated at FTG was the Beechcraft King Air twin-turboprop aircraft with 527 operations. Depending on its individual model and configuration, the King Air can have an RDC of B-I or B-II. However, this is anticipated to change in the future as FTG continues to accommodate a wide range of corporate jet aircraft ranging in size from the Cessna Citation Mustang (RDC B-I) to the Bombardier Challenger (RDC C-II) to the Gulfstream V/G500 (RDC C-III) at an increasing rate. As suggested earlier in this chapter, economic and industrial growth is steadily migrating eastward from Denver into Adams County. It is reasonable to conclude that FTG will continue to experience increasing rates of corporate jet activity in association with increasing industrial development within the area.

Table 3-10 provides a listing of the operational totals by corporate jet aircraft type currently being experienced at FTG. Note that the individual totals reflect an average of 2016 and 2017 to help account for potential anomalies. It should also be recognized that there are limitations to the TFMSC database in that it typically captures a relatively small percentage of the actual aircraft operations experienced,

meaning that the data included in the table is likely underestimated, potentially significantly.

TABLE 3-10 - CORPORATE JET AIRCRAFT OPERATIONS AT FTG

Aircraft Type	Average Annual Operations*
C25 - Cessna Citation (all C25 variants)	117
C500 - Cessna 500/Citation I	14
C510 - Cessna Citation Mustang	39
C525 - Cessna CitationJet/CJ1	140
C550 - Cessna Citation II/Bravo	47
C560 - Cessna Citation V/Ultra/Encore	60
C56X - Cessna Excel/XLS	62
C650 - Cessna III/VI/VII	6
C680 - Cessna Citation Sovereign	2
C750 - Cessna Citation X	15
CL60 - Bombardier Challenger 300/600/604	28
E135 - Embraer ERJ 135/140/Legacy	7
E50P - Embraer Phenom 100	10
E55P - Embraer Phenom 300	27
EA50 - Eclipse 500/550	41
F2TH - Dassault Falcon 2000	8
F900 - Dassault Falcon 900	13
FA50 - Dassault Falcon/Mystère 50	28
GLF5 - Gulfstream V/G500	15
H25B - BAe HS 125/700-800/Hawker 800	28
LJ35 - Bombardier Learjet 35/36	10
LJ45 - Bombardier Learjet 45	11
LJ60 - Bombardier Learjet 60	18
PRM1 - Raytheon Premier 1/390 Premier 1	11
Other Misc Aircraft	48
TOTAL:	805

Source: FAA Traffic Flow Management System Counts (TFMSC) database.
* Average of years 2016 and 2017.

Since FTG's current cumulative corporate jet aircraft operational totals exceed the 500-annual operational total, that this total is underestimated and that this total is reasonably anticipated to continue to increase into the foreseeable future, it is recommended that FTG continue to base its design aircraft on a corporate jet aircraft. Given that FTG's existing design aircraft (the Bombardier CL 604 Challenger) represents a reasonable balance of the widely varying operational requirements and specifications of these corporate jets, it is also recommended that the Challenger remain the design aircraft for FTG.

3.10 Summary of Preferred Forecasts

It is anticipated that FTG will experience moderate growth during the 20-year planning period that generally reflects the socioeconomic development trends of the area. Market demographic trends indicate that the Airport will slightly outpace prevailing national and state growth trends in general aviation. Based aircraft are expected to increase from approximately 369 aircraft to 491 aircraft by 2037. The Airport will also see an increase in the number of operations. By the end of the planning period, over 90,000 operations should be expected. Additional operations could be realized in future years should addition aviation businesses locate on or around the Airport. **Table 3-11** summarizes the projections contained in this chapter.

TABLE 3-11 - SUMMARY OF FTG PROJECTIONS

	2017[1]	2022	2027	2032	2037	CAGR[2]
Passenger Enplanements						
Air Carrier	0	0	0	0	0	0.0%
Commuter	0	0	0	0	0	0.0%
TOTAL ENPLANEMENTS	0	0	0	0	0	0.0%
Operations						
Itinerant						
Air Carrier	0	0	0	0	0	0.0%
Commuter/Air Taxi	439	468	532	587	678	2.31%
Total Commercial Operations	439	423	458	546	678	2.31%
General Aviation	31,685	34,236	39,592	43,649	50,363	2.47%
Military	548	574	602	601	629	0.73%
Local						
General Aviation	47,583	49,116	52,390	57,839	61,611	1.37%
Military	1,650	1,651	1,596	1597	1,542	-0.36%
TOTAL OPERATIONS	81,905	86,045	94,712	104,273	114,823	1.79%
Instrument Operations	6,552	6,884	7,577	8,342	9,186	1.79%
Peak Hour Operations	50.0	52.5	57.8	63.6	70.0	1.79%
Cargo (enplaned+deplaned tons)	0	0	0	0	0	0.0%
Based Aircraft						
Single Engine (nonturbine)	323	337	362	369	398	1.05%
Multi Engine (nonturbine)	36	36	38	41	44	1.01%
Jet Engine (turbine)	5	12	13	23	25	8.38%
Helicopter	5	12	13	23	25	8.38%
Other	0	0	0	0	0	0.0%
TOTAL BASED AIRCRAFT	369	396	426	456	491	1.44%

Source: Jviation
[1] Current (actual) data
[2] CAGR 2017-2037

Additionally, and as described previously, to secure FAA approval for the Master Plan activity projections, FAA requires a comparison of the forecasts to the annually-produced TAF, preferring that airport planning forecasts not vary significantly from the TAF. Specifically, the FAA looks at the airport's recommended passenger enplanements, commercial operations, and total operations forecasts to be within 10 percent of their five-year TAF and within 15 percent of their 10-year TAF. If they are not within these tolerances, an explanation must be provided. A comparison between the forecasts shows that the preferred projections are within FAA tolerances in **Table 3-12** .

TABLE 3-12 – COMPARISON OF FTG PROJECTIONS WITH FAA TAF

	Year	FTG Forecast	TAF[1]	Forecast / TAF (% diff)
Passenger Enplanements[2]				
Base year	2017	0	0	0.0%
Base year + 5 years	2022	0	0	0.0%
Base year + 10 years	2027	0	0	0.0%
Base year + 15 years	2032	0	0	0.0%
Commercial Operations[3]				
Base year	2017	467	467	0.0%
Base year + 5 years	2022	467	467	4.2%
Base year + 10 years	2027	467	467	13.9%
Base year + 15 years	2032	467	467	29.4%
Total Operations				
Base year	2017	81,905	82,562	0.8%
Base year + 5 years	2022	86,045	83,609	2.9%
Base year + 10 years	2027	94,712	84,349	11.6%
Base year + 15 years	2032	104,273	85,099	20.3%

Source: Jviation

[1] FAA TAF Issued January 2018.

[2] Includes only reported Air Carrier and Commuter enplanements (not air taxi, general aviation, etc.).

[3] Includes Air Carrier, Commuter and Air Taxi operations.

It is important to note that the recommended forecast for FTG is an unconstrained projection which has an inherent implication that all facilities necessary to accommodate the forecasted growth will be constructed, regardless of potential constraints to development. The following chapters of this Master Plan will explore the facility implications of accommodating the projected demand and design requirements.

4.0 AIRFIELD CAPACITY & FACILITY REQUIREMENTS

A key step in the Airport Master Plan (AMP) process is determining future requirements for airport facilities that will allow for airside and landside development over the term of the 20-year planning period. By comparing the existing conditions of an airport to its predicted growth, an AMP process can define requirements for runways, taxiways, aprons, hangars, terminals, and other related airport facilities to accommodate growth over the short-, intermediate-, and long-term planning periods.

An essential step in the process of estimating future airport needs is the determination of an airport's current capability to accommodate anticipated demand. Such "demand-capacity" analyses aid in the identification of airport deficiencies, surpluses, and opportunities for future development. Ultimately, they yield information that is used to design the Airport Layout Plan (ALP) and set the stage for future facility development.

The Facility Requirements analysis establishes what airside and landside development should be planned for over the next 20 years.

This chapter of the Front Range Airport (the Airport or FTG) AMP identifies facility requirements for the Airport through the year 2037. Existing and future facility requirements and development standards are identified based on current Airport strategic development initiatives, and by comparing the Airport's existing facilities to future facility needs rooted in the forecasts of aviation demand presented in the previous chapter. The results of this **Airfield Capacity & Facility Requirements** chapter will serve as input into the next chapter, **Alternatives Analysis & Development Concepts**, that will present an examination of development alternatives to meet any current and projected deficiencies for the Airport. That analysis will ultimately result in identifying the best strategy to meet the needs of the Airport, its users, and the community.

Note that the Federal Aviation Administration (FAA) provides guidance for planning and design of airport facilities through Advisory Circulars (AC) that promote airport safety, economy, efficiency, and sustainability. Many of the facility requirements identified for FTG incorporate FAA planning and design standards presented in FAA AC 150/5300-13A, *Airport Design*, and FAA AC 150/5060-5, *Airport Capacity and Delay.* Other FAA ACs were used to develop sections of this chapter and are cited throughout the document.

4.1 Airfield Demand Capacity

"Airfield Demand Capacity" refers to the number of aircraft operations that a given facility can accommodate on either an hourly or yearly basis. (Note that capacity does not relate to the size or weight of aircraft.) The capacity of an airfield is primarily a function of the major aircraft operating infrastructure elements that comprise an airfield (i.e., runways and taxiways), as well as their alignment and configuration. It is also related to and considered in conjunction with wind coverage, airspace utilization, and the availability and type of navigational aids. Each of these components has been examined as part of the airfield demand capacity analysis.

Delays that result from a deficiency in airfield capacity produce real losses with respect to time, money, and productivity.

Airfield capacity is generally defined as the number of aircraft operations that can be safely accommodated on the runway-taxiway system at a given point in time before an unacceptable level of delay is experienced. The ability of Front Range Airport's current airside facilities to accommodate aviation operational demand is described below and is expressed in terms of potential excesses and deficiencies in capacity. The methodology used for the measurement of airfield capacity in this study is described in FAA AC 150/5060-5, *Airport Capacity and Delay*. This guidance is used in planning to determine the demand for an additional runway. Key terms relative to the discussion of capacity are:

- Demand – the magnitude of aircraft operations to be accommodated in a specified period of time, provided by the forecasts.
- Capacity – a measure of the maximum number of aircraft operations that can be accommodated on an airport in one hour.
- Annual Service Volume (ASV) – a reasonable estimate of an airport's annual capacity (i.e., level of annual aircraft operations that will result in an average annual aircraft delay of approximately one to four minutes).
- Delay – the difference between the actual time it takes an aircraft to operate on the airfield and the time it would take the aircraft if it were operating without interference from other aircraft or other influences, usually expressed in minutes.

Airfield capacity is defined as the theoretical number of aircraft operations that an airport can accommodate within a given period of time.

There are several factors known to influence airport capacity. Visual Flight Rule (VFR) and Instrument Flight Rule (IFR) hourly capacities are based on the following assumptions:

- Runway-use Configuration. The appropriate runway use configuration (No. 14) was taken from Figure 2-1 in the Advisory Circular.
- Percent Arrivals. Arrivals equal departures.
- Percent of Touch and Go's. Approximately 55%-65% of the total operations are typically considered to be "touch and go" local operations. Based on data from the FTG Air Traffic Control Tower (ATCT), 65% of all operations are currently touch and go's, although that percentage is expected to decrease to 60% over time.
- Taxiways. The Airport has dedicated full-length parallel taxiways serving both the primary runway and crosswind runway. They each provide ample runway entrance/exit taxiways.

- Airspace limitations. Even with its close proximity to Denver International Airport (DEN), FTG has very few airspace procedural conflicts, all of which are addressed by the Airport's dedicated ATCT.
- Runway Instrumentation. The Airport has three published precision approach procedures that allow access during inclement weather conditions.
- Mix Index. This index is a mathematical expression used to represent the percentage of operations conducted by various classes of aircraft using the Airport. While FTG regularly serves mid to large corporate aircraft, the majority of operations are projected to remain with smaller aircraft. Therefore, the Mix Index is estimated to fall between 0%-20% (the weighed share of larger aircraft) based on existing fleet usage and will continue to be in this range in future years. This index range is used as a reference for determining the ASV.

Considering these factors under optimum conditions, FTG would have a VFR hourly capacity of 150 operations, and an IFR capacity of 59 operations. Based on annual forecast figures presented in **Chapter 3**, the Airport will likely not experience peak hour activity near this level throughout the forecast period.

Further, by applying methodologies found in the Advisory Circular on capacity and demand, the ASV for FTG has been calculated to be a maximum of 270,000 annual operations. (It should also be noted that the capacity of the Airport is enhanced by the presence of the ATCT.)

The forecast for annual operations is expected to increase from 81,905 (2017) to 114,823 operations by the end of the forecast period (2037). **Table 4-1** compares FTG's expected forecasted demand to its estimated capacity.

TABLE 4-1 - AVIATION DEMAND CAPACITY ANALYSIS

	2017	2022	2027	2037
Capacity - ASV	270,000	270,000	270,000	270,000
Demand - Aircraft Operations	81,905	86,045*	94,712*	114,823*
Percent of Capacity	30.3%	31.9%	35.1%	42.5%

*Forecasted, per Chapter 3.

According to the FAA, the following guidelines should be used to determine when airport capacity improvements should be enacted as demand reaches designated airfield capacity levels.

- 60% of ASV: Threshold at which planning for capacity improvements should begin.
- 80% of ASV: Threshold at which planning for improvements should be complete and construction should begin.
- 100% of ASV: The airport has reached the total number of annual operations (demand) it can accommodate, and capacity-enhancing improvements should be made to avoid extensive delays.

According to FAA's standards, FTG should start planning for capacity improvements when airport operational levels reach 162,000 operations (60% of ASV), and should initiate construction of those improvements at 216,000 operations (80% of ASV).

Based on the range of forecasts presented in **Chapter 3 - Forecast**, it is not anticipated that FTG will exceed any of the hourly or annual capacities in any given year during the 20-year planning period.

Conclusion: Since the operations forecasted in the 20-year planning period will not exceed 60% of the ASV, planning for additional airfield capacity will not be required during this planning period.

4.2 Airfield Facility Requirements

Airfield facilities generally include those that support the transition of aircraft from flight to the ground or the movement of aircraft from parking or storage areas to departure and flight. This section describes the airside requirements needed to accommodate the current and projected general aviation activity at Front Range Airport throughout the planning period.

Areas of particular focus include FAA airport design classifications and dimensional standards, runway and taxiway design standards and requirements, airfield pavement, visual and navigational aids, and obstructions and airspace requirements.

4.2.1 Airport Design Requirements

The FAA defines a wide variety of airport dimensional design requirements in order to promote safety, efficiency and consistency at airports across the country. In that these standards can change over time due to updates to the regulatory documents, changes to local airport operational patterns, or due to some other priority, it is important that a Master Plan review all of the critical design criteria to ensure compliance or to identify areas of improvement. This section reviews those standards contained in FAA AC 150/5300-13A, which presents the FAA design criteria for FTG based on its current and projected operational patterns throughout the planning period.

Improvements recommended in this section to maintain safety clearances on the airfield will be shown on the ALP prepared for this Airport Master Plan.

Design Aircraft Classification

The basis for the FAA airport design standards is the “design” or “critical design aircraft,” defined as the largest aircraft or family of aircraft anticipated to utilize a given airport on a regular basis. The FAA defines “regular basis” as conducting at least 500 annual itinerant operations (defined as a takeoff or a landing). As described in **Chapter 3**, the existing and future design aircraft for FTG was identified as a mid- to large-sized corporate jet, such as a Bombardier Challenger CL 604, a Challenger 300, a Cessna C750 Citation X, the Embraer ERJ145, and the Gulfstream G350.

Based on that selection of a design aircraft, an appropriate Airport Reference Code (ARC) can be identified. The ARC is a coding system used to relate airport design

criteria to the operational and physical characteristics of the types of aircraft intended to operate at that airport. Specifically, the ARC is an airport designation that signifies the airport's highest Runway Design Code (RDC), which itself consists of the following components:

- The Aircraft Approach Category (AAC) (depicted by a letter and based on aircraft approach speed).
- The Airplane Design Group (ADG) (depicted by a Roman numeral and based on aircraft wing span and tail height).
- Runway Visual Range (RVR) (based on runway visibility minimums).

Table 4-2 shows the Aircraft Approach Categories, Airplane Design Groups and Visibility Minimums that comprise the Runway Design Code system, as well as representative aircraft.

TABLE 4-2 - RUNWAY DESIGN CODE SYSTEM (RDC)

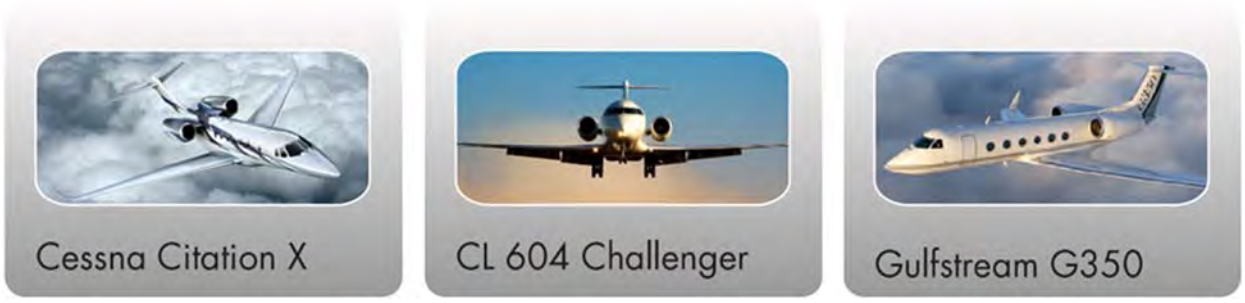
Contributing Elements		
Aircraft Approach Category (AAC)		
Approach Category	Approach Speed	
A	< 91 knots	
B	91 knots ≤ 121 knots	
C	121 knots ≤ 141 knots	
D	141 knots ≤ 166 knots	
E	166 knots or more	
Airplane Design Group (ADG)		
Design Group	Wingspan	Tail Height
I	< 49 feet	< 20 feet
II	49 feet ≤ 79 feet	20 feet ≤ 30 feet
III	79 feet ≤ 118 feet	30 feet ≤ 45 feet
IV	118 feet ≤ 171 feet	45 feet ≤ 60 feet
V	171 feet ≤ 214 feet	60 feet ≤ 66 feet
VI	214 feet ≤ 262 feet	66 feet ≤ 80 feet
Runway Visual Range (RVR) - 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 ¾ mile but not lower than ½ mile	
1600	Lower than ½ mile but not lower than ¼ mile	
1200	Lower than 1/4 mile	

Source: Jviation, FAA AC 150/5300-13A.

Both of FTG's existing runways meet FAA's design criteria for RDC of C-II-2400 based on existing conditions and aircraft operations. Additionally, as detailed in **Chapter Three**, the future critical design aircraft is projected to be consistent with current operational patterns; hence, the RDC will remain as a C-II. Specifically, this designation represents a wide variety of mid-sized to larger business aircraft (see

Figure 4-1). Given that the RDC for both of the Airport's runways will remain a C-II, the ARC for FTG will also remain a C-II.

FIGURE 4-1 - RDC C-II AIRCRAFT



Source: Jviation

Like runway design, taxiway design standards are based on a combination of the ADG and the Taxiway Design Group (TDG) criteria, also defined in FAA AC 150/5300-13A. The TDG is centered on the ratio of the overall Main Gear Width (MGW) to the Cockpit to Main Gear (CMG) distance of the critical or design aircraft. As described in previous sections, the current design aircraft for FTG is the Bombardier Challenger CL 604, which translates to a TDG 2 classification. See **Table 4-3** for a summary of all existing, future and ultimate Airport Design Standard classifications for FTG.

TABLE 4-3 - FTG DESIGN STANDARD CLASSIFICATIONS

	Existing	Future	Ultimate*
Aircraft Approach Category (AAC)	C	C	C
Airplane Design Group (ADG)	II	II	IV
Runway Visual Range (RVR)	2400	2400	2400
Runway Design Code (RDC)	C-II 2400	C-II 2400	C-IV 2400
Airport Reference Code (ARC)	C-II	C-II	C-IV
Taxiway Design Code (TDC)	2	2	3

Source: FAA AC 150/5300-13A.
*The “ultimate” classifications are recommended for long-term considerations. These are not endorsed by the FAA which cannot issue approvals beyond the “future” planning range.

It should be noted that the future ARC and RDC recommendations provided above are consistent with the existing ALP and will not substantively change any proposed safety or design related projects shown on the current ALP. The ultimate ARC, RDC and TDG have been established to preserve for potential development that could occur beyond the 20-year planning period and reflect accommodating the largest existing aircraft currently being utilized for general aviation.

FAA Airport Design Standards

FAA airport design standards include requirements for physical runway and taxiway characteristics as well as safety-related areas and setbacks. As described in FAA AC 150/5300-13A, *Airport Design*, these standards are established for individual airport facilities (e.g., runways, taxiways, etc.) based on several variables that can include

RDCs, TDGs, instrument approach minimums, etc. FAA require airports to meet these standards to help ensure safe and efficient operations.

It should be noted that any condition on an airport that does not meet FAA design criteria is considered to be "non-standard" and subject to correction. When local airport conditions are such that a non-standard condition cannot be corrected, it is at the discretion of the FAA to issue a Modification to Design Standards (MOD). On a case-by-case basis, the FAA may issue a MOD if it is necessary to accommodate unique local conditions for a specific project, while maintaining an acceptable level of safety. MODs are applicable to attaining equipment, design, or a construction project on an airport. Once the nonstandard condition is approved as a MOD, the standard at that location is no longer considered to be a non-standard condition. Note that there are currently no MODs in place at FTG.

Table 4-4 and **Table 4-5** provide summaries for FTG's compliance with these critical airport design standards with respect to its existing runways and its primary taxiways. Following the tables are brief overviews of the relevant airport design standards as well as descriptions of any current deficiencies at FTG.

TABLE 4-4 - FAA RUNWAY DESIGN STANDARDS FOR FTG

Runway Design Standards	FAA Standard (RDC = C-II ≥ ½-Mile Vis)	Runway 08/26 (existing conditions)	Runway 17/35 (existing conditions)
Runway Width	100'	100'	100'
Runway Shoulder			
– Width	10'	10'	10'
– Surface	Turf/Stabilized Soil	5' Asphalt + 5' Turf	Turf
Runway Safety Area (RSA)			
– Width	500'	500'	500'
– Length	1,000'	1,000'	1,000'
Runway Object Free Area (ROFA)			
– Width	800'	800'	800'
– Length	1,000'	1,000'	1,000'
Runway Object Free Zone (ROFZ)			
– Width	400'	400'	400'
– Length beyond RW end	200'	200'	200'
Precision Object Free Zone (POFZ)			
– Width	200'	200'	200'
– Length	800'	800'	800'
Blast Pad*			
– Width	120'	0'	0'
– Length	150'	0'	0'
Runway Centerline to:			
– Parallel Taxiway Centerline	400'	400'	500'
– Aircraft Parking Area	500'	>500'	>500'
– Holding Position Markings	250'	275'	305'

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

* FAA only requires blast pads for runways accommodating ADG IV and higher aircraft, and only recommends blast pads for runways accommodating ADG III aircraft

TABLE 4-5 - TAXIWAY DESIGN STANDARDS FOR FTG

Taxiway Design Standards	FAA Standard (TDG 2 / ADG II)	Taxiway A (existing conditions)	Taxiway D (existing conditions)
Taxiway Type	-	Full Length Parallel	Full Length Parallel
Associated Runway	-	RWY 08/26	RWY 17/35
Taxiway Width	35'	50'	50'
Taxiway Shoulder – Width – Surface	 20' Turf/Stabilized Soil	 20' Turf/Stabilized Soil	 20' Turf/Stabilized Soil
Taxiway Safety Area Width	79'	79'	79'
Taxiway Object Free Area Width	131'	131'	131'
Taxiway Centerline to: – Parallel Taxiway/Taxilane – Fixed or Movable object	 105' 65.5'	 197' 261'	 N/A 170'
Taxiway Wing Tip clearance	26'	26'	26'

Source: Jviation, FAA AC 150/5300-13A.

Runway Safety Area

The Runway Safety Area (RSA) is a defined surface surrounding the runway that is specifically prepared and suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the paved surface. RSAs are also required to be free of non-frangible objects except when fixed by function. As shown in **Table 4-4**, FTG's RSAs are currently compliant with FAA design standards.

FTG meets all RSA requirements for RDC C-II; no action is required.

Runway Object Free Area

The Runway Object Free Area (ROFA) is a two-dimensional FAA-defined runway safety standard that requires the clearing of objects within a specific area around a given runway. This standard requires the clearing of all above-ground objects protruding above the nearest point of the RSA. Exceptions to this requirement include objects that need to be located in the ROFA for air navigation or aircraft ground maneuvering purposes. In those cases, objects must meet FAA frangibility requirements. As shown in **Table 4-4**, FTG's ROFAs meet current design standards.

FTG meets all ROFA requirements for RDC C-II; no action is required.

Runway Obstacle Free Zone (ROFZ)

The Obstacle Free Zone (OFZ) is a volume of airspace intended to protect aircraft in the early and final stages of flight. It must remain clear of object penetrations, except for frangible Navigational Aids (NAVAIDs) located in the OFZ because of their function. For runways serving aircraft with Maximum Takeoff Weight (MTOWs) greater than 12,500 pounds, the OFZ is 400 feet wide and extends 200 feet beyond the end of the runway. As shown in **Table 4-4**, FTG's ROFZs meet current design standards.

FTG meets all ROFZ requirements for RDC C-II; no action is required.

Precision Obstacle Free Zone

The Precision Obstacle Free Zone (POFZ) is defined as a volume of airspace above an area beginning at the threshold at the threshold elevation and centered on the extended runway centerline that is 200 long by 800 feet wide. It exists on runway ends that have a vertically guided approach, and is only in effect when the reported ceiling is below 250 feet or visibility is less than ¾ statute mile, and an aircraft is on final approach within two miles of the runway threshold. Only a wing of an aircraft holding on a taxiway waiting for runway clearance may penetrate the POFZ as can airport vehicles up to 10 feet in height that are necessary for maintenance. FTG has POFZs on the approach ends to Runway 26 and Runway 35; all currently meet those POFZ requirements.

FTG meets all POFZ requirements for RDC C-II; no action is required.

Runway Protection Zone

A Runway Protection Zone (RPZ) is an area beyond each runway end designed to enhance the protection of people and property on the ground. To ensure that the RPZs are kept clear of incompatible uses, the land included in the RPZ should be owned by the Airport or protected via an avigation easement. This gives the Airport the right to control the presence and height of objects as well as the use of the land within the RPZ. The FAA Memorandum, *Interim Guidance on Land Uses Within a Runway Protection Zone*, indicates that existing incompatible land uses within the RPZ should be removed when those land uses would enter the limits of the RPZ as the result of:

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

The size of an RPZ for a particular runway end is a function of the critical aircraft and the visibility minimums established for that end. Visual runways have smaller RPZs because the landing minimums are higher and the runway is not used during periods of reduced visibility. Essentially, the greater precision of the approach (and the lower the visibility minimums for landing), the larger the resulting RPZ. **Table 4-6** presents FTG's RPZ design criteria. All the Airport's RPZs currently meet FAA design standards.

TABLE 4-6 - RUNWAY PROTECTION ZONE DIMENSIONS

RPZ Criteria	RWY 08	RWY 26	RWY 17	RWY 35
Visibility Minimums	Visual	½-mile	¾-mile	½-mile
Approach RPZ				
– Length	1,700 ft	2,500 ft	1,700 ft	2,500 ft
– Inner Width	500 ft	1,000 ft	1,000 ft	1,000 ft
– Outer Width	1,010 ft	1,750 ft	1,510 ft	1,750 ft

Source: Jviation, FAA AC 150/5300-13A

FTG meets all RPZ requirements; no action is required.

Building Restriction Line (BRL)

A Building Restriction Line (BRL) is the line indicating the limit of where airport buildings can be located in order to limit their proximity to aircraft movement areas. The BRL is an amalgamation of airport design standards including RPZs, OFAs, OFZs, the runway visibility zone, NAVAID critical areas, and various other critical airspace-related areas (typically associated with a 35-foot building height limitation). The BRL at FTG considers all of these factors. Note that structures taller than 35 feet require additional analysis to ensure compliance with the 14 CFR Part 77 surfaces.

FTG meets all BRL requirements, all existing buildings are located outside of the BRL; no action is required.

Runway Line-of-Sight Requirements

For a single runway or a system of non-intersecting runways, the runway line-of-sight standard requires that two points located five feet above the runway centerline must be mutually visible for the entire runway length. However, if there is a full-length parallel taxiway (like Taxiway A and Taxiway D at FTG), that visibility requirement is reduced to one half of the runway length.

FTG meets all Line-of-Sight standards; no action is required.

Runway Blast Pads

A runway blast pad is a paved surface adjacent to the ends of runways designed to reduce the erosive effect of jet blast and propeller wash during takeoff operations. FTG currently lacks blast pads on all its runway ends. FAA requires blast pads for runways accommodating ADG IV and higher aircraft, and recommends blast pads for runways accommodating ADG III aircraft. Since FTG's ADG is planned to be II throughout the planning period, no action is required. However, if either runway's ADG were to ultimately be increased to III or above, blast pads would have to be constructed.

FTG meets blast pad design standards; no action is required.

Runway & Taxiway Shoulders

Shoulders are areas adjacent to the defined edge of paved runways or taxiways that provide a transition between the pavement and the adjacent surface. They are designed to enhance drainage, provide for blast protections, and support aircraft and emergency vehicles that deviate from the full-strength pavement. Like runway blast pads, FAA requires paved shoulders for runways and taxiways accommodating ADG IV and higher aircraft, and recommends paved shoulders for runways and taxiways accommodating ADG-III aircraft. Based on its current ADG C-II classification, the Airport meets the current shoulder standards for all its runways and taxiways.

FTG meets all runway and taxiway shoulder design standards; no action is required.

Taxiway Design Standards

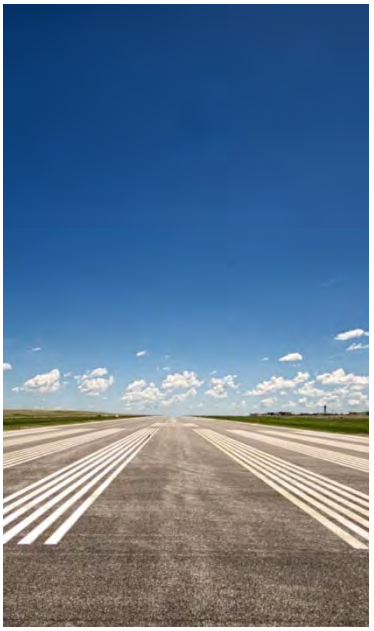
Similar runway design requirements, all taxiways have FAA-mandated Taxiway Safety Area (TSA) and Taxiway Object Free Area (TOFA) design requirements to help ensure safe operational conditions on an airport. These standards promote the safe movement of aircraft without the threat of aircraft wingspan striking any objects or other aircraft. As shown in **Table 4-5**, FTG's taxiways meet current design standards.

FTG meets all taxiway design standards; no action is required.

4.2.2 Runways

Runway Orientation

The runway configuration is the physical layout of the airfield system, including the number of runways, their orientation, and their locations relative to each other, as well as to the landside facilities. Each runway configuration has a different capacity due to operational limitations and restrictions. For example, runways that converge or intersect have lower capacities than parallel runways since an aircraft on a converging runway must wait to land or takeoff until the aircraft on the second converging runway has either completed its landing or has cleared the path for aircraft arriving or departing from the other runway.



Runway 8 at FTG

As described in *Chapter Two*, FTG has two runways: Runway 08/26 is positioned in an East/West orientation, while Runway 17/35 is positioned in a North/South alignment. These runways effectively converge on each other since they do not allow for independent simultaneous operations (meaning that only one runway can be operational as a time, even during ATCT operations). However, even though the Airport's runways and approach paths converge, reducing their overall operational potential, the overall capacity of the airfield remains substantially above the demand projected over for the planning period.

Additionally, climatological conditions specific to the location of an airport not only influence the layout of the airfield, but also affect the use of the runway system. Surface wind conditions have a direct impact on airport operations in that runways not oriented to take the maximum advantage of prevailing winds will restrict the capacity of an airport to varying degrees. When landing and taking off, aircraft are able to operate properly on a runway if the wind component perpendicular to the direction of travel (defined as a crosswind) is not excessive (generally, this is specific to the operational requirements and capabilities of individual aircraft).

Surface wind conditions (i.e., direction and speed) generally determine the desired alignment and configuration of the runway system. Wind conditions affect all airplanes in varying degrees; however, the ability to land and takeoff in crosswind conditions varies according to pilot proficiency and aircraft type. It can be generally stated that the smaller the aircraft, the more susceptible it is to the effects of crosswinds. To determine wind velocity and direction at Front Range Airport, wind data from observations taken at the Airport from 2005 to 2015 was obtained from the National Climatic Data Center and was utilized to construct new VFR, IFR and all-weather wind roses.

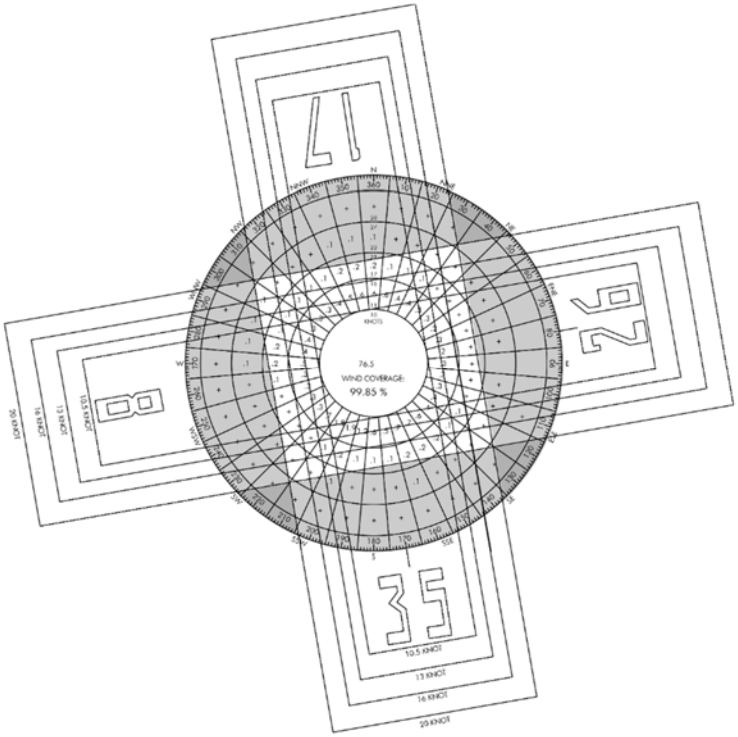
The allowable crosswind component is dependent upon the types of aircraft that utilize the Airport on a regular basis. As described earlier, the future RDC for both FTG runways is C-II. Based on FAA AC 150/5300-13A, this RDC requires that a 16-knot crosswind component be utilized for this analysis. The crosswind components of 10.5, 13, and 16 knots were used for this analysis to look at the allowable crosswind component for various sizes of aircraft. The following illustrations (**Figure 4-2** and **Figure 4-3**) illustrate the all-weather wind coverage wind rose generated for the Front Range Airport. According to the FAA, the desirable wind coverage for an airport is 95% during all weather conditions. This means that the runway orientation and configuration should be developed so that the maximum crosswind component is not exceeded more than 5% of the time annually. (Note that this is a recommendation, not a requirement.) As shown in **Table 4-7**, FTG's crosswind coverage in all weather conditions is 98.52% (at 10.5 knots), exceeding FAA's minimum recommended coverage of 95%. Therefore, the wind coverage at FTG by its current runway orientation is considered to be adequate for the planning period.

TABLE 4-7 - FTG WIND COVERAGE

	10.5 knots	13 knots	16 knots
All Weather			
Runway 8/26	85.52%	91.42%	97.08%
Runway 17/35	92.76%	95.91%	98.47%
Combined	98.52%	99.54%	99.87%
IFR			
Runway 8/26	79.16%	86.49%	93.97%
Runway 17/35	93.37%	96.86%	99.29%
Combined	98.59%	99.64%	99.86%
VFR			
Runway 8/26	85.86%	91.69%	97.24%
Runway 17/35	92.73%	95.87%	98.44%
Combined	98.50%	99.52%	99.87%

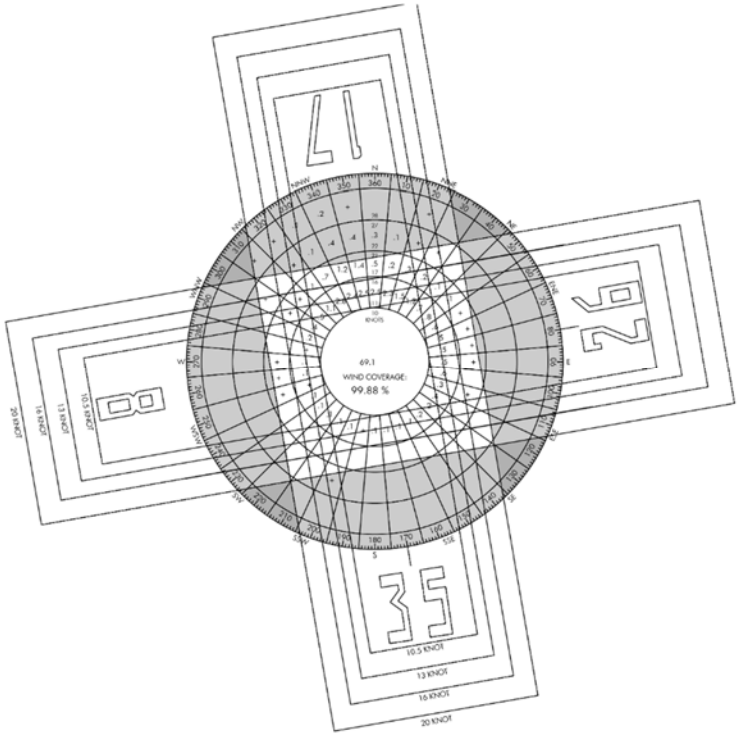
Source: NCDC, Station 724694, FAA AGIS Wind Rose Form, FTG Annual Period of Record: 2005-2015

FIGURE 4-2 - ALL-WEATHER WIND ROSE



Source: FAA Wind Rose Analysis, Jviation

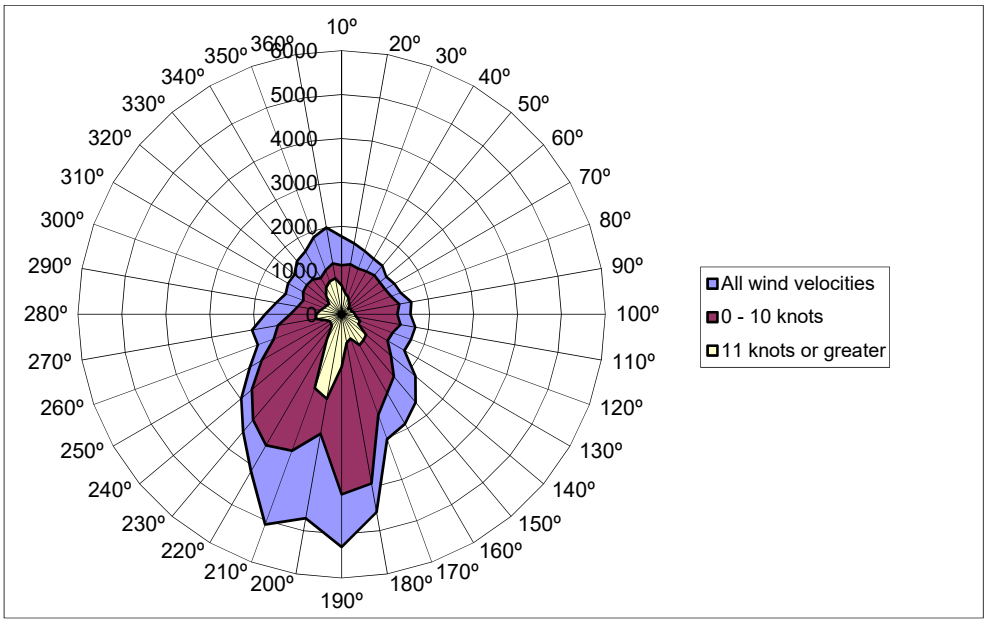
FIGURE 4-3 - IFR WIND ROSE



Source: FAA Wind Rose Analysis, Jviation

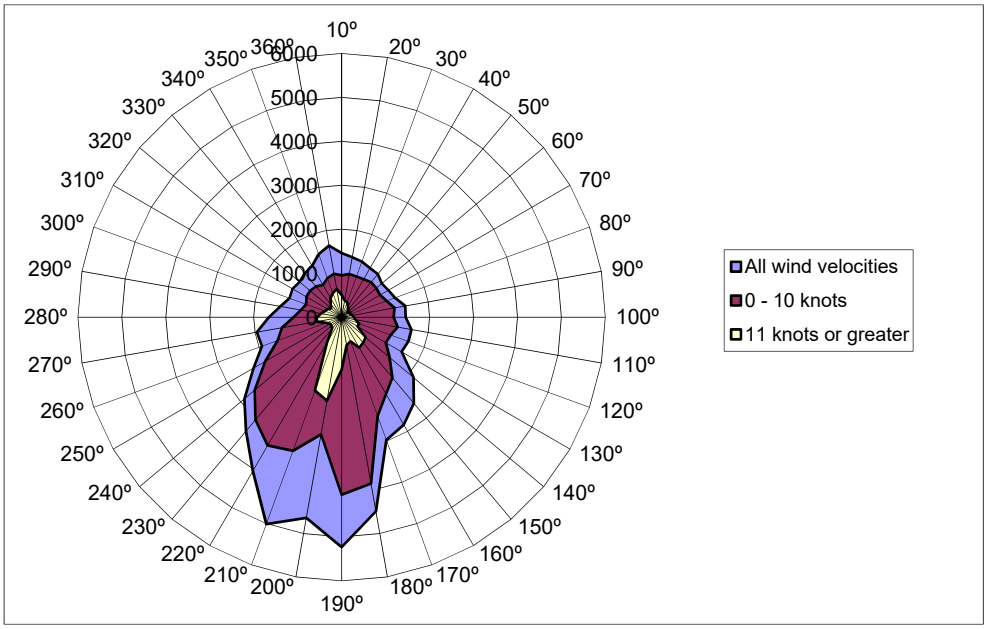
Beyond these wind rose percentage calculations, it is often useful to examine annual wind persistency trends near the Airport to identify any potential anomalies that should be considered. **Figure 4-4**, **Figure 4-5**, and **Figure 4-6** reflect annualized wind patterns at FTG based on all weather, VFR, and IFR weather conditions, respectively.

FIGURE 4-4 - ALL-WEATHER WIND PERSISTENCY



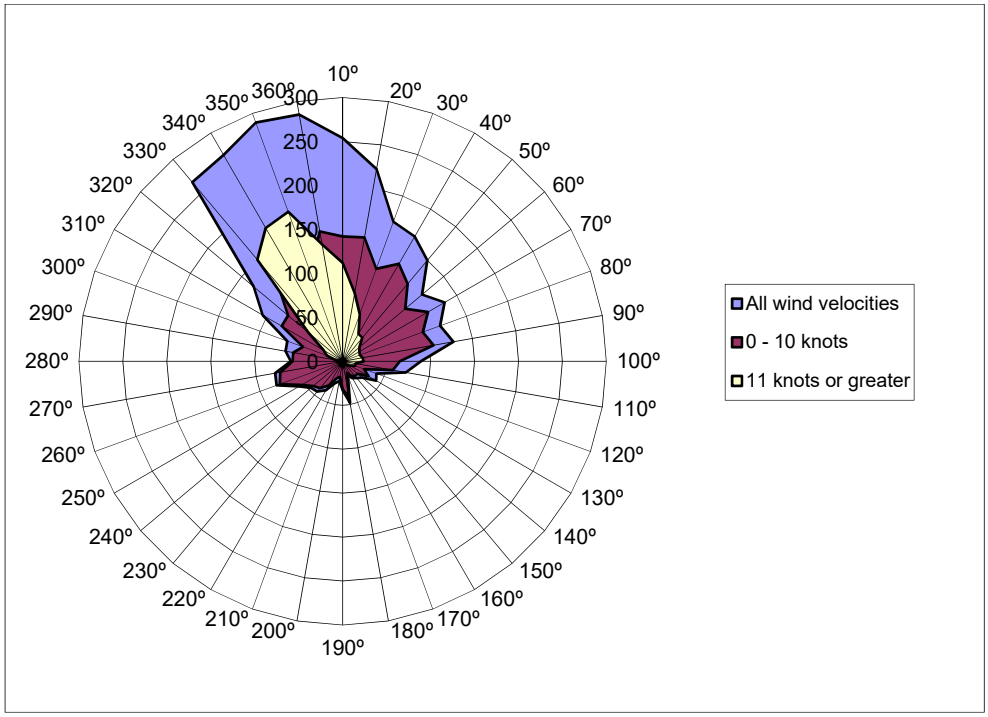
Source: Jviation, FAA GIS wind rose generator; station 724694 2005-2014 annualized data

FIGURE 4-5 - VFR WIND PERSISTENCY



Source: Jviation, FAA GIS wind rose generator; station 724694 2005-2014 annualized data

FIGURE 4-6 - IFR WIND PERSISTENCY



Source: Jviation, FAA GIS wind rose generator; station 724694 2005-2014 annualized data.

Demonstrated in the wind coverage analysis, and reinforced by the persistency tables shown above, winds are typically blowing in the northerly or southerly direction, calling for greater usage of Runway 17/35. The current runway configuration at FTG adequately accommodates the requirements of the area weather patterns.

The existing configuration for FTG's runway layout provide adequate wind coverage and capacity per FAA guidance, no further alternatives will be recommended during the 20-year planning period.

Runway Length

The purpose of this section is to determine if the lengths of the existing runways are adequate to accommodate the aircraft fleet currently operating and projected to operate at FTG. It should be noted that in practical application, specific runway length requirements must be generated for each individual flight that originates at any airport. At FTG along with all other airports, these requirements are dependent on a wide range of variables (see **Figure 4-7**), many of which can vary dramatically daily or even hourly. For planning purposes, to normalize those variables, this runway length analysis was conducted in accordance with FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design,* to ensure that the existing and future runway lengths are suitable for the forecasted range of critical design aircraft. The FAA methodology establishes minimum runway length requirements based primarily upon several factors including airport elevation, average temperature, and type aircraft expected to use the runway on a regular basis.

FIGURE 4-7 - FACTORS AFFECTING RUNWAY LENGTH

Source: Jviation

Both runways at FTG are 8,000 feet long, and the Airport's published altitude is 5,512 feet Mean Sea Level (MSL) with a mean daily maximum temperature in the hottest month of 88.1° Fahrenheit. Additionally, as discussed previously, the future critical design aircraft is projected to maintain an RDC of C-II, which is representative of a wide variety of mid-sized to larger business aircraft (e.g., Cessna Citation X, Embraer ERJ145, Gulfstream G350, etc.). Through application of these criteria within the FAA methodology, runway length requirements were calculated and are presented below in **Table 4-8**.

TABLE 4-8 - RECOMMENDED RUNWAY LENGTHS FOR FTG

Category	Runway Data
Airport Elevation	5,512 feet
Mean Daily Maximum Temperature of the Hottest Month	88.1˚F
Maximum Difference in Runway Centerline Elevation	35.6 feet
Small Airplanes with Approach Speeds <30 Knots	465 feet
Small Airplanes with Approach Speeds <50 Knots	1240 feet
Small Airplanes with <10 Passenger Seats – 95% of these Small Airplanes – 100% of these Small Airplanes	 6,800 feet 7,000 feet
Large airplanes weighing less than or equal to 60,000 pounds:	
— 75% of these Large Airplanes at 60% Useful Load	6,800 feet
— 75% of these Large Airplanes at 90% Useful Load	8,600 feet*
— 100% of these Large Airplanes at 60% Useful Load	10,600 feet
— 100% of these Large Airplanes at 90% Useful Load	>11,000 feet
Airplanes of more than 60,000 pounds	See Manufacturer Data

Source: FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design*.
*Climb limitation is shown. Actual recommended runway length exceeds climb limitations.

Table 4-8 indicates that 75 percent of aircraft greater than 12,500 pounds and less than 60,000 pounds (a category which includes most corporate jets) can be accommodated by FTG's existing 8,000-foot runways with limited to no operational penalties. The Airport currently has sufficient runway length to accommodate all of the small aircraft with less than 10 passenger seats. For aircraft weighing more than 60,000 pounds, runway length requirements are more appropriately calculated

through specific aircraft manufacturer technical data. It should be noted that depending upon the stage length, aircraft can operate on shorter runways by modifying the aircraft loading (i.e. passengers, fuel, or cargo). Reduction of useful load and payload by the business jet fleet is typical when operating on runways of less than optimal length.

To date, neither current users of FTG, nor the airport administration, have identified an immediate need for additional runway length. Documentation from users demonstrating the need for a longer runway length, or overriding needs for future aeronautical activities reasonably expected to occur would be necessary to justify a runway extension. Currently, no such demand or need for an exist, and therefore not warranted within the 20-year planning period.

However, it should also be acknowledged that the previous master plan, completed in 2004, proposed extensions for both runways at the Airport. A 2,000-foot extension for Runway 8/26 (for a total runway length of 10,000 feet) and a phased 4,000-foot extension for Runway 17/35 (for a total length of 12,000 feet) were recommended to accommodate future significant air cargo operations. Unfortunately, since the completion of that master plan, the economic and logistical conditions anticipated to occur that would support such cargo operations did not materialize. In fact, regional air cargo operations are now largely being accommodated at nearby Denver International Airport. However, as noted in the previous chapter, significant economic growth and development are steadily migrating eastward from Denver and towards Front Range Airport that would likely generate future demand for aeronautical activities at the Airport. This trend is likely to be enhanced by the Denver Intergovernmental Agreements and Revenue Sharing with Adams County that was approved in November 2015. It is expected that this agreement will result in an increasing rate of area development, which in turn, would realistically produce increased demand for general aviation activity. While the actual nature of this future demand is currently largely undefined, through discussions with airport management and the FAA, it was determined that it would be reasonable to preserve the potential for the runway extensions by continuing to show them on the Ultimate Airport Layout Plan sheet. This would enable the Airport and the FAA to continue to preserve the abutting land use and airspace for such enhancements in the future. Additionally, this action is supported by the 2011 Colorado Department of Transportation (CDOT) Aviation System Plan which identified FTG as not meeting its state system benchmark of 8,950 feet for runway length, indicating that the Airport should consider the potential for a longer runway in order for the state to meet its overall system goals.

The existing lengths for Runway 8/26 and Runway 17/35 are sufficient to accommodate most aircraft currently operating or projected to operate at FTG with minimal weight penalties; therefore, no runway extension is recommended within the 20-year planning period.

Runway Width

The required width of a runway is defined in FAA AC 150/5300-13A, *Airport Design*, and is a function of the RDC and the instrument approaches available for that runway. The minimum width for a C-II runway that is equipped with precision instrument approaches is 100 feet. Since both Runway 8/26 and Runway 17/35 are currently 100

feet wide, they are consistent with current airport design standards, and no changes are recommended in the planning period.

Additionally, as discussed in the previous section, the 2004 FTG Master Plan recommended not only extensions for both of Front Range Airport's runways, but also increases in their widths to 150 feet (to accommodate potential air cargo aircraft). Like the desire to protect for the long-term potential of the runway extensions, the Ultimate Airport Layout Plan will reflect the potential widening of both runways to protect for that potential development over the long term.

The existing width of Runway 8/26 and Runway 17/35 are sufficient to accommodate the current and projected design aircraft; therefore, runway widening is not recommended within the 20-year planning period.

4.2.3 Taxiways

Taxiway A9 at FTG

A taxiway system should be designed to facilitate safe and efficient aircraft movement to and from the runways and the aprons that serve passenger terminals, hangars, and general aviation facilities. It is generally recommended that an airport's primary runway be served by a full-length parallel taxiway to allow aircraft to enter or exit the runway environment as expeditiously as possible. At Front Range Airport, the taxiway system is based on two full-length parallel taxiways that each service one of its runways (Taxiway A, located south of Runway 8/26, and Taxiway D, located east of Runway 17/35). Taxiway A has seven access taxiways designed to allow aircraft to exit or enter Runway 8/26 at various distances, as does Taxiway D which has seven access taxiway connectors to Runway 17/35. Taxiway A also has four access taxiways linking it to the Terminal Area Apron, while Taxiway D has one access taxiway to the East Apron. Additionally, there are three taxiways (Taxiway B, Taxiway C, and Taxiway E) that connect the Airport's two runways and their associated support facilities. All taxiways are equipped with full signage and taxiway centerlines, but lack any lighting. It should also be noted that all taxiways (except for Taxiway C) are all in excellent condition with each having been rehabilitated or reconstructed within the past five years.

Taxiway Width

All taxiways at Front Range Airport have a current width of 50 feet. Based on the FAA design requirements as described in FAA AC 150/5300-13A, an airport with taxiways based on TDG 2 (like FTG) have a minimum width requirement of 35 feet. Therefore, the Airport's current taxiway widths meet the minimum requirements for width throughout the planning period.

The existing widths of the Airport taxiways will meet the FAA's minimum width requirements throughout the planning period. No action is required.

Taxiway Lighting

Taxiways at Front Range Airport do not currently have any type of taxiway lighting or reflectors. This is considered to be a potential safety issue by the FAA since clearly defining pavement boundaries, particularly during inclement weather, is an important goal in preventing potential deviations by vehicles from the taxiway

environment. Therefore, the Airport should consider the installation of FAA-standard medium intensity taxiway lighting (MITL) systems for all of its taxiways.

MITLs at FTG

The Airport should install MITLs on all of its taxiways to promote safe operations, particularly during inclement weather.

Taxiway Capacity

As discussed above, Front Range Airport does not have a need to enhance its current overall airfield capacity through the addition of new taxiways within the 20-year planning period. However, there are two considerations that should be recognized. First, it was noted by representatives of the FTG Air Traffic Control Tower (ATCT) that FTG does experience occasional taxiway conflicts centered on Taxiway E. Specifically, during active periods of Runway 17/35 operations, aircraft flowing from the terminal area to the runway (and vice versa) must all utilize Taxiway E, which can only accommodate unidirectional travel. On the occasions when there are conflicting operations (i.e., an aircraft leaving the terminal area to depart on the runway, and another aircraft transitioning to the terminal area having landed on Runway 17/35), there can be a significant delay in that the ATCT would must either hold departing aircraft on Taxiway C or hold arriving aircraft on the East Apron. Additionally, during hours when the ATCT is closed, a situation could arise where two aircraft, heading in opposite directions, occupy Taxiway E at one time in conflict with one another. While it is understood that these conflicts are generally infrequent, they are likely to become more pronounced as activity at the Airport builds over time. Therefore, it is recommended that the Airport consider alternatives to eliminate these potential conflicts. Discussed in greater detail in the following chapter, the potential construction of an aircraft hold apron on the west side of Taxiway E large enough to allow an airplane to pull off the taxiway to allow for another aircraft to pass through would halve any delay time and provide a safe alternative for aircraft that find themselves facing opposite directions on Taxiway E. Alternatively, the potential construction of an end around taxiway (EAT) would accomplish similar results.

Second, as detailed in the 2004 FTG Airport Master Plan, there is a potential long-term need to construct a new, full-length parallel taxiway on the west side of Runway 17/35. Locating a taxiway on that side of the runway would significantly enhance the efficiency and safety of operations between the existing terminal area and Runway 17/35 by eliminating unnecessary crossings of the Runway 17 threshold to access the existing full-length parallel taxiway (Taxiway D). Additionally, this proposed configuration provides for an additional taxiway to alleviate the potential Taxiway E bottleneck described above. Therefore, the Airport should continue to show the existing taxiway system in its Future ALP, while also reflecting the enhanced system on its Ultimate ALP.

It is recommended that FTG resolve potential Taxiway E conflicts within the 20-year planning period. Additionally, the Airport should show an enhanced taxiway system on the Ultimate ALP to preserve for that potential development over the long term.

Other Taxiway Considerations

There are a variety of additional taxiway design requirements identified in FAA AC 150/5300-13A intended to enhance the overall safety of taxiway operations and

minimize opportunities for runway incursions. Note that many of these requirements are relatively new (circa 2012) and were not in effect when most of FTG's pavements were constructed or during the previous master planning effort in 2004. These newer design principles for taxiway system layouts are listed in **Table 4-9**.

TABLE 4-9 - FAA TAXIWAY DESIGN PRINCIPLES

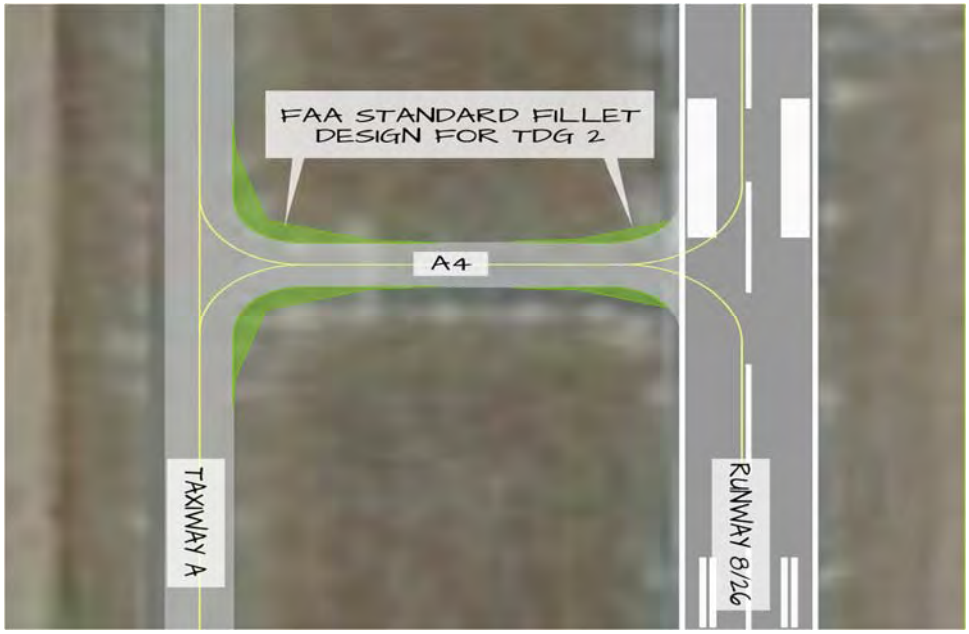
Design Principle	Summarized Definition
Steering Angle	– Design taxiways such that the nose gear steering angles is < 50 degrees
Fillet Design	– Traditional fillet design standards have been replaced – New fillet design more effectively reflects aircraft wheel tracks.
Standardize Intersection Angles	–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

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

Based on these newer taxiway design standards, the following recommendations are made for FTG's existing taxiway system:

- The updated taxiway fillet design should be incorporated into the future and ultimate ALP drawing set. The new fillet design should be instituted at the time of each taxiway's next major rehabilitation or reconstruction. (See example in **Figure 4-8**)
- Figure 4-8To prevent direct access from the Terminal Apron to Runway 8/26 via Taxiway A6 or Taxiway A7, the inner sections of those taxiways should be shifted. This would require a pilot leaving the apron area to make at least two intentional turns before accessing the runway, minimizing the potential for a runway incursion.
- To prevent direct access from the East Apron to Runway 17/35 via Taxiway D7, Taxiway D should be extended to the north to allow for a new access point to the apron. This would require a pilot leaving the apron area to make at least two intentional turns before accessing the runway, minimizing the potential for a runway incursion.

FIGURE 4-8 - TAXIWAY FILLET DESIGN STANDARDS



Source: Jviation

It is recommended that FTG eliminate the direct access from the Terminal Apron to Runway 8/26 by way of Taxiway A6, A7 as well as direct access from the East Apron to Runway 17/35 utilizing Taxiway D7. Additionally, it is recommended that the new taxiway fillet design standards be implemented on individual taxiways at the time of their next major rehabilitation or reconstruction.

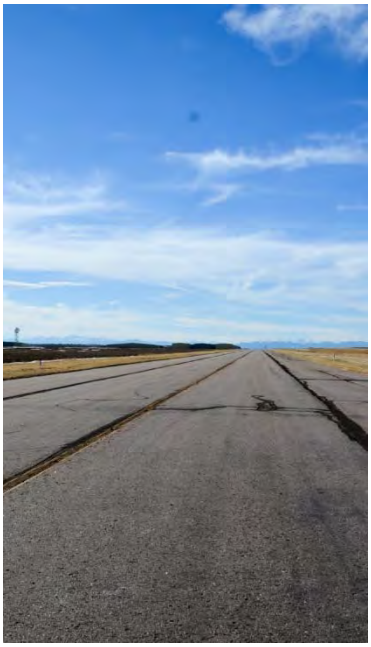
4.2.4 Airfield Pavement

Runway & Taxiway Pavement Strength

Airfields are constructed to provide adequate pavement strength for aircraft loads, as well as resisting the abrasive action of traffic and deterioration from adverse weather conditions and other influences. They are designed not only to withstand the loads of the heaviest aircraft expected to use the airport, but they must also be able to withstand the repetitive loadings of the entire range of aircraft expected to use the pavement over many years. Proper pavement strength design represents the most economical solution for long-term aviation needs.

There are several factors that must be considered when determining appropriate pavement strength for airfield structures. These factors include, but are not limited to, aircraft loads, frequency and concentration of operations, and the condition of subgrade soils. Runway pavement strength at airports is typically expressed by common aircraft landing gear configurations. Example aircraft for each type of gear configuration are as follows:

- Single-wheel: each landing gear unit has a single tire, example aircraft include light aircraft and some business jet aircraft.



Taxiway C at FTG

- Dual-wheel: each landing gear unit has two tires, example aircraft are the Boeing 737, Boeing 727, MD-80, CRJ 200, and the Dash 8.
- Dual-tandem: main landing gear unit has four tires arranged in the shape of a square, example aircraft are the Boeing 707 and KC135.

The aircraft gear type and configuration dictates how aircraft weight is distributed to the pavement and determines pavement response to loading. It should be noted that aircraft operating on a runway generally can exceed the defined pavement strength, but such operations will ultimately degrade the pavement prematurely and create wear issues that require more aggressive pavement maintenance. The published pavement strengths of the runways at FTG are presented in **Table 4-10**.

TABLE 4-10 - RUNWAY PAVEMENT STRENGTH

Runways	Published Pavement Strength	Surface & Condition	Representative Aircraft
Runway 8/26			
– Single Wheel Gear (S)	28,000 lbs	Asphalt	– Dassault Falcon 20
– Dual Wheel Gear (D)	40,000 lbs	Good	– Bombardier Challenger 604
Runway 17/35			
– Single Wheel Gear (S)	34,000 lbs	Asphalt	– Cessna Citation Excel
– Dual Wheel Gear (D)	75,000 lbs	Good	– Gulfstream G-IV

Source: Jviation; FAA 5010 Data; FAA Airport Facility Directory.

The dual-wheel configuration is appropriate for application on both runways. At present, both runways' pavement is in good condition and their current strength is sufficient to accommodate the critical aircraft (Bombardier Challenger CL604). Therefore, no modification to pavement strength is currently required to meet the projected fleet mix. However, it should be noted that anecdotal evidence related to Runway 17/35 has indicated that its current pavement strength rating is understated. Specifically, it is believed that at the time of its last rehabilitation (2004), Runway 17/35 was in fact constructed to sustain a heavier aircraft than presently indicated. While there is not a need for greater pavement strength based on the current and projected demand levels presented in **Chapter 3**, this is a potential asset for the Airport that should be investigated further. On multiple occasions in the past, Front Range Airport has been approached regarding the potential of accommodating a limited number of larger general aviation aircraft (e.g., Bombardier Global Express, Gulfstream G650, Boeing Business Jet, etc.). (Note that the number of potential operations of large general aviation aircraft is very limited and would not impact the critical design aircraft determination for FTG.) These inquiries have been turned away since FTG could not meet the published pavement strength requirements for these aircraft. Given that in its role as a general aviation reliever airport FTG ideally would be able to accommodate the full range of general aviation aircraft (including large aircraft), and that the primary physical barrier to meeting the requirements of larger general aviation aircraft has historically been insufficient runway pavement strength, and that it is possible that barrier does not actually exist at Front Range Airport, it is recommended that the actual pavement strength of Runway 17/35 be determined.

Taxiway pavement strength is also expressed in terms of aircraft weights associated with common aircraft landing gear configurations. Based on the findings of the *Front Range Airport Pavement Evaluation Study* (2009) as well as the fact that all taxiway

pavements on FTG (apart from Taxiway C) have been either reconstructed or rehabilitated since 2009, the taxiway pavement strengths at the Airport are considered to be sufficient to meet the needs of its existing and projected fleet mix. Additionally, it should also be acknowledged that if it were to be established that Runway 17/35 can accommodate heavier aircraft, in order to fully realize that capability for the Airport, strengthening of selected taxiway elements associated with the runway would likely be required. At a minimum, Taxiway D7, Taxiway D1, Taxiway D2, and that section of Taxiway D connecting D1 and D2 would all require an upgraded weight bearing capacity to avoid back-taxi operations on the runway.

The existing pavement strength of Runway 8/26, Runway 17/35 and the overall taxiway system is sufficient to accommodate the current and projected design aircraft; therefore, no pavement strengthening is required. However, it is recommended that the existing pavement strength for Runway 17/35 be determined.

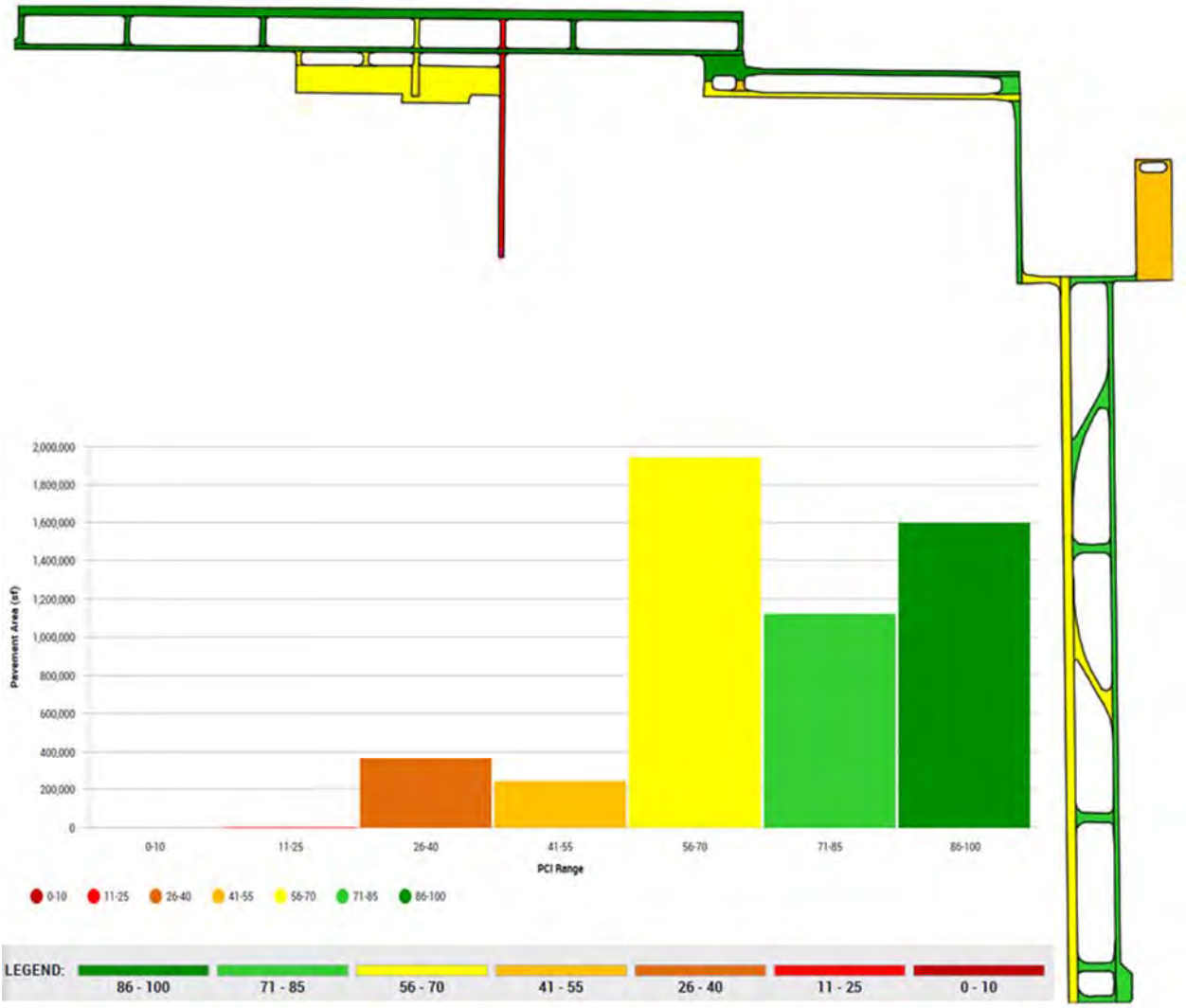
Runway & Taxiway Surface Condition

FAA AC 150/5380-6b, *Guidelines and Procedures for Maintenance of Airport Pavements*, recommends that detailed pavement inspections be conducted regularly to monitor conditions and establish an appropriate Pavement Condition Index (PCI) for each section. The 2014 CDOT Pavement Evaluation and Pavement Maintenance System Update, shown in **Routine maintenance*, such as joint and crack sealing, should be performed on a scheduled basis to extend the pavement life. Taxiway C should be programmed for rehabilitation no later than 2019. Rehabilitation of other airfield pavements should be identified in appropriate timeframes within the 20-year planning period.***

Figure 4-9 identifies the majority of taxiway and apron pavement on the airfield to be in “Good” to “Excellent” condition, based on CDOT’s PCI ratings. This is consistent with expectations since both runways and nearly all taxiways have been reconstructed or rehabilitated since 2009. The exception to this is Taxiway C, which was last rehabilitated in 1999 and is considered to be in "Fair" to "Poor" condition. Assuming the FAA 20-year life expectancy for pavement, this taxiway would be eligible for rehabilitation in 2019.

Routine maintenance, such as joint and crack sealing, should be performed on a scheduled basis to extend the pavement life. Taxiway C should be programmed for rehabilitation no later than 2019. Rehabilitation of other airfield pavements should be identified in appropriate timeframes within the 20-year planning period.

FIGURE 4-9 - EXISTING PAVEMENT CONDITION INDEX AND RANGE



Source: Colorado Department of Transportation Pavement Evaluations and Management 2017

4.2.5 Airfield Visual Aids

Airfield visual aids provide a variety of functions on an airport, including assisting aircraft in locating the airport, affording aircraft guidance to and alignment with a specific runway end, offering visual cues on surface weather conditions, providing direction for aircraft and vehicles operating on the ground, among other services. Generally, visual aids can be broken down into airfield markings, airfield signage, and airfield lighting.

Airfield Markings

According to FAA AC 150/5340-1L, *Standards for Airport Markings*, precision markings are required for runways with precision instrument approaches with vertical guidance lower than ¾-mile visibility minimums. As discussed in *Chapter Two*, FTG's Runway 17, Runway 35, and Runway 26 are currently all equipped with

instrument landing systems (ILS) and appropriately marked for precision approaches. While Runway 8 currently only has a visual approach, it too has the more extensive precision approach markings that include the runway designator, centerline, threshold markings, aiming point, touchdown zone, and edge markings.

All taxiways are marked with yellow centerline striping; and runway hold positions are appropriately marked with an enhanced yellow centerline to meet the new airport marking standards as required. However, the new TDG 2 taxiway pavement design standards in FAA AC 150/5300-13A should be evaluated against the existing taxiway connectors to ensure compliance prior to the next pavement maintenance projects for individual taxiways.

FTG's airfield markings are currently in compliance with FAA design standards; no action is required. During upcoming taxiway rehabilitation projects, it is recommended that the standards for TDG 2 be reviewed.

Taxiway Sign at FTG

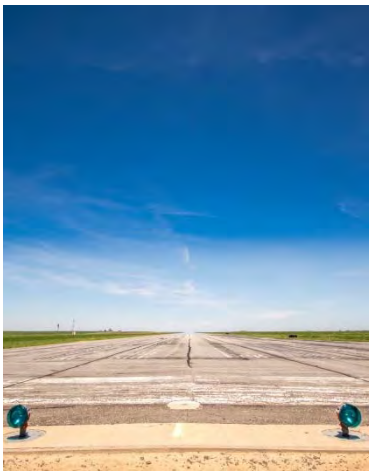
Airfield Signage

Airfield signage provides essential guidance information that is used to identify items and locations on an airport. FTG is currently equipped with standard FAA required signage including instruction, location, direction, destination, and information signs, and meet the standards given in FAA AC 150/5340-18F, *Standards for Airport Sign Systems.*

FTG's existing airfield signage meets FAA standards and is in excellent condition; no action is required.

Airfield Lighting

Airfield lighting provides enhanced situational awareness to those operating on or around an airport, particularly during times of reduced visibility (i.e., nighttime, inclement weather, etc.). For example, to land during periods of limited visibility, pilots must be able to see the runway or associated lighting at a certain distance from and height above the runway. If the runway environment cannot be identified at the minimum visibility point on the approach, FAA regulations do not authorize pilots to land.



Runway Edge Lights at FTG

Table 4-11 shows the current airfield lighting available at FTG. In addition to this lighting equipment, the Airport is also equipped with a rotating beacon and two lighted windsocks. It is recommended that FTG continue to maintain its current light infrastructure. Additionally, it is recommended that the Airport pursue the installation of medium intensity taxiway lighting (MITLs) on Taxiway A, Taxiway, B, Taxiway C, and Taxiway E, as well as on their associated connector taxiways. Note that this would be consistent with FAA AC 150/5340-30D, *Design and Installation Details for Airport Visual Aids*, which recommends the installation of MITLs on taxiways and aprons at airports where runway lighting systems are installed.

TABLE 4-11 - AIRFIELD LIGHTING

Facility	Type of Approach	Edge Marking	Runway Approach Lighting	Visual Glide Slope Indicator (VGSI)	Lighting Owner
Runway 8	Visual	HIRL	REILs	PAPI	FTG (all)
Runway 26	Precision	HIRL	MALSR	PAPI	FTG (all)
Runway 17	Precision	MIRL	REILs	PAPI	FTG (all)
Runway 35	Precision	MIRL	MALSR	PAPI	FTG (all)
Taxiways A, B, C, E	-	None*	-	-	-
Taxiway D		MITL			

Source: Jviation; FAA 5010 Data; FAA Airport Facility Directory.
Notes:
HIRL: High Intensity Runway Lighting; MIRL: Medium Intensity Runway Lighting; REIL: Runway End Identifier Lights; MALSR: Medium Intensity Approach Lighting System w/ Runway Alignment Indicator Lights; PAPI: Precision Approach Path Indicator; MITL: Medium Intensity Taxiway Lighting
* Taxiways are equipped with blue and white reflectors

It is recommended that FTG install taxiway lighting systems on Taxiway A (including Taxiways A3-A9), Taxiway B, Taxiway C (including Taxiways C1-C2), and Taxiway E (including Taxiway E7).

4.2.6 Navigational Aids (NAVAIDs)

Glideslope Antenna at FTG

Navigational aids (NAVAIDs) consist of equipment to aid pilots in locating an airport (particularly for those airports without Air Traffic Control assistance during approach), provide horizontal guidance information for a non-precision approach, and provide horizontal and vertical guidance information for a precision instrument approach. Approach minimums for such procedures are based upon several factors, including aircraft characteristics, obstacles, navigation equipment, approach lighting, and weather reporting equipment. A summary of the existing visual and navigational aids and their conditions are shown in **Table 4-12.**

TABLE 4-12 - NAVAIDS AND VISUAL AID CONDITION

NAVAIDs and Visual Aids	Condition
Area Navigation (RNAV)/Global Positioning System (GPS) – Runways 17, 26, and 35	Good*
Instrument Landing System (ILS)/Distance Measuring Equipment (DME) and Localizer (LOC) – Runway 17, 26 and 35	Good*
Non-Directional Beacon (NDB) – Runway 26	Good*
High Intensity Runway Lights (HIRL) – Runway 8/26	Good
Medium Intensity Runway Lights (MIRL) – Runway 17/35	New
Runway End Identifier Lights (REIL) – Runway 8, Runway 17	New
Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR) – Runway 26, Runway 35	Good
Precision Approach Path Indicators (PAPI) – Runway 8/26, Runway 17/35	New
Precision Runway Markings – Runway 8/26, Runway 17/35	Painted Bi-Annually
Medium Intensity Taxiway Lights (MITLs) - Taxiway B	Good
Airport Rotating Beacon	Good

NAVAIDs and Visual Aids	Condition
Runway & Taxiway Guidance Signs	Good
Automated Weather Observation System (AWOS)-3 & Automatic Terminal Information Service (ATIS) Frequency 119.025	Fair

*Owned, installed and maintained by the FAA

As discussed in **Chapter 2, Inventory**, FTG has seven published instrument approach procedures that are designed to provide pilots with varying degrees of navigational guidance at the Airport during inclement weather (i.e., when operating under instrument flight rules [IFR]). These procedures and their respective minimums are shown in **Table 4-13**. Note that of those seven, the Airport has three Category I ILS Precision Approaches installed on Runway 17, Runway 35, and Runway 26, all of which are owned and maintained by the FAA. Since Runway 8 has no instrument approaches, it is considered to be a visual runway. It should be acknowledged the lack of instrument approaches on Runway 8 is not because of any physical constraint or limitation, it is to minimize potential conflicts between aircraft landing on Runway 8 at FTG and aircraft operating on the north/south runways at Denver International Airport, located to the northwest of FTG.

TABLE 4-13 - INSTRUMENT PROCEDURE MINIMA

Instrument Approaches	Lowest Minimums (AGL and visibility)	Visual Aids
Runway 17 ILS	200 ft 3/4 sm	MIRL; REILs; PAPI
Runway 17 LPV (GPS)	200 ft 3/4 sm	MIRL; REILs; PAPI
Runway 26 ILS	200 ft 1/2 sm	HIRL; MALSR; PAPI
Runway 26 LPV (GPS)	200 ft 1/2 sm	HIRL; MALSR; PAPI
Runway 26 NDB MDA	555 ft 3/4 sm	HIRL; MALSR; PAPI
Runway 35 ILS	200 ft 1/2 sm	MIRL; MALSR; PAPI
Runway 35 LPV (GPS)	200 ft 1/2 sm	MIRL; MALSR; PAPI
Runway 8 Visual	3 miles	HIRL; REILs; PAPI

Source: Jviation, Airnav.com, FAA Instrument Approach Charts.
Notes:
HIRL: High Intensity Runway Lighting; MIRL: Medium Intensity Runway Lighting; REIL: Runway End Identifier Lights; MALSR: Medium Intensity Approach Lighting System w/ Runway Alignment Indicator Lights; PAPI: Precision Approach Path Indicator

FTG's existing NAVAIDs are adequate to meet the needs of the Airport throughout the planning period; no action is required.

4.2.7 Obstructions and Airspace Requirements

In addition to the primary airport infrastructure on the ground, the FAA also requires airports to consider airspace infrastructure that surrounds the airport. Specifically, through various federal regulatory resources such as Title 14, Code of Federal Regulations (CFR) Part 77, *Safe, Efficient Use, and Preservation of the Navigable Airspace*, FAA AC 150/5300-13A, *Airport Design*, and FAA Order 8260.3B, *U.S. Standard for Terminal Instrument procedures (TERPS)*, the FAA defines and establishes the standards for determining obstructions that affect airspace near an airport. These standards apply to the use of navigable airspace by aircraft and to

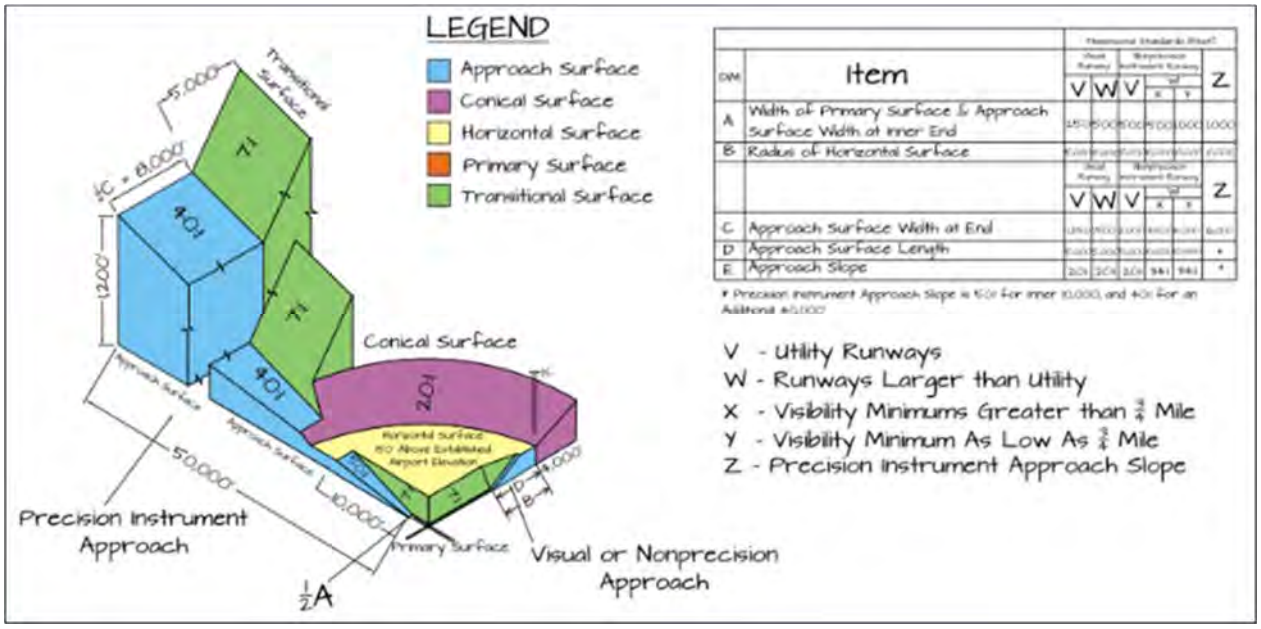
existing or planned air navigation facilities (airports). This is enforced primarily through the definition of imaginary airspace surfaces that are sized based on the criteria they are designed to protect. Specifically, imaginary airspace surfaces are geometric shapes the size and dimensions of which are based on the category of each runway for existing and planned airport operations, the types of instrument approaches, and their enabling regulatory document. A penetration to these surfaces is considered to be an "obstruction," which can be an existing or proposed manmade object, object of natural growth, or terrain. Note that the FAA grant assurances signed by FTG require that the imaginary surfaces be cleared of all obstructions, to the extent feasible.

Any changes to the airfield must reviewed by the FAA to ensure the appropriate obstacle clearance necessary to maintain safe airport operations. Prior to any airport development, the Airport or the development sponsor must request the FAA to conduct an airspace evaluation to determine the potential impact that a project may have on airport safety, regardless of scale. Part of the airspace evaluation involves the determination of the impact of proposed development on an airport's imaginary airspace surfaces. For the purposes of the Master Plan, there are three primary regulatory documents (and their associated airspace surfaces) to be considered:

- 14 CFR Part 77 defines five imaginary surfaces as shown in **Figure 4-10**, including the Primary, Approach, Horizontal, Conical, and Transitional surfaces. Any object which penetrates these surfaces is considered to be an obstruction and may affect navigable airspace. Unless these obstructions undergo additional aeronautical study to conclude they are not a hazard, obstructions are presumed to be a hazard to air navigation.[1] Hazards to air navigation may include terrain, trees, permanent or temporary construction equipment, or permanent or temporary manmade structures (such as power lines) penetrating one of the 14 CFR Part 77 imaginary surfaces.
- FAA AC 150/5300-13A defines approach airspace surfaces that are separate from 14 CFR Part 77, and are designed to protect the use of the runway in both visual and instrument meteorological conditions near the airport. These approach surfaces are defined by each runway's current approach type (i.e., visual, non-precision instrument, etc.), and typically are trapezoidal in shape, extending away from the runway along the centerline and at a specific slope. To establish the location of a runway threshold, the associated approach surface must be clear of all obstructions. If it is not clear, either the obstructions must be removed, or the runway threshold must be relocated until its associated approach surface is clear.
- TERPS generally defines a wide variety of airspace surfaces that are designed to establish and maintain safe operational conditions around an airport for aircraft that are utilizing a defined instrument approach. Obstructions to a TERPS surface can result in operational impacts to the instrument approach that could include a raising of minimums, making the approach unavailable in certain conditions, or decommissioning the instrument approach altogether.

[1] Title 14, Code of Federal Regulations Part 77, *Safe, Efficient Use, and Preservation of the Navigable Airspace*

FIGURE 4-10 - 14 CFR PART 77 IMAGINARY SURFACES



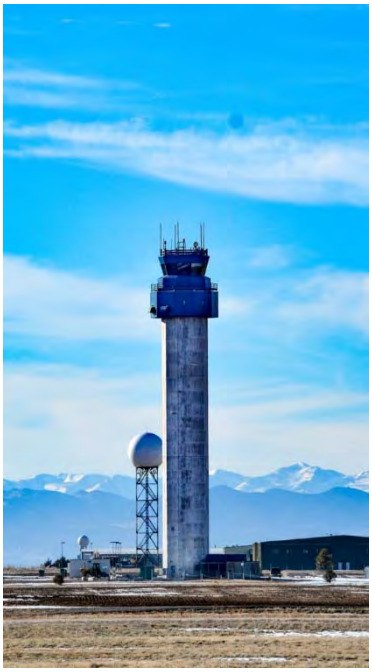
Source: FAA 14 CFR Part 77, *Safe, Efficient Use, and Preservation of the Navigable Airspace*.

An obstruction survey will be completed as part of this Master Plan. Results of the obstruction survey will be submitted to the National Geodetic Survey (NGS) for review. Obstructions will be identified and included in the ALP set once finalized.

4.2.8 Airspace Class and Air Traffic Control

The airspace that surrounds an airport is classified per the activity level of the facility and the presence of an air traffic control tower. FTG is currently in Class D airspace, which is airspace that surrounds an airport with an operating air traffic control tower. Because of its proximity to Denver International Airport (DEN), when Front Range Airport's ATCT is closed, it is subject to the requirements of DEN's Class B airspace.

FTG's current airspace classification is consistent with existing and future activity levels; no action is required.

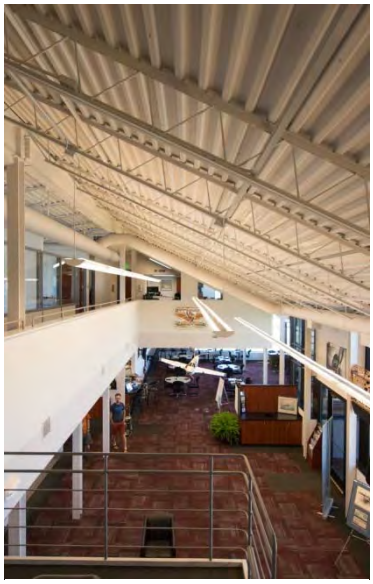


ATCT at FTG

4.3 Landside Facility Requirements

This section describes the landside facility requirements needed to accommodate FTG's general aviation activity throughout the planning period. Areas of particular focus include the terminal building, hangars, aprons and tie-down areas, automobile parking, access, as well as the various associated support facilities

4.3.1 Terminal Building



Terminal Building at FTG (interior)

The Front Range Airport Terminal Building is a 9,500-square-foot facility with two levels that accommodates a variety of functions for the Airport. Current activities in the terminal include airport administrative offices, a restaurant, and the Airport's only Fixed Base Operator (FBO), which itself includes operational areas, a customer service counter, conference rooms, a pilot lounge, a flight planning room, bathrooms, etc. In 2011, the terminal building underwent a major renovation and is in excellent condition. Based on discussions with airport management as well as an analysis utilizing standard terminal building programming criteria, the terminal building has been deemed to be adequate in size to meet existing and future demand throughout the planning period. The only recommendation is for the Airport to continue to maintain the facility appropriately.

FTG's current terminal building is adequate to meet existing and future activity levels; no action is required other than regular maintenance.

4.3.2 Aircraft Hangar Requirements

Hangar Buildings at FTG

Utilization of hangar space at airports varies as a function of local climate, security, and owner preferences. The trend in general aviation aircraft (single or multi-engine) is toward newer, more sophisticated and consequently, more expensive aircraft. Therefore, most aircraft owners reasonably prefer an enclosed hangar space to locating their aircraft outside on tie-downs. This is particularly true in states like Colorado, where harsh, cold-weather climates can degrade or damage aircraft stored outside. This trend has led to a general increase in demand for hangars and a reduction in demand for apron tie-down space.

Based aircraft are routinely stored at airports in a variety of hangar types. The type of hangars needed is usually determined by aircraft size, the type of aircraft owner (business or leisure), and the region of the country. Following are the types of hangars currently at or anticipated to be constructed at FTG:

- T-hangars: T-hangars are a series of interconnected (forming a single large structure) aircraft hangars with footprints in the shape of a "T" that can store one single- or multi-aircraft in each individual unit. At FTG, there are 12 T-hangar buildings (approximately 191,600 square feet) that have a total of 148 individual hangar units. According to Airport administration, there is currently a waiting list for T-hangars comprised of many aircraft owners currently based on an Airport and using tie-downs.
- Box Hangars: This hangar type generally includes individual, unattached, clear-span hangar units that are typically designed to accommodate one or two smaller aircraft. These can be attached as part of single building, or as standalone units. There are currently 21 structures of box hangars on the

Airport with 156 individual units for a total of approximately 439,300 square feet.

- Corporate Hangars: This classification typically includes larger, clear-span hangars used solely for storing aircraft and/or housing a variety of businesses that are located on the airport. These typically have an attached office and are used by one tenant only. These hangars can house just one or more corporate aircraft (i.e. turboprops and jets), depending on the owner's needs. FTG currently has nine such hangars ranging in size from 8,000 square feet to 34,000 square feet, for a total of approximately 160,000 square feet.

The demand for aircraft storage hangars is largely dependent upon the number and type of aircraft expected to be based at the airport in the future. For planning purposes, it is necessary to estimate hangar requirements based upon forecasted operational activity. Note that it is assumed that larger, higher value based aircraft are more likely to be stored in a hangar, as well as 100% of the based multi-engine aircraft fleet. Additionally, it is assumed that 100% of larger, higher value itinerant aircraft would prefer to be in a hangar. Based on those assumptions, the hangar space requirements by aircraft type can be found below in **Table 4-14**. (Refer to **Figure 2-11** and **Table 2-11** for hangar inventory and building layout.)

Hangar Buildings at FTG

Based on the analysis below, FTG's current hangar infrastructure requires a mixture of additional T-hangars and corporate itinerant hangars throughout the planning period. It is important to note, however, that hangar development is subject to the specific requirements of the users, meaning that even if an airport has capacity in its hangar inventory, it may not meet the particular needs of a given user. This is especially true for large box hangar and corporate tenants and it is for this reason that FTG should continue to preserve its hangar development concepts to maintain the potential for future customized development.

It is recommended that FTG plan for future T-hangar and corporate hangar development to accommodate immediate needs in addition to preserving potential hangar development modules for long-term development.

TABLE 4-14 - AIRCRAFT HANGAR REQUIREMENTS

	2017	2022	2027	2032	2037
Based Aircraft Demand					
– Single Engine	323	336	362	369	397
– Multi-Engine	36	36	38	41	44
– Jet/Turbine	5	12	13	23	25
– Helicopter	5	12	13	23	25
– Other (military / ultralight)	0	0	0	0	0
Total	369	396	426	456	491
T-Hangars / Small Box Hangars					
– Single Engine / Other (90%) (1,400 sf)	452,000	470,000	506,000	516,000	556,000
– Multi-Engine (90%) (1,600 sf)	75,000	75,000	81,000	87,000	93,000
– Jet / Turbine (0%)	0	0	0	0	0
– Helicopter (0%)	0	0	0	0	0
– Total T-Hangar Demand (aircraft)	235	243	262	269	289
– Total T-Hangar Demand (SF)	527,000	545,000	587,000	603,000	649,000
– Total Existing T-Hangar (SF)	324,864	324,864	324,864	324,864	324,864
Surplus/(Deficiency) (SF)	(202,136)	(220,136)	(262,136)	(278,136)	(324,136)
Large Box / Corporate Hangars					
– Single Engine / Other (5%) (1,400 sf)	194,000	202,000	218,000	222,000	238,000
– Multi-Engine (5%) (1,600 sf)	33,000	33,000	33,000	36,000	39,000
– Jet /Turbine (100%) (6,400 sf)	60,000	144,000	156,000	276,000	300,000
– Helicopter (100%) (2,000 sf)	10,000	24,000	26,000	46,000	50,000
– Total Demand (aircraft)	134	153	164	187	202
– Total Demand Aircraft (SF)	297,000	403,000	433,000	580,000	627,000
– Existing Hangars (SF)	465,974	465,974	465,974	465,974	465,974
Surplus/(Deficiency) (SF)	168,974	62,974	32,97	(114,026)	(161,026)
Itinerant Aircraft Demand					
– Total Demand (aircraft)	2	3	4	5	6
– Total Demand (SF)	24,000	36,000	48,000	60,000	72,000
– Existing Hangars (SF)	0	0	0	0	0
Surplus/(Deficiency) (SF)	(24,000)	(36,000)	(48,000)	(60,000)	(72,000)
Total Demand (SF)	848,000	984,000	1,068,000	1,243,000	1,348,000
Total Existing Hangars (SF)	790,838	790,838	790,838	790,838	790,838
SURPLUS/(DEFICIENCY) (SF)	(57,162)	(193,162)	(277,162)	(452,162)	(557,162)

Source: Jviation

4.3.3 Aircraft Parking Aprons

Aprons are considered premium airport space and should be strategically utilized to maximize their operational efficiency and benefit for the airport. Apron layout design should account for the location of airport terminal building, FBO facilities, and other aviation-related access facilities, as well as to provide parking for based and transient airplanes, access to the terminal facilities, fueling, and surface transportation. Apron spatial requirements for FTG were based on criteria provided in FAA AC 150/5300-13A, *Airport Design*. For planning purposes, apron area requirements focused exclusively on the Terminal Apron, where nearly all aircraft apron operations currently occur (note that the East Apron has an additional 505,000 square feet of pavement). Additionally, the apron area requirements were separated for based versus transient aircraft, and general aircraft size assumptions were made. The aircraft apron parking requirements for based and transient aircraft are presented in **Table 4-15**. (It should be noted that the apron area located west of the extended Taxiway A6 is considered to be the based aircraft apron, while the area east is designated as apron for transient aircraft operations.)

Terminal Apron at FTG

TABLE 4-15 - APRON PARKING REQUIREMENTS

	2017	2022	2027	2032	2037
Based Aircraft					
– Projected Apron Demand (SF)	50,056	52,647	55,310	61,000	63,773
– Current Apron Availability (SF)	382,500	382,500	382,500	382,500	382,500
Surplus/(Deficiency) (SF)	332,444	329,853	327,190	321,500	318,727
Transient Aircraft					
– Projected Apron Demand (SF)	113,960	117,782	126,195	147,662	156,348
– Current Apron Availability (SF)	391,250	391,250	391,250	391,250	391,250
Surplus/(Deficiency) (SF)	277,290	273,468	265,055	243,588	234,902

Source: Jviation

As shown in **Table 4-15**, FTG has a surplus of apron space for both based and transient aircraft. For based aircraft, this is consistent with the general industry trend to move aircraft off apron tie-downs and into hangars, protecting them from inclement weather. For transient aircraft, the results reflect an increasing amount of larger aircraft activity at FTG over the planning period. While that activity will not result in the need for additional apron space, it is recommended that the current transient apron layout and configuration (which was originally designed for based aircraft) be reassessed for transient aircraft use to maximize efficiency and convenience for transient users. Additionally, it should be noted that there are paved areas within the Airport's aprons and in particular those areas associated with the existing hangar development areas in need of maintenance and repair (**Routine maintenance*, such as joint and crack sealing, should be performed on a scheduled basis to extend the pavement life. Taxiway C should be programmed for rehabilitation no later than 2019. Rehabilitation of other airfield pavements should be identified in appropriate timeframes within the 20-year planning period.***

Figure 4-9).

FTG's current apron area is sufficient to meet for current and forecasted demand for based and transient aircraft. It is recommended that the transient apron layout be reassessed to ensure that it is configured in an appropriate manner for efficient transient use over the long term. It is also recommended that existing pavement conditions be assessed, repaired and maintained as required.

4.3.4 Landside Access and Parking Requirements

Regional Transportation Network

Regional roadway access to FTG provided by Interstate 70, E-470, East Colfax Avenue, Imboden Road, Manilla Road, and East 48th Avenue is adequate to accommodate the existing and projected need within the 20-year planning period.

FTG's existing regional roadway network is sufficient to meet the Airport's access needs throughout the planning period; no action is required.

On-Airport Circulation Roadways

Ground access to the terminal building is provided by Front Range Parkway, leading to the parking areas and hangar access, and provides curb front access and general circulation. Front Range Parkway is in good condition. There are multiple on-airport vehicle service roadways that provide access to the existing hangar facilities, as well as to the East Apron and ARFF/SRE areas on the east side of the airfield. They generally range in condition from good to fair, and appear to be adequate to meet Airport demand over the planning period.

FTG's existing on-airport roadways should be subject to regular maintenance to prolong their life expectancy; no other action is required.

Auto Parking

FTG currently has five paved auto parking lots, totaling approximately 280 public parking spots. The largest parking lot abuts the terminal building, which itself is capable of accommodating over 60 vehicles in paved, marked spots, in addition to a turf area estimated to be able to accommodate an additional 35 vehicles. For planning purposes, forecasted enplanements are utilized to determine auto parking space requirements for passengers, rental cars, and airport employee parking. (Note that restaurant parking requirements are a function of local business conditions and are not factored into this analysis.)

TABLE 4-16 - AUTO PARKING DEMAND

	2017	2022	2027	2032	2037
Forecasted GA Enplanements	24,831	26,120	28,432	30,983	34,141
Parking Spaces Requirement	61	66	72	78	86
Existing Terminal Area Parking	95	95	95	95	95
Surplus/(Deficiency)	34	29	23	17	9

Source: Jviation, FAA ATADS 2017

Based on this analysis, aviation-related auto parking at FTG is currently considered to be adequate for meeting existing and future demand levels.

FTG's existing on-auto parking areas are adequate to meet demand levels throughout the planning period. Other than regular maintenance, no additional action is required.

4.4 Airport Support Facilities

4.4.1 Airport Security

Airport security is essential to the safe operation of any airport. FTG should maintain a level of security that is commensurate with federal requirements and the industry's current best practices for a general aviation reliever airport. Regarding federal requirements, since FTG does not have an air carrier or a commercial operator with a security program, the Airport does not fall under 49 CFR 1544 or 1546, meaning that it is not under the direct regulatory authority of the Transportation Security Administration (TSA). However, the TSA has previously released guidance documents designed to establish non-regulatory best practices for general aviation airport security. This guidance from TSA, combined with direction from other aviation-related organizations (i.e., state aeronautics agencies, AOPA, NBAA, AAAE, ACRP, etc.), loosely comprise the general aviation industry's best management practices for security. (It should be noted that General Aviation Subgroup of the TSA Aviation Security Advisory Committee (ASAC) is currently in the process of providing updated recommendations to the TSA guidance.) In general, appropriate security measures should include the following:

- Controlling movement on the Airport: including the movement of persons, aircraft and ground vehicles on airport property by installing airport user signs, aircraft guidance signs, airfield lights and markers, and pavement markings, as appropriate.
- Preventing theft and illegal operation of aircraft: including airport lighting and promotion of aircraft owner anti-theft measures.
- Preventing unauthorized access: including unauthorized access of persons and ground vehicles into unauthorized areas on airport property. This entails, among other things, preventing unauthorized access into the Airport/Air Operations Area (AOA), moving between areas within the AOA, and separating / segregating persons and ground vehicles from aircraft, fueling facilities and other areas of concern within the AOA.

Additionally, the Transportation Security Administration's (TSA) Security Guidelines for General Aviation Airports publication states that an appropriate security boundary design is a function not only of its effectiveness in preventing unauthorized access, but also of the cost of equipment, installation, and maintenance. A scoring system developed by TSA and included in the document rates FTG in the "high" security category, which suggests security recommendations that include security fencing, closed circuit television (CCTV), intrusion detection system, access controls, lighting system, personnel ID systems, vehicle ID systems, challenge procedures, LEO support, the establishment of a security committee, transient plot sign-in/out

procedures, signs, documented security procedures, all aircraft secured, positive passenger/cargo/baggage ID, community watch program, and a contact list.

Based on these considerations, the following recommendations are made for FTG to deter unauthorized access to restricted airport areas and improve safety.

- Perimeter security fencing and access control: FTG does not currently have any perimeter security fencing. Fencing is an important airport attribute designed to increase not only airport security, but also airport safety in that it aids in the prevention of wildlife intrusions. The 2011 Colorado Aviation System Plan recognized FTG for its lack of security fencing, considering the Airport to be a "medium" risk. Additionally, the plan recommended an access control system, as well as a personnel and vehicle identification system. (Note that a service/perimeter road should be constructed in association with a new security fence to help maintain/inspect the fence and enhance security.
- Enhanced surveillance: Selected areas of the Airport should be monitored by video or camera surveillance. Cameras or systems with improved capabilities are recommended in sensitive areas and can be connected to airport administration/operations as well as local law enforcement.
- Area lighting: Improved lighting in the terminal area such as terminal vehicle parking lot and transient aircraft parking apron area to enhance safety and security should be considered.
- Security Checks: Regular airport staff patrols along the Airport perimeter are recommended to conduct maintenance operations and security inspections.

It is recommended that FTG consider airport security enhancements that include the installation of fencing and access controls, as well as that potential installation enhanced surveillance equipment, area lighting, etc.

4.4.2 Fuel Storage Requirements

Self-Serve Avgas at FTG

As a major revenue source for the maintenance and operation of the Airport, aviation fuel sales have significant financial impact for the Airport in addition to benefiting its users. FTG has one 10,000-gallon Avgas aboveground storage tank (AST) located west of the terminal building, and three underground fuel storage tanks (UST) located at the fuel farm: one 20,000-gallon Avgas fuel tank, and two 15,000-gallon Jet-A storage tanks. There is also a 1,000-gallon Mogas AST located at the fuel farm. Additionally, the Airport has mobile fueling trucks including a 1,000-gallon Avgas truck, a 500-gallon Avgas truck, and a 2,000-gallon Jet-A truck. All storage tanks and fuel trucks are owned Adams County and operated by airport personnel through the Airport FBO.

As with similar airports, fuel storage requirements are typically based upon maintaining a two- or three-week supply of fuel during an average month. The availability for more frequent deliveries can reduce the fuel storage capacity requirement. Storage beyond a four-week period is not recommended as it could degrade the quality of fuel. Because an increasing percentage of future aircraft utilizing the Airport will require Jet-A fuel, future fuel storage requirements may consider increasing Jet-A fuel requirements.

As shown in **Table 4-17**, FTG's existing fuel storage provides an adequate level of service for existing and future operations for the 20-year planning period. Existing storage capacity also is adequate to account for any potential limited disruption in fuel delivery services. It should also be noted that underground storage tanks are generally being replaced by aboveground tanks for a variety of reasons including cost, environmental considerations, risk management, etc. As it continues to monitor the condition of its fuel tanks, FTG should consider aboveground tanks as a potential ultimate condition.

TABLE 4-17 - FUEL TANK STORAGE REQUIREMENTS

	2017	2022	2027	2032	2037
Average day peak month departures	167	175	193	212	233
Avgas					
– Storage Requirement (gal)	17,215	17,652	19,031	20,436	22,548
– Existing Storage Capacity (gal)	30,000	30,000	30,000	30,000	30,000
Surplus/(Deficiency)	12,785	12,348	10,969	9,564	7,452
Jet-A					
– Storage Requirement (gal)	18,321	20,274	23,273	26,843	29,430
– Existing Storage Capacity (gal)	30,000	30,000	30,000	30,000	30,000
Surplus/(Deficiency)	11,679	9,726	6,727	3,157	570

Source: Jviation.

FTG's fuel tanks provide adequate capacity to accommodate both existing and projected demand. It is recommended that the Airport appropriately maintain its existing fuel tanks and prepare for a potential expansion of its Jet-A capacity over the long term.

4.4.3 Deicing Facilities

All FTG deicing fluids are stored securely in the FBO hangar, and according to Airport Administration, the FBO uses less than 20 gallons of deicing fluid annually. At this level, the Airport is not required to control the deicing fluid discharge through a glycol recovery and containment system. However, FTG should continue to monitor its deicing activities to ensure compliance with US EPA standards. Based on the demand forecast over the 20-year planning period, glycol containment or collection is not required for FTG.

FTG's current deicing operations comply with US EPA requirements; no action is required.

4.4.4 Aircraft Rescue and Firefighting (ARFF) Station/Snow Removal Equipment (SRE)/Maintenance Facilities

FTG has two buildings located on the East Ramp that accommodate the Airport's ARFF and SRE operational needs. The larger of the two buildings was constructed in 1993 and is approximately 11,000 square feet. This facility contains storage for ARFF and SRE vehicles and associated equipment, as well as offices, general storage, a kitchen, and a training area. Located immediately to the east, the second building is

approximately 6,400 square feet and was constructed in 2012. It also houses SRE and maintenance equipment.

SRE Storage Facilities at FTG

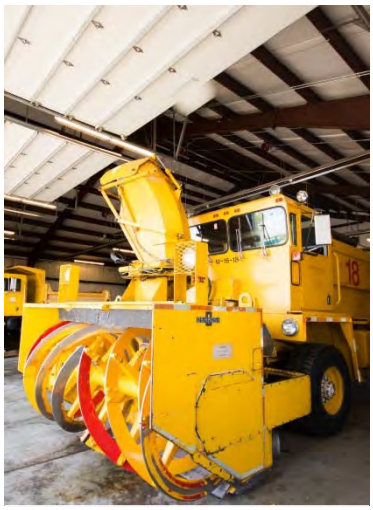
Airport Administration has reported that the combined space of the two buildings is insufficient to keep all its equipment under cover. FAA AC 150/5220-18A, *Buildings for Storage and Maintenance of Airport Snow and Ice Control Equipment and Materials*, requires that SRE storage space be allocated to accommodate storage areas, support areas, and special equipment areas. To minimize the deterioration of that equipment that must still be stored outside, the Airport wants to consider the construction of an additional storage structure to protect the equipment from the elements. Airport staff has indicated, an additional storage space of 80-feet by 80-feet (6,400 square feet) would be adequate to accommodate the Airport's long-term SRE storage needs.

It is also important to note that the existing buildings are not optimally located to provide the most immediate and efficient response to relevant events. Ideally, emergency vehicles stored in the buildings would have immediate taxiway (if not runway) access and would not have to cross a runway unless it they were operating on it. In terms of very long-term planning, the Airport should consider an ultimate location to accommodate these operations that maximize their efficiency and safety. Any recommendations associated with this should be reflected on the Ultimate Airport Layout Plan.

It is recommended that an additional 6,400 square feet of storage be constructed to accommodate existing and future SRE vehicles and equipment within the 20-year planning period. Additionally, the Airport should consider an ultimate location for its ARFF and SRE operational areas.

4.4.5 Airport Equipment

Aircraft Rescue and Firefighting Equipment



Snow Blower at FTG

FTG's existing ARFF vehicles meet ARFF Index B[2] requirements and are considered to be in fair to good condition. These vehicles are stored under cover in a maintenance bay with most of the SRE and other maintenance vehicles. Additionally, FTG ARFF requirements are supported by a mutual governmental agreement with the Bennet Fire Department (BFD) which has donated previously used firefighting equipment to the Airport.

No additional or replacement ARFF equipment is recommended for this planning period.

Snow Removal Equipment and Maintenance Equipment

FTG's current SRE and airfield maintenance equipment (listed previously in *Chapter Two*) is currently adequate to meet the requirements of FAA AC 150/5200-30C, *Airport Winter Safety and Operations*. However, it should be noted that FAA Order

[2] Although not certificated under 14 CFR Part 139, *Certification of Airports*, FTG voluntarily provides ARFF equipment and extinguishing agent equivalent to Part 139 Index B requirements (see Part 139.317, *Aircraft rescue and firefighting: Equipment and agents*).

5100.38D, *Airport Improvement Program Handbook (AIP)*, specifies that the useful life for equipment to be 10 years. In considering the eligibility for replacing equipment, it must be designed and justified based on both FAA AC 150/5200-30, and AC 150/5220-20, *Airport Snow and Ice Control Equipment*.[3] Maintenance vehicles for safety area mowing and wildlife management consist of the 2014 John Deere 5085E tractor (condition new), the 2009 New Holland TV 6070 tractor (condition good), the 1992 Bush Hog mower deck (condition poor), the 1991 Rhino mower deck (poor), and the 2009 Schulte mower deck (poor). It is recommended that the airport maintenance vehicles be replaced during the 20-year planning period.

The two 1993 Oshkosh P-Series trucks, two 1996 Stewart Stevenson Brooms, and 2001 Case 821 C Loader are recommended to be replaced within the 20-year planning period and are currently in the Airport's Capital Improvement Program. The vehicles that will need to be replaced, based on the replacement schedule include the; 1993 and 1994 International Paystar brooms, the 1993 International plow trucks, the 1983 and 1987 Oshkosh blowers and the 2003 Oshkosh broom during the 20-year planning period.

Ground Support Equipment (GSE)

Ground support equipment at FTG is provided by the Airport's FBO, which is owned by Adams County. GSE can include aircraft tugs, deicers, ground power units, lavatory carts, potable water carts, baggage carts, belt loaders, air stairs, and other service vehicles. The Airport's existing GSE is stored in a storage bay on the east side of the terminal building. Note that the amount of GSE required at an airport is generally determined by the demand of individual operators. GSE at the Airport is projected to be adequate to meet the demand of existing and future operations. Existing parking for GSE is also adequate for existing operations. FTG will need to continue to maintain or replace its equipment as required.

GSE equipment storage is adequate for current and future demand during the 20-year planning period.

4.4.6 Utilities

All utility lines serving the Airport are buried underground and provide service to the terminal building, hangar area, airfield facilities, lighting, and navigation aids. Utilities at FTG include water, sanitary sewer, phone, electric, storm water, and natural gas. Wastewater is treated on-site via a wastewater treatment facility that was built in 2008 and located west of the airfield. The current utilities at the Airport are adequate for the existing structure as well as for potential taxiway lighting system installment. For future hangar and/or landside development, the water lines and wells would need to be analyzed for capacity and/or limitations to the current system.

It should also be noted that the east development area on the airport lacks natural gas lines and sewer, with the existing facilities being on septic systems. In order for development to continue on the east side of the Airport, additional utility

[3] For airports that are not 14 CFR part 139 certificated airports, per FAA policy, only one snow removal carrier vehicle is eligible unless the ADO concurs that the airport is large enough, busy enough, and/or has significant snowfall to warrant an additional vehicle.

infrastructure will be required that is dependent on the nature of future development.

It is recommended that FTG maintain the utility infrastructure to meet current demand within the 20-year planning period. As future landside and hangar development occurs, utility locations and capacity would have to be analyzed for limitations to the current infrastructure.

4.5 Other Airport Considerations

4.5.1 Airports Geographic Information Systems (AGIS)

To better support FAA NextGen, GIS standards have been introduced and are gradually being phased in over time. The goal with NextGen is to create a system-wide standard for collection and input of aviation data. The FAA introduced three new advisory circulars to provide guidance for these new standards, which became mandatory for all federally obligated airports on September 2009. FAA AC 150/5300-16A, *General Guidance and Specifications for Aeronautical Surveys*, FAA AC 150/5300-17C, *General Guidance and Specifications for Aeronautical Surveys: Airport Imagery Acquisition and Submission to the appropriate government agencies*, and AC 150/5300-18B, *General Guidance and Specification for Aeronautical Surveys: Airport Survey Data Collection and Geographic Information System Standards,* describe how the data is collected and processed. As part of the Master Plan, GIS data will be collected in accordance with these criteria and aeronautical information included on the ALP.

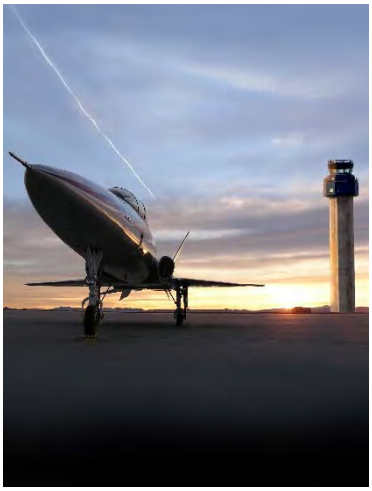
FTG will be compliant with the AGIS requirement at the completion of this Master Plan.

4.5.2 Spaceport Colorado

Front Range Airport has recently submitted an application to the FAA's Office of Commercial Space Transportation for a Commercial Launch Site Operator License to conduct spaceport launch activities based on a horizontal takeoff, horizontal landing, manned, reusable launch vehicle (RLV) based at FTG. The Office of Commercial Space Transportation is charged with ensuring the protection of the public, property, and the national security and foreign policy interests of the United States during commercial launch or reentry activities, and to encourage, facilitate, and promote U.S. commercial space transportation. Federal law requires commercial launch operators to hold licenses, either as permission for a single launch of a specific vehicle or a broader license to allow a certain type of vehicle to be launched by that operator from a specific facility. These licensing certificates are active for five years from date of approval.

The operational and development requirements of a spaceport are directly related to the specific launch vehicles that utilize the facility. Each RLV and operator has specific requirements that must be satisfied before a spaceport can support their needs. Facility requirements, dictated by launch vehicle type, include the specific requirements of propellant storage and loading, the housing of the RLV prior to and after flight, as well as processing, maintenance, and integration of vehicle components. Airfield facilities, such as runways and taxiways, also must meet the

specific needs of each RLV. In addition, planned facilities should include a terminal that will serve as a departure/arrival point for spaceflight participants and guests, mission control, a training/education center, and media access. However, it must also be recognized that any commercial space facilities would have to be incorporated into existing airfield facility infrastructure in accordance with current FAA safety requirements and Federal grant assurances.



The existing airfield infrastructure at FTG, including existing runways and taxiways, is fully capable of supporting operations by any RLV operator currently being considered in the existing application. The primary focus of facility requirements associated with spaceport development is the need to isolate a space vehicle that is fully loaded with fuel and oxidizer, due to the potential for explosion. These setback requirements must be observed while keeping spaceport operations compatible with all other existing and planned activities and development at the Airport.

Through previous spaceport planning efforts that include the *2014 Spaceport Colorado* Business Plan and the 2015 Environmental Assessment (EA) for Front Range Airport Launch Site Operator License, facility requirements for the current spaceport proposal have been identified that include two mission prep areas, a fuel storage area, an oxidizer storage area, and a static hot fire test stand area. These are pursuant to the provisions set forth in 14 CRF 400-460 that regulate requirements such as launch safety, launch and reentry of an RLV, experimental permits, financial responsibility and human space flight requirements.

The commercial space launch business is rapidly changing and developing—in fact, it should be considered an industry in its infancy; therefore, particularly when it comes to horizontal-launch vehicles, infrastructure improvements at FTG must be carefully planned and justified to ensure they are both necessary and affordable. To that end, any potential infrastructure improvements will need to meet the criteria of being suitable for aviation use should commercial space operations prove not viable.

For the purposes of the FTG Airport Master Plan, only the airport land area needed to meet the potential facility requirements for Spaceport Colorado will be considered. The following chapter will only reserve appropriate areas for the potential development of these facilities.

4.6 Airport User Survey

FTG users were surveyed in 2015 about the condition of airport facilities, operations, safety and services (see **Figure 4-11** and **Figure 4-12**). In general, the Airport received primarily positive responses (average to excellent) and other comments generally supported the recommendations included in this chapter.

FIGURE 4-11 - FTG USER SURVEY RESPONSES

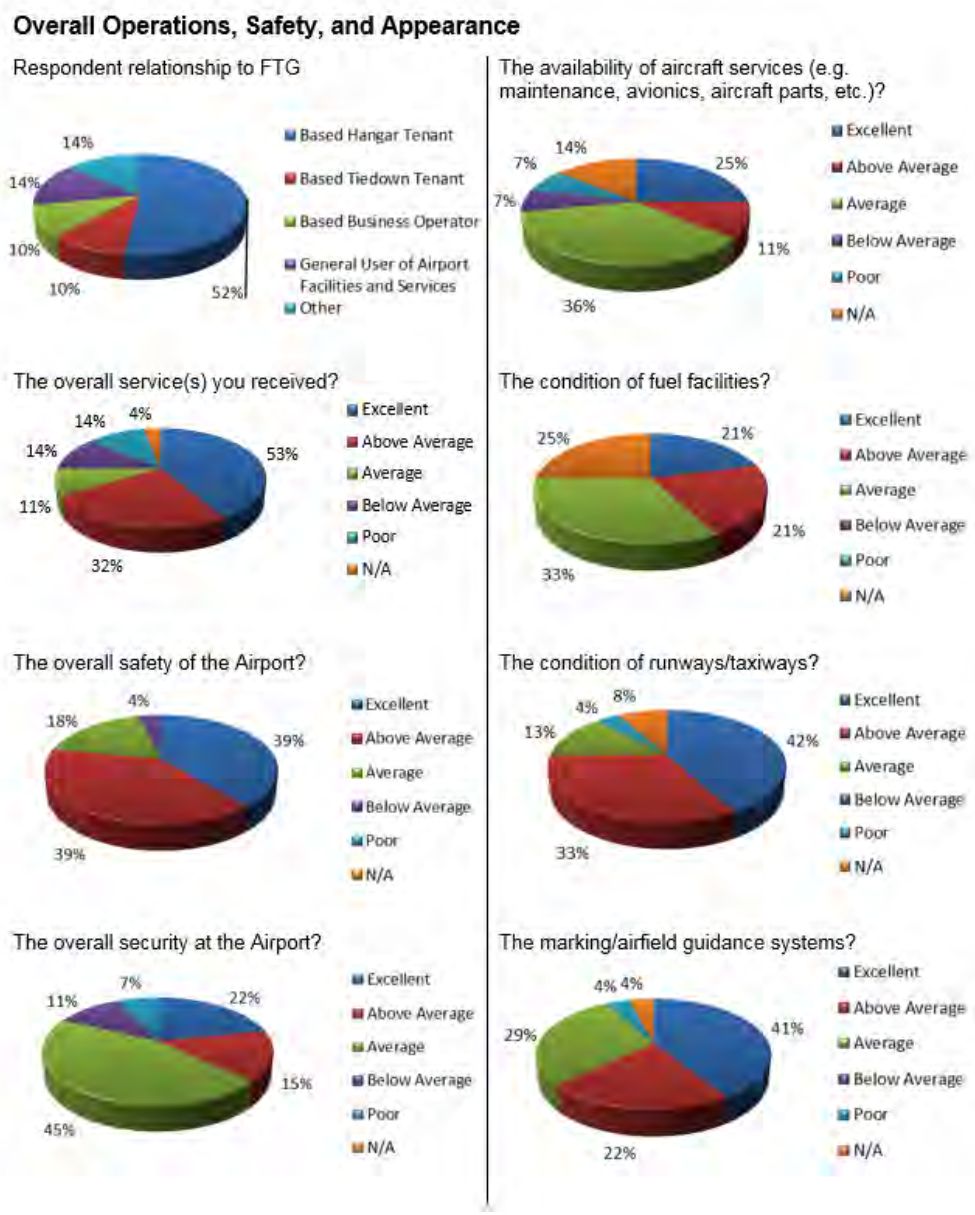
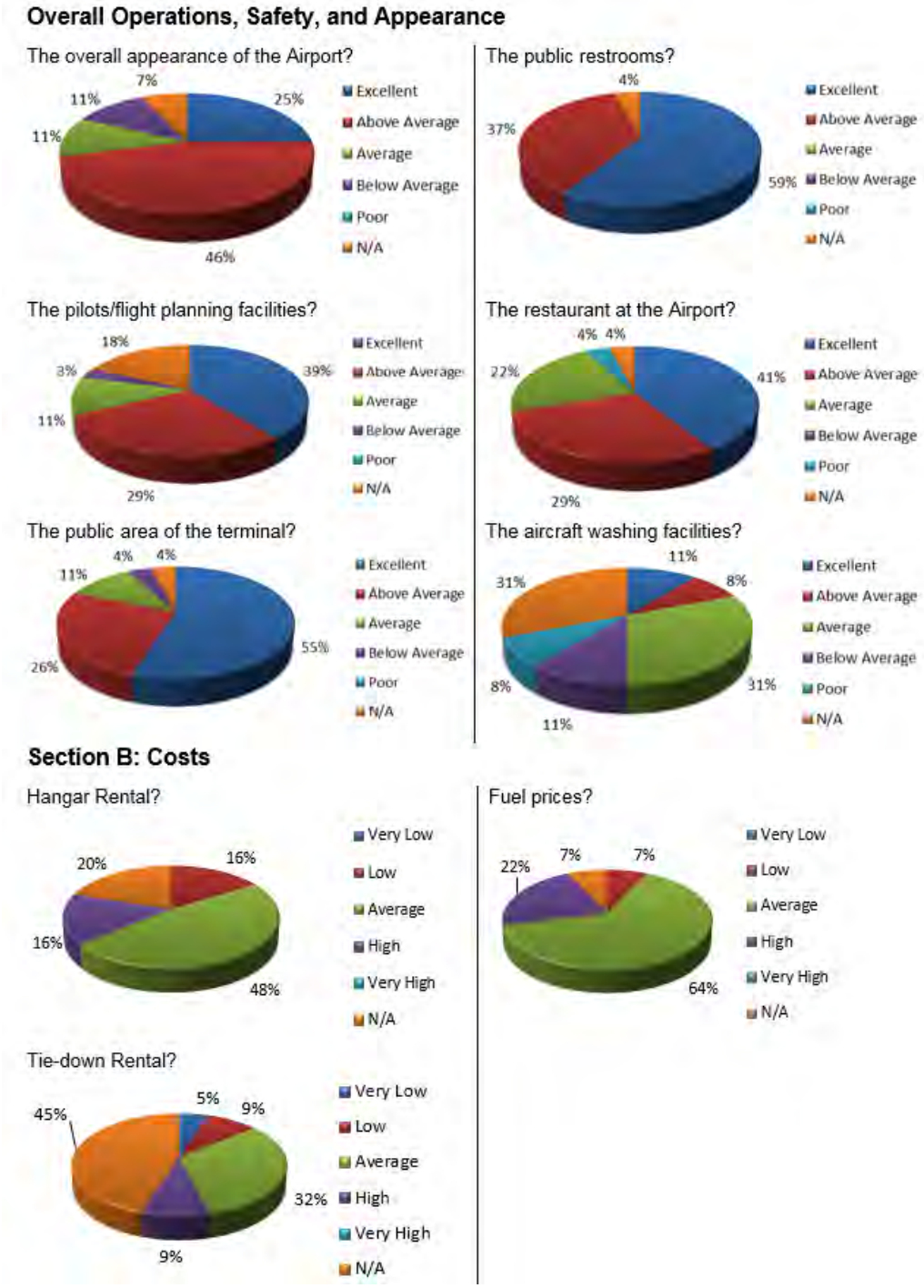


FIGURE 4-12 - FTG USER SURVEY RESPONSES



4.7 Previous Master Plan Deficiencies & Recommendations

In addition to meeting long-term operational demands and complying with FAA design standards, the 2005 Front Range Airport Master Plan Update had two primary focal points:

- Promote and Enhance General Aviation Activities: identify requirements to meet the long-term operational demands of the general aviation community and to fully accommodate general aviation design aircraft and allow for appropriate growth and development.
- Provide Opportunity and Environment for Air Cargo Operations: identify requirements within developed air cargo forecast scenarios to establish viable air cargo facilities, as well as the airfield infrastructure required for them to operate.

Specific facility requirements were generated for each of these focal points and they are summarized **Table 4-18**. Note that the 2005 Master Plan assumes that the general aviation requirements would be needed since that was the primary role of FTG. Additionally, based on the assumption that air cargo operations could be established at the Airport, an additional layer of facility requirements were identified to meet the needs of that potential activity.

Since the completion of the 2005 Master Plan, air cargo operations have not materialized as had been speculated. However, the facility requirements identified for general aviation activities remain valid and are in fact consistent with many of the facility requirements listed previously in this chapter.

TABLE 4-18 - 2005 FTG MASTER PLAN UPDATE FACILITY REQUIREMENTS

	Existing Conditions	Proposed Development General Aviation	Proposed Development Air Cargo
Access	Imboden Road to 48th Ave	Improve Imboden Road to 48th Ave	Improve and extend Manilla Road
Auto Parking	1,666 Parking Spaces	125 Parking Spaces	22 Parking Spaces
Air Traffic Control Tower	None	190-foot ATCT	190-foot ATCT
Critical Aircraft Design Group	Challenger CL 604 C-II	Gulfstream IV D-II	Airbus A300F C-IV
Runway 8/26 – Length – Width – Strength	 8,000' 100' 40,000 lbs. DWG	 8,000' 100' 90,000 lbs. DWG	 10,000' 150' 380,000 lbs. DTWG
Runway 17/35 – Length – Width – Strength	 8,000' 100' 37,000 lbs. DWG	 10,000' 100' 90,000 lbs. DWG	 12,000' 150' 380,000 lbs. DTWG
Taxiway A – Width – Separation – Strength	 50' 400' 40,000 lbs. DWG	 50' 400' 90,000 lbs. DWG	 75' High Speed 600' 380,000 lbs. DTWG
Taxiway B & C – Width – Separation – Strength	 50' N/A 40,000 lbs. DWG	 50' N/A 90,000 lbs. DWG	 75' N/A 380,000 lbs. DTWG
Taxiway D – Width – Separation – Strength	 50' 500' 40,000 lbs. DWG	 50' 500' 90,000 lbs. DWG	 75' High Speed 500' 380,000 lbs. DTWG
Taxiway E – Width – Separation – Strength	 N/A N/A N/A	 50' High Speed 600' 90,000 lbs. DWG	 75' High Speed 600' 380,000 lbs. DWG
Navigational Aids	CAT I ILS (8/26) CAT I ILS (17/35)	None None	CAT III ILS (8/26) CAT III ILS (17/35)
Lighting & Marking – Taxiway System – Runway Centerline – Touchdown Zone – Runway Visual Range	 Reflectors None None None	 MITLS Not Required Not Required Not Required	 MITLS Required Required Required
Air Cargo Facility	None	Not Required	21,500 SF Building
De-Icing Apron	100' x 50' Concrete Pad	100' x 50' Concrete Pad	150' x 200' Deicing Apron
– ARFF Index – ARFF Vehicle	Index "A" 1 Vehicle	Index "B" 2 Vehicles	Index "D" 3 Vehicles
Snow Removal Equipment	See Inventory	1 - High Speed Snow Plow	2 - High Speed Snow Plow
Fuel Storage	(2) 15,000-gal Jet A (1) 20,000-gal Avgas	(4) 15,000-gal Jet A (1) 20,000-gal Avgas	(6) 30,000-gal Jet A (1) 20,000-gal Avgas

Source: 2005 Front Range Airport Master Plan Update.

4.8 Regional Airport System Role

In 2011, CDOT Aeronautics Division published the Colorado Aviation System Plan. The Plan evaluated and measured the performance of the Colorado system of publicly-owned airports and assigned each airport to one of three functional categories:

Major, Intermediate, or Minor. The Plan currently has FTG classified as a Major General Aviation Reliever airport and is included in the National Plan of Integrated Airport System (NPIAS). CDOT evaluated the Airport's current facilities against the Plan's objectives and identified facilities and services that required improvement. **Table 4-19** provides a summary of that evaluation.

TABLE 4-19 - CDOT 2011 IDENTIFIED BENCHMARKS FOR FTG

CDOT Benchmark	CDOT Standard	FTG Existing Condition	Meets Standard?
Federal Aviation Regulations (FAR) Part 77 Compliance	– FAR Part 77 Airspace Drawings – Part 77 local height Zoning	– FAR Part 77 Drawings – Part 77 Zoning	Yes
Master Plan update every five years for Major Category Airports	Master Plan completion for: FTG YR 2013	Last Master Plan: 2004	No*
King Air B200 Airport Accessibility (emergency aircraft operating on minimum runway) (single pilot, up to 7 passengers)	RW length requirement, weather reporting, rotating beacon, published approach, MIRL or HIRL	Has all facilities	Yes
Learjet 35 Airport Accessibility (emergency aircraft) (2 crew, up to 9 passengers)	RW length requirement, weather reporting, rotating beacon, published approach, MIRL or HIRL	Has all facilities	Yes
Existing runway length	Major General Aviation Reliever Airport accounting for 75% of large aircraft at 90% useful load	8,000 feet	No
Primary Runway Pavement Condition Index (PCI) rating	Primary Runway PCI of 75 or greater	PCI of 90	Yes
Primary Taxiway Pavement Condition Index (PCI) rating	Primary Taxiway PCI of 75 or greater	PCI of 58	No*
Primary Apron Area PCI Rating	Primary Apron PCI of 75 or greater	PCI of 86	Yes
Security Level Classification based on TSA Guidelines by System Plan Role	Minimum, Low, Medium, High Risk	Medium Risk	No/NA
Recent and Pending LPV/APV Approaches for System Airports	If a Major category airport cannot accommodate an ILS, the airport should at least have an approach with vertical guidance	Published since 2005	Yes
GPS Approach Status for Major and Intermediate Airports	Included in 2005	Publish Date: 9/25/2005	Yes
Major Airport Performance Snow Removal Equipment Objective	Snow Removal Equipment Plan by year 2011		Yes
Major Airport Facility and Service Objectives De-Icing Equipment	De-Icing Equipment Objective in YR 2011		No
Airport Safety/Security Fencing	NPIAS Airport Security/Safety Fence		No
Facility and Service Objectives:			
– Runway Width	RW Width Objective 75 feet in YR 2000, 2005, 2011	RW width of 100 feet	Yes
– Runway Strength	Runway Strength Objective of 34,000 pounds in YR 2000, 2005, 2011	30,000 pounds	Yes
– Taxiway Type	Major Airports: Full or partial parallel Taxiway	Full Parallel Taxiway	Yes
– Published Approach	Published Approach Objective: Precision in YR 2000, 2005, 2011		Yes
– Visual Aids	Rotating beacon, lighted wind cone, REILs, PAPIs, VASIs in YR 2000, 2005, 2011		Yes
– Runway Lighting	Runway Lighting HIRL or MIRL in YR 2000, 2005, 2011	HIRL	Yes
– Weather Reporting Facilities	On-site ASOS or AWOS	AWOS	Yes

CDOT Benchmark	CDOT Standard	FTG Existing Condition	Meets Standard?
– Telephone, Restroom, FBO, Aircraft Maintenance, Fuel: Jet A & 100LL, Courtesy Car, Taxi/Shuttle, Rental Car, Terminal, Apron, Hangars, Auto Parking	Met Objectives in YR 2000, 2005, 2011		Yes

*Has since been corrected since 2011

It was determined that FTG does not meet some airport-specific objectives identified in the 2011 System Plan[4] (several of the deficiencies either have been or are in the process of being addressed). Of greatest significance is the recognition that FTG does not have safety/security fencing, an important improvement to increase airport safety and security in that it helps protect airport assets, and aids in prevention of wildlife intrusions[5]. The Plan also recommends the integration of an access control system and suggests that FTG convene a security committee to address long-term security enhancements. Finally, it should be recognized that the Plan recommends a runway length benchmark of 8,950 feet, 950 longer than the Airport's existing runways. The study also acknowledges that "aircraft can operate on runway lengths that are less than optimum if they shorten their trips lengths and/or depart with less than full loads."

4.9 Summary

A summary of the facility improvements that currently need to be addressed during the 20-year planning period is provided below in **Table 4-20**. Certain improvements will be further examined in **Chapter Five - Alternatives Analysis** to evaluate options to accommodate the facility requirements.

TABLE 4-20 - FACILITY REQUIREMENTS SUMMARY

Facility	Identified Requirement
Airfield Facility Requirements	
Airfield Demand Capacity	– No action required
Airport Design Standards	– No action required
Runways	– Preserve potential runway extensions and widening in Ultimate ALP – Add blast pads to Ultimate ALP per FAA AC 150/5300-13A
Taxiways	– Update fillet standards per FAA AC 150/5300-13A – Eliminate direct access from apron to runway via Taxiways A5, A6 and D7 per FAA AC 150/5300-13A – Resolve potential operational conflicts on Taxiway E – Preserve potential taxiway system expansion in Ultimate ALP
Airfield Pavement	– Investigate existing pavement strength of Runway 17/35 – Investigate potential selected strengthening of taxiways to support Runway 17/35
Airfield Visual Aids	– Install MITLs on Taxiway A, Taxiways A3-A9, Taxiway B, Taxiway C, Taxiways C1-C2, and Taxiway E and E7

[4] 2011 Colorado Aviation System Plan Technical Report, Colorado Department of Transportation, Division of Aeronautics. http://www.coloradodot.info/programs/aeronautics/colorado-airport-system/2011SP_TechReport/view

[5] 2011 Colorado Aviation System Plan Technical Report, CDOT; 'the system plan has not established a specific objective related to which system airports should have fencing, not has an objective been established as to how much fencing is appropriate, since conditions at each airport vary."

Facility	Identified Requirement
Navigation Aids (NAVAIDs)	– No action required
Obstruction Removal	– Recommendations to be incorporated into the ALP set
Landside Facility Requirements	
Terminal Building	– No action required
Aircraft Hangar Requirements	– Prepare for short-term T-hangar development – Preserve / refine hangar development modules
Aircraft Parking Aprons	– Redesign transient apron
Landside Access and Parking Requirements	– No action required
Airport Support Facility Requirements	
Airport Security	– Construct security fence and perimeter road – Install access control – Establish Airport Security Committee
Fuel Storage Requirements	– No action required
Deicing Facilities	– No action required
ARFF / SRE Facilities	– Construct an SRE/maintenance building of 6,400 square feet
Airport Equipment	– Replace SRE and maintenance vehicles as they reach their useful life, as reflected on CIP.
Utilities	– No action required
Spaceport Facilities Requirements	
Spatial Requirements	– Reserve appropriate airport land area required to meet projected facility needs for potential spaceport operations – Ensure that prospective spaceport development areas do not adversely impact traditional airport operational activities.

5.0 DEVELOPMENT ALTERNATIVES & RECOMMENDED PLAN

The purpose of this chapter is to identify, present, and evaluate various development alternatives for the Front Range Airport (FTG or the Airport) that are designed to meet projected levels of aviation demand and their associated facility and design requirements over the next 20 years. The result of that evaluation is a preferred development plan for the Airport that will support its evolution and growth in a manner that enables it to meet its future aviation needs in a safe, efficient, and sustainable way over the 20-year planning period. The preferred development plan is the culmination of the planning process detailed in the previous four chapters and will serve as the basis of the remaining two chapters of the Airport Master Plan (AMP), including the Airport Layout Plan (ALP) drawing set.

This alternatives analysis solicited input from a variety of sources including previous chapters of this master plan, the Planning Advisory Committee (PAC), Airport staff, the general public, the FAA, the State of Colorado, and other interested parties. It examines various development concept alternatives designed to meet the previously identified facility requirements by employing evaluation criteria to select a preferred development plan. Following their identification, each alternative is evaluated on their ability meet demand and provide for future flexibility, while maintaining a safe aviation environment. Additionally, this chapter provides a description of the various factors and influences, which will form the basis for the Airport's long-term development program.

It should be noted that the FAA encourages airports to consider the no-build option as a comparison against the development alternatives that is based on the existing infrastructure. In a no-build alternative, facilities, structures and layout would remain unchanged and the Airport would maintain its current physical conditions and operational patterns.

"The alternatives chapter brings together many different elements of the planning process to identify and evaluate alternatives for meeting the needs of airport users as well as the strategic vision of the airport sponsor. Airports have a wide variety of development options, so an organized approach to identifying and evaluating alternative development options is essential for effective planning."

- FAA AC 150/5070-6B, Airport Master Plans

5.1 Development Goals

To assist in conducting the alternatives analysis, several development goals have been formed for purposes of directing the planning effort and establishing continuity in the future development of the Airport. These goals take into account several considerations relating to the needs of the Airport, both in the short-term and the

long-term, including safety, noise, capital improvements, land use compatibility, financial and economic conditions, public interest and investment, and community recognition and awareness. While all are project-oriented, some goals represent more tangible activities than others; however, all are deemed important and appropriate to the future of the Airport. (These goals are designed to augment the AMP study objectives defined in **Chapter 1, Study Introduction and Goals**.) These development goals include the following:

- Accommodate FTG's forecasted demand for aviation activity in a safe and efficient manner by providing necessary airport facilities and services.
- Provide effective guidance for the future development of FTG through the preparation of a logical development program that presents a realistic vision to meet future aviation-related demand.
- Prepare a plan that enables the Airport to fulfill the mission of facilitating and enhancing local, regional, and national general aviation services by "right-sizing" facilities.
- Conduct an analysis that identifies financially feasible projects that maximize use of available Airport areas while meeting needs of the community.
- Develop future development alternatives based upon the most efficient and cost-effective methods.
- Continue to develop and operate the Airport in a manner that is consistent with local ordinances and codes, federal and state statutes, federal grant assurances, federal agency regulations, and FAA design standards.
- Ensure that Airport development remains compatible with the surrounding community and the environment on and near airport property.
- Preserve the development potential of the Airport beyond the forecasted aviation demand to account for possible future aviation services and facility demand increases resulting from unforeseen economic development initiatives and associated aviation uses.
- Encourage and protect public and private investment in land and facility development near the Airport.

5.2 Evaluation Criteria

The Alternatives Analysis is a regimented process by which development options are identified and the final Recommended Plan is established. The Recommended Plan is what is ultimately included on the resulting Airport Layout Plan (ALP).

To facilitate the selection of a preferred development plan, a set of evaluation criteria have been identified for use in this analysis. Through an assessment that incorporates these criteria, the potential benefits and impacts of the various alternative development scenarios can be compared and contrasted, to aid in the selection process. The criteria used to assist in evaluating development alternatives include, but are not limited to the following:

- **Safety/Operational Factors:** Alternatives were evaluated to determine their ability to safely accommodate future demand for aircraft, vehicles, and other relevant factors based on the specific facility being assessed. This criterion evaluates alternative development concepts based on anticipated improvements to operational safety, capacity, and delay, as well as tenant convenience, and other relevant planning considerations such as their ability to meet or enhance FAA design standards.

- **Environmental Factors:** A broad evaluation of environmental factors associated with development was part of the review and comparison of alternatives. Relevant environmental factors include those stipulated in FAA Order 1050.1E, *Environmental Impacts: Policies and Procedures*. Additional considerations include potential physical impacts to the surrounding community.
- **Economic Considerations:** Economic factors include historic infrastructure investment, the remaining useful life of existing airport facilities, anticipated alternative project costs, and property acquisition requirements. These factors provide a basis for comparing the cost-effectiveness and economic ramifications of various development scenarios.
- **Implementation Feasibility:** There are often factors, both tangible and intangible, that can impact an airport's ability to implement certain development alternatives. The practicability of constructing a new development is an example of a tangible factor. Community and political acceptance are examples of less tangible implementation feasibility dynamics that were considered.

Where appropriate, development alternatives were quantitatively and qualitatively evaluated based on these factors. In addition to these criteria, selected improvements were presented to the Airport in order to receive feedback and input on the demand for and preferred location of each facility. The results of this analysis are used to select preferred development alternatives for specific facility recommendations identified in **Chapter 4, Airfield Capacity & Facility Requirements**.

5.3 Airside Development Concepts & Alternatives

Because all other airport functions relate to and revolve around the basic runway/taxiway geometry, airside development alternatives should be first to be examined and evaluated. While it is essential that the initial development recommendations for the Airport be commensurate with the near-term needs and requirements of the Airport users, the long-term improvement (beyond the 20-year planning period) of the facility should also be considered and planned for to ensure the Airport's capability to accommodate future potential activity levels. Consequently, the main objective of the planning recommendations presented in this section is to identify future development that will result in a runway/taxiway system capable of accommodating forecasted aviation activity levels while preserving potential for unforeseen future development opportunities.

Inclusion of a project on the Airport Layout Plan (ALP) is not a guarantee of federal funding support. It simply protects airport land and airspace for a project's potential construction.

Chapter 4 examines the ability of the Airport's existing runway/taxiway system to accommodate projected levels of activity at FTG through the 20-year planning period. The findings of that analysis indicated that the existing airfield provides sufficient operational capacity to efficiently accommodate aircraft operational demand over the long term. However, to preserve the Airport's capability to accommodate future potential activity levels beyond the 20-year planning period, runway/taxiway improvements are recommended on the Ultimate ALP. Within the planning period, certain airside elements require modification to ensure that the Airport continues to comply with FAA airport design, airspace and safety criteria. Some recommended airfield improvements are intended to enhance the efficiency of aircraft movement on the taxiway system.

The following sections provide overviews of the alternatives analyses for several of the airfield infrastructure requirements as reflected in **Table 5-1**. Although these individual analyses are presented separately, it must be understood that they can and do impact each other. Such potential interactions are acknowledged and addressed as appropriate.

TABLE 5-1 - AIRSIDE FACILITY REQUIREMENTS SUMMARY

Facility	Identified Requirement
Runway	– Preserve potential runway extensions and widening in Ultimate ALP – Add blast pads to Ultimate ALP
Taxiway System	– Eliminate direct access from apron to runway via Taxiways A5, A6 and D7 – Update fillet standards – Resolve potential operational conflicts on Taxiway E – Preserve potential taxiways in Ultimate ALP
Airfield Pavement	– Investigate existing pavement strength of Runway 17/35 – Investigate potential selected strengthening of taxiways to support Runway 17/35
Airfield Visual Aids	– Install MITLs on Taxiway A, Taxiways A3-A9, Taxiway B, Taxiway C, Taxiways C1-C2, and Taxiway E and E7
Navigation Aids (NAVAIDs)	– No action required
Obstruction Removal	– Data to be incorporated into the ALP set

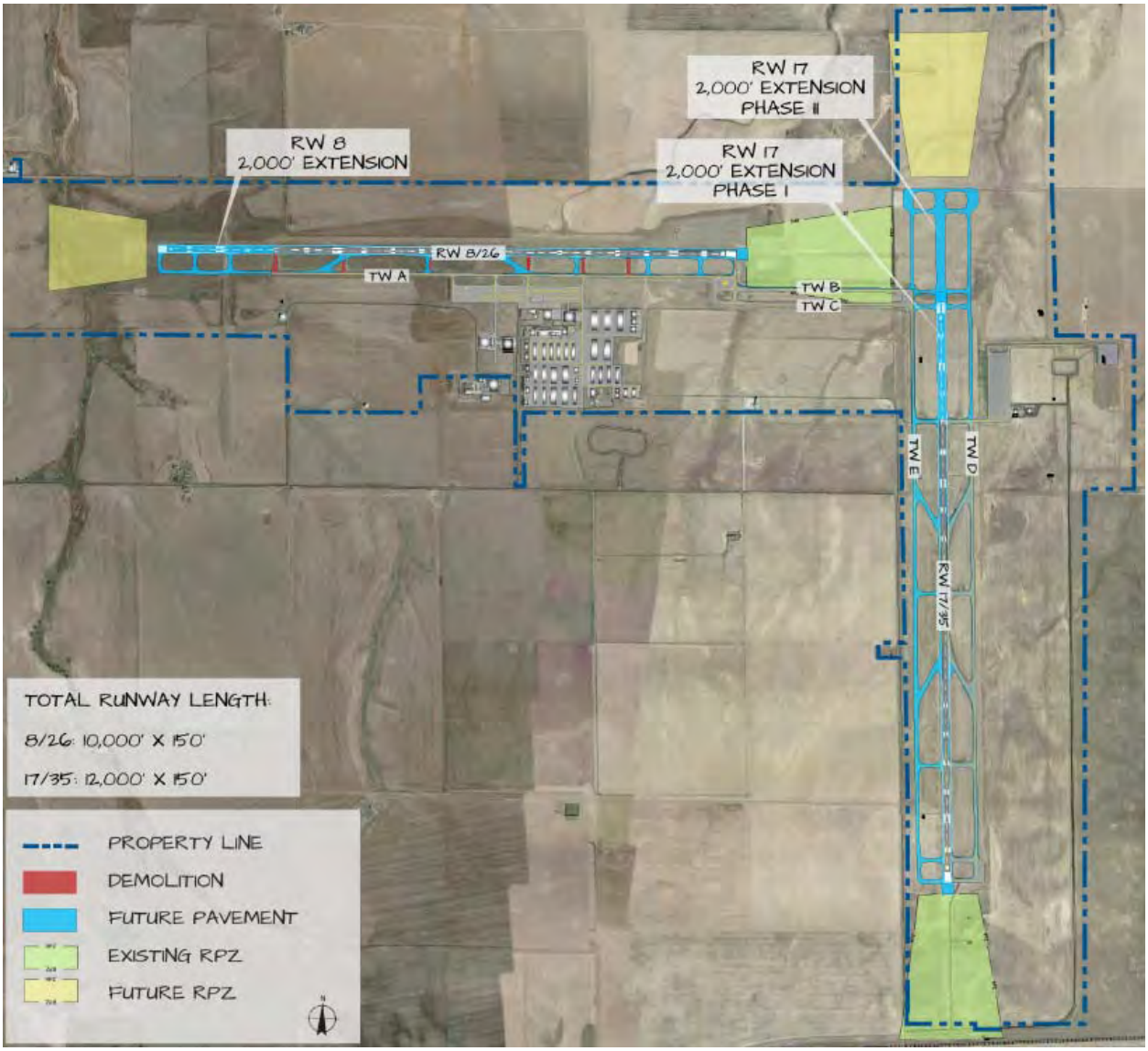
Source: Jviation

5.3.1 Runways

Chapter 4 provides a comprehensive review of FTG's runway system, including orientation, runway lengths and runway widths. The conclusion of that analysis is that the current characteristics of the Airport's two runways (Runway 8/26 and Runway 17/35) are adequate to meet FTG's projected operational requirements for the 20-year planning period. Subsequently, no modifications are required for those characteristics (note that pavement strength is discussed below in **Section 5.3.3**).

However, it was also acknowledged that very long-term development trends within the region and the aviation industry indicate that FTG, in its capacity as a Reliever Airport for Denver International Airport, may require additional runway length at some point in the future. It is assumed that this would likely be needed to accommodate an increased regional demand for aviation services by newer and larger general aviation aircraft, capable of flying greater distances than today. Considering that FTG, the FAA, and the Colorado Department of Transportation (CDOT) Aeronautics Division all want to protect for that future potential development beyond the 20-year planning period, this Master Plan will include an Ultimate Airport Layout Plan sheet within the resultant ALP set that reflects longer lengths for both of FTG's runways (see **Figure 5-1**). It should be noted that these extensions are currently included on a similar Ultimate ALP sheet within the Airport's existing ALP from FTG's 2004 Master Plan; inclusion of these extensions in the current Master Plan's ALP will be a continuation of the existing plan.

FIGURE 5-1 - RUNWAY / TAXIWAY EXTENSIONS INCLUDED IN THE FTG ULTIMATE ALP



Source: Jviation

5.3.2 Taxiways

The Airport's taxiway system should provide for smooth aircraft taxiing requiring minimal changes in aircraft speed and direct routing to and from the runways, terminal area, and aircraft parking areas. Taxiway design principles include:

- Provide each runway with a parallel taxiway or the capability of a parallel taxiway.
- Build taxiways to provide as direct a route as possible.
- Provide bypass capability or multiple access points to runway ends.
- Ensure that taxiways ascribe to the new design criteria detailed in FAA AC 150/5300-13A, *Airport Design*; including updated taxiway fillet design.

- Avoid crossing runways whenever possible.
- Avoid constructing taxiways off the ends of runways.

FTG's present taxiway configuration is generally adequate to serve the present and forecasted levels of operational activity at the Airport. However, there are several additional design considerations that must be addressed, which are reviewed in the following sections.

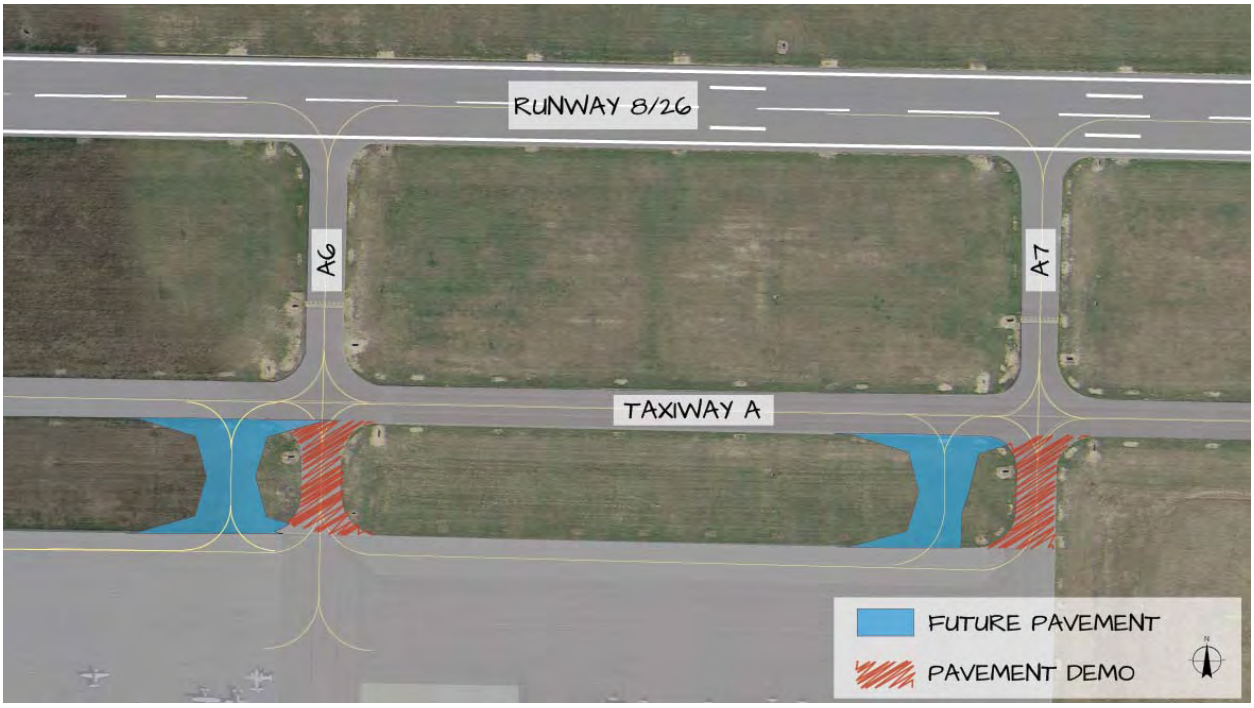
Taxiways A6, A7 and D7 Indirect Access Alternatives

As discussed in the previous chapter, Taxiways A6, A7, and D7 currently do not meet FAA AC 150/5300-13A design standards for taxiways. In an effort to reduce the potential for runway incursions, the design standards do not permit taxiways/taxilanes that lead directly from an apron to a runway without requiring an operating pilot to make a turn. Taxiways A6, A7, and D7 all currently allow for such direct access from an apron to a runway. The following alternatives have been identified to eliminate this noncompliant condition.

Alternative 1 - No Action. This alternative would leave Taxiways A6, A7, and D7 in their current locations and in a non-compliant condition. Since compliance with these design standards is now mandatory, adoption of this alternative would require the FAA to issue a Modification of Standard (MOS) for this condition. It should be noted that issuances of an MOS by the FAA has become increasingly rare and only in situations where there are not reasonable means of meeting design standards. This particular circumstance is not viewed as one which may qualify for an MOS.

Alternative 2 - Relocate Taxilane connectors for Taxiways A6, A7, and Taxiway D7. This alternative would effectively relocate the apron taxilane connectors associated with Taxiways A6 and A7 by closing/removing the existing taxiways and replacing them approximately 150 feet west of their current location (see **Figure 5-2**). It is anticipated that this would occur at the time of their next reconstruction, currently estimated to be in 2034. Similarly, Taxiway D7 would be relocated to the north at the time of its next reconstruction (see **Figure 5-3**). Note that this would also require the partial extension of Taxiway D, which is also consistent with FTG's long-term taxiway plan.

FIGURE 5-2 - TAXIWAYS A6 AND A7: ALTERNATIVE 2



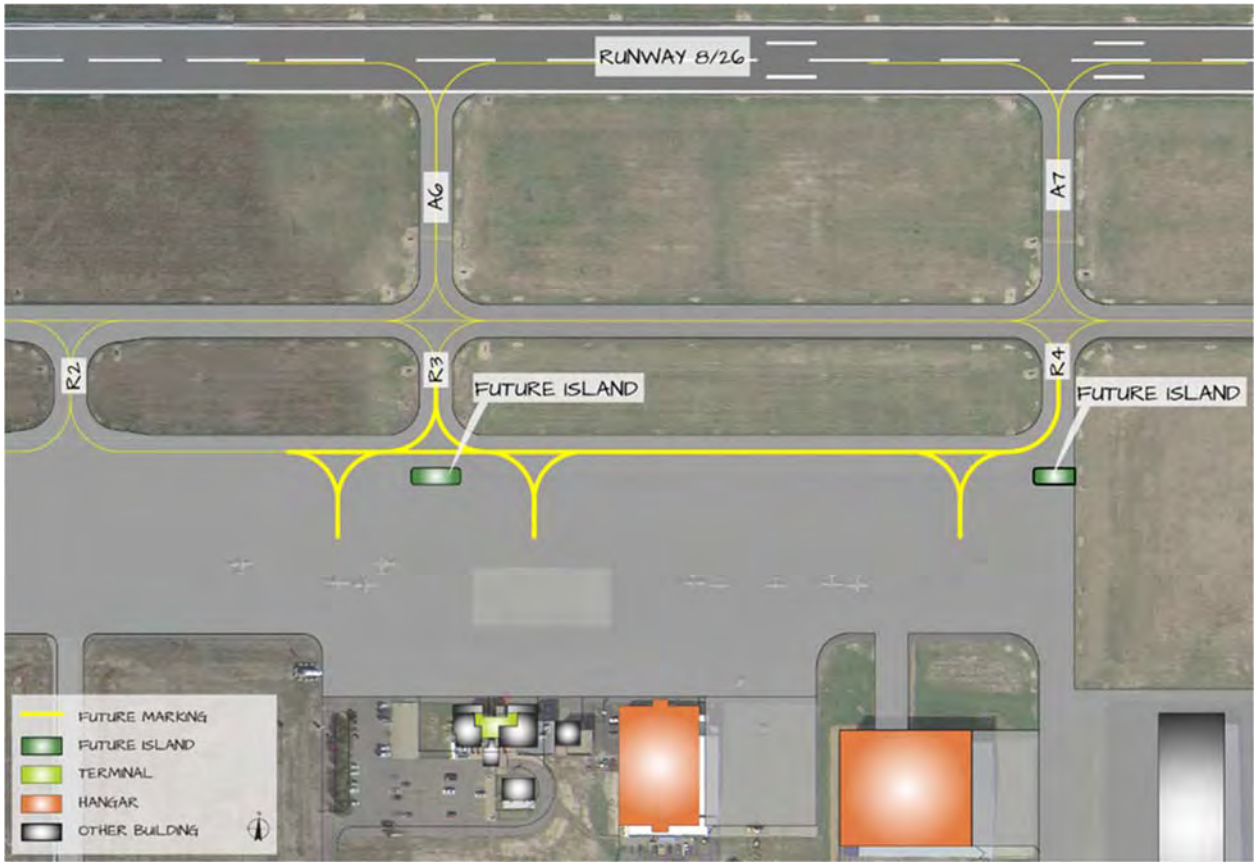
Source: Jviation

FIGURE 5-3 - TAXIWAY D7: ALTERNATIVE 2

Source: Jviation

Alternative 3 - Construct No-Taxi Apron Island. This is considered a "low cost" alternative to eliminate direct access between FTG's aprons and its runways. The existing location of the taxilane connectors (R3 and R4) to Taxiways A6 and A7 would be maintained, and two no-taxi apron islands would be established in the Terminal Apron (see **Figure 5-4**). These islands would require pilots exiting the apron to make at least one turn to access the Airport taxiway system, in compliance with FAA design criteria. The islands themselves could be painted as a non-movement area in the short term, while over the long term the pavement could be removed. Note that this alternative could also be introduced on the East Apron (see **Figure 5-5**) with respect to Taxiway D7.

FIGURE 5-4 - TAXIWAYS A6 AND A7: ALTERNATIVE 3



Source: Jviation

FIGURE 5-5 - TAXIWAY D7: ALTERNATIVE 3

Source: Jviation

Alternative 4 - Remove Existing Taxilane Connectors. This alternative rectifies the direct apron to runway access issue by simply by closing and ultimately removing the connectors associated with Taxiways A6 and A7. However, not only would this alternative halve the points of access to the Terminal Apron, but it would also force aircraft operations accessing the airfield to taxi to the far west end of the apron. This is an inherently inefficient operation that would require significantly more taxi time. Note that this alternative is not an option for the East Apron as Taxiway D7 is the apron's only point of access and egress.

To evaluate the alternatives described above, the matrix in **Table 5-2** presents general advantages and disadvantages of each alternative, and considers them with respect to the evaluation criterion defined previously in this chapter.

TABLE 5-2 - TAXIWAYS A6, A7, AND D7 INDIRECT ACCESS COMPARISON MATRIX

	Alternative 1	Alternative 2	Alternative 3	Alternative 4
	No Action	Relocate Access	Install Apron Islands	Remove Access
Advantages	No airport construction actions area required	– Meets new FAA design standards – Maintains apron square footage – Maintains existing aircraft taxi time from Taxiway to Apron	– Meets new FAA design standards – Lowest cost action – Maintains existing aircraft taxi time from Taxiway to Apron	– Meets new FAA design standard – Reduce costs for maintenance, snow removal, etc.
Disadvantages	Requires an FAA MOS	– Highest cost action – Increased drive time for ARFF vehicles for access routes (most noticeable with D7)	– Slightly reduced apron square footage – Increased drive time for ARFF vehicles for access routes (most noticeable with D7)	– Increased aircraft taxi times from apron – Reduces terminal apron flexibility – Increased drive time for ARFF vehicles accessing terminal apron
Safety / Operational	FTG will not comply with current FAA safety regulations	Will not alter current airport operations	Will have minimal impact on current airport operations	Will have significant negative impacts on airport operations
Environmental	No impacts	No significant environmental impacts anticipated	No significant environmental impacts anticipated (may be beneficial regarding impervious areas)	No significant environmental impacts anticipated
Economic*	$0	$796,000	$5,000	$627,000
Feasibility	Obtaining an MOS from the FAA is unlikely	Relocation of access points would likely have to coincide with a major pavement rehabilitation project (est. 2034)	– Short term implementation would be paint – Long term pavement removal would be associated with larger construction project	– Short term would be closures – Airport sponsor & users would vigorously resist this alternative.

Source: Jviation
* Cost estimates are in 2017 dollars.

Through coordination and consultation with the FTG AMP PAC regarding the four alternatives, Alternative 1 was eliminated because it does not adequately address this safety design issue, while Alternative 4 was eliminated since it would create an inefficient operating condition for the Airport where one does not currently exist. Of the remaining two, the PAC determined that Alternative 3 presented the most viable short-term means of addressing the immediate access issue as it is based on remarking the existing aprons. It was also recognized that over the long term, the Airport would have to weigh the costs of relocating the taxiway connectors (which could occur no sooner than 2034) against the costs of removing pavement in the existing aprons in the future. However, at this point, removal of the apron pavement to establish permanent islands should be reflected in the Ultimate ALP.

Taxiway E Operational Conflicts

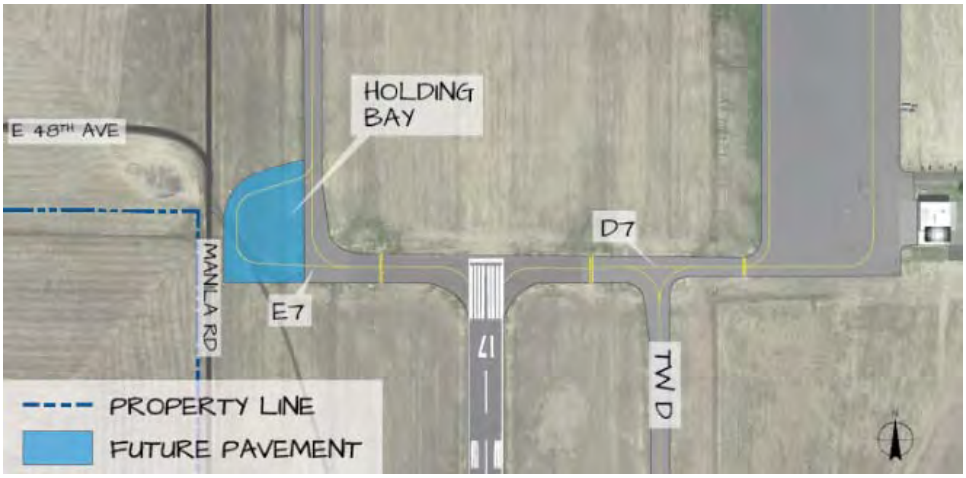
Representatives of the FTG Air Traffic Control Tower (ATCT) have indicated that FTG experiences occasional taxiway conflicts centered on Taxiway E, which can be a bottleneck for multiple aircraft simultaneously transitioning between the Terminal Apron to Runway 17/35. This is both a safety and an efficiency issue. Specifically, aircraft can be forced to hold at the east end of Taxiway C to permit arriving aircraft to taxi to the apron, or aircraft can be held near Taxiway D7 or further back on Taxiway D to allow aircraft to depart on Runway 17/35. In either case, significant

delays can be experienced. From a safety perspective, during hours when the ATCT is closed two aircraft could end up on Taxiway E facing each other, which would force at least one to conduct a 180-degree turn on the taxiway so they could back-taxi and yield to the other aircraft. This is not an ideal condition and aircraft could accidentally exit the taxiway when maneuvering such a turn. The following alternatives have been identified to eliminate this condition:

Alternative 1 - No-Action. This would retain the existing configuration of the north/south Taxiway E with no additional pavement changes. It does not address the operational constraints occasionally experienced by the Airport for aircraft taxiing to/from Runway 17/35, via Taxiway E. With the current pavement layout, only one aircraft can utilize Taxiway E to taxi to/from Runway 17/35. The potential operational conflicts remain.

Alternative 2 - Holding Pad. This alternative would establish a paved holding pad on the southwest corner of Taxiway E large enough to temporarily hold an aircraft so that another aircraft could by-pass it on the taxiway (see **Figure 5-6**). While not providing for independent operations, this pad would provide the ATCT additional flexibility in managing traffic flow. Additionally, during times when the ATCT is closed and there are conflicting Taxiway E operations, a pad would provide pilots with an appropriate means of safely avoiding potential issues.

FIGURE 5-6 - TAXIWAY E OPERATIONAL CONFLICT: ALTERNATIVE 2



Source: Jviation

Alternative 3 - End-Around Taxiway (EAT). An end-around taxiway could be constructed by extending Taxiway D approximately 2,000 feet to the north and then extending Taxiway C approximately 1,000 feet to the east (see **Figure 5-7**). This alternative would provide the safest and most operationally efficient condition by allowing independent taxiing operations for aircraft operating on or transiting to and from Runway 17/35. Facilitating independent operations would also reduce the number of Runway 17/35 crossings, enhancing operational safety. It should be noted that the extension of these taxiways is consistent with FTG's ultimate development

plan, and an appropriate subbase has already been established for these extensions during a previous construction effort.

FIGURE 5-7 - TAXIWAY E OPERATIONAL CONFLICT: ALTERNATIVE 3

Source: Jviation

The matrix shown below in **Table 5-3** presents general advantages and disadvantages of each alternative, and considers them with respect to the evaluation criteria defined previously in this chapter.

TABLE 5-3 - TAXIWAY E OPERATIONAL CONFLICTS ALTERNATIVES COMPARISON

	Alternative 1	Alternative 2	Alternative 3
	No Action	Holding Bay	End-Around Taxiway
Advantages	No cost	– Provides relief for safety and efficiency issues at minimal cost – Could be used as a run-up pad for aircraft departing Runway 17	– Maximizes safety and efficiency of taxiway system – Advances Airport's ultimate buildout plan – Assists in Taxiway D7 relocation
Disadvantages	Safety and efficiency issues related to Taxiway E remain	Cost of construction	Cost of more extensive construction project
Safety / Operational	Safety and efficiency issues related to Taxiway E would remain and should be expected to become more pronounced as traffic levels increase.	Would improve safety and efficiency of airfield operations by providing a means to lessen the potential impact of problem through a limited project.	Would improve safety and efficiency of airfield operations by providing a means to eliminate the issue.
Environmental	None	No significant environmental impacts anticipated	No significant environmental impacts anticipated
Economic*	$0	$895,000	$5,959,000
Feasibility	None	If approved by the FAA, funding may be available in conjunction with a major pavement rehabilitation project	If approved by the FAA, funding may be available in conjunction with a major pavement rehabilitation or ultimate runway extension project

Source: Jviation
* Cost estimates are in 2017 dollars.

Through coordination and consultation with the FTG AMP PAC regarding these three alternatives, Alternative 1 was eliminated since it did not address the safety and efficiency issue that is likely to become more pronounced over time. Of the remaining two, the PAC recognized that Alternative 3 provided the most effective long-term resolution to the issue, assisted in resolving the Taxiway D7 relocation issue (discussed above in **Section 5.3.2.1**) and advanced FTG's ultimate runway development plan; however, construction costs made it prohibitive in the near term. Therefore, the PAC recommended Alternative 2 since it presented the most viable short-term means of addressing this safety issue by providing an area to relieve potential operational conflicts at the least cost. Additionally, it was noted that the holding apron could be used as a run-up area and/or bypass to sequence aircraft departing on Runway 17/35.

Ultimate Taxiway Configuration

Based on the same rationale discussed in Section 5.3.1, FTG should also preserve the potential for long-term taxiway expansion by including future taxiway upgrades on the Ultimate ALP sheet. This would include possible development that lies beyond the needs of the 20-year planning period, but should be maintained as a potential to preserve appropriate Airport areas that could be needed for its ultimate development (see **Figure 5-1**). As was the case with the runways, the taxiway upgrades were originally introduced in the 2004 FTG Master Plan Update; inclusion of these in the current ALP set will be a continuation of the existing plan.

5.3.3 Airfield Pavement Strength

Addressed in the previous chapter, runway and taxiway pavement strengths are designed not only to withstand the loads of the heaviest aircraft expected to use the Airport, but also to be able to withstand the repetitive loadings of the entire range of aircraft expected to use the pavement over the planning period. FTG's pavement strengths for critical airfield infrastructure include the following:

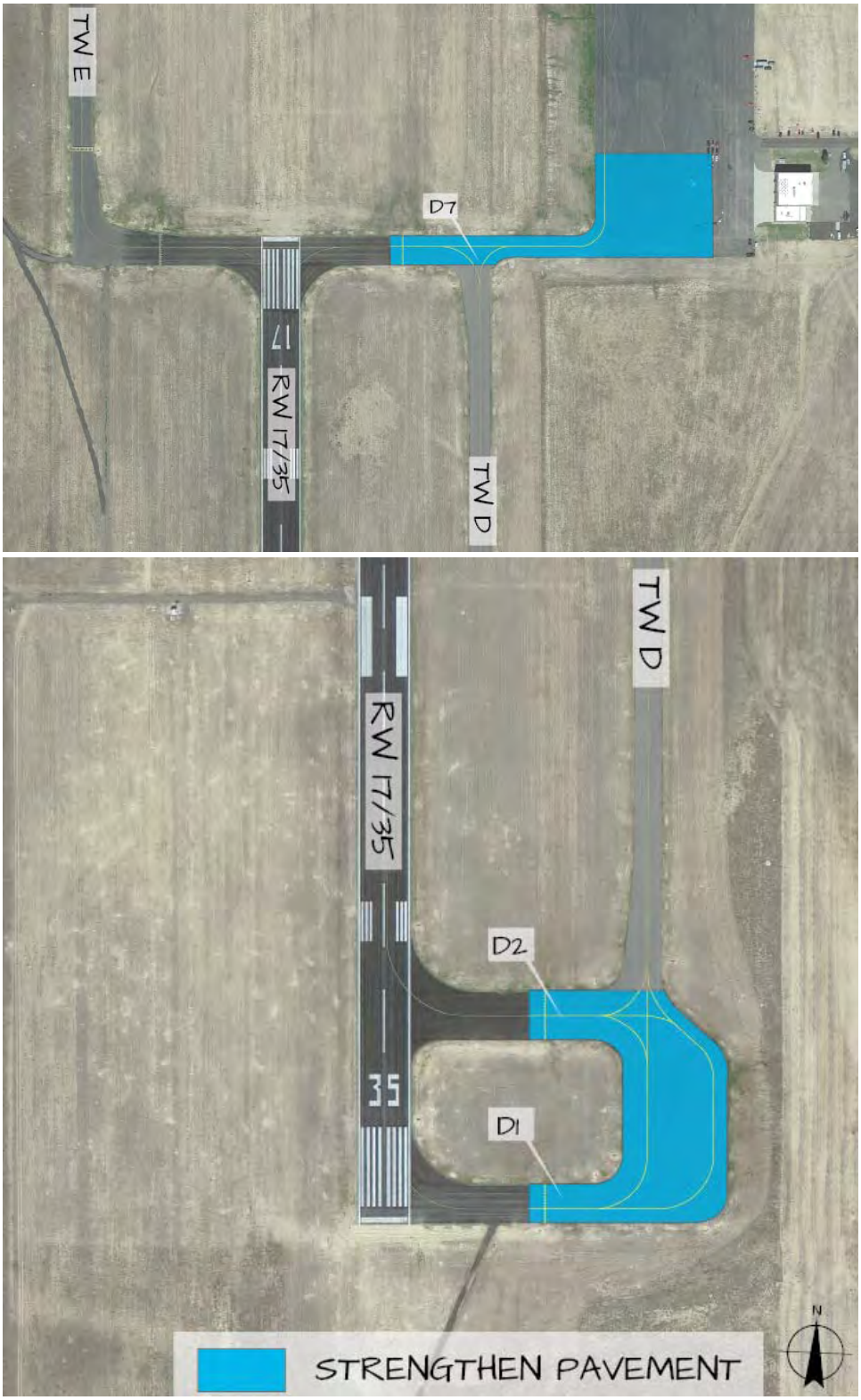
- Runway 8/26: 28,000 pounds (Single Wheel or SW), 40,000 pounds (Dual Wheel or DW)
- Runway 17/35: 34,000 pounds (SW), 75,000 pounds (DW)
- Taxiways: 28,000 pounds (SW), 40,000 pounds (DW)

Whereas the current design aircraft for FTG has been identified as a Bombardier Challenger 300 (a dual-wheel aircraft with a maximum takeoff weight of 38,850 pounds), the current pavement strengths have been deemed to be sufficient for the 20-year planning period.

However, as also recognized in **Chapter 4**, it is understood that Runway 17/35 likely has a pavement strength that significantly exceeds its reported capabilities. Additionally, the Airport has stated that it has had to turn away a limited number of larger general aviation aircraft (e.g., Bombardier Global Express, Gulfstream G650, Boeing Business Jet, etc.) that have maximum takeoff weights that exceed 95,000 pounds (DW). This runs contrary to the Airport's defined role as a Reliever Airport for general aviation aircraft and deprives FTG of potential revenue from those operations. Given those factors, it was recommended that the actual pavement strength of Runway 17/35 be established and that the updated strength be ultimately published.

Assuming that a larger weight-bearing capacity is documented for Runway 17/35, the Airport should also review the strength of associated taxiways, as their current weight bearing capabilities would likely be less than that of the runway. Since aircraft require appropriate pavement strength on taxiways as well as runways to operate at an airport, FTG may have to consider strengthening selected segments of Taxiway D and its connectors to permit such operations. Based on discussions with Airport management, for the limited number of additional aircraft operations that FTG would realize if the weight limit were to be raised, **Figure 5-8** shows those areas of pavement that would have to be strengthened.

FIGURE 5-8 - TAXIWAY STRENGTHENING AT FTG



Source: Jviation

In this scenario, larger general aviation aircraft are assumed to be operating on the East Apron (and not the Terminal Apron), requiring Taxiway D7 to be strengthened. Since some back-taxi operations would be required on Runway 17/35, Taxiways D1, D2, and the segment of Taxiway D connecting the two would have to be strengthened to form a "jug handle" to permit aircraft operating on the runway to turn around. This would eliminate the need for those aircraft to pivot on the runway itself, which could ultimately result in damage to the pavement under certain weather conditions (e.g., high pavement temperatures). The FTG AMP PAC supported this development recommendation.

Beyond the planning period or at the time of the next runway reconstructions, FTG should review its pavement requirements and consider potential strengthening options. Greater weight-bearing capacities would be consistent with its status as a general aviation reliever airport in combination with industry trends towards larger aircraft. Although not justified within this planning effort, it would be reasonable for FTG to ultimately consider the potential of strengthening Runway 8/26 to 60,000 pounds (DW) to accommodate most Group C aircraft. While a separate pavement strength analysis would be required for Runway 17/35 if it were to be extended in the future, it would be realistic to expect that its pavement strength would require a minimum of 100,000 pounds (DW) to accommodate the full range of general aviation aircraft into the future.

5.3.4 Airfield Visual Aids

Chapter 4 recommended that the Airport pursue the installation of medium-intensity taxiway lighting (MITLs) on Taxiways A, B, C, and E, as well as on their associated connector taxiways. Such lighting provides enhanced situational awareness to those operating on or around an airport, particularly during times of reduced visibility (i.e., nighttime, inclement weather, etc.). It is a safety-related enhancement and appropriate for a designated reliever airport like FTG. Installation of these lights would also be consistent with FAA AC 150/5340-30D, *Design and Installation Details for Airport Visual Aids*, which recommends MITLs on taxiways and aprons at airports where runway lighting systems are installed. FTG has runway lighting systems on both of its runways.

For the purposes of this analysis, there are only two alternatives: no-build and build. Based on the reasons explained above and supported by the FTG AMP PAC, it is recommended that MITLs be installed on the identified taxiways and selected aprons. Note that installation of this lighting system may be phased and/or coordinated with another future construction project.

Clearance of critical airspace surfaces is essential for the safe operation of a runway. Known penetrations to these surfaces must be addressed within a reasonable time frame to ensure that runways continue to maintain a safe operating condition.

5.3.5 Airspace Obstructions

As part of this AMP, an aerial survey was completed for FTG that complied with the requirements associated with FAA AC 150/5300-16A; FAA AC 150/5300-17C, ch 1; and FAA AC 150/5300-18B. In association with this effort and the creation of an ALP set, an obstructions analysis was conducted to establish an inventory of objects identified as obstructions to 14 CFR Part 77 airspace surfaces. In accordance with FAA criteria, any obstructions have been listed in the ALP set, as well as any proposed actions to eliminate or remediate these obstructions.

5.4 Landside & Airport Support Facilities Development Concepts & Alternatives

This section identifies development concepts and alternatives to address FTG's existing and future needs for landside and airport support facilities within the 20-year planning period. The following sections provide overviews of the alternative analyses for several of the landside infrastructure requirements as reflected in **Table 5-4**.

TABLE 5-4 - LANDSIDE FACILITY REQUIREMENTS SUMMARY

Facility	Identified Requirement
Aircraft Hangar Requirements	– Prepare for short-term T-hangar development – Preserve / refine hangar development modules
Aircraft Parking Aprons	– Redesign transient apron
Airport Security	– Construct security fence and perimeter road – Install access control – Establish Airport Security Committee
ARFF / SRE Facilities	– Construct an SRE/maintenance building of 6,400 square feet

Source: Jviation

5.4.1 Aircraft Hangar Development

Airport management has indicated that there is currently a demand for additional hangar storage specifically related to smaller and mid-sized T-hangars. As demonstrated in **Chapter 4**, there is a current deficiency in T-hangars and small box hangars that is projected to continue throughout the planning period. (Note that a surplus of larger box/corporate hangars was also identified over the same time period, meaning that some of the demand could conceivably be accommodated by larger hangars. For aircraft owners, this would likely be a function of the financial practicability of leasing a larger hangar than what they may require.) The current ALP shows a series of hangar development modules throughout the Airport designed to promote uniform and sequential growth. Within the existing Hangar Module 3, there is sufficient space available for future T-hangar and small box hangar development to accommodate demand throughout the planning period (see **Figure 5-9**).

FIGURE 5-9 - HANGAR DEVELOPMENT WITHIN MODULE 3 AND VICINITY

Source: Jviation

Additionally, through discussions with Airport management, some adjustments will be made to the terminal area hangar design configuration reflected in the current ALP. Specifically, the number of hangar development modules will be reduced and renumbered, and the suggested hangar development configurations of those yet-to-be constructed modules will be eliminated from the ALP. This is to provide the Airport with the maximum flexibility to market and develop those sites in the future (see **Figure 5-10**).

FIGURE 5-10 - UPDATED HANGAR DEVELOPMENT MODULES FOR THE ULTIMATE FTG ALP

Source: Jviation

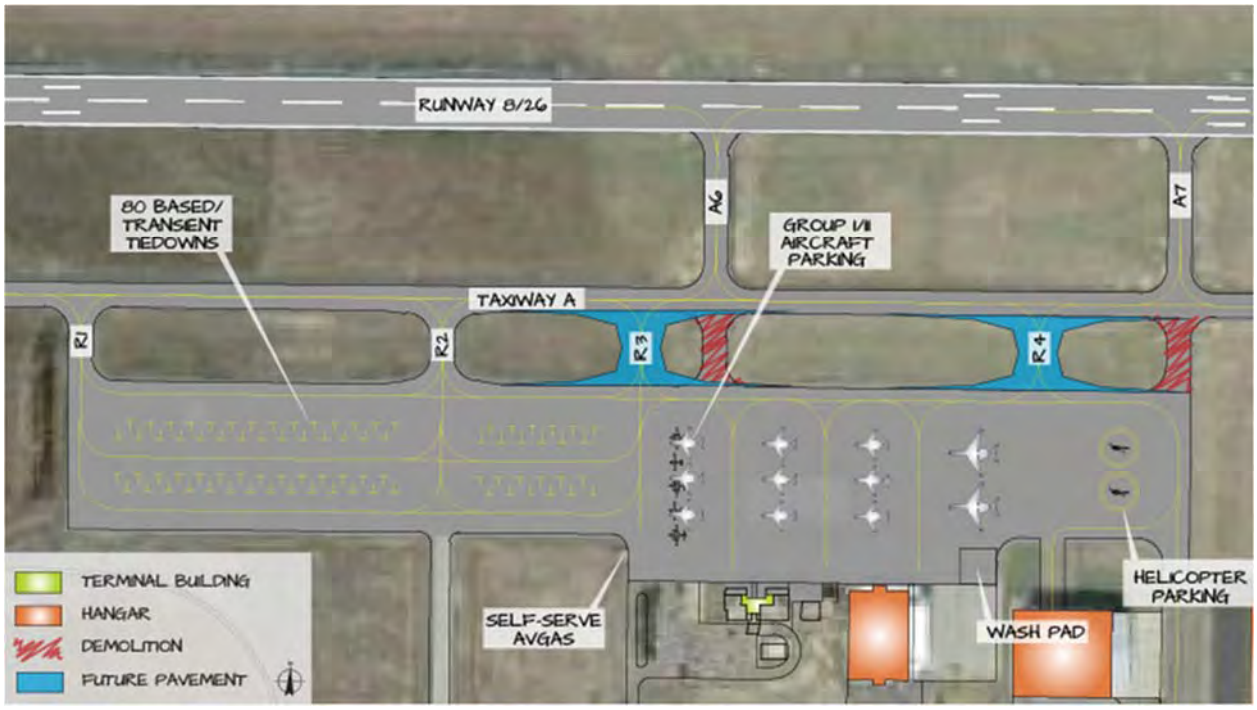
5.4.2 Terminal Apron Layout

The existing FTG Terminal Apron has nearly 775,000 square feet of pavement designed primarily to accommodate small general aviation aircraft. As discussed in **Chapter 4**, based on operational projections, the Airport is projected to have a surplus of apron space for both based and transient aircraft throughout the planning period. Accordingly, additional apron areas are not required.

However, it was also noted that two important aviation industry trends will likely have an impact on FTG's future apron operational requirements. First, as aircraft become more expensive to own, operate, and maintain, it is reasonable that a growing number of aircraft owners will want to house their investment inside a hangar and not keep them on tie-downs where aircraft are exposed to inclement and damaging weather. This trend is generating pressure for FTG to construct more T-hangars and creating an increasing surplus of tie-downs. Second, the most significant growth experienced in general aviation has been, and will continue to be, in larger, corporate turbine aircraft. These aircraft have different operational patterns than that of small general aviation aircraft (e.g., power-in/power-out transient parking, towing operations, a wide range of apron occupancy times, etc.) and require the apron to be designed and operated in different ways. This has compelled the Airport to consider new and more efficient ways to manage its Terminal Apron to

accommodate these aircraft and their operational requirements. Based on discussions with Airport administration, **Figure 5-11** presents an updated configuration for the Terminal Apron recommended for inclusion in the ALP.

FIGURE 5-11 - TERMINAL APRON RECOMMENDED REDESIGN



Source: Jviation

This apron development concept has several key features:

- The layout changes the primary focus of the eastern half of the Terminal Apron from accommodating based tie-down aircraft to accommodating transient aircraft. In doing so, this fundamentally alters the designing principles of the apron from one of rigidity to flexibility. Since transient operations are inherently uncertain in terms of aircraft types, aircraft numbers, operational missions, length of stay, etc., FTG's apron operations must become more flexible.
- The design preserves current operational patterns associated with accessing the existing hangar infrastructure, the self-serve fueling system, and the western apron tie-downs.
- The layout removes tie-downs from that eastern half of the Terminal Apron, as well as the area light poles located within the apron. (Note that based on the findings in **Chapter 4**, these tie-downs are not required to meet current or future demand.) It also preserves 80 tie-down locations, which exceeds the facility requirements for the planning period.
- On the eastern half of the apron, the aircraft traffic flow is reoriented from being primarily east-west to north-south. This change facilitates power-in/power-out aircraft operations that would follow lead-in lines scaled to accommodate up to Group II aircraft. This design feature would provide a more efficient flow and would minimize the need for the Airport to marshal

aircraft and/or conduct towing operations. The configuration would also improve passenger walking lines from the terminal to aircraft, and vice versa.

- The design effectively incorporates potential upgrades to the apron including two helicopter parking positions and an aircraft wash pad. Additionally, it reserves a relatively large area of apron for undefined use. This again provides the Airport with flexibility to respond to unforeseen demands.

While this development concept is subject to refinement and/or significant changes, it does demonstrate the effective potential of the Terminal Apron.

5.4.3 Airport Security & Perimeter Fencing

Chapter 4 recommends that FTG consider airport security enhancements that include the installation of fencing and access controls, as well as the potential installation of enhanced surveillance equipment. This was in response to FTG's need to:

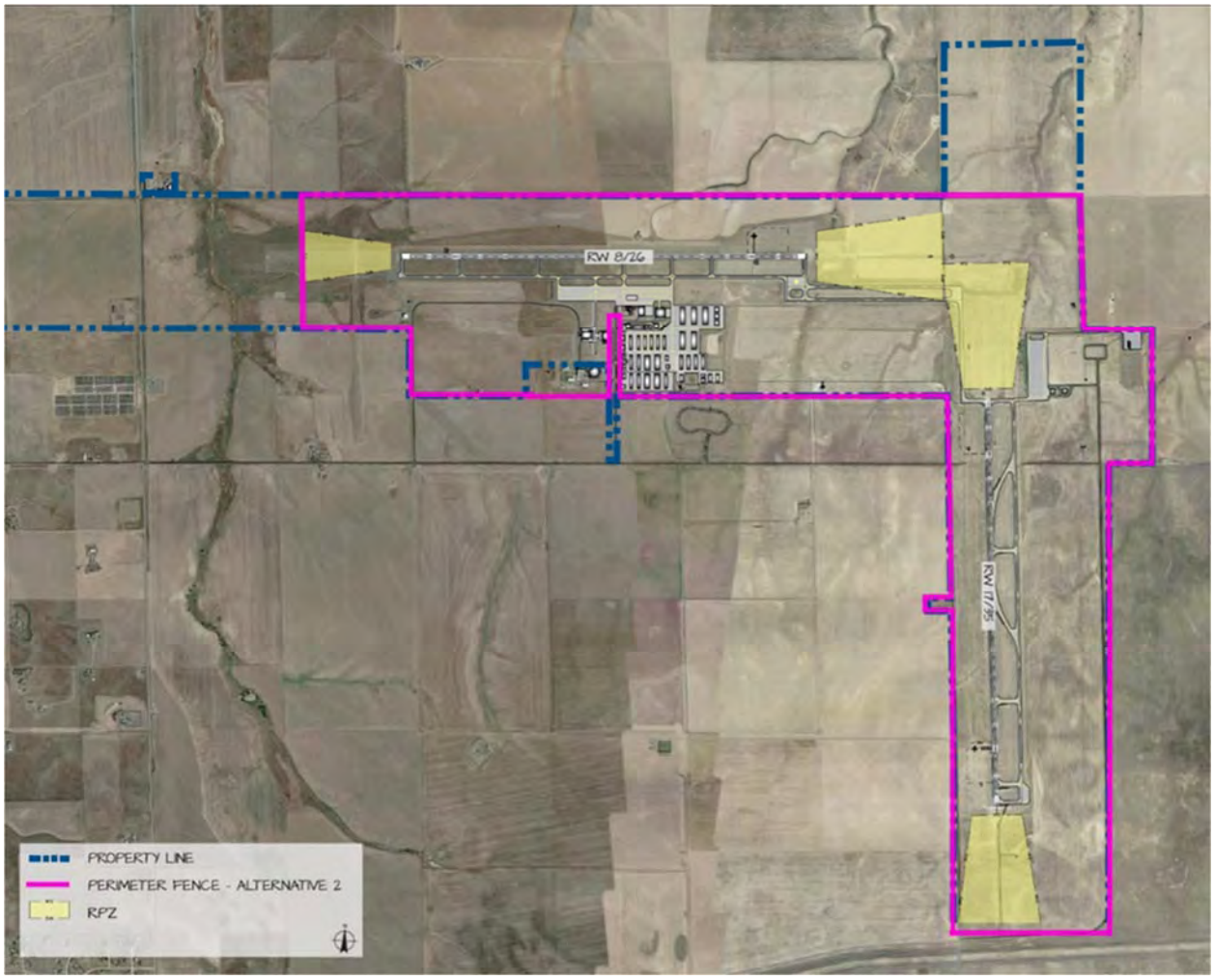
- Limit the ability of unauthorized persons and ground vehicles to access sensitive areas of airport property (i.e. Air Operations Area).
- Limit the ability to move between areas within the Air Operations Area.
- Separate/segregate persons and ground vehicles from aircraft, fueling facilities and other areas of concern.
- Potentially address future wildlife management concerns.

It should be noted that these recommendations are also supported by the 2011 Colorado Aviation System Plan, and the 2015 airport tenant survey that classified FTG's overall security primarily as being “average” to “poor.” Alternatives for security upgrades at FTG are described in the following descriptions:

Alternative 1 - No-Action. This would maintain FTG in its current state, which includes a lack of security fencing, security cameras, access controls to the Air Operations Area for individuals and vehicles, etc.

Alternative 2 - Full Perimeter Fencing. This alternative includes the installation of a perimeter fence around the Airport boundary. (It should be noted that the fencing would be designed to comply with TSA guidelines, but could also serve a secondary role in managing wildlife access to the Airport.) It is estimated that FTG will require approximately 90,600 linear feet of perimeter fencing to encompass the Airport (see **Figure 5-12**), in addition to a limited number of access control points (vehicle gates, personnel gates, electronically controlled or monitored points, etc.). The number of access points should be minimized in order to allow for their use and condition to be regularly monitored.

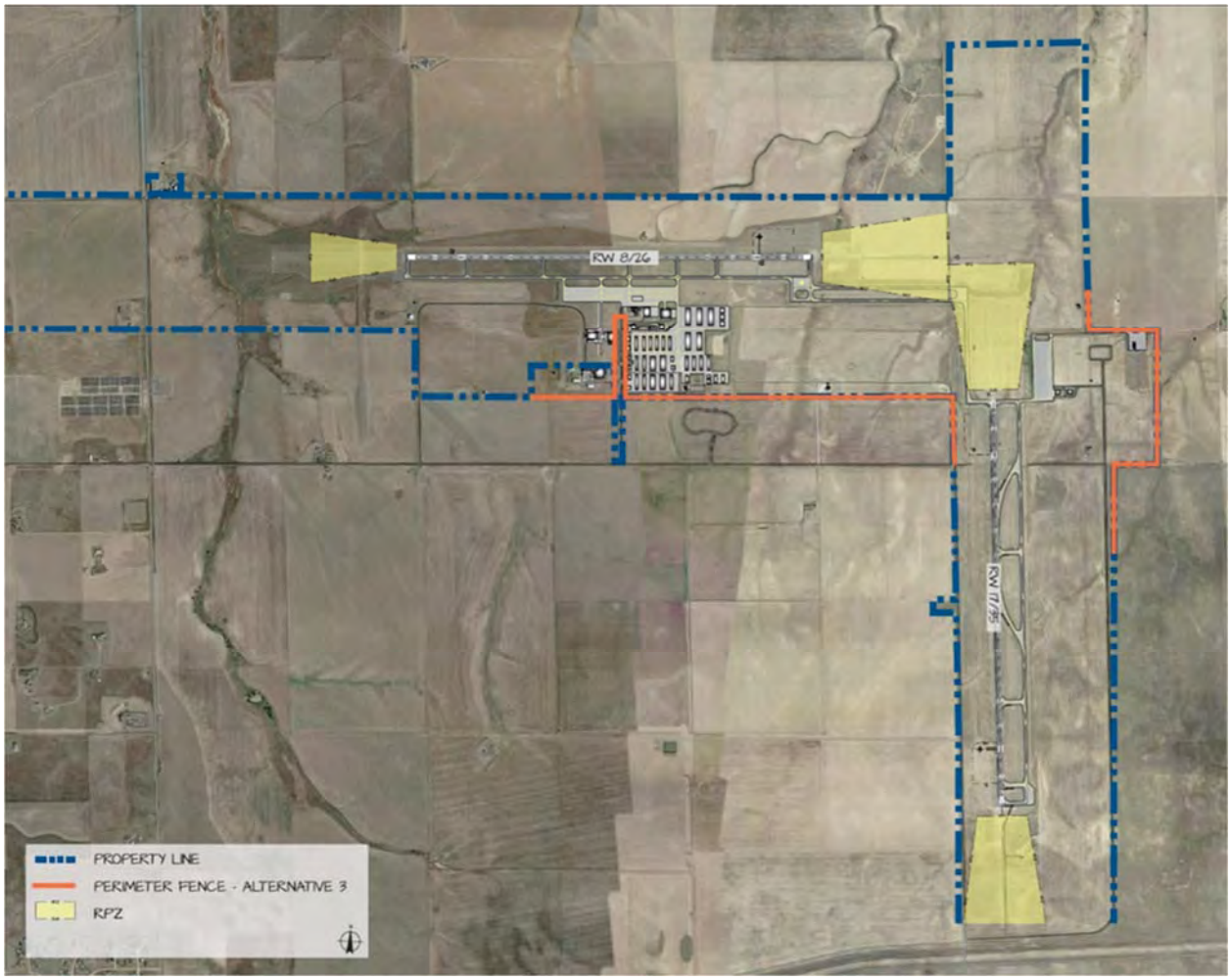
FIGURE 5-12 - PERIMETER SECURITY FENCING: ALTERNATIVE 2



Source: Jviation

Alternative 3 - Partial Perimeter Security Fencing. This alternative is based on the installation of perimeter fencing and access control points in areas with the most direct public interface, such as the terminal area, hangar areas, east apron, and areas abutting active public roadways (see **Figure 5-13**). This could also be viewed as a more cost-effective first phase in the ultimate construction of Alternative 2. While this partial fencing option does not protect all potential entry points, it would serve as a deterrent to unauthorized pedestrian and/or vehicle access by protecting the most critical areas on the Airport.

FIGURE 5-13 - PERIMETER SECURITY FENCING: ALTERNATIVE 3



Source: Jviation

Alternative 4 - Perimeter Surveillance. While not providing a physical barrier to unauthorized entry to the airfield, security or surveillance closed circuit television (CCTV) cameras can provide multiple views of the Airport and serve in either an active security role (through continual manned surveillance), or a passive role (by recording activities for potential review at a later time). If employing active security surveillance, use of security cameras could mitigate the need for a full perimeter security fence. Note that CCTV cameras could be installed in conjunction with, or as an alternative to Alternatives 2 and 3.

As a mechanism to evaluate these alternatives, the matrix in **Table 5-5** presents general advantages and disadvantages of each alternative, and considers them with respect to the evaluation criterion defined previously in this chapter.

TABLE 5-5 - AIRPORT SECURITY & PERIMETER FENCING COMPARISON MATRIX

	Alternative 1	Alternative 2	Alternative 3	Alternative 4
	No Action	Full Perimeter Security Fencing	Partial Perimeter Security Fencing	Perimeter Surveillance
Advantages	No cost	– Creates physical barrier to unauthorized entry – Protection of airfield, equipment, hangars, aircraft and NAVAIDs – Acts as wildlife deterrent	– Creates limited physical barriers to unauthorized entry – Limited protection of airfield, equipment, hangars, aircraft and NAVAIDs	– Scalable and flexible – Real time surveillance – Video record – Can be combined with other alternatives
Disadvantages	AOA remains open to unauthorized access by persons and/or vehicles	– Requires maintenance and some degree of monitoring – Highest cost	– Limited Airport perimeter protection – Requires limited maintenance and monitoring	– Could require a continuous manned personnel position – Utility infrastructure for installation.
Safety / Operational	– Does not secure airport or aircraft from unauthorized persons or vehicles – Wildlife remains undeterred	– Secures airport & operations – Deters wildlife incursions	– Deters unauthorized persons or vehicles – Wildlife remains undeterred	– Does not secure airport or aircraft from unauthorized persons or vehicles – Wildlife remains undeterred
Environmental	No impacts	Some environmental impacts anticipated	Limited environmental impacts anticipated	No significant environmental impacts anticipated
Economic*	$0	$2,400,000	$570,000	$60,000 **
Feasibility	Maintaining existing limited security measures is inadvisable over the long term	– Eligible for federal & state funding – Supports FAA wildlife management initiatives	– Eligible for federal & state funding – Provides significant short-term impact for reduced cost	Eligible for federal & state funding

Source: Jviation
* Cost estimates are in 2017 dollars.
** Cost does not include security staff positions for active monitoring

Through coordination and consultation with the FTG AMP PAC regarding these four alternatives, Alternative 1 was eliminated since it did not adequately address the safety and security issue that is likely to become more important over time. The PAC noted that the remaining three alternatives could be viewed as a phased approach to providing an appropriate level of security at FTG over the long term. Specifically, all or parts of Alternative 3 could be implemented in the short term to provide immediate physical solutions to discourage unauthorized entrance to the Air Operations Area by vehicles and/or pedestrians in areas most accessible to the general public. Depending on funding availability, any remaining sections of that alternative and/or Alternative 2 could be progressively constructed. Additionally, dependent on Airport priorities, Alternative 4 could be instituted separately or in conjunction with the other alternatives. Supported by the PAC, this was the final recommendation.

5.4.4 Airport Support Facilities

Chapter 4 discusses the Airport's reported need for additional Snow Removal Equipment (SRE) and Airfield Maintenance storage capacity, since it currently keeps some SRE vehicles located outside and exposed to the weather. However, it is important to note these particular pieces of equipment are in excess of that required under FAA AC 150/5220-20, *Airport Snow and Ice Control Equipment*, FAA AC 150/5200-30C, *Airport Winter Safety Operations*, and FAA AC 150/5220-10E, *Guide Specification for Aircraft Rescue and Fire Fighting (ARFF).* Per FAA standards, FTG not only currently has the required amount of SRE and ARFF equipment based on its

current and projected operations and airfield paved area, but it also has the appropriate amount of storage to accommodate that equipment. Beyond those prescribed FAA minimum requirements, FTG has accumulated additional pieces of equipment which it currently utilizes for airfield maintenance and snow removal operations. While it is understood that the FAA will not fund further storage space for these additional pieces of equipment, the Airport still considers this equipment to be critical to its operation and wishes to protect it from the elements. The supplementary storage space requirements are assumed to be approximately 80 feet by 80 feet (6,400 square feet) and will be required within the planning period.

The following alternatives have been identified for consideration:

Alternative 1 - No-Action. This would maintain FTG in its current state with SRE and airfield maintenance equipment remaining outside in the weather.

Alternative 2 - Existing Facility Expansion. This alternative would construct a new 6,400-square-foot structure of covered storage space near the existing SRE and ARFF facilities. It would also include the construction of a reasonable amount of associated apron (see **Figure 5-14**).

Alternative 3 - New Facility Location. This alternative would site a new 15,000-square-foot storage structure in a location separate from the existing facilities. The new location would be more centralized to the Airport, providing more efficient airfield access and effective response times. The Airport has said that while acceptance of this alternative would be beneficial for its long-term operational efficiency, there would be short-term challenges in managing their operations, which would be located in two locations. Note that this alternative would also require greater site work, extension of utilities, new associated apron areas, and the construction of two new access roads to support the facility (see **Figure 5-14**).

Table 5-6 presents the general advantages and disadvantages of each alternative, and considers them with respect to the evaluation criterion defined previously in this chapter.

FIGURE 5-14 - AIRPORT SUPPORT FACILITIES ALTERNATIVES

Source: Jviation

TABLE 5-6 - AIRPORT SUPPORT FACILITIES COMPARISON MATRIX

	Alternative 1	Alternative 2	Alternative 3
	No Action	Existing Location Expansion	New Facility Location
Advantages	No cost	– Maintenance/SRE storage facilities will be in same location to promote operational efficiency and personnel will be in close proximity to ARFF vehicles – Will use existing pavement footprint – Existing utilities available	– Initiates eventual relocation of SRE and ARFF facilities – Preserves long-term development area – Site would eliminate operational requirements to cross runways and provide more immediate management by airport administration
Disadvantages	Additional equipment will continue to deteriorate due to weather exposure.	Federal funding likely not available	– Requires new vehicle access route and site development, including utilities – No fueling facilities in close proximity at this proposed location – SRE operations would will be separated – Federal funding likely not available
Safety / Operational	If equipment degrades such that it is unusable, level of airport service could decline.	Maintains current level of operations	Maintains current level of operations
Environmental	No impacts	No significant environmental impacts anticipated	Some environmental impacts anticipated due to new site development
Economic*	$0	$673,000	$4,289,000
Feasibility	No impacts	May be eligible for CDOT funding, though likely not FAA funding	May be eligible for CDOT funding, though likely not FAA funding

Source: Jviation
* Cost estimates are in 2017 dollars.

With respect to planning beyond 20 years and related to Alternative 3, the Airport should also identify and preserve a location for future SRE and ARFF facilities for the very long term. The current facilities are not ideally located to maximize the efficiency of its SRE and airfield maintenance operations, nor does the siting for ARFF structure meet the response requirements for enhanced levels of service (which could potentially be required in the future). Therefore, the Ultimate ALP should also include potential building sites for relocated SRE and ARFF facilities in order to maintain their possible use in the future. Through discussions with the Airport, a site located west of Taxiway E was identified to be reserved for potential future SRE, ARFF, and airfield maintenance facilities. This site is ideally located in a centralized area to maximize operational efficiency.

5.5 Miscellaneous Planning Recommendations

In addition to the alternative presented above, there are several planning recommendations that require description prior to their inclusion in the following two chapters.

5.5.1 Spaceport Colorado

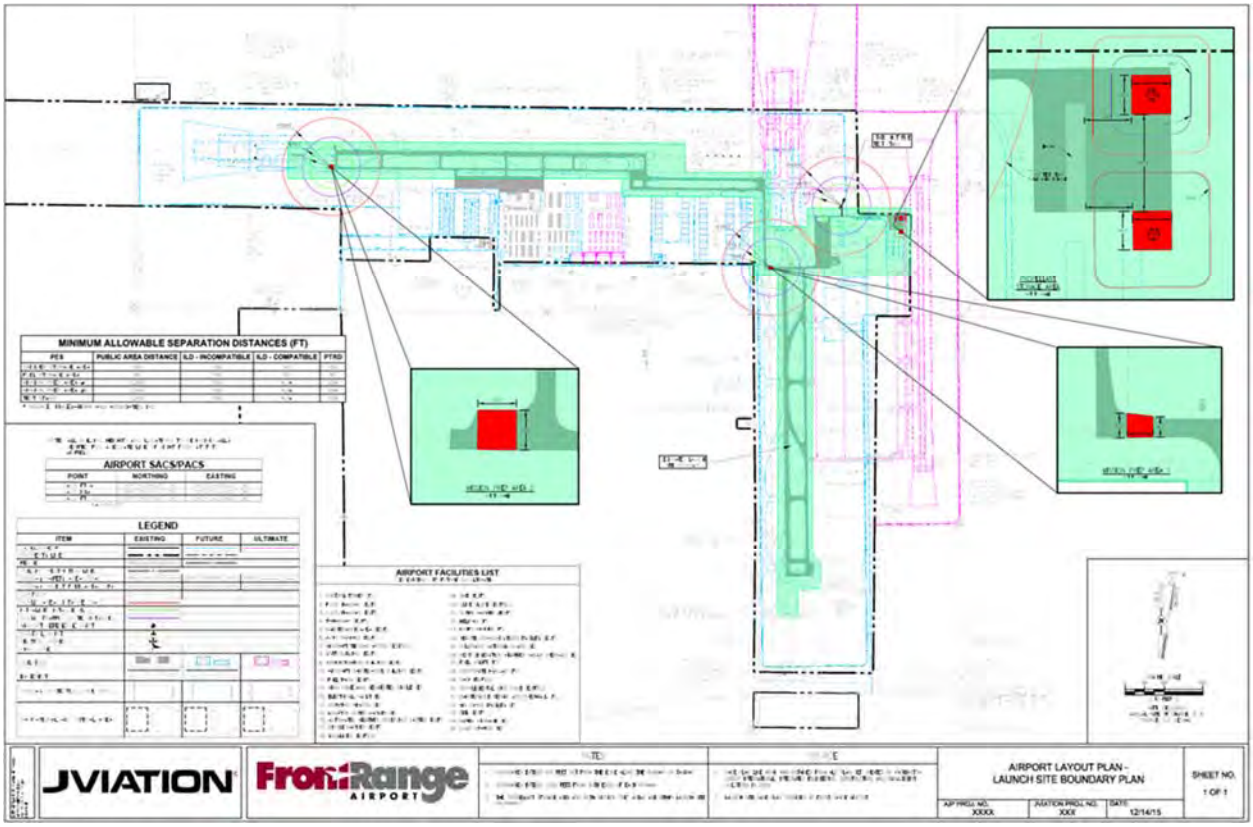
Front Range Airport is actively engaged with the FAA's Office of Commercial Space Transportation for a Commercial Launch Site Operator License to conduct spaceport launch activities based on a horizontal takeoff, horizontal landing, manned, reusable launch vehicle (RLV) based at FTG. In that the commercial space launch business is still in its embryonic stage, the process for securing that license is not firmly established and can be subject to a wide range of operational variables and federal

concerns. This is particularly true for an airport like FTG that is working to combine traditional public use aviation activities with RLVs. (Note that Cecil Field in Florida and Clinton-Sherman Industrial Airpark in Oklahoma are the only two public use airports in the United States that have licensed spaceport facilities.) The challenge facing FTG is how to integrate these vastly different types of operations in a safe and effective manner while still preserving and promoting the Airport's fundamental role within the National Aviation System.

For FTG, through discussions with the FAA Airports Division, it was determined that areas required for potential spaceport use (as detailed in the Airport's spaceport application) should simply be reserved for their potential future use (see **Figure 5-15**). Note that the only permanent facilities required under current planning assumptions include fuel and oxidizer storage areas located on the northeast corner of the east apron. It is estimated that this site will be approximately 4.5 acres in size (650 feet by 300 feet). The remaining two sites are operational in nature (i.e., mission prep areas) and will not require any physical support facilities.

Inclusion of these areas on the ALP should not be interpreted as an official endorsement of the plans detailed in the application by FAA Airports Division, only that these areas should be held apart from development to preserve them for potential future use in spaceport operations. Also, potential airfield infrastructure improvements required solely for spaceport operations are not eligible to be funded through the FAA Airport Improvement Program (AIP). Also note that if these areas were to ultimately be utilized for spaceport operations, they could be subject to an official FAA release of airport property process as detailed in FAA Order 5190.6B, *Airport Compliance Manual*.

FIGURE 5-15 - FTG LAUNCH SITE BOUNDARY PLAN



Source: Jviation

5.5.2 Pavement Management Recommendations

Appropriate pavement maintenance is critical to ensure the operational and financial sustainability of any airport. Because of the significant financial commitment required to maintain pavement, it is critical that an airport establish a long-term preservation and maintenance plan. This plan will consist of annual inspections, regular crack sealing, fog sealing every four years, and ultimate pavement rehabilitation or reconstruction no sooner than 20 years after the pavement's last rehabilitation or reconstruction (the 20-year requirement is current FAA policy). FTG's current pavement age and the anticipated year of its next reconstruction is included in **Table 5-7**. Specific recommendations will be incorporated into the FTG CIP in **Chapter 7**.

TABLE 5-7 - MAJOR PAVEMENT REHABILITATION SCHEDULE

Pavement Area	Year of Last Construction and/or Rehabilitation	Year of Earliest Scheduled Construction and/or Rehabilitation
Runway 08/26	2012	2032
Runway 17/35	2004	2024
Taxiway A	2014	2034
Taxiways A3-A9	2014	2034
Taxilanes – R1 – R2	 2014 2012	 2034 2022

Pavement Area	Year of Last Construction and/or Rehabilitation	Year of Earliest Scheduled Construction and/or Rehabilitation
Terminal Apron		
– West	2009	2029
– East	1999	2019
– Concrete Pad	1999	2019
Taxiway C	1999	2019
Taxiways C1 & C2	1999	2019
Taxiway B	2012	2032
Taxiway E	2012	2032
Taxiway E7	2012	2032
Taxiway D	2009	2029
Taxiways D1-D7 (East half / West half)	2009 (East half) 2004 (West half)	2029
East Apron	1992	2012*
Auto parking paved lots	1992	2012*
Airport access roads		
– Front Range Parkway	1992	2012*
– Manila Road	1992	2012*

Source: Jviation, Airport Administration
*These areas are over-due on pavement maintenance

5.6 Non-Aeronautical Development

In addition to the development alternatives presented above, there are other potential development options requiring consideration prior to their inclusion in the plan. In the sponsor grant assurances, the FAA has stated that airports should be as financially self-sufficient as possible. One way of meeting that goal is for airports to develop property that has been designated as surplus for aeronautical purposes. Property designated as surplus for aeronautical purposes must be shown on the ALP as such and approved by the FAA. Any non-aeronautical development must be fully compatible with airport operations and could be subject to an official FAA release of airport property process as detailed in FAA Order 5190.6B, *Airport Compliance Manual*. Additionally, the FAA requires that any airport property used for non-aeronautical purposes must be leased at fair market value, and as a result could potentially generate significant amounts of revenue for FTG. Such development could include commercial, light industrial, storage, etc.

It is critical to note that through this master planning process, it has been established that FTG has property in excess of what has been projected to be needed within the 20-year planning window and beyond. Therefore, the Airport could consider the integration of non-aeronautical related development into its overall development and financial plans. However, it must also be recognized that once an airport and the FAA releases airport property for non-aeronautical development, it is often very difficult to return that property to aeronautical use. Thus, the Airport must be extremely thoughtful in identifying areas for non-aeronautical uses, focusing largely on properties that lie outside of any airport critical operational areas and away from prime aviation-related development areas (e.g., terminal area, flight line, etc.). Such non-aeronautical development areas will be identified on the ALP.

5.6.1 Equipment Replacement Schedule

Like pavement maintenance, it is important that an airport establish a long-term maintenance and replacement plan for its critical airfield equipment. As described in previous chapters, FTG has a wide variety of Aircraft Rescue and Firefighting Equipment (ARFF), Snow Removal Equipment (SRE), airfield maintenance equipment, Ground Support Equipment (GSE), and other airport support vehicles. This section focuses exclusively on vehicles eligible for FAA AIP funding for replacement, which is limited to SRE. **Table 5-8** lists FTG's current SRE, its age and the anticipated year of its replacement. Specific recommendations have been incorporated into the FTG CIP in **Chapter 7**.

TABLE 5-8 - AIRFIELD EQUIPMENT REPLACEMENT SCHEDULE

Vehicle	Year	Eligible for Replacement	Notes
Oshkosh P-Series Truck 1	1993	2003*	Scheduled for replacement in 2020 per FTG CIP
Oshkosh P-Series Truck 2	1993	2003*	Eligible for replacement & federal funding per FAA Order 5100.38D
Stewart Stevenson Broom 1	1996	2006*	Eligible for replacement & federal funding per FAA Order 5100.38D
Stewart Stevenson Broom 2	1996	2006*	Eligible for replacement & federal funding per FAA Order 5100.38D
Case 821 C Loader	2001	2011*	Scheduled for replacement in 2017 per FTG CIP
International Paystar Broom 1	1993	2003*	Scheduled for replacement in 2023 per FTG CIP
International Paystar Broom 2	1994	2004*	Eligible for replacement & federal funding per FAA Order 5100.38D
International Plow Truck	1993	2003*	Scheduled for replacement in 2020 per FTG CIP
Oshkosh Blower 1	1983	1993*	Eligible for replacement & federal funding per FAA Order 5100.38D
Oshkosh Blower 2	1987	1997*	Eligible for replacement & federal funding per FAA Order 5100.38D
Oshkosh Broom	2003	2013*	Eligible for replacement & federal funding per FAA Order 5100.38D

Source: Jviation, Airport Administration
*These vehicles are potentially over-due for replacement

5.7 Recommended Development Plan

Recommended airside and landside alternatives are aligned with forecasted operations and based aircraft and to allow the Airport space to accommodate additional hangars and other landside development. Utilizing the evaluation of alternatives described in the previous sections, feedback from Airport staff, and the PAC (made up of key tenants and stakeholders), future improvements have been summarized in **Table 5-9**.

Table 5-9 also includes key inputs for the ALP that will directly result from this Master Plan, and for an Ultimate ALP that will be included in the set. Again, the purpose of an Ultimate ALP is to protect for future potential development beyond the 20-year

planning period, and any projects included on that sheet should not be interpreted as being endorsed or funded by the FAA.

TABLE 5-9 - RECOMMENDED DEVELOPMENT PLAN

Development	Master Plan Recommendations	Ultimate ALP Recommendations
Airside Development		
Runway 8/26	No change	Show runway extension and widening
Runway 17/35	No change	Show runway extension and widening
Taxiway System	No change	Show taxiway system expansion
Taxiways A6 & A7	Alternative 3	Create islands by removing apron pavement
Taxiway D7	Alternative 3	Create island by removing apron pavement
Taxiway E	Alternative 2	Alternative 3 (in association with Runway 17/35 extension)
Airfield Pavement Strength	Selected strengthening to accommodate large business jets	N/A
Visual Aids	Install MITLs	N/A
Airspace Obstructions	Remove / mitigate obstructions as required	N/A
Landside / Other Development		
Hangar Development	Construct hangars as required/planned	Consolidate modules
Terminal Apron	Reconfigure apron	N/A
Airport Security	Alternative 3	Alternative 2
Airport Support Facilities	Alternative 2	Alternative 3
Spaceport	Preserve required areas as “nonaeronautical development”	N/A
Airfield Equipment	Replace as required	N/A

Source: Jviation

These projects will be carried through the rest of the Master Plan study for further evaluation and depiction on the Airport Layout Plan, presented in the next chapter. The final chapter will estimate costs and financial resources available to fund recommended projects.

5.8 Environmental Review

The analysis of potential environmental impacts as a result of airport development projects is a crucial part of the master planning process. Early consideration of potential impacts can allow for more accurate project budgets and schedules. This Master Plan integrated the evaluation of environmental impacts throughout each chapter, specifically looking at the potential impacts future development projects may have on existing environmental resources. Through the environmental analysis completed as part of this Master Plan, potential environmental impacts were recognized and taken into consideration when determining preferred alternatives.

Per the National Environmental Policy Act (NEPA) and FAA Orders 1050.1F Environmental Impacts: Policies and Procedures and 5050.4B National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions, airport development

projects must be evaluated for environmental impacts. FAA Order 1050.1F specifically defines what level of environmental review is required. Typically, there are four levels of NEPA review depending on the scope and potential environmental impacts of the proposed action. These include FAA internal memo, documented categorical exclusions (CATEX), environmental assessments (EA), and environmental impact statements (EIS):

- **FAA Internal Memo**. Projects that can be categorically excluded per FAA Order 1050.1F and per FAA knowledge of the airport and project do not require documented analysis of each environmental category. The FAA issues a list of projects internally reviewed each year; these projects will likely be included on that list.
- **Documented CATEX**. Projects that can be categorically excluded per FAA Order 1050.1F; however, the FAA requires documented analysis of potential impacts to environmental resources.
- **EA**. Projects that can normally be categorically excluded but involve extraordinary circumstances; cannot be categorical excluded; do not require an EIS; that do not create significant environmental impacts; or may create significant impacts, but the impacts can be mitigated.
- **EIS**. Projects that were evaluated in an EA and it was found that the project would result in impacts greater than the allowable significance threshold and that mitigation would not reduce the impacts below the threshold. It is not anticipated that any projects at FTG will require an EIS.

FTG is located in an area with minimal environmental resources as discussed previously; as such it is not anticipated that any of the proposed development projects would result in significant environmental impacts. Based on a review of projects in the recommended plan and the environmental resources inventoried in **Chapter 2**, some environmental documentation may be required for each project. The likely environmental documentation required for each project has been included in **Chapter 7** which includes detailed descriptions of the projects included in the 20-year planning window. It should be noted that this is a high-level evaluation of environmental documentation requirements; all projects should be coordinated with the FAA who will make the final decision on the level of environmental documentation needed.

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6.0 AIRPORT LAYOUT PLAN

The future development plan for the Front Range Airport (FTG or the Airport) has evolved through a progressive analysis in the Airport Master Plan (AMP) that started with establishing a baseline of current data for the airport, to the development of aviation demand forecasts that were translated into long-term airport facility requirements, which then resulted in an alternatives analysis to establish an appropriate path for airport development into the long-term future. That future development plan then must be translated to the Airport Layout Plan (ALP) drawing set, which is a graphical depiction of the Airport's existing conditions including building facilities, pavements, airspace and obstructions as well as proposed future development for the 20-year planning period. The ALP is intended to provide guidance for the Airport, federal and state agencies and consultants for short-term and long-term capital improvement projects at the Airport. The ALP drawings were prepared in compliance with Federal Aviation Administration (FAA) Standard Operating Procedure (SOP) 2.00, *Standard Procedure for FAA Review and Approval of Airport Layout Plans (ALPs).*

The following pages, although not to scale, are an 11" x 17" version of the ALP sheet set. The actual 24" x 36" scaled version of the ALP sheet set has been provided to the FAA, the CDOT Division of Aeronautics, and Adams County for official approval and signature. The FTG ALP set is comprised of the following plan sheets:

- Sheet 1 - Title Sheet
- Sheet 2 - Data Sheet
- Sheet 3 - Airport Layout Plan – Existing and Future
- Sheet 4 - Airport Layout Plan - Ultimate
- Sheet 5 - Terminal Area Plan
- Sheet 6 - Airport Airspace Drawing
- Sheet 7 - Airport Airspace Profile
- Sheet 8 - Obstruction Data Table
- Sheet 9 - Runway 8 Inner Approach
- Sheet 10 - Runway 26 Inner Approach
- Sheet 11 - Runway 17 Inner Approach

- Sheet 12 - Runway 35 Inner Approach
- Sheet 13 - Runway 8 Departure
- Sheet 14 - Runway 26 Departure
- Sheet 15 - Runway 17 Departure
- Sheet 16 - Runway 35 Departure
- Sheet 17 – Land Use Plan
- Sheet 18 – Exhibit A Property Map

FRONT RANGE AIRPORT

WATKINS, CO

AIRPORT LAYOUT PLAN DRAWING SET
SEPTEMBER 2019

LOCATION MAP
NOT TO SCALE

VICINITY MAP
NOT TO SCALE

NOT TO SCALE

INDEX OF DRAWINGS		
SHEET NO.	TITLE	REVISION DATE
01	TITLE SHEET	
02	AIRPORT DATA SHEET	
03	AIRPORT LAYOUT PLAN	
04	AIRPORT LAYOUT PLAN - ULTIMATE	
05	TERMINAL AREA DRAWING	
06	AIRPORT AIRSPACE DRAWING - 1	
07	AIRPORT AIRSPACE DRAWING - 2	
08	AIRPORT AIRSPACE PROFILES	
09	RUNWAY 8 INNER APPROACH SURFACE DRAWING	
10	RUNWAY 26 INNER APPROACH SURFACE DRAWING	
11	RUNWAY 17 INNER APPROACH SURFACE DRAWING	
12	RUNWAY 35 INNER APPROACH SURFACE DRAWING	
13	RUNWAY 8/26 DEPARTURE SURFACE DRAWING	
14	RUNWAY 17/35 DEPARTURE SURFACE DRAWING	
15	LAND USE PLAN	
16	EXHIBIT A - PROPERTY MAP	
17	EXHIBIT A - PROPERTY MAP TABLES	
18	LAUNCH SITE BOUNDARY PLAN	

SPONSOR APPROVAL
ADAMS COUNTY
TITLE
DATE

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Sep 18, 2019 - 11:42am
Sean.Jarvis

JVIATION®

Front Range AIRPORT

DES: S.G.J.
DR: S.G.J.
CH: J.B.M.
APP: J.B.M.

ISSUE RECORD			
NO.	BY	DATE	DESCRIPTION

AIRPORT
LAYOUT PLAN

TITLE SHEET

AIP PROJ. NO.	JVIATION PROJ. NO.	DATE:
3-08-0016-040-2015	2015.FTG.03	SEPTEMBER 2019

SHEET NO.
01 of 18

RUNWAY DATA TABLE

	RUNWAY 8/26						RUNWAY 17/35					
	EXISTING		FUTURE		ULTIMATE		EXISTING		FUTURE		ULTIMATE	
RUNWAY DESIGN CODE (RDC)	C-II-2400		SAME		C-III-2400		C-II-2400		SAME		C-III-2400	
RUNWAY LENGTH AND WIDTH	8,000' X 100'		SAME		10,000' X 150'		8,000' X 100'		SAME		12,000' X 150'	
RUNWAY SURFACE COMPOSITION	ASPHALT		SAME		SAME		ASPHALT		SAME		SAME	
PAVEMENT DESIGN STRENGTH (LBS)												
SINGLE WHEEL GEAR (SWG)	28,000		SAME		90,000		34,000		SAME		90,000	
DUAL TANDEM WHEEL GEAR (DTWG)	40,000		SAME		250,000		75,000		SAME		250,000	
PERCENT EFFECTIVE GRADIENT	0.4%		SAME		SAME		0.5%		SAME		SAME	
PCN	12/F/B/Y/U		SAME		SAME		12/F/B/Y/U		SAME		SAME	
SURFACE TREATMENT	NONE		SAME		SAME		NONE		SAME		SAME	
PERCENT WIND COVERAGE												
10.5 KNOT ALL WEATHER	85.55%		SAME		SAME		92.74%		SAME		SAME	
13 KNOT ALL WEATHER	91.15%		SAME		SAME		95.85%		SAME		SAME	
16 KNOT ALL WEATHER	97.11%		SAME		SAME		98.40%		SAME		SAME	
20 KNOT ALL WEATHER	98.97%		SAME		SAME		99.41%		SAME		SAME	
RUNWAY SAFETY AREA (RSA)												
WIDTH	500'		SAME		SAME		500'		SAME		SAME	
LENGTH BEYOND RUNWAY END	1,000'		SAME		SAME		1,000'		SAME		SAME	
RUNWAY OBJECT FREE AREA (ROFA)												
WIDTH	800'		SAME		SAME		800'		SAME		SAME	
LENGTH BEYOND RUNWAY END	1,000'		SAME		SAME		1,000'		SAME		SAME	
RUNWAY OBSTACLE FREE ZONE (ROFZ)												
WIDTH	400'		SAME		SAME		400'		SAME		SAME	
LENGTH BEYOND RUNWAY END	200'		SAME		SAME		200'		SAME		SAME	
RUNWAY END DATA	**8**	**26**	**8**	**26**	**8**	**26**	**17**	**35**	**17**	**35**	**17**	**35**
RUNWAY END ELEVATION (MSL)	5,453.42'	5,489.12'	SAME	SAME	5,438.12'	SAME	5,476.49'	5,515.19'	SAME	SAME	5,455.21'	SAME
RUNWAY END COORDINATES	LAT: N39°47'38.42" LONG: W104°33'54.88"	LAT: N39°47'36.82" LONG: W104°32'12.44"	SAME	SAME	LAT: N39°47'38.82" LONG: W104°34'20.50"	SAME	LAT: N39°47'08.14" LONG: W104°31'27.25"	LAT: N39°45'49.10" LONG: W104°31'27.23"	SAME	SAME	LAT: N39°47'47.68" LONG: W104°31'27.27"	SAME
TOUCHDOWN ZONE ELEVATION (MSL)	5,469.96'	5,489.12'	SAME	SAME	5,458.16'	SAME	5,491.15'	5,515.19'	SAME	SAME	5,470.01'	SAME
DISPLACED THRESHOLD ELEVATION (MSL)	N/A	N/A	SAME	SAME	SAME	SAME	N/A	N/A	SAME	SAME	SAME	SAME
DISPLACED THRESHOLD DISTANCE	N/A	N/A	SAME	SAME	SAME	SAME	N/A	N/A	SAME	SAME	SAME	SAME
DISPLACED THRESHOLD COORDINATES	N/A	N/A	SAME	SAME	SAME	SAME	N/A	N/A	SAME	SAME	SAME	SAME
APPROACH RUNWAY PROTECTION ZONE												
INNER WIDTH	500'	1,000'	SAME	SAME	1,000'	SAME	1,000'	1,000'	SAME	SAME	SAME	SAME
LENGTH	1,700'	2,500'	SAME	SAME	1,700'	SAME	2,500'	2,500'	SAME	SAME	SAME	SAME
OUTER WIDTH	1,010'	1,750'	SAME	SAME	1,510'	SAME	1,750'	1,750'	SAME	SAME	SAME	SAME
DEPARTURE RUNWAY PROTECTION ZONE												
INNER WIDTH	500'	1,000'	SAME	SAME	SAME	SAME	1,000'	1,000'	SAME	SAME	SAME	SAME
LENGTH	1,700'	2,500'	SAME	SAME	SAME	SAME	2,500'	2,500'	SAME	SAME	SAME	SAME
OUTER WIDTH	1,010'	1,750'	SAME	SAME	SAME	SAME	1,750'	1,750'	SAME	SAME	SAME	SAME
RUNWAY MARKING	PRECISION	PRECISION	SAME	SAME	SAME	SAME	PRECISION	PRECISION	SAME	SAME	SAME	SAME
APPROACH CATEGORY (14 CFR PART 77)	20:1	50:1	SAME	SAME	34:1	SAME	50:1	50:1	SAME	SAME	SAME	SAME
APPROACH TYPE (14 CFR PART 77)	VISUAL	PRECISION	SAME	SAME	NON-PRECISION	SAME	PRECISION	PRECISION	SAME	SAME	SAME	SAME
VISIBILITY MINIMUMS	VISUAL	1/2 MILE	SAME	SAME	>3/4 MILE	SAME	3/4 MILE	1/2 MILE	SAME	SAME	1/2 MILE	SAME
TYPE OF AERONAUTICAL SURVEY FOR APPROACH	NOT VERTICALLY GUIDED	VERTICALLY GUIDED	SAME	SAME	VERTICALLY GUIDED	SAME	VERTICALLY GUIDED	VERTICALLY GUIDED	SAME	SAME	SAME	SAME
APPROACH THRESHOLD SITING CRITERIA (TSC) (FAA AC 150/5300-13A, TABLE 3-2)	400' x 1,000' x 1,500' 20:1	800' x 3,400' x 10,000' 34:1 AND 300' x 1,520' x 10,000' 30:1	SAME	SAME	400' x 3,400' x 10,000' 20:1 AND 300' x 1,520' x 10,000' 30:1	SAME	400' x 3,400' x 10,000' 20:1 AND 300' x 1,520' x 10,000' 30:1	800' x 3,400' x 10,000' 34:1 AND 300' x 1,520' x 10,000' 30:1	SAME	SAME	800' x 3,400' x 10,000' 34:1 AND 300' x 1,520' x 10,000' 30:1	SAME
RUNWAY DEPARTURE SURFACE (FAA AC 150/5300-13A, TABLE 3-2)	YES	YES	SAME	SAME	SAME	SAME	YES	YES	SAME	SAME	SAME	SAME
RUNWAY LIGHTING	HIRL	HIRL	SAME	SAME	SAME	SAME	MIRL	MIRL	SAME	SAME	SAME	SAME
VISUAL AND INSTRUMENT NAVAIDS	HIRL, REIL, PAPI	RNAV, ILS, NDB, HIRL, PAPI, MALSR	SAME	SAME	SAME	SAME	RNAV, ILS, MIRL, PAPI	RNAV, ILS, MIRL, MALSR, PAPI	SAME	SAME	RNAV, ILS, MIRL, PAPI, MALSR	SAME

AIRPORT DATA TABLE

	EXISTING	FUTURE	ULTIMATE
AIRPORT REFERENCE CODE (ARC)	C-II	SAME	C-III
MEAN MAX. TEMP. - HOTTEST MONTH	88.1°F	SAME	SAME
AIRPORT ELEVATION (MSL)	5,515.9'	SAME	SAME
AIRPORT & TERMINAL NAVAIDS	RNAV, ILS, LOCALIZER, LOM, ROTATING BEACON	SAME	SAME
MISCELLANEOUS FACILITIES	MIRL, REIL, MALSR, PAPI-2L, MITL, SEGMENTED CIRCLE/WIND CONE (LIGHTED), AWOS, ATIS	SAME	SAME
AIRPORT REFERENCE POINT (ARP)	LAT: N39°47'03.12" LONG: W104°32'15.45"	SAME	LAT: N39°47'10.86" LONG: W104°32'16.90"
CRITICAL AIRCRAFT	BOMBARDIER CHALLENGER 604	SAME	BOEING BBJ (B737-700)
WINGSPAN	64.4'	SAME	117.5'
TAIL HEIGHT	20.8'	SAME	41.6'
MAX. T.O. WEIGHT	48,200 LBS	SAME	175,000 LBS
APPROACH SPEED	125 KNOTS	SAME	135 KNOTS
MAGNETIC VARIATION	7° 57' E ± 0° 21' CHANGING BY 0° 6' W PER YEAR	SAME	SAME
NPIAS SERVICE LEVEL	REGIONAL AIRPORT	SAME	SAME
NPIAS STATE EQUIVALENT SERVICE ROLE	MAJOR GENERAL AVIATION	SAME	SAME

DECLARED DISTANCES

RUNWAY	TAKEOFF RUN AVAILABLE (TORA)		TAKEOFF DIST. AVAILABLE (TODA)		ACCELERATE STOP DIST. AVAILABLE (ASDA)		LANDING DIST. AVAILABLE (LDA)	
	EXISTING	FUTURE	EXISTING	FUTURE	EXISTING	FUTURE	EXISTING	FUTURE
8	8,000'	SAME	8,000'	SAME	8,000'	SAME	8,000'	SAME
26	8,000'	SAME	8,000'	SAME	8,000'	SAME	8,000'	SAME
17	8,000'	SAME	8,000'	SAME	8,000'	SAME	8,000'	SAME
35	8,000'	SAME	8,000'	SAME	8,000'	SAME	8,000'	SAME

TAXIWAY DATA TABLE

	TAXIWAYS A,B,C,D, AND E		
	EXISTING	FUTURE	ULTIMATE
TAXIWAY DESIGN GROUP (TDG)	1B	SAME	3
AIRPLANE DESIGN GROUP (ADG)	II	SAME	III
WIDTH	50'	SAME	SAME
SAFETY AREA WIDTH (TSA)	79'	SAME	SAME
OBJECT FREE AREA WIDTH (TOFA)	131'	SAME	SAME
SEPARATION DISTANCE (CENTERLINE TO FIXED OR MOVEABLE OBJECT)	65.5'	SAME	SAME
OBJECTS WITHIN TAXIWAY OBJECT FREE AREA	NONE	SAME	SAME
LIGHTING	MITL, BLUE REFLECTORS	SAME	MITL
TAXILANE OBJECT FREE AREA	115'	SAME	SAME

NAVIGATIONAL & COMMUNICATION AIDS OWNERSHIP TABLE

	EXISTING		FUTURE		ULTIMATE	
	AIRPORT	FAA	AIRPORT	FAA	AIRPORT	FAA
RNAV	X		X		X	
ILS	X		X		X	
LOCALIZER	X		X		X	
LOM	X		X		X	
BEACON	X		X		X	
AWOS		X		X		X
PAPI	X		X		X	
MIRL	X		X		X	
REIL	X		X		X	
WINDCONE	X		X		X	

MODIFICATION TO STANDARDS

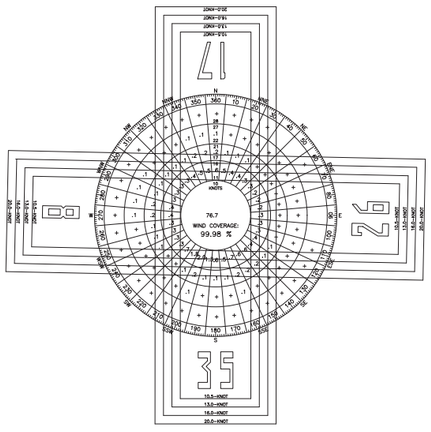
APPROVAL DATE	AIRSPACE CASE NO.	STANDARD TO BE MODIFIED	DESCRIPTION
NONE	NONE	NONE	NONE

NOTES

1. ELEVATIONS EXPRESSED IN MEAN SEA LEVEL (MSL).

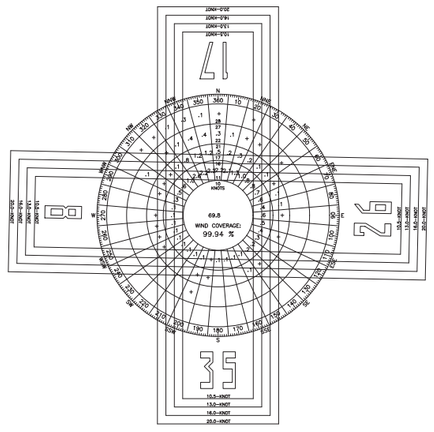
SOURCES

1. SURVEY DATA IS BASED ON THE PLANIMETRIC MAPPING AND ORTHO-IMAGERY INFORMATION COMPILED BY MARTINEZ GEOSPATIAL IN 2017.
2. ALL HORIZONTAL COORDINATES - NAD83/2011
   ALL VERTICAL COORDINATES - NAVD88
3. WIND ROSE DATA OBTAINED NCDC, STATION 724694, FAA AGIS WIND ROSE FORM, FTG ANNUAL PERIOD OF RECORD: 2005-2015



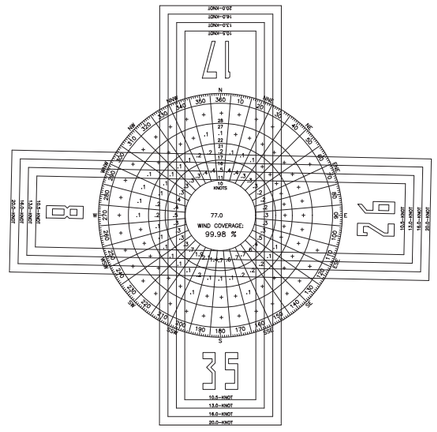
ALL WEATHER WIND COVERAGE ANALYSIS

RUNWAY	10.5 KNOTS	13 KNOTS	16 KNOTS	20 KNOTS
8/26	85.55%	91.15%	97.11%	98.97%
17/35	92.74%	95.85%	98.40%	99.41%
COMBINED	98.52%	99.53%	99.87%	99.98%



IFR WEATHER WIND COVERAGE ANALYSIS

RUNWAY	10.5 KNOTS	13 KNOTS	16 KNOTS	20 KNOTS
8/26	79.00%	86.20%	93.54%	97.47%
17/35	93.08%	96.80%	99.27%	99.80%
COMBINED	98.53%	99.62%	99.86%	99.94%



VFR WEATHER WIND COVERAGE ANALYSIS

RUNWAY	10.5 KNOTS	13 KNOTS	16 KNOTS	20 KNOTS
8/26	85.85%	91.7%	97.28%	99.05%
17/35	92.68%	95.78%	98.36%	99.40%
COMBINED	98.49%	99.51%	99.86%	99.98%

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Nov 18, 2019 - 11:52am
Sean.Jones

JVIATION®

FrontRange AIRPORT

DES: S.G.J.
DR: S.G.J.
CH: J.B.M.
APP: J.B.M.

ISSUE RECORD

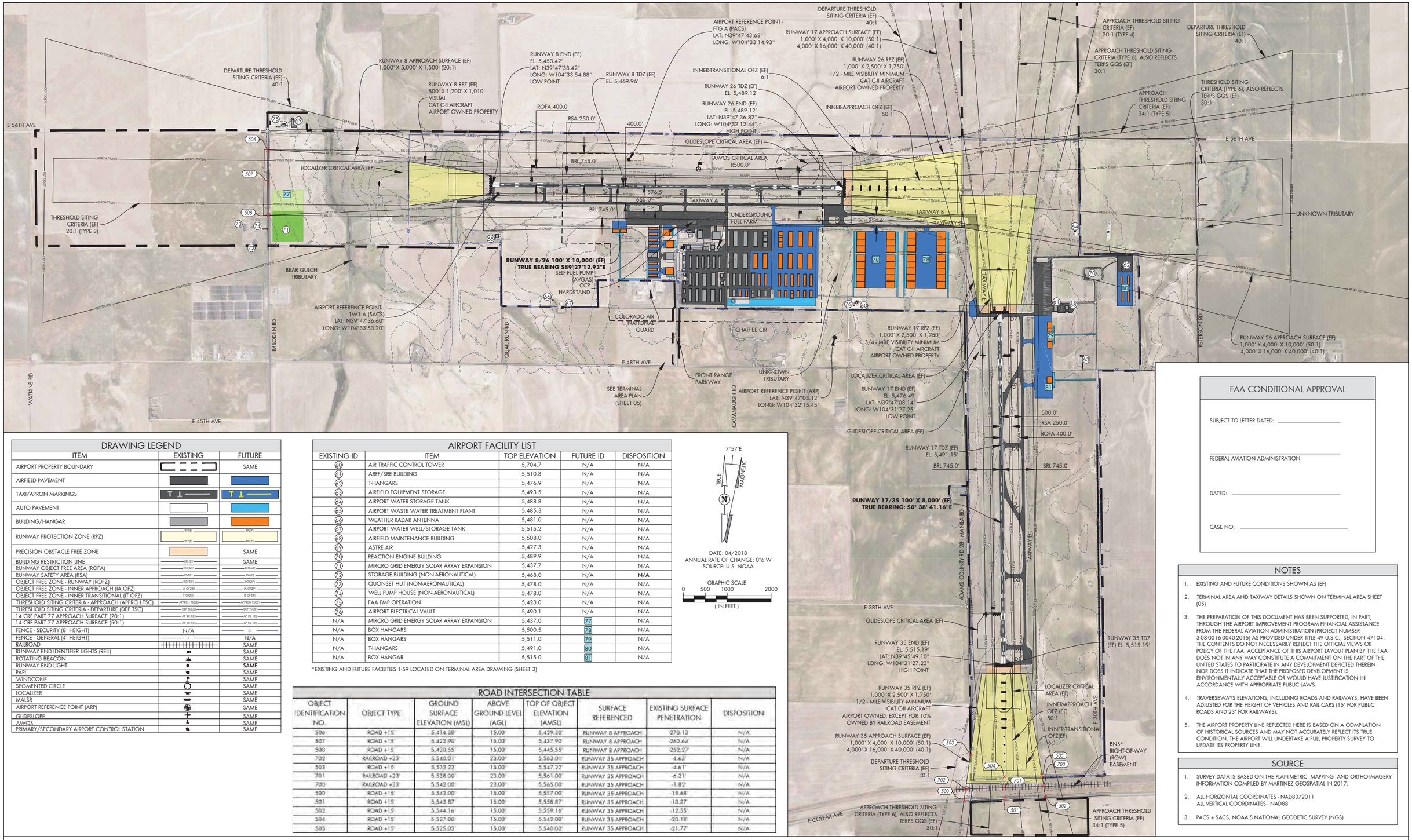
NO.	BY	DATE	DESCRIPTION

AIRPORT LAYOUT PLAN

AIRPORT DATA SHEET

AIP PROJ. NO.	JVIATION PROJ. NO.	DATE:
3-08-0016-040-2015	2015.FTG.03	SEPTEMBER 2019

SHEET NO.
02 of 18



DRAWING LEGEND

ITEM	EXISTING	FUTURE
AIRPORT PROPERTY BOUNDARY		SAME
AIRFIELD PAVEMENT		
TAXI/APRON MARKINGS		
AUTO PAVEMENT		
BUILDING/HANGAR		
RUNWAY PROTECTION ZONE (RPZ)		
PRECISION OBSTACLE FREE ZONE		SAME
BUILDING RESTRICTION LINE		SAME
RUNWAY OBJECT FREE AREA (ROFA)		
RUNWAY SAFETY AREA (RSA)		
OBJECT FREE ZONE - RUNWAY (ROFZ)		
OBJECT FREE ZONE - INNER APPROACH (IA OFZ)		
OBJECT FREE ZONE - INNER TRANSITIONAL (IT OFZ)		
THRESHOLD SITING CRITERIA - APPROACH (APPRCH TSC)		
THRESHOLD SITING CRITERIA - DEPARTURE (DEP TSC)		
14 CRF PART 77 APPROACH SURFACE (20:1)		
14 CRF PART 77 APPROACH SURFACE (50:1)		
FENCE - SECURITY (8' HEIGHT)	N/A	
FENCE - GENERAL (4' HEIGHT)		N/A
RAILROAD		SAME
RUNWAY END IDENTIFIER LIGHTS (REIL)		SAME
ROTATING BEACON		SAME
RUNWAY END LIGHT		SAME
PAPI		SAME
WINDCONE		SAME
SEGMENTED CIRCLE		SAME
LOCALIZER		SAME
MALSR		SAME
AIRPORT REFERENCE POINT (ARP)		SAME
GLIDESLOPE		SAME
AWOS		SAME
PRIMARY/SECONDARY AIRPORT CONTROL STATION		SAME

AIRPORT FACILITY LIST

EXISTING ID	ITEM	TOP ELEVATION	FUTURE ID	DISPOSITION
60	AIR TRAFFIC CONTROL TOWER	5,704.7'	N/A	N/A
61	ARFF/SRE BUILDING	5,510.8'	N/A	N/A
62	T-HANGARS	5,476.9'	N/A	N/A
63	AIRFIELD EQUIPMENT STORAGE	5,493.5'	N/A	N/A
64	AIRPORT WATER STORAGE TANK	5,488.8'	N/A	N/A
65	AIRPORT WASTE WATER TREATMENT PLANT	5,485.3'	N/A	N/A
66	WEATHER RADAR ANTENNA	5,481.0'	N/A	N/A
67	AIRPORT WATER WELL/STORAGE TANK	5,515.2'	N/A	N/A
68	AIRFIELD MAINTENANCE BUILDING	5,508.0'	N/A	N/A
69	ASTRE AIR	5,427.3'	N/A	N/A
70	REACTION ENGINE BUILDING	5,489.9'	N/A	N/A
71	MICRO GRID ENERGY SOLAR ARRAY EXPANSION	5,437.7'	N/A	N/A
72	STORAGE BUILDING (NON-AERONAUTICAL)	5,468.0'	N/A	N/A
73	QUONSET HUT (NON-AERONAUTICAL)	5,478.0'	N/A	N/A
74	WELL PUMP HOUSE (NON-AERONAUTICAL)	5,478.0'	N/A	N/A
75	FAA FMP OPERATION	5,423.0'	N/A	N/A
76	AIRPORT ELECTRICAL VAULT	5,490.1'	N/A	N/A
N/A	MICRO GRID ENERGY SOLAR ARRAY EXPANSION	5,437.0'	77	N/A
N/A	BOX HANGARS	5,500.5'	78	N/A
N/A	BOX HANGARS	5,511.0'	79	N/A
N/A	T-HANGARS	5,491.0'	80	N/A
N/A	BOX HANGAR	5,515.0'	81	N/A

*EXISTING AND FUTURE FACILITIES 1-59 LOCATED ON TERMINAL AREA DRAWING (SHEET 3)

ROAD INTERSECTION TABLE

OBJECT IDENTIFICATION NO.	OBJECT TYPE	GROUND SURFACE ELEVATION (MSL)	ABOVE GROUND LEVEL (AGL)	TOP OF OBJECT ELEVATION (AMSL)	SURFACE REFERENCED	EXISTING SURFACE PENETRATION	DISPOSITION
506	ROAD +15'	5,414.30'	15.00'	5,429.30'	RUNWAY 8 APPROACH	-270.13'	N/A
507	ROAD +15'	5,422.90'	15.00'	5,437.90'	RUNWAY 8 APPROACH	-260.64'	N/A
508	ROAD +15'	5,430.55'	15.00'	5,445.55'	RUNWAY 8 APPROACH	-252.27'	N/A
702	RAILROAD +23'	5,540.01'	23.00'	5,563.01'	RUNWAY 35 APPROACH	-4.63'	N/A
503	ROAD +15'	5,532.22'	15.00'	5,547.22'	RUNWAY 35 APPROACH	-4.61'	N/A
701	RAILROAD +23'	5,538.00'	23.00'	5,561.00'	RUNWAY 35 APPROACH	-6.21'	N/A
700	RAILROAD +23'	5,542.00'	23.00'	5,565.00'	RUNWAY 35 APPROACH	-1.82'	N/A
500	ROAD +15'	5,542.00'	15.00'	5,557.00'	RUNWAY 35 APPROACH	-15.68'	N/A
501	ROAD +15'	5,543.87'	15.00'	5,558.87'	RUNWAY 35 APPROACH	-13.27'	N/A
502	ROAD +15'	5,544.16'	15.00'	5,559.16'	RUNWAY 35 APPROACH	-12.55'	N/A
504	ROAD +15'	5,527.00'	15.00'	5,542.00'	RUNWAY 35 APPROACH	-20.18'	N/A
505	ROAD +15'	5,525.02'	15.00'	5,540.02'	RUNWAY 35 APPROACH	-21.77'	N/A

FAA CONDITIONAL APPROVAL

SUBJECT TO LETTER DATED: _____

FEDERAL AVIATION ADMINISTRATION

DATED: _____

CASE NO: _____

NOTES

1. EXISTING AND FUTURE CONDITIONS SHOWN AS (EF)
2. TERMINAL AREA AND TAXIWAY DETAILS SHOWN ON TERMINAL AREA SHEET (05)
3. THE PREPARATION OF THIS DOCUMENT HAS BEEN SUPPORTED, IN PART, THROUGH THE AIRPORT IMPROVEMENT PROGRAM FINANCIAL ASSISTANCE FROM THE FEDERAL AVIATION ADMINISTRATION (PROJECT NUMBER 3-08-0016-0040-2015) AS PROVIDED UNDER TITLE 49 U.S.C., SECTION 47104. THE CONTENTS DO NOT NECESSARILY REFLECT THE OFFICIAL VIEWS OR POLICY OF THE FAA. ACCEPTANCE OF THIS AIRPORT LAYOUT PLAN BY THE FAA DOES NOT IN ANY WAY CONSTITUTE A COMMITMENT ON THE PART OF THE UNITED STATES TO PARTICIPATE IN ANY DEVELOPMENT DEPICTED THEREIN NOR DOES IT INDICATE THAT THE PROPOSED DEVELOPMENT IS ENVIRONMENTALLY ACCEPTABLE OR WOULD HAVE JUSTIFICATION IN ACCORDANCE WITH APPROPRIATE PUBLIC LAWS.
4. TRAVERSEWAYS ELEVATIONS, INCLUDING ROADS AND RAILWAYS, HAVE BEEN ADJUSTED FOR THE HEIGHT OF VEHICLES AND RAIL CARS (15' FOR PUBLIC ROADS AND 23' FOR RAILWAYS).
5. THE AIRPORT PROPERTY LINE REFLECTED HERE IS BASED ON A COMPILATION OF HISTORICAL SOURCES AND MAY NOT ACCURATELY REFLECT ITS TRUE CONDITION. THE AIRPORT WILL UNDERTAKE A FULL PROPERTY SURVEY TO UPDATE ITS PROPERTY LINE.

SOURCE

1. SURVEY DATA IS BASED ON THE PLANIMETRIC MAPPING AND ORTHO-IMAGERY INFORMATION COMPILED BY MARTINEZ GEOSPATIAL IN 2017.
2. ALL HORIZONTAL COORDINATES - NAD83/2011
   ALL VERTICAL COORDINATES - NAD88
3. PACS + SACS, NOAA'S NATIONAL GEODETIC SURVEY (NGS)

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02 - FTG_ALP_ALP.dwg
Sep 20, 2019 - 11:30am
Sean.Jarvis

JVIATION®

Front Range AIRPORT

DES: S.G.J.
DR: S.G.J.
CH: J.B.M.
APP: J.B.M.

ISSUE RECORD

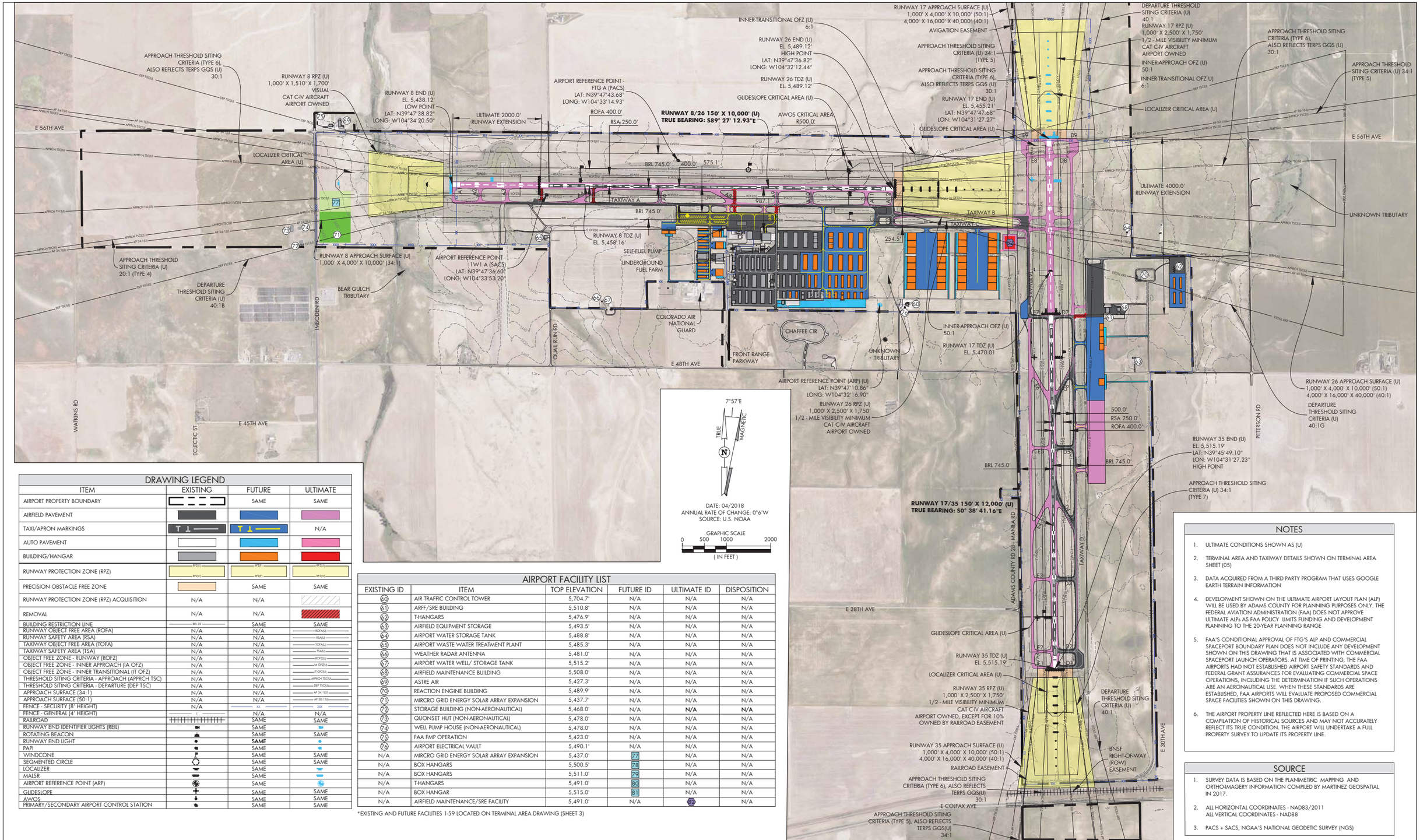
NO.	BY	DATE	DESCRIPTION

AIRPORT LAYOUT PLAN

AIRPORT LAYOUT PLAN

AIP PROJ. NO.	JVIATION PROJ. NO.	DATE:
3-08-0016-040-2015	2015.FTG.03	SEPTEMBER 2019

SHEET NO.
03 of 18



DRAWING LEGEND

ITEM	EXISTING	FUTURE	ULTIMATE
AIRPORT PROPERTY BOUNDARY		SAME	SAME
AIRFIELD PAVEMENT			
TAXI/APRON MARKINGS			N/A
AUTO PAVEMENT			
BUILDING/HANGAR			
RUNWAY PROTECTION ZONE (RPZ)			
PRECISION OBSTACLE FREE ZONE		SAME	SAME
RUNWAY PROTECTION ZONE (RPZ) ACQUISITION	N/A	N/A	
REMOVAL	N/A	N/A	
BUILDING RESTRICTION LINE	BRL 35	SAME	SAME
RUNWAY OBJECT FREE AREA (ROFA)	N/A	N/A	ROFA35
RUNWAY SAFETY AREA (RSA)	N/A	N/A	RSA35
TAXIWAY OBJECT FREE AREA (TOFA)	N/A	N/A	TOFA35
TAXIWAY SAFETY AREA (TSA)	N/A	N/A	TSA35
OBJECT FREE ZONE - RUNWAY (ROFZ)	N/A	N/A	ROFZ35
OBJECT FREE ZONE - INNER APPROACH (IA OFZ)	N/A	N/A	IA OFZ35
OBJECT FREE ZONE - INNER TRANSITIONAL (IT OFZ)	N/A	N/A	IT OFZ35
THRESHOLD SITING CRITERIA - APPROACH (APPRCH TSC)	N/A	N/A	APPRCH TSC35
THRESHOLD SITING CRITERIA - DEPARTURE (DEP TSC)	N/A	N/A	DEP TSC35
APPROACH SURFACE (34:1)	N/A	N/A	AP 34:1 35
APPROACH SURFACE (50:1)	N/A	N/A	AP 50:1 35
FENCE - SECURITY (8' HEIGHT)	N/A	XX	XXX
FENCE - GENERAL (4' HEIGHT)	N/A	N/A	N/A
RAILROAD		SAME	SAME
RUNWAY END IDENTIFIER LIGHTS (REIL)		SAME	SAME
ROTATING BEACON		SAME	SAME
RUNWAY END LIGHT		SAME	SAME
PAPI		SAME	SAME
WINDCONE		SAME	SAME
SEGMENTED CIRCLE		SAME	SAME
LOCALIZER		SAME	SAME
MALSR		SAME	SAME
AIRPORT REFERENCE POINT (ARP)		SAME	SAME
GLIDESLOPE		SAME	SAME
AWOS		SAME	SAME
PRIMARY/SECONDARY AIRPORT CONTROL STATION		SAME	SAME

AIRPORT FACILITY LIST

EXISTING ID	ITEM	TOP ELEVATION	FUTURE ID	ULTIMATE ID	DISPOSITION
60	AIR TRAFFIC CONTROL TOWER	5,704.7'	N/A	N/A	N/A
61	ARFF/SRE BUILDING	5,510.8'	N/A	N/A	N/A
62	T-HANGARS	5,476.9'	N/A	N/A	N/A
63	AIRFIELD EQUIPMENT STORAGE	5,493.5'	N/A	N/A	N/A
64	AIRPORT WATER STORAGE TANK	5,488.8'	N/A	N/A	N/A
65	AIRPORT WASTE WATER TREATMENT PLANT	5,485.3'	N/A	N/A	N/A
66	WEATHER RADAR ANTENNA	5,481.0'	N/A	N/A	N/A
67	AIRPORT WATER WELL/ STORAGE TANK	5,515.2'	N/A	N/A	N/A
68	AIRFIELD MAINTENANCE BUILDING	5,508.0'	N/A	N/A	N/A
69	ASTRE AIR	5,427.3'	N/A	N/A	N/A
70	REACTION ENGINE BUILDING	5,489.9'	N/A	N/A	N/A
71	MIRCRO GRID ENERGY SOLAR ARRAY EXPANSION	5,437.7'	N/A	N/A	N/A
72	STORAGE BUILDING (NON-AERONAUTICAL)	5,468.0'	N/A	**N/A**	**N/A**
73	QUONSET HUT (NON-AERONAUTICAL)	5,478.0'	N/A	N/A	N/A
74	WELL PUMP HOUSE (NON-AERONAUTICAL)	5,478.0'	N/A	N/A	N/A
75	FAA FMP OPERATION	5,423.0'	N/A	N/A	N/A
76	AIRPORT ELECTRICAL VAULT	5,490.1'	N/A	N/A	N/A
N/A	MIRCRO GRID ENERGY SOLAR ARRAY EXPANSION	5,437.0'	77	N/A	N/A
N/A	BOX HANGARS	5,500.5'	78	N/A	N/A
N/A	BOX HANGARS	5,511.0'	79	N/A	N/A
N/A	T-HANGARS	5,491.0'	80	N/A	N/A
N/A	BOX HANGAR	5,515.0'	81	N/A	N/A
N/A	AIRFIELD MAINTENANCE/SRE FACILITY	5,491.0'	N/A	82	N/A

*EXISTING AND FUTURE FACILITIES 1-59 LOCATED ON TERMINAL AREA DRAWING (SHEET 3)

NOTES

1. ULTIMATE CONDITIONS SHOWN AS (U)
2. TERMINAL AREA AND TAXIWAY DETAILS SHOWN ON TERMINAL AREA SHEET (05)
3. DATA ACQUIRED FROM A THIRD PARTY PROGRAM THAT USES GOOGLE EARTH TERRAIN INFORMATION
4. DEVELOPMENT SHOWN ON THE ULTIMATE AIRPORT LAYOUT PLAN (ALP) WILL BE USED BY ADAMS COUNTY FOR PLANNING PURPOSES ONLY. THE FEDERAL AVIATION ADMINISTRATION (FAA) DOES NOT APPROVE ULTIMATE ALPs AS FAA POLICY LIMITS FUNDING AND DEVELOPMENT PLANNING TO THE 20-YEAR PLANNING RANGE
5. FAA'S CONDITIONAL APPROVAL OF FTG'S ALP AND COMMERCIAL SPACEPORT BOUNDARY PLAN DOES NOT INCLUDE ANY DEVELOPMENT SHOWN ON THIS DRAWING THAT IS ASSOCIATED WITH COMMERCIAL SPACEPORT LAUNCH OPERATORS. AT TIME OF PRINTING, THE FAA AIRPORTS HAD NOT ESTABLISHED AIRPORT SAFETY STANDARDS AND FEDERAL GRANT ASSURANCES FOR EVALUATING COMMERCIAL SPACE OPERATIONS, INCLUDING THE DETERMINATION IF SUCH OPERATIONS ARE AN AERONAUTICAL USE. WHEN THESE STANDARDS ARE ESTABLISHED, FAA AIRPORTS WILL EVALUATE PROPOSED COMMERCIAL SPACE FACILITIES SHOWN ON THIS DRAWING.
6. THE AIRPORT PROPERTY LINE REFLECTED HERE IS BASED ON A COMPILATION OF HISTORICAL SOURCES AND MAY NOT ACCURATELY REFLECT ITS TRUE CONDITION. THE AIRPORT WILL UNDERTAKE A FULL PROPERTY SURVEY TO UPDATE ITS PROPERTY LINE.

SOURCE

1. SURVEY DATA IS BASED ON THE PLANIMETRIC MAPPING AND ORTHO-IMAGERY INFORMATION COMPILED BY MARTINEZ GEOSPATIAL IN 2017.
2. ALL HORIZONTAL COORDINATES - NAD83/2011
   ALL VERTICAL COORDINATES - NAD88
3. PACS + SACS, NOAA'S NATIONAL GEODETIC SURVEY (NGS)

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04-FTG-ALP-LU-ALP.dwg
Sep 27, 2019 - 11:56am
Sean.Jordre

JVIATION®

Front Range AIRPORT

DES:	S.G.J.
DR:	S.G.J.
CH:	J.B.M.
APP:	J.B.M.

ISSUE RECORD

NO.	BY	DATE	DESCRIPTION

AIRPORT LAYOUT PLAN

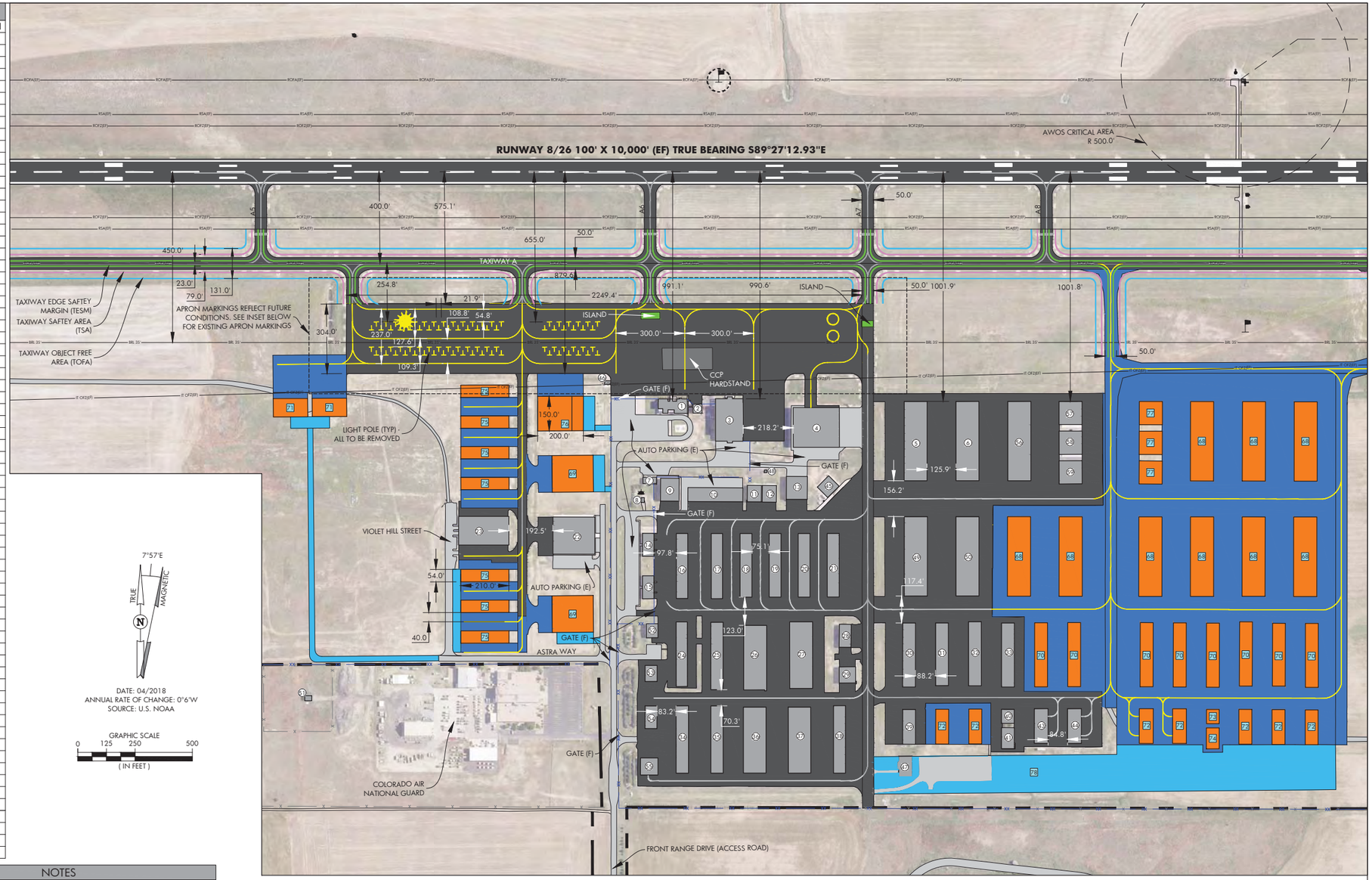
AIRPORT LAYOUT PLAN - ULTIMATE

AIP PROJ. NO.	JVIATION PROJ. NO.	DATE:
3-08-0016-040-2015	2015.FTG.03	SEPTEMBER 2019

SHEET NO.
04 of 18

AIRPORT FACILITY LIST

EXISTING ID	ITEM	TOP ELEVATION	FUTURE ID	DISPOSITION
①	TERMINAL BUILDING	5,519.8'	N/A	N/A
②	AIRPORT STORAGE BUILDING	5,504.7'	N/A	N/A
③	EXECUTIVE HANGAR (FIXED BASE OPERATOR)	5,520.7'	N/A	N/A
④	EXECUTIVE HANGAR	5,528.3'	N/A	N/A
⑤	BOX HANGAR (12 UNITS) (CESSNA WAY)	5,516.5'	N/A	N/A
⑥	BOX HANGAR (12 UNITS) (CESSNA WAY)	5,517.3'	N/A	N/A
⑦	MODULAR BUILDING (AVIATION-RELATED)	5,500.1'	N/A	N/A
⑧	STORAGE BUILDING (AVIATION-RELATED)	5,494.8'	N/A	N/A
⑨	EXECUTIVE HANGAR (BEECHCRAFT WAY)	5,515.3'	N/A	N/A
⑩	BOX HANGAR (4 UNITS) (BEECHCRAFT WAY)	5,514.5'	N/A	N/A
⑪	EXECUTIVE HANGAR (BEECHCRAFT WAY)	5,518.0'	N/A	N/A
⑫	EXECUTIVE HANGAR (BEECHCRAFT WAY)	5,519.4'	N/A	N/A
⑬	EXECUTIVE HANGAR (BEECHCRAFT WAY)	5,517.5'	N/A	N/A
⑭	OFFICE BUILDING (AIR METHODS CORPORATION)	5,507.6'	N/A	N/A
⑮	OFFICE BUILDING (COLORADO DIVISION OF AERONAUTICS)	5,509.3'	N/A	N/A
⑯	T-HANGAR (7 UNITS)	5,512.1'	N/A	N/A
⑰	T-HANGAR (7 UNITS)	5,513.1'	N/A	N/A
⑱	T-HANGAR (13 UNITS)	5,509.4'	N/A	N/A
⑲	T-HANGAR (13 UNITS)	5,508.4'	N/A	N/A
⑳	T-HANGAR (13 UNITS)	5,509.1'	N/A	N/A
㉑	T-HANGAR (13 UNITS)	5,509.6'	N/A	N/A
㉒	EXECUTIVE BOX HANGAR	5,524.5'	N/A	N/A
㉓	BOX HANGAR (6 UNITS)	5,515.6'	N/A	N/A
㉔	T-HANGAR (15 UNITS)	5,508.6'	N/A	N/A
㉕	T-HANGAR (15 UNITS)	5,513.1'	N/A	N/A
㉖	BOX HANGAR (12 UNITS)	5,520.0'	N/A	N/A
㉗	BOX HANGAR (10 UNITS)	5,524.0'	N/A	N/A
㉘	EXECUTIVE HANGAR	5,518.9'	N/A	N/A
㉙	EXECUTIVE HANGAR	5,519.9'	N/A	N/A
㉚	BOX HANGAR (5 UNITS)	5,519.2'	N/A	N/A
㉛	T-HANGAR (13 UNITS)	5516.7'	N/A	N/A
㉜	T-HANGAR (13 UNITS)	5,514.7'	N/A	N/A
㉝	BOX HANGAR (5 UNITS)	5,518.2'	N/A	N/A
㉞	T-HANGAR (13 UNITS)	5,512.6'	N/A	N/A
㉟	T-HANGAR (13 UNITS)	5,513.5'	N/A	N/A
㊱	T-HANGAR (12 UNITS)	5,521.0'	N/A	N/A
㊲	T-HANGAR (12 UNITS)	5,521.8'	N/A	N/A
㊳	T-HANGAR (13 UNITS)	5,516.0'	N/A	N/A
㊴	BOX HANGAR (3 UNITS)	5,518.9'	N/A	N/A
㊵	EXECUTIVE BOX HANGAR	5,520.6'	N/A	N/A
㊶	EXECUTIVE BOX HANGAR	5,519.2'	N/A	N/A
㊸	T-HANGAR (7 UNITS)	5,529.0'	N/A	N/A
㊹	T-HANGAR (7 UNITS)	5,525.2'	N/A	N/A
㊺	UNDERGROUND FUEL FARM	5,495.5'	N/A	N/A
㊻	FUEL TANKS & SELF- FUELING PUMP	5,493.0'	N/A	N/A
㊼	NATIONAL WEATHER SERVICE	5,518.0'	N/A	N/A
㊽	SHED	5,496.0'	N/A	N/A
㊾	BOX HANGAR (12 UNITS)	5,528.2'	N/A	N/A
㊿	BOX HANGAR (12 UNITS)	5,528.5'	N/A	N/A
(51)	AIRPORT WATER STORAGE (500K GALLONS)	5,514.5'	N/A	N/A
(52)	BOX HANGAR	5,511.9'	N/A	N/A
(53)	BOX HANGAR	5,516.9'	N/A	N/A
(54)	BOX HANGAR	5,515.2'	N/A	N/A
(55)	BOX HANGAR	5,524.3'	N/A	N/A
(56)	BOX HANGAR (12 UNITS) (CESSNA WAY)	5,523.2'	N/A	N/A
(57)	BOX HANGAR (CESSNA WAY)	5,522.3'	N/A	N/A
(58)	BOX HANGAR (CESSNA WAY)	5,523.1'	N/A	N/A
(59)	BOX HANGAR (CESSNA WAY)	5,523.6'	N/A	N/A
N/A	BOX HANGAR (12 UNITS)	5,503.0' - 5,518.0'	68	N/A
N/A	BOX HANGAR (12 UNITS)	5,513.0' - 5,519.0'	69	N/A
N/A	BOX HANGAR (5 UNITS)	5,505.0' - 5,515.0'	70	N/A
N/A	BOX HANGAR (5 UNITS)	5,509.0'	71	N/A
N/A	BOX HANGAR (3 UNITS)	5,505.0' - 5,519.0'	72	N/A
N/A	EXECUTIVE BOX HANGAR	5,514.0'	73	N/A
N/A	EXECUTIVE BOX HANGAR	5,509.0'	74	N/A
N/A	BOX HANGAR	5,408.0' - 5,521.0'	75	N/A
N/A	FBO HANGAR	5,510.0'	76	N/A
N/A	BOX HANGAR	5,520.0' - 5,522.0'	77	N/A
N/A	AUTO PARKING	5,492.0'	78	N/A



GRAPHIC SCALE
0 125 250 500
(IN FEET)

DRAWING LEGEND

ITEM	EXISTING	FUTURE
AIRPORT PROPERTY BOUNDARY		SAME
AIRFIELD PAVEMENT		
TAXI/APRON MARKINGS		
AUTO PAVEMENT		
BUILDING/HANGAR		
BUILDING RESTRICTION LINE	BRL 35'	SAME
RUNWAY OBJECT FREE AREA (ROFA)	ROFA(F)	ROFA(F)
RUNWAY SAFETY AREA (RSA)	RSA(F)	RSA(F)
TAXIWAY OBJECT FREE AREA (TOFA)		SAME
TAXIWAY SAFETY AREA (TSA)		SAME
TAXIWAY EDGE SAFETY MARGIN (TESM)		SAME
OBJECT FREE ZONE - RUNWAY (ROFZ)	ROFZ(F)	ROFZ(F)
OBJECT FREE ZONE (OFZ)	OFZ(F)	OFZ(F)
FENCE - SECURITY (8' HEIGHT)	N/A	XX
FENCE - GENERAL (4' HEIGHT)	X	N/A
ROTATING BEACON		SAME

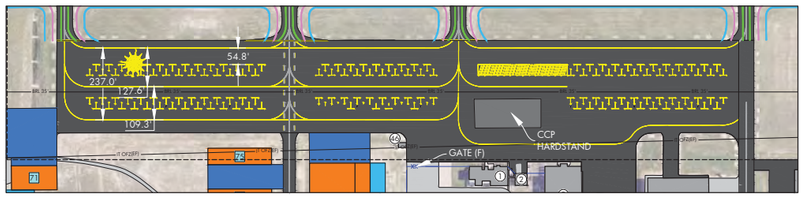
NOTES

1. EXISTING AND FUTURE CONDITIONS SHOWN AS (EF)
2. THE PREPARATION OF THIS DOCUMENT HAS BEEN SUPPORTED, IN PART, THROUGH THE AIRPORT IMPROVEMENT PROGRAM FINANCIAL ASSISTANCE FROM THE FEDERAL AVIATION ADMINISTRATION (PROJECT NUMBER 3-08-0016-0040-2015) AS PROVIDED UNDER TITLE 49 U.S.C., SECTION 47104. THE CONTENTS DO NOT NECESSARILY REFLECT THE OFFICIAL VIEWS OR POLICY OF THE FAA. ACCEPTANCE OF THIS AIRPORT LAYOUT PLAN BY THE FAA DOES NOT IN ANY WAY CONSTITUTE A COMMITMENT ON THE PART OF THE UNITED STATES TO PARTICIPATE IN ANY DEVELOPMENT DEPICTED THEREIN NOR DOES IT INDICATE THAT THE PROPOSED DEVELOPMENT IS ENVIRONMENTALLY ACCEPTABLE OR WOULD HAVE JUSTIFICATION IN ACCORDANCE WITH APPROPRIATE PUBLIC LAWS.
3. TRAVERSEWAYS ELEVATIONS, INCLUDING ROADS AND RAILWAYS, HAVE BEEN ADJUSTED FOR THE HEIGHT OF VEHICLES AND RAIL CARS (15' FOR PUBLIC ROADS AND 23' FOR RAILWAYS).
4. THE AIRPORT PROPERTY LINE REFLECTED HERE IS BASED ON A COMPILATION OF HISTORICAL SOURCES AND MAY NOT ACCURATELY REFLECT ITS TRUE CONDITION. THE AIRPORT WILL UNDERTAKE A FULL PROPERTY SURVEY TO UPDATE ITS PROPERTY LINE.

SOURCE

1. SURVEY DATA IS BASED ON THE PLANIMETRIC MAPPING AND ORTHO-IMAGERY INFORMATION COMPILED BY MARTINEZ GEOSPATIAL IN 2017.
2. ALL HORIZONTAL COORDINATES - NAD83/2011 ALL VERTICAL COORDINATES - NAD88

EXISTING APRON MARKINGS



LAYER(AVPLANS)
04-FTG-ALP-TERM.dwg
Date: Aug 28, 2019 - 11:43am
SeanJoe

JVIATION®

Front Range AIRPORT

DES:	S.G.J.
DR:	S.G.J.
CH:	J.B.M.
APP:	J.B.M.

ISSUE RECORD

NO.	BY	DATE	DESCRIPTION

AIRPORT LAYOUT PLAN

TERMINAL AREA DRAWING

AIP PROJ. NO.	JVIATION PROJ. NO.	DATE:
3-08-0016-040-2015	2015.FTG.03	SEPTEMBER 2019

SHEET NO.
05 of 18

MATCHLINE SHEET 07 (RUNWAY 17 END)

APPROACH SURFACE (EF)
50:1 FOR 10,000'
40:1 FOR 40,000'

APPROACH SURFACE (EF)
20:1

RUNWAY 26 END (EF)
EL. 5,489.12'

RUNWAY 8 END (EF)
EL. 5,453.42'

RUNWAY 17 END (EF)
EL. 5,476.49'

HORIZONTAL SURFACE
EL. 5,665.19'

CONICAL SURFACE 20:1

RUNWAY 35 END (EF)
EL. 5,515.19'

APPROACH SURFACE (EF)
50:1 FOR 10,000'
40:1 FOR 40,000'

APPROACH SURFACE (EF)
50:1 FOR 10,000'
40:1 FOR 40,000'

7°57'E
TRUE
MAGNETIC
N

DATE: 04/2018
ANNUAL RATE OF CHANGE: 0°6'W
SOURCE: U.S. NOAA
GRAPHIC SCALE
0 1500 3000 6000
(IN FEET)

GRAPHIC SCALE
0 500 1000 2000
(IN FEET)

MATCHLINE SHEET 07 (RUNWAY 35 END)

OBSTRUCTION TABLE

OBJECT IDENTIFICATION NO.	OBJECT TYPE	GROUND SURFACE ELEVATION (MSL)	ABOVE GROUND LEVEL (AGL)	TOP OF OBJECT ELEVATION (AMSL)	SURFACE REFERENCED	EXISTING SURFACE PENETRATION	DISPOSITION
11	GUIDE SIGN	5,479.66'	19.3'	5,511.20'	PRIMARY	58.80'	FIXED BY FUNCTION
12	AWOS	5,478.88'	39.32'	5,538.20'	PRIMARY	22.10'	FIXED BY FUNCTION
34	GROUND	5,472.80'	0.00'	5,472.80'	PRIMARY	9.70'	TO BE LOWERED
35	GROUND	5,473.20'	0.00'	5,473.20'	PRIMARY	9.70'	TO BE LOWERED
47	GROUND	5,472.90'	0.00'	5,472.90'	PRIMARY	7.90'	TO BE LOWERED
48	GROUND	5,472.50'	0.00'	5,472.70'	PRIMARY	7.70'	TO BE LOWERED
53	GROUND	5,468.30'	0.00'	5,468.30'	PRIMARY	5.40'	TO BE LOWERED
57	GROUND	5,481.80'	0.00'	5,481.80'	PRIMARY	5.20'	TO BE LOWERED
65	GROUND	5,672.40'	0.00'	5,672.40'	PRIMARY	5.40'	TO BE LOWERED
83	GROUND	5,473.10'	0.00'	5,473.10'	PRIMARY	3.10'	TO BE LOWERED
84	GROUND	5,473.80'	0.00'	5,473.80'	PRIMARY	4.80'	TO BE LOWERED
88	AWOS	5,478.34'	11.76'	5,491.00'	PRIMARY	4.70'	FIXED BY FUNCTION
89	GROUND	5,472.90'	0.00'	5,472.90'	PRIMARY	4.40'	TO BE LOWERED
74	GROUND	5,478.40'	0.00'	5,478.40'	PRIMARY	3.80'	TO BE LOWERED
75	GROUND	5,474.20'	0.00'	5,474.20'	PRIMARY	3.60'	TO BE LOWERED
76	GROUND	5,464.20'	0.00'	5,464.20'	PRIMARY	3.50'	TO BE LOWERED
78	GROUND	5,474.50'	0.00'	5,474.50'	PRIMARY	3.50'	TO BE LOWERED
79	GROUND	5,477.40'	0.00'	5,477.40'	PRIMARY	3.40'	TO BE LOWERED
81	GROUND	5,474.90'	0.00'	5,474.90'	PRIMARY	3.40'	TO BE LOWERED
82	GROUND	5,478.90'	0.00'	5,478.90'	PRIMARY	3.00'	TO BE LOWERED
86	GUIDE SIGN	5,479.85'	9.10'	5,489.00'	PRIMARY	2.70'	FIXED BY FUNCTION
87	GROUND	5,475.30'	0.00'	5,475.30'	PRIMARY	2.30'	TO BE LOWERED
101	FAN	5,482.93'	5.27'	5,488.20'	PRIMARY	1.80'	FIXED BY FUNCTION
95	GROUND	5,460.60'	0.00'	5,460.60'	PRIMARY	1.00'	TO BE LOWERED
96	GROUND	5,440.40'	0.00'	5,440.40'	PRIMARY	0.80'	TO BE LOWERED
97	GROUND	5,477.20'	0.00'	5,477.20'	PRIMARY	0.80'	TO BE LOWERED
98	GROUND	5,477.10'	0.00'	5,477.10'	PRIMARY	0.70'	TO BE LOWERED
106	BEES	5,450.15'	3.25'	5,453.50'	PRIMARY	0.00'	FIXED BY FUNCTION
108	GROUND	5,487.60'	0.00'	5,487.60'	TRANSITIONAL	7.10'	TO BE LOWERED
110	GROUND	5,491.10'	0.00'	5,491.10'	TRANSITIONAL	6.90'	TO BE LOWERED
113	GROUND	5,491.40'	0.00'	5,491.40'	TRANSITIONAL	6.80'	TO BE LOWERED
113	GROUND	5,490.10'	0.00'	5,490.10'	TRANSITIONAL	6.70'	TO BE LOWERED
114	GROUND	5,488.40'	0.00'	5,488.40'	TRANSITIONAL	6.00'	TO BE LOWERED
117	GROUND	5,492.30'	0.00'	5,492.30'	TRANSITIONAL	5.00'	TO BE LOWERED
118	GROUND	5,486.30'	0.00'	5,486.30'	TRANSITIONAL	4.70'	TO BE LOWERED
122	GROUND	5,484.30'	0.00'	5,484.30'	TRANSITIONAL	3.80'	TO BE LOWERED
125	GROUND	5,483.00'	0.00'	5,483.00'	TRANSITIONAL	2.90'	TO BE LOWERED
129	GROUND	5,465.30'	0.00'	5,465.30'	TRANSITIONAL	2.30'	TO BE LOWERED
128	GROUND	5,477.80'	0.00'	5,477.80'	TRANSITIONAL	1.89'	TO BE LOWERED
126	GROUND	5,480.80'	0.00'	5,480.80'	TRANSITIONAL	1.70'	TO BE LOWERED
130	GROUND	5,485.30'	0.00'	5,485.30'	TRANSITIONAL	1.50'	TO BE LOWERED
131	GROUND	5,489.50'	0.00'	5,489.50'	TRANSITIONAL	1.49'	TO BE LOWERED
136	GROUND	5,489.80'	0.00'	5,489.80'	TRANSITIONAL	1.30'	TO BE LOWERED
138	GROUND	5,482.70'	0.00'	5,482.70'	TRANSITIONAL	1.20'	TO BE LOWERED
139	GROUND	5,472.80'	0.00'	5,472.80'	TRANSITIONAL	1.20'	TO BE LOWERED
142	GROUND	5,488.30'	0.00'	5,488.30'	TRANSITIONAL	1.00'	TO BE LOWERED
146	GROUND	5,492.00'	0.00'	5,492.00'	TRANSITIONAL	1.00'	TO BE LOWERED
148	GROUND	5,483.00'	0.00'	5,483.00'	TRANSITIONAL	0.99'	TO BE LOWERED
149	GROUND	5,486.40'	0.00'	5,486.40'	TRANSITIONAL	0.90'	TO BE LOWERED
151	GROUND	5,486.80'	0.00'	5,486.80'	TRANSITIONAL	0.70'	TO BE LOWERED
157	GROUND	5,480.70'	0.00'	5,480.70'	TRANSITIONAL	0.70'	TO BE LOWERED
156	GROUND	5,469.20'	0.00'	5,469.00'	TRANSITIONAL	0.30'	TO BE LOWERED
198	GROUND	5,476.80'	0.00'	5,476.80'	TRANSITIONAL	0.10'	TO BE LOWERED
202	ANTENNA	5,305.30'	50.10'	5,359.40'	PRIMARY	87.50'	FIXED BY FUNCTION
203	ANTENNA	5,476.94'	41.16'	5,518.10'	PRIMARY	38.80'	FIXED BY FUNCTION
205	BEES	5,472.03'	4.79'	5,477.80'	PRIMARY	1.30'	FIXED BY FUNCTION
206	BEES	5,476.61'	4.63'	5,477.70'	PRIMARY	1.20'	FIXED BY FUNCTION
207	GROUND	5,562.60'	0.00'	5,562.60'	TRANSITIONAL	0.20'	TO BE LOWERED
208	TOWER	5,484.50'	31.08'	5,646.30'	HORIZONTAL	21.30'	FIXED BY FUNCTION

DRAWING LEGEND

ITEM	EXISTING	FUTURE
AIRPORT PROPERTY BOUNDARY		SAME
APPROACH SURFACE		SAME
CONICAL SURFACE		SAME
HORIZONTAL SURFACE		SAME
PRIMARY SURFACE		SAME
TRANSITIONAL SURFACE		SAME
AIRSPACE OBSTRUCTIONS	•	SAME

NOTES

1. EXISTING, FUTURE CONDITIONS SHOWN AS (E)(F)
2. OBSTRUCTIONS DETAIL TO INNER APPROACH SURFACES SHOWN ON SHEETS 09-12
3. SURFACES BASED ON EXISTING/ FUTURE RUNWAY DIMENSIONS
4. PER 14 CFR PART 77, SURFACE TRANSPORTATION ENTITIES' ELEVATION INCLUDE AN ADJUSTMENT FOR OBSTRUCTION ANALYSES PURPOSES (23 FEET FOR RAILWAYS, 17 FEET FOR INTERSTATE HIGHWAYS, AND 15 FEET FOR ALL OTHER PUBLIC ROADS)
5. THE AIRPORT PROPERTY LINE REFLECTED HERE IS BASED ON A COMPILATION OF HISTORICAL SOURCES AND MAY NOT ACCURATELY REFLECT ITS TRUE CONDITION. THE AIRPORT WILL UNDERTAKE A FULL PROPERTY SURVEY TO UPDATE ITS PROPERTY LINE.
6. ADAMS COUNTY HAS ESTABLISHED AN AIRPORT INFLUENCE AREA OVERLAY DISTRICT (OR AIRPORT INFLUENCE ZONE [AIZ]) AND ASSOCIATED REGULATIONS THAT GOVERN THE TYPES OF DEVELOPMENT WITHIN THE AREA SURROUNDING THE AIRPORT TO ENDURE COMPATIBLE LAND USES IN CLOSE PROXIMITY TO THE AIRPORT. (SEE ADAMS COUNTY DEVELOPMENT STANDARDS & REGULATIONS DOCUMENT, CHAPTER 3.)
7. ADDITIONAL LAND USE GUIDANCE IS PROVIDED BY THE STATE OF COLORADO (SEE COLORADO REVISED STATUTE 43-10-113, SAFE OPERATING AREAS AROUND AIRPORTS, AND COLORADO REVISED STATUTE 24-65.1-202, CRITERIA FOR ADMINISTRATION OF AREAS OF STATE INTERESTS)

SOURCE

1. SURVEY DATA IS BASED ON THE PLANIMETRIC MAPPING AND ORTHO-IMAGERY INFORMATION COMPILED BY MARTINEZ GEOSPATIAL IN 2017.
2. ALL HORIZONTAL COORDINATES - NAD83/2011
   ALL VERTICAL COORDINATES - NAD88
3. USGS TOPO MAP OBTAINED FROM USGS DATABASE IN 2017

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Sep 26, 2019 - 11:44am
Sean.Jovis

JVIATION®

Front Range AIRPORT

DES: S.G.J.
DR: S.G.J.
CH: J.B.M.
APP: J.B.M.

ISSUE RECORD

NO.	BY	DATE	DESCRIPTION

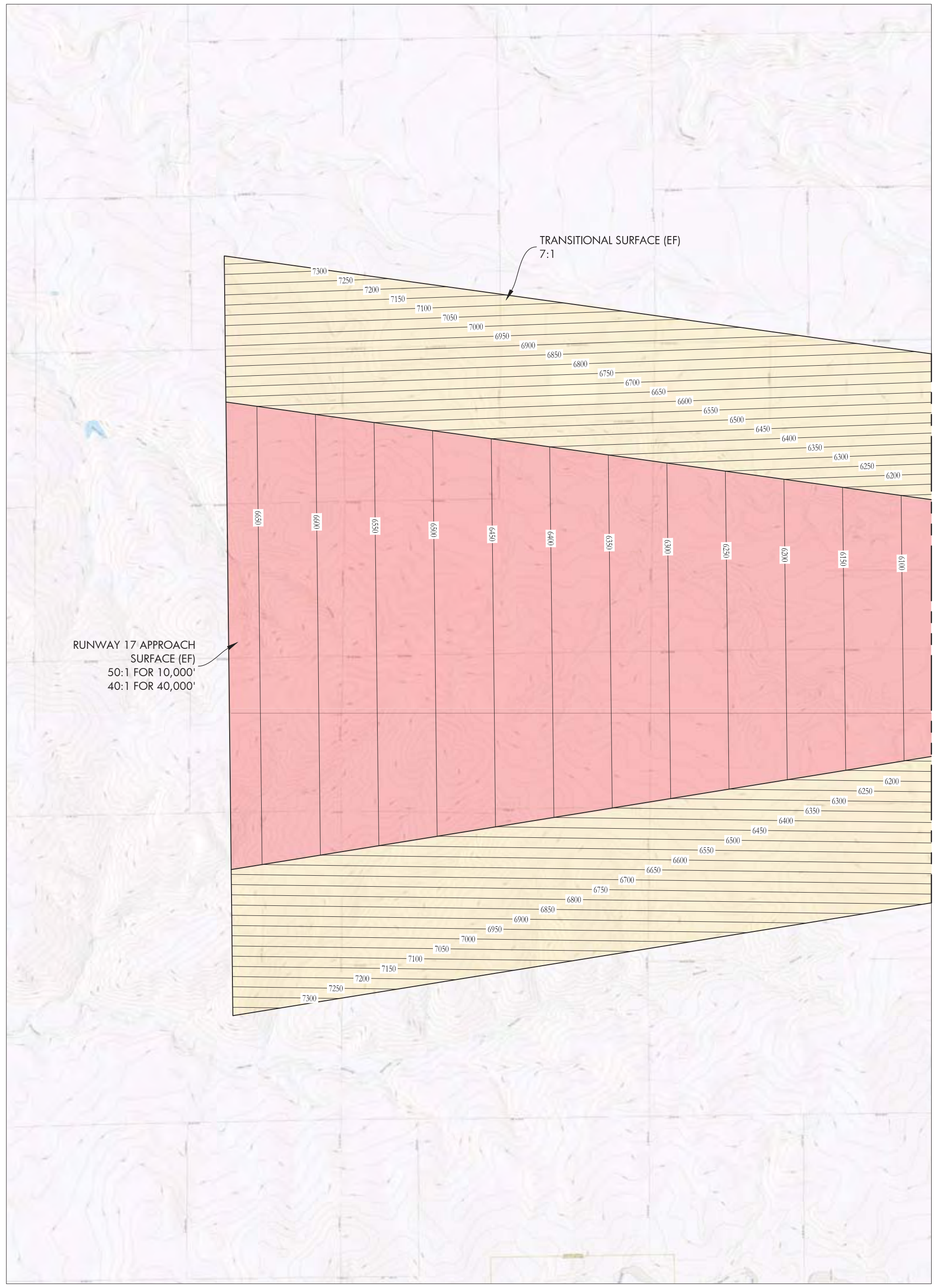
THE PREPARATION OF THIS DOCUMENT MAY HAVE BEEN SUPPORTED, IN PART, THROUGH THE AIRPORT IMPROVEMENT PROGRAM FINANCIAL ASSISTANCE FROM THE FEDERAL AVIATION ADMINISTRATION AS PROVIDED UNDER TITLE 49 U.S.C., SECTION 47104. THE CONTENTS DO NOT NECESSARILY REFLECT THE OFFICIAL VIEWS OR POLICY OF THE FAA. ACCEPTANCE OF THIS AIRPORT LAYOUT PLAN BY THE FAA DOES NOT IN ANY WAY CONSTITUTE A COMMITMENT ON THE PART OF THE UNITED STATES TO PARTICIPATE IN ANY DEVELOPMENT DEPICTED THEREIN NOR DOES IT INDICATE THAT THE PROPOSED DEVELOPMENT IS ENVIRONMENTALLY ACCEPTABLE OR WOULD HAVE JUSTIFICATION IN ACCORDANCE WITH APPROPRIATE PUBLIC LAWS.

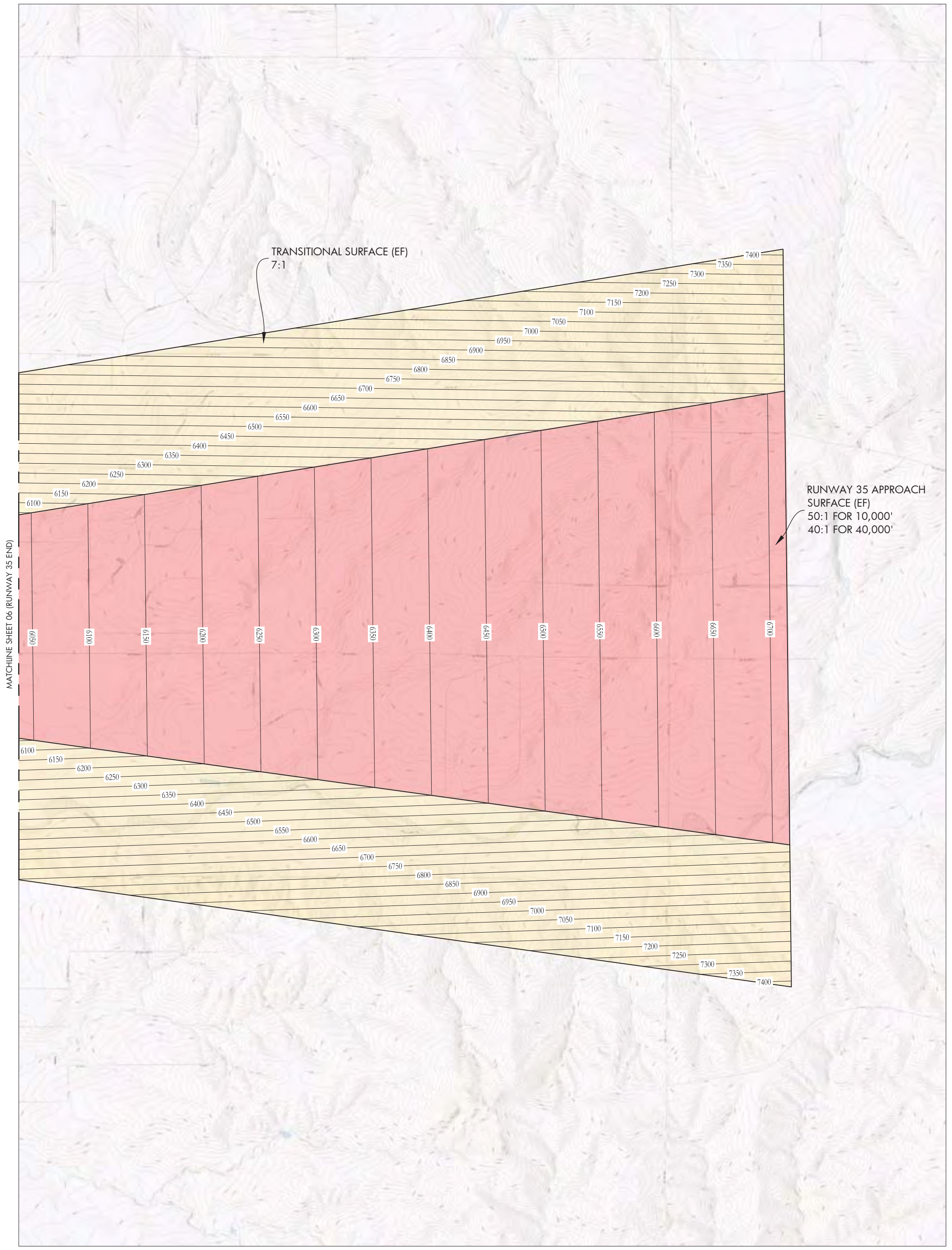
AIRPORT LAYOUT PLAN

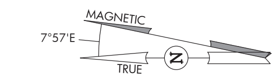
AIRPORT AIRSPACE DRAWING - 1

AIP PROJ. NO.	JVIATION PROJ. NO.	DATE:
3-08-0016-040-2015	2015.FTG.03	SEPTEMBER 2019

SHEET NO.
06 of 18







DATE: 04/2018
ANNUAL RATE OF CHANGE: 0°6'W
SOURCE: U.S. NOAA

GRAPHIC SCALE
0 1500 3000 6000
(IN FEET)

DRAWING LEGEND

ITEM	EXISTING	FUTURE
APPROACH SURFACE		SAME
TRANSITIONAL SURFACE		SAME

NOTES

1. EXISTING, FUTURE CONDITIONS SHOWN AS (E)(F)
2. OBSTRUCTIONS DETAIL TO INNER APPROACH SURFACES SHOWN ON SHEETS 09-12
3. SURFACES BASED ON EXISTING/ FUTURE RUNWAY DIMENSIONS
4. PER 14 CFR PART 77, SURFACE TRANSPORTATION ENTITIES' ELEVATION INCLUDE AN ADJUSTMENT FOR OBSTRUCTION ANALYSES PURPOSES (23 FEET FOR RAILWAYS, 17 FEET FOR INTERSTATE HIGHWAYS, AND 15 FEET FOR ALL OTHER PUBLIC ROADS)
5. THE AIRPORT PROPERTY LINE REFLECTED HERE IS BASED ON A COMPILATION OF HISTORICAL SOURCES AND MAY NOT ACCURATELY REFLECT ITS TRUE CONDITION. THE AIRPORT WILL UNDERTAKE A FULL PROPERTY SURVEY TO UPDATE ITS PROPERTY LINE.
6. ADAMS COUNTY HAS ESTABLISHED AN AIRPORT INFLUENCE AREA OVERLAY DISTRICT (OR AIRPORT INFLUENCE ZONE [AIZ]) AND ASSOCIATED REGULATIONS THAT GOVERN THE TYPES OF DEVELOPMENT WITHIN THE AREA SURROUNDING THE AIRPORT TO ENDURE COMPATIBLE LAND USES IN CLOSE PROXIMITY TO THE AIRPORT. (SEE ADAMS COUNTY DEVELOPMENT STANDARDS & REGULATIONS DOCUMENT, CHAPTER 3.)
7. ADDITIONAL LAND USE GUIDANCE IS PROVIDED BY THE STATE OF COLORADO (SEE COLORADO REVISED STATUTE 43-10-113, SAFE OPERATING AREAS AROUND AIRPORTS, AND COLORADO REVISED STATUTE 24-65.1-202, CRITERIA FOR ADMINISTRATION OF AREAS OF STATE INTERESTS)

SOURCE

1. SURVEY DATA IS BASED ON THE PLANIMETRIC MAPPING AND ORTHO-IMAGERY INFORMATION COMPILED BY MARTINEZ GEOSPATIAL IN 2017.
2. ALL HORIZONTAL COORDINATES - NAD83/2011
   ALL VERTICAL COORDINATES - NAD88
3. USGS TOPO MAP OBTAINED FROM USGS DATABASE IN 2017

JVIATION®

Front Range AIRPORT

DES: S.G.J.
DR: S.G.J.
CH: J.B.M.
APP: J.B.M.

ISSUE RECORD

NO.	BY	DATE	DESCRIPTION

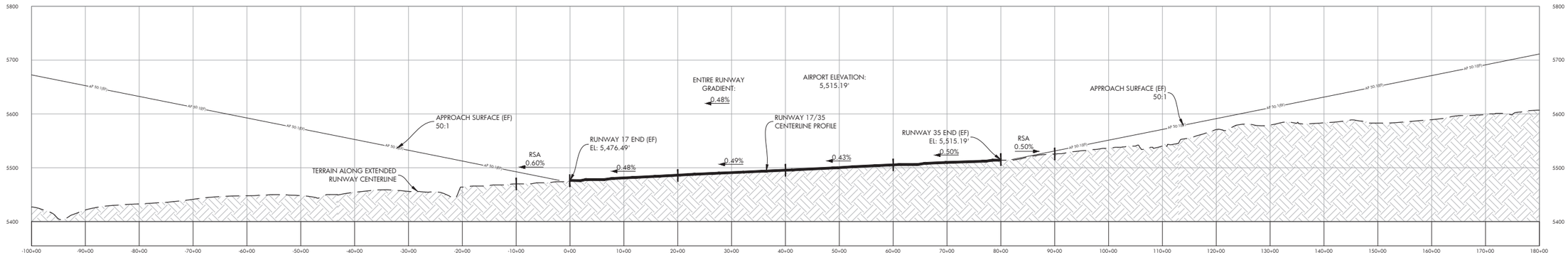
THE PREPARATION OF THIS DOCUMENT MAY HAVE BEEN SUPPORTED, IN PART, THROUGH THE AIRPORT IMPROVEMENT PROGRAM FINANCIAL ASSISTANCE FROM THE FEDERAL AVIATION ADMINISTRATION AS PROVIDED UNDER TITLE 49 U.S.C., SECTION 47104. THE CONTENTS DO NOT NECESSARILY REFLECT THE OFFICIAL VIEWS OR POLICY OF THE FAA. ACCEPTANCE OF THIS AIRPORT LAYOUT PLAN BY THE FAA DOES NOT IN ANY WAY CONSTITUTE A COMMITMENT ON THE PART OF THE UNITED STATES TO PARTICIPATE IN ANY DEVELOPMENT DEPICTED THEREIN NOR DOES IT INDICATE THAT THE PROPOSED DEVELOPMENT IS ENVIRONMENTALLY ACCEPTABLE OR WOULD HAVE JUSTIFICATION IN ACCORDANCE WITH APPROPRIATE PUBLIC LAWS.

AIRPORT
LAYOUT PLAN

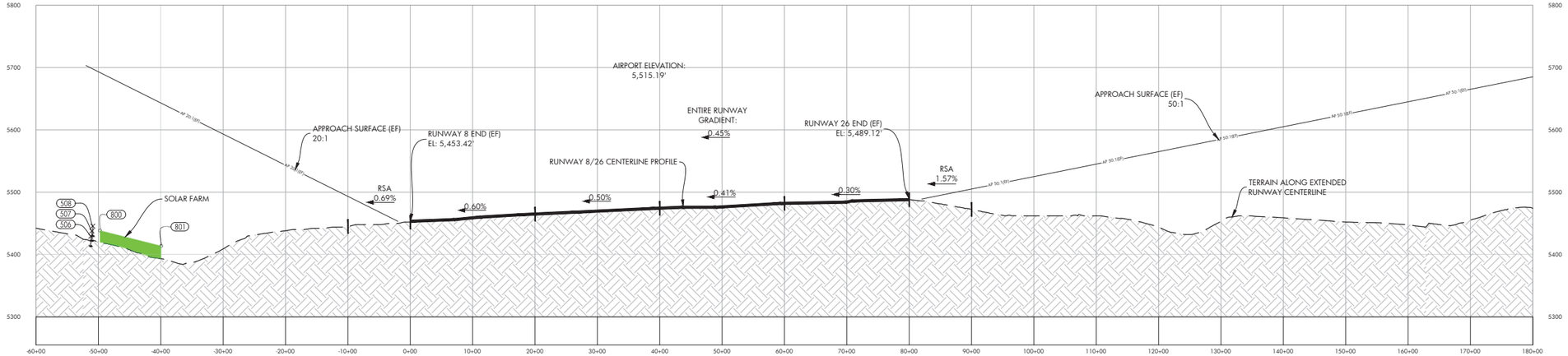
AIRPORT AIRSPACE DRAWING - 2

AIP PROJ. NO. 3-08-0016-040-2015
JVIATION PROJ. NO. 2015.FTG.03
DATE: SEPTEMBER 2019

SHEET NO.



PROFILE
HORIZ: 1" = 1000'
VERT: 1" = 100'



PROFILE
HORIZ: 1" = 1000'
VERT: 1" = 100'

OBSTRUCTION TABLE						
OBJECT IDENTIFICATION NO.	OBJECT TYPE	GROUND SURFACE ELEVATION (MSL)	ABOVE GROUND LEVEL (AGL)	TOP OF OBJECT ELEVATION (AMSL)	EXISTING/FUTURE APPROACH SURFACE PENETRATION	DISPOSITION
506	ROAD +15'	5,414.30'	15.00'	5,429.30'	270.13'	N/A
507	ROAD +15'	5,422.90'	15.00'	5,437.90'	260.64'	N/A
508	ROAD +15'	5,430.55'	15.00'	5,445.55'	252.27'	N/A
800	SOLAR FARM	5,426.60'	12.00'	5,438.60'	253.45'	N/A
801	SOLAR FARM	5,401.81'	12.00'	5,413.81'	229.20'	N/A

NOTES

1. EXISTING AND FUTURE CONDITIONS SHOWN AS (E)(F)
2. OBSTRUCTIONS OF THE INNER APPROACH SURFACES ARE SHOWN ON SHEETS 09-12
3. PER 14 CFR PART 77, SURFACE TRANSPORTATION ENTITIES' ELEVATION INCLUDE AN ADJUSTMENT FOR OBSTRUCTION ANALYSES PURPOSES (23 FEET FOR RAILWAYS, 17 FEET FOR INTERSTATE HIGHWAYS, AND 15 FEET FOR ALL OTHER PUBLIC ROADS)

SOURCE

1. SURVEY DATA, INCLUDING OBSTRUCTION DATA, IS BASED ON THE PLANIMETRIC MAPPING AND ORTHO-IMAGERY INFORMATION COMPILED BY MARTINEZ GEOSPATIAL IN 2017.
2. ALL HORIZONTAL COORDINATES - NAD83/2011
   ALL VERTICAL COORDINATES - NAD88

L:\FTG\ALP\PLANES\
08-FTG-ALP-AIRP-RW 8-26.dwg
Sep 18, 2019 - 11:44am
Sean.Jarvis

JVIATION®

Front Range AIRPORT

DES: S.G.J.
DR: S.G.J.
CH: J.B.M.
APP: J.B.M.

ISSUE RECORD

NO.	BY	DATE	DESCRIPTION

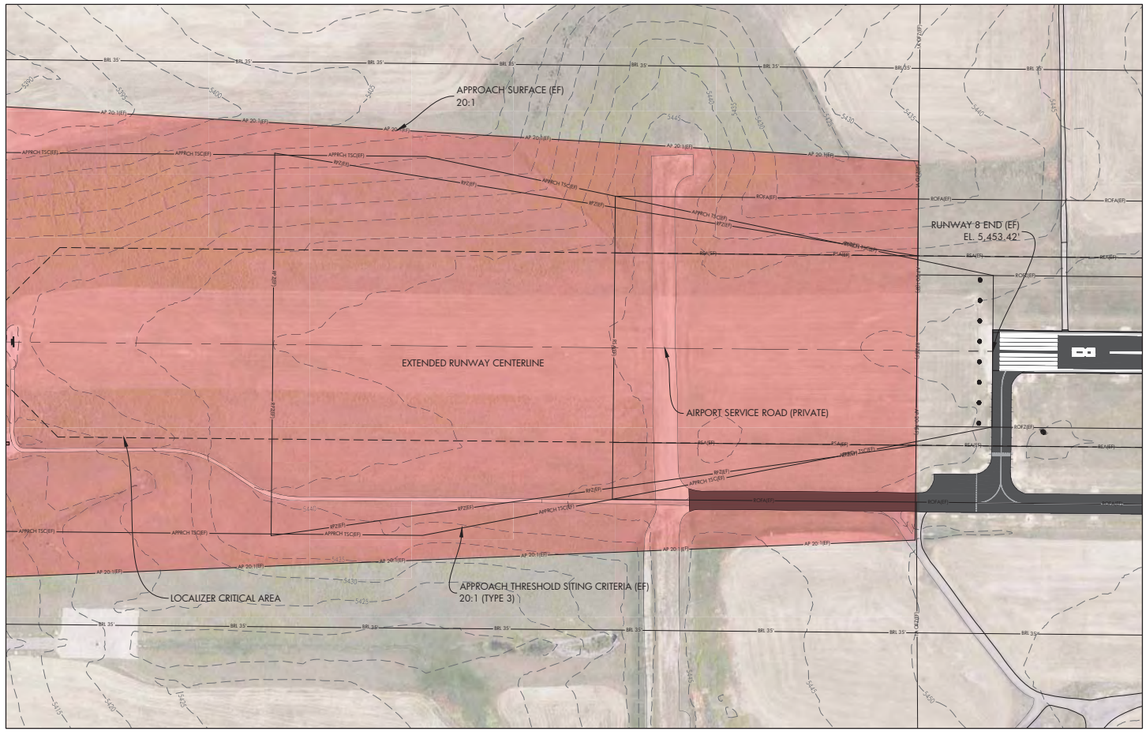
AIRPORT
LAYOUT PLAN

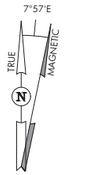
AIRPORT AIRSPACE PROFILES

AIP PROJ. NO.	JVIATION PROJ. NO.	DATE:
3-08-0016-040-2015	2015.FTG.03	SEPTEMBER 2019

SHEET NO.
08 of 18

RUNWAY 26 INNER APPROACH OBSTACLE TABLE						
OBJECT IDENTIFICATION NO.	OBJECT TYPE	GROUND SURFACE ELEVATION (MSL)	ABOVE GROUND LEVEL (AGL)	TOP OF OBJECT ELEVATION (AMSL)	SURFACE REFERENCED	EXISTING/FUTURE SURFACE PENETRATION
-	-	-	-	-	-	-

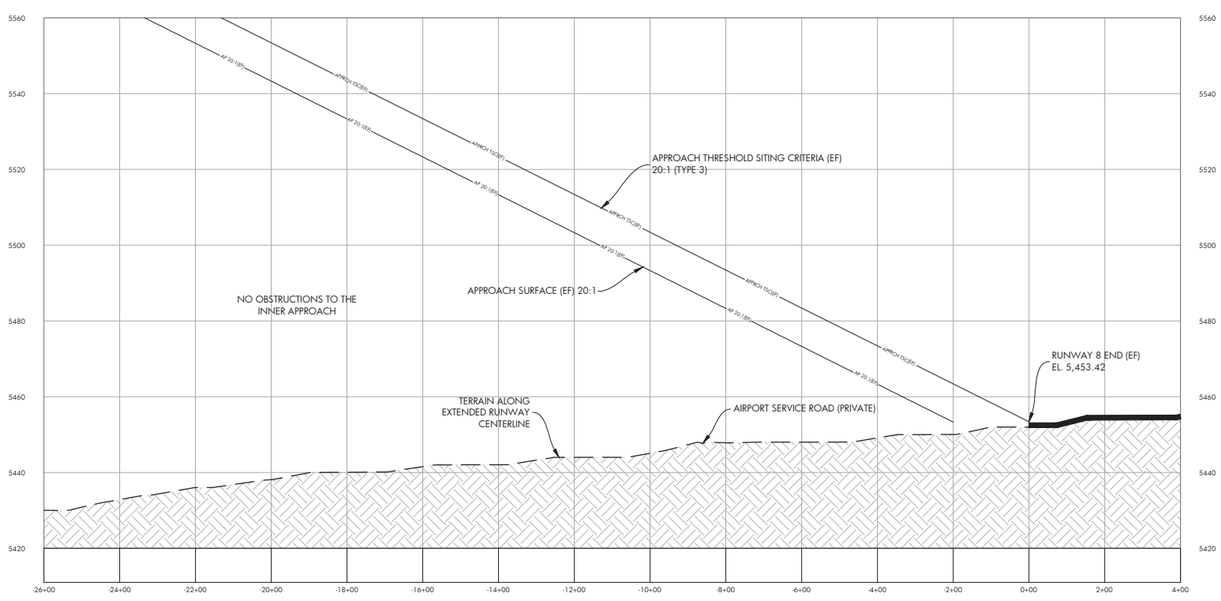




DATE: 04/2018
ANNUAL RATE OF CHANGE: 0°6'W
SOURCE: U.S. NOAA

GRAPHIC SCALE
0 100 200 400
(IN FEET)

PROFILE
HORIZ: 1" = 200'
VERT: 1" = 20'



NOTES

1. EXISTING AND FUTURE CONDITIONS SHOWN AS (E)(F)
2. THE SURVEY WAS COMPLETED TO THE STANDARDS OUTLINED IN AC 150/5300-18B
3. PER 14 CFR PART 77, SURFACE TRANSPORTATION ENTITIES' ELEVATION INCLUDE AN ADJUSTMENT FOR OBSTRUCTION ANALYSES PURPOSES (23 FEET FOR RAILWAYS, 17 FEET FOR INTERSTATE HIGHWAYS, AND 15 FEET FOR ALL OTHER PUBLIC ROADS)

SOURCE

1. SURVEY DATA IS BASED ON THE PLANIMETRIC MAPPING AND ORTHO-IMAGERY INFORMATION COMPILED BY MARTINEZ GEOSPATIAL IN 2017.
2. ALL HORIZONTAL COORDINATES - NAD83/2011
   ALL VERTICAL COORDINATES - NAD88

DRAWING LEGEND		
ITEM	EXISTING	FUTURE
AIRFIELD PAVEMENT		N/A
TAXI/APRON MARKINGS		N/A
RUNWAY PROTECTION ZONE (RPZ)	RPZ(E) RPZ(E)	RPZ(F) RPZ(F)
BUILDING RESTRICTION LINE	BRL 35'	SAME
RUNWAY OBJECT FREE AREA (ROFA)	ROFA(E)	ROFA(F)
RUNWAY SAFETY AREA (RSA)	RSA(E)	RSA(F)
OBJECT FREE ZONE - RUNWAY (ROFZ)	ROFZ(E)	ROFZ(F)
OBJECT FREE ZONE - INNER APPROACH (IA OFZ)	IA OFZ(E)	IA OFZ(F)
THRESHOLD SITING CRITERIA - APPROACH (APPRCH TSC)	APPRCH TSC(E)	APPRCH TSC(F)
APPROACH SURFACE (20:1)	AP 20:1(E)	AP 20:1(F)
RUNWAY END LIGHT		SAME
LOCALIZER		SAME
PRIMARY/SECONDARY AIRPORT CONTROL STATION		SAME

09- 10- MSD- RW 8- 26.dwg
09-18-2019 - 11:56am
Sean.Jones

JVIATION®

FrontRange AIRPORT

DES: S.G.J.
DR: S.G.J.
CH: J.B.M.
APP: J.B.M.

ISSUE RECORD

NO.	BY	DATE	DESCRIPTION

AIRPORT LAYOUT PLAN

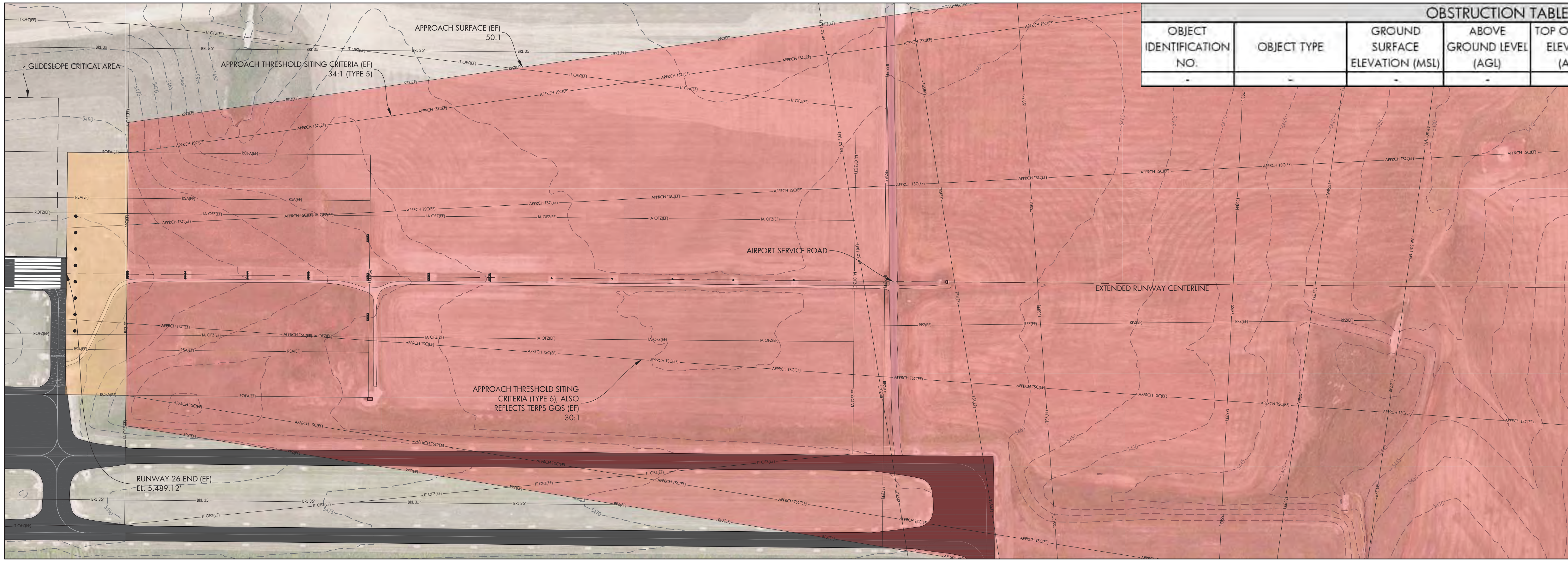
RUNWAY 8 INNER APPROACH SURFACE DRAWING

AIP PROJ. NO.	JVIATION PROJ. NO.	DATE:
3-08-0016-040-2015	2015.FTG.03	SEPTEMBER 2019

SHEET NO.
09 of 18

L:\FTFVA\PLP\DWG\

OBSTRUCTION TABLE						
OBJECT IDENTIFICATION NO.	OBJECT TYPE	GROUND SURFACE ELEVATION (MSL)	ABOVE GROUND LEVEL (AGL)	TOP OF OBJECT ELEVATION (AMSL)	EXISTING APPROACH SURFACE PENETRATION	DISPOSITION
-	-	-	-	-	-	-

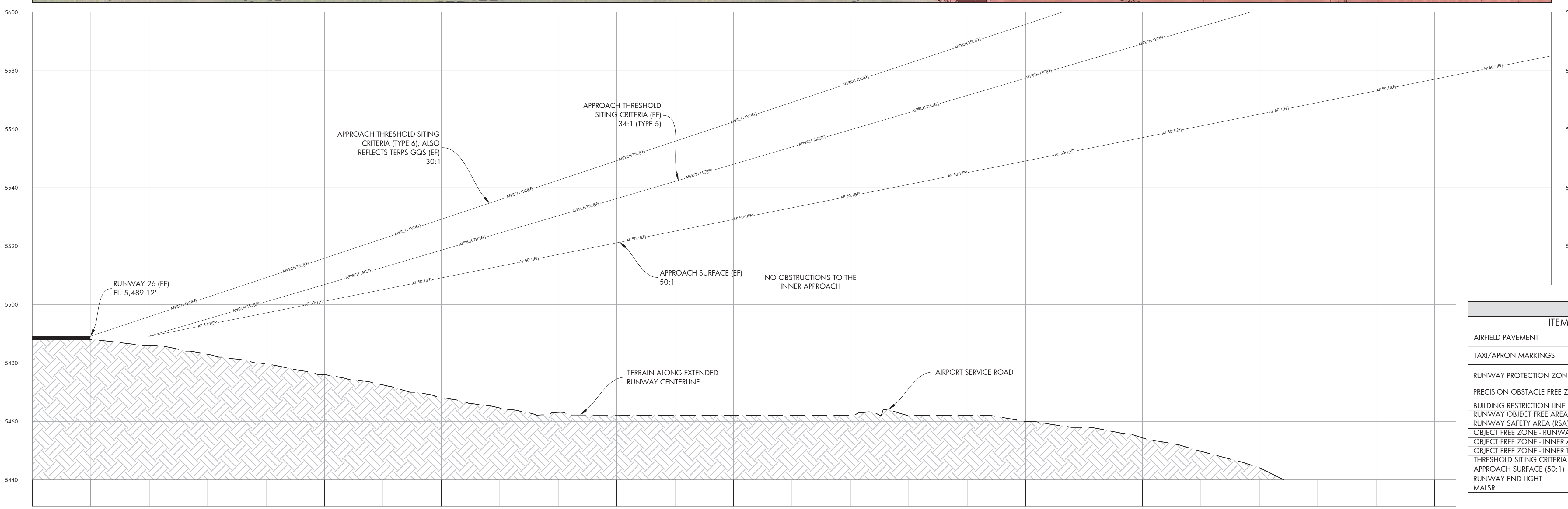


7°57'E
TRUE
MAGNETIC
N

DATE: 04/2018
ANNUAL RATE OF CHANGE: 0°6'W
SOURCE: U.S. NOAA

GRAPHIC SCALE
0 100 200 400
(IN FEET)

PROFILE
HORIZ: 1" = 200'
VERT: 1" = 20'



NOTES

1. EXISTING AND FUTURE CONDITIONS SHOWN AS (E)(F)
2. THE SURVEY WAS COMPLETED TO THE STANDARDS OUTLINED IN AC 150/5300-18B
3. PER 14 CFR PART 77, SURFACE TRANSPORTATION ENTITIES' ELEVATION INCLUDE AN ADJUSTMENT FOR OBSTRUCTION ANALYSES PURPOSES (23 FEET FOR RAILWAYS, 17 FEET FOR INTERSTATE HIGHWAYS, AND 15 FEET FOR ALL OTHER PUBLIC ROADS)

SOURCE

1. SURVEY DATA IS BASED ON THE PLANIMETRIC MAPPING AND ORTHO-IMAGERY INFORMATION COMPILED BY MARTINEZ GEOSPATIAL IN 2017.
2. ALL HORIZONTAL COORDINATES - NAD83/2011
   ALL VERTICAL COORDINATES - NAD88

DRAWING LEGEND		
ITEM	EXISTING	FUTURE
AIRFIELD PAVEMENT		N/A
TAXI/APRON MARKINGS		N/A
RUNWAY PROTECTION ZONE (RPZ)	RPZ(E)	RPZ(F)
PRECISION OBSTACLE FREE ZONE		SAME
BUILDING RESTRICTION LINE	BRL 35'	SAME
RUNWAY OBJECT FREE AREA (ROFA)	ROFA(E)	ROFA(F)
RUNWAY SAFETY AREA (RSA)	RSA(E)	RSA(F)
OBJECT FREE ZONE - RUNWAY (ROFZ)	ROFZ(E)	ROFZ(F)
OBJECT FREE ZONE - INNER APPROACH (IA OFZ)	IA OFZ(E)	IA OFZ(F)
OBJECT FREE ZONE - INNER TRANSITIONAL (IT OFZ)	IT OFZ(E)	IT OFZ(F)
THRESHOLD SITING CRITERIA - APPROACH (APPRCH TSC)	APPRCH TSC(E)	APPRCH TSC(F)
APPROACH SURFACE (50:1)	AP 50:1(E)	AP 50:1(F)
RUNWAY END LIGHT	•	SAME
MALSR		SAME

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09-10--IASD--RW 8--26.dwg
Sep 18, 2019 - 11:45am
Sean.Jarvis

JVIATION®

FrontRange AIRPORT

DES: S.G.J.
DR: S.G.J.
CH: J.B.M.
APP: J.B.M.

ISSUE RECORD			
NO.	BY	DATE	DESCRIPTION

AIRPORT LAYOUT PLAN

RUNWAY 26 INNER APPROACH SURFACE DRAWING

AIP PROJ. NO. 3-08-0016-040-2015
JVIATION PROJ. NO. 2015.FTG.03
DATE: SEPTEMBER 2019

SHEET NO.

OBSTRUCTION TABLE

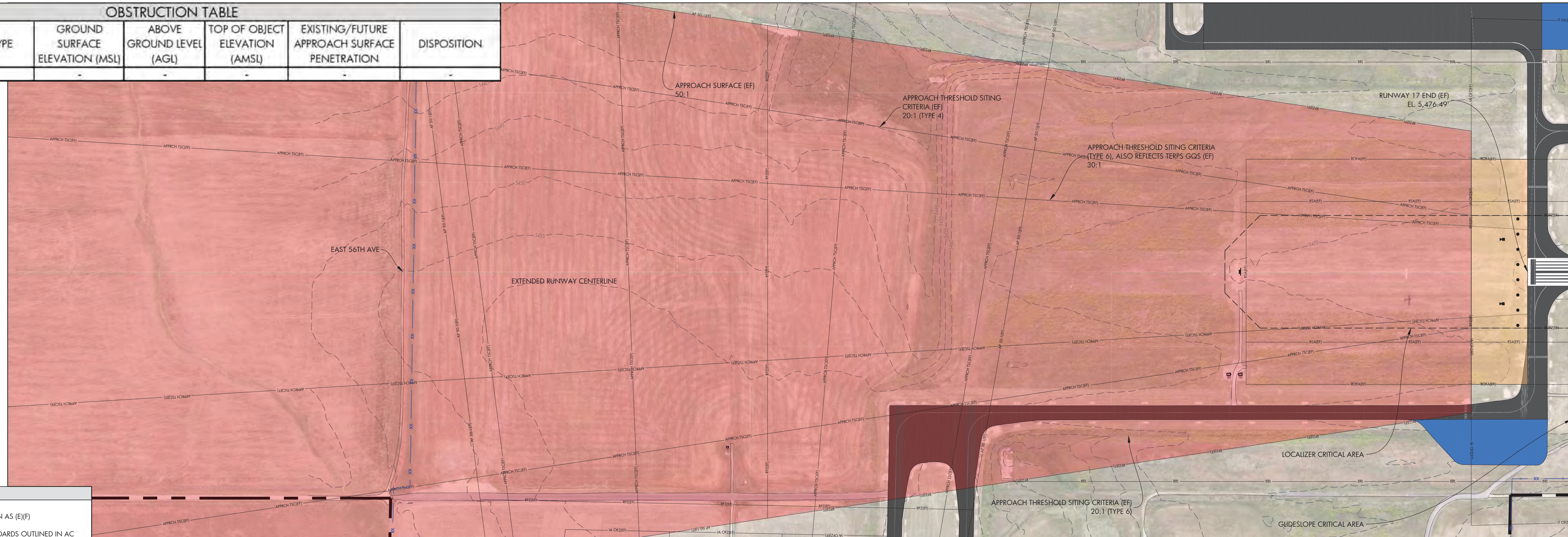
OBJECT IDENTIFICATION NO.	OBJECT TYPE	GROUND SURFACE ELEVATION (MSL)	ABOVE GROUND LEVEL (AGL)	TOP OF OBJECT ELEVATION (AMSL)	EXISTING/FUTURE APPROACH SURFACE PENETRATION	DISPOSITION
-	-	-	-	-	-	-

MAGNETIC
7°57'E
TRUE

DATE: 04/2018
ANNUAL RATE OF CHANGE: 0°6'W
SOURCE: U.S. NOAA

GRAPHIC SCALE
0 100 200 400
(IN FEET)

PROFILE
HORIZ: 1" = 200'
VERT: 1" = 20'



NOTES

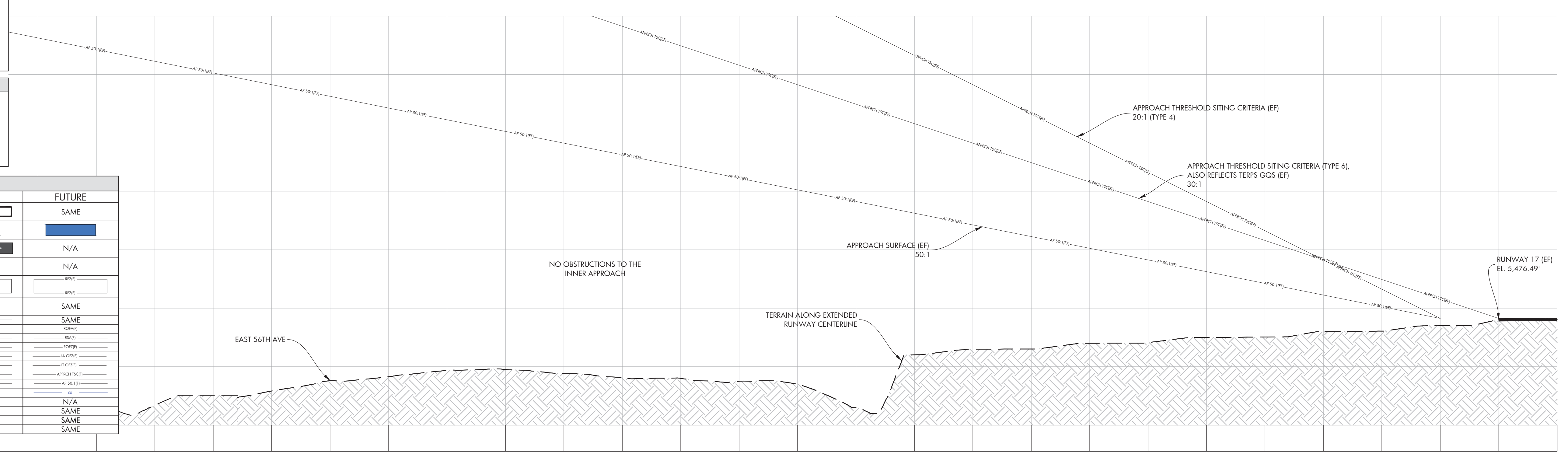
1. EXISTING AND FUTURE CONDITIONS SHOWN AS (E)(F)
2. THE SURVEY WAS COMPLETED TO THE STANDARDS OUTLINED IN AC 150/5300-18B
3. PER 14 CFR PART 77, SURFACE TRANSPORTATION ENTITIES' ELEVATION INCLUDE AN ADJUSTMENT FOR OBSTRUCTION ANALYSES PURPOSES (23 FEET FOR RAILWAYS, 17 FEET FOR INTERSTATE HIGHWAYS, AND 15 FEET FOR ALL OTHER PUBLIC ROADS)
4. THE AIRPORT PROPERTY LINE REFLECTED HERE IS BASED ON A COMPILATION OF HISTORICAL SOURCES AND MAY NOT ACCURATELY REFLECT ITS TRUE CONDITION. THE AIRPORT WILL UNDERTAKE A FULL PROPERTY SURVEY TO UPDATE ITS PROPERTY LINE.

SOURCE

1. SURVEY DATA IS BASED ON THE PLANIMETRIC MAPPING AND ORTHO-IMAGERY INFORMATION COMPILED BY MARTINEZ GEOSPATIAL IN 2017.
2. ALL HORIZONTAL COORDINATES - NAD83/2011
   ALL VERTICAL COORDINATES - NAD88

DRAWING LEGEND

ITEM	EXISTING	FUTURE
AIRPORT PROPERTY BOUNDARY		SAME
AIRFIELD PAVEMENT		
TAXI/APRON MARKINGS		N/A
AUTO PAVEMENT		N/A
RUNWAY PROTECTION ZONE (RPZ)		
PRECISION OBSTACLE FREE ZONE		SAME
BUILDING RESTRICTION LINE		SAME
RUNWAY OBJECT FREE AREA (ROFA)		
RUNWAY SAFETY AREA (RSA)		
OBJECT FREE ZONE - RUNWAY (ROFZ)		
OBJECT FREE ZONE - INNER APPROACH (IA OFZ)		
OBJECT FREE ZONE - INNER TRANSITIONAL (IT OFZ)		
THRESHOLD SITING CRITERIA - APPROACH (APPRCH TSC)		
APPROACH SURFACE (50:1)		
FENCE - SECURITY (8' HEIGHT)	N/A	
FENCE - GENERAL (4' HEIGHT)		N/A
RUNWAY END IDENTIFIER LIGHTS (REIL)		SAME
RUNWAY END LIGHT		SAME
LOCALIZER		SAME



JVIATION®

FrontRange AIRPORT

DES:	S.G.J.
DR:	S.G.J.
CH:	J.B.M.
APP:	J.B.M.

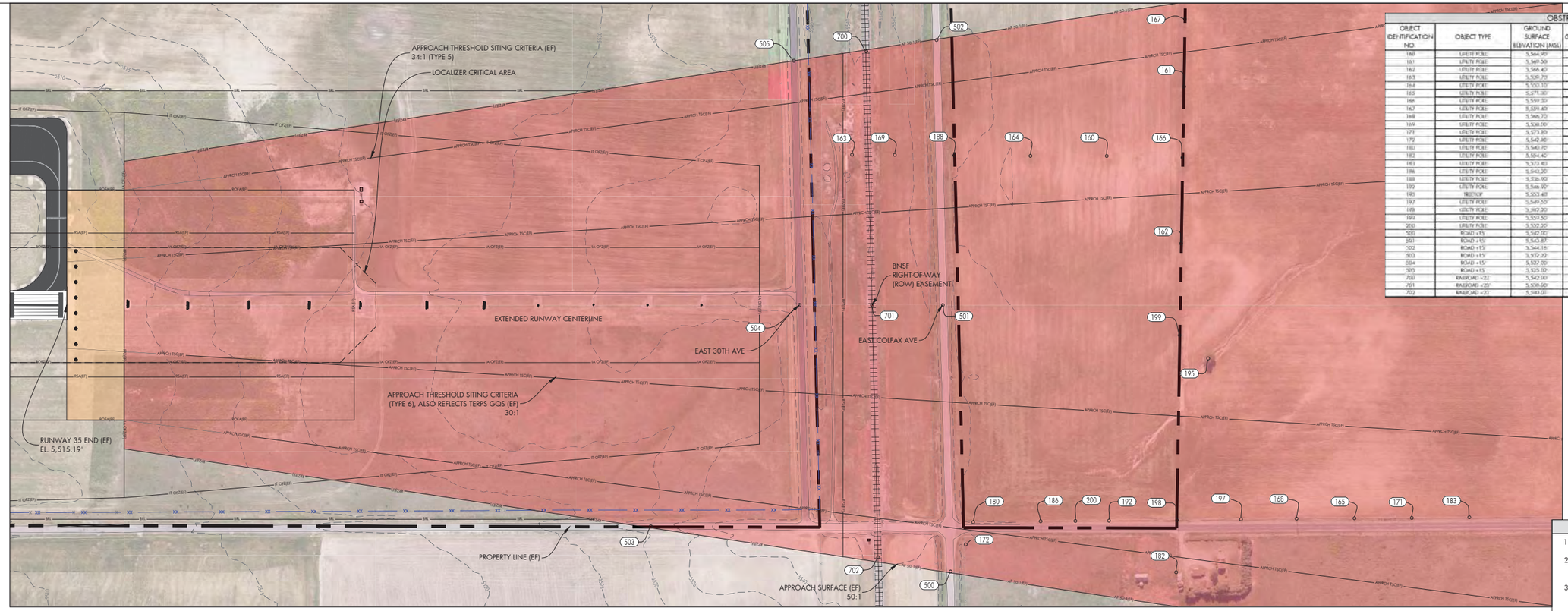
ISSUE RECORD

NO.	BY	DATE	DESCRIPTION

AIRPORT LAYOUT PLAN

RUNWAY 17 INNER APPROACH SURFACE DRAWING

AIP PROJ. NO. 3-08-0016-040-2015
JVIATION PROJ. NO. 2015.FTG.03
DATE: SEPTEMBER 2019



OBSTRUCTION TABLE

OBJECT IDENTIFICATION NO.	OBJECT TYPE	GROUND SURFACE ELEVATION (MSL)	ABOVE GROUND LEVEL (AGL)	TOP OF OBJECT ELEVATION (AMSL)	EXISTING/FUTURE APPROACH SURFACE PENETRATION	DISPOSITION
160	UTILITY POLE	5,564.90'	30.00	5,584.90'	11.36'	MARK/LIGHT
161	UTILITY POLE	5,569.50	30.00	5,599.50'	10.57'	MARK/LIGHT
162	UTILITY POLE	5,566.40'	30.00	5,596.40'	7.68'	MARK/LIGHT
163	UTILITY POLE	5,535.70'	30.00'	5,569.70'	3.87'	MARK/LIGHT
164	UTILITY POLE	5,553.10'	30.00	5,583.10'	5.86'	MARK/LIGHT
165	UTILITY POLE	5,571.30'	30.00	5,601.30'	0.52'	MARK/LIGHT
166	UTILITY POLE	5,559.50'	30.00'	5,589.50'	0.49'	MARK/LIGHT
167	UTILITY POLE	5,559.40'	30.00	5,589.40'	0.43'	MARK/LIGHT
168	UTILITY POLE	5,986.70'	30.00	5,986.70'	0.05'	N/A
169	UTILITY POLE	5,568.50'	30.00	5,568.50'	0.80'	N/A
171	UTILITY POLE	5,573.80'	30.00	5,603.80'	-0.96'	N/A
172	UTILITY POLE	5,542.80'	30.00'	5,572.80'	-0.93'	N/A
180	UTILITY POLE	5,540.70'	30.00	5,570.70'	5.70'	N/A
182	UTILITY POLE	5,564.40'	30.00	5,594.40'	-6.80'	N/A
183	UTILITY POLE	5,573.80	30.00'	5,603.80'	-7.10'	N/A
186	UTILITY POLE	5,543.20'	30.00	5,573.20'	-8.74'	N/A
188	UTILITY POLE	5,536.90'	30.00	5,566.90'	-8.04'	N/A
192	UTILITY POLE	5,546.90'	30.00	5,576.90'	-8.79'	N/A
195	TREETOP	5,553.40	99.00	5,592.40	-8.58'	TRIM/REMOVE (2018)
197	UTILITY POLE	5,549.50'	30.00	5,579.50'	-9.01'	N/A
198	UTILITY POLE	5,562.20'	30.00'	5,592.20'	-9.11'	N/A
199	UTILITY POLE	5,559.50'	30.00	5,589.50'	-9.16'	N/A
200	UTILITY POLE	5,552.20'	30.00'	5,582.20'	0.84'	MARK/LIGHT
500	ROAD +15	5,542.00'	15.00	5,557.00'	-15.68'	N/A
501	ROAD +15	5,543.87'	15.00	5,558.87'	-13.27'	N/A
502	ROAD +15	5,544.16'	15.00	5,559.16'	-12.55'	N/A
503	ROAD +15'	5,532.22'	15.00'	5,547.22'	-4.61'	N/A
504	ROAD +15'	5,527.00'	15.00'	5,542.00'	-20.18'	N/A
505	ROAD +15	5,525.02'	15.00	5,540.02'	-21.77'	N/A
700	RAILROAD +23	5,542.00'	23.00	5,565.00'	-1.82'	N/A
701	RAILROAD +23	5,538.00'	23.00	5,561.00'	-6.21'	N/A
702	RAILROAD +23	5,540.01'	23.00	5,563.01'	-4.63'	N/A

MAGNETIC
7°57'E
TRUE

DATE: 04/2018
ANNUAL RATE OF CHANGE: 0°6'W
SOURCE: U.S. NOAA

GRAPHIC SCALE
0 100 200 400
(IN FEET)

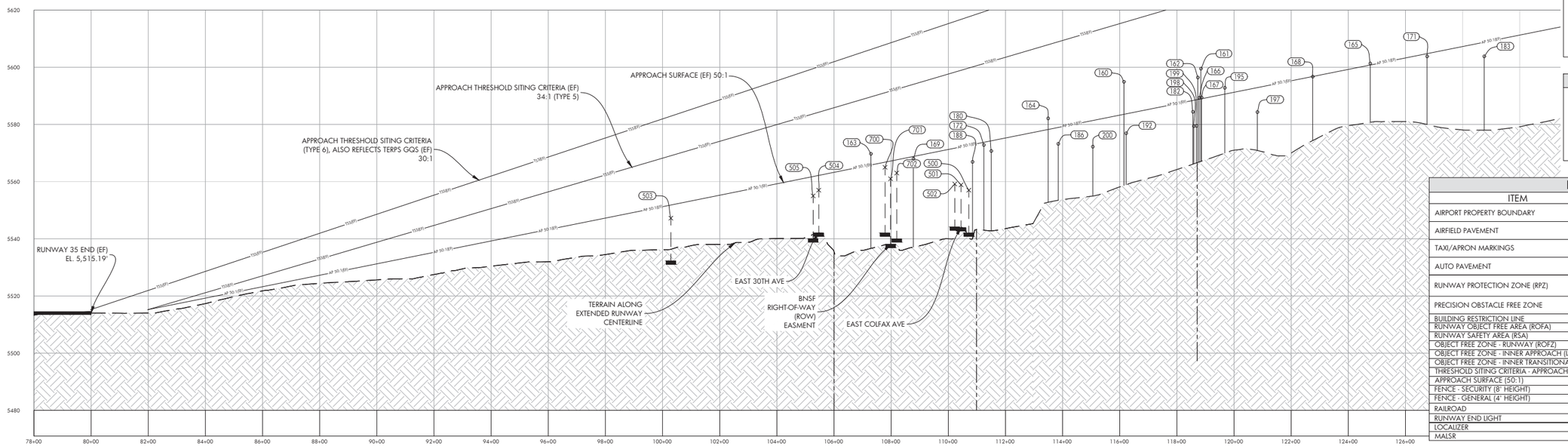
PROFILE
HORIZ: 1" = 200'
VERT: 1" = 20'

NOTES

1. EXISTING AND FUTURE CONDITIONS SHOWN AS (E)(F)
2. THE SURVEY WAS COMPLETED TO THE STANDARDS OUTLINED IN AC 150/5300-18B
3. PER 14 CFR PART 77, SURFACE TRANSPORTATION ENTITIES' ELEVATION INCLUDE AN ADJUSTMENT FOR OBSTRUCTION ANALYSES PURPOSES (23 FEET FOR RAILWAYS, 17 FEET FOR INTERSTATE HIGHWAYS, AND 15 FEET FOR ALL OTHER PUBLIC ROADS)
4. THE AIRPORT PROPERTY LINE REFLECTED HERE IS BASED ON A COMPILATION OF HISTORICAL SOURCES AND MAY NOT ACCURATELY REFLECT ITS TRUE CONDITION. THE AIRPORT WILL UNDERTAKE A FULL PROPERTY SURVEY TO UPDATE ITS PROPERTY LINE.

SOURCE

1. SURVEY DATA IS BASED ON THE PLANIMETRIC MAPPING AND ORTHO-IMAGERY INFORMATION COMPILED BY MARTINEZ GEOSPATIAL IN 2017.
2. ALL HORIZONTAL COORDINATES - NAD83/2011
   ALL VERTICAL COORDINATES - NAD88



DRAWING LEGEND

ITEM	EXISTING	FUTURE
AIRPORT PROPERTY BOUNDARY		SAME
AIRFIELD PAVEMENT		N/A
TAXI/APRON MARKINGS		N/A
AUTO PAVEMENT		N/A
RUNWAY PROTECTION ZONE (RPZ)	RPZ(E) / RPZ(E)	RPZ(F) / RPZ(F)
PRECISION OBSTACLE FREE ZONE		SAME
BUILDING RESTRICTION LINE	BRL 35	SAME
RUNWAY OBJECT FREE AREA (ROFA)	ROFA(E)	ROFA(F)
RUNWAY SAFETY AREA (RSA)	RSA(E)	RSA(F)
OBJECT FREE ZONE - RUNWAY (ROFZ)	ROFZ(E)	ROFZ(F)
OBJECT FREE ZONE - INNER APPROACH (IA OFZ)	IA OFZ(E)	IA OFZ(F)
OBJECT FREE ZONE - INNER TRANSITIONAL (IT OFZ)	IT OFZ(E)	IT OFZ(F)
THRESHOLD SITING CRITERIA - APPROACH (APPRCH TSC)	APPRCH TSC(E)	APPRCH TSC(F)
APPROACH SURFACE (50:1)	AP 50:1(E)	AP 50:1(F)
FENCE - SECURITY (8' HEIGHT)	N/A	XX
FENCE - GENERAL (4' HEIGHT)		N/A
RAILROAD		SAME
RUNWAY END LIGHT		SAME
LOCALIZER		SAME
MALSR		SAME

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Nov 18, 2019 - 11:46am
Sean.Jarvis

JVIATION®

Front Range AIRPORT

DES:	S.G.J.
DR:	S.G.J.
CH:	J.B.M.
APP:	J.B.M.

ISSUE RECORD

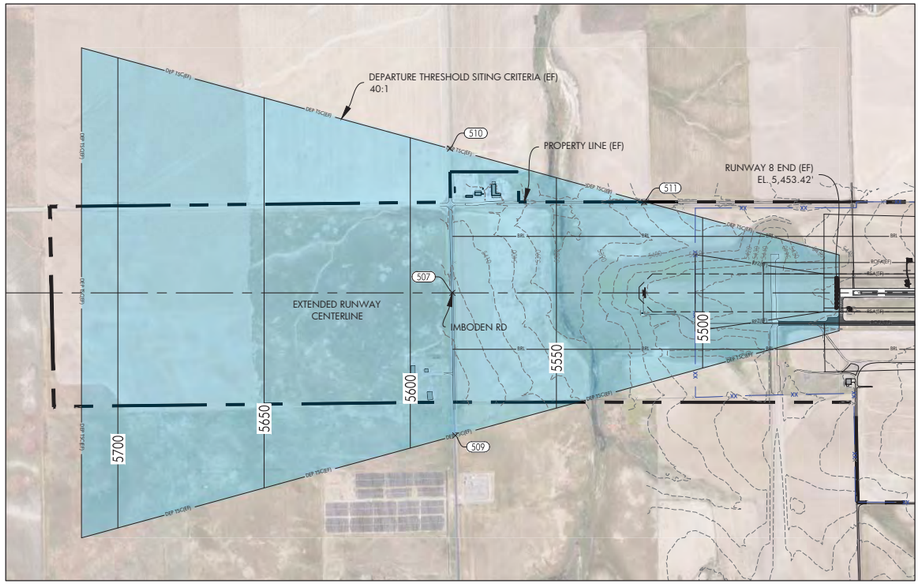
NO.	BY	DATE	DESCRIPTION

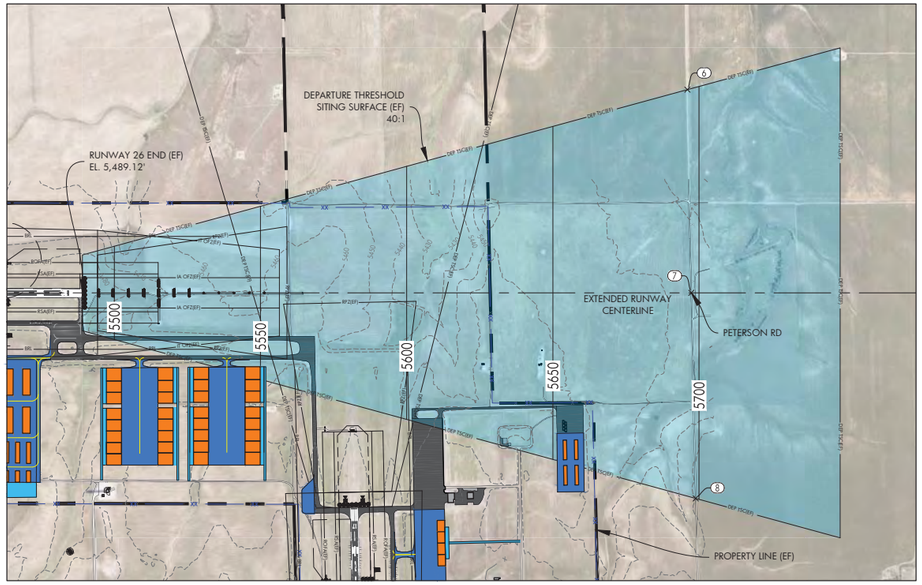
AIRPORT
LAYOUT PLAN

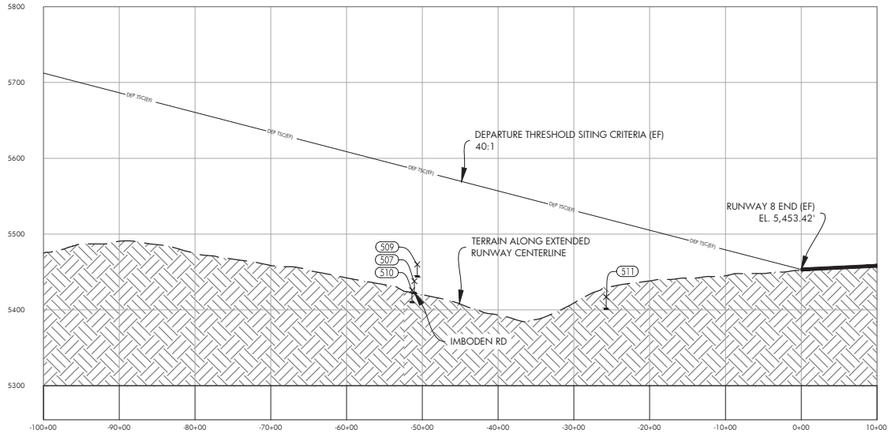
RUNWAY 35 INNER APPROACH SURFACE DRAWING

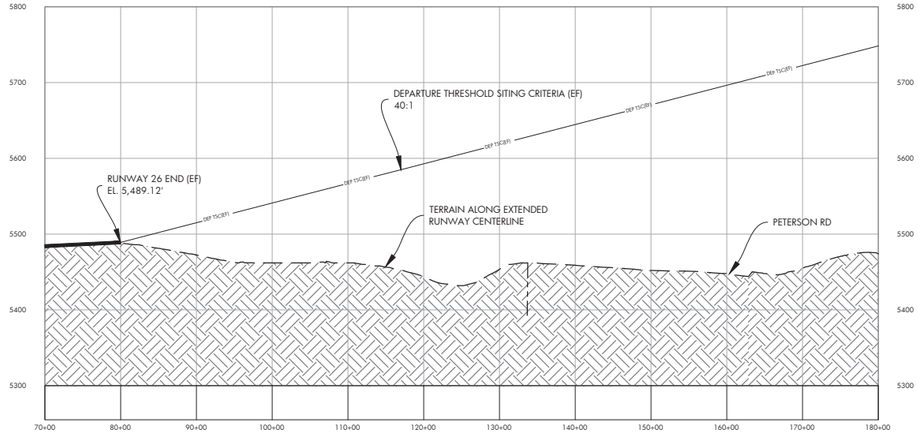
AIP PROJ. NO.	JVIATION PROJ. NO.	DATE:
3-08-0016-040-2015	2015.FTG.03	SEPTEMBER 2019

SHEET NO.
12 of 18









7°57'E
TRUE
MAGNETIC
N

DATE: 04/2018
ANNUAL RATE OF CHANGE: 0°6'W
SOURCE: U.S. NOAA

GRAPHIC SCALE
0 500 1000 2000
(IN FEET)

PROFILE
HORIZ: 1" = 1000'
VERT: 1" = 100'

NOTES

1. EXISTING AND FUTURE CONDITIONS SHOWN AS (E)(F)
2. THE SURVEY WAS COMPLETED TO THE STANDARDS OUTLINED IN AC 150/5300-18B
3. PER 14 CFR PART 77, SURFACE TRANSPORTATION ENTITIES' ELEVATION INCLUDE AN ADJUSTMENT FOR OBSTRUCTION ANALYSES PURPOSES (23 FEET FOR RAILWAYS, 17 FEET FOR INTERSTATE HIGHWAYS, AND 15 FEET FOR ALL OTHER PUBLIC ROADS)
4. THE AIRPORT PROPERTY LINE REFLECTED HERE IS BASED ON A COMPILATION OF HISTORICAL SOURCES AND MAY NOT ACCURATELY REFLECT ITS TRUE CONDITION. THE AIRPORT WILL UNDERTAKE A FULL PROPERTY SURVEY TO UPDATE ITS PROPERTY LINE.

SOURCE

1. SURVEY DATA IS BASED ON THE PLANIMETRIC MAPPING AND ORTHO-IMAGERY INFORMATION COMPILED BY MARTINEZ GEOSPATIAL IN 2017.
2. ALL HORIZONTAL COORDINATES - NAD83/2011
   ALL VERTICAL COORDINATES - NAD88

OBSTRUCTION TABLE

OBJECT IDENTIFICATION NO.	OBJECT TYPE	GROUND SURFACE ELEVATION (MSL)	ABOVE GROUND LEVEL (AGL)	TOP OF OBJECT ELEVATION (AMSL)	EXISTING DEPARTURE SURFACE PENETRATION	DISPOSITION
510	ROAD +15'	5,411.00'	15.00'	5,426.00'	-160.41'	N/A
507	ROAD +15'	5,422.90'	15.00'	5,437.90'	-147.70'	N/A
509	ROAD +15'	5,445.00'	15.00'	5,460.00'	-124.61'	N/A
511	ROAD +15'	5,402.02'	15.00'	5,417.02'	-103.01'	N/A

DRAWING LEGEND

ITEM	EXISTING	FUTURE
AIRPORT PROPERTY BOUNDARY		SAME
AIRFIELD PAVEMENT		
TAXI/APRON MARKINGS		
AUTO PAVEMENT		
BUILDING/HANGAR		
RUNWAY PROTECTION ZONE (RPZ)	RPZ(E) RPZ(E)	RPZ(F) RPZ(F)
BUILDING RESTRICTION LINE	BRL (E)	SAME
RUNWAY OBJECT FREE AREA (ROFA)	ROFA(E)	ROFA(F)
RUNWAY SAFETY AREA (RSA)	RSA(E)	RSA(F)
OBJECT FREE ZONE - RUNWAY (ROFZ)	ROFZ(E)	ROFZ(F)
OBJECT FREE ZONE - INNER APPROACH (IA OFZ)	IA OFZ(E)	IA OFZ(F)
OBJECT FREE ZONE - INNER TRANSITIONAL (IT OFZ)	IT OFZ(E)	IT OFZ(F)
THRESHOLD SITING CRITERIA - APPROACH (APPRCH TSC)	APPRCH TSC(E)	APPRCH TSC(F)
THRESHOLD SITING CRITERIA - DEPARTURE (DEP TSC)	DEP TSC(E)	DEP TSC(F)
FENCE - SECURITY (8' HEIGHT)	N/A	XX
FENCE - GENERAL (4' HEIGHT)	X	N/A
RUNWAY END IDENTIFIER LIGHTS (REIL)		SAME
RUNWAY END LIGHT		SAME
PAPI		SAME
LOCALIZER		SAME
MALSR		SAME
AIRPORT REFERENCE POINT (ARP)		SAME
PRIMARY/SECONDARY AIRPORT CONTROL STATION		SAME

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13-FTG-ALP-DEPT-8-26.dwg
Sep 10, 2019 - 11:46am
Sean.Jarvis

JVIATION®

Front Range AIRPORT

DES: S.G.J.
DR: S.G.J.
CH: J.B.M.
APP: J.B.M.

ISSUE RECORD

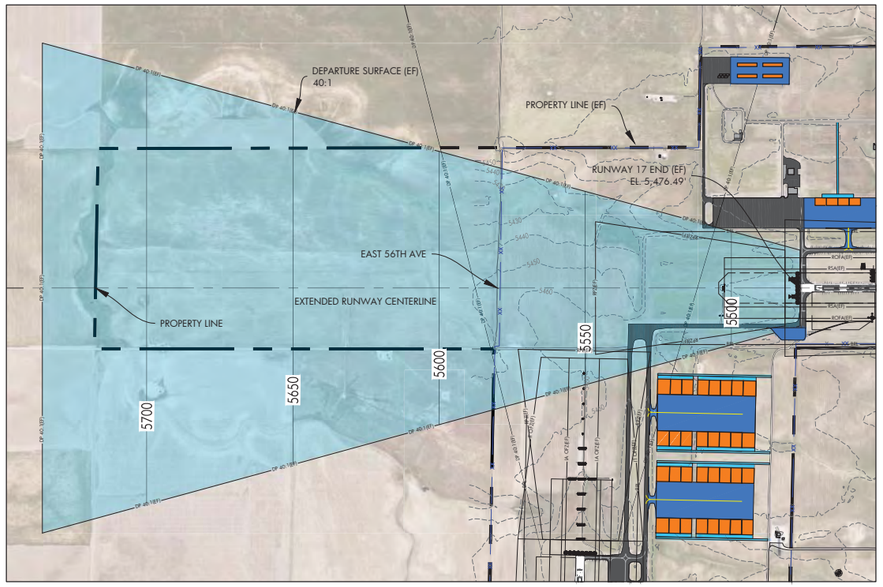
NO.	BY	DATE	DESCRIPTION

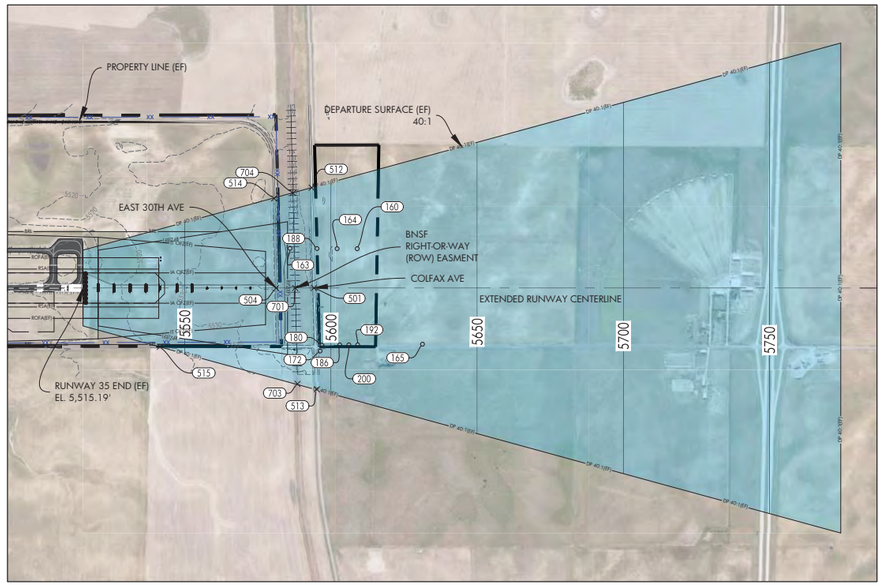
AIRPORT LAYOUT PLAN

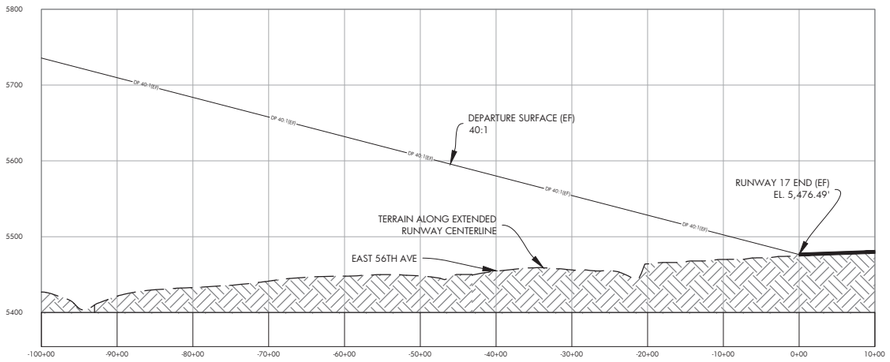
RUNWAY 8/26 DEPARTURE SURFACE DRAWING

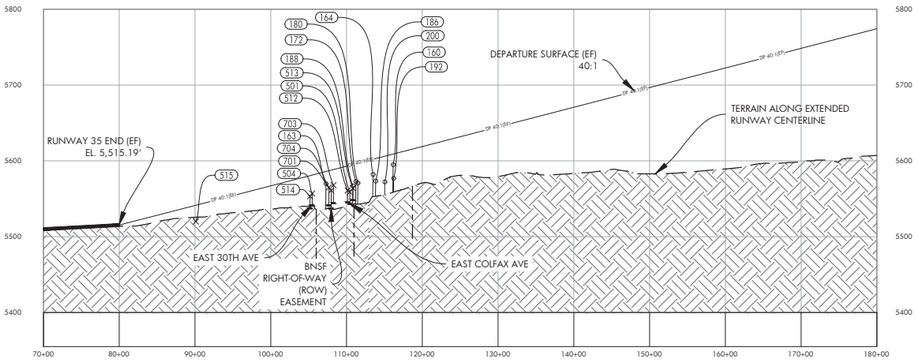
AIP PROJ. NO.	JVIATION PROJ. NO.	DATE:
3-08-0016-040-2015	2015.FTG.03	SEPTEMBER 2019

SHEET NO.
13 of 18



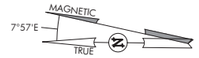






OBSTRUCTION TABLE

OBJECT IDENTIFICATION NO.	OBJECT TYPE	GROUND SURFACE ELEVATION (MSL)	ABOVE GROUND LEVEL (AGL)	TOP OF OBJECT ELEVATION (AMSL)	EXISTING DEPARTURE SURFACE PENETRATION	DISPOSITION
703	RAILROAD +23'	5,571.90'	23.00'	5,594.90'	-20.55'	N/A
515	ROAD +15'	5,554.70'	15.00'	5,569.70'	-6.47'	N/A
701	RAILROAD +23'	5,559.10'	23.00'	5,582.10'	-26.78'	N/A
704	RAILROAD +23'	5,578.30'	23.00'	5,601.30'	-22.00'	N/A
514	ROAD +15'	5,557.80'	15.00'	5,572.80'	-27.35'	N/A
513	ROAD +15'	5,555.70'	15.00'	5,570.70'	-31.16'	N/A
501	ROAD +15'	5,558.20'	15.00'	5,573.20'	-35.29'	N/A
512	ROAD +15'	5,551.90'	15.00'	5,566.90'	-32.40'	N/A
160	UTILITY POLE	5,564.90'	30.00'	5,594.90'	-14.04'	N/A
163	UTILITY POLE	5,539.70'	30.00'	5,569.70'	-16.29'	N/A
164	UTILITY POLE	5,552.10'	30.00'	5,582.10'	-19.97'	N/A
165	UTILITY POLE	5,571.30'	30.00'	5,601.30'	-29.98'	N/A
172	UTILITY POLE	5,542.80'	30.00'	5,572.80'	-23.43'	N/A
180	UTILITY POLE	5,540.70'	30.00'	5,570.70'	-26.20'	N/A
186	UTILITY POLE	5,543.20'	30.00'	5,573.20'	-29.78'	N/A
188	UTILITY POLE	5,536.90'	30.00'	5,566.90'	-28.30'	N/A
192	UTILITY POLE	5,546.90'	30.00'	5,576.90'	-32.24'	N/A
200	UTILITY POLE	5,542.20'	30.00'	5,572.20'	-33.92'	N/A
504	ROAD +15'	5,527.00'	15.00'	5,542.00'	-39.26'	N/A



DATE: 04/2018
ANNUAL RATE OF CHANGE: 0°6'W
SOURCE: U.S. NOAA

GRAPHIC SCALE
0 500 1000 2000
(IN FEET)

PROFILE
HORIZ: 1" = 1000'
VERT: 1" = 100'

NOTES

1. EXISTING AND FUTURE CONDITIONS SHOWN AS (E)(F)
2. THE SURVEY WAS COMPLETED TO THE STANDARDS OUTLINED IN AC 150/5300-18B
3. PER 14 CFR PART 77, SURFACE TRANSPORTATION ENTITIES' ELEVATION INCLUDE AN ADJUSTMENT FOR OBSTRUCTION ANALYSES PURPOSES (23 FEET FOR RAILWAYS, 17 FEET FOR INTERSTATE HIGHWAYS, AND 15 FEET FOR ALL OTHER PUBLIC ROADS)
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SOURCE

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2. ALL HORIZONTAL COORDINATES - NAD83/2011
   ALL VERTICAL COORDINATES - NAD88

DRAWING LEGEND

ITEM	EXISTING	FUTURE
AIRPORT PROPERTY BOUNDARY		SAME
AIRFIELD PAVEMENT		
TAXI/APRON MARKINGS		
AUTO PAVEMENT		
BUILDING/HANGAR		
RUNWAY PROTECTION ZONE (RPZ)	RPZ(E) RPZ(E)	RPZ(F) RPZ(F)
BUILDING RESTRICTION LINE	BRL 35'	SAME
RUNWAY OBJECT FREE AREA (ROFA)	ROFA(E)	ROFA(F)
RUNWAY SAFETY AREA (RSA)	RSA(E)	RSA(F)
OBJECT FREE ZONE - RUNWAY (ROFZ)	ROFZ(E)	ROFZ(F)
OBJECT FREE ZONE - INNER APPROACH (IA OFZ)	IA OFZ(E)	IA OFZ(F)
OBJECT FREE ZONE - INNER TRANSITIONAL (IT OFZ)	IT OFZ(E)	IT OFZ(F)
THRESHOLD SITING CRITERIA - APPROACH (APPRCH TSC)	APPRCH TSC(E)	APPRCH TSC(F)
THRESHOLD SITING CRITERIA - DEPARTURE (DEP TSC)	DEP TSC(E)	DEP TSC(F)
FENCE - SECURITY (8' HEIGHT)	N/A	SAME
FENCE - GENERAL (4' HEIGHT)		N/A
RUNWAY END IDENTIFIER LIGHTS (REIL)		SAME
RUNWAY END LIGHT		SAME
PAPI		SAME
LOCALIZER		SAME
MALSR		SAME
AIRPORT REFERENCE POINT (ARP)		SAME
PRIMARY/SECONDARY AIRPORT CONTROL STATION		SAME

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Sep 18, 2019 - 11:43am
Sean.Jarvis

JVIATION®

Front Range AIRPORT

DES: S.G.J.
DR: S.G.J.
CH: J.B.M.
APP: J.B.M.

ISSUE RECORD

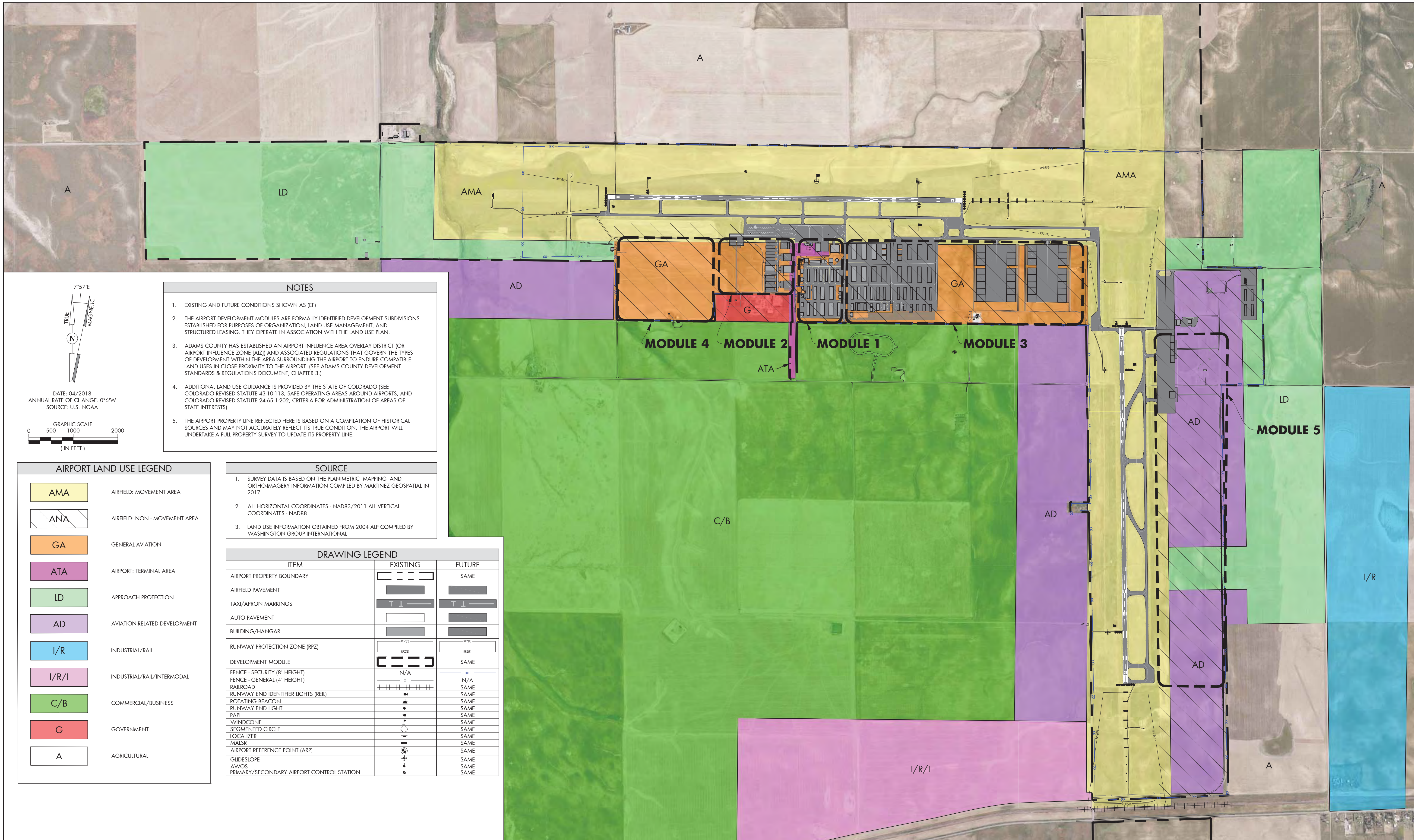
NO.	BY	DATE	DESCRIPTION

AIRPORT LAYOUT PLAN

DEPARTURE SURFACE DRAWING
RUNWAY 17/35

AIP PROJ. NO.	JVIATION PROJ. NO.	DATE:
3-08-0016-040-2015	2015.FTG.03	SEPTEMBER 2019

SHEET NO.
14 of 18



NOTES

1. EXISTING AND FUTURE CONDITIONS SHOWN AS (EF)
2. THE AIRPORT DEVELOPMENT MODULES ARE FORMALLY IDENTIFIED DEVELOPMENT SUBDIVISIONS ESTABLISHED FOR PURPOSES OF ORGANIZATION, LAND USE MANAGEMENT, AND STRUCTURED LEASING. THEY OPERATE IN ASSOCIATION WITH THE LAND USE PLAN.
3. ADAMS COUNTY HAS ESTABLISHED AN AIRPORT INFLUENCE AREA OVERLAY DISTRICT (OR AIRPORT INFLUENCE ZONE [AIZ]) AND ASSOCIATED REGULATIONS THAT GOVERN THE TYPES OF DEVELOPMENT WITHIN THE AREA SURROUNDING THE AIRPORT TO ENDURE COMPATIBLE LAND USES IN CLOSE PROXIMITY TO THE AIRPORT. (SEE ADAMS COUNTY DEVELOPMENT STANDARDS & REGULATIONS DOCUMENT, CHAPTER 3.)
4. ADDITIONAL LAND USE GUIDANCE IS PROVIDED BY THE STATE OF COLORADO (SEE COLORADO REVISED STATUTE 43-10-113, SAFE OPERATING AREAS AROUND AIRPORTS, AND COLORADO REVISED STATUTE 24-65.1-202, CRITERIA FOR ADMINISTRATION OF AREAS OF STATE INTERESTS)
5. THE AIRPORT PROPERTY LINE REFLECTED HERE IS BASED ON A COMPILATION OF HISTORICAL SOURCES AND MAY NOT ACCURATELY REFLECT ITS TRUE CONDITION. THE AIRPORT WILL UNDERTAKE A FULL PROPERTY SURVEY TO UPDATE ITS PROPERTY LINE.

AIRPORT LAND USE LEGEND

AMA	AIRFIELD: MOVEMENT AREA
ANA	AIRFIELD: NON - MOVEMENT AREA
GA	GENERAL AVIATION
ATA	AIRPORT: TERMINAL AREA
LD	APPROACH PROTECTION
AD	AVIATION-RELATED DEVELOPMENT
I/R	INDUSTRIAL/RAIL
I/R/I	INDUSTRIAL/RAIL/INTERMODAL
C/B	COMMERCIAL/BUSINESS
G	GOVERNMENT
A	AGRICULTURAL

SOURCE

1. SURVEY DATA IS BASED ON THE PLANIMETRIC MAPPING AND ORTHO-IMAGERY INFORMATION COMPILED BY MARTINEZ GEOSPATIAL IN 2017.
2. ALL HORIZONTAL COORDINATES - NAD83/2011 ALL VERTICAL COORDINATES - NAD88
3. LAND USE INFORMATION OBTAINED FROM 2004 ALP COMPILED BY WASHINGTON GROUP INTERNATIONAL

DRAWING LEGEND

ITEM	EXISTING	FUTURE
AIRPORT PROPERTY BOUNDARY		SAME
AIRFIELD PAVEMENT		
TAXI/APRON MARKINGS		
AUTO PAVEMENT		
BUILDING/HANGAR		
RUNWAY PROTECTION ZONE (RPZ)		
DEVELOPMENT MODULE		SAME
FENCE - SECURITY (8' HEIGHT)	N/A	
FENCE - GENERAL (4' HEIGHT)		N/A
RAILROAD		SAME
RUNWAY END IDENTIFIER LIGHTS (REIL)		SAME
ROTATING BEACON		SAME
RUNWAY END LIGHT		SAME
PAPI		SAME
WINDCONE		SAME
SEGMENTED CIRCLE		SAME
LOCALIZER		SAME
MALSR		SAME
AIRPORT REFERENCE POINT (ARP)		SAME
GLIDESLOPE		SAME
AWOS		SAME
PRIMARY/SECONDARY AIRPORT CONTROL STATION		SAME

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Sean Lewis

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Front Range AIRPORT

DES: S.G.J.
DR: S.G.J.
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APP: J.B.M.

ISSUE RECORD			
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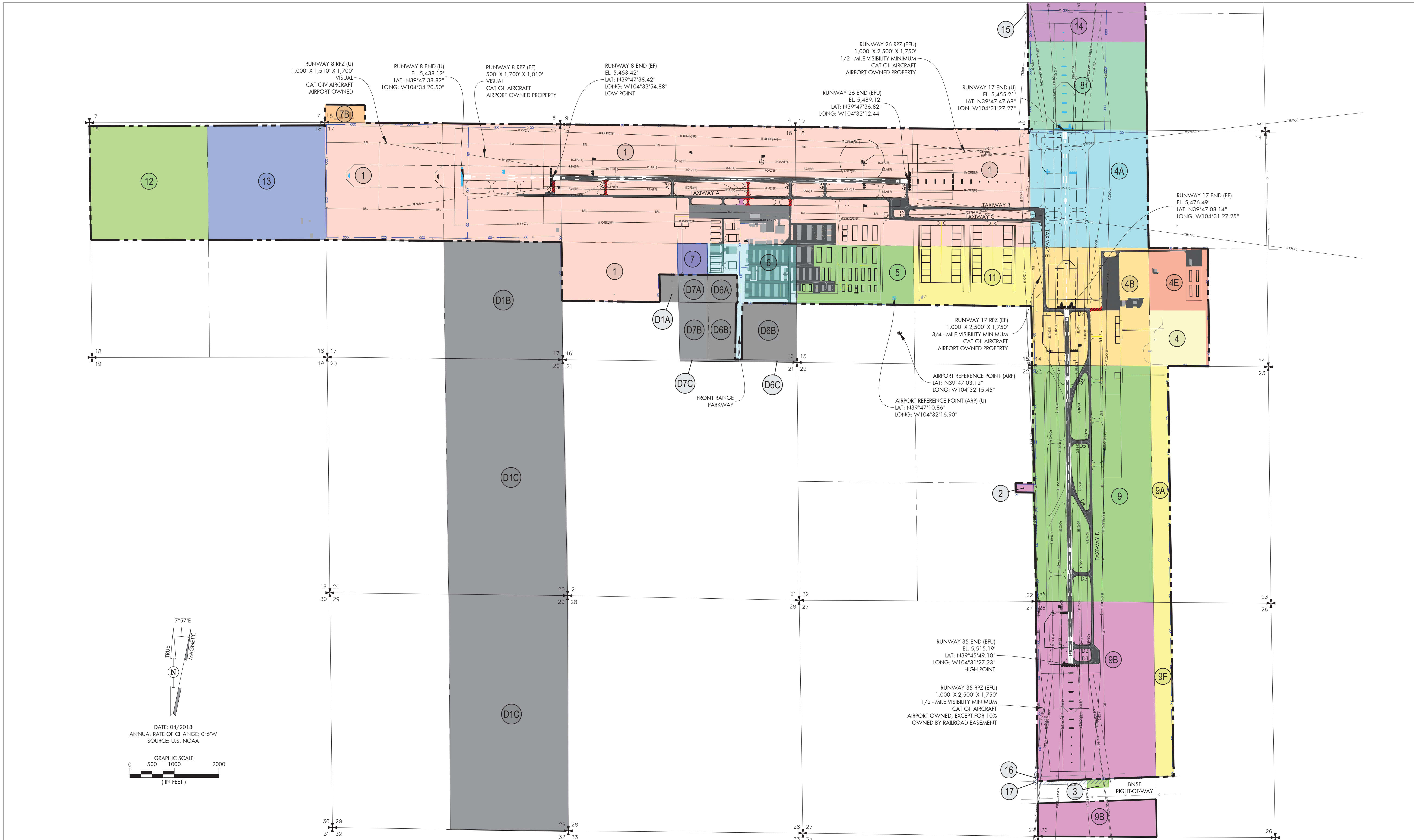
THE PREPARATION OF THIS DOCUMENT MAY HAVE BEEN SUPPORTED, IN PART, THROUGH THE AIRPORT IMPROVEMENT PROGRAM FINANCIAL ASSISTANCE FROM THE FEDERAL AVIATION ADMINISTRATION AS PROVIDED UNDER TITLE 49 U.S.C., SECTION 47104. THE CONTENTS DO NOT NECESSARILY REFLECT THE OFFICIAL VIEWS OR POLICY OF THE FAA. ACCEPTANCE OF THIS AIRPORT LAYOUT PLAN BY THE FAA DOES NOT IN ANY WAY CONSTITUTE A COMMITMENT ON THE PART OF THE UNITED STATES TO PARTICIPATE IN ANY DEVELOPMENT DEPICTED THEREIN NOR DOES IT INDICATE THAT THE PROPOSED DEVELOPMENT IS ENVIRONMENTALLY ACCEPTABLE OR WOULD HAVE JUSTIFICATION IN ACCORDANCE WITH APPROPRIATE PUBLIC LAWS.

AIRPORT LAYOUT PLAN

LAND USE PLAN

AIP PROJ. NO. 3-08-0016-040-2015
JVIATION PROJ. NO. 2015.FTG.03
DATE: SEPTEMBER 2019

SHEET NO.


RUNWAY 8 RPZ (U)
1,000' X 1,510' X 1,700'
VISUAL
CAT C-IV AIRCRAFT
AIRPORT OWNED
RUNWAY 8 END (U)
EL. 5,438.12'
LAT: N39°47'38.82"
LONG: W104°34'20.50"
RUNWAY 8 RPZ (EF)
500' X 1,700' X 1,010'
VISUAL
CAT C-II AIRCRAFT
AIRPORT OWNED PROPERTY
RUNWAY 8 END (EF)
EL. 5,453.42'
LAT: N39°47'38.42"
LONG: W104°33'54.88"
LOW POINT
RUNWAY 26 RPZ (EFU)
1,000' X 2,500' X 1,750'
1/2 - MILE VISIBILITY MINIMUM
CAT C-II AIRCRAFT
AIRPORT OWNED PROPERTY
RUNWAY 26 END (EFU)
EL. 5,489.12'
LAT: N39°47'36.82"
LONG: W104°32'12.44"
RUNWAY 17 END (U)
EL. 5,455.21'
LAT: N39°47'47.68"
LON: W104°31'27.27"
RUNWAY 17 END (EF)
EL. 5,476.49'
LAT: N39°47'08.14"
LONG: W104°31'27.25"
TAXIWAY A
TAXIWAY B
TAXIWAY C
TAXIWAY E
TAXIWAY D
RUNWAY 17 RPZ (EF)
1,000' X 2,500' X 1,750'
3/4 - MILE VISIBILITY MINIMUM
CAT C-II AIRCRAFT
AIRPORT OWNED PROPERTY
AIRPORT REFERENCE POINT (ARP)
LAT: N39°47'03.12"
LONG: W104°32'15.45"
AIRPORT REFERENCE POINT (ARP) (U)
LAT: N39°47'10.86"
LONG: W104°32'16.90"
FRONT RANGE
PARKWAY
RUNWAY 35 END (EFU)
EL. 5,515.19'
LAT: N39°45'49.10"
LONG: W104°31'27.23"
HIGH POINT
RUNWAY 35 RPZ (EFU)
1,000' X 2,500' X 1,750'
1/2 - MILE VISIBILITY MINIMUM
CAT C-II AIRCRAFT
AIRPORT OWNED, EXCEPT FOR 10%
OWNED BY RAILROAD EASEMENT
BNSF
RIGHT-OF-WAY
1
2
3
4
4A
4B
4E
5
6
7
7B
8
9
9A
9B
9F
11
12
13
14
15
16
17
D1A
D1B
D1C
D6A
D6B
D6C
D7A
D7B
D7C
7°57'E
TRUE
MAGNETIC
N
DATE: 04/2018
ANNUAL RATE OF CHANGE: 0°6'W
SOURCE: U.S. NOAA
GRAPHIC SCALE
0 500 1000 2000
(IN FEET)

JVIATION®

FrontRange AIRPORT

DES: S.G.J.
DR: S.G.J.
CH: J.B.M.
APP: J.B.M.

ISSUE RECORD			
NO.	BY	DATE	DESCRIPTION

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AIRPORT LAYOUT PLAN

EXHIBIT A - PROPERTY MAP

AIP PROJ. NO. 3-08-0016-040-2015

JVIATION PROJ. NO. 2015.FTG.03

DATE: SEPTEMBER 2019

AIRPORT PARCEL DATA

PARCEL ID	DESCRIPTION	GRANTOR	GRANTEE	DATE	RECORDING DATA	INTEREST	CURRENT ACRES	HISTORIC PARCEL ID	FAA PROJECT NO.	PURPOSE	NOTES
1	A PORTION OF SECTIONS 15, 16, & 17, T.3S., R.64W., 6TH P.M.	DANFORD-CHAMPLIN FARMS, LTD.	FRONT RANGE AIRPORT AUTHORITY	2/21/1983	BOOK 2725 PAGE 838	FEE BY WARRANTY DEED	160 ±	1A	AIP 3-08-0016-07	RUNWAY, TAXIWAY	
	A PORTION OF SECTIONS 15, 16, & 17, T.3S., R.64W., 6TH P.M.	DANFORD-CHAMPLIN FARMS, LTD.	FRONT RANGE AIRPORT AUTHORITY	2/21/1983	BOOK 2725 PAGE 838	FEE BY WARRANTY DEED	236 ±	1B	AIP 3-08-0016-10	RUNWAY, TAXIWAY	
	A PORTION OF SECTIONS 15, 16, & 17, T.3S., R.64W., 6TH P.M.	DANFORD-CHAMPLIN FARMS, LTD.	FRONT RANGE AIRPORT AUTHORITY	2/21/1983	BOOK 2725 PAGE 838	FEE BY WARRANTY DEED	564 ±	1C	AIP 3-08-0016-11	RUNWAY, TAXIWAY	
	A PORTION OF SECTIONS 15, 16, & 17, T.3S., R.64W., 6TH P.M.	DANFORD-CHAMPLIN FARMS, LTD.	FRONT RANGE AIRPORT AUTHORITY	2/21/1983	BOOK 2725 PAGE 838	FEE BY WARRANTY DEED	75 ±	1D	AIP 3-08-0016-11	RUNWAY, TAXIWAY	
2	A PORTION OF THE SE4, SECTION 22, T.3S., R.64W., 6TH P.M.	WILLARD E. GEICK	FRONT RANGE AIRPORT AUTHORITY	3/16/1990	BOOK 3658 PAGE 104	FEE BY WARRANTY DEED	2 ±	2	AIP 3-08-0016-12	AIRPORT IMPROVEMENT	
3	A PORTION OF THE SW4, SECTION 26, T.3S., R.64W., 6TH P.M.	UNION PACIFIC RAILROAD	FRONT RANGE AIRPORT AUTHORITY	2/20/1996	FILE COPY FOLDER 180-70	LEASE	2 ±	3	SPONSOR PAYMENTS	RUNWAY APPROACH PROTECTION	
4	A PORTION OF THE SW4SE4, SECTION 14, T.3S, R.64W., 6TH P.M.	CARROLL J. AND EVELYN JEAN LESCO	FRONT RANGE AIRPORT AUTHORITY	12/26/1989	BOOK 3634 PAGE 146	FEE BY WARRANTY DEED	36 ±	4	AIP 3-08-0016-15	AIRPORT IMPROVEMENT	
4A	THE NW4, SECTION 14, T.3S., R.64W., 6TH P.M.	CARROLL J. AND EVELYN JEAN LESCO	FRONT RANGE AIRPORT AUTHORITY	6/12/1986	BOOK 3156 PAGE 961	FEE BY WARRANTY DEED	160 ±	4A	AIP 3-08-0016-05	AIRPORT IMPROVEMENT	
4B	THE SW4, SECTION 14, T.3S, R.64W., 6TH P.M.	CARROLL J. AND EVELYN JEAN LESCO	FRONT RANGE AIRPORT AUTHORITY	1/31/1986	BOOK 3106 PAGE 558	FEE BY WARRANTY DEED	120 ±	4B	AIP 3-08-0016-12	AIRPORT IMPROVEMENT	
	THE SW4, SECTION 14, T.3S, R.64W., 6TH P.M.	CARROLL J. AND EVELYN JEAN LESCO	FRONT RANGE AIRPORT AUTHORITY	1/31/1986	BOOK 3106 PAGE 558	FEE BY WARRANTY DEED	40 ±	4D	AIP 3-08-0016-15	AIRPORT IMPROVEMENT	
4C	PARCEL ID NOT USED ON THIS EXHIBIT "A"	-	-	-	-	-	-	-	-	-	-
4D	PARCEL ID NOT USED ON THIS EXHIBIT "A" INCORPORATED INTO PARCEL ID 4B	-	-	-	-	-	-	-	-	-	-
4E	A PORTION OF THE SE4, SECTION 14, T.3S, R.64W., 6TH P.M.	CAROLL J. AND EVELYN JEAN LESCO	FRONT RANGE AIRPORT AUTHORITY	8/28/1991	BOOK 3812 PAGE 329	FEE BY WARRANTY DEED	44±	4E	AIP 3-08-0016-18	AIRPORT IMPROVEMENT	
5	THE N2SW4, SECTION 15, T.3S., R.64W., 6TH P.M.	PLAND-CRONK COMPANY	FRONT RANGE AIRPORT AUTHORITY	3/14/1984	BOOK 2851 PAGE 164	FEE BY WARRANTY DEED	11.5 ±	5	AIP 3-08-0016-12	AIRPORT IMPROVEMENT	
	THE N2SW4, SECTION 15, T.3S., R.64W., 6TH P.M.	PLAND-CRONK COMPANY	FRONT RANGE AIRPORT AUTHORITY	3/14/1984	BOOK 2851 PAGE 164	FEE BY WARRANTY DEED	68.5 ±	5A	AIP 3-08-0016-11	AIRPORT IMPROVEMENT	
6	A PORTION OF THE SE4, SECTION 16, T.3S., R.64W., 6TH P.M.	DISTRICT COURT OF ADAMS COUNTY	FRONT RANGE AIRPORT AUTHORITY	9/22/1983	BOOK 2793 PAGE 754	FEE BY COURT ACTION	47.6±	6	AIP 3-08-0016-12	AIRPORT IMPROVEMENT	
	A PORTION OF THE SE4, SECTION 16, T.3S., R.64W., 6TH P.M.	DISTRICT COURT OF ADAMS COUNTY	FRONT RANGE AIRPORT AUTHORITY	9/22/1983	BOOK 2793 PAGE 754	FEE BY COURT ACTION	16.4 ±	6A & 7A	SPONSOR ACQUISITION	AIRPORT IMPROVEMENT	SEE NOTE 2
7	PORTION OF THE W2SE4, SECTION 16, T.3S., R.64W., 6TH P.M.	MARGARET V. DAVIDSON	FRONT RANGE AIRPORT AUTHORITY	5/20/1983	BOOK 2755 PAGE 623	FEE BY WARRANTY DEED	12 ±	7	AIP 3-08-0016-12	AIRPORT IMPROVEMENT	
7A	PARCEL ID NOT USED ON THIS EXHIBIT "A" INCORPORATED INTO PARCEL ID 6							7A			SEE NOTE 2
7B	PORTION OF THE SW4, SECTION 8, T.3S., R.64W., 6TH P.M.	DANFORD-CHAMPLIN FARMS LTD	FRONT RANGE AIRPORT AUTHORITY	12/17/1983	BOOK 2849 PAGE 370	FEE BY WARRANTY DEED	8.3 ±	7B	AIP 3-08-0016-12	AIRPORT IMPROVEMENT	
8	PORTION OF THE SW4, SECTION 11, T.3S., R.64W., 6TH P.M.	SHERYL HENSON (1/4 INTEREST) NATALI SOUTH (1/4 INTEREST) ROBERT D. CULP (1/2 INTEREST)	FRONT RANGE AIRPORT AUTHORITY	10/25/2006 10/25/2006 11/3/2006	RECEPTION NO. 2006001011450 RECEPTION NO. 2006001011451 RECEPTION NO. 2006001011452	FEE BY WARRANTY DEED	120 ±	8		AIRPORT PROTECTION	
9	THE W2, SECTION 23, T.3S., R.64W., 6TH P.M.	LULA MAY BANCHOR	FRONT RANGE AIRPORT AUTHORITY	4/21/1986	BOOK 3134 PAGE 914	FEE BY WARRANTY DEED	240 ±	9	AIP 3-08-0016-12	AIRPORT IMPROVEMENT	
	THE W2, SECTION 23, T.3S., R.64W., 6TH P.M.	LULA MAY BANCHOR	FRONT RANGE AIRPORT AUTHORITY	4/21/1986	BOOK 3134 PAGE 914	FEE BY WARRANTY DEED	80 ±	9C	AIP 3-08-0016-15	AIRPORT IMPROVEMENT	
9A	A PORTION OF SECTION 23, T.3S., R.64W., 6TH P.M.	LULA MAY BANCHOR	FRONT RANGE AIRPORT AUTHORITY	3/5/1993	BOOK 4038 PAGE 253	FEE BY SPECIAL WARRANTY DEED	50 ±	9A	AIP 3-08-0016-18	AIRPORT IMPROVEMENT AND PROTECTION	PARCEL 2 OF DEED
9B	PORTION OF THE W2, SECTION 26, T.3S., R.64W., 6TH P.M.	LULA MAY BANCHOR	FRONT RANGE AIRPORT AUTHORITY	2/15/1990	BOOK 3649 PAGE 144	FEE BY SPECIAL WARRANTY DEED	178 ±	9B	AIP 3-08-0016-12	AIRPORT IMPROVEMENT AND PROTECTION	
	PORTION OF THE W2, SECTION 26, T.3S., R.64W., 6TH P.M.	LULA MAY BANCHOR	FRONT RANGE AIRPORT AUTHORITY	2/15/1990	BOOK 3649 PAGE 144	FEE BY SPECIAL WARRANTY DEED	73 ±	9D	AIP 3-08-0016-17	AIRPORT IMPROVEMENT AND PROTECTION	
	PORTION OF THE W2, SECTION 26, T.3S., R.64W., 6TH P.M.	LULA MAY BANCHOR	FRONT RANGE AIRPORT AUTHORITY	2/15/1990	BOOK 3649 PAGE 144	FEE BY SPECIAL WARRANTY DEED	54 ±	9E	AIP 3-08-0016-17	AIRPORT IMPROVEMENT AND PROTECTION	
9C	PARCEL ID NOT USED ON THIS EXHIBIT "A" INCORPORATED INTO PARCEL ID 9										
9D	PARCEL ID NOT USED ON THIS EXHIBIT "A" INCORPORATED INTO PARCEL ID 9B										
9E	PARCEL ID NOT USED ON THIS EXHIBIT "A" INCORPORATED INTO PARCEL ID 9B										
9F	PORTION OF SECTION 26, T.3S., R.64W., 6TH P.M.	LULA MAY BANCHOR	FRONT RANGE AIRPORT AUTHORITY	3/5/1993	BOOK 4038 PAGE 253	FEE BY SPECIAL WARRANTY DEED	35 ±	9F	AIP 3-08-0016-18	AIRPORT IMPROVEMENT AND PROTECTION	PARCEL 1 OF DEED
10	PORTION OF THE NE4, SECTION 16, T.3S., R.63W., 6TH P.M.	ROBERT WAYNE TAYLOR	FRONT RANGE AIRPORT AUTHORITY	7/11/1988	BOOK 3476 PAGE 532	FEE BY WARRANTY DEED	2 ±	10	SPONSOR ACQUISITION	OUTER MARKER	PARCEL IS FOR THE OUTER MARKER NOT SHOWN GRAPHICALLY HEREON
11	N2SE4, SECTION 15, T.3S., R.64W., 6TH P.M.	CFA ACQUISITION CORP.	FRONT RANGE AIRPORT AUTHORITY	4/13/1990	BOOK 3665 PAGE 612	FEE BY WARRANTY DEED	80 ±	11	AIP 3-08-0016-12	AIRPORT IMPROVEMENT	
12	A PORTION OF THE NW4, SECTION 18, T.3S., R.64W., 6TH P.M.	SHUCK TRANSPORT LIMITED, LLLP	FRONT RANGE AIRPORT AUTHORITY	5/31/2000	BOOK 6144 PAGE 416	FEE BY SPECIAL WARRANTY DEED	160 ±	PARCEL C(WEST)	SPONSOR ACQUISITION	AIRPORT IMPROVEMENT AND PROTECTION	SPECIFICALLY EXCLUDES NORTH 70 FEET OF PARCEL
13	A PORTION OF THE NE4, SECTION 18, T.3S., R.64W., 6TH P.M.	SHUCK TRANSPORT LIMITED, LLLP	FRONT RANGE AIRPORT AUTHORITY	5/31/2000	BOOK 6144 PAGE 428	FEE BY SPECIAL WARRANTY DEED	36.49 ±	C(E1)	AIP 3-08-0016-24	AIRPORT IMPROVEMENT AND PROTECTION	SPECIFICALLY EXCLUDES NORTH 70 FEET OF PARCEL
	A PORTION OF THE NE4, SECTION 18, T.3S., R.64W., 6TH P.M.	SHUCK TRANSPORT LIMITED, LLLP	FRONT RANGE AIRPORT AUTHORITY	5/31/2000	BOOK 6144 PAGE 428	FEE BY SPECIAL WARRANTY DEED	36.49 ±	C(E2)	AIP 3-08-0016-24	AIRPORT IMPROVEMENT AND PROTECTION	SPECIFICALLY EXCLUDES NORTH 70 FEET OF PARCEL
	A PORTION OF THE NE4, SECTION 18, T.3S., R.64W., 6TH P.M.	SHUCK TRANSPORT LIMITED, LLLP	FRONT RANGE AIRPORT AUTHORITY	5/31/2000	BOOK 6144 PAGE 428	FEE BY SPECIAL WARRANTY DEED	24.16 ±	C(E3)	AIP 3-08-0016-25	AIRPORT IMPROVEMENT AND PROTECTION	SPECIFICALLY EXCLUDES NORTH 70 FEET OF PARCEL
	A PORTION OF THE NE4, SECTION 18, T.3S., R.64W., 6TH P.M.	SHUCK TRANSPORT LIMITED, LLLP	FRONT RANGE AIRPORT AUTHORITY	5/31/2000	BOOK 6144 PAGE 428	FEE BY SPECIAL WARRANTY DEED	7.47 ±	C(E4)	AIP 3-08-0016-27	AIRPORT IMPROVEMENT AND PROTECTION	SPECIFICALLY EXCLUDES NORTH 70 FEET OF PARCEL
	A PORTION OF THE NE4, SECTION 18, T.3S., R.64W., 6TH P.M.	SHUCK TRANSPORT LIMITED, LLLP	FRONT RANGE AIRPORT AUTHORITY	5/31/2000	BOOK 6144 PAGE 428	FEE BY SPECIAL WARRANTY DEED	55.39 ±	C(W2)	SPONSOR ACQUISITION	AIRPORT IMPROVEMENT AND PROTECTION	SPECIFICALLY EXCLUDES NORTH 70 FEET OF PARCEL
14	THE NW4 AND A PORTION OF THE SW4, SECTION 11, T.3.S., R.64W., 6TH P.M.	ROBERT D. CULP, SHERYL HENSON AND NATALI SOUTH	FRONT RANGE AIRPORT AUTHORITY	11/23/2005	RECEPTION NO. 2005120500013329 40 RECEPTION NO. 2005120500013329 50	FEE BY WARRANTY DEED	200 ±			AIRPORT IMPROVEMENT AND PROTECTION	

NOTE 1: PREVIOUS EXHIBIT A SHOWED FUTURE ACQUISITION PARCELS LABELED AS PARCELS 15, 17, 18, 19, 20, 21, 22. THESE PARCELS ARE NO LONGER PLANNED FOR PURCHASE.

NOTE 2: PARCEL 7A SHOWN ON THE PREVIOUS EXHIBIT 'A' WAS ACQUIRED AS A PART OF PARCEL 6, BOOK 2793 PG 754 . PARCEL 7A WAS INCORRECTLY IDENTIFIED AS A PARCEL ACQUIRED BY SPONSOR ACQUISITION BY DOCUMENT BK 2849 PG 457. THIS DOCUMENT IS FOR THE RELEASE AND TRANSFER OF PARCELS D6B TO DANFORD-CHAMPLAIN FARMS, LTD. AS SHOWN ON THIS EXHIBIT A. PARCEL 7A SHOWN ON PREVIOUS EXHIBIT 'A' WAS ACQUIRED UNDER PARCEL 6.

**** THE FRONT RANGE AIRPORT AUTHORITY WAS DISSOLVED AND ALL PROPERTIES TRANSFERRED TO ADAMS COUNTY FOR AIRPORT PURPOSES BY RESOLUTION DATED DECEMBER 11, 2013 AND RECORDED AS RECEPTION NO. 2016000089167.

PARCEL DISPOSAL BY THE AIRPORT

ID	GRANTEE	DATE	RECORDING DATA	INTEREST	ACRES	HISTORIC PARCEL ID	FAA PROJECT NO.	NOTES
D1A	STATE OF COLORADO DEPT. OF MILITARY AFFAIRS	6/28/2001	RECEPTION NO. C0834580	FEE	5 ±	D	AIP 3-08-0016-11	PART OF PARENT PARCEL 1
D1B	SCHUCK TRANSPORT LIMITED, LLLP	5/31/2000	BOOK 6144 PAGE 412	FEE	160 ±	B	RELEASED	PART OF PARENT PARCEL 1
D1C	TRANSPORTATION INDUSTRIAL DEVELOPMENT, LTD	3/2/2009	RECEPTION NO. 2009000015464	FEE	640 ±	1	SPONSOR ACQUISITION	PART OF PARENT PARCEL 1
D6A	STATE OF COLORADO DEPT. OF MILITARY AFFAIRS	6/28/2001	RECEPTION NO. C0834580	FEE	9 ±	D	AIP 3-08-0016-12	PART OF PARENT PARCEL 6
D6B	DANFORD-CHAMPLIN FARMS, LTD	1/27/1984	BOOK 2849 PAGE 457	FEE	52 ±	6	SPONSOR ACQUISITION	PART OF PARENT PARCEL 6
D6C	ADAMS COUNTY PLANNING COMMISSION	1/30/1984	BOOK 2835 PAGE 819	FEE	0.6 ±	6	SPONSOR ACQUISITION	PART OF PARENT PARCEL 6 ROAD ROW DEDICATION
D7A	STATE OF COLORADO DEPT. OF MILITARY AFFAIRS	6/28/2001	RECEPTION NO. C0834580	FEE	9.5 ±	D	AIP 3-08-0016-12	PART OF PARENT PARCEL 7
D7B	DANFORD-CHAMPLIN FARMS, LTD	1/27/1984	BOOK 2849 PAGE 457	FEE	19 ±	7	AIP 3-08-0016-12	PART OF PARENT PARCEL 7
D7C	ADAMS COUNTY PLANNING COMMISSION	1/30/1984	BOOK 2835 PAGE 817	FEE	0.6 ±	7	AIP 3-08-0016-12	PART OF PARENT PARCEL 7 ROAD ROW DEDICATION

PARCEL NAMING DESIGNATION AS FOLLOWS D#A. WHERE (D) SIGNIFIES PARCEL OF LAND DISPOSED BY AIRPORT, (#) IS THE PARENT PARCEL NUMBER THAT THE LAND IS TAKEN FROM, (A) IS AN ALPHA CHARACTER DESIGNATING COMMON PARCELS DISPOSED BY DEED BUT TAKEN FROM DIFFERENT PARENT PARCELS.

FUTURE ACQUISITION TABLE

ID	CURRENT OWNER	DOCUMENT NO.	ACQUISITION TYPE	ACRES	NOTES
15	RICARDO AND HORACIO BEJARANO	BOOK 2006 PAGE 517	AVIGATION EASEMENT	1.4 ±	IT IS POSSIBLE THIS PARCEL EXTENDS TO A SECOND LANDOWNER
16	WESTERN TRANSPORT LLC	BOOK 2017 PAGE 62653	AVIGATION EASEMENT	0.6 ±	
17	BNSF RAILROAD		AVIGATION EASEMENT	9.4 ±	

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16-FTG-ALP-EXHIBIT A.dwg
Sep 19, 2019 - 11:47am
Sean.Jovick

JVIATION®

Front Range AIRPORT

DES: S.G.J.
DR: S.G.J.
CH: J.B.M.
APP: J.B.M.

ISSUE RECORD

NO.	BY	DATE	DESCRIPTION

THE PREPARATION OF THIS DOCUMENT MAY HAVE BEEN SUPPORTED, IN PART, THROUGH THE AIRPORT IMPROVEMENT PROGRAM FINANCIAL ASSISTANCE FROM THE FEDERAL AVIATION ADMINISTRATION AS PROVIDED UNDER TITLE 49 U.S.C., SECTION 47104. THE CONTENTS DO NOT NECESSARILY REFLECT THE OFFICIAL VIEWS OR POLICY OF THE FAA. ACCEPTANCE OF THIS AIRPORT LAYOUT PLAN BY THE FAA DOES NOT IN ANY WAY CONSTITUTE A COMMITMENT ON THE PART OF THE UNITED STATES TO PARTICIPATE IN ANY DEVELOPMENT DEPICTED THEREIN NOR DOES IT INDICATE THAT THE PROPOSED DEVELOPMENT IS ENVIRONMENTALLY ACCEPTABLE OR WOULD HAVE JUSTIFICATION IN ACCORDANCE WITH APPROPRIATE PUBLIC LAWS.

AIRPORT LAYOUT PLAN

EXHIBIT A - PROPERTY MAP TABLES

AIP PROJ. NO.	JVIATION PROJ. NO.	DATE:
3-08-0016-040-2015	2015.FTG.03	SEPTEMBER 2019

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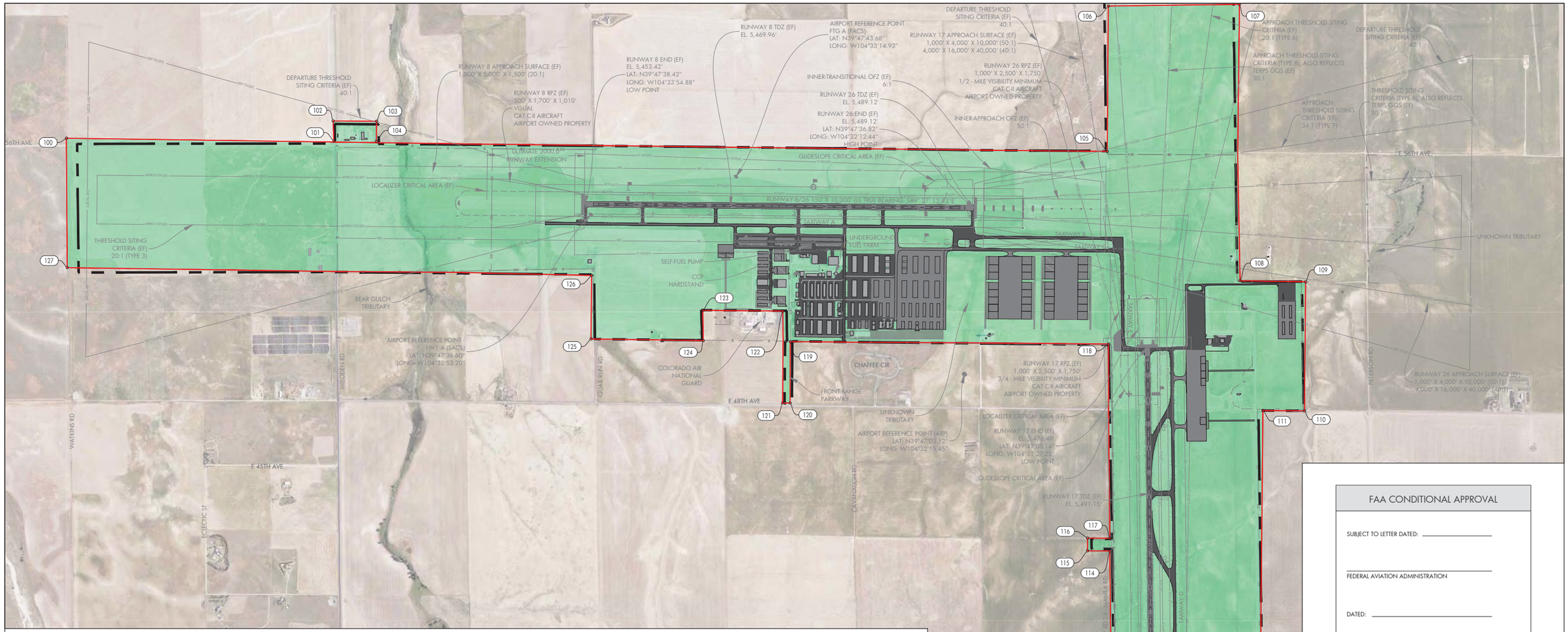


DRAWING LEGEND

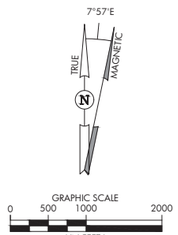
ITEM	EXISTING	FUTURE	ULTIMATE
AIRPORT PROPERTY BOUNDARY		SAME	SAME
DESIGNATED LAUNCH SITE BOUNDARY	N/A	N/A	
RUNWAY PROTECTION ZONE (RPZ)	N/A	N/A	
BUILDING RESTRICTION LINE	N/A	N/A	
RUNWAY OBJECT FREE AREA (ROFA)	N/A	N/A	
RUNWAY SAFETY AREA (RSA)	N/A	N/A	
TAXIWAY OBJECT FREE AREA (TOFA)	N/A	N/A	
TAXIWAY SAFETY AREA (TSA)	N/A	N/A	
OBJECT FREE ZONE - RUNWAY (ROFZ)	N/A	N/A	
THRESHOLD SITING SURFACE (TSS)	N/A	N/A	
APPROACH SURFACE (34:1)	N/A	N/A	
APPROACH SURFACE (50:1)	N/A	N/A	
FENCE - SECURITY (8' HEIGHT)	N/A		
FENCE - GENERAL (4' HEIGHT)		N/A	N/A
RAILROAD		N/A	
RUNWAY END IDENTIFIER LIGHTS (REIL)		N/A	
ROTATING BEACON		N/A	
PAPI		N/A	
WINDCONE		N/A	
SEGMENTED CIRCLE		N/A	
LOCALIZER		N/A	
MALSR		N/A	
AIRPORT REFERENCE POINT (ARP)		N/A	
PRIMARY/SECONDARY AIRPORT CONTROL STATION		N/A	

POINT TABLE

POINT	LATITUDE	LONGITUDE
P131	N039° 45' 19.45"	W104° 31' 04.44"
P130	N039° 45' 10.52"	W104° 31' 04.63"
P106	N039° 48' 17.48"	W104° 31' 36.54"
P129	N039° 45' 11.15"	W104° 31' 39.19"
P128	N039° 45' 20.00"	W104° 31' 38.95"
P127	N039° 47' 26.64"	W104° 36' 11.01"
P126	N039° 47' 23.94"	W104° 33' 53.15"
P125	N039° 47' 11.09"	W104° 33' 53.51"
P124	N039° 47' 10.48"	W104° 33' 24.00"
P123	N039° 47' 16.64"	W104° 33' 24.01"
P122	N039° 47' 16.31"	W104° 33' 03.01"
P121	N039° 46' 57.67"	W104° 33' 03.32"
P120	N039° 46' 57.64"	W104° 33' 01.35"
P119	N039° 47' 10.10"	W104° 33' 01.10"
P118	N039° 47' 08.91"	W104° 31' 37.47"
P117	N039° 46' 29.49"	W104° 31' 37.71"

POINT TABLE

POINT	LATITUDE	LONGITUDE
P116	N039° 46' 29.59"	W104° 31' 43.53"
P115	N039° 46' 27.02"	W104° 31' 43.60"
P114	N039° 46' 26.93"	W104° 31' 37.71"
P113	N039° 45' 24.98"	W104° 31' 38.81"
P112	N039° 45' 24.36"	W104° 30' 59.53"
P111	N039° 46' 55.09"	W104° 30' 57.06"
P110	N039° 46' 54.92"	W104° 30' 46.17"
P109	N039° 47' 21.09"	W104° 30' 45.47"
P108	N039° 47' 21.46"	W104° 31' 02.73"
P107	N039° 48' 17.50"	W104° 31' 02.05"
P105	N039° 47' 47.98"	W104° 31' 37.28"
P104	N039° 47' 51.61"	W104° 34' 49.35"
P103	N039° 47' 55.66"	W104° 34' 49.25"
P102	N039° 47' 55.84"	W104° 35' 00.68"
P101	N039° 47' 51.76"	W104° 35' 00.55"
P100	N039° 47' 52.90"	W104° 36' 10.85"



DATE: 04/2018
ANNUAL RATE OF CHANGE: 0°6'W
SOURCE: U.S. NOAA

FAA CONDITIONAL APPROVAL

SUBJECT TO LETTER DATED: _____

FEDERAL AVIATION ADMINISTRATION

DATED: _____

CASE NO: _____

NOTES

1. EXISTING AND FUTURE CONDITIONS SHOWN AS (EF)
2. BOUNDARIES EXTEND 200 FEET OUT FROM THE EDGE ALONG THE RUNWAY OR TAXIWAY
3. BOUNDARIES EXTEND 1,000 FEET FROM BOTH ENDS OF EACH RUNWAY
4. THE AIRPORT PROPERTY LINE REFLECTED HERE IS BASED ON A COMPILATION OF HISTORICAL SOURCES AND MAY NOT ACCURATELY REFLECT ITS TRUE CONDITION. THE AIRPORT WILL UNDERTAKE A FULL PROPERTY SURVEY TO UPDATE ITS PROPERTY LINE.

SOURCE

1. SURVEY DATA IS BASED ON THE PLANIMETRIC MAPPING AND ORTHO-IMAGERY INFORMATION COMPILED BY MARTINEZ GEOSPATIAL IN 2017.
2. ALL HORIZONTAL COORDINATES - NAD83/2011
   ALL VERTICAL COORDINATES - NAD88

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Sep 26, 2019 - 11:40am
Sean.Jarvis

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Front Range AIRPORT

DES: S.G.J.
DR: S.G.J.
CH: J.B.M.
APP: J.B.M.

ISSUE RECORD

NO.	BY	DATE	DESCRIPTION

AIRPORT LAYOUT PLAN

LAUNCH SITE BOUNDARY PLAN

AIP PROJ. NO.	JVIATION PROJ. NO.	DATE:
3-08-0016-40	2015.FTG.03	SEPTEMBER 2019

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7.0 FINANCIAL IMPLEMENTATION PLAN

This chapter of the Airport Master Plan (AMP) presents the financial implementation analysis for Front Range Airport (FTG or the Airport), and examines various facets of the financial operating condition of the Airport. In addition, this chapter reviews the Airport's historic operating revenues and expenses, and provides estimates for future financial results. The goal of this chapter is to help the Airport meet the requirements of FAA sponsor assurance number 24, Fee and Rental Structure, which states: "It (i.e. the airport sponsor) will maintain a fee and rental structure for the facilities and services at the airport which will make the airport as self-sustaining as possible under the circumstances existing at the particular airport, taking into account such factors as the volume of traffic and economy of collection."

The projections of airport revenues and expenses focus on the three planning periods of this AMP's Capital Improvement Program (CIP): Phase I (Short-term, 2017-2021), Phase II (Intermediate-term, 2022-2026), and Phase III (Long-term, 2027-2036). These planning periods are utilized to assist the Airport in financially supporting future capital projects either by contributing the local share of costs in coordination with FAA and CDOT grants, or by wholly funding them. The CIP and associated financial plan included in this chapter should be viewed as a guideline that is based on the circumstances and conditions that were current at the time of the completion of this Master Plan. Ultimately, capital projects should be undertaken when demand warrants and appropriate funding becomes available.

The overall approach for the development of the financial implementation analysis included the following elements:

- Gathered and reviewed key Airport documents related to historical financial results, capital improvement plans, operating budgets, regulatory requirements, and Airport policies.
- Interviewed key Airport management personnel to gain an understanding of the existing operating and financial environment, as well as the overall financial management philosophy.
- Reviewed the AMP Capital Improvement Plan (CIP), project cost estimates, and development schedule anticipated for the three planning periods, to project the overall financial requirements to implement the CIP.

- Identified and analyzed the sources and timing of capital funding available to meet the financial requirements for funding the CIP.
- Analyzed historical and budgeted operating expenses, developed operations and maintenance expense assumptions, and projected future operating costs for the planning periods.
- Analyzed historical and budgeted operating revenues, developed operating revenue assumptions, and projected future operating revenues for the planning periods.
- Completed results of the analysis and evaluation in a Financial Plan Summary that provides conclusions regarding the financial feasibility of the CIP.

Airport budgets can be broadly categorized as capital improvements and operating and maintenance (O&M). Grants issued by the FAA and CDOT are generally restricted to capital improvement projects, and with few exceptions cannot be used for airport operating and maintenance expenses. Operating revenues generated by aircraft landing and parking fees, fuel flowage fees, land and building leases, etc., can be applied to both capital improvements as well as O&M expenses.

7.1 Capital Funding Sources

The implementation of FTG's Master Plan CIP is anticipated to be funded primarily through the following sources:

- Federal Aviation Administration (FAA) grants from its Airport Improvement Program (AIP)
- State of Colorado funding sources
- Local funding sources
- Other capital project funding sources, such as private parties

Each of these funding sources is described in the following sections.

7.1.1 Federal Aviation Administration Grants

Airports included in FAA's National Plan of Integrated Airport Systems (NPIAS) are eligible to receive FAA grants. For general aviation airports, the FAA provides the most significant percentage of the funding required for the construction of eligible capital projects. Following World War II, the federal government recognized the need to develop airports to meet the nation's long-term aviation needs, and thereafter initiated a Grants-In-Aid Program for eligible airport sponsors. Following a series of federal airport funding programs, the Airport Improvement Program (AIP) was established by Congress on behalf of the FAA through the Airport and Airway Improvement Act of 1982.

AIP grants are generally available for planning, development, or noise compatibility projects at public-use airports included in the NPIAS. Eligible projects include improvements related to enhancing airport safety, capacity, security, and environmental concerns. Funds obligated for the AIP are drawn from the Airport and Airway Trust Fund, which itself is designed to support the improvement of the country's air transportation system by funding airport improvements, airport repair

projects, and modernizing the Air Traffic Control system. The Trust Fund receives revenue through taxes on aviation fuels, airline ticket sales, and air freight shipments.

The initial AIP legislation provided funding through FY 1992, but since then, the AIP has been reauthorized and amended multiple times, most recently through the FAA Extension, Safety, and Security Act of 2016[1]. That legislation has since expired, although Congress extended it for one year (i.e., through FY 2017 or September 30, 2017). In order for FAA to continue issuing grants after that date, Congress will ultimately need to authorize a new AIP program or else pass continuing resolutions as it has frequently done in the past. (Each time Congress reauthorizes AIP, it typically changes parts of the program including funding disbursements, project eligibility requirements, appropriation levels, etc. These changes and the debate they can generate often delay the AIP reauthorization, and also make it difficult for airports to know how much FAA funding will be available in the future, and what requirements may be in place to secure that funding.)

Under current legislation, the AIP will typically provide 90 percent of the total cost of an FAA-eligible capital project (with the balance often being covered through a combination of state and local funding), although this percentage can be reduced based on the size, complexity, and requirements of a specific project. FAA Order 5100.38D, *Airport Improvement Handbook* specifies the eligibility requirements for capital projects to receive FAA grants. In general, sponsors can apply AIP funds to most airfield capital improvements and preservation efforts, and in limited situations, for terminals, hangars, aprons, and other non-aviation development. Professional services that are necessary for eligible projects, such as planning, surveying, and engineering design, may also be eligible. In most cases, an airport's demand for capital improvements must be appropriately quantified and documented (such as through an airport master plan process), and each project must be shown on an approved Airport Layout Plan (ALP). Additionally, all proposed capital improvements must meet appropriate Federal environmental and procurement requirements. Projects related to revenue-generating improvements (such as privately owned or leased hangars and aprons, or those portions of a terminal building leased by airlines or concessions, etc.) are typically not eligible for AIP funding, nor are standard airport operations and maintenance costs (e.g., salaries, equipment, supplies, etc.).

AIP grants are generally divided into two categories: entitlements and discretionary. Entitlement Grants are allocated among NPIAS airports through a formula largely driven by passenger enplanements, landed cargo weights, and types of operations. Currently, "primary" airports, defined in the NPIAS as having a particular level of commercial air service (i.e. enplane more than 10,000 passengers annually), receive $1 million annually in entitlement funding. "Non-primary" airports, which include small commercial service airports and general aviation airports like FTG, are currently eligible for $150,000 of annual FAA entitlement funding. AIP grants must be expended within four years of being issued or be returned to the FAA. This means airports can accrue a maximum of three years' worth of annual entitlements to be applied towards eligible projects in the fourth year. There are also options potentially available to airports whereby they may "borrow" entitlements from future years to apply to a project in the near-term.

[1] https://www.congress.gov/114/bills/hr636/BILLS-114hr636enr.pdf

Similar to entitlements to individual airports, each state receives an annual apportionment from the FAA based on an area-population formula. These federal funds are utilized at the discretion of the individual states.

In addition to entitlement grants, the AIP also distributes discretionary grants, since the capital requirements of airports often will exceed the limits of their annual entitlement funding. National discretionary funding levels are established annually by the FAA, and result from federal funds that remain available after the distribution of entitlements. Congress sets the requirements for how discretionary funds are allocated by the FAA, with certain amounts set-asides for projects of special interest (e.g., airport safety, noise mitigation, the military airport program, etc.).

Each NPIAS airport development project is subject to eligibility and justification requirements as part of the normal AIP funding process. Generally, airports within similar categories (general aviation, reliever, primary, etc.) compete for these discretionary grants, which are typically awarded based on priority ratings given by the FAA to each potential project. Given the lack of adequate discretionary funding available, this prioritization process tries to ensure that the most important and beneficial projects (as viewed by the FAA) are given priority.

7.1.2 State of Colorado Funding Sources

Colorado Aviation Grant Program

In support of the Colorado Department of Transportation's (CDOT) stated goal to develop a forward-looking multi-modal transportation system for the 21st century, the Colorado Division of Aeronautics is charged with promoting partnerships with its public and private constituents to enhance aviation safety, aviation education, and the development of an effective air transportation system through the efficient administration of the Colorado Aviation Fund. Specifically, through the Colorado Aviation Grant program and at the discretion of the Colorado Aeronautical Board (CAB), the Division annually awards discretionary aviation grants to the state's public-use, publicly-owned airports from the Aviation Fund.

The chief priority for distributing these state grants is to leverage Federal AIP grants by providing a five percent match to state airports. The State awards half of the local match requirement up to a limit, recommended annually by the Division and approved by the CAB. Currently the grant cap is $150,000 through the year 2020, after which that cap may be raised to $250,000. Although the State is currently limiting grants to matches on AIP projects, it does have the statutory authority to give grants for overmatch on an AIP project that may be short of funds, as well as to award grants for State and Local projects without federal participation. In general, State funding is focused on non-revenue generating projects that are prioritized from the "runway out" – meaning that preference is given to projects related to runways, then taxiways, and then others.

The Colorado Aviation Fund is directly supported by revenues generated through a state sales tax on aviation fuel. This tax is indexed to a percentage of the cost of a gallon of commercial jet fuel. Therefore, as the cost of jet fuel increases, the size of the Colorado Aviation Fund increases, allowing for more state grant availability.

Conversely, when fuel prices decline, the fund will decrease in size, reducing state grant availability.

At the time of this document, the Colorado Aviation Fund was in process of recovering from a significant deficit that was precluding the State from actively funding programs other than matching funds for individual AIP projects. This recovery is anticipated to be complete in FY 2018 at which time the State will then be able to progressively start to reinstitute some of its former funding programs.

State Infrastructure Bank

The State Infrastructure Bank (SIB) Loan Program was enacted by the Colorado Legislature in 1998 and adopted by CDOT in 1999. This unique funding source is administered by the Colorado Transportation Commission and helps provide funding for all types of transportation facilities (including aviation) through a low-interest revolving loan program. For aviation needs, a separate fund has been established within the SIB so that airports only compete with other airports for funding.

Loans awarded to Colorado public-use airports from the SIB have been used to support funding for projects such as capital airport improvements, air traffic control towers, snow removal equipment, and airport pavement reconstruction. Additionally, these low-interest loans have been utilized for land acquisitions that have protected Colorado airports from incompatible land-use surrounding airports. These loans are awarded for a maximum of 10 years with an interest rate that is set every six months by the Transportation Commission. In November 2016, the interest rate was set at 2¼ percent and the aviation fund had an available balance of approximately $11,000,000.

State Aviation Fuel Tax Disbursements

Pursuant to Colorado statutes, the State currently collects multiple sales taxes on aviation fuels at publicly owned, public-use airports at the following rates:

- Commercial jet fuel = 2.9 percent of the cost of a gallon.
- Non-commercial jet fuel = $0.04 per gallon
- Aviation gasoline = $0.06 per gallon

Of the commercial jet fuel sales taxes collected annually, 65 percent are distributed back to the airport where the fuel was sold, with the remaining 35 percent being used to fund the Colorado Division of Aeronautics Program. Of the non-commercial jet fuel taxes collected, 100 percent is provided to the airport of origin. With respect to aviation gasoline tax revenues, 66 percent is sent to the airport, and the remaining 33 percent is applied to the State Aviation Program. **Table 7-1** shows the amount CDOT passed through to FTG from the aviation fuel taxes that were collected:

TABLE 7-1 - CDOT AVIATION FUEL TAX DISTRIBUTION TO FTG

Fiscal Year	Amount
2016	$27,284.77
2015	$25,985.73
2014	$18,289.45
2013	$21,693.45
2012	$25,332.11
2011	$27,927.91
2010	$20,660.54
2009	$23,997.65

Source: CDOT Division of Aeronautics https://www.codot.gov/programs/aeronautics/FuelTax

7.1.3 Local Funding Sources

Local funding is typically generated from operating revenues accrued on a given airport and generally consist of user fees associated with leases, fuel sales, services, etc. The user fees are typically established by the airport based on market conditions in the area and vary from airport to airport. FTG has several sources for generating revenue including:

- Aircraft fuel sales
- Hangar leases
- Land leases
- Tie-down fees
- Other operating revenues, such as the restaurant in the terminal building
- Non-operating revenues, such as return on investments, interest payments, etc.

Landside facility development and levels of aviation activity are typically the primary factors affecting airport operating revenues. These revenues will normally increase as a function of usual inflationary growth as well as average annual increases associated with existing leases. Additionally, as additional airport development occurs, growth in the numbers of based aircraft and itinerant aircraft operational levels will often be realized. In general, land and building leases provide the most stable long-term sources of revenue at an airport. Fuel sales, tie-downs and other operational fees will fluctuate with traffic levels. Unlike commercial service airports, GA airports typically generate little to no revenue from auto parking, concessions (e.g. restaurants and shops), and terminal building tenants (airlines, rental car agencies).

7.1.4 Other Capital Project Funding Sources

The traditional funding sources described in previous sections (FAA and CDOT grants and airport revenue) are often insufficient to finance the full range of capital projects programmed for development during a CIP. In addition, some projects are not eligible for FAA or state grants. When the availability of traditional funding is lacking, other non-traditional sources need to be investigated and possibly utilized for the ultimate implementation of projects. (In this chapter, these sources have collectively been referenced as “Other Funding Sources.”) If funding sources cannot be ultimately

identified and obtained in the time frames planned, the associated projects should be delayed until appropriate funding can be identified and secured.

Non-traditional funding sources for an airport typically include general fund revenues, bond issues, and private funding. Of these, general fund revenues and general obligation bonds are by far the most common funding sources, particularly at commercial service airports. The ability of municipalities and counties to issue general obligation bonds for airport capital projects is directly affected by their debt level and ability to finance their existing and future debt load. As the debt burden increases, rating agencies often lower their credit ratings, which increases their interest payments. Revenue bonds supported by airport-generated revenues are seldom used by general aviation airports because most such airports do not generate enough income to pay operating expenses and the debt service of capital funding requirements.

Private funding sources such as FBOs, aircraft owners, investors, etc., often assume the responsibility of paying for hangars, fuel storage tanks, and sometimes for parking aprons, taxiways, and utility hookups. However, when private parties make capital investments in airports, they often try to negotiate reduced land and/or building lease rates to balance their capital investment. Additionally, they can seek to avoid property reversion clauses whereby ownership facilities constructed on an airport ultimately revert to the airport after a set period (often a minimum of 20).

General Fund Revenues

General fund revenues are those provided by the airport sponsor (county, municipality, or state) from their general tax revenues. Airport capital development expenditures from general fund sources have been somewhat difficult to obtain in recent years. One reason for this difficulty is the seemingly universal shortfall in local general fund revenues. Budgetary problems have created an environment where local funding is uncertain. The amount of general fund support for airport improvement projects varies by airport and is generally based upon the local tax base, the credit rating of the county, municipality, and state, priority of the development project, historical funding trends, and, of course, local attitudes concerning the importance of aviation.

Bond Funds

The period since the mid-1990s has seen the unprecedented development of various types of municipal bonds and securities used for airport projects. Municipal and County securities (bonds) refer generically to interest-bearing obligations issued by state and local governmental entities to finance capital costs. These funding instruments are generally broken down into the following categories: (1) general obligation bonds, (2) revenue and special facility bonds, (3) hybrid source bonds, and (4) industrial development and exempt facility bonds.

For an airport owned by a county, like FTG, bond issues funding the local share of airport development projects will often compete for the same attention and leadership consideration as other departments or divisions within the county government (i.e., schools, highways, sewer, etc.). As with the general fund

apportionment, bond issues supporting airport development depend greatly on the priority assigned to such projects by the local community.

Private Funds

Items such as hangars, fuel systems, and pay parking lots are not typically eligible for federal or state grant funding at public airports because they generate income for the airport. Communities sometimes work with FBOs or other local businesses to fund these types of improvements.

Each of these options would need to be weighed independently to determine the appropriateness of their potential application for eligible projects.

7.2 Financial Analysis and Implementation Plan

This section, along with the tables presented at the end of the section, provide the analysis and results of evaluating the financial reasonableness of implementing the master plan CIP during the planning period (2016 through 2035).

7.2.1 Capital Improvement Program (CIP)

The following is a listing and brief description of the projects identified within this AMP for inclusion in FTG's CIP. The individual projects are listed in order of their CIP identifying letter and all projects are assumed to require some level of federal, state, and/or local funding, unless otherwise indicated. (Each project's associated "CIP ID" is not an indication of prioritization, importance, or funding participation, but simply a mechanism for tracking the individual projects.) Note that this listing is the best estimate of anticipated projects at the time of this AMP; however, it should be understood that many of these projects may change in scope or in timing based on future requirements. Therefore, the CIP must be reviewed, assessed and updated on a regular basis (typically annually). Additionally, as noted in **Chapter 5**, each description contains the environmental documentation that is anticipated to be required prior to the project being executed.

A. **Rehabilitate Taxilane A7 into the Hangar Area:** This project rehabilitates Taxilane A7 from the East Terminal ramp into the hangar areas. The pavement is currently failing. Anticipated environmental documentation = documented Categorical Exclusion (CatEx).

B. **Fog Seal[2] Terminal Ramp (East):** Pavements should have fog sealing applied and cracks repaired every five to seven years to extend pavement life. This project will help preserve the existing pavement until it is ultimately rehabilitated (see Projects M and KK). Anticipated environmental documentation = FAA Internal Memorandum.

[2] Fog seal is an application of a specially formulated asphalt emulsion (a thin liquid oil) to an existing asphalt pavement surface. As asphalt is subjected to traffic loads and weathering, it oxidizes and becomes more brittle, leading to cracks developing in the surface (oxidation is one of the reasons asphalt concrete pavement fades in color). Fog seal applications serve to seal narrow cracks and slightly restore lost flexibility to the pavement surface, helping to preserve the underlying pavement structure and extend pavement life. Fog seal can typically last five years before it should be reapplied.

C. **Acquire Airport Maintenance Equipment – Replace Loader:** As defined by the FAA, the useful life of airport maintenance and snow removal equipment (SRE) is 10 years, and therefore should be replaced on a regular schedule. All of FTG's current equipment is more than 10 years old, and the Airport should progressively replace those with newer equipment. There are options potentially available for FTG to acquire used equipment at significantly reduced costs. Anticipated environmental documentation = FAA Internal Memorandum.

D. **Construct Solar Farm:** FTG plans to lease 20 acres of airport property (located on Imboden Road) for the construction and operation of a solar farm by a third-party vendor. Costs associated with the project will be provided by the venture developer and FTG will realize land lease revenue. The property has already been released from aeronautical use by FAA. Anticipated environmental documentation = documented CatEx or a potential Environmental Assessment (EA).

E. **Construct Deicing Manufacturer:** FTG plans to lease airport property (located west of the Colorado National Guard facility) for the construction and operation of a deicing manufacturer. Costs associated with the project will be provided by the developer and FTG will realize land-lease revenue. The property has already been released from aeronautical use by FAA. Anticipated environmental documentation = documented CatEx or a potential EA.

F. **Construct Hangar Building:** FTG has long-term plans to accommodate the construction of future hangar facilities in accordance with its ALP. Costs associated with such development would be the responsibility of the developer with FTG realizing land lease revenue. Anticipated environmental documentation = documented CatEx.

G. **Fog Seal Terminal Ramp (West):** Pavement surfaces ideally should have fog sealing applied and cracks repaired every five to seven years to extend pavement life. CDOT has historically provided assistance to airports conducting fog sealing operations in the form of materials. Anticipated environmental documentation = FAA Internal Memorandum.

H. **Fog Seal Runway 8/26:** Pavements should have fog sealing applied and cracks repaired every five to seven years to extend pavement life. CDOT has historically provided assistance to airports conducting fog sealing operations in the form of materials. Anticipated environmental documentation = FAA Internal Memorandum.

I. **Acquire Airport Maintenance Equipment - Replace Loader and Snow Blower Attachment:** Airport maintenance and snow removal equipment should be replaced on a regular schedule. FTG's current equipment is older and should be progressively replaced with newer equipment. There are options potentially available for FTG to acquire used equipment at significantly reduced costs. Anticipated environmental documentation = FAA Internal Memorandum.

J. **Construct Hangar Building:** FTG has long-term plans to accommodate the construction of future hangar facilities in accordance with its ALP. Costs associated with such development would be the responsibility of the developer with FTG realizing land-lease revenue. Anticipated environmental documentation = documented CatEx.

K. **Fog Seal Taxiways A, B, and E:** Pavement surfaces ideally should have fog sealing applied and cracks repaired every five to seven years to extend pavement life.

CDOT has historically provided assistance to airports conducting fog sealing operations in the form of materials. Anticipated environmental documentation = FAA Internal Memorandum.

L. **Acquire Airport Maintenance Equipment – Replace SRE Truck:** Airport maintenance and snow removal equipment should be replaced on a regular schedule. FTG's current equipment is older and should be progressively replaced with newer equipment. There are options potentially available for FTG to acquire used equipment at significantly reduced costs. Anticipated environmental documentation = FAA Internal Memorandum.

M. **Rehabilitate Terminal Apron (East) (Phase 1):** The entire terminal apron is in need of rehabilitation. Because of the size of the apron and the associated costs, this rehabilitation has been broken down into three separate projects in this CIP (Projects I, BB, and JJ). Project I consists of the design and construction costs associated with the eastern half of the Terminal Apron (East) (defined as being the apron area that lies east of Taxiway A6). This project also includes painting islands on the apron to eliminate the direct runway access from the apron currently afforded by Taxiways A6 and A7. This is in conformance with FAA taxiway design criteria, as discussed in **Chapter 5**. This project also includes removal of the light stanchions currently located within the apron, installation of new lighting located off-pavement, and the start of implementing the aircraft parking redesign. Anticipated environmental documentation = FAA Internal Memorandum.

N. **Rehabilitate Taxiway C and Install Lighting on Taxiways A & C:** The useful pavement life of Taxiway C is rapidly nearing its end and is in very poor condition, having last been rehabilitated in 1999. This project consists of the design and construction costs associated with the rehabilitation of the entire taxiway. Additionally, as discussed in **Chapter 5**, the installation of Medium Intensity Taxiway Lights (MITL) was recommended for all taxiways to enhance overall airport safety by increasing a pilot's directional awareness. As a first step in that process, this project includes the installation of MITLs on the entire length of Taxiway C as well as all of Taxiway A, including connecting stubs. Anticipated environmental documentation = FAA Internal Memorandum.

O. **Acquire Airport Maintenance Equipment – Replace High-speed Runway Blower:** Airport maintenance and snow removal equipment should be replaced on a regular schedule. FTG's current equipment is older and should be progressively replaced with newer equipment. There are options potentially available for FTG to acquire used equipment at significantly reduced costs. Anticipated environmental documentation = FAA Internal Memorandum.

P. **Fog Seal Runway 17/35:** Pavement surfaces ideally should have fog sealing applied and cracks repaired every five to seven years to extend pavement life. CDOT has historically provided assistance to airports conducting fog sealing operations in the form of materials. Anticipated environmental documentation = FAA Internal Memorandum.

Q. **Acquire Airport Maintenance Equipment – Replace Runway Broom:** Airport maintenance and snow removal equipment should be replaced on a regular schedule. FTG's current equipment is older and should be progressively replaced with newer equipment. There are options potentially available for FTG

to acquire used equipment at significantly reduced costs. Anticipated environmental documentation = FAA Internal Memorandum.

R. Construct Hangar Building: FTG has long-term plans to accommodate the construction of future hangar facilities in accordance with its ALP. Costs associated with such development would be the responsibility of the developer with FTG realizing land-lease revenue. Anticipated environmental documentation = documented CatEx.

S. Fog Seal Taxilane A7: Pavement surfaces ideally should have fog sealing applied and cracks repaired every five to seven years to extend pavement life. CDOT has historically provided assistance to airports conducting fog sealing operations in the form of materials. Anticipated environmental documentation = FAA Internal Memorandum.

T. Acquire Airport Maintenance Equipment – Replace SRE Truck: Airport maintenance and snow removal equipment should be replaced on a regular schedule. FTG's current equipment is older and should be progressively replaced with newer equipment. There are options potentially available for FTG to acquire used equipment at significantly reduced costs. Anticipated environmental documentation = FAA Internal Memorandum.

U. Fog Seal Taxiway D: Pavement surfaces ideally should have fog sealing applied and cracks repaired every five to seven years to extend pavement life. CDOT has historically provided assistance to airports conducting fog sealing operations in the form of materials. Anticipated environmental documentation = FAA Internal Memorandum.

V. Rehabilitate Runway 17-35 (Design): Runway 17/35 was last rehabilitated in 2004 and will be eligible for federal funding in 2025. This project consists of the engineering design phase required for the pavement's ultimate rehabilitation, projected to occur the following year. Anticipated environmental documentation = FAA Internal Memorandum.

W. Construct Hangar Building: FTG has long-term plans to accommodate the construction of future hangar facilities in accordance with its ALP. Costs associated with such development would be the responsibility of the developer with FTG realizing land-lease revenue. Anticipated environmental documentation = documented CatEx.

X. Rehabilitate Runway 17-35 (Construct): Associated with Project V, this project encompasses the construction phase of the rehabilitation of Runway 17/35. This project will also include the updating of the Medium Intensity Runway Lighting (MIRL) and Runway End Identifier Lights (REILs). Anticipated environmental documentation = FAA Internal Memorandum.

Y. Fog Seal Taxiway A, B, E: Pavement surfaces ideally should have fog sealing applied and cracks repaired every five to seven years to extend pavement life. CDOT has historically provided assistance to airports conducting fog sealing operations in the form of materials. Anticipated environmental documentation = FAA Internal Memorandum.

Z. Fog Seal Runway 8/26: Pavement surfaces ideally should have fog sealing applied and cracks repaired every five to seven years to extend pavement life. CDOT has historically provided assistance to airports conducting fog sealing operations in the form of materials. Anticipated environmental documentation = FAA Internal Memorandum.

AA. Acquire Airport Maintenance Equipment – Replace ARFF Truck (Index B): Airport maintenance and snow removal equipment should be replaced on a regular schedule. FTG's current equipment is older and should be progressively replaced with newer equipment. There are options potentially available for FTG to acquire used equipment at significantly reduced costs. Anticipated environmental documentation = FAA Internal Memorandum.

BB. Install Airfield Perimeter Fencing: As discussed in **Chapter 5**, it is recommended that FTG install perimeter fencing to enhance general airport security, airport safety and limit wildlife activity on the Airport. While this fencing effort could be broken down into multiple phases, this project assumes encompassing the entire airfield with access control points in areas with the most direct public interface. Anticipated environmental documentation = documented CatEx.

CC. Construct Hangar Building: FTG has long-term plans to accommodate the construction of future hangar facilities in accordance with its ALP. Costs associated with such development would be the responsibility of the developer with FTG realizing land-lease revenue. Anticipated environmental documentation = documented CatEx.

DD. Fog Seal Taxiway A: Pavement surfaces ideally should have fog sealing applied and cracks repaired every five to seven years to extend pavement life. CDOT has historically provided assistance to airports conducting fog sealing operations in the form of materials. Anticipated environmental documentation = FAA Internal Memorandum.

EE. Construct Hangar Building: FTG has long-term plans to accommodate the construction of future hangar facilities in accordance with its ALP. Costs associated with such development would be the responsibility of the developer with FTG realizing land-lease revenue. Anticipated environmental documentation = documented CatEx.

FF. Rehabilitate Runway 8/26: Runway 8/26 was last rehabilitated in 2012 and will be eligible for federal funding in 2033. This project consists of the engineering design phase and construction phase required to rehabilitate the runway. This project will also include the updating of the MIRL and REILs. Anticipated environmental documentation = FAA Internal Memorandum.

GG. Construct Hangar Building: FTG has long-term plans to accommodate the construction of future hangar facilities in accordance with its ALP. Costs associated with such development would be the responsibility of the developer with FTG realizing land-lease revenue. Anticipated environmental documentation = documented CatEx.

HH. Fog Seal Runway 17/35: Pavement surfaces ideally should have fog sealing applied and cracks repaired every five to seven years to extend pavement life. CDOT has historically provided assistance to airports conducting fog sealing operations in the form of materials. Anticipated environmental documentation = FAA Internal Memorandum.

II. Reconstruct and Strengthen East Ramp (Phase 1) and Taxiway D7: As described in **Chapter 5**, Runway 17/35's pavement strength likely could allow larger general aviation aircraft to operate on it on a regular basis. Unfortunately, its associated taxiways and aprons do not have sufficient strength to accommodate such heavier aircraft. This project includes the required reconstruction of a portion of the East Ramp (last rehabilitated in 1992) as well as the strengthening

of that pavement to be consistent with Runway 17/35. This project would also strengthen Taxiway D7, the connecting taxiway between Runway 17/35 and the East Ramp. This pavement strengthening effort is also associated with Project JJ. Anticipated environmental documentation = documented CatEx.

JJ. Strengthen Taxiways D1 and D2: Related to Project II, this project will strengthen pavements for Taxiway D1, D2, and the connecting section of Taxiway D such that they are consistent with Runway 17/35. Strengthening these pavements will allow heavier aircraft to turn around on the Runway 35 approach end, facilitating their back-taxi operations on the runway. Anticipated environmental documentation = documented CatEx.

KK. Rehabilitate Terminal Apron (East) (Phase 2): Associated with Project II, Project KK consists of the design and construction costs associated with the western half of the Terminal Apron (East) (defined as being the apron area that lies to the east of Taxiway A6). This project also includes removal of any light stanchions currently located within the apron, installation of new lighting located off-pavement, the reconfiguration of the existing hardstand, and the completion of the aircraft parking redesign. Anticipated environmental documentation = FAA Internal Memorandum.

LL. Expand Existing SRE Facility: Per FAA criteria, FTG currently has an appropriate amount of covered space to house its airfield maintenance and snow removal equipment. However, in order to effectively maintain the airfield, the Airport has had to acquire additional equipment that it currently stores outside. That is not an ideal operating condition as equipment left outdoors will deteriorate faster than if it is stored inside. Therefore, this project encompasses the construction of a cold storage addition to the existing SRE facility to accommodate FTG's additional equipment. Anticipated environmental documentation = documented CatEx.

MM. Construct Taxiway E Holding Bay: At some point, FTG could experience an operational constraint and potential safety issue on Taxiway E. As described in **Chapter 5**, the recommended solution to this potential issue is the construction of a holding bay on the taxiway to allow aircraft to bypass each other. This project encompasses the design and construction of that holding bay. Anticipated environmental documentation = documented CatEx.

NN. Rehabilitate Taxilane A7D: This project anticipates the required design and construction of a Taxilane A7D rehabilitation. Anticipated environmental documentation = FAA Internal Memorandum.

OO. Rehabilitate Taxilane A8A: This project anticipates the required design and construction of a Taxilane A8A rehabilitation. Anticipated environmental documentation = FAA Internal Memorandum.

PP. Rehabilitate Taxilane A8B: This project anticipates the required design and construction of a Taxilane A8B rehabilitation. Anticipated environmental documentation = FAA Internal Memorandum.

QQ. Rehabilitate Taxilane A8C: This project anticipates the required design and construction of a Taxilane A8C rehabilitation. Anticipated environmental documentation = FAA Internal Memorandum.

RR. Construct New Taxiway from Taxiway A to Hangars: Module 3 is a proposed future hangar development area located to the east of the existing hangar complex. This project includes the design and construction of a new taxiway

from existing Taxiway A to the south into the future Module 3. Anticipated environmental documentation = documented CatEx.

SS. **Rehabilitate Terminal Apron (West):** Associated with Projects II and KK, this project consists of the design and construction costs associated with the entire the Terminal Apron (West) (defined as being the apron area that lies to the west of Taxiway A6). This project also includes removal of any light stanchions currently located within the apron. Anticipated environmental documentation = FAA Internal Memorandum.

TT. **Reconstruct East Apron (Phase 2):** Associated with Project II, this project completes the reconstruction of the East Ramp, last rehabilitated in 1992. Costs associated with this project include design and construction. Anticipated environmental documentation = documented CatEx.

UU. **Construct Large FBO Hangar:** This project encompasses the construction of a new large fixed base operator (FBO) hangar that would be constructed and operated by the Airport. Anticipated environmental documentation = documented CatEx.

7.2.2 Estimated Project Costs and Development Schedule

A list of capital improvement projects has been assembled based on the preferred development alternatives for the Airport established in **Chapter Five** of this Master Plan. This project list has been coordinated with the ALP drawing set and the CIP, both of which should be maintained and updated by Airport management, as required. Generally, the CIP has three primary purposes:

1. Identify projects that will be required to improve an airport over a specific period of time.
2. Estimate the order of implementation of the projects included in the plan.
3. Estimate the total costs and funding sources for each of the projects.

As the CIP progresses from project planning in the current year to projects planned in future years, the plan becomes less detailed and more flexible. Additionally, the CIP is typically modified on an annual basis as new projects are identified, priorities change, funding sources evolve, and financial environments evolve.

Each proposed capital improvement project within the planning horizon has been assigned to one of three specific planning periods: Phase I, Short-term (2017-2021); Phase II, Intermediate-term (2022-2026); and Phase III, Long-term (2027-2036). The assignment of these projects into appropriate periods are depicted in **Table 7-2**, **Table 7-3**, and **Table 7-4**, which show all proposed CIP projects (including AIP-funded, State-funded, Airport-funded, and privately-funded) and their estimated costs for each phase within the planning horizon. (As mentioned previously, reauthorization of the FAA AIP by Congress may change the funding formulas used in these tables.) The complete current CIP summary is found in **Table 7-11**, **Table 7-12.** (While the cost estimates for the individual projects are based on 2017 dollars, the CIP incorporates an assumed 3.0 percent annual escalation to compensate for future inflationary increases.)

TABLE 7-2 - CAPITAL IMPROVEMENT PROGRAM PHASE I (2017-2021)

CIP ID	Project	Primary Funding Source	Estimated Capital Costs*	Funding Sources			
				Federal	State	Local	Other/ Private
A	Rehab Taxilane A7 into Hangar Area	FAA	$500,000	$450,000	$25,000	$25,000	$0
B	Fog Seal Terminal Ramp (East)	Local	$379,225	$0	$0	$379,225	$0
C	Acquire Airport Maintenance Equipment – Replace Loader	Local	$200,000	$0	$0	$200,000	$0
D	Construct 20-acre Solar Farm (land lease)	Other	$10,000,000	$0	$0	$0	$10,000,000
E	Construct Deicing Manufacturer (land lease)	Other	$2,500,000	$0	$0	$0	$2,500,000
F	Construct Hangar Building (land lease)	Other	$600,000	$0	$0	$0	$600,000
G	Fog Seal Terminal Ramp (West)	Local	$416,764	$0	$0	$416,764	$0
H	Fog Seal Runway 8/26	Local	$780,319	$0	$0	$780,319	$0
I	Acquire Airport Maintenance Equipment - Replace Loader & Snow Blower Attachment	Local	$530,000	$0	$0	$530,000	$0
J	Construct Hangar Building (land lease)	Other	$636,000	$0	$0	$0	$636,000
K	Fog Seal Taxiways A, B, and E	Local	$331,420	$0	$0	$331,420	$0
L	Acquire Airport Maintenance Equipment – Replace SRE Truck	Local	$654,000	$0	$0	$654,000	$0
M	Rehabilitate Terminal Apron (East) (Phase 1)	FAA	$1,210,539	$1,089,485	$55,556	$65,498	$0
N	Rehabilitate Taxiway C & Install Lighting on Taxiways A & C	FAA	$2,015,925	$1,814,333	$100,796	$100,796	$0
O	Acquire Airport Maintenance Equipment – Replace High-speed Runway Blower:	Local	$672,000	$0	$0	$672,000	$0
	Phase I Program Totals		$21,426,192	$3,353,818	$181,352	$4,155,022	$13,736,000

Source: Jviation
* 2017 cost estimate with assumed 3.0 percent annual cost escalation from 2017.

TABLE 7-3 - CAPITAL IMPROVEMENT PROGRAM PHASE II (2022-2026)

CIP ID	Project	Primary Funding Source	Estimated Capital Costs*	Funding Sources			
				Federal	State	Local	Other/ Private
P	Fog Seal Runway 17/35	Local	$828,782	$0	$0	$828,782	$0
Q	Acquire Airport Maintenance Equipment – Replace Runway Broom	Local	$690,000	$0	$0	$690,000	$0
R	Construct Hangar Building (land lease)	Other	$690,000	$0	$0	$0	$690,000
S	Fog Seal Taxilane A7	Local	$64,900	$0	$0	$64,900	$0
T	Acquire Airport Maintenance Equipment – Replace SRE Truck	Local	$708,000	$0	$0	$708,000	$0
U	Fog Seal Taxiway D	Local	$313,910	$0	$0	$313,910	$0
V	Rehabilitate Runway 17/35 (Design)	FAA	$413,333	$372,000	$20,666	$20,667	$0
W	Construct Hangar Building (land lease)	Other	$744,000	$0	$0	$0	$744,000
X	Rehabilitate Runway 17/35 (Construct)	FAA	$7,620,000	$6,858,000	$381,000	$381,000	$0
Y	Fog Seal Taxiway A, B, E	State	$386,150	$0	$347,535	$38,615	$0
	Phase II Program Totals		$12,459,075	$7,230,000	$749,201	$3,045,874	$1,434,000

Source: Jviation
* 2017 cost estimate with assumed 3.0 percent annual cost escalation from 2017.

TABLE 7-4 - CAPITAL IMPROVEMENT PROGRAM PHASE III (2027-2036)

CIP ID	Project	Primary Funding Source	Estimated Capital Costs*	Funding Sources			
				Federal	State	Local	Other/ Private
Z	Fog Seal 8/26	State	$979,080	$0	$881,172	$97,908	$0
AA	Acquire Airport Maintenance Equipment – Replace ARFF Truck (Index B)	Local	$1,064,000	$0	$0	$1,064,000	$0
BB	Install Airfield Perimeter Fencing	FAA	$3,950,100	$3,555,090	$197,505	$197,505	$0
CC	Construct Hangar Building (land lease)	Other	$798,000	$0	$0	$0	$798,000
DD	Fog Seal Taxiway A	State	$245,868	$0	$221,281	$24,587	$0
EE	Construct Hangar Building (land lease)	Other	$852,000	$0	$0	$0	$852,000
FF	Rehabilitate Runway 8/26	FAA	$6,859,800	$6,173,820	$342,990	$342,990	$0
GG	Construct Hangar Building (land lease)	Other	$906,000	$0	$0	$0	$906,000
HH	Fog Seal Runway 17/35	State	$1,109,847	$0	$998,862	$110,985	$0
II	Reconstruct & Strengthen East Ramp (Phase 1) & Taxiway D7	FAA	$9,180,300	$8,262,270	$459,015	$459,015	$0
JJ	Strengthen Taxiways D1 & D2	FAA	$3,140,000	$2,826,000	$157,000	$157,000	$0
KK	Rehabilitate Terminal Apron (East) (Phase 2)	FAA	$2,355,000	$2,119,500	$117,750	$117,750	$0
LL	Expand Existing SRE Facility	Local	$1,056,610	$0	$0	$1,056,610	$0
MM	Construct Taxiway E Holding Bay	FAA	$1,405,150	$1,264,635	$70,257	$70,258	$0
NN	Rehabilitate Taxilane A7D	FAA	$523,333	$471,000	$26,166	$26,167	$0
OO	Rehabilitate Taxilane A8A	FAA	$523,333	$471,000	$26,166	$26,167	$0
PP	Rehabilitate Taxilane A8B	FAA	$523,333	$471,000	$26,166	$26,167	$0
QQ	Rehabilitate Taxilane A8C	FAA	$523,333	$471,000	$26,166	$26,167	$0
RR	Construct New Taxiway from Taxiway A to Hangars	FAA	$2,355,000	$2,119,500	$117,750	$117,750	$0
SS	Rehabilitate Terminal Apron (West)	FAA	$4,710,000	$4,239,000	$235,500	$235,500	$0
TT	Reconstruct East Apron (Phase 2)	FAA	$15,700,000	$14,130,000	$785,000	$785,000	$0
UU	Construct Large FBO Hangar	Local	$6,280,000	$0	$0	$6,280,000	$0
	Phase III Program Totals		$65,040,087	$46,573,815	$4,688,746	$11,221,526	$2,556,000

Source: Jviation

* 2017 cost estimate with assumed 3.0 percent annual cost escalation from 2017.

TABLE 7-5 - FTG CIP SUMMARY

FRONT RANGE AIRPORT
WATKINS, CO
CAPITAL IMPROVEMENT PLAN
2017

JVIATION

YEAR	DESCRIPTION	TOTAL ESTIMATED PROJECT COST 2017 DOLLARS	TOTAL ESTIMATED PROJECT COST w/ Annual % Escalation 3%	FUNDING SOURCES												
				FEDERAL				STATE			Local				Other		TOTAL PROPOSED FUNDING
				Total	Entitlement (% project funding) 90%	Discretionary (% project funding) 90%	State Apportionment 90%	Total	Federal Match (% project funding) 5%	CDAG Grant (% project funding) 90%	Total	Federal Match (% project funding) 5%	CDAG Grant Match (% project funding) 10%	Other Local Funding	Private Investment	Unidentified	
2017	Rehab Taxilane A7 into Hangar Area	$ 500,000	$ 500,000	$ 450,000	$ 450,000	$ -		$ 25,000	$ 25,000		$ 25,000	$ 25,000					$ 500,000
2017	Fog Seal Terminal Ramp (East)	$ 379,225	$ 379,225					$ -			$ 379,225			$ 379,225			$ 379,225
2017	Acquire Airport Maintenance Equipment – Replace Loader	$ 200,000	$ 200,000					$ -			$ 200,000			$ 200,000			$ 200,000
2017	Construct 20-acre Solar Farm (land lease)	$ 10,000,000	$ 10,000,000					$ -			$ -			$ -	$ 10,000,000		$ 10,000,000
2017	Construct Deicing Manufacturer (land lease)	$ 2,500,000	$ 2,500,000					$ -			$ -			$ -	$ 2,500,000		$ 2,500,000
2017	Construct Hangar Building (land lease)	$ 600,000	$ 600,000					$ -			$ -			$ -	$ 600,000		$ 600,000
2017	**SUBTOTAL**	**$ 14,179,225**	**$ 14,179,225**	**$ 450,000**	**$ 450,000**	**$ -**	**$ -**	**$ 25,000**	**$ 25,000**	**$ -**	**$ 604,225**	**$ 25,000**	**$ -**	**$ 579,225**	**$ 13,100,000**	**$ -**	**$ 14,179,225**
2018	Fog Seal Terminal Ramp (West)	$ 404,625	$ 416,764					$ -			$ 416,764			$ 416,764			$ 416,764
2018	Payback NPE Funds for 2017	$ -	$ -	$ -		$ -		$ -	$ -		$ -	$ -					$ -
2018	**SUBTOTAL**	**$ 404,625**	**$ 416,764**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 416,764**	**$ -**	**$ -**	**$ 416,764**	**$ -**	**$ -**	**$ 416,764**
2019	Fog Seal Runway 8/26	$ 736,150	$ 780,319					$ -			$ 780,319			$ 780,319			$ 780,319
2019	Acquire Airport Maintenance Equipment - Replace Loader & Snow Blower Attachme	$ 500,000	$ 530,000					$ -			$ 530,000			$ 530,000			$ 530,000
2019	Construct Hangar Building (land lease)	$ 600,000	$ 636,000					$ -			$ -			$ -	$ 636,000		$ 636,000
2019	Roll NPE Funds to 2021	$ -	$ -	$ -		$ -		$ -	$ -		$ -	$ -					$ -
2019	**SUBTOTAL**	**$ 1,836,150**	**$ 1,946,319**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 1,310,319**	**$ -**	**$ -**	**$ 1,310,319**	**$ 636,000**	**$ -**	**$ 1,946,319**
2020	Fog Seal Taxiways A, B, and E	$ 304,055	$ 331,420					$ -			$ 331,420			$ 331,420			$ 331,420
2020	Acquire Airport Maintenance Equipment – Replace SRE Truck	$ 600,000	$ 654,000					$ -			$ 654,000			$ 654,000			$ 654,000
2020	Roll NPE Funds to 2021	$ -	$ -					$ -			$ -						$ -
2020	**SUBTOTAL**	**$ 904,055**	**$ 985,420**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 985,420**	**$ -**	**$ -**	**$ 985,420**	**$ -**	**$ -**	**$ 985,420**
2021	Rehabilitate Terminal Apron (East) (Phase 1)	$ 1,080,838	$ 1,210,539	$ 1,089,485	$ -	$ 589,485	$ 500,000	$ 55,556	$ 55,556		$ 65,498	$ 65,498					$ 1,210,539
2021	Rehabilitate Taxiway C & Install Lighting on Taxiways A & C	$ 1,799,933	$ 2,015,925	$ 1,814,333	$ 600,000	$ 1,214,333		$ 100,796	$ 100,796		$ 100,796	$ 100,796					$ 2,015,925
2021	Acquire Airport Maintenance Equipment – Replace High-speed Runway Blower:	$ 600,000	$ 672,000					$ -			$ 672,000			$ 672,000			$ 672,000
2021	**SUBTOTAL**	**$ 3,480,771**	**$ 3,898,464**	**$ 2,903,818**	**$ 600,000**	**$ 1,803,818**	**$ 500,000**	**$ 156,352**	**$ 156,352**	**$ -**	**$ 838,294**	**$ 166,294**	**$ -**	**$ 672,000**	**$ -**	**$ -**	**$ 3,898,464**
2022	Fog Seal Runway 17/35	$ 720,680	$ 828,782					$ -			$ 828,782			$ 828,782			$ 828,782
2022	Acquire Airport Maintenance Equipment – Replace Runway Droom	$ 600,000	$ 690,000					$ -			$ 690,000			$ 690,000			$ 690,000
2022	Construct Hangar Building (land lease)	$ 600,000	$ 690,000					$ -			$ -			$ -	$ 690,000		$ 690,000
2022	Payback NPE Funds for 2021	$ -	$ -					$ -			$ -						$ -
2022	**SUBTOTAL**	**$ 1,920,680**	**$ 2,208,782**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 1,518,782**	**$ -**	**$ -**	**$ 1,518,782**	**$ 690,000**	**$ -**	**$ 2,208,782**
2023	Fog Seal Taxilane A7	$ 55,000	$ 64,900					$ -			$ 64,900			$ 64,900			$ 64,900
2023	Acquire Airport Maintenance Equipment – Replace SRE Truck	$ 600,000	$ 708,000					$ -			$ 708,000			$ 708,000			$ 708,000
2023	Roll NPE Funds to 2025	$ -	$ -					$ -			$ -						$ -
2023	**SUBTOTAL**	**$ 655,000**	**$ 772,900**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 772,900**	**$ -**	**$ -**	**$ 772,900**	**$ -**	**$ -**	**$ 772,900**
2024	Fog Seal Taxiway D	$ 259,430	$ 313,910					$ -			$ 313,910			$ 313,910			$ 313,910
2024	Roll NPE Funds to 2025	$ -	$ -					$ -			$ -						$ -
2024	**SUBTOTAL**	**$ 259,430**	**$ 313,910**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 313,910**	**$ -**	**$ -**	**$ 313,910**	**$ -**	**$ -**	**$ 313,910**
2025	Rehabilitate Runway 17/35 (Design)	$ 333,333	$ 413,333	$ 372,000	$ 300,000	$ 72,000		$ 20,666	$ 20,666		$ 20,667	$ 20,667					$ 413,333
2025	Construct Hangar Building (land lease)	$ 600,000	$ 744,000					$ -			$ -			$ -	$ 744,000		$ 744,000
2025	Roll NPE Funds to 2026	$ -	$ -					$ -			$ -						$ -
2025	**SUBTOTAL**	**$ 933,333**	**$ 1,157,333**	**$ 372,000**	**$ 300,000**	**$ 72,000**	**$ -**	**$ 20,666**	**$ 20,666**	**$ -**	**$ 20,667**	**$ 20,667**	**$ -**	**$ -**	**$ 744,000**	**$ -**	**$ 1,157,333**

Source: Jviation, 2017

TABLE 7-6 - FTG CIP SUMMARY (CONT.)

FRONT RANGE AIRPORT
WATKINS, CO
CAPITAL IMPROVEMENT PLAN
2017

JVIATION

YEAR	DESCRIPTION	TOTAL ESTIMATED PROJECT COST 2017 DOLLARS	TOTAL ESTIMATED PROJECT COST w/ Annual % Escalation 3%	FUNDING SOURCES													
				FEDERAL				STATE			Local				Other		TOTAL PROPOSED FUNDING
				Total	Entitlement (% project funding) 90%	Discretionary (% project funding) 90%	State Apportionment 90%	Total	Federal Match (% project funding) 5%	CDAG Grant (% project funding) 90%	Total	Federal Match (% project funding) 5%	CDAG Grant Match (% project funding) 10%	Other Local Funding	Private Investment	Unidentified	
2026	Rehabilitate Runway 17/35 (Construct)	$ 6,000,000	$ 7,620,000	$ 6,858,000	$ 300,000	$ 6,058,000	$ 500,000	$ 381,000	$ 381,000		$ 381,000	$ 381,000					$ 7,620,000
2026	Fog Seal Taxiway A, B, E	$ 304,055	$ 386,150					$ 347,535		$ 347,535	$ 38,615			$ 38,615			$ 386,150
2026	**SUBTOTAL**	**$ 6,304,055**	**$ 8,006,150**	**$ 6,858,000**	**$ 300,000**	**$ 6,058,000**	**$ 500,000**	**$ 728,535**	**$ 381,000**	**$ 347,535**	**$ 419,615**	**$ 381,000**	**$ -**	**$ 38,615**	**$ -**	**$ -**	**$ 8,006,150**
2027	Roll NPE Funds to 2028	$ -	$ -					$ -			$ -						$ -
2027	**SUBTOTAL**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
2028	Fog Seal 8/26	$ 736,150	$ 979,080					$ 881,172		$ 881,172	$ 97,908			$ 97,908			$ 979,080
2028	Acquire Airport Maintenance Equipment – Replace ARFF Truck (Index B)	$ 800,000	$ 1,064,000					$ -			$ 1,064,000			$ 1,064,000			$ 1,064,000
2028	Install Airfield Perimeter Fencing	$ 2,970,000	$ 3,950,100	$ 3,555,090	$ 600,000	$ 2,955,090		$ 197,505	$ 197,505		$ 197,505	$ 197,505					$ 3,950,100
2028	Construct Hangar Building (land lease)	$ 600,000	$ 798,000					$ -			$ -			$ -	$ 798,000		$ 798,000
2028	**SUBTOTAL**	**$ 5,106,150**	**$ 6,791,180**	**$ 3,555,090**	**$ 600,000**	**$ 2,955,090**	**$ -**	**$ 1,078,677**	**$ 197,505**	**$ 881,172**	**$ 1,359,413**	**$ 197,505**	**$ -**	**$ 1,161,908**	**$ 798,000**	**$ -**	**$ 6,791,180**
2029	Fog Seal Taxiway A	$ 180,785	$ 245,868					$ 221,281		$ 221,281	$ 24,587			$ 24,587			$ 245,868
2029	Payback NPE Funds for 2028	$ -	$ -					$ -			$ -						$ -
2029	**SUBTOTAL**	**$ 180,785**	**$ 245,868**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 221,281**	**$ -**	**$ 221,281**	**$ 24,587**	**$ -**	**$ -**	**$ 24,587**	**$ -**	**$ -**	**$ 245,868**
2030	Payback NPE Funds for 2028	$ -	$ -					$ -			$ -						$ -
2030	**SUBTOTAL**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
2031	Construct Hangar Building (land lease)	$ 600,000	$ 852,000					$ -			$ -			$ -	$ 852,000		$ 852,000
2031	Roll NPE Funds to 2033	$ -	$ -					$ -			$ -						$ -
2031	**SUBTOTAL**	**$ 600,000**	**$ 852,000**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 852,000**	**$ -**	**$ 852,000**
2032	Roll NPE Funds to 2033	$ -	$ -					$ -			$ -						$ -
2032	**SUBTOTAL**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**
2033	Rehabilitate Runway 8/26	$ 4,635,000	$ 6,859,800	$ 6,173,820	$ 600,000	$ 5,573,820		$ 342,990	$ 342,990		$ 342,990	$ 342,990					$ 6,859,800
2033	**SUBTOTAL**	**$ 4,635,000**	**$ 6,859,800**	**$ 6,173,820**	**$ 600,000**	**$ 5,573,820**	**$ -**	**$ 342,990**	**$ 342,990**	**$ -**	**$ 342,990**	**$ 342,990**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 6,859,800**
2034	Construct Hangar Building (land lease)	$ 600,000	$ 906,000					$ -			$ -			$ -	$ 906,000		$ 906,000
2034	Payback NPE Funds for 2033	$ -	$ -					$ -			$ -						$ -
2034	**SUBTOTAL**	**$ 600,000**	**$ 906,000**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 906,000**	**$ -**	**$ 906,000**
2035	Fog Seal Runway 17/35	$ 720,680	$ 1,109,847					$ 998,862		$ 998,862	$ 110,985			$ 110,985			$ 1,109,847
2035	Roll NPE Funds to 2036	$ -	$ -					$ -			$ -						$ -
2035	**SUBTOTAL**	**$ 720,680**	**$ 1,109,847**	**$ -**	**$ -**	**$ -**	**$ -**	**$ 998,862**	**$ -**	**$ 998,862**	**$ 110,985**	**$ -**	**$ -**	**$ 110,985**	**$ -**	**$ -**	**$ 1,109,847**
2036	Reconstruct & Strengthen East Ramp (Phase 1) & Taxiway D7	$ 5,847,325	$ 9,180,300	$ 8,262,270	$ -	$ 8,262,270		$ 459,015	$ 459,015		$ 459,015	$459,015					$ 9,180,300
2036	Strengthen Taxiways D1 & D2	$ 2,000,000	$ 3,140,000	$ 2,826,000	$ -	$ 2,826,000		$ 157,000	$ 157,000		$ 157,000	$157,000					$ 3,140,000
2036	Rehabilitate Terminal Apron (East) (Phase 2)	$ 1,500,000	$ 2,355,000	$ 2,119,500	$ -	$ 2,119,500		$ 117,750	$ 117,750		$ 117,750	$117,750					$ 2,355,000
2036	Expand Existing SRE Facility	$ 673,000	$ 1,056,610		$ -	$ -					$ 1,056,610	$1,056,610					$ 1,056,610
2036	Construct Taxiway E Holding Bay	$ 895,000	$ 1,405,150	$ 1,264,635	$ -	$ 1,264,635		$ 70,257	$ 70,257		$ 70,258	$70,258					$ 1,405,150
2036	Rehabilitate Taxilane A7D	$ 333,333	$ 523,333	$ 471,000	$ 300,000	$ 171,000		$ 26,166	$ 26,166		$ 26,167	$26,167					$ 523,333
2036	Rehabilitate Taxilane A8A	$ 333,333	$ 523,333	$ 471,000	$ -	$ 471,000		$ 26,166	$ 26,166		$ 26,167	$ 26,167					$ 523,333
2036	Rehabilitate Taxilane A8B	$ 333,333	$ 523,333	$ 471,000	$ -	$ 471,000		$ 26,166	$ 26,166		$ 26,167	$26,167					$ 523,333
2036	Rehabilitate Taxilane A8C	$ 333,333	$ 523,333	$ 471,000	$ -	$ 471,000		$ 26,166	$ 26,166		$ 26,167	$26,167					$ 523,333
2036	Construct New Taxiway from Taxiway A to Hangars	$ 1,500,000	$ 2,355,000	$ 2,119,500	$ -	$ 2,119,500		$ 117,750	$ 117,750		$ 117,750	$117,750					$ 2,355,000
2036	Rehabilitate Terminal Apron (West)	$ 3,000,000	$ 4,710,000	$ 4,239,000	$ -	$ 4,239,000		$ 235,500	$ 235,500		$ 235,500	$235,500					$ 4,710,000
2036	Reconstruct East Apron (Phase 2)	$ 10,000,000	$ 15,700,000	$ 14,130,000	$ -	$ 14,130,000		$ 785,000	$ 785,000		$ 785,000	$785,000					$ 15,700,000
2036	Construct Large FBO Hangar	$ 4,000,000	$ 6,280,000		$ -	$ -					$ 6,280,000			$ 6,280,000			$ 6,280,000
2036	**SUBTOTAL**	**$ 30,748,657**	**$ 48,275,392**	**$ 36,844,905**	**$ 300,000**	**$ 36,544,905**	**$ -**	**$ 2,046,936**	**$ 2,046,936**	**$ -**	**$ 9,383,551**	**$ 3,103,551**	**$ -**	**$ 6,280,000**	**$ -**	**$ -**	**$ 48,275,392**
	TOTALS 2017-2035	**$ 73,468,596**	**$ 98,925,354**	**$ 57,157,633**	**$ 3,150,000**	**$ 53,007,633**	**$ 1,000,000**	**$ 5,619,299**	**$ 3,170,449**	**$ 2,448,850**	**$ 18,422,422**	**$ 4,237,007**	**$ -**	**$ 14,185,415**	**$ 17,726,000**	**$ -**	**$ 98,925,354**

Source: Jviation, 2017

7.2.3 Airport Operating Revenues and Expenses

Airport revenues are typically generated through user fees charged by a given airport for the facilities and services that it provides. These user fees are normally established by that airport based on the market conditions within its service area and can vary dramatically from airport-to-airport. At FTG, operating revenues are realized through several sources including, but not limited to:

- Hangar Leases
- Ground Leases
- Aircraft Fuel Sales
- Tiedown/Ramp Fees
- Meeting Room and Office Rent
- Restaurant Lease
- Rental Car Commissions
- Direct Financial Contributions by Adams County

The amount of land and the number of buildings leased, the lease rates charged, and levels of aviation activity that generate fuel sales, parking and hangar storage, are the primary factors affecting operating revenues at the Airport. At FTG, the Airport also serves as the fixed base operator (FBO). As a result, the Airport receives the full mark-ups on fuel and other product sales, as opposed to receiving just fuel flowage fees from a third-party FBO. However, the higher revenues generated by the Airport acting as the FBO is somewhat offset by higher costs associated with staffing, wholesale fuel purchasing, maintaining fuel tanks and mobile fuelers, and associated insurance.

One industry trend of note affecting airports and FBOs in general is the ability of corporate aircraft to 'tanker' fuel due to their increasingly fuel-efficient engines. Because turbine powered aircraft can buy between 500 to 2,000 gallons of fuel at one time, corporate operators often negotiate the retail price per gallon before buying fuel at a given airport. If they do not reach agreement with the FBO on the discount they will not buy fuel, relying on their fuel reserves to fly to another airport that offers lower fuel prices. As a result, a given FBO is competing not just with adjacent airports for fuel sales, but also against airports located hundreds of miles away that may offer lower fuel prices. Some FBOs have noted that although overall corporate aircraft activity has risen, their fuel sales have not increased as quickly due to their inability to compete other FBOs on price.

As additional airport development occurs, the number of based aircraft and itinerant aircraft operations should reasonably be expected to increase, resulting in a commensurate increase in airport operating revenues. (Note that revenues associated with fuel sales, aircraft tiedowns and transient hangar rentals are directly influenced by traffic levels). Additionally, as new leases are enacted and existing leases are updated to reflect prevailing rates and terms, the Airport's most stable source of revenue will continue to increase over the long term.

In that the Airport accepts AIP grants with the stipulation that it abide by FAA grant assurances, it is important that the Airport continue to consider the following with respect to the future establishment of lease rates and other income generating fees:

- FAA Grant Assurance 22, *Economic Nondiscrimination*, states: "It [the airport sponsor] will make the airport available as an airport for public use on reasonable terms and without unjust discrimination to all types, kinds and classes of aeronautical activities, including commercial aeronautical activities offering services to the public at the airport."
- FAA Grant Assurance 22 also states that the sponsor, as well as airport tenants who enter into an agreement with the sponsor, will "furnish said services on a reasonable, and not unjustly discriminatory, basis to all users" and "charge reasonable, and not unjustly discriminatory prices."
- FAA Grant Assurance 22 also states that "each fixed-based operator at the airport shall be subject to the same rates, fees, rentals, and other charges as are uniformly applicable to all other fixed-based operators making the same or similar uses of such airport and utilizing the same or similar facilities."
- The FAA considers any lease with a term of greater than 20 years to be "long-term", and a lease with a term of 50 years or greater to be in violation of FAA policy (per FAA Order 5160.9B, *Airport Compliance Manual*). The FAA considers 50-year lease terms as equivalent to the sale of airport property, which FAA allows only under very specific circumstances. FAA recommends that lease terms extend no longer than the end of the amortization period and/or useful life of the facility.

It should be noted that the potential future operation of the Colorado Spaceport may ultimately have a significant impact on the revenues generated at Front Range Airport. However, this Master Plan did not analyze the potential revenues to be generated by the Spaceport, or the timeframe within which they might be realized.

Ideally, airport operating revenues will at least offset the airport's operating expenses, typically referred to as Operation and Maintenance (O&M) costs. Airport operating expenses are the day-to-day costs incurred by operating the airport. They do not include non-cash and capital costs associated with depreciation and infrastructure development. Primary components of O&M costs at FTG include, but are not limited to, the following:

- Personnel Services
- Airport Supplies
- Aviation Fuel
- Equipment Maintenance
- Utilities

At FTG, fuel and personnel services typically account for the largest percentage of expenses incurred on an annual basis. In FY 2014, combined they represented just over 75 percent of the Airport's total operating expenses, decreasing to approximately 61 percent in FY2016. It should be noted that in addition to the operating expenses, FTG does also incur depreciation expenses, but they are not reflected in this analysis.

The historical operating revenues and expenses for FTG between 2014 and 2016 are presented below in **Table 7-7**. With respect to this table, it is important to note the following. First, FTG was owned and operated by the Front Range Airport Authority until January 2014, the Airport and all its employees merged with Adams County, becoming its own department. Totals reflected for FY2014 in the following table are reflective of that transition period. Second, FY2016 actuals reflect unaudited totals. At the time of this writing, those figures had not yet been confirmed.

TABLE 7-7 - AIRPORT OPERATING REVENUES AND EXPENSES (HISTORICAL)

	FY2014 (actual)	FY2015 (actual)	FY2016 (actual*)
Airport Operating Revenues			
Operating Revenues (Aviation Fuel)	$1,207,747	$922,943	$910,731
Operating Revenues (Hangar & Land Rental)	$1,823,034	$1,108,224	$1,090,424
Operating Revenues (Other)	$170,474	$187,263	$330,762
Non-Operating Revenues	-$136,693	$24,964	$3,110
Adams County Contribution	$698,560	$560,000	$500,000
Total Operating Revenues:	$3,763,122	$2,803,395	$2,835,027
Airport Operating Expenses			
Personnel Services	$895,585	$1,037,014	$1,090,711
O&M (less aviation fuel)	$72,579	$112,164	$73,530
O&M (aviation fuel)	$1,032,350	$730,545	$673,824
Charges & Services (Utilities)	$188,140	$164,971	$154,130
Charges & Services (Repairs & Maintenance)	$143,571	$165,802	$324,678
Charges & Services (Other)	$178,698	$234,815	$462,634
Capital Outlay	$0	$0	$89,902
Other Financing Uses	$44,800	$0	$0
Total Operating Expenses:	$2,555,723	$2,445,311	$2,869,409
NET OPERATING INCOME:	$1,207,399	$358,084	-$34,382

Source: Adams County
Note: * 2016 financial data from Adams County is unaudited and therefore could be subject to change.

In addition to the Airport itself, the wastewater treatment plant located on airport property also incurs both operational revenues, expenses, and debt service that are all maintained in an account separate from the Airport. The historical operating revenues and expenses for the water treatment plant between 2014 and 2016 are presented below in **Table 7-8**. Note that there are two important clarification to make with respect to this table. First, direct personnel services were outsourced in 2015, resulting the those costs dropping to $0 by 2016. This is anticipated to continue into the future. Second, as reported by the Airport, the net operating income identified in the table is applied directly to the outstanding debt balance for the original wastewater facility construction. That debt is scheduled to be retired in 2017.

TABLE 7-8 - WATER TREATMENT PLANT OPERATING REVENUES AND EXPENSES (HISTORICAL)

	FY2014 (actual)	FY2015 (actual)	FY2016 (actual*)
Water Treatment Plant Operating Revenues			
Charges for Services	$17,881	$21,263	$21,024
Adams County Contribution	$348,925	$304,125	$329,752
Total Operating Revenues:	$366,806	$325,388	$350,776
Water Treatment Plant Operating Expenses			
Personnel Services	$79,321	$15,688	$0
O&M and Services	$56,438	$89,304	$111,703
Debt Service	$21,173	$15,478	$12,113
Total Operating Expenses:	$156,932	$120,470	$123,816
NET OPERATING INCOME:	$209,874	$204,918	$226,960

Source: Adams County
Note: * 2016 financial data from Adams County is unaudited and therefore could be subject to change.

7.2.4 Projected Operating Revenues and Expenses

The continued growth of FTG in terms of activity, tenants, new leases and facility development will impact the Airport's operating revenues and expenses over the 20-year planning period. Projections developed in this evaluation depict future airport operating revenues and expenses based on recent financial results, budgeted revenues and expenses, forecasted increases in airport based and itinerant aircraft activities, as well as airport tenant population trends identified in previous chapters of this Master Plan. Projections of future airport operating revenues and expenses at FTG for the periods 2017 through 2036 are presented below in **Table 7-9.**

Specifically, the estimates for future operating revenues were established through close consideration of historical trends, as well as proposed airport development initiatives and how they might impact those future revenues. In most instances, revenue projections resulted from normal, conservative growth factors refined to more closely reflect the circumstances of the Airport. These revenues were projected to increase between 2.0 percent and 3.5 percent annually with an average at the standard 3.0 percent annual growth rate. The exception to these rates may be miscellaneous revenues that could be realized through the one-time sales of airport assets, such as easement rights or other assets. Additionally, since the Airport is projected to continue to hangar construction throughout the planning period, increased revenue growth associated with hangar and land leases was identified in selected years.

On the operating expenses side, increases in salaries and wages, as well as overall operational activities are based on accepted inflationary growth rates (ranging from 2.0 percent to 3.5 percent average annual growth) with the higher growth factors being applied to fuel costs to account for some volatility in the supply market.

TABLE 7-9 - AIRPORT OPERATING REVENUES AND EXPENSES (PROJECTED)

	FY2016 (actual*)	FY2017	FY2021	FY2026	FY2036
Airport Operating Revenues					
Operating Revenues (Aviation Fuel)	$910,731	$933,499	$1,045,560	$1,241,797	$1,751,677
Operating Revenues (Hangar & Land Rental)	$1,090,424	$1,123,137	$1,313,669	$1,552,474	$2,253,227
Operating Revenues (Other)	$330,762	$340,684	$383,443	$444,515	$597,391
Non-Operating Revenues	$3,110	$10,000	$11,038	$12,489	$16,785
Adams County Contribution	$500,000	$447,127	$436,439	$422,162	$377,515
Total Operating Revenues:	$2,831,917	$2,854,447	$3,190,149	$3,673,437	$4,996,595
Airport Operating Expenses					
Personnel Services	$1,090,711	$1,123,432	$1,264,432	$1,465,823	$1,969,944
O&M (less aviation fuel)	$73,530	$75,369	$84,417	$97,863	$131,521
O&M (aviation fuel)	$673,824	$690,669	$773,580	$896,791	$1,265,012
Charges & Services (Utilities)	$154,130	$157,983	$176,949	$205,133	$275,683
Charges & Services (Repairs & Maintenance)	$324,678	$332,794	$367,343	$415,616	$558,554
Charges & Services (Other)	$462,634	$474,200	$523,428	$592,211	$795,881
Capital Outlay	$89,902	$0	$0	$0	$0
Other Financing Uses	$0	$0	$0	$0	$0
Total Operating Expenses:	$2,869,409	$2,854,447	$3,190,149	$3,673,437	$4,996,595
NET OPERATING INCOME:	-$34,382	$0	$0	$0	$0

Source: Jviation, 2016
Note: * 2016 financial data from Adams County is unaudited and therefore could be subject to change.

Based on projected activity growth and assumptions regarding future aviation activity and tenant growth, and overall development at Front Range Airport, airport revenues are projected to increase from $2,831,917 in FY2016 to $4,996,595 by FY2036. Similarly, operations and maintenance expenses are projected to increase from $2,869,409 in FY2016 to $4,996,595 by FY 2036. When combined, these projections reflect a balanced airport operations and maintenance budget throughout the planning period.

It is important to recognize a key assumption to this analysis. FTG has historically operated at a deficit, with its operational expenses outpacing its revenues. Since 2014, this annual deficit has been accounted for through direct financial contributions by Adams County. As noted previously, FAA states in the sponsor grant assurances that airports should be as financially self-sufficient as possible given their particular circumstances. It has been assumed that the County annual contributions will continue throughout the planning period to support Front Range, albeit at reduced levels as airport revenues start to overtake expenses.

Additionally, as described above, the wastewater treatment plant located on airport property also incurs both operational revenues, expenses, and debt service that are all maintained by in an account separate from the Airport. The projected operating revenues and expenses for the water treatment plant between 2017 and 2036 are presented below in **Table 7-10**. Note that revenues and expenses were both

projected to increase at the standard 3.0 percent annual growth rate. In addition, with the facility debt being retired in 2017, the debt service will be eliminated and the Adams County contribution will be reduced to a consistent $200,000 annually to anticipate continued facility maintenance and updates.

TABLE 7-10 – WATER TREATMENT PLANT OPERATING REVENUES AND EXPENSES (PROJECTED)

	FY2016 (actual*)	FY2017	FY2021	FY2026	FY2036
Water Treatment Plant Operating Revenues					
Charges for Services	$21,025	$21,655	$24,373	$12,489	$37,973
Adams County Contribution	$329,752	$330,000	$200,000	$200,000	$200,000
Total Operating Revenues:	$350,777	$351,655	$224,373	$212,489	$237,973
Water Treatment Plant Operating Expenses					
Personnel Services	$0	$0	$0	$0	$0
O&M and Services	$111,703	$115,054	$129,495	$150,119	$201,749
Debt Service	$12,113	$12,113	$0	$0	$0
Total Operating Expenses:	$123,816	$127,167	$129,495	$150,119	$201,749
NET OPERATING INCOME:	$226,960	$224,488	$94,878	$62,370	$36,224

Source: Adams County
Note: * 2016 financial data from Adams County is unaudited and therefore could be subject to change.

7.3 Financial Plan Summary

The primary goal is for FTG to evolve into a facility that will best serve the air transportation needs of Adams County, while simultaneously maintaining itself as a self-sustaining economic generator. This Airport Master Plan can best be described as the road map to helping the Airport and the County achieve these goals. In order to realize those goals through the successful implementation of airport development projects, the Airport must make sound and measured decisions. Two of the most important factors influencing the decision to move forward with a specific improvement are airport activity levels (i.e., demand) and funding availability. Both factors must be considered in the implementation of the CIP, because while airport activity levels provide the "what" and the "why" in implementing future airport improvements, the timing of funding provides the "how." The "what" and the "why" have been discussed in detail in previous chapters.

This chapter has addressed the "how" by providing an overview of the practical financial realities required to implement this overall airport development program. While every effort has been made in this chapter to conservatively estimate when facility development may be required, aviation demand and the availability of financial resources for capital projects will ultimately dictate when facility improvements need to be implemented, accelerated or delayed.

The financial plan presented in this chapter and summarized in **Table 7-11**, **Table 7-12**, and **Table 7-13** includes projection totals for operating revenues, operating expenses, capital expenditures, capital funding, and cash flow that result from the projections presented above. Based on the assumptions identified within the

previous sections, and subject to the availability of FAA and CDOT funding (identification of a potential funding source does not guarantee its availability), and the identification of Unidentified Funding for Capital Expenditures described in the analysis, implementation of FTG's Master Plan CIP is financially feasible.

The most significant concern of implementing this CIP is the identification of the Unidentified Funding for Capital Expenditures. However, it should be noted that this funding gap could be addressed through two primary means. First, much of this unidentified funding is related to locally-funded projects, and while the project cost estimates are based on industry standards, FTG could realize significant project cost savings through use of local and County resources, as it has historically for other projects. Second, several of these projects could be shifted to later phases until funding can be secured or is made available by accumulating airport revenue.

Key assumptions supporting the financial plan relate to the availability and timeliness of the funding sources. Continuation of the AIP entitlement program at authorized funding levels is essential. Additionally, securing federal funding of approximately $3,353,818 during Phase I, $7,230,000 during Phase II and $46,573,815 during Phase III is critical to the financial feasibility of implementing these projects. Without these levels of funding, these projects are not feasible and would need to be delayed or cancelled unless another source of funds could be acquired.

As noted previously, when Congress reauthorizes the FAA's AIP, the funding formulas shown in the FTG CIP may change. If that happens, the CIP should be adjusted accordingly and the feasibility of implementing the projects in the time frame shown should be reconfirmed. After a new AIP program has been authorized, discussions will need to be held between FTG and the Denver Airports District Office (ADO) to determine the ADO's funding availability based on the new formulas and stipulations set by Congress. Similarly, CDOT funding levels and formulas change over time and need to be monitored, and close coordination with CDOT be maintained to ensure that state funding will be available when anticipated.

However, it should be recognized that planning is a continuous process that does not end with the completion of the Master Plan—the fundamental issues that have driven this planning effort will remain valid for many years. Therefore, the ability to continuously monitor actual revenues and expenses, as well as aviation activity levels, will be key to maintaining a sound financial position. Actual future financial outcomes will be determined by a variety of factors, many of which are difficult to identify at this time, such as future FAA and CDOT funding formulas, and potential revenues associated with currently unforeseen sources (e.g., Spaceport Colorado).

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TABLE 7-11 - ACTUAL, BUDGETED, AND PROJECTED OPERATING REVENUES

Revenues	Historical Data (2014-2016) Actual 2014	2015	2016	Phase I (2017-2021) Projected 2017	2018	2019	2020	2021	Total	Phase II Projected 2022-2026	Phase III Projected 2027-2036
Airport Annual Revenues											
Non-Airport Contributions											
Adams County Contribution	$698,560	$560,000	$500,000	$421,127	$418,333	$426,799	$410,796	$418,830	*$2,095,885*	*$2,053,848*	*$4,098,173*
Annual Growth Rate		-19.8%	-10.7%	-15.8%	-0.7%	2.0%	-3.7%	2.0%	-16.2%	*-1.2%*	*0.5%*
Total Non-Airport Contributions	*$698,560*	*$560,000*	*$500,000*	*$421,127*	*$418,333*	*$426,799*	*$410,796*	*$418,830*	*$2,095,885*	*$2,053,848*	*$4,098,173*
Airport Operating Revenues				-15.8%	-0.7%	2.0%	-3.7%	2.0%	-16.2%	*-1.2%*	*0.5%*
Operating Revenues (Aviation Fuel)	$1,207,747	$922,943	$910,731	$933,499	$956,836	$985,541	$1,015,107	$1,045,560	*$4,936,543*	*$5,803,017*	*$15,077,892*
Annual Growth Rate		-23.6%	-1.3%	2.5%	2.5%	3.0%	3.0%	3.0%	*2.8%*	*3.5%*	*3.5%*
Operating Revenues (Hangar & Land Rental)	$1,823,034	$1,108,224	$1,090,424	$1,149,137	$1,195,102	$1,230,955	$1,292,503	$1,331,278	*$6,198,975*	*$7,360,033*	*$19,102,625*
Annual Growth Rate		-39.2%	-1.6%	3.0%	4.0%	3.0%	5.0%	3.0%	*4.1%*	*3.5%*	*3.4%*
Operating Revenues (Other)	$170,474	$187,263	$330,761.58	$340,684	$350,905	$361,432	$372,275	$383,443	*$1,808,739*	*$2,096,821*	*$5,248,742*
Annual Growth Rate		$0	$1	3.0%	3.0%	3.0%	3.0%	3.0%	*3.0%*	*3.0%*	*3.0%*
Total Airport Operating Revenues	$3,201,255	$2,218,431	$2,331,917	$2,423,320	$2,502,843	$2,577,928	$2,679,885	$2,760,281	$12,944,257	$15,259,871	$39,429,259
Total Annual Revenues	$3,899,815	$2,778,431	$2,831,917	$2,844,447	$2,921,176	$3,004,727	$3,090,681	$3,179,111	$15,040,142	$17,313,719	$43,527,432
Annual Growth Rate			1.9%	0.4%	2.7%	2.9%	2.9%	2.9%	*2.3%*	*2.9%*	*3.1%*
Total Non-Operating Revenues											
Non-Operating Revenues	-$136,693	$24,964	$3,110	$10,000	$10,250	$10,506	$10,769	$11,038	*$52,563*	*$59,471*	*$147,473*
Annual Growth Rate			-87.5%	2.5%	2.5%	2.5%	2.5%	2.5%	*28.8%*	*2.5%*	*3.0%*
Total Annual Airport Revenues	$3,763,122	$2,803,395	$2,835,027	$2,854,447	$2,931,426	$3,015,233	$3,101,450	$3,190,149	*$15,092,705*	*$17,373,190*	*$43,674,905*
Annual Growth Rate			1.1%	0.7%	2.7%	2.9%	2.9%	2.9%	*2.4%*	*2.9%*	*3.1%*
Water & Wastewater Annual Revenues											
Non-Airport Contributions											
Adams County Contribution	$348,925	$304,125	$329,752	$330,000	$200,000	$200,000	$200,000	$200,000	*$1,130,000*	*$1,000,000*	*$2,000,000*
Annual Growth Rate		-12.8%	8.4%	0.1%	-39.4%	0.0%	0.0%	0.0%	-39.3%	*0.0%*	*0.0%*
Total Non-Airport Contributions	*$348,925*	*$304,125*	*$329,752*	*$330,000*	*$200,000*	*$200,000*	*$200,000*	*$200,000*	*$1,130,000*	*$1,000,000*	*$2,000,000*
Water & Watewater Operating Revenues				0.1%	-39.4%	0.0%	0.0%	0.0%	-39.3%	*0.0%*	*0.0%*
Charges for Services	$17,881	$21,264	$21,025	$21,655	$22,305	$22,974	$23,663	$24,373	*$114,970*	*$133,281*	*$333,631*
Annual Growth Rate		18.9%	-1.1%	3.0%	3.0%	3.0%	3.0%	3.0%	*3.0%*	*3.0%*	*3.0%*
Total Water &Wastewater Operating Revenues	$17,881	$21,264	$21,025	$21,655	$22,305	$22,974	$23,663	$24,373	$114,970	$133,281	$333,631
Total Annual Water & Wastewater Revenues	$366,806	$325,389	$350,777	$351,655	$222,305	$222,974	$223,663	$224,373	*$1,244,970*	*$1,133,281*	*$2,333,631*
Annual Growth Rate		-11.3%	7.8%	0.3%	-36.8%	0.3%	0.3%	0.3%	*-8.5%*	*0.3%*	*0.4%*

Source: Adams County, Jviation

TABLE 7-12 - ACTUAL, BUDGETED, AND PROJECTED OPERATIONS AND MAINTENANCE EXPENSES

Expenses	Historical Data (2014-2016) Actual 2014	2015	2016	Phase I (2017-2021) Projected 2017	2018	2019	2020	2021	*Total*	Phase II Projected 2022-2026	Phase III Projected 2027-2036
Airport Operations & Maintenance Expenses											
Personnel Services	$895,585	$1,037,014	$1,090,711	$1,123,432	$1,157,135	$1,191,849	$1,227,604	$1,264,432	*$5,964,452*	$6,914,432	$17,308,143
Annual Growth Rate		15.8%	5.2%	3.0%	3.0%	3.0%	3.0%	3.0%	*3.0%*	3.0%	3.0%
O&M (less aviation fuel)	$72,579	$112,164	$73,530	$75,369	$77,253	$79,571	$81,958	$84,417	*$398,568*	$461,631	$1,155,552
Annual Growth Rate		54.5%	-34.4%	2.5%	2.5%	3.0%	3.0%	3.0%	*2.8%*	3.0%	3.0%
O&M (aviation fuel)	$1,032,350	$730,545	$673,824	$690,669	$707,936	$729,174	$751,049	$773,580	*$3,652,408*	$4,230,252	$10,888,827
Annual Growth Rate		-29.2%	-7.8%	2.5%	2.5%	3.0%	3.0%	3.0%	*2.8%*	3.0%	3.5%
Charges & Services (Utilities)	$188,140	$164,971	$154,130	$157,983	$161,933	$166,791	$171,795	$176,949	*$835,451*	$967,630	$2,422,175
Annual Growth Rate		-12.3%	-6.6%	2.5%	2.5%	3.0%	3.0%	3.0%	*2.8%*	3.0%	3.0%
Charges & Services (Repairs & Maintenance)	$143,571	$165,802	$324,678	$332,794	$341,114	$349,642	$358,383	$367,343	*$1,749,276*	$1,979,151	$4,907,510
Annual Growth Rate				2.5%	2.5%	2.5%	2.5%	2.5%	*2.5%*	$0	$0
Charges & Services (Other)	$178,698	$234,815	$462,634	$474,200	$486,055	$498,206	$510,661	$523,428	*$2,492,550*	$2,820,094	$6,992,698
Annual Growth Rate				2.5%	2.5%	2.5%	2.5%	2.5%	*2.5%*	$0	$0
Capital Outlay	$0	$0	$89,902	$0	$0	$0	$0	$0	*$0*	$0	$0
Annual Growth Rate				0.0%	0.0%	0.0%	0.0%	0.0%	*-100.0%*		
Other Financing Uses	$44,800	$0	$0	$0	$0	$0	$0	$0	*$0*	$0	$0
Annual Growth Rate		-100.0%		0.0%	0.0%	0.0%	0.0%	0.0%			
Total O&M Expenses/Expenditures	$2,555,723	$2,445,311	$2,869,409	$2,854,447	$2,931,426	$3,015,233	$3,101,450	$3,190,149	*$15,092,705*	$17,373,190	$43,674,905
Annual Growth Rate		-4.3%	17.3%	-0.5%	2.7%	2.9%	2.9%	2.9%	*2.1%*	2.9%	3.1%
Charges & Services (Depreciation)	$1,619,900	$1,600,112	$1,588,881	$1,588,881	$1,588,881	$1,588,881	$1,588,881	$1,588,881	*$7,944,405*	$7,944,405	$15,888,810
Annual Growth Rate		-1.2%	-0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	*0.0%*	$0	$0
Total Airport Expenses/Expenditures	$4,175,623	$4,045,423	$4,458,290	$4,443,328	$4,520,307	$4,604,114	$4,690,331	$4,779,030	*$23,037,110*	$25,317,595	$59,563,715
Annual Growth Rate		-3.1%	10.2%	-0.3%	1.7%	1.9%	1.9%	1.9%	*1.4%*	1.9%	2.3%
Water & Wastewater Operations & Maintenance Expenses											
Personnel Services	$79,322	$15,688	$0	$0	$0	$0	$0	$0	*$0*	$0	$0
Annual Growth Rate		-80.2%	-100.0%	3.0%	3.0%	3.0%	3.0%	3.0%			
O&M and Services	$56,438	$89,304	$111,703	$115,054	$118,506	$122,061	$125,723	$129,495	*$610,839*	$708,129	$1,772,586
Annual Growth Rate		58.2%	25.1%	3.0%	3.0%	3.0%	3.0%	3.0%	*3.0%*	3.0%	3.0%
Debt Service	$21,173	$15,478	$12,113	$12,113	$0	$0	$0	$0	*$12,113*	$0	$0
Annual Growth Rate		-26.9%	-21.7%	0.0%	-100.0%	0.0%	0.0%	0.0%	*-100.0%*		
Total O&M Expenses/Expenditures	$156,933	$120,471	$123,816	$127,167	$118,506	$122,061	$125,723	$129,495	*$622,952*	$708,129	$1,772,586
Annual Growth Rate		-23.2%	2.8%	2.7%	-6.8%	3.0%	3.0%	3.0%	*0.9%*	3.0%	3.0%
Charges & Services (Depreciation)	$53,167	$53,167	$53,167	$53,167	$53,167	$53,167	$53,167	$53,167	*$265,835*	$265,835	$531,670
Annual Growth Rate		0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	*0.0%*	$0	$0
Total Wastewater Expenses/Expenditures	$210,100	$173,637	$176,983	$180,334	$171,673	$175,228	$178,890	$182,662	*$888,787*	$973,964	$2,304,256
Annual Growth Rate		-17.4%	1.9%	1.9%	-4.8%	2.1%	2.1%	2.1%	*0.6%*	2.2%	2.3%

Source: Adams County, Jviation

TABLE 7-13 - BUDGETED AND PROJECTED NET REVENUES, CAPITAL FUNDING, AND CAPITAL EXPENDITURES

Operating and Capital Cash Flow	Historical Data (2014-2016) Actual			Phase I (2017-2021) Projected						Phase II Projected	Phase III Projected
	2014	2015	2016	2017	2018	2019	2020	2021	Total	2022-2026	2027-2036
Airport Operating Cash Flow											
Revenues:											
Total Operating Revenues	$3,201,255	$2,218,431	$2,331,917	$2,423,320	$2,502,843	$2,577,928	$2,679,885	$2,760,281	$12,944,257	$15,259,871	$39,429,259
Total Non-Operating Revenues	($136,693)	$24,964	$3,110	$10,000	$10,250	$10,506	$10,769	$11,038	$52,563	$59,471	$147,473
County Contributions (Direct)	$698,560	$560,000	$500,000	$421,127	$418,333	$426,799	$410,796	$418,830	$2,095,885	$2,053,848	$4,098,173
Total Revenues	$3,763,122	$2,803,395	$2,835,027	$2,854,447	$2,931,426	$3,015,233	$3,101,450	$3,190,149	$15,092,705	$17,373,190	$43,674,905
Expenses:											
Total Operation and Maintenance Expenses	$2,555,723	$2,445,311	$2,869,409	$2,854,447	$2,931,426	$3,015,233	$3,101,450	$3,190,149	$15,092,705	$17,373,190	$43,674,905
Net Operating Cash Flow	$1,207,399	$358,084	($34,382)	$0	$0	$0	$0	$0	$0	$0	$0
Total Operating Airport Funds Available for Capital Expenditures	$1,207,399	$358,084	($34,382)	$0	$0	$0	$0	$0	$0	$0	$0
Airport Capital Cash Flow											
Capital Improvement Program (CIP):											
AIP-Eligible Expenditures		$0	$0	$500,000	$0	$0	$0	$3,226,464	$3,726,464	$8,033,333	$52,805,292
CDAG-Eligible Expenditures				$0	$0	$0	$0	$0	$0	$347,535	$2,101,315
Expenditures Ineligible for Fed/State Grants				$13,679,225	$416,764	$1,946,319	$985,420	$672,000	$17,699,728	$4,078,207	$10,133,480
Total Public/Airport Capital Expenditures		$0	$0	$14,179,225	$416,764	$1,946,319	$985,420	$3,898,464	$21,426,192	$12,459,075	$65,040,087
Non-CIP Capital Expenditures (airport projects)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Other Capital Funding Sources:											
AIP Entitlement Grants (Primary + Rollover)				$450,000	$0	$0	$0	$600,000	$1,050,000	$600,000	$1,500,000
AIP Discretionary Grants				$0	$0	$0	$0	$1,803,818	$1,803,818	$6,130,000	$45,073,815
State Apportionment				$0	$0	$0	$0	$500,000	$500,000	$500,000	$0
CDOT Aeronautics Division				$25,000	$0	$0	$0	$156,352	$181,352	$749,201	$4,688,746
Private or Unknown Capital Funding Source				$13,100,000	$0	$636,000	$0	$0	$13,736,000	$1,434,000	$2,556,000
Total Capital Funding Sources	$0	$0	$0	$13,575,000	$0	$636,000	$0	$3,060,170	$17,271,170	$9,413,201	$53,818,561
Total Funds Available for Capital Expenditures	$1,207,399	$358,084	-$34,382	$13,575,000	$0	$636,000	$0	$3,060,170	$17,271,170	$9,413,201	$53,818,561
Unidentified Funding Required for Capital Expenditures	$0	$0	$0	$604,225	$416,764	$1,310,319	$985,420	$838,294	$4,155,022	$3,045,874	$11,221,526
FAA AIP Entitlement Rollover				$0	$150,000	$300,000	$450,000	$0			
Ending Airport Fund Balance	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Water & Wastewater Operating Cash Flow											
Revenues:											
Total Operating Revenues	$17,881	$21,264	$21,025	$21,655	$22,305	$22,974	$23,663	$24,373	$114,970	$133,281	$333,631
Adams County Contribution	$348,925	$304,125	$329,752	$330,000	$200,000	$200,000	$200,000	$200,000	$1,130,000	$1,000,000	$2,000,000
Total Revenues	$366,806	$325,389	$350,777	$351,655	$222,305	$222,974	$223,663	$224,373	$1,244,970	$1,133,281	$2,333,631
Expenses:											
Total Operation and Maintenance Expenses	$135,760	$104,993	$111,703	$115,054	$118,506	$122,061	$125,723	$129,495	$610,839	$708,129	$1,772,586
Debt Service	$21,173	$15,478	$12,113	$12,113	$0	$0	$0	$0	$12,113	$0	$0
Total Revenues	$156,933	$120,471	$123,816	$127,167	$118,506	$122,061	$125,723	$129,495	$622,952	$708,129	$1,772,586
Net Operating Cash Flow	$209,873	$204,918	$226,960	$224,488	$103,799	$100,913	$97,940	$94,878	$622,018	$425,152	$561,045
Total Adams County Contribution (Airport & Water/Wastewater)											
Total Adams County Contribution	$1,047,485	$864,125	$829,752	$751,127	$618,333	$626,799	$610,796	$618,830	$3,225,885	$3,053,848	$6,098,173

Source: Adams County, Jviation

APPENDIX A – AVIATION GLOSSARY OF TERMS

ABOVE GROUND LEVEL (AGL). An altitude that is measured with respect to the underlying ground.

ACCELERATED-STOP DISTANCE AVAILABLE (ASDA). See *Declared Distances.*

ADMINISTRATOR. Federal Aviation Administrator or any person to whom he has delegated his authority in the matter concerned.

ADVISORY CIRCULAR (AC). External communications or publications issued by the FAA to provide non-regulatory guidelines for the recommendations relative to a policy, and guidance and information relative to a specific aviation subject matter. An example of this is AC 150/1300-13A, *Airport Design*, which is frequently referenced throughout a typical master plan.

AIR CARRIER. A person or company who undertakes directly by lease, or other arrangement, to engage in air transportation.

AIR ROUTE TRAFFIC CONTROL CENTERS (ATRCC). A facility responsible for en route control of aircraft operating under IFR in a particular volume of airspace (within its area of jurisdiction) at high altitudes between airport approaches and departures. Approximately 26 such centers cover the United States.

AIR TAXI. An aircraft operating under an air taxi operating certificate for the purpose of carrying passengers, mail, cargo for revenue in accordance with FAR 121 or FAR Part 135.

AIR TRAFFIC. Any aircraft operating in the air or on an airport surface, exclusive of loading ramps and parking areas.

AIR TRAFFIC CONTROL (ATC). A service provided by ground-based controllers who direct aircraft on the ground and in the air. The primary purpose of ATC systems is to separate aircraft to prevent collisions, to organize and expedite the flow of traffic, and to provide information and other support for pilots when able.

AIR TRAFFIC CONTROL TOWER (ATCT). A facility in the terminal air traffic control system located at an airport which consists of a tower cab structure and an associated instrument flight rules rooms, if radar equipped, that uses ground-to-air and air-to-ground communications and radar, visual, signaling, and other devices to provide for the safe and expeditious movement of terminal area air traffic in the airspace and airports within its jurisdiction.

AIR TRAFFIC CONTROL (ATC) SERVICE. A service provided for the purpose of promoting the safe, orderly, and expeditious flow of air traffic, including airport, approach, and enroute air traffic control services. ATC is provided by the Federal Aviation Administration, a branch of the federal government under the Department of Transportation or, at Airport Traffic Control Tower (ATCT), through an independent service provider contracted with the Federal Aviation Administration.

AIRCRAFT. A device that is used or intended to be used for flight in the air.

- **Airplane.**
    - **Heavy.** As defined by FAA Aviation System Performance Metrics (ASPM), an airplane capable of takeoff weight of more than 255,000 pounds whether or not they are operating at this weight during a particular phase of flight

  - **Large.** As defined by FAA AC 150/5200-13A, an airplane of more than 12,500 pounds maximum certified takeoff weight. As defined by FAA Aviation System Performance Metrics, an airplane weighing more than 41,000 pounds and up to 255,000 pounds.
  - **Medium.** As defined by FAA Aviation System Performance Metrics, an airplane weighing more than 12,500 pounds up to 41,000 pounds.
  - **Small.** As defined by both FAA AC150/5300-13A and FAA Aviation System Performance Metrics, an airplane of 12,500 pounds or less maximum certified takeoff weight**.**
- **Balloon.** A lighter-than-air aircraft that is not engine-driven, and that sustains flight through the use of either gas buoyancy or an airborne heater.
- **Glider.** A heavier-than-air aircraft that is supported in flight by the dynamic reaction of the air against its lifting surfaces and whose free flight does not depend principally on an engine.
- **Helicopter.** A rotorcraft that, for horizontal motion, depends principally on its engine-driven rotors.
- **Regional Jet (RJ).** There is no regulatory definition for an RJ; however, for FAA use, an RJ is a commercial jet airplane that carries fewer than 100 passengers.
- **Rocket.** An aircraft propelled by ejected expanding gases generate in engine from self-contained propellants and not dependent on the intake of outside substances.
- **Rotorcraft.** A heavier-than-air aircraft that depends principally for it support in flight on the lift generated by one or more rotors.

AIRCRAFT APPROACH CATEGORY (AAC). A grouping of aircraft based on approach speed, defined as 1.3 times the aircraft stall speed at maximum certificated takeoff weight. The categories are as follows:

- **Category A**: Speed less than 91 knots.
- **Category B**: Speed 91 knots or more but less than 121 knots
- **Category C**: Speed 121 knots or more but less than 141 knots.
- **Category D**: Speed 141 knots or more but less than 166 knots.
- **Category E**: Speed 166 knots or more.

AIRCRAFT DEICING PAD. See *Deicing Pad*.

AIRCRAFT ENGINE. The component of the propulsion system for an aircraft that generates mechanical power. They are almost always either lightweight piston engines or gas turbines, although electric engines are currently in development.

- **Piston Engine.** A heat engine that uses one or more reciprocating pistons to convert pressure generated from aviation gasoline into a rotating motion.
- **Turbine Engine.** A mechanical device or engine that spins in reaction to fluid flow through or over it. This device is used in turbofan, turbojet, and turboprop-powered aircraft and utilizes jet fuel.
  - **Turbofan.** A turbojet engine whose thrust has been increased by the addition of a low-pressure compressor fan.
  - **Turbojet.** An engine that derives power from a fanned wheel spinning in reaction to burning gases escaping from a combustion chamber. The turbine in turn drives a compressor and other accessories.
  - **Turboprop.** A turbine engine in which the rotating turbine turns a propeller.

AIRCRAFT OPERATION. See *Operation*.

AIRCRAFT RESCUE AND FIRE FIGHTING (ARFF). A special category of fire fighting that involves the response, hazard mitigation, evacuation and possible rescue of passengers and crew of an aircraft involved in (typically) an airport ground emergency.

AIRPLANE. An engine-driven fixed-wing aircraft heavier than air that is supported in flight by the dynamic reaction of the air against its wings. See *Aircraft.*

AIRPLANE DESIGN GROUP (ADG). A numerical classification aircraft based on wingspan or tail height. Where an airplane is in two categories, the most demanding category should be used. The groups are as follows:

- **Group I**: Up to but not including 49 feet wingspan or tail height up to but not including 20 feet. (e.g. Cessna 172)
- **Group II**: 49 feet up to but not including 79 feet wingspan or tail height from 20 up to not including 30 feet. (e.g. Cessna Citation Business jet).
- **Group III**: 79 feet up to but not including 118 feet wingspan or tail height from 30 up to but not including 45 feet. (e.g. Boeing 737)
- **Group IV**: 118 feet up to but not including 171 feet wingspan or tail height from 60 up to but not including 66 feet. (e.g. Boeing 767)
- **Group V**: 171 feet up to but not including 214 feet wingspan or tail height from 60 up to but not including 66 feet. (e.g. Boeing 747)
- **Group VI**: 214 feet up to but not including 262 feet wingspan or tail height from 66 up to but not including 80 feet. (e.g. Airbus A380)

AIRPORT. An area of land or water that is used or intended to be used for the landing and takeoff of aircraft, and includes its buildings and facilities, if any. Different types of airports include the following:

- **Cargo Service Airport.** An airport served by aircraft providing air transportation of property only, including mail, with an annual aggregate landed weight of at least 100 million pounds.
- **Certificated Airport.** An airport that has been issued an Airport Operating Certificate by the FAA under the authority of FAR Part 139, Certification and Operation.
- **Commercial Service Airport.** A public airport providing scheduled passenger service that enplanes at least 2,500 annual passengers.
- **General Aviation Airport.** An airport that provides air service to only general aviation.
- **Hub Airport.** An airport that an airline uses as a transfer point to get passengers to their intended destination. It is part of a hub and spoke model, where travelers moving between airports not served by direct flights change planes en route to their destinations.
    - **Large Hub Airport.** An airport that handles over 1% of the country's annual enplanements.
    - **Medium Hub Airport.** An airport that handles 0.25% ≥ 1% of the country's annual enplanements.
    - **Small Hub Airport.** An airport that handles 0.05% ≥ 0.25% of the country's annual enplanements.
    - **Non-Hub Airport.** An airport that handles over 10,000 enplanements, but less than 0.05% of the country's annual enplanements.
- **International Airport.** Relating to international flight, it means:
    - An airport of entry which has been designated by the Secretary of Treasury or Commissioner of Customs as an international airport for customs service.
    - A landing rights airport at which specific permission to land must be obtained from customs authorities in advance of contemplated use.
    - Airports designated under the Convention on ICAO as an airport for use by international commercial air transport and/or international general aviation.

- **Primary Airport.** A commercial service airport that enplanes at least 10,000 annual passengers.
- **Reliever Airport.** General aviation airports in a major metropolitan area that provides pilots with attractive alternatives to using congested hub airports.
- **Uncontrolled Airport.** An airport without an air traffic control tower at which the control of VFR traffic is not exercised. Pilots "see and avoid" other traffic without the aid of air traffic control.

AIRPORT AUTHORITY. A quasi-government public organization responsible for setting the policies governing the management and operation of an airport or system of airports under its jurisdiction.

AIRPORT CAPITAL IMPROVEMENT PLAN (CIP). The planning program used by the FAA to identify, prioritize, and distribute funds for airport development and the needs of National Airspace System (NAS) to meet specified national goals and objectives.

AIRPORT ELEVATION. The highest point of an airport's usable runway(s) expressed in feet above mean sea level (MSL).

AIRPORT FACILITY DIRECTORY (AFD). Now known as a Chart Supplement, a publication with information on all airports, seaplane bases, and heliports open to the public. This publication is issued in seven volumes according to geographical area, and includes communications data, navigational facilities, and certain special notices and procedures.

AIRPORT HAZARD. Any structure or natural object located on or in the vicinity of a public airport, or any use of land near such airport, that obstructs the airspace required for the flight of aircraft in landing or taking off at the airport or is otherwise hazardous to aircraft landing, taking of, or taxiing at the airport.

AIRPORT IMPROVEMENT PROGRAM (AIP). An FAA program authorized by the Airport and Airway Improvement Act of 1982 that serves as the primary source of funding airport planning and development. This funding is provided at specific levels, with the funding priority based on the airport's Capital Improvement Program (CIP) and available funds.

AIRPORT INFLUENCE AREA. The area defined by overlaying the FAR Part 77 Imaginary Surfaces, Aircraft Accident Safety Zone data, and Noise Contour data over the top of an existing land use map, critical areas map or other base map.

AIRPORT LAYOUT PLAN (ALP). A scaled drawing (or set of drawings), in either traditional or electronic form, of current and future airport facilities that provides a graphic representation of the existing and long-term development plan for the airport and demonstrates the preservation and continuity of safety, utility, and efficiency of the airport to the satisfaction of the FAA.

AIRPORT LIGHTING. Various lighting aids that may be installed on an airport. Types of airport lighting include:

- **ALS.** See *Approach Light System.*
- Boundary **Lights.** Lights defining the perimeter of an airport or landing area.
- **Runway Centerline Lighting.** Flush centerline lights spaced at 50-foot intervals beginning 75 feet from the landing threshold and extending to within 75 feet of the opposite end of the runway. Only used on Category II/III ILS Runways.
- **Runway Edge Lights.** Lights used to outline the edges of the runways during periods of darkness or restricted visibility conditions. They are usually uniformly spaced at intervals of approximately 200 feet, and intensity may be controlled or preset. These light systems are classified according to the intensity they are capable of producing:
    - High Intensity Runway Lights (HIRLs).
    - Medium Intensity Runway Lights (MIRLs).

    - Low Intensity Runway Lights (LIRLs).
- **Runway End Identifier Lights (REIL).** Provides rapid and positive identification of the approach end of particular runway. The system consists of a pair of synchronized flashing lights, one on each side of the runway threshold.
- **Threshold Lights.** Fixed lights arranged symmetrically left and right of the runway centerline, identifying the runway threshold. Lights are green for arriving aircraft and red for departing aircraft.
- **Touchdown Zone Lighting.** Two rows of transverse light bars located symmetrically about the runway centerline normally at 100-foot intervals. Only used on Category II/III ILS Runways.

AIRPORT MARKINGS. Markings used on runway and taxiway surfaces to identify a specific runway, a runway threshold, a centerline, a hold line, etc. A runway should be marked in accordance with its present usage such as: 1) Visual, 2) Nonprecision instrument, 3) Precision Instrument.

AIRPORT MASTER PLAN. A comprehensive study of an airport that focuses on the short-, medium-, and long-term development plan to meet future aviation demand of the airport.

AIRPORT OBSTRUCTION CHART (OC). A scaled drawing depicting the FAR Part 77 imaginary airspace surfaces, a representation of objects that penetrate these surfaces, runway, taxiway, and ramp areas, navigational aids, buildings, roads, and other detail in the vicinity of the airport.

AIRPORT OPERATIONS AREA (AOA). An area of an airport used or intended to be used for landing, takeoff, or surface maneuvering of aircraft. An AOA includes such paved areas or unpaved areas that are used or intended to be used for the unobstructed movement of aircraft in addition to its associated runway, taxiways, or apron.

AIRPORT OPERATOR. The operator (private or public) or sponsor of a public-use airport.

AIRPORT REFERENCE CODE (ARC). A coding system used to relate the airport design criteria to the operational and physical characteristics of the airplanes intended to use the airport or the critical aircraft. It is a two-character code consisting of the Aircraft Approach Category and the Airplane Design Group.

AIRPORT REFERENCE POINT (ARP). The latitude and longitude of the approximate center of the runway(s) at an airport.

AIRPORT SIGNS. Signs used to identify items and locations on the airport. Following are the most common sign types:

- **Boundary Sign.** These signs are used to identify the location of the boundary of the RSA/ROFZ or ILS critical areas for a pilot, or an existing the runway. These signs have a black inscription on a yellow background.
- **Destination Sign.** These signs indicate the general direction to a remote location. They have black inscriptions on a yellow background and ALWAYS contain an arrow.
- **Direction Sign.** These signs indicate directions of taxiways leading out of an intersection. They may also be used to indicate a taxiway exit from a runway. These signs have black inscriptions on a yellow background and ALWAYS contain arrows.
- **Information Sign.** These signs are installed on the airside of an airport and are considered to be signs other than mandatory signs. They have black inscriptions on a yellow background.
- **Location Sign.** These signs identify the taxiway or runway upon which the aircraft is located. The sign has yellow inscriptions on a black background with a yellow border and does NOT use arrows.
- **Mandatory Instruction Sign.** They denote taxiway/runway intersections, runway/runway intersections, ILS critical areas, OFZ boundaries, runway approach areas, CAT II/II operations areas, military landing zones, and no entry areas. These signs have white inscriptions with a black outline on a red background.

- **Roadway Sign.** These signs are located on the airfield and are solely intended for vehicle operators. They should conform to the categorical color codes established by the Manual on Uniform Traffic Control Devices (MUTCD).
- **Runway Distance Remaining Signs.** These signs are used to provide distance remaining information to pilots during takeoff and landing operations. These signs have a white numeral inscription on a black background.

AIRPORT SPONSOR. The entity that is legally responsible for the management and operation of an airport including the fulfillment of the requirements of laws and regulations related thereto.

AIRPORT SURVEILLANCE RADAR (ASR). A radar system used at airports to detect and display the position of aircraft in the terminal area.

AIRSIDE. The portion of an airport that contains the facilities necessary for the operations of aircraft.

ANNUAL SERVICE VOLUME (ASV). The number of annual operations that can reasonably be expected to occur at the airport based on a given level of delay.

APPROACH END OF RUNWAY. The approach end of runway is the near end of the runway as viewed from the cockpit of a landing airplane.

APPROACH LIGHT SYSTEM (ALS). An airport lighting facility aids in runway identification during the transition from instrument flight to visual flight for landing. Typical approach lighting systems used at airports include:

- **Approach Light System with Sequenced Flashing (ALSF).**
- **Lead-in-light System (LDIN).** Consists of one or more series of flashing lights installed at or near ground level that provides positive visual guidance along an approach path, either curving or straight, where special problems exist with hazardous terrain, obstructions, or noise abatement procedures.
- **Medium-Intensity Approach Light System with Runway Alignment Indicator (MALSR).** A lighting system installed on the approach end of a runway and consists of a series of lightbars, strobe lights, or a combination that extends outward from the runway end. It usually serves a runway that has an instrument approach procedure associated with it and allows the pilot to visually identify and align self with the runway environment once the pilot has arrived at a prescribed point on the approach.
- **Omnidirectional Approach Lighting System (ODALS).** Consist of seven omnidirectional flashing lights located in the approach area of a non-precision runway. Five lights are located on the runway centerline extended with the first light located 300 feet from the threshold and extending at equal intervals up to 1,500 feet from the threshold. The other two lights are located on each side of the runway, with a lateral distance of 40 feet from the runway edge, or 75v feet from the runway edge when installed on a runway equipped with VASI.
- **Runway Alignment Indicator Lights (RAILS).** Sequenced Flashing Lights which are installed only in combination with other lighting systems.

APPROACH PROCEDURES WITH VERTICAL GUIDANCE (APV). Instrument approach procedures conducted under IFR that provide both lateral and vertical guidance, but that do not meet all the accuracy requirements and navigation specifications to be classified as precision approach. Examples of APV approaches include Area Navigation (RNAV) (lateral approach procedures with vertical guidance (LPV) or lateral navigation (LNAV)/vertical navigation (VNAV) minimums) and localizer-type directional aid (LDA) with glideslope (GS).

APPROACH SURFACE. See *Imaginary Surfaces*.

APRON. A specific portion of the airfield used for passenger, cargo or freight loading and unloading, aircraft parking, and the refueling, maintenance and servicing of aircraft. Also referred to as ramp or tarmac.

ARFF BUILDING. A facility located at an airport that provides emergency vehicles, extinguishing agents, and personnel responsible for minimizing the impacts of an aircraft accident or incident.

ARRIVAL TIME. The time an aircraft touches down on arrival.

AUTOMATED FLIGHT SERVICE STATION (AFSS). An automated air traffic facility that provides information and services to aircraft pilots before, during, and after flights, but it is not responsible for giving instructions or clearances or providing separation.

AUTOMATED SURFACE OBSERVATION SYSTEM (ASOS). Similar data reporting as an AWOS, but usually owned and maintained by the National Weather Service.

AUTOMATED WEATHER OBSERVATION SYSTEM (AWOS). An automated sensor suite which is voice synthesized to provide a weather report that can be transmitted via VHF radio, NDB, or VOR ensuring that pilots on approach have up-to-date airport weather for safe and efficient aviation operations. Most AWOS observe and record temperature and dew point in degrees Celsius, wind speed and direction in knots, visibility, cloud coverage and ceiling up to 12,000 feet, freezing rain, thunderstorm (lightning), and altimeter setting.

AVGAS. Aviation fuel (gasoline) used for aircraft with internal-combustion engines. The most common Avgas is currently 100LL (Low Lead).

AVIGATION EASEMENT. A contractual right or a property interest in land over which a right of unobstructed flight in the airspace can occur.

BALLOON. See *Aircraft*.

BAGGAGE CLAIM. An area where passengers obtain luggage that was previously checked at an airline ticket counter at the departing airport.

BASED AIRCRAFT. An aircraft permanently stationed at an airport by agreement between the airport owner (management or FBO) and the aircraft owner.

BASE LEG. See *Traffic Pattern*.

BENEFIT-COST ANALYSIS (BCA). An analysis of the cost, benefit, and the uncertainty associated with a project or action. A formal BCA is required for capacity projects of $5 million or more AIP discretionary funds.

BIRDS BALLS. High-density plastic floating balls that can be used to cover ponds and prevent birds from using the sites.

BLAST FENCE. A barrier used to divert or dissipate jet blast or propeller wash.

BOUNDARY LIGHTS. See *Airport Lighting.*

BOUNDARY SIGN. See *Airport Signs.*

BUILDING RESTRICTION LINE (BRL). A line that identifies suitable building area locations on airports to limit building proximity to aircraft movement areas. Typically based on the FAR Part 77 Airport Imaginary Surfaces.

CAPACITY (THROUGHPUT CAPACITY). A measure of the maximum number of aircraft operations or their airport components which can be accommodated on the airport.

CAPITAL IMPROVEMENT PROGRAM (CIP). Provides a schedule of development for the proposed projects identified by an airport or through the development of an Airport Master Plan.

CARGO SERVICE AIRPORT. See *Airport.*

CEILING. The height above the earth's surface of the lowest layer of clouds or obscuring phenomena that is reported as broken, overcast or obscured.

CERTIFICATED AIRPORT. See *Airport.*

CIRCLING APPROACH. A maneuver initiated by the pilot to align the aircraft with a runway for landing when a straight-in landing from an instrument approach is not possible or is not desirable.

CLEARWAY (CWY). A defined rectangular area beyond the end of the runway cleared or suitable for use in lieu of runway to satisfy take off distance requirements.

COMMERCIAL SERVICE AIRPORT. See *Airport.*

COMMON TRAFFIC ADVISORY FREQUENCY (CTAF). The VHF radio frequency used for air-to-air communication at uncontrolled airports or where no control tower is currently active. Pilots use the common frequency to coordinate their arrivals and departures safely, give position reports, and acknowledge other aircraft in the airfield traffic pattern.

COMPASS ROSE. A circle, graduated in degrees, printed on some charts or marked on the ground at an airport. It is used as a reference to either true or magnetic direction. When marked on the ground it is used to calibrate an aircraft's compass.

CONICAL SURFACE. See *Imaginary Surfaces.*

CONSULTANT. A firm, individual, partnership, corporation, or joint venture that performs architectural, engineering or planning service as defined in FAA AC150/5100-14D, employed to undertake work funded under an FAA airport grant assistance program.

CONTROLLED AIRSPACE. Airspace of defined dimensions within which air traffic control service is provided to IFR flight and to VFR flights in accordance with the airspace classification. Controlled airspace is a generic term that covers Class A, Class B, Class C, Class D, and Class E Airspace.

CRITICAL (DESIGN) AIRCRAFT. The most demanding aircraft with at least 500 annual operations that operates, or is expected to operate, at the airport.

CROSSWIND. A wind that is not parallel to a runway centerline or to the intended flight path of an aircraft.

CROSSWIND COMPONENT. The component of wind that is at a right angle to the runway centerline or the intended flight path of an aircraft.

CROSSWIND LEG. See *Traffic Pattern.*

DECISION HEIGHT (DH). The lowest height or altitude in an approach descent and the point at which a missed approach shall be initiated if the required visual reference has not been established. This term is used only in procedures where an electronic glide slope provides the reference for descent, as in ILS.

DECLARED DISTANCES. The distances the airport owner declares available for an aircraft's takeoff run, takeoff distance, accelerated-stop distance, and landing distance requirements.

- **Takeoff Run Available (TORA).** The runway length declared available and suitable for the ground run of an aircraft taking off.
- **Takeoff Distance Available (TODA).** The runway length equal to the TORA plus the length of any remaining runway or clearway beyond the far end of the TORA; the full length of TODA may need to be reduced because of obstacles in the departure area.
- **Accelerated Stop Distance Available (ASDA).** The runway length equal to the runway plus stopway length declared available and suitable for the acceleration and deceleration of an aircraft aborting a takeoff.
- **Landing Distance Available (LDA).** The runway length equal to the length of runway available and suitable for the landing ground run of airplanes.

DESIGN AIRCRAFT. An aircraft whose dimensions and/or other requirements make it the most demanding aircraft for an airport's facilities (i.e. runways and taxiways). The Design Aircraft is used as the basis for airport planning and design since it is assumed that airport facilities are designed to accommodate the Design Aircraft will also be able to accommodate less demanding aircraft as well. An aircraft can be utilized as the Design Aircraft for an airport if it will (has) conduct(ed) 500 or more annual operations (250 landings) at that airport.

DECISION HEIGHT (DH). This is associated with precision approaches and the aircraft is continually descending on final approach. When the aircraft reaches the DH, the pilot must make a decision to land or execute the missed approach procedure.

DEICING. The removal, though application of a max of heated water and propylene or ethylene glycol, of frost, ice, slush, or snow from the aircraft in order to provide clean surfaces.

DEICING PAD. A facility where an aircraft received deicing or anti-icing.

DELAY. The difference between constrained and unconstrained operating time.

DEMAND. The number of aircraft operations, passengers, or other factors that are required in a specific period of time.

DEPARTMENT OF TRANSPORTATION (DOT). The United States federal department that institutes and coordinates national transportation programs; created in 1966. The FAA is an organization within the DOT.

DEPARTURE AIRSPACE. See *Approach Airspace.*

DESTINATION SIGN. See *Airport Signs.*

DETENTION PONDS. Storm water management ponds that hold storm water for short periods of time, a few hours to a few days.

DIRECTION SIGN. See *Airport Signs.*

DISCRETIONARY GRANT FUNDS. Annual Federal grant funds that may be appropriate to an airport based upon designation by the Secretary of Transportation or Congress to meet a specified national priority such as enhancing capacity, safety, and security or mitigating noise.

DISPLACED THRESHOLD. See *Threshold.*

DISTANCE MEASURING EQUIPMENT (DME). See *Navigation Aid.*

DOWNWIND LEG. See *Traffic Pattern.*

EMERGENCY LOCATOR TRANSMITTER (ELT). A radio transmitter attached to the aircraft structure that aids in locating downed aircraft by radiating an audio tone on 121.5 MHz or 243 MHz.

ENPLANEMENT. The boarding of a passenger, cargo, freight or mail on an aircraft at an airport.

END-AROUND TAXIWAY (EAT). Taxiways constructed to allow an aircraft to cross the extended centerline of the runway without specific clearance from ATC. EAT projects must be pre-approved by the FAA Office of Airport Safety and Standards, Airport Engineering Division.

ENTITLEMENT GRANT FUNDS. Annual federal funds for which all airports in the NPIAS are eligible for.

ENVIRONMENTAL ASSESSMENT (EA). An environmental analysis performed pursuant to the Nation Environmental Policy Act to determine whether an action would significantly affect the environment and thus require a more detailed environment al impact statement.

ENVIRONMENTAL IMPACT STATEMENT (EIS). A document required of federal agencies by the National Environmental Policy Act (NEPA) for major projects or legislative proposals affecting the environment. It is a tool for decision-making describing the positive. If no significant impact is found a Finding of No Significant Impact (FONSI) is issued.

FEDERAL AVIATION ADMINISTRATION (FAA). An agency of the United States Department of Transportation with authority to regulate and oversee all aspects of civil aviation in the United States.

FEDERAL AVIATION REGULATION (FAR). The general and permanent rules established by the executive departments and agencies of the Federal government for aviation which are published in the Federal Register. These are the aviation subset of the U.S. Code of Federal Regulations (CFR).

FEDERAL GRANT AGREEMENT. A Federal agreement that represents an agreement made between the FAA (on the behalf of the United States) and an airport sponsor for the grant of Federal Funding.

FEDERAL GRANT ASSURANCE. A provision within a Federal grant agreement to which the recipient of Federal airport development assistance has agreed to comply in consideration of the assistance provided.

FINAL APPROACH FIX (FAF). The fix from or over which final approach (IFR) to an airport is executed.

FINAL APPROACH. A flight path of a landing aircraft in the direction of landing along the extended runway centerline from the base leg to the runway. For instrument approaches, the final approach typically begins at the final approach fix (FAF).

FINDING OF NO SIGNIFICANT IMPACT (FONSI). A public document prepared by a Federal agency that presents the rationale why a proposed action will not have a significant effect on the environment and for which an environmental impact statement will not be prepared.

FIX. A geographical position determined by visual reference to the surface by reference to one or more radio NAVAIDs, by celestial plotting, or by another navigational device.

FIXED BASE OPERATION or FIXED BASE OPERATOR (FBO). A business enterprise located on the airport property that provides services to pilots including aircraft rental, training, fueling, maintenance, parking, and the sale of pilot supplies.

FLIGHT SERVICE STATION (FSS). An air traffic facility that provides information and services to aircraft pilots before, during, and after flights, but unlike ATC, is not responsible for giving instructions, clearances, or providing separation.

FLIGHT STANDARDS DISTRICT OFFICE (FSDO). An FAA field office serving an assigned geographical area and staffed with Flight Standard personnel who serve the aviation industry and the general public on matters relating to the certification and operation of air carrier and general aviation aircraft. Activities include general surveillance of operation safety, certification of airmen and aircraft, accident prevention, investigation, enforcement, etc.

FOREIGN OBJECT DEBRIS (FOD). Any object found on an airport that does not belong in or near airplanes, and as a result can injure personnel and damage aircraft.

FORM 7460-1, *NOTICE OF PROPOSED CONSTRUCTION OR ALTERNATION*. Federal law requires filing a Notice of Proposed Construction or Alteration (Form 7460) for all structures over 200 feet AGL or lower if closer than 20,000 feet to a public use airport with a runway over 3,200 feet in length.

FORM 7480-1, *NOTICE OF LANDING AREA PROPOSAL.* Submitted to the FAA Airport Regional Division Office or ADO as formal written notification for project involving the construction of a new airport; the construction, realigning, altering, activating, or abandoning of a runway, landing strip, or associated taxiway; or the deactivation or abandoning of an entire airport.

FUEL FLOWAGE FEE. A tax assessed on the user, which is paid at the pump. Fuel flowage fee revenues are sent to the airport governing body, usually the board or authority and are then used for airport improvements or other expenses.

GAP ANALYSIS. See *Safety Management System*.

GATE. An aircraft parking position used by a single aircraft loading or unloading passengers, mail, or cargo, etc.

GENERAL AVIATION (GA). The segment of aviation that encompasses all aspects of civil aviation except certified air carriers and other commercial operators, such as airfreight carriers.

GENERAL AVIATION AIRPORT. See *Airport.*

GEOGRAPHIC INFORMATION SYSTEM (GIS). A technology that manages, analyzes, and disseminates geographic data.

GLIDER. See *Aircraft.*

GLIDESLOPE. See *Instrument Landing System.*

GLOBAL POSITIONING SYSTEM (GPS). A satellite based navigational system that provides signals in the cockpit of aircraft defining aircraft position in terms of latitude, longitude, and altitude.

GPS RUNWAY. See *Runway.*

GRANT AGREEMENT. See *Federal Grant Agreement.*

GROUND ACCESS. The transportation system on and around the airport that provides access to and from the airport by ground transportation vehicle for passengers, employees, cargo, freight, and airport services.

HAZARD. See *Safety Management System.*

HAZARD TO AIR NAVIGATION. An existing or proposed object that the FAA, as a result of an aeronautical study, determines will have a substantial adverse effect upon the safe and efficient use of navigable airspace by aircraft, operation of air navigation facilities, or existing or potential airport capacity.

HAZARDOUS WILDLIFE. Species of wildlife (birds, mammals, reptiles) including feral animals and domesticated animals not under control, that are associated with aircraft strike problems, are capable of causing structural damage to airport facilities, or act as attractants to other wildlife that pose a strike hazard.

HEAVY AIRCRAFT. See *Aircraft.*

HEIGHT ABOVE AIRPORT (HAA). Indicates the height of the MDA above the published airport elevation. This is published in conjunction with circling minimums.

HELICOPTER. See *Aircraft.*

HELIPAD. A small, designated area, usually with prepared surface, on a heliport, airport, landing/takeoff area, apron/ramp, movement area used for takeoff, landing, or parking of helicopters.

HELIPORT. An area of land, water, or structure used or intended to be used for the landing and takeoff of helicopters.

HIGH INTENSITY RUNWAY LIGHTING (HIRL). See *Airport Lighting.*

HOLDING. A predetermined maneuver which keeps an aircraft within a specified airspace while awaiting further clearance.

HOLDING FIX. A specified geographical point or NAVAID used as a reference point in establishing and maintaining the position of an aircraft while holding.

HOLDOVER TIME. The estimated time the application of anti-icing fluid will prevent the formation of frozen contamination on the protected surfaces of an aircraft. With a one-step deicing/anti-icing operation, the holdover beings at the start of the operations; with a two-step operation, the holdover beings at the start of the final anti-icing application.

HOT SPOT. A location on an airport movement area with a history of potential risk of collision or runway incursion, and where heightened attention by pilots and drivers is necessary.

HORIZONTAL SURFACE. See *Imaginary Surfaces.*

HUB AIRPORT. See *Airport.*

IMAGINARY SURFACES. Are surfaces defined in 14 CFR Part 77, and are in relation to the airport and each runway. The size of these imaginary surfaces is based on the category of each runway for current and future airport operations. Any objects which penetrate these surfaces are considered an obstruction and affects navigable airspace.

- **Approach Surface.** An imaginary obstruction limiting surface defined in 14 CFR Part 77which is longitudinally centered on an extended runway centerline and extends outward and upward from the primary surface at each end of a runway at a designated slope and distance upon the type of available or planned approach by aircraft to a runway.
- **Conical Surface.** An imaginary obstruction-limiting surface defined in 14 CFR Part 77that extends from the edge of the horizontal surface outward and upward at a slope of 20 to 1 for a horizontal distance of 4,000 feet.
- **Horizontal Surface.** An imagery obstruction-limiting surface defined in 14 CFR Part 77that is specified as a portion of a horizontal plane surrounding a runway located 150 feet above the established airport elevation. The specific horizontal dimension of this surface is a function of the types of approaches existing or planned for the runway.
- **Primary Surface.** An imaginary obstruction-limiting surface defined in 14 CFR Part 77that is specified as a rectangular surface longitudinally centered about a runway. The specific dimensions of this surface are function of types of approaches existing or planned for the runway.
- **Transitional Surface.** An imaginary obstruction-limiting surface defined in 14 CFR Part 77that extends outward and upward at right angles to the runway centerline and the runway centerline extended at a slope of 7 to 1 from the slides of the primary surface.

INCURSION. The unauthorized entry by an aircraft, vehicle, or obstacle into the defined protected area surrounding an active runway, taxiway, or apron.

INFORMATION SIGN. See *Airport Signs.*

INITIAL APPROACH. The segment of a standard instrument approach procedure between the initial approach fix and the intermediate fix, or the point where the aircraft is established on the intermediate segment of the final approach course.

INITIAL APPROACH ALTITUDE. The altitude prescribed for the initial approach segment of an instrument approach.

INNER MARKER (IM). See *Instrument Landing System.*

INSTRUMENT APPROACH PROCEDURE (IAP). A series of predetermined maneuvers for the orderly transfer of an aircraft under instrument flight conditions from the beginning of the initial approach to a landing or to a point from which a landing may be made visually.

INSTRUMENT FLIGHT RULES (IFR). Procedures for the conduct of flight in weather conditions below Visual Flight Rules (VFR) weather minimums. The term IFR is often also used to define weather conditions and type of flight plan under which an aircraft is operating. IFR is defined as the weather condition that occurs whenever the cloud ceiling is at least 500 feet above ground level, but less than 1,000 feet and/or visibility is at least one statue mile, but less than 3 statute miles.

INSTRUMENT LANDING SYSTEM (ILS). A precise ground based navigation system for aircraft that provides precision guidance to an aircraft approaching a runway. It uses a combination of radio signals and, in many cases, high-intensity lighting arrays to enable a safe landing during instrument meteorological conditions. Normally consists of the following components and visual aids:

- **Localizer.** The component of an ILS which provides horizontal guidance to the runway.
- **Glideslope.** An independent ILS subsystem that provides vertical guidance to aircraft approaching a runway. It is an antenna array that is usually located on one side of the runway touchdown zone.
- **Outer Marker (OM).** A marker beacon at or near the glideslope intercept altitude of an ILS approach and it keyed to transmit two dashes per second.
- **Middle Marker (MM).** A marker beacon that defines a point along the glideslope of an ILS normally located at or near the point of DH (CAT I). It is keyed to transmit alternate dots and dashes.
- **Inner Marker (IM).** A marker beacon used with an ILS (CAT II & CAT III) precision approach located between the middle marker and the end of the ILS runway, transmitting a radiation pattern keyed at six dots per second, and indicating that the pilot, both aurally and visually, is at the DH
- **Approach Lights.** See *Approach Lighting Systems.*

ILS CATEGORIES. The weather minimums associated with an ILS is defined by the following categories (note that to make landing under these conditions, aircraft must be equipped with special avionics, pilot must be qualified to land under specified conditions for that category, and aircraft must have proper ground equipment for conditions):

- **Category I:** 200-foot ceiling and 2,400-foot RVR;
- **Category II:** 100-foot ceiling and 1,200-foot RVR;
- **Category IIIA:** zero-foot ceiling and 700- foot RVR;
- **Category IIIB:** zero-foot ceiling and 150-foot RVR; and
- **Category IIIC:** zero-foot ceiling and zero-foot RVR.

INSTRUMENT METEOROLOGICAL CONDITIONS (IMC). Meteorological conditions expressed in terms of specific visibility and ceiling conditions that are less than the minimums specified for visual meteorological conditions. IMC are defined as period when cloud ceiling are less than 1,000 feet above ground and/or visibility less than three miles

INSTRUMENT RUNWAY. See *Runway.*

INTERNATIONAL CIVIL AVIATION ORGANIZATION (ICAO). An agency of the United Nations which codifies the principles and techniques of the international air navigation, and fosters the planning and development of international air transport to ensure safe and orderly growth. The ICAO Council adopts standards and recommended practices concerning air navigation, prevention of unlawful interference, and facilitation of border-crossing procedure for international civil aviation.

ISLAND. An unused paved or grassy area between taxiways, between runways, or between a taxiway and a runway. Paved islands are clearly marked as unusable, either by painting or the use of artificial turf.

ITINERANT OPERATIONS. See *Operation.*

JET-A. Type of aviation fuel designed for use in aircraft powered by gas-turbine engines.

KNOT. A unit of speed equal to one nautical mile per hour, or 1.15 statute mile per hour.

LAND AND HOLD SHORT OPERATIONS (LAHSO). To increase airport capacity, efficiency, and safety, LAHSO clearances usually instruct an aircraft to land, and then hold short of an intersecting runway, taxiway, or predetermined point.

LARGE HUB AIRPORT. See *Airport.*

LANDING DISTANCE AVAILABLE (LDA). See *Declared Distances.*

LANDSIDE. The portion of an airport that provides the facilities necessary for the processing of passengers, cargo, freight, and ground transportation vehicles.

LARGE AIRPLANE. See *Aircraft.*

LEAD-IN-LIGHT SYSTEM (LDIN). See *Approach Light System.*

LOCALIZER. See *Instrument Landing System.*

LOCALIZER PERFORMANCE WITH VERTICAL GUIDANCE (LPV). An instrument approach procedure that uses wide area augmentation system (WAAS) and very precise GPS capabilities to attain an airplane's position. Although it does provide vertical guidance and can provide minimums consistent with an ILS, an LPV is considered to be a non-precision approach.

LOCALIZER TYPE DIRECTIONAL AID (LDA). A facility of comparable utility and accuracy to a localizer but which is not part of a complete ILS and will not be aligned with the runway.

LOCAL OPERATIONS. See *Operation.*

LOCATION SIGN. See *Airport Signs.*

LOW INTENSITY AIRPORT LIGHTING. See *Airport Lighting.*

LOCAL OPERATION. See *Operations.*

MAGNETIC (COMPASS) HEADING. The heading relative to the magnetic poles of the Earth and indicated by a magnetic compass.

MANDATORY INSTRUCTION SIGN. See *Airport Signs.*

MAXIMUM CERTIFIED TAKEOFF WEIGHT (MTOW). The Maximum certificated weight for the airplane at takeoff, i.e. the airplane’s weight at the start of the takeoff run.

MEAN SEA LEVEL (MSL). The average or mean height of the sea, with reference to a suitable reference surface.

MEDIUM HUB AIRPORT. See *Airport.*

MEDIUM INTENSITY APPROACH LIGHT SYSTEM WITH RUNWAY ALIGNMENT INDICATOR (MASLR). See *Approach Light System.*

MEDIUM INTENSITY RUNWAY LIGHTS (MIRL). See *Airport Lighting.*

MIDDLE MARKER (MM). See *Instrument Landing System.*

MILITARY OPERATIONS. See *Operation.*

MINIMUM DESCENT ALTITUDE (MDA). This is associated with non-precision approaches and is the lowest altitude an aircraft can fly until the pilot sees the airport environment. If the pilot has not found the airport environment by the Missed Approach Point (MAP) a missed approach is initiated.

MISSED APPROACH POINT (MAP). The point prescribed in an instrument approach at which a missed approach procedure shall be executed if visual reference of the runway environment is not in sight or the pilot decides it is unsafe to continue. The MAP is similar in principle to the Decision Height.

MODIFICATION TO STANDARDS (MOS). Any approved nonconformance to FAA standards, other than dimensional standards for Runway Safety Areas (RSAs), applicable to an airport design, construction, or equipment procurement project that is necessary to accommodate an unusual local condition for a specific project on a case-by-case basis while maintaining an acceptable level of safety.

MOVEMENT AREA. The runway, taxiways, and other area of an airport an airport/heliport which are utilized for taxiing, air taxiing, takeoff, and landing of aircraft, exclusive of loading ramps and parking areas. At those airports with a tower, specific approval for entry onto the movement area must be obtained from ATC.

NATIONAL AIRSPACE SYSTEM (NAS). The network of air traffic control facilities, air traffic control areas, and navigational facilities throughout the U.S.

NATIONAL ENVIRONMENTAL POLICY ACT (NEPA). Federal legislation that established environmental policy for the nation. It requires an interdisciplinary framework for federal agencies to evaluate environmental impacts and contains action-forcing procedures to ensure that federal agency decision makers take environmental factors into account.

NATIONAL PLAN OF INTEGRATED AIRPORT SYSTEMS (NPIAS). The national airport system plan developed by the Secretary of Transportation on a biannual basis for the development of public use airports to meet national air transportation needs.

NATIONAL TRANSPORTATION SAFETY BOARD (NTSB). A federal investigatory board whose mandate is to ensure safe public transportation. As part of the DOT, the NTSB investigates accidents, conducts studies, and makes recommendations to federal agencies and the transportation industry.

NAUTICAL MILE (NM). The unit measure of distance in both nautical and aeronautical context. A nautical mile equals 1.15 statute miles (6,080 feet). The measure of speed in regards to nautical miles is known as KNOTS (nautical miles per hour).

NAVIGATION AID (NAVAID). Any electronic and visual air navigation aids, lights, signs, and associated supporting equipment used or available for providing point-to-point guidance information or position data to aircraft in flight.

- **Distance Measuring Equipment (DME).** Equipment (airborne and ground) used to measure, in nautical miles, the slant range distance of an aircraft from the DME NAVAID.
- **Non-Directional Beacon (NDB).** A radio beacon transmitting non-directional signals whereby an aircraft equipped with direction finding equipment can determine headings to or from the radio beacon and "home" in on a track to or from it. The signal transmitted does not include inherent directional information.
- **Precision Approach Path Indicator (PAPI).** A path indicator that uses a single row of lights arranged to provide precision descent guidance information during approach to a runway.

- **Rotating Beacon.** A visual NAVAID used to assist pilots in finding an airport, particularly those flying in IMC or VFR at night. The beacon provides information about the type of airport through the use of a particular set of color filter:
    - Green flashed alternated with two quick white flashes: Lighted military land airport.
    - Alternating White and green flashes: Lighted civilian land airport.
    - Alternating white and yellow flashes: lighted water airport
    - Alternating yellow, green, and white: Lighted heliport.
- **Tactical Air Navigation (TACAN).** An ultra-high frequency electronic rho-theta NAVAID which provides suitably equipped aircraft a continuous indication of bearing and distance to the TACAN station.
- **Visual Approach Slope Indicator (VASI).** A system of lights arranged to provide vertical visual approach slope guidance to aircraft during approach to landing by radiating a directional pattern of high intensity red and white focused light beam.
- **VOR (Very High Frequency Omni-directional Radio-range).** A ground-based electronic NAVAID transmitting very high frequency navigation signals, 360-degree azimuth, oriented from magnetic north, used as a basis for navigation in NAS.
- **VORTAC (Very High Frequency Omni-Directional Radio-range/Tactical Aircraft Control).** A NAVAID providing VOR azimuth, TACAN azimuth, and TACAN DME at one site.

NIGHT. The time between the end of evening civil twilight and the beginning of morning civil twilight, as published in the American Air Almanac, converted to local time.

NOISE ABATEMENT PROCEDURES. Procedures developed by the FAA and community to reduce the level of noise generated by aircraft departing over populated areas.

NOISE CONTOUR. A continuous line on a map of the airport vicinity connecting all points of the same noise level. These contours represent noise levels generated from aircraft operations, takeoff and landing of aircraft. They are generated based on mythology developed by the FAA and the data provides information that can be used to identify varying degrees of noise impacts on the surrounding area.

NON-DIRECTIONAL BEACON (NDB). See *Navigation Aid.*

NON-HUB AIRPORT. See *Airport.*

NON-MOVEMENT AREA. Taxilanes and apron areas not in the movement area and therefore not under the control of traffic control.

NONPRECISION APPROACH PROCEDURE. A standard instrument approach procedure in which no electronic glideslope is provided.

NONPRECISION RUNWAY. See *Runway.*

NOTICE TO AIRMEN (NOTAM). A notice containing information concerning the establishment, condition, or change in any component (facility, service, procedure of, or hazard in the NAS) the timely knowledge of which is essential to personnel concerned with flight operations.

OBJECT. Includes, but is not limited to above ground structures, NAVAIDs, people, equipment, vehicles, natural growth, terrain, and parked aircraft.

OBJECT FREE AREA (OFA). An area on the ground centered on a runway (ROFA), taxiway (TOFA), or taxilane centerline provided to enhance the safety of aircraft operations by having the area free of objects, except for objects that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes.

OBSTACLE. An existing object at a fixed geographical location or which may be expected at a fixed location within a prescribed area with reference to which vertical clearance is or must be provided during flight operation.

OBSTACLE FREE ZONE (OFZ). The three-dimensional airspace along the runway and extended runway centerline that is required to be clear of obstacles for protection for aircraft landing or taking off from the runway and for missed approaches. It is the airspace below 150 feet above the established airport elevation and along the runway and extended runway centerline that is required to be clear of all objects, except for frangible visual NAVAIDs that need to be located in the OFZ because of their function, in order to provide clearance protection for aircraft landing or taking off from the runway, and for missed approaches.

OBSTRUCTION. An existing or future object that is of a greater height than any of the heights or surfaces defined in 14 CFR Part 77.23 and 77.25. (Note that obstructions to air navigation are presumed to be hazards to air navigation until an FAA study has determined otherwise.)

OMNIDIRECTIONAL APPROACH LIGHTING SYSTEM (ODALS). See *Approach Light System.*

OPERATION. The landing, takeoff, or touch-and-go procedure by an aircraft on a runway at an airport. Operations can be categorized into the following categories:

- **Itinerant Operations.** Operations by aircraft that leaves the local airspace.
- **Local Operations.** Aircraft operations performed by aircraft that are based at the airport and that operate in the local traffic pattern or within sight of the airport, that are known to be departing for or arriving from flights in local practice areas within a prescribed distance from the airport, or that execute simulated instrument approaches at the airport.
- **Military Operations.** Aircraft operations performed in military aircraft. May be itinerant or local operations.
- **Transient Operations.** Operations by aircraft that are not based at a specified airport.

OUTER MARKER (OM). See *Instrument Landing System.*

PARALLEL RUNWAYS. See *Runway.*

PARALLEL TAXIWAYS. See *Taxiway.*

PASSENGER FACILITY CHARGE (PFC). The collection of PFC fees for every enplaned passenger at commercial airports controlled by public agencies to be used to fund FAA-approved projects that enhance safety, security, or Capacity; reduce noise; or increase air carrier competition.

PEAK HOUR (PH). An estimate of the busiest hour in a day. This is also known as the design hour.

PERFORMANCE-BASED NAVIGATION (PBN). It specifies that aircraft RNP and RNAV systems performance requirements be defined in terms of accuracy, integrity, availability, continuity and functionality required for the proposed operations in the context of a particular airspace, when supported by the appropriate navigation infrastructure.

- **Area Navigation (RNAV).** A method of navigation that permits aircraft operations on any desired flight path.
- **Required Navigation Performance (RNP).** A type of Performance-Based Navigation (PBN) that allows an aircraft to fly a specific path between two, 3 dimensionally defined points in space.

PISTON ENGINE. See *Aircraft Engine.*

PLANNING ACTIVITY LEVEL (PAL). Selected activity levels that may trigger the need for additional facilities or improvements.

PRECISION APPROACH CATEGORIES I, II, III (CAT I, CAT II, CAT III). See *Instrument Landing System.*

PRECISION APPROACH PROCEDURE. A standard precision approach procedure in which an electronic glideslope is provided, such as ILS or PAR.

PRIMARY AIRPORT. See *Airport.*

PRIMARY SURFACE. See *Imaginary Surfaces.*

POOR VISIBILITY AND CEILING (PVC). Is a condition that exists whenever the cloud ceiling is less than 500 feet and/or the visibility is less than one statue mile.

PRECISION APPROACH PATH INDICATOR (PAPI). See *Navigational Aid.*

PUBLIC USE AIRPORT. An airport that is open to the general public with or without a prior request to use the airport.

RADAR (RADIO DETECTION AND RANGING). A device which, by measuring the time interval between transmission and reception of radio pulses, provides information on range, azimuth and/or elevation of objects in the path of the transmitted pulses.

RADAR SERVICE. A term which encompasses aircraft separation, navigation guidance, and/or flight track monitoring services based on the use of radar which can be provided by a controller to a pilot of a radar-identified aircraft.

RADAR SURVEILLANCE. The radar observation of a given geographic area for the purpose of performing some radar function.

RADIAL. A magnetic bearing extending from a VOR, a VORTAC, or a TACAN navigational facility.

RAMP. Synonymous with Apron. See *Apron.*

RECORD OF DECISION (ROD). A public document that reflects the FAA's final decision of an EIS, rationale behind that decision, and commitments to enforce and monitor mitigation.

REGIONAL JET. See *Aircraft.*

REGRESSION ANALYSIS. A statistical technique that seeks to identify and quantify the relationships between factors associated with a forecast.

RELIEVER AIRPORT. See *Airport.*

RETENTION PONDS. Storm water management ponds that hold water for several months.

RISK ASSESSMENT. See *Safety Management System.*

RNAV. See *Performance Based Navigation*

RNP. See *Performance Based Navigation.*

ROADWAY SIGN. See *Airport Signs.*

ROCKET. See *Aircraft.*

ROTATING BEACON. See *Navigation Aid.*

ROTORCRAFT. See *Aircraft.*

RUNWAY (RW). Defined as rectangular surface on an airport prepared or suitable for the landing and takeoff of airplanes. Runways can be classified as the following:

- **Instrument Runway.** A runway equipped with electronic and visual navigation aids for which a precision or nonprecision approach procedure having straight-in landing minimums has been approved.
- **GPS Runway.** A runway having a precision or nonprecision approach procedure using GPS navigational guidance with or without vertical guidance.
- **Nonprecision Instrument Runway.** A runway having an existing instrument approach procedure utilizing air navigation facilities with only horizontal guidance for which a straight-in or side-step nonprecision approach procedure has been approved.
- **Nonprecision Runway.** A runway with only horizontal guidance available.
- **Parallel Runways.** Two or more runways at the same airport whose centerlines are parallel. In addition to runway number, parallel runways are designated as L (left) and R (right) or, if three parallel runways exist, L (left), C (center), and R (right).
- **Precision Instrument Runway.** A runway having an existing instrument approach procedure utilizing air navigation facilities with both horizontal and vertical guidance for which a precision approach procedure has been approved.
- **Utility Runway.** A runway that is constructed for and intended to be used by propeller driven aircraft of 12,500 pounds maximum gross weight and less.
- **Visual Runway.** A runway without an existing or planned straight-in instrument approach procedure and no instrument approach procedure/equipment.

RUNWAY ALIGNMENT INDICATOR LIGHTS (RAILS). See *Approach Light System.*

RUNWAY BLAST PAD. A surface adjacent to the ends of the runways provided to reduce the erosive effect of jet blast and propeller wash.

RUNWAY CENTERLINE LIGHTING. See *Airport Lighting.*

RUNWAY DESIGN CODE (RDC). A code signifying the design standards to which a runway is to be built.

RUNWAY DISTANCE REMAINING SIGN. See *Airport Signs.*

RUNWAY EDGE LIGHTS. See *Airport Lighting.*

RUNWAY END IDENTIFIER LIGHTS (REIL). See *Airport Lighting.*

RUNWAY ENVIRONMENT. The physical runway and the areas surrounding the runway out to the hold position marking.

RUNWAY GRADIENT. The ratio of the change in elevation divided by the length of the runway expressed as a percentage.

RUNWAY HEADING. The magnetic direction that corresponds with the runway centerline extended.

RUNWAY INCURSION. Any occurrence at an airport involving the incorrect presence of an aircraft, vehicle, or person on the protected area of a surface designated for the landing and takeoff of aircraft.

RUNWAY LIGHTS. See *Airport Lighting.*

RUNWAY PROTECTION ZONE (RPZ). A trapezoidal area off the runway end intended to enhance the protection of people and property on the ground.

RUNWAY SAFETY AREA (RSA). A defined surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway.

RUNWAY VISUAL RANGE (RVR). The distance over which a pilot of an aircraft on the centerline of the runway can see the runway surface markings delineating the runway or identifying its centerline. RVR is normally expressed in feet.

SAFETY ASSESSMENT. See *Safety Management System.*

SAFETY ASSURANCE. See *Safety Management System.*

SAFETY MANAGEMENT SYSTEM (SMS). The formal top-down business-like approach to managing safety risk. It includes systematic procedures, practices, and policies for the management of safety (including safety risk management, safety policy, safety assurance, and safety promotion).

- **Gap Analysis*.*** Identification of existing safety components, compare to SMS program requirements. Gap analysis provides an airport operator an initial SMS development plan and Safety roadmap to compliance.
- **Hazard*.*** Any existing or potential condition that can lead to injury, illness, or death to people; damage to or loss of a system, equipment, or property, or damage to the environment. A hazard is a condition that is a prerequisite to an accident or incident.
- **Risk Assessment.** Assessment of the system or component to compare the achieved risk level with the tolerable risk level.
- **Safety Assessment.** A systematic, comprehensive evaluation of an implemented system.
- **Safety Assurance*.*** SMS process management functions that systematically provides confidence that organizational products/services meet or exceed safety requirements.
- **Safety Policy.** Defines the fundamental approach to managing safety that is to be adopted within an organization. Safety policy further defines the organization's commitment to safety and overall safety vision.
- **Safety Promotion**. A combination of safety culture, training, and data sharing activities that supports the implementation and operation of an SMS in an organization.

- **Safety Risk Control.** Anything that mitigates the safety risk of a hazard. Safety risk controls necessary to mitigate an unacceptable risk should be mandatory, measurable, and monitored for effectiveness.
- **Safety Risk Management (SRM).** A formal process within the SMS composed of describing the system, identifying the hazards, assessing the risk, analyzing the risk, and controlling the risk. The SRM process is embedded in the operation system: is not a separate/distinct process.
- **Severity**. The consequence or impact of a hazard in terms of degree of loss or harm.

SAFETY POLICY. See *Safety Management System.*

SAFETY PROMOTION. See *Safety Management System.*

SAFETY RISK. See *Safety Management System.*

SAFETY RISK CONTROL. See *Safety Management System.*

SAFETY RISK MANAGEMENT (SRM). See *Safety Management System.*

SCOPE. The document that identifies and defines the tasks emphasis, and level of effort associated with a project or study.

SELF-FUELING. The fueling of an aircraft by the owner or operator of the aircraft.

SEGMENTED CIRCLE. A circle located on an airport where wind and runway pattern information are located. It performs two functions: it aids the pilot in locating the obscure airports, and it provides a centralized location for wind and traffic pattern indicators as may be required on a particular airport.

SEPARATION. The spacing of aircraft to achieve their safe and orderly movement in flight and while landing and taking off.

SEPARATION MINIMA. The minimum longitudinal, lateral, or vertical distances by which aircraft are spaced through the application of air traffic control procedures.

SEVERITY. See *Safety Management System.*

SHOULDER. An area adjacent to the edge of paved runways, taxiways, or aprons providing a transition between the pavement and the adjacent surface; support for aircraft running off the pavement; enhanced drainage; and blast protection.

SMALL AIRPLANE. *See Aircraft.*

SMALL HUB AIRPORT. See *Airport.*

SNOW REMOVAL EQUIPMENT (SRE). Equipment, such as plow trucks and brooms, to remove snow from the paved surfaces on an airport.

SPONSOR. A public agency or private owner of a public-use airport that submits to the Secretary an application for financial assistance for the airport.

STATUTE MILE. A regular "highway" mile measuring 5,280 feet.

STOP END OF RUNWAY. The far runway end as viewed from the cockpit of a landing airplane.

STOPWAY. An area beyond the stop end of the takeoff runway which is no less wide than the runway and is centered on the extended centerline of the runway. It is able to support an airplane during an aborted takeoff without causing structural damage to the airplane, and designated by airport authorities for use in decelerating the airplane during an aborted takeoff. A blast pad is not a stopway.

SURFACE MOVEMENT GUIDANCE AND CONTROL SYSTEM (SMGCS). Systems providing routing, guidance, surveillance and control to aircraft and affected vehicles in order to maintain movement rates under all local weather condition within the Aerodrome Visibility Operational Level (AVOL) whilst maintaining the required level of safety.

SYSTEM OF AIRPORT REPORTING (SOAR). The FAA Office of Airport integrated database that contains airport planning, development, and financial information.

STRAIGHT-IN APPROACH. Entry into the traffic pattern by interception of the extended runway centerline (final approach) without executing any other portion of the traffic pattern.

TACTICAL AIR NAVIGATION (TACAN). See *Navigation Aid.*

TAILWIND. Any wind more than 90 degrees to the longitudinal axis of the runway.

TAKEOFF DISTANCE AVAILABLE (TODA). See *Declared Distances.*

TAKEOFF RUN AVAILABLE (TORA). See *Declared Distances.*

TAXI. The movement of an airplane under its own power on the surface of an airport.

TAXILANE (TL). The portion of the aircraft parking area used for access between taxiways and aircraft parking positions. A taxilane is outside the movement area, and is normally not controlled by the Air Traffic Control Tower.

TAXIWAY (TW). A defined path established for the taxiing aircraft from one part of an airport to another.

- **Parallel Taxiway.** A taxiway whose centerline is parallel to an adjacent runway.

TAXIWAY/TAXILANE OBJECT FREE AREA (TOFA). Clearing standards which prohibit service vehicle roads, parked aircraft, and other objects, except for objects that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes. Vehicles may operate within the OFA provided they give right of way to oncoming aircraft.

TAXIWAY/TAXILANE SAFETY AREA (TSA). A defined surface alongside the taxiway prepared or suitable for reducing the risk of damage to an airplane unintentionally departing the taxiway.

TAXIWAY DESIGN GROUP (TDG). FAA aircraft classification system for taxiway design based on design aircraft undercarriage dimensions. These include the overall Main Gear Width (MGW) and the Cockpit to Main Gear Distance (CMG).

TECHNICAL ADVISORY COMMITTEE (TAC). A group of individuals that provide input on technical issues.

TERMINAL AREA. A general term used to describe airspace in which approach control service or airport traffic control service is provided.

TERMINAL AREA FORECAST (TAF). The official forecast of aviation activity, both aircraft and enplanements, at FAA facilities. This includes FAA-towered airports, federally contracted towered airports, non-federal towered airports, and many non-towered airports.

TERMINAL INSTRUMENT PROCEDURES (TERPS). Published flight procedure standards for conducting instrument approaches to runways under instrument meteorological conditions. Information on TERPS is contained in FAA Order 8260.3, United States Standard for Terminal Instrument Procedures (TERPS).

THRESHOLD (TH). The beginning of that portion of the runway available for landing. In some instances, the landing threshold may be displaced.

- **Displaced Threshold.** A threshold that is located at a point on the runway other than the designated beginning of the runway.

THRESHOLD LIGHTING. See *Airport Lighting.*

THROUGH-THE-FENCE (TTF) OPERATIONS. Those activities permitted by the airport sponsor through an agreement that permits access to the public landing area by independent entities or operator offering an aeronautical activity or to owners of aircraft based on land adjacent to, but not a part of, the airport property. The obligation to make an airport available for the use and benefit of the public does not impose any requirement for the airport sponsor to permit ground access by aircraft from adjacent property.

THROUGHPUT CAPACITY. See *Capacity.*

TOUCH AND GO. A training operation in which a landing approach is made, the aircraft touches-down on the runway, but does not fully reduce speed to turn off the runway. Instead, full engine power is applied while still rolling and a takeoff is made, thereby practicing both maneuvers as part of one motion. It counts as two separate aircraft operations.

TOUCHDOWN ZONE LIGHTING. See *Airport Lighting.*

TRACK. The flight path of an aircraft over the surface of the earth.

TRAFFIC PATTERN. The traffic flow that is prescribed for aircraft landing at, taxiing on, or taking off from an airport. The following defines components of a standard traffic pattern:

- **Base Leg.** A flight path at right angles to the landing runway off its approach end. The base leg extends from the downwind leg to the intersection of the extended runway centerline.
- **Crosswind Leg.** A flight path at right angles to the landing runway off its upwind end.
- **Downwind Leg**. A flight path parallel to the landing runway in the direction opposite to landing. The downwind leg normally extends between the crosswind leg and the base leg.
- **Upwind Leg.** A flight path parallel to the landing runway in the direction of the landing.

TRANSITIONAL SURFACE. See *Imaginary Surfaces.*

TRANSIENT OPERATIONS. See *Operation.*

TRANSPORTATION SECURITY ADMINISTRATION (TSA). An agency established in 2001 to safeguard United States transportation systems and to insure safe air travel. TSA operates under the Department of Homeland Security.

TRUE HEADING. A heading relative to the actual North and South Poles of the Earth, rather than the magnetic poles.

TURBINE ENGINE. See *Aircraft Engine.*

TURBOFAN. See *Aircraft Engine.*

TURBOJET. See *Aircraft Engine.*

TURBOPROP. See *Aircraft Engine.*

UNCONTROLLED AIRPORT. See *Airport.*

UNCONTROLLED AIRSPACE. Airspace where an ATC service is not deemed necessary or cannot be provided for practical reasons. Uncontrolled airspace is a generic term that covers Class F and Class G Airspace.

UNIVERSAL INTEGRATED COMMUNICATIONS (UNICOM). An air-ground communication facility operated by a private agency to provide advisory service at uncontrolled airport. Aircraft call the ground station to make announcements of their intentions. In some cases, the ground station is not staffed. If no one is staffing the ground station, pilots broadcast their location and intentions over the UNICOM or CTAF channel. When the ground station is closed this is done without an acknowledgement.

UPWIND LEG. See *Traffic Pattern.*

UTILITY RUNWAY. See *Runway.*

VISIBILITY. A measure of the horizontal opacity of the atmosphere at which prominent unlighted objects may be seen and identified by day and prominent lighted objects may be seen and identified by night; and is expressed in terms of the horizontal distance at which a person should be able to see and identify, is measured in statute miles.

VISUAL APPROACH. An approach conducted on an IFR flight plan which authorizes the pilot to proceed visually and clear of clouds to the airport. The pilot, at all times, must have either the airport or the preceding aircraft in sight. Reported weather at the airport must be ceiling at or above 1,000 feet and visibility of three miles or greater.

VISUAL APPROACH SLOPE INDICATOR (VASI). See *Navigational Aid.*

VISUAL FLIGHT RULES (VFR). Procedures for the conduct of flight in weather conditions above Visual Flight Rules (VFR) weather minimums. The term VFR is often also used to define weather conditions and type of flight plan under which an aircraft is operating. VFR is defined as the weather condition whenever the cloud ceiling is at least 1,000 feet above ground level and visibility is at least three statue miles.

VISUAL METEOROLOGICAL CONDITIONS (VMC). Meteorological conditions expressed in terms of specific visibility and ceiling conditions which are equal to or greater than the threshold values for IMC.

VISUAL RUNWAY. See *Runway.*

VOR. See *Navigation Aid.*

VORTAC. See *Navigation Aid.*

WAKE TURBULENCE. The air turbulence caused by a moving aircraft, originating at the tips of the wings. The turbulence is caused by vortices generated by an aircraft's wingtips as it travels through the air. This turbulence is greatest when the aircraft is taking off and landing.

WIDE AREA AUGMENTATION SYSTEM (WAAS). An enhancement of the GPS that includes integrity broadcasts, differential correction, and additional ranging signals for the purpose of providing the accuracy, integrity, availability, and continuity required to support all phases of flight.

WILDLIFE ATTRACTANTS. Any human-made structure, land-use practice, or human-made or natural geographic feature that can attract or sustain hazardous wildlife within the approach or departure airspace or the airport's AOA. These attractants can include architectural features, landscaping, waste disposal sites, wastewater treatment facilities, agricultural or aquaculture activities, surface mining, or wetlands.

WILDLIFE HAZARD ASSESSMENT (WHA). An FAA assessment to assess the potential of, and mitigate the risk of wildlife strikes at an airport. It includes an analysis of the airport's wildlife strike history; the identification of the wildlife species observed and their numbers, locations, local movements, and daily and seasonal occurrences; the identification and location of features on and near the airport that attract wildlife; a description of wildlife hazards to aircraft operations; and ultimately, if required, a Wildlife Hazard Management Plan (WHMP) to identify measures to be implemented to reduce the risk of wildlife strikes.

WIND COVERAGE. The percent of time for which aeronautical operations are considered safe due to acceptable crosswind components.

WIND DIRECTION. The opposite direction in which the windsock is pointing, and is specified in terms of a magnetic heading.

WINDSOCK (WIND CONE). A conical textile tube designed to indicate wind direction and relative wind speed.

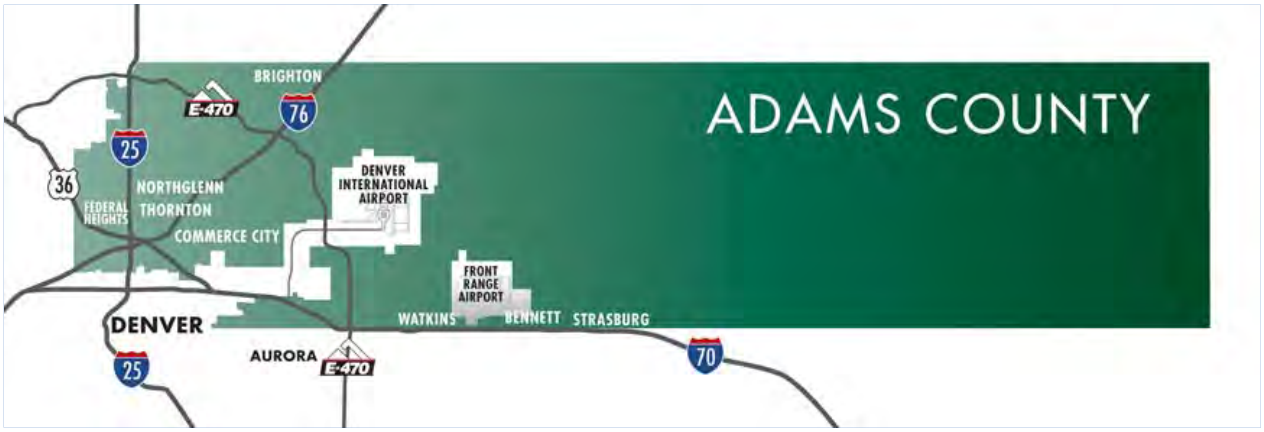
WINGSPAN. The maximum horizontal distance from one wingtip to the other wingtip, including the horizontal component of any extensions such as winglets or raked wingtips.

APPENDIX B – LAND USE PLAN

B.1 Existing Airport Location

Front Range Airport (FTG or the Airport) is situated in the southwestern portion of Adams County (**Figure B-1**), six miles southeast of Denver International Airport and four miles north of State Route 36 - East Colfax Avenue and I-70. Both roads are oriented east-west. Adams County is the airport sponsor, and is also responsible for land use control through the adoption and enforcement of land use plans, zoning ordinances, site plan review, and the issuance of building permits.

FIGURE B-1 – ADAMS COUNTY



Source: Adams County Economic Development (ACED), https://www.adamscountyed.com/

As noted in the Adams County Comprehensive Plan:

> "Adams County contains a total of 1,185 square miles (759,000 acres). Land uses range from intensive urban activities in the western portions of the County, to crop and razing land in the central and eastern portions of the County. Eight incorporated cities and two towns are wholly or partially located in Adams County, including the cities of Arvada, Aurora, Brighton, Commerce City, Federal Heights, Northglenn, Thornton, and Westminster and the towns of Bennett and Lochbuie. Together, they comprise 15% of the County's total land area. Agricultural activities are the single largest land use throughout the County, accounting for more than three quarters of the land area. An extensive network of canals in the northwest part of the County supports most of the irrigated farmland."[1]

The predominant existing land use in the vicinity of Front Range Airport is open space, primarily agricultural (**Figure B-2**).

[1] Source: Adams County Comprehensive Plan, Chapter 4, Economic Development, December 2012

FIGURE B-2 – OPEN SPACE IN THE VICINITY OF FRONT RANGE AIRPORT

Source: Google Earth, 2017

B.2 Adams County Comprehensive Plan

The policy document driving the existing County zoning and land use is the Adams County Comprehensive Plan, last adopted in December 2012. It is the official policy document of the Adams County Planning Commission and Board of County Commissioners, and provides a concise statement of the County's objectives for future development within unincorporated areas of the County and in municipal growth areas. Specifically, it establishes goals, policies, and strategies to:

- Guide day-to-day decision making regarding future growth and public investment in the County over the next ten to twenty years;
- Promote intergovernmental coordination at a local and regional level;
- Guide future growth and promote public and private investment;
- Coordinate activities and investment with other County Plans including the Transportation Plan; Open Space, Parks and Trails Master Plan; Hazard Identification and Risk Assessment, and other neighborhood and subarea plans;
- Protect the health, safety, and welfare of Adams County's inhabitants; and
- Promote a more sustainable and resilient Adams County.

The six goals of the Adams Count Comprehensive Plan include the following:

1. Promote Coordinated and Connected Growth;
2. Protect the Health, Safety, and Welfare of Adams County's Inhabitants;
3. Foster Regional Collaboration and Partnerships;

4. Reduce the Fiscal Impact of Growth;
5. Promote Economic Vitality; and
6. Preserve the County's Natural Resources.

Of the multiple policies presented in the Plan, Front Range Airport is only specifically mentioned with respect to Economic Development. Specifically, the Airport is recognized in the following two strategies:

> "Strategy 4.1.a - Supply of Suitable Land – Through zoning and other land use authority, provide an adequate supply of both serviced and raw land suitable for commercial and industrial development and redevelopment, especially at key E-470 interchanges, along the I-70, I-25, I-76, I-270, US 85 corridors and other major highway corridors, at Front Range Airport, and in the vicinity of Denver International Airport."[2]

> "Strategy 4.1.e - Leverage County Assets – Market and invest in the existing economic assets the County possesses. Determine how the County can best leverage existing assets, such as Front Range Airport, DIA, future transit stations, and major transportation corridors, to attract new employers and strengthen the existing businesses related to these assets. Determine the potential for economic growth in the County from the proposed Aerotropolis/Airport City plans for DIA and from the development of a spaceport at Front Range Airport to ensure land use plans adequately plan for these significant projects." [3]

Additionally, the County's Comprehensive Plan also notes that:

> "It (Front Range Airport) is also planned as a mixed use/employment area, particularly for aviation-dependent industries. It is one of the only multi-modal locations in the United States with onsite access to major road, rail, and air facilities. . . The State of Colorado and the County are advocating for a spaceport at Front Range Airport, which could become an important hub of economic development and growth, first for private cargo or research flights and then eventually as launching grounds for space tourism."[4]

This resulted in the establishment of the following policies and strategies associated with FTG:

> "POLICY 11.4: INFORM DEVELOPMENT OF POTENTIAL AIRPORT-RELATED IMPACTS
>
> *Alert future residents of Estate Residential development of any potential airport-related impacts.*
>
> Strategy 11.4.a. Easements of Notice — Continue to require avigation easements and/or notice to prospective purchasers of residential property located within two miles (or other appropriate distance) of the 60 Ldn noise contour associated with the full build out of Front Range and Denver International Airports.
>
> POLICY 18.1: SUPPORT THE EXPANSION OF THE FRONT RANGE AIRPORT
>
> *Continue to support and develop the Front Range Airport to accommodate large aircraft, as a general aviation and intermodal cargo hub for the state and region.*
>
> Strategy 18.1.a. Zoning Provisions – Review zoning provisions to ensure that aviation-related and supporting commercial and employment uses are permitted by right within the Airport

[2] Adams County Comprehensive Plan, Chapter 3, Countywide Policies & Strategies, December 2012
[3] Adams County Comprehensive Plan, Chapter 3, Countywide Policies & Strategies, December 2012
[4] Adams County Comprehensive Plan, Chapter 4, Area-Specific Policies and Strategies, December 2012

Influence Zone. Require all uses within the Front Range Airport Overlay to go through the special use permit process to ensure interim uses do not limit or preclude the long-term expansion of the airport.

Strategy 18.1.b. Airport Master Plan – Review and update the Airport Master Plan at least every 5 years. Require avigation easements and disclosure statements as a condition of development in the Airport Influence Area. Along with Arapahoe County, the Town of Bennett and the City of Aurora adopt a coordinated plan for Front Range Airport and its Influence Zone.

POLICY 18.2: SUPPORT COMPATIBLE COMMERCIAL AND INDUSTRIAL DEVELOPMENT

Support compatible commercial and industrial development around the Front Range Airport.

Strategy 18.2.a. Airport Overlay Zone District – Review and update the underlying A-3 zone's permitted uses and the use restrictions contained in the Airport Overlay Zone District to ensure they adequately encourage the development of a wide range of commercial and industrial uses within the Front Range Airport Influence Zone, while assuring adequate mitigation of any adverse impacts.

Strategy 18.2.b. Incentives – Provide economic incentives that attract new commercial and industrial businesses or that redevelop or expand existing businesses that pay wages higher than the current county average when the economic advantages to the County are greater than the costs of the incentives.

Strategy 18.2.c. Infrastructure Improvements – Invest in infrastructure required to attract and support new industrial and commercial developments when necessary to attract desired new commercial or industrial development including but not limited to roadway improvements, such as paving Manilla Road between I-70 and SH 36; paving remaining unpaved segments of Imboden Road; and the eventual extension of 56th Avenue along the north boundary of the Airport to Peterson Road.

POLICY 18.3: ENSURE COMPATIBLE SURROUNDING USES

Ensure that land uses outside the Airport Influence Zone surrounding the Front Range Airport are compatible with airport operations and impacts.

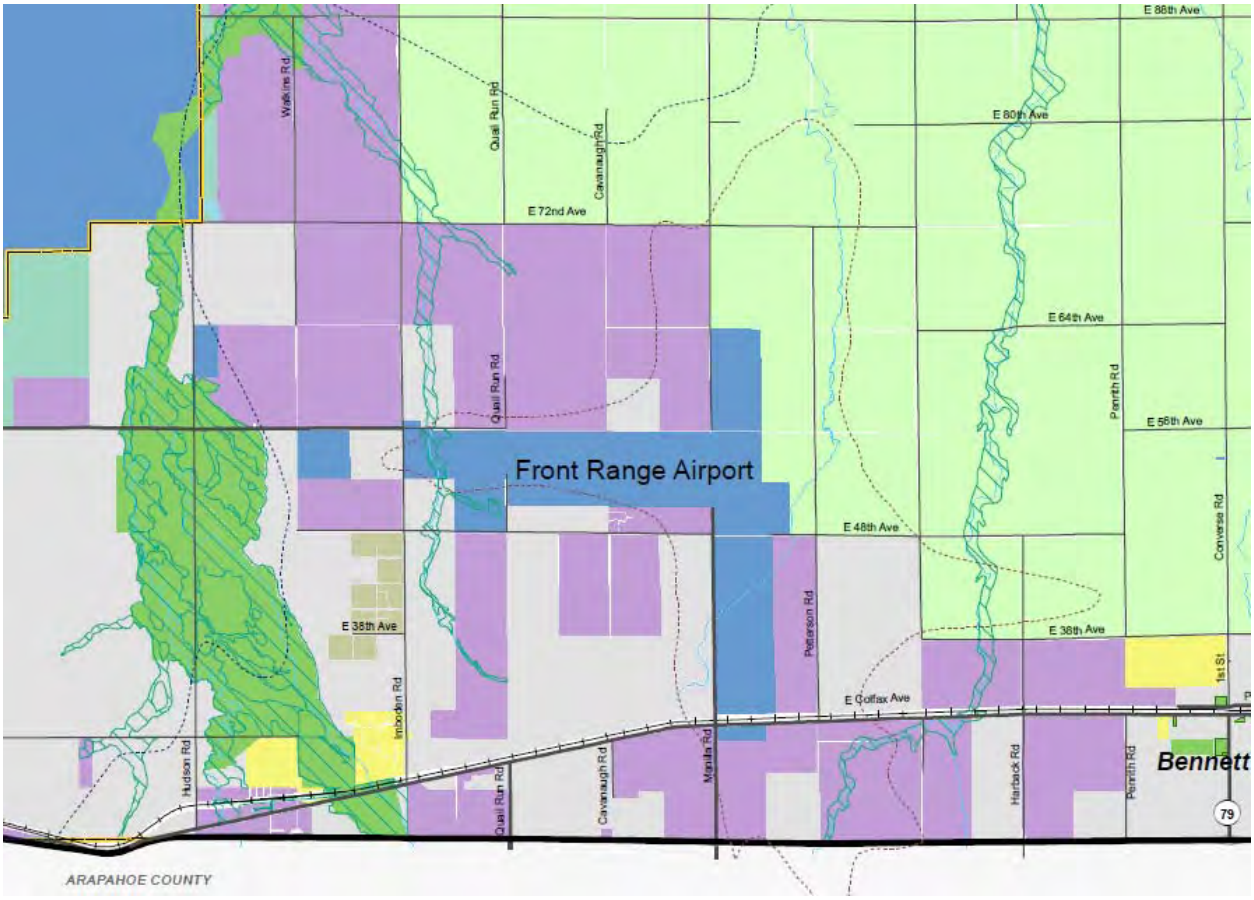
Strategy 18.3.a. Airport Influence Zone – Review the current boundaries of the Airport Influence Zone and amend as appropriate.

Strategy 18.3.b. Referrals — Require proposed development within the Airport Influence Zone to be reviewed by Front Range Airport prior to approval." [5]

Future land uses as proposed by the Adams County Comprehensive Plan for areas around Front Range Airport are shown below in **Figure B-3**.

[5] Adams County Comprehensive Plan, Chapter 4, Area-Specific Policies and Strategies, December 2012

FIGURE B-3 – ADAMS COUNTY COMPREHENSIVE PLAN FUTURE LAND USE (EXCERPT)



Legend

- Adams County Boundary
- Adjacent County
- Water Body
- Existing Parks and Open Space
- Rail
- Future FasTracks Station
- DIA Noise Impact Area
- Front Range Noise Impact Area

Future Land Use

Residential
- Urban Residential
- Estate Residential

Mixed Use
- Mixed Use Neighborhood
- Activity Center
- Mixed Use Employment

Commercial/Industrial
- Commercial
- Industrial

Special Overlays
- Agricultural Tourism Study Area
- Natural Resource Conservation

Other
- Agriculture
- DIA Reserve
- Parks and Open Space
- Public
- Municipal Area

Source: Adams County, CO (http://www.adcogov.org/sites/default/files/2012%20Comprehensive%20Plan.pdf)

From an implementation perspective, these policies and strategies have been codified in the current *Adams County Development Standards and Regulations.*

B.3 Adams County Zoning

Per the current *Adams County Development Standards and Regulations* (last updated August 14, 2017), County zoning (see **Figure B-4**) for the existing Front Range Airport property is classified as Aviation (AV), which is designed to "provide for non-residential land uses associated with aviation operations while minimizing risks to public safety and hazards to aviation users including those employed at public aviation facilities."[6] Permitted uses in the AV district include the following (subject to the plans, terms, and conditions of the Airport Layout Plan and subject to building permit review and approval):

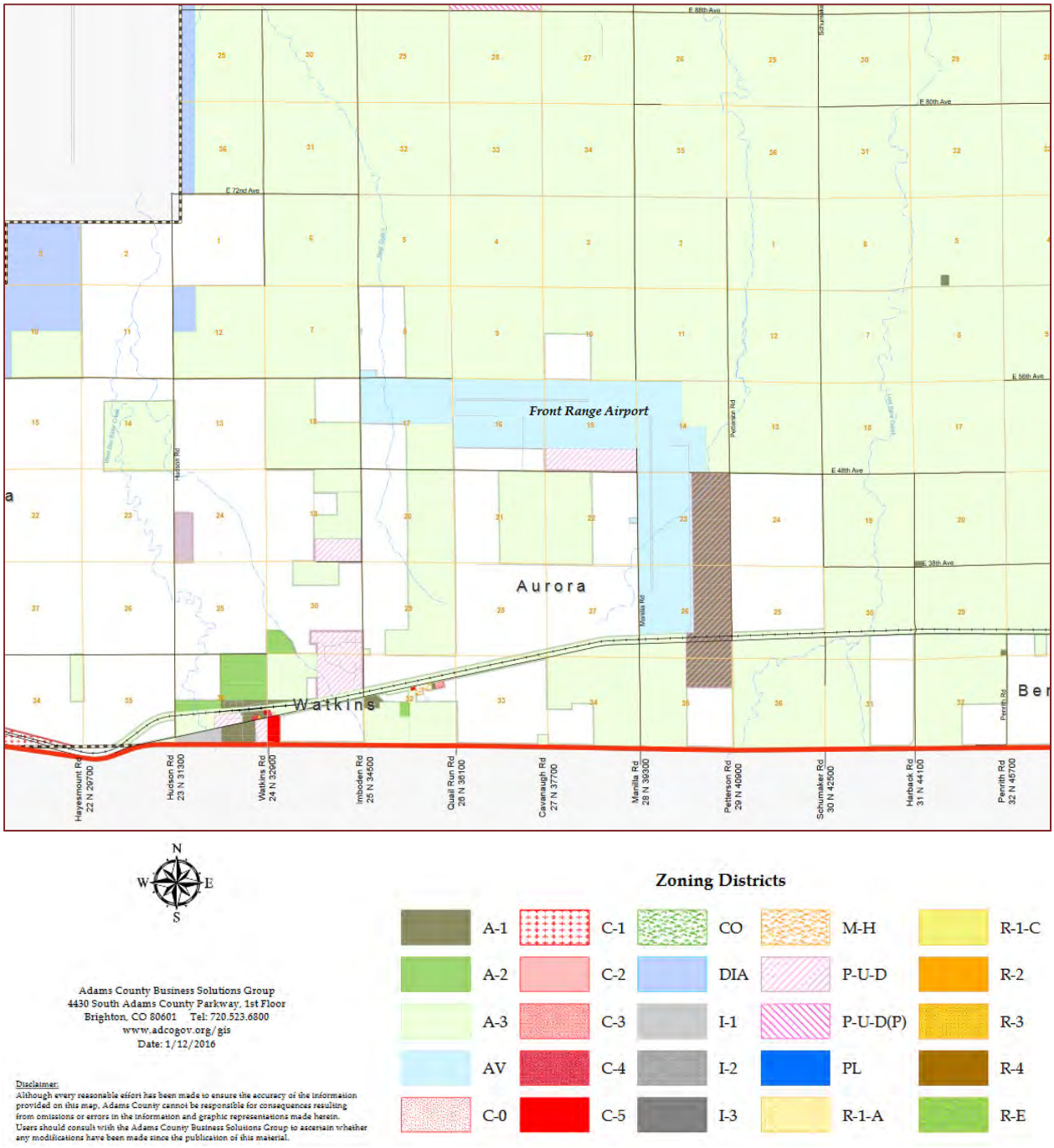
1. Air cargo terminals and freight forwarding facilities
2. Air passenger terminal buildings, hangars, and air traffic control facilities
3. Aircraft sales, repair, service, storage
4. Aviation related manufacturing and distribution uses
5. Farming, no structures
6. Flight kitchens and related facilities
7. Ground transportation facilities such as taxi and bus terminals
8. Noise and weather monitoring devices, navigational aids
9. Outside storage of non-hazardous materials not to exceed 10% of the building area
10. Parking areas for employees and passengers
11. Public and quasi-governmental buildings, structures, and uses essential to the operations including fire stations, pump stations, water tanks, and public utility facilities
12. Ranching, no structures
13. Retail and personal service outlets catering to aviation passengers and employees
14. Runways, taxiways, takeoff and landing areas, aprons, clear zones, and; aircraft tie-down areas
15. Snack shops, restaurants, and lounges for airport clientele
16. Support facilities essential for aviation operations such as fuel storage, hangar use, and associated offices
17. Training schools relating to aircraft operations and service work
18. Underground fuel tanks
19. Traditional Farming, No structures

Prohibited uses in the AV zone include all uses not expressly identified as permitted uses in the previously listed 19 accepted uses; those determined not to be prohibited by the Director of Community and Economic Development pursuant to Section 3-05-01 of the Adams County Zoning Regulations; or those not permitted by the Airport Layout Plan. Additionally, there are a range of additional minimum lot size requirements, setbacks, and general design standards associated with this zoning designation, all of which generally require conformance to the existing Airport Layout Plan, and other County standards.

Much of the property adjacent to Front Range Airport is either nonzoned or zoned as Agricultural District (A-3), as well as several Planned Unit Development (P.U.D.) districts. Generally, with regard to airport compatible land use development, conditional use of agricultural and industrial development is deemed to be consistent with current federal and industry standards, but not that of residential districts.

[6] Adams County, Adams County Development Standards and Regulations, Chapter 3 - Zone District Regulations Public Lands, Parks, Open Space, and Facilities District (PL), August 2017.

FIGURE B-4 – ADAMS COUNTY 2016 ZONING MAP (EXCERPT)



Source: Adams County, CO (http://www.co.adams.co.us/sites/default/files/Zoning_Map_West.pdf)

Additionally, the Adams County Development Standards and Regulations includes use charts that summarize the permitted, conditionally permitted, and prohibited uses in each zone district. With respect to airports, landings strips and heliports, the Adams County use tables are reflected in **Figure B-5**.

FIGURE B-5 – ADAMS COUNTY 2016 ZONING USE CHART (EXCERPT)

USE CATEGORIES	ZONE DISTRICT					
	A-1	A-2	A-3	RE	R-1-C	R-2
COMMERCIAL USES						
Airports, Landing Strips and Heliports	C	C	C	-	-	-

USE CATEGORIES	ZONE DISTRICT						
	R-3	R-4	MH	C-0	C-1	C-2	C-3
COMMERCIAL USES							
Airports, Landing Strips and Heliports	-	-	-	-	-	-	-

USE CATEGORIES	ZONE DISTRICT						
	C-4	C-5	I-1	I-2	I-3	CO	P-L
COMMERCIAL USES							
Airports, Landing Strips and Heliports	-	-	C	C	C	-	C

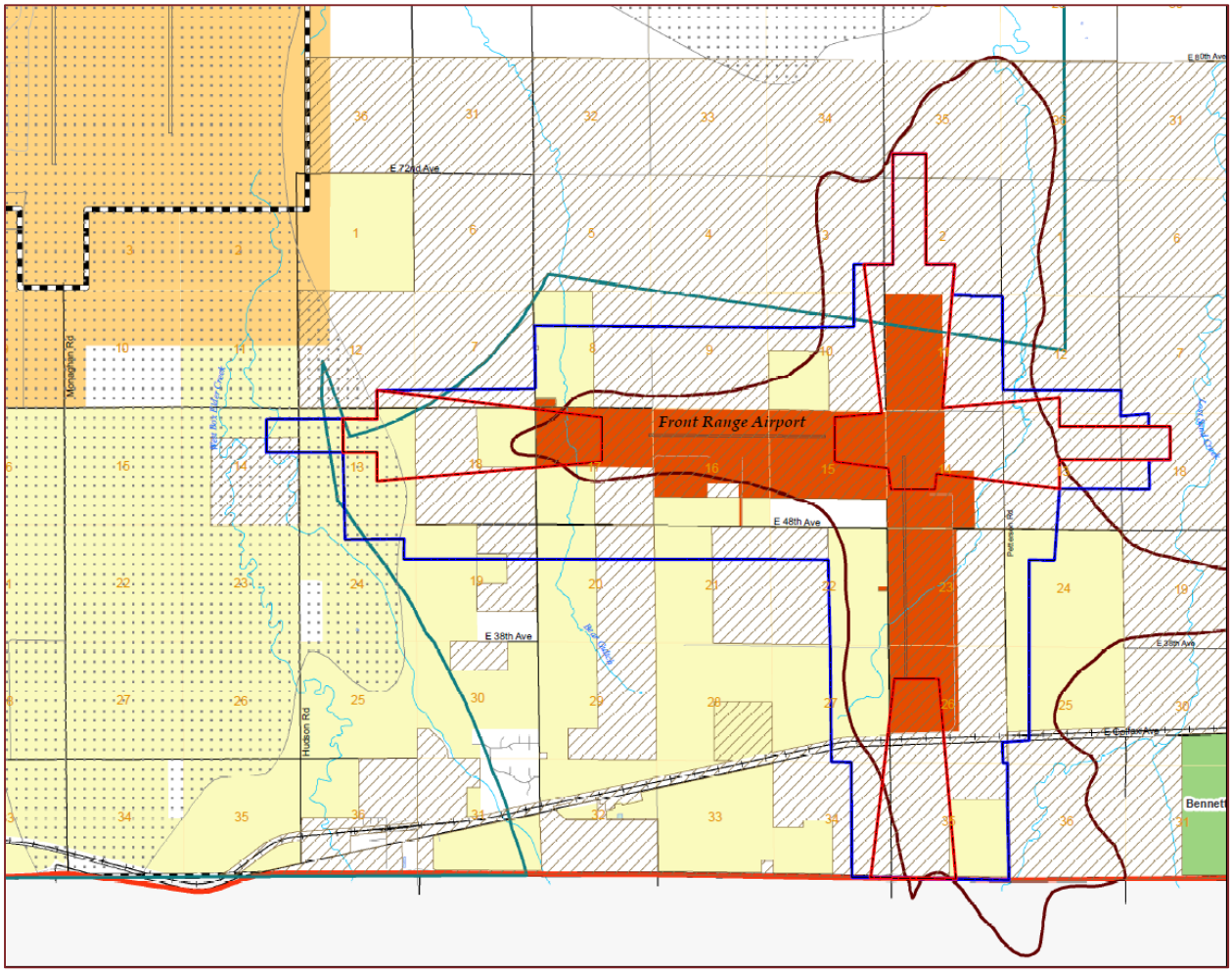
(P) Permitted **(C) Conditional** **(S) Special Use Permit** **(-) Prohibited**

Source: Adams County, CO (http://www.adcogov.org/sites/default/files/Chapter%2003%20-%20Zone%20District%20Regulations_1.pdf)

Beyond zoning, Adams County has adopted three overlay zones pertaining airport activity in the County (see **Figure B-6**). Note that the County requires all land uses within an overlay zone to go through the special use permit process to ensure interim uses do not limit or preclude the long-term expansion of the airports.

- **Airport Influence Zone (AIZ)** - Established for all lands impacted by the location of the Front Range Airport and the noise created by low-flying aircraft. The AIZ is a nine-mile by nine-mile area around FTG generally bounded by 80th Avenue on the north, Interstate 70 (County line) on the south, Harback Mile Road on the east, and Hayesmount Mile Road on the west. The AIZ is intended to provide areas within Adams County suitable for the economical development and safe operation of air carrier and/or general aviation airports for public use without adversely affecting the activities upon surrounding properties. It is also intended to provide for notice and disclosure of the airport location to owners of residential and non-residential properties in areas which may be subjected to aircraft activities of such duration and frequency which would constitute a nuisance to residential and other uses. The AIZ also contains two Restriction Areas, which further restrict the land uses within the overlay zone district, particularly with respect to residential development. The geographic extent of the Airport Influence Zone and the Restriction Areas are delineated on the official Adams County Zoning Map (Figure 7-3).

FIGURE B-6 – ADAMS COUNTY AVIATION OVERLAYS (EXCERPT)



Source: Adams County, CO (http://www.adcogov.org/sites/default/files/Aviation_Overlay_22x34.pdf)

- **Airport Height Overlay (AHO)** - Intended to provide for protection of residential and non-residential land uses in areas which may be subjected to frequent overflights by aircraft flying low to the ground upon an approach to landing, upon takeoff, or operating in a traffic pattern at an aviation facility. Within this area, the hazards of natural and man-made objects may create severe hazards to avigation and must be regulated accordingly. The Airport Height Overlay area includes all land where the height of structures, or natural features may obstruct or otherwise influence aviation activities. The extent of the AHO is determined by applying the standards and criteria listed in Title 14 of the Code of Federal Regulations, Subchapter E, FAR Part 77, *Objects Affecting Navigable Airspace*. Applicants requesting zone changes, conditional uses, temporary and special uses, certificates of designation, site plans, site specific development plans, and building permits must complete an FAA aeronautical study on obstructions to determine if the proposed development could be a hazard to air navigation. If no hazard is determined, the proposed development may proceed, pending compliance with other County requirements.
- **Airport Noise Overlay (ANO) -** Intended to provide for protection of residential and non-residential land uses in areas which may be subjected to noise levels of such duration and frequency which would constitute a nuisance to residential and other uses. The ANO includes all land heavily impacted by the noise created by low-flying aircraft, and lying within the sixty (60) Ldn or greater noise contour area. These computations are based upon the fleet mix that forms the "worst case scenario" for the type and volume of aircraft activity proposed at full build-out of the facility. The geographic extent of the noise overlay for each aviation facility affecting Adams County is delineated on the official Adams County Zoning Map (Figure 7-3). Prohibited land uses within the ANO include all uses not expressly identified as permitted uses in the underlying zone district; or determined to be permitted by the Director of Planning and Development. In addition, specifically prohibited uses in an Airport Noise Overlay Zone include neighborhood indoor uses, institutional care, and universities.

B.4 Future Land Use Considerations

In the Fall of 2015, voters in Adams County approved amendments to the Intergovernmental Agreement (IGA) between Adams County and the City of Denver to create a 1,500-acre pilot program on Denver International Airport (DIA) to allow a wider spectrum of commercial uses than is currently permitted under the original 1988 IGAs. For example, the pilot program clearly would allow uses such as retail, office parks, warehouses and manufacturing even if they are not directly related to airport operations or aviation.

Denver and Adams County communities will also create a regional entity to jointly market these new commercial business opportunities at DIA and the region – and possibly plan, fund and develop regional infrastructure over time.

Land-use restrictions also will be lifted on property on the edges of DIA. These "clear zones" were initially created as a buffer around DIA but there is now consensus that the restrictions are no longer needed. Adams County and overlapping municipalities would receive 100 percent of the tax revenue from new development in the clear zones, while DIA would retain the lease revenue.

The changes to the IGA will strengthen the on-going expansion of the greater Denver metropolitan region to the east, into Adams County. As noted in Adams County Comprehensive Plan: "Adams County's location within the Denver Metropolitan Area and proximity to major economic generators such as Denver International Airport, Front Range Airport, and the I-70, E-470, I-25, I-76, US 85, and I-270 corridors and other highway corridors present numerous opportunities from an economic and community development perspective. The County should continue to work with its economic development partners to increase awareness of opportunities for infill and redevelopment in the Southwest Area of the County; to preserve opportunities for

longer-term growth in the central portions of the County; and to increase awareness of the opportunity for businesses to benefit from the County's lower tax rate."[7]

B.5 Airport Land Use Compatibility

B.5.1 What is airport compatible land use?

Airport compatible land uses can be defined as "those uses that can co-exist with an airport without constraining the safe and efficient operation of the airport or exposing people living or working nearby to unacceptable levels of noise or hazards." This definition is intentionally broad since there are many variables that must be factored when considering whether a given land use is compatible with in an airport operational environment. For example, variables that can influence the compatibility of a given land use include how the land is managed; the location of the land use relative to the airport, and specifically, its runways; the attributes of the land use; and the potential ancillary impacts associated with the land uses. Consequently, it is reasonable to infer that airport land use compatibility is highly fluid and very dependent on the individual circumstances present in any given environment. However, regardless of those variabilities, the underlying premise that must be addressed to identify and assess the degree of compatibility of the land use rests in two general questions:

1. What conditions are required for the airport to operate safely and efficiently? (Conversely, what land use characteristics can adversely affect airport operations?)
2. What airport attributes could potentially compromise the safety and setting of people living or working in neighborhoods surrounding the airport?

These two questions form the foundation of any evaluation of land use compatibility near airports. At the local level, answers to these questions should guide the development and implementation of compatible land use planning tools and techniques to promote both the safety of aircraft operations and the well-being of persons on the ground near an airport.

B.5.2 Why is airport land use compatibility important?

Incompatible land use is considered to be an issue of high importance for the FAA in its efforts to maintain the capacity and safety of the nation's aviation system. As the federal agency charged with the oversight of the nation's aviation system, the FAA recognizes that airport land use compatibility is not a new subject for airport planners and managers. Over the years the subject has been well-discussed and well-researched – it continues to be a growing and evolving issue for the aviation industry and the airport community.

Historically, many airports were built in undeveloped and unwanted areas located well away from population centers. Those airports that were constructed near or in towns were often done to stimulate local economies by leveraging the burgeoning aviation industry. As economies developed, often related to airport activities, towns expanded and naturally grew around their centers of economic activity, including those same airports. Inevitably, conflicts over airport noise, safety, and airspace protection arose. Oftentimes these conflicts have resulted in operational and developmental limitations being directly or indirectly imposed on the airports as a result of encroaching incompatible land use development. Unfortunately for airports, these limitations can significantly retard their effectiveness as a transportation asset and their value to the community.

The pattern of an airport essentially being suffocated by the very community development that it had initially helped to spur is one that has been repeatedly experienced throughout the country. What has changed on a

[7] Adams County Comprehensive Plan, Chapter 4, Area-Specific Policies and Strategies, December 2012

national level is that most airports are no longer open fields and turf landing strips – many are now multi-billion-dollar transportation assets that are essentially irreplaceable.

Viable development sites where a new airport could be built are simply becoming much more difficult to find. As the number of federal, state, and local regulations and environmental restrictions continues to increase significantly, the cost of building becomes more prohibitive and the availability of buildable properties continues to decline. Moreover, communities themselves have become increasingly resistant to hosting airports, regardless of their economic value.

Beyond those difficulties, even when a new site is found and a new airport constructed, one of the fundamental qualities of an airport is that it will ultimately become an economic generator – attracting industries, development and people. Without proper land use management to ensure appropriate compatibility, the cycle likely will ultimately repeat itself. Essentially, without proper land use compatibility planning, a new airport is almost guaranteed to experience the same development patterns that may have caused their relocation in the first place. These conflicts play out across the nation daily—within large urban areas as well as the smaller rural towns—as communities and airports struggle to find a balance between airport operations and compatible land use.

In order to help avoid these cycles, federal legislation and regulations related to compatible land use planning were initially developed with the advent of jet aircraft in the 1960s. As air travel continued to evolve into a primary mode of travel, federal interest in appropriate land use management has only increased. Specifically, noise and safety are two of the most important considerations in determining the effect of airport operations on the surrounding land use and vice versa. Since that time, the federal initiative to assure compatibility between airport operations and the surrounding environment has been promoted and advanced by the FAA.

Today, the FAA is an instrumental force in encouraging and promoting compatible land use planning, which it does through direct guidance and multiple support programs. However, the FAA by itself cannot specifically mandate appropriate land use around airports. Several of the most important airport-related regulations and design requirements produced by the FAA and other industry resources that influence airport land use compatibility include the following:

- The FAA Advisory Circular 150-5300-13A, *Airport Design*, defines setback requirements and Runway Protection Zones (RPZ).
- The FAA Advisory Circular 150-5070-6, *Airport Master Plans*, defines guidelines in preparing and airport master plan, including land use planning.
- The Aviation Safety and Noise Abatement Act of 1979 requires establishment of a single noise metric system to measure cumulative aircraft noise exposure and identification of compatible land uses.
- The Federal Aviation Regulation Part 150 Noise Compatibility Program is the primary federal regulation regarding noise related land use compatibility on and around airports.
- The Airport and Airway Improvement Act of 1982 is the funding mechanism utilized by the FAA for improvement projects and which requires grant recipients to meet grant assurances.
- The Airport Noise and Capacity Act of 1990 established the national aviation-related noise policy.
- The National Environmental Policy Act (NEPA) of 1969 has a variety of environmental impacts related to airport land use and noise compatibility.
- Airport Cooperative Research Program (ACRP) Report 27 - *Enhancing Airport Land Use Compatibility* (2010).
- Washington State Department of Transportation (WSDOT) *Airports and Compatible Land Use Guidebook* (2011).

The preservation of airports from the encroachment of incompatible land uses must be a priority for airports and their host communities. But in order to ensure the success of land use compatibility planning, it is critical that airports and local communities take active roles to develop, implement, and maintain land use compatibility programs at their airports. More than ever, it is imperative that a cooperative approach to airport land use compatibility planning be embraced. For that reason, the FAA actively encourages airport owners, state aviation officials, and local jurisdictions to work together to develop compatible land uses around airports to protect these important transportation and economic assets.

B.5.3 What are the most common land use compatibility concerns?

While there are many specific concerns related to airport land use compatibility, they can be grouped into two broad categories: noise-related concerns and safety-related concerns. Each category is generally described below.

Noise-Related Concerns

Aircraft noise is a primary concern when addressing airport compatible land uses and is an important consideration that has the potential to significantly affect airport operations. Aircraft operations can create sound levels that produce annoyance in populated areas near airports, as well as additional effects such as speech interference, sleep disturbance, and affected classroom learning. These quality-of-life impacts are often directly related to the presence and location of population densities near an airport.

It should also be noted that noise-related concerns are most frequently associated with larger, commercial air service airports due to the size of their typical aircraft, the frequency of their operations, and their resultant noise signatures. General aviation airports do not typically experience the same level of noise-related concerns. This is due to the smaller aircraft that typically operate at these types of airports and the lower frequency of their normal operations.

Safety-Related Concerns

Addressing the safety-related aspects of airport land use compatibility can pose a greater challenge than noise issues. Dealing with safety is primarily preventing possible problems, whereas noise is a mitigation of existing conditions. Safety-related concerns are particularly relevant for smaller general aviation airports since many lack the resources and support required to appropriately address these concerns. For land use compatibility planning purposes, safety-related concerns can be divided into two broad classes.

Land use characteristics that constitute hazards to flight and can cause or contribute an aircraft accident

Land use conditions can contribute to aircraft accidents. Protecting against potential conflicts is essential to airport safety. Land use conditions that are hazards to flight impact the viability of airport operations and limit the ability of an airport to operate as designed. Examples of the most prominent adverse land use conditions include tall structures, visual obstructions, electronic interference, and wildlife/bird attractants

Land use characteristics that can add to or limit the severity of aircraft accidents if they were to occur

The ideal circumstance for any airport is to maintain open lands in its immediate vicinity, particularly with respect to its runway ends. Open lands can serve two principle functions with respect to impacting the severity of an aircraft accident:

- Open land uses generally have few occupants, thus limiting the number of people potentially placed in harm's way; and
- Open land areas can potentially reduce the amount of aircraft damage and enhance the survivability for the occupants of an aircraft forced to make an emergency landing away from a runway.

If sufficiently large and clear of obstacles, open land areas can be valuable for aircraft anywhere near an airport. When open lands are not available, the two typical land use characteristics that can most significantly impact the severity of an aircraft incident or accident near an airport include high concentrations of people, and high-risk sensitive uses (e.g., schools, hospitals, etc.).

B.5.4 Implications and Recommendations for Front Range Airport

As noted in the previous section, the three most common airport land use compatibility issues experienced by airports throughout the United States are related to airport-related noise (particularly with respect to residential development areas), height-related issues of off-airport development, and preservation of appropriate land uses around the airport. In all three of these critical areas, Adams County has already established appropriate airport land use compatibility controls for Front Range Airport in the form of the following:

- Recognition, inclusion and integration of FTG into the Adams County Comprehensive Plan
- Establishment of an appropriate zoning district for FTG and the areas surrounding the Airport.
- Inclusion of an airport-related use category in the Adams County Zoning Use charts.
- Establishment of an Airport Influence Zone for FTG.
- Establishment of an Airport Noise Overlay for FTG.
- Establishment of an Airport Height Overlay for FTG.
- Maintaining a current Airport Master Plan.
- Maintaining a current Airport Layout Plan (ALP).

All these controls are consistent with best management practices as currently recognized by the FAA and the airport industry. These land use controls provide Adams County with a wide range of effective tools that will allow the County to ensure that Front Range Airport will not be constrained by non-compatible land uses into the future. Recommendations for Front Range Airport and Adams County would be simply to be diligent in monitoring current industry and federal best management practices for compatible airport land use development. This will be particularly important as the pace and range of development migrating east from the Denver metro area and DIA creates pressures on the Airport and County to adjust those controls based on individual requests and circumstances.

APPENDIX C - AIRPORT RECYCLING, REUSE, AND WASTE REDUCTION PLAN

C.1 Introduction

The Federal Aviation Administration (FAA) Modernization and Reform Act (FMRA) of 2012 was signed into law, which amended Title 49 of the United States Code. The law included several changes to the Airport Improvement Program (AIP), two of which relate to recycling, reuse, and waste reduction at airports. Section 132(b) of the FMRA expanded the definition of airport planning to include, "developing a plan for recycling and minimizing the generation of airport solid waste, consistent with applicable State and local recycling laws, including the cost of a waste audit." Section 133 of the FMRA added a provision requiring airports that have or plan to prepare a master plan, and that receive AIP funding for an eligible project, ensure that the new or updated master plan addresses issues relating to solid waste recycling at the Airport. This includes:

- The feasibility of solid waste recycling at the airport;
- Minimizing the generation of solid waste at the airport;
- Operation and maintenance requirements;
- Review of waste management contracts; and
- The potential for cost savings or the generation of revenue.

As defined by Congress, "recycling" refers to any program, practice, or opportunity to reduce the amount of waste disposed in a landfill. This includes reuse and waste reduction as well as the recycling of materials.

The FAA issued a memorandum on September 30, 2014, to provide guidance on preparing airport recycling, reuse, and waste reduction plans as an element of airport master plans, as well as within a sustainability document, or as a standalone document. The guidance is mandatory when preparing an airport master plan.

The purpose of this chapter is to review the current recycling, reuse, and waste program at Front Range Airport (FTG or the Airport), and to provide guidance on ways to reduce waste and improve recycling and reuse, in compliance with the FAA's guidance.

C.2 Airport Description and Background

FTG is a is a public-use, general aviation airport owned and operated by Adams County. As FTG's owner, the County is responsible for operating and maintaining the Airport in a safe condition, and leasing properties within the Airport boundary. Additional facility information is presented in **Chapter 2, Inventory**, of this Master Plan.

As noted in **Chapter 3, Aviation Activity and Forecasts**, the number of operations and based aircraft at FTG have fluctuated over the past ten years, with a significant drop followed by a significant recovery. The forecasts anticipate growth in activity in the future as well. FTG accommodates a variety of users, including military, business, recreation, flight training, and private operators.

C.3 Existing Waste Sources

The identification and evaluation of sources of waste at an airport can be complicated. There are numerous groups, agreements, operational styles, and collection/disposal processes that play into the overall generation of waste at a given airport. The three primary sources of waste at FTG are the airfield, the terminal building,

and hangars/tenants. The sources of waste, per the FAA's September 30, 2014 memo, can be further broken down by how much control the Airport has on the generation and disposal of waste. The three levels of control are:

1. Areas where the Airport has direct control of waste management (public space, office space, terminal building, airfield). These areas are controlled by the Airport and therefore could have recycling, reuse, and waste reduction programs introduced directly.
2. Areas where the Airport has no direct control, but can influence waste management (tenants). These are areas owned by FTG; however, they are leased out to tenants. The Airport can recommend that recycling, reuse, and waste reduction programs be used and can include language in the tenant contracts, but realistically can't completely control what is done.
3. Areas where the Airport has no control or influence over waste management. These are areas the Airport neither owns or leases (none of which are included in this appendix).

Table C-1 shows the identified areas of waste generation, what waste is generated, how the waste is collected, if any reduction and/or recycling programs are in place, and the Airport's level of control.

TABLE C-1 – WASTE GENERATION

Area	Waste Generated	Control
Area 1: Airfield	General debris found on airfield. Construction material (asphalt, concrete, wood, metal)	Direct Control
Area 2: Terminal Building	Plastic, glass, aluminum, oil, batteries, trash	Direct Control
Area 3: Hangars/Tenants	Plastic, glass, aluminum, oil, batteries, trash	No Direct Control, but can Influence

Source: Jviation, 2018

C.4 Local Recycling and Waste Management Programs

Adams County promotes recycling, reuse, and waste reduction through their Sustainable Adams County 2030 Plan.[1] This Plan outlines specific directions for the County to include the following Waste Management and Reduction and Conservation of Energy and Resources goals:

- Waste Management and Reduction
  - Reduce the amount of waste sent to the landfill through County operations by 30%
  - Ensure that all Adams County residents have access to recycling
- Conservation of Energy and Resources
  - Reduce the amount of energy consumed from non-renewable sources by County buildings per square foot by 25%
  - Support policies and provide incentives to reduce energy consumed from non-renewable resources by residential and commercial building throughout the County
  - Reduce the use of potable water at County buildings and parks by 30%
  - Support policies and provide incentives to reduce water used by residential and commercial building throughout the County

[1] http://www.adcogov.org/goals-and-targets

- Reduce fuel consumption from traditional resources in County fleet operations by 30% through increase efficiency and the use of alternative fuels
- Reduce vehicle miles traveled by employees for work purposes by 10%
- Increase number of residents with access to multi-modal transportation options with ¼ mile of their residence by 30%
- Increase number of total online revenue transactions for County services by 200%

To achieve these goals, Adams County offers numerous recycling locations and events throughout the County to give residents and businesses the opportunity to participate. This includes resources for recycling hard-to-recycle materials. Recycling guidelines can be found on the County's website: http://www.adcogov.org/recycling-guides.

In addition to recycling centers, five (5) landfills are available throughout Adams County for businesses and residents to dispose of materials that aren't recyclable or reusable.

C.5 Overview of Airport Recycling, Reuse, and Waste Management

Airports throughout the United States are "greening" their operations. Both the FAA and the U.S. Congress have directed airports to develop reuse, recycling, and waste management programs. Airports, other government agencies, and private companies have seen financial as well as environmental benefits from adopting environmentally sustainable practices, including recycling, reuse, and waste management programs. In response, airports have installed solar panels and energy-efficient light fixtures, use low-emission vehicles in their fleets, constructed LEED-certified[2] buildings, and have changed their waste management programs.

The U.S. Environmental Protection Agency (EPA) published a guide titled Developing and Implementing an Airport Recycling Program to help airport managers who want to create a more environmentally-friendly waste operation. The EPA hierarchy of waste management prioritizes source reduction, then reuse, recycling, and finally disposal in landfills. However, the EPA's guide focuses on recycling as a positive first step for airports to take as they conquer their waste issues.

Many commercial service and general aviation airports have adopted their own individual reuse, recycling, and waste management programs, in part because of their financial benefits, and because they reduce waste and energy usage. Yet as an entity within a larger governmental entity or agency (e.g., county, municipality, state, etc.), airports most often employ the recycling, reuse, and waste management programs that are in place throughout the larger government entity; this is also the case at FTG.

C.6 Recycling at FTG

The Airport does not currently have an established recycling program in the terminal building. According to Airport Management, the Airport would have to pay to have recyclables picked up due to its relatively remote location and have not yet found a cost-effective program to employ. However, the Airport is interested in pursuing a recyclable program and does participate in the County's Sustainable Adams County 2030 Plan.

Although the Airport is not actively recycling waste in the terminal, the Airport has implemented basic recycling and reuse strategies in construction and maintenance. These include the following:

- Reuse of asphalt millings for service roads and other projects.
- Collects and recycles (through a third party) waste oil.

[2] LEED = Leadership in Energy and Environmental Design

- Collects and recycles waste metal.

C.7 Plans to Minimize Waste Generation

Reasonable and applicable waste reduction strategies vary by airport size, location, and resource availability. FTG's location creates some limitations; however, the implementation of a few simple practices could significantly decrease the amount of waste generated at the Airport. This may include the following:

- Implement a basic recycling program for terminal/tenant waste.
- Provide adequate signage with recycling bins clearly showing type of materials accepted.
- Provide educational material to tenants and airport employees on what material should be recycled and the appropriate business contacts.
- Add recycling, reuse, and reduce waste objectives to future tenant leases.
- When feasible, purchase products made from recycled material and encourage tenants to do so as well.

The above-mentioned practices are relatively basic; however, the success of implementing a long-term recycling, reuse, and waste reduction program requires management buy-in, staff commitment, planning, and follow-up. **Figure C-1** outlines "10 Steps to Design and Implement an Effective Airport Recycling/Waste Minimization Program" as recommended by the FAA in their Recycling, Reuse and Waste Reduction at Airports – A Synthesis Document[3]. FTG should follow these steps when implementing their recycling program.

FIGURE C-1 - 10 STEPS TO DESIGN AND IMPLEMENT RECYCLING PROGRAM

10 Steps to Design and Implement an Effective Airport Recycling/Waste Minimization Program
1. Commitment from Management 2. Program Leadership 3. Waste Identification 4. Waste Collection and Hauler 5. Waste Management Plan Development 6. Education and Outreach 7. Monitor and Refine 8. Performance Monitoring 9. Promote Success 10. Continuous Improvements

Source: FAA, Recycling, Reuse and Waste Reduction at Airport – A Synthesis Document, 2013

C.8 Conclusion

With minimal effort and expense, FTG could implement some very basic procedures to create a simple yet effective program and reduce the amount of solid waste they generate. Through coordination with local entities, FTG could play a more active role in recycling, reusing, and reducing solid waste.

[3] FAA, Recycling, Reuse and Waste Reduction at Airport – A Synthesis Document, 2013